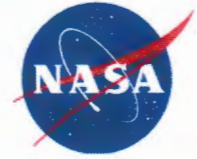


National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
White Sands Test Facility
P.O. Box 20
Las Cruces, NM 88004-0020



December 27, 2017

Reply to Attn of: RE-17-154

Mr. John E. Kieling, Chief
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505

Subject: NASA WSTF 400 Area Closure Investigation Report

Enclosed is the Investigation Report (IR) for the NASA WSTF 400 Area Closure Hazardous Waste Management Unit, which was prepared in accordance with the WSTF Hazardous Waste Permit and is consistent with the requirements of NMED's August 30, 2016 approval of NASA's 400 Area Investigation Abbreviated Drilling Work Plan and Notification of Field Work Commencement. The 400 Area investigation was performed in accordance with that abbreviated work plan and the initial 400 Area Closure Investigation Work Plan, submitted by NASA on June 27, 2011 and approved by NMED on November 8, 2011.

The Executive Summary for the IR is included as Enclosure 1. Bound paper copies of the IR (without appendices) are provided as Enclosure 2. Enclosure 3 provides an electronic version of the IR, Excel workbooks for Soil Analytical Results, Soil Vapor Analytical Results, and Groundwater Results, and Lab Reports on a DVD.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. If you have any questions or comments concerning this submittal, please contact Antonette Doherty at 575-524-5497.

Sincerely,

A handwritten signature in blue ink, appearing to read "A. Davis".

for Timothy J. Davis
Chief, Environmental Office

3 Enclosures

cc:

Mr. Gabriel Acevedo
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505

Executive Summary

The National Aeronautics and Space Administration (NASA) is required by the Hazardous Waste Permit (Permit; NMED, 2016b) issued by the New Mexico Environment Department (NMED) to investigate historical releases of hazardous waste or hazardous constituents from the former 400 Area Closure, a hazardous waste management unit (HWMU) at the Johnson Space Center (JSC) White Sands Test Facility (WSTF). The Permit requires that the investigation work plan (IWP) (NASA, 2011d) address investigation of contamination that has historically affected groundwater and that potentially is a source of on-going groundwater contamination. This Investigation Report (IR) addresses NASA's applicable regulatory requirements, describes the investigation activities, summarizes investigation results, provides an interpretation of the results, and presents conclusions and recommendations for future corrective actions at the 400 Area Closure.

Investigation activities were conducted at the 400 Area Closure beginning in September 2016 and continuing through September 2017. To determine the nature, extent and potential migration pathways of contaminant release from the HWMU the following actions were taken:

- A total of 15 borings were installed to various depths at locations upgradient from, co-located with, and downgradient from the former impoundments.
- During drilling, soil samples were collected for lithologic characterization, field screening for VOCs, and laboratory analysis for geotechnical parameters, COCs, and waste management requirements. Groundwater grab samples were collected from five borings for chemical analysis.
- Downhole video logs were performed in five of the borings to examine the lithology and search for locations where groundwater was entering the boring.
- Seven multiport soil vapor monitoring (MSVM) and eight multiport soil vapor and groundwater monitoring (MSVGM) wells were installed. MSVGM wells with adequate groundwater production were developed.
- The well locations and elevations were surveyed and the depth to groundwater below ground surface was measured in all MSVGM wells.
- Dedicated low-flow sampling pumps were installed in six of the MSVGM wells. Transducers were installed in three of the wells to compare changes in the potentiometric surface to precipitation events and water releases during 400 Area testing.
- Soil vapor and groundwater samples were collected and analyzed for COCs.
- Based on the lithologic characterization and the results of the field and laboratory analysis, maps and cross sections were produced illustrating the geology, hydrogeology, and distribution and concentration gradients of COCs in and adjacent to the 400 Area Closure.
- Based on the changes in potentiometric surface relative to natural (precipitation) and human caused ("Overboard" discharge from LASS testing) events, the relative influences of each at different points in the Closure were classified.
- All investigation-derived waste (IDW) was properly managed.

The drill cores indicated that unconsolidated alluvium overlays bedrock located 80 to 109 feet (ft) below ground surface (bgs). Bedrock consists of two units: a conglomerate consisting of a cemented alluvium, which is underlain by andesite (except in one boring, where the underlying unit is hornfels).

A total of 22 soil samples were analyzed for geotechnical parameters. The results indicated that virtually all the unconsolidated alluvium is a sandy, silty gravel and that the porosity ranges from 26 to 43 percent.

A total of 52 soil chemical sample sets were collected for chemical analysis, including six duplicate soil sample sets. Soil samples were analyzed by a National Environmental Laboratory Accreditation Program accredited laboratory for constituents of concern (COCs) that included volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs),

total metals, pesticides, herbicides, nitrate/nitrite, dioxins/furans, and chloride. As part of the performance acceptance criteria of the data quality objectives (DQOs), validated soil chemical analytical data were reviewed and compared to New Mexico residential and industrial soil screening levels (RSSLs, ISSLs, NMED, 2017e), in accordance with Attachment 15 of the Permit (NMED, 2016b). There were few COCs above applicable regulatory limits, but most of those were metals which are indigenous due to the upgradient presence of limestones injected with rhyolite to form high temperature skarn and polymetallic carbonate replacement deposits.

A total of 68 soil vapor samples were collected for laboratory analysis, including 17 duplicate samples. The relatively few COC detections exhibited a high correlation with their concentrations in the underlying groundwater. Off gassing from the dissolved phase is believed to be responsible for their presence in soil vapor.

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Based on the results of this investigation, NASA concludes that soil underlying and adjacent to the 400 Area Closures does not present a continuing source of contamination to groundwater or pose a threat to human health. VOC concentrations in soil vapor are below site-specific risk-based concentrations there is no pathway for vapor intrusion into buildings. NASA recommends no further investigation of the 400 Area vadose zone at this time, though further evaluations of data from the 300 and 400 Areas are advisable. NDMA concentrations in groundwater exceed the WSTF cleanup level. The 300 and 400 Areas are geographically contiguous, part of the same hydrologic unit, and received similar waste streams. NASA recommends a Corrective Measures Study encompassing both areas to determine if there are technically and financially feasible options for accelerating the ongoing natural decline in residual NDMA in the groundwater underlying these areas.



400 Area Closure Investigation Report

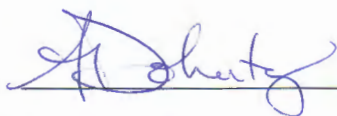
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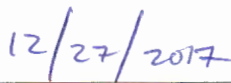
400 Area Closure Investigation Report

December 2017

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for Timothy J. Davis
Chief, Environmental Office



Date

National Aeronautics and Space Administration

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White Sands Test Facility
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List of Acronyms

µg	Microgram
µm	Micrometer
ADWP	Abbreviated Drilling Work Plan
amsl	Above Mean Sea Level
ASTM	American Society for Testing and Materials
bgs	Below Ground Surface
CAP	Corrective Action Process
CFR	Code of Federal Regulations
CMS	Corrective Measures Study
COC	Contaminant of Concern
COPC	Contaminants of Potential Concern
CWSSL	Construction Worker Soil Screening Level
DAF	Dilution Attenuation Factor
DMN	N-nitrodimethylamine
DOT	U.S. Department of Transportation
DQO	Data Quality Objectives
EPA	Environmental Protection Agency
ft	Foot/Feet
GMP	Groundwater Monitoring Plan
HIS	Historical Information Summary
HWB	Hazardous Waste Bureau
HWMU	Hazardous Waste Management Unit
ID	Inside Diameter
IDW	Investigation-Derived Waste
in.	Inch(es)
IPA	Isopropyl Alcohol
IR	Investigation Report
ISSL	Industrial Soil Screening Level
IWP	Investigation Work Plan
JSC	Johnson Space Center
kg	Kilogram
L	Liter
LASS	Large Altitude Steam System
lb	Pound(s)
m.y.	Million Year(s)
MCL	Maximum Contaminant Level
mg	Milligram
mi	Mile(s)
MPITS	Mid-Plume Interception and Treatment System
MSVGM	Multiport Soil Vapor and Groundwater Monitoring
MSVM	Multiport Soil Vapor Monitoring
NASA	National Aeronautics and Space Administration
ND	Not Detected
NDMA	N-nitrosodimethylamine
NLCID	No Longer Contained-In Determination
NMED	New Mexico Environment Department
NMGW	New Mexico Groundwater
NR	Not Read
NTU	Nephelometric Turbidity Unit

OD	Outside Diameter
OSHA	Occupational Safety and Health Administration
PCC	Post-Closure Care
PCE	Tetrachloroethene
pcf	Per Cubic Foot
PFTS	Plume Front Treatment System
pH	Potential of Hydrogen
PI	Pressure Indicator
PID	Photo Ionization Detector
PP	Project Plan
ppb	Parts per Billion
PPE	Personal Protective Equipment
ppm	Parts per Million
ppt	Parts Per Trillion
PVC	Polyvinyl Chloride
QA	Quality Assurance
QC	Quality Control
RBC	Risk-Based Concentration
RCRA	Resource Conservation and Recovery Act
RCS	Reaction Control System
RFI	RCRA Facility Investigation
RSL	Regional Screening Level
RSSL	Residential and Industrial Soil Screening Levels
SAM	San Andres Mountains
SASS	Small Altitude Steam System
SJDMB	Southern Jornada del Muerto Basin
SSHASP	Site-Specific Health and Safety Plan
SSL	Soil Screening Level
SVOC	Semi-volatile Organic Compound
SWMU	Solid Waste Management Unit
TCA	1,1,1-Trichloroethane
TCE	Trichloroethene
TS	Test Stand
USCS	United Soil Classification System
VISL	Vapor Intrusion Screening Level
VOC	Volatile Organic Compounds
WBFZ	Western Boundary Fault Zone
WSTF	White Sands Test Facility

1.0 Introduction

The NASA Johnson Space Center (JSC) White Sands Test Facility (WSTF) (Environmental Protection Agency [EPA] ID No. NM8800019434) has supported testing of space flight equipment and hazardous materials for over 50 years. As part of the WSTF Management Policy, NASA is committed to environmental stewardship of the state's resources and sustainability of NASA operations.

There are five closed Hazardous Waste Management Units (HWMUs) at WSTF. The five HWMUs, located in the 200 (2 units), 300, 400, and 600 Areas, were closed in 1989 and were previously managed under the NASA Post-Closure Care (PCC) Permit. The PCC Permit was integrated into NASA's Hazardous Waste Permit (Permit) which was renewed in 2009. The Investigation Work Plan (IWP) (NASA, 2011d) requirements for these closures are contained within the Permit (NMED, 2016b).

On August 2, 2016, NASA submitted the 400 Area Investigation Abbreviated Drilling Work Plan (ADWP; NASA, 2016a), which was approved by the New Mexico Environment Department (NMED) on August 30, 2016 (NMED, 2016a). The original schedule for submittal of the 400 Area Closure Investigation Report (IR) was 300 days after the start of fieldwork. Fieldwork involving drilling, well installations, and analytical sampling began on September 21, 2016. Due to complex drilling conditions and additional project scope recommended by NMED, the investigation fieldwork required three additional months. On May 10, 2017, NASA requested an extension of time for submittal of the 400 Area Investigation Report (NASA, 2017e) from the anticipated due date to October 17, 2017, which was approved by NMED on May 24, 2017 (NMED, 2017g). Frequent propulsion testing in the 400 Area and limited access to the groundwater and soil vapor sampling wells throughout July and August 2017 further delayed groundwater and soil vapor sampling activities by approximately two months. On September 25, 2017, NASA requested an additional extension of time for submittal of the 400 Area IR to December 29, 2017 (NASA, 2017h), which was approved by NMED on October 18, 2017 (NMED, 2017i).

This document presents the IR for the 400 Area Closure (Closure) HWMU located near the 400 Area Propulsion Test Facility. This document was prepared in accordance with the Permit (NMED, 2016b).

1.1 Facility Location and Description

WSTF is located in Doña Ana County, New Mexico, 18 miles (mi) northeast of Las Cruces, New Mexico, and 65 mi north of El Paso, Texas. Access to the site is provided via NASA Road, a paved road with a guarded security gate. NASA Road intersects U.S. Highway 70, 1 mi west of Organ, New Mexico. [Figure 1.1](#) provides a WSTF location map.

WSTF was constructed in 1964 at this remote location adjacent to the San Andres Mountains (SAM). The land occupied by WSTF is owned by the Department of the Army, and is used by NASA under a land use agreement with the Army. The primary activities at WSTF in support of the space program are:

- Development, qualification, refurbishment, and testing of spacecraft propulsion systems, subsystems, and ground support equipment.
- Investigation of flight hardware anomalies.
- Testing of materials and components.
- Performance of hazard and failure analyses.

Industrial areas of WSTF and general facilities within each are:

- 100 Area: Administrative offices, and firefighting, vehicle maintenance, warehousing facilities.

- 200 Area: Laboratories and clean rooms.
- 300 Area: Altitude chambers, engine test stands, and former wastewater treatment facilities.
- 400 Area: Altitude chamber, engine test stands, and former wastewater treatment facilities.
- 500 Area: Waste fuel treatment and storage.
- 600 Area: Groundwater supply wells, groundwater monitoring wells, and groundwater remediation systems.
- 800 Area: Hazardous fluids and materials test cells.

1.2 Regulatory Requirements

The Permit (NMED, 2016b) requires NASA to investigate and address historical releases of hazardous waste and hazardous constituents that may have occurred at sites throughout WSTF as part of the Recourse Conservation and Recovery Act (RCRA) Corrective Action Process (CAP). The CAP consists of investigation, characterization, and if necessary, cleanup. The principal components of the CAP are:

- RCRA Facility Assessment.
- RCRA Facility Investigation (RFI).
- Interim Corrective Measures (if necessary).
- Corrective Measures Study (if necessary).
- Corrective Measures Implementation (if necessary).

NASA is currently implementing Interim Corrective Measures to address groundwater contamination and is conducting RFIs for specific HWMUs and solid waste management units (SWMUs). Section V.B.6.c of the WSTF Hazardous Waste Permit (NMED, 2016b) requires that NASA conduct subsurface explorations at the 400 Area Closure to investigate contamination that has historically affected groundwater and that potentially is a source of ongoing groundwater contamination. Section VII.H.3 requires that the investigation results be documented in an investigation report.

The Permit states that NMED will require corrective measures if NMED determines, based upon investigation results and other relevant information available to NMED, that there has been a release of hazardous waste or hazardous constituents into the environment and that corrective action is necessary to protect human health or the environment from the release (NMED, 2016b, Section VII).

The Permit specifies the approach for identifying cleanup standards for soil and groundwater (NMED, 2016b, Attachment 15). Cleanup levels may be changed over time if underlying criteria such as allowable maximum contaminant levels (MCLs) or soil screening levels (SSLs) are revised. Cleanup levels are discussed in Section 5.0.

1.3 Purpose and Method of Investigation

The purpose of the 400 Area Closure investigation is to determine the nature and extent of potential contamination in the vadose zone from the HWMU and to establish if corrective action is necessary. During the investigation, NASA complied with applicable internal site procedures regarding: health and safety, investigation activities, soil vapor sampling, soil sampling, groundwater sampling, data management and quality control, as well as external federal (40 Code of Federal Regulations [CFR], RCRA, and Occupational Safety and Health Administration [OSHA], 2015) and New Mexico State regulations. Analytical samples for soil vapor, soil, and groundwater were shipped to the contracted

analytical laboratories and reports were delivered to NASA. Analytical results were assessed and compared with the applicable NMED screening levels to determine if corrective actions are required.

The scope of activities was developed based on project data quality objectives (DQOs) and other requirements of the Permit. The Permit allows for alternative methods to be proposed in the IWP for NMED review and approval. Initial deviations to the Permit sampling requirements were discussed in Appendix B of the NMED-approved IWP (NASA, 2011d). Section 5.0 of this IR discusses the DQO process.

1.4 Types of Results Presented in the Report

The following types of information are presented in this report.

- Investigation Activity Summary
 - Discussion of the scope of activities performed during this investigation, including the DQOs, the site conceptual model, summary of investigation activities. [Appendix A](#) contains photographs of the investigation.
 - Field investigation results, including surface and subsurface conditions, a discussion of the drilling program.
 - Evaluation criteria.
 - A summary and interpretation of investigation results including a comparison of detected contaminant concentrations to evaluation criteria and previous investigations, identification of potential receptors, evaluation of the vapor intrusion exposure pathway, conclusions, and recommendations.
- Soil and Bedrock Lithological Descriptions
 - Lithologic logs for borings that penetrated vadose zone alluvial deposits and bedrock. Some borings were advanced far enough beneath the potentiometric surface that groundwater monitoring wells could be installed. Lithologic logs are included in [Appendix B](#).
 - Lithologic logs contain location and installation information, photo ionization detector (PID) readings, types of soil samples with depths, United Soil Classification System (USCS) group, a lithologic description, depth to bedrock, and the total depth drilled for each soil boring.
- Soil Boring Chemical and Geotechnical Sampling
 - Soil analytical data summaries and contract laboratory analytical data reports for all soil samples collected.
 - Chemical analytical results for vadose zone soil samples and soil property testing results from geotechnical soil sampling.
- Well Installations
 - Multiport soil vapor monitoring (MSVM) and multiport soil vapor and groundwater monitoring (MSVGM) well completion diagrams containing location and installation information, well construction materials, annular completion materials and volumes, soil vapor sampling zones, groundwater sampling zones, and the total depth of the boring and the well.

- Soil Vapor Screening, Headspace, and Soil Vapor Sampling
 - Chemical analytical results for soil vapor samples collected from new MSVM and MSVGM well vapor ports.
- Groundwater Sampling
 - Chemical analytical results for groundwater samples collected from the new MSVGM wells.

2.0 Background

2.1 Facility Location and Historical Use

The 400 Area is located in Section 35 of Township 20 South, Range 3 East. Access to the 400 Area is via Road L that intersects with Apollo Blvd., the main thoroughfare at WSTF ([Figure 2.1](#)). The 400 Area is part of the Propulsion Test Department and supports the testing of rocket engines and fuels. Project activity declined with the retirement of the Space Shuttle Program.

2.2 Current and Former Structures in the 400 Area

Buildings and structures in the 400 Area are shown in [Figure 2.2](#). There are five test stands (TS; TS 401, TS 402, TS 403, TS 405, and TS 406), test stand support buildings, a Test Control Center, and several buildings used for staff offices. Detailed descriptions of the 400 Area Test Stands are provided in Appendix A of the 400 Area Historical Information Summary (HIS; NASA, 2011d). Large and small altitude steam systems in the 400 Area are used to evacuate the atmosphere from the test stands in order to create a partial vacuum that simulates high altitude conditions. The Small Altitude Steam System (SASS) uses boilers to run vacuum pumps and the Large Altitude Steam System (LASS) employs isopropyl alcohol (IPA)/liquid oxygen combustion, injectors and three rocket engines to create the partial vacuum. These steam systems are supported with diesel generators, above-ground IPA and diesel fuel tanks for the boilers, a water tank, as well as pretreatment system and discharge pond (salt ponds). The LASS, SASS, and discharge pond are managed in accordance with NMED-issued discharge permits, discussed in detail in Section 5.7 of the HIS (NASA, 2011d).

The 400 Area has a network of closed-loop piping systems for the pressurization, storage, and handling of large amounts of alcohol, liquid oxygen, nitrogen, and hypergolic propellants. These include two dump tank systems comprised of approximately 1,800-gallon tanks, one for nitrogen tetroxide (oxidizer) and one for hydrazine fuel (all tanks have secondary containment); a remote hydrazine fuel scrubber system; and a remote oxidizer burner and vent stack system. Additional buildings are used for the Ground Support Equipment Shelter, Minuteman/Peacekeeper Program, an employee break area, and a Gantry crane.

Although most of the facilities sit atop concrete surfaces, some dirt surfaces are present. There are both paved and unpaved service roads, and an employee parking lot. The test control and office buildings have heating/cooling systems and the area is serviced with potable water and sewer. Attachment 22 of the Permit identifies SWMUs (NMED, 2016b). The SWMUs in operation at the 400 Area ([Figure 2.3](#)) include: the oxidizer burner (SWMU 12), the salt ponds (SWMU 48) and the 400 Area Aspirator Discharge Pipe (SWMU 13). One HWMU, the impoundments/treatment tanks, was closed in 1989.

Prior to the activation of the WSTF sewer system, the 400 Area utilized three septic tanks. All three tanks have been excavated and removed in accordance with NMED Liquid Waste Program regulations. In accordance with NMED's approval with modifications (NMED, 2013), the tanks were inspected during removal. There was no evidence of leakage from the Main 400 Area tanks, Building 463, or Building 447

septic tanks. Tank condition was photographed immediately preceding and during removal. No further action (sampling or investigation) was required.

2.2.1 400 Area Test Stands

Facilities in the 400 Area were originally designed for testing the Apollo Lunar Module propulsion system. From 1965 through 1970, both ambient and vacuum tests were performed on Apollo test articles in TSs 401, 402, and 403. The transition from the Apollo to Shuttle eras began in 1970, and during this time, WSTF performed testing on a satellite booster engine in support of the National Space Development Agency of Japan and reaction control system (RCS) engines and propellant storage module for the Skylab project. From 1974 through 1977, WSTF expanded its capabilities and expertise by modifying and improving the propulsion test facilities to accommodate extensive testing of the Space Shuttle propulsion systems, including the Orbital Maneuvering System and RCS engines.

Space Shuttle testing continued over the next 30 years with the various test facilities often requiring extensive structural modifications and new construction. Vacuum TS 405 was constructed in 1986 to support RCS thruster testing of solid rocket motors of up to 25,000 pounds. A hypergolic propellant system and thrust mount were added to TS 405 in 1990 to support the Space Shuttle RCS thruster anomaly investigation and acceptance tests and development testing of the Space Station Freedom propulsion modules. TS 406 was constructed to test engines with a maximum thrust of 1,000 pounds. Its altitude-equivalent capability is greater than 100,000 feet (ft) for engine firing with the steam system and up to 250,000 ft for non-firing with vacuum pumps.

2.2.2 400 Area Impoundments

The 400 Area impoundments and treatment tanks became operational in 1965 as part of the 400 Area propulsion test facilities in support of the Apollo space program. They functioned primarily as an oxidation treatment system for discharges of hypergolic propellants in aqueous solution from the various testing programs conducted in the 400 Area test stands (NASA HIS, 2011b). Treatment consisted of neutralization with sodium hydroxide, oxidation with calcium hypochlorite trihydrate, and possibly aeration.

During the mid-1970s, both impoundments of the 400 Area waste management unit were refurbished with a 4- to 6-inch (in.) thick concrete cap due to the deterioration of the existing gunite cap. The impoundments' contents were discharged to the adjacent arroyo (to the northwest; [Figure 2.4](#)) following oxidation, neutralization, and aeration treatment. The concrete flume and piping originally directed fuel wastes to the impoundments and treatment tanks; however, in the mid-1980s the piping and delivery channels were modified to direct fuel wastes to the treatment tanks only. From that time, the impoundments were utilized only for emergency spill containment. The units were also originally designed to receive emergency dumps of nitrogen tetroxide, when spills or overflows of 400 Area oxidizer tanks occurred; however, the oxidizer piping lines were later rerouted to the propane burner.

The impoundments and tank system consisted of three interconnected reaction tanks constructed of reinforced concrete located between two concrete-lined surface impoundments. Each reaction tank system was capable of holding approximately 10,000 gallons. The impoundments measured approximately 140 ft x 80 ft x 7 ft deep and had a maximum capacity of approximately 400,000 gallons each.

2.3 Historical Industrial and Waste Disposal Activities in the 400 Area

Chemicals known to have been managed in the 400 Area during historical operations include uncombusted hydrazine; monomethyl hydrazine; unsymmetrical dimethylhydrazine; Aerozine 50 and

nitrogen tetroxide from static hot firing rocket engine tests; and, Freon^{®1} 11, Freon 21, Freon 113, and isopropyl alcohol which were used as referee propellants during early cold flow firings.

The practice of “discharge to grade” for waste water from the 400 Area impoundments is identified in several historical 400 Area documents (NASA 1986, 1996a). These documents describe the design of the impoundments with concrete bottoms to limit the infiltration of waste water to soil directly beneath, and indicate that the impoundments were operated essentially as temporary holding tanks. After treating the waste water with an oxidizer and neutralizing pH, it was released to the ground outside of the tanks. Soil directly beneath the impoundments would have been only minimally contaminated by leakage through cracks or other problems with the concrete liners. Final wastes were received at the impoundments on November 8, 1985 (NASA, 1986).

A separate HIS (NASA, 2011d) detailing the results of the historical research was submitted with the IWP (NASA, 2011d) as required by Permit Attachment 20 (NMED, 2016b).

2.3.1 Decommissioning and Closure of 400 Area Impoundments

NASA submitted a Closure and Post-Closure Care Plan to the NMED (formerly New Mexico Environmental Improvement Division) and EPA in August 1986 (NASA, 1986).

The 400 Area Closure is comprised of two adjacent 140 ft x 80 ft units (covering the former impoundments) located down topographic gradient (downgradient) and to the northwest of the 400 Area. An erosion-resistant hazardous waste Closure cap was designed and constructed for each unit between September 1988 and May 1989 to control the movement of water and vapor through the vadose zone below the site. The Closure caps were designed to prevent ponding and eventual infiltration of water by forcing runoff from the Closure area to the northwest (NASA, 1989a). To render the Closure caps incapable of holding water, a berm section at the lowest point within each impoundment was removed, thus directing the water out of the impoundments and into the existing concrete flume ([Figure 2.4](#)).

The original concrete treatment tanks were left in place and their tops sealed with concrete. Both impoundments had originally been gunite-lined. During Closure cap construction, construction joints and cracks in the concrete were saw-cut and sealed with a Chevron Industrial Membrane and the cracks with THIOKOL^{®2} Polysulfide Polymer joint sealer. A polymer modified high float (asphalt) emulsion was applied over the bottom and sides of both the east and west impoundments and flume (NASA, 1988). A 6-in. thick layer of sand overlies the asphalt and a 7-in. thick layer of ¾-in. top size graded rock drainage layer overlies the sand. A 3-in. thick erosion layer of 1½-in. top size crushed rock caps the drainage layer.

The original impoundments’ waste water inlets are sealed to ensure that drainage water does not enter the Closure. Surface runoff from precipitation is re-routed around the Closure by an underground 1-ft diameter polyvinyl chloride (PVC) pipe that discharges at a point beyond the western edge of the Closure into a 20-footlong section of riprap. A concrete wingwall exists to prevent erosion of the pipe inlet area.

Spillways in the breached berms allow rainfall to discharge into the existing concrete flume to the northwest. The spillways are constructed of poured concrete with pneumatically-emplaced concrete on the side slopes to minimize erosion. Each spillway section is covered with asphalt emulsion, the drainage layer, erosion layer, and retention structure. Retention structures on the spillway sections help retain the granular drainage layer material in place.

¹ Freon is a registered trademark of The Chemours Company CF, LLC.

² THIOKOL is a registered trademark of Morton International, Inc.

In 2007, NASA constructed diversion structures for the 400 Area Closure to prevent stormwater from flowing onto the Closure caps. The objective of that construction project was to minimize the possibility of stormwater and sediment from flowing or seeping into the existing 400 Area Closures. Stormwater diversion curbs (8 in. wide by 12 in. high, with 12-in. to 18-in. footings) were installed along the perimeter of Closure caps. The design also included repairing spalled (degradation caused by high temperature) concrete in the Closure caps, grading and shaping the landscape to divert storm water runoff and sediment away from the caps, and installing gabions to prevent gravel from being washed out of the caps.

2.4 Previous Investigations and Post-Closure Monitoring

In August of 1986, NASA submitted the Closure and Post-Closure Care Plan for the 400 Area to the NMED (formerly NMEID) (NASA, 1986). In it, procedures were outlined for achieving final closure of the 400 Area HWMU and providing post-closure care for those units once closure is completed. Final engineering designs and specifications to meet closure were deemed dependent on assessments of the magnitude and areal extent of potential contamination. The 400 Area Contamination Assessment program was submitted concurrently with the Closure and Post-Closure Care Plan. The assessment program provided the initial approach for evaluating potential contamination of the soils and groundwater of the 400 Area and resulted in the investigations that followed (NASA, 1986).

2.4.1 Soil Investigation

A soil boring investigation was conducted in the vicinity of the 400 Area Closure in 1987. A total of 12 soil borings were installed around the perimeter of the impoundments and in the arroyo below the impoundments. Results were summarized in the RCRA Facility Investigation (NASA, 1996b) and identified Freon 11 and Freon 113 as soil contaminants. Both analytes were observed at trace levels marginally above detection limits and three to four orders less than RCRA action levels. One detection of the semi-volatile organic compound (SVOC) hydrazine was reported at a depth of 1 ft adjacent to the west impoundment. The concentration of hydrazine in the sample at 0.1 parts per million (ppm) was very close to the detection limit of 0.05 ppm. All metal detections were believed to be representative of native background soil conditions.

2.4.2 Shallow Soil Vapor Investigation

A shallow soil vapor investigation conducted across WSTF during 1986 included the 400 Area. This investigation was performed prior to the installation of the closure cap in 1989. A complete description of this investigation is presented in *Shallow Soil Gas Investigation at NASA-Johnson Space Center White Sands Test Facility, Final Report* (NASA, 1989b). Soil vapor samples were collected by hydraulically driving a 0.75-in. diameter hollow galvanized steel probe to an average depth of 2.5 ft and evacuating 5-10 liters of soil vapor with a vacuum pump. During evacuation of soil vapor from the shallow subsurface, vapor samples were obtained by inserting a hypodermic needle through a section of silicone rubber tubing connecting the soil probe and the vacuum pump. A mobile field laboratory was equipped with two vapor chromatographs with electron capture detectors and two computing integrators. Detection limits for soil vapor contaminants ranged from 0.00002 to 0.2 micrograms per liter ($\mu\text{g/L}$) for the electron capture detectors (injection volume and detector sensitivity affect the detection limits for a given compound).

Soil vapor samples were collected at 95 point locations in the vicinity of the 400 Area HWMU. Analysis of soil vapor in and around the 400 Area revealed low concentrations of Freon 113, 1,1,1 trichloroethane (TCA), trichloroethene (TCE), and IPA in the shallow unsaturated zone. The Freon 113 concentrations in soil vapor reported from the mid-1980s were significantly higher than in the upgradient 300 Area, suggesting that more significant concentrations of the compound were released within the 400 Area. Low

concentrations of Freon 113 were also detected in groundwater monitoring wells within the 400 Area (NASA, 1986).

2.4.3 Soil Vapor Monitoring Well Investigation

In 1987, four soil vapor monitor wells (400-SGW-1, 400-SGW-2, 400-SGW-3 and 400-SGW-4) were installed above the saturated zone immediately downgradient of the 400 Area Impoundments. The soil vapor wells were drilled using a two-stage drilling process. The first stage used a standard drill bit and a bentonite-mud drilling fluid to drill to the top of the desired sampling interval. The second stage utilized dry drilling (no drilling fluids) with a push tube sampler that collected soil samples within the desired completion interval. The top of the 5-ft continuous slot well screens were set at 42 ft, 65.5 ft, 88 ft, and 110 ft below grade. Monthly soil vapor samples were collected from each well for a period of nine months using a similar sampling method as described above (NASA, 1990).

2.4.4 Groundwater Investigation

Prior to approval of NASA's Groundwater Monitoring Plan (GMP; NASA, 2010) site-wide groundwater monitoring and sampling was conducted in accordance with the WSTF Post-Closure Care (PCC) GMP and the RFI GMP. NASA routinely collected PCC and RFI groundwater samples for the analysis of the following primary constituents: halogenated volatile organic compounds; volatile organic compounds (VOCs); N-nitrosodimethylamine (NDMA), N-nitrodimethylamine (DMN), and bromacil; several semi-volatile constituents; total phenolics; sulfide; dioxins and furans; and metals. The current NMED-approved GMP identifies the specific samples that are collected at each groundwater monitoring well at WSTF (NASA, 2017f). In addition to WSTF's routine groundwater samples, samples for other chemical analyses are frequently collected at many of the groundwater monitoring wells.

2.5 Nature and Extent of Contamination

Construction of the 400 Propulsion Test Area was completed in November 1965. Detailed background information on the 400 Area environmental setting, a description of the investigation site, history of operations, historical waste management/disposal practices, and previous investigations conducted at the site were presented in the 400 Area HIS and IWP (NASA, 2011d). The known operational history, results of the previous site investigations, and results from the ongoing groundwater monitoring were used to develop the list of COPCs for the 400 Area (NASA, 2011d) as required by Permit Attachment 20 (NMED, 2016b).

2.5.1 Nature of Contaminants

The list of COPCs associated with the 400 Area include chemicals and wastes known to have been released and contaminants that were detected during previous soil, soil vapor, and groundwater investigations ([Table 2.1](#)). The only screening that was applied to the review of COPCs was to exclude inorganic analytes considered to be essential nutrients (e.g., magnesium, potassium, iron, sodium, and fluoride).

Calcium and chloride were retained based on the past use of calcium hypochlorite trihydrate to oxidize hydrazine fuels. However, these analytes are nontoxic and are being analyzed only for informational purposes. For example, the presence of high levels of chloride could impact the selection of construction materials for a potential future remediation system as chloride enhances the corrosion of stainless steel. Hexavalent chromium was not historically used for operations in the 400 Area, however, it was retained as a COPC as required by the Permit Section V.B.6.c.iii. Contaminants that have been consistently and reliably detected in the groundwater during historical RFI and PCC sampling at 400 Area groundwater

monitoring wells are identified as COPCs for the vadose zone investigation. Although many of the COPCs are not contaminants of concern for groundwater, they are of interest for the vadose zone because of the potential for them to exist at significant levels in the soil above the water table.

2.5.2 Waste in the 400 Area Closure

Past releases of waste water potentially containing contaminants have been specifically targeted by previous vadose zone investigations at the 400 Area Closure, including the installation of conventional monitoring Wells NASA 6 and NASA 9 (1985), a shallow soil gas investigation (1986), shallow soil boring investigation (1987), soil gas well investigation (1989), and the installation of Westbay^{®3} multi-port well 400-D (1995). The shallow soil gas investigation included the installation and sampling of 95 shallow soil gas points to a depth of 5 ft in the area immediately surrounding the Closure. Four historical soil borings were completed as soil gas wells (400-SG-1 through 400-SG-4) downgradient of the west toe of the Closures within the arroyo where discharges to grade are believed to have occurred. The soil gas wells were installed adjacent to the west toe of the Closure to provide a vertical profile of the vadose zone. Groundwater monitoring wells profile groundwater downgradient of the Closure. The remaining historical soil borings surround the Closure on the north, south, east, and west sides in areas that are difficult to access with a drilling rig. Past releases in the 400 Area have been explored in some detail by the aforementioned investigations with the results discussed in the individual investigation reports. A summary is provided in the Draft RCRA Facility Investigation Report (NASA, 1996b).

2.5.3 Vadose Zone Contamination

Alluvium in the vadose zone below the 400 Area Closure comprises Quaternary to Tertiary intercalated fan, interfan valley and erosion surface veneer deposits derived from the southern SAM from Bear Canyon, the mouth of which lies approximately 1 mi to the east northeast of the 400 Area. The heterogeneous alluvial soil lithologies in the vadose zone have porosities that range between 26 and 43% based on geotechnical (physical property) soil samples collected for this investigations and consist of unconsolidated to moderately cemented, poorly to moderately sorted, pebble to boulder gravels with interbedded lenticular sandy gravels, and sandy silts. At depth above bedrock, the gravels typically become cemented and indurated, which is inferred to be in part due to the flow of water along the bedrock-alluvial interface.

The upper 80 to 120 ft of the vadose zone (thickening to the west) is comprised of unconsolidated and relatively poorly sorted alluvial gravels. At greater depth, the alluvium becomes coarser-grained and is consolidated to cemented. The clast fraction of this unit consists primarily of limestone, mudstone, siltstone, granite, and quartzite clasts. A well-cemented horizon identified in the deep alluvial section above bedrock varies between 1 to 50 ft in thickness. The potential for the presence of subsurface barriers to contaminant migration (either advective or gaseous diffusion) in the unconsolidated alluvium is low based on depositional method (alluvial fan) and lithologic observations of previous borings. The cemented alluvial conglomerate at depth is a potentially more significant barrier. Historical monthly soil vapor data collected following the installation of soil vapor wells on the northwest edge of the Closure did not suggest significant soil vapor migration barriers (NASA, 1990). Analytical results from the Phase I soil boring investigation in the 400 Area (January 1987) indicated traces of Freon 11 and Freon 113 which showed high variability with depth and location. A minor correlation with lithology was noted. Relatively higher levels were reported from lithologic horizons containing greater proportions of clay and silt fines.

³ Westbay is a registered trademark of Nova Metrix Ground Monitoring (Canada) Ltd.

2.5.4 Groundwater Contamination

Active groundwater monitoring wells in the 400 Area comprise conventional well and multiport well zones. Routine groundwater monitoring is performed in accordance with the NMED Hazardous Waste Permit (NMED, 2016b) and the GMP (NASA, 2017f). Historical information is available from seven groundwater monitoring wells located downgradient of the 400 Area closure (400-A-151, 400-C-118, 400-C-143, 400-D, BW-1-268, NASA 6, and NASA 9). With the exception of deep multiport well 400-D, these wells are screened in cemented alluvium near or above the andesite bedrock surface located at 145 ft below ground surface (bgs) near the toe of the 400 Area Closure. The groundwater elevation in the 400 Area is approximately 130 ft bgs. There are two general trends that have been observed during groundwater recharge events and/or test stands water releases:

- Wells that exhibit relatively stable contaminant concentrations (400-A-151, 400-C-118, 400-C-143, 400-D); and,
- Wells that exhibit more irregular fluctuating contaminant concentrations (NASA 6 and NASA 9).

The wells with more stable concentrations are located away from the toe of the 400 Area closure and the axis of the 400 Area arroyo or are located near the toe of the closure but screened at depth within andesite bedrock. The wells that exhibit fluctuating concentrations show varying levels of increased contamination that is generally dependent on proximity to the 400 Area Closure or the adjacent arroyo.

Beneath the 400 Area Closure, the top of groundwater is hosted within a cemented alluvial unit. The potentiometric surface is typically between 5 ft and 20 ft above the contact of the cemented alluvium with the underlying andesite bedrock unit. Historical information from a continuous water level recorder installed downgradient of the 400 Area in well NASA 1 from February 1989 to August 1997 indicated irregular fluctuations related to significant precipitation recharge events (affecting the groundwater table elevation throughout the 400 Area) and test water releases (primarily affecting the groundwater elevation at the concrete flume discharge near the toe of the closure). These events temporarily increased the local water table elevation for wells within the 400 Area arroyo by up to 8 ft over a period of a few hours to a few days. Elevated groundwater in the 400 Area is believed to have leached residual NDMA, Freon 113, and Freon 11 contamination from the vadose zone in the vicinity of the Closure cells increasing the concentrations of these contaminants in wells NASA 6 and NASA 9. This was particularly apparent in the November through December timeframe in 1995 during Cassini testing activities that resulted in continuous flow and standing water in the arroyo near well NASA 9 (NASA, 1996a). Grading of the area was subsequently performed to reduce any ponding, and a steel culvert extension was installed at the base of the concrete flume. The culvert successfully precluded the infiltration of test water in this area, which suppressed and stabilized the water table elevation and groundwater contaminant concentrations.

2.6 Site Wide Health Risk Screening

Analytical results from investigation samples were compared with various site-specific risk based concentrations (RBCs), NMED soil screening levels (SSLs) and vapor intrusion screening levels (VISLs), NMED-approved groundwater cleanup levels, and EPA Regional Screening Levels (RSLs) as detailed in Section 4.0. These comparisons were performed to provide additional information regarding impacts to site soil, soil vapor and groundwater, identify areas of potential concern, and assist in determination of subsequent actions. Application for site closure is inappropriate at this time, therefore a formal risk screening was not performed.

3.0 Environmental Setting

3.1 WSTF Environmental Setting

3.1.1 Facility Geography, Climate, and Ecology

WSTF occupies over 60,000 acres across the southern SAM, one of the most prominent north-south trending mountain ranges in southwestern New Mexico. The SAM is a typical uplifted and tilted fault block separated by broad intermontaine basins characteristic of the Basin and Range province of the southwestern United States.

The industrial area at WSTF is located at the base of the western (dip slope) flank of the southern SAM on a pediment mantled by dissected alluvial fans. The major alluvial fan systems originate from Bear Canyon just north of the WSTF industrial area and Loman Canyon at the south end of the industrial area.

Numerous well developed arroyos are present but often hidden from sight within the low profile topography and vegetation. The arroyos flow only during periods of heavy rainfall, most commonly during summer monsoons. Surface water (when present) flows in a westward direction towards the Southern Jornada del Muerto Basin (SJDMB). The alluvial fans are typically 4,800 to 5,000 ft above mean sea level (amsl), are moderately sloping (3 to 4%), and consist of unconsolidated alluvium covering limestone and volcanic bedrock.

The industrial area is bordered on the west by a broad sloping plain that extends into the SJDMB. The western side of the SJDMB is bounded by the Doña Ana Mountains, located about 8 mi west of the industrial area ([Figure 1.1](#)). The elevation of the adjacent plains is about 4,000 ft above mean sea level.

WSTF is located in the Chihuahuan Desert. The desert climate is characterized by abundant sunshine, low humidity, low annual rainfall, and a large diurnal temperature variation. The mountainous terrain west of southern New Mexico influences the climate by blocking the incursion of moisture-laden air from the Pacific Ocean.

Biotic resources at WSTF are typical of those found in the arid southwest, and are characterized by a relatively low biodiversity in plant and animal species. Major vegetation at WSTF includes a combination of woody shrubs and grasses characteristic of the Chihuahuan Desert Shrub Biotic Community. These shrubs include Louisiana White Sage, Creosote Bush, Honey Mesquite, Tarbush, Broom Snakeweed, and Lotebush. Common grasses include Alkali Sacaton, Side-Oats Grama, Fluff Grass, Tobosa Grass, and Purple Three Awn. The variety of plant species is low relative to that in better drained upland slopes to the east that receive higher annual rainfall. Shrubs provide a microhabitat for warm season grasses and herptiles.

WSTF is considered to be a low affectability area. A 1996 biological survey concluded that “no critical habitat to the survival or reproduction of any listed species of plant or animal was observed on or in the immediate vicinity of the WSTF property.” The results were published in *Threatened and Endangered Species Survey of the National Aeronautics and Space Administration’s White Sands Test Facility, New Mexico* (Sullivan and Houde-Nethers, 1996). The majority of WSTF is considered to be of moderate or low ecological sensitivity as defined by the 1996 study.

3.1.2 WSTF Geology

WSTF is located in the Mexican Highland Section of the Basin and Range Province and in the center of the Rio Grande Rift Zone. North-trending mountain ranges and intermountain basins characterize the Rift

Zone, which extends from southern Colorado to northern Mexico. These features form when an underlying, linear heat source causes the earth's crust to rise and stretch. Eventually listric faults develop in the brittle upper crust and as the footwall subsides the hanging wall is exposed. This is the case with the steep eastern face of the SAM overlooking the Tularosa Basin. Often during faulting the hanging wall block dips gently away from the listric fault. This is also the case with the SAM.

The operational areas at WSTF are located along the western flank of the SAM, where the dipping sedimentary bedrock and intrusive rhyolites give way to alluvial fan deposits that slope towards the SJDMB. The uppermost alluvial deposits upon which the WSTF industrial area is located consist of silt, sand, gravel, boulders, and conglomerates. Locally these are cemented with calcium carbonate to form caliche. The alluvial deposits range from 0 to 200 ft thick adjacent to the SAM and gradually thicken to the west until they reach the Western Boundary Fault Zone (WBFZ) approximately 3 mi west of the Industrial Area. The WBFZ is a down-to-the-west extensile fault with more than 2,000 ft of offset. At that point the alluvium abruptly thickens to >2,500 ft thick at the eastern edge of the SJDMB.

3.1.3 WSTF Hydrogeology

The primary water supply within the SJDMB for potable, industrial (including WSTF), and agricultural use is from underground water resources within the regional aquifer. The SJDMB represents a closed basin separated from the adjacent Tularosa Basin to the east by the SAM, and Rio Grande basin to the west by the Dona Ana Mountains. The two mountain ranges represent faulted horst blocks separating the downfaulted basins that serve to isolate the SJDMB aquifer from the adjacent basins and allow only minimal groundwater intercommunication.

Recharge of the SJDMB aquifer occurs primarily from groundwater originating as mountain-front precipitation on the adjacent SAM. Precipitation averages approximately 10 in. per year within the SAM (Jornada, n.d.), occurring primarily within the monsoon months of June through September. Storm runoff recharges the aquifer by infiltrating into the unconsolidated alluvium and fractures in the underlying bedrock.

Up to 75% of total rainfall may flow across the site as surface runoff during flash floods. This is exacerbated by the reduced soil infiltration capacity common to soils in arid climates. The remainder rapidly infiltrates into the alluvium due to high soil porosities of up to 40%.

Groundwater in the fractured bedrock aquifer beneath WSTF generally migrates westward from the recharge areas near the SAM into the thick basin-fill alluvial deposits of the SJDMB. The average hydraulic conductivity of the cemented alluvium and volcanic rocks that host the aquifer in the WSTF industrial area range between 10⁻⁴ to 10⁻⁹ ft/sec. The fracture porosity is estimated at approximately five percent for limestone and two percent for andesite. The hydraulic gradient in the volcanic bedrock is relatively steep at approximately 0.05 ft/ft (NASA, 1996b, Volume Two, Chapter Four). In the alluvial aquifer matrix of the SJDMB the gradient is only one-tenth as steep.

3.2 400 Area Environmental Setting

3.2.1 Geology

Soil in the vicinity of the 400 Area belong to the Tencee-Nickel Association. These soils comprise shallow to deep well-drained soils, which formed in calcareous gravelly loamy alluvial sediments on old alluvial fans. The upper to 100 ft of the vadose zone is comprised of unconsolidated and relatively fine-grained alluvium. Alluvium in the vadose zone below the 400 Area Closure comprises Quaternary to

Tertiary intercalated fan, interfan valley and erosion surface veneer deposits derived from the SAM from Bear Canyon to the east northeast of the 400 Area.

The alluvium becomes coarser-grained with depth and becomes more consolidated in the deep alluvial section. The coarse fraction of this unit consists primarily of limestone, dolomite, and quartzite clasts. Bedrock in the 400 Area is encountered at depths of approximately 100 to 120 ft bgs. The uppermost well-cemented Tertiary alluvial bedrock forms a veneer on top of volcanic bedrock. The cemented alluvium varies in thickness from approximately 1 ft (east) up to 50 ft (west) down topographic gradient across the 400 Area, most significantly across normal half graben faults in the volcanic basement. The volcanic basement comprises the Tertiary Orejon andesite of Seager (1981), which is locally hornfelsed in response to contact metamorphism.

Prior to beginning this investigation, it was believed that the top of bedrock was approximately 145 ft bgs. (ADWP, NASA, 2016a). It was also believed that Tertiary andesite was the only bedrock unit present and that unconsolidated alluvium rested directly on top of it. Based on the elevation of the potentiometric surface in existing wells, it was believed that the upper portion of the groundwater resided in the lower portion of the unconsolidated alluvium.

Two areas of faulting were inferred to exist beneath the 400 Area:

1. A fault striking north-south located east of the 400 area impoundments and beneath the operational buildings of the 400 Area Propulsion Facility. This fault was hypothesized based on cross-sections from Post Closure Care reports (NASA, 2009) to help account for the decline in the elevation of bedrock between the 300 and 400 Areas.
2. A north-south striking set of normal fault located adjacent to and west of the 400 Area Closure. These faults were hypothesized based on the geophysical studies performed by Reynolds (1988) and Maciejewski (1996; [Figure 2.4](#)).

The faults were perpendicular to the slope of the potentiometric surface. It was not known if the faults had any influence on the migration of groundwater and dissolved phase COCs.

3.2.2 400 Area Hydrogeology

Groundwater beneath the 400 Area primarily originates from recharge in the Bear Canyon catchment area of the southern SAM. Under the effect of a steep hydraulic gradient of approximately 0.05 ft/ft, groundwater recharge infiltrates through the porous alluvium to the bedrock surface, and subsequently into fractures in the cemented alluvium (conglomerate) and andesite bedrock in the 400 Area. In the absence of secondary porosity (fractures) the conglomerate and underlying andesite are very well indurated, dense and not conducive to groundwater flow. The hydraulic gradient moves groundwater to the west, potentially following subtle depressions in lower conductivity bedrock that act as preferred pathways from the SAM towards the SJDMB. In the 400 Area, a subtle depression in bedrock appears to be approximately coincident and directly below the location of the 300/400 Area arroyo (Section 11.4).

Prior to the drilling and well completions of the current investigation, the uppermost groundwater was believed to be hosted in the unconsolidated alluvium above andesite bedrock under unconfined conditions. As a result of the fieldwork, the hydrogeologic understanding of the 400 Area has been refined and groundwater is now known to be hosted under semiconfined to confined conditions in fractures in bedrock (conglomerate and andesite) underlying the unconsolidated alluvium. A more thorough discussion of the results of the current investigation as they relate to hydrogeology is presented in Section 7.6.

4.0 Data Quality Objectives

The investigation methodology was developed based on guidance from Systematic Planning Using the Data Quality Objectives Process (EPA, 2006), the 400 Area IWP (NASA, 2011), and the 400 Area Corrective Action Requirements of the Permit (NMED, 2016; Section V.B.6.c). The data acquisition plan (i.e., sampling design) is based on the DQO process.

4.1 Problems and Objectives

In accordance with the 400 Area Closure IWP (NASA, 2011d), the problem statement summarized in the Permit (NMED, 2016; Section V.B.6.a.i) states that the IWP (NASA, 2011d) shall address investigation of contamination that was historically released to the subsurface and that potentially is a source of on-going groundwater contamination. The primary decision is whether additional corrective actions are warranted for the 400 Area Closure due to the presence of a residual contamination source or sources. Alternative actions for the decisions include:

- Consider a “Corrective Action Complete” status determination.
- If needed, perform a corrective measures evaluation to identify remedial options for mitigation of source(s) of continuing contamination or human health risk.

4.2 Information Inputs

Concentrations of contaminants of concern (COCs) measured in vadose zone soil, soil vapor, and groundwater are primary inputs to the decision. COCs for this investigation have been identified using two primary information sources:

- Detailed information pertinent to the operational history and use of chemicals documented in the 400 Area HIS (NASA, 2011d) through a variety of historical documents and reports, personnel interviews, and personnel questionnaires.
- Comprehensive analytical data sets for samples collected from previous 400 Area investigations that include soil, soil vapor, and groundwater. Analytical methods selected for this investigation will be used to quantify COC concentrations at or below NMED soil screening levels whenever possible (NMED, 2017a).

4.3 Spatial Extent of Investigation

This investigation addresses and is limited to the vadose zone (i.e., the unsaturated area between ground surface and the water table) and groundwater beneath and immediately surrounding the 400 Area Closure HWMU and adjacent areas. Information acquired during the performance of this investigation will be evaluated in conjunction with existing data derived from previous investigations that include groundwater monitoring well analytical results.

4.4 Performance or Acceptance Criteria

The purpose of this investigation is to measure vadose zone and groundwater contamination within the area of 400 Area Closure and to determine if observed concentrations exceed levels of concern. The associated strategy was to comprehensively address the Closure and adjacent areas, with a focus on the locations known to have the greatest potential for contamination (i.e., the former impoundments and the adjacent arroyo).

Project DQOs are summarized as follows: If COC concentrations in vadose zone soils exceed the screening level as described in Permit Attachment 15 for direct exposure routes under the residential, industrial/occupational and construction worker exposure scenarios, then move to the corrective measures evaluation phase. Otherwise, consider a “Corrective Action Complete.”

5.0 Site Conceptual Model

5.1 Preliminary Site Conceptual Exposure Model

A preliminary Site Conceptual Exposure Model was developed ([Figure 5.1](#)) to provide an understanding of the potential for exposure to hazardous contaminants at the site based on the source of contamination, the release mechanism, the exposure pathway, and the potential receptor(s). Exposure scenarios for soils are defined in the NMED’s Risk Assessment Guidance for Site Investigations and Remediation (NMED, 2017a) and include:

1. Residential – soils from 0 to 10 ft bgs;
2. Commercial/Industrial Worker – soils from 0 to 1 ft bgs;
3. Construction Worker – soils from 0 to 10 ft bgs;
4. Vapor Intrusion – depth of maximum detection;
5. Ecological Receptors (non-burrowing) – soils from 0 to 1 ft bgs, and;
6. Ecological Receptors (burrowing) – soils from 0 to 10 ft bgs.

The original 400 Area waste water impoundments are considered the primary source. They are identified as a “Surface Impoundment.” Secondary sources are identified as: 1) groundwater that was directly impacted by releases of waste water during historic operations; 2) subsurface soils beneath the impoundments that may have been contaminated with the waste from the impoundments; 3) surface soil or exposed subsurface soil outside of the impoundments that was commingled or in contact with the waste from the impoundments, including soil and sediment in swales, drainage ditches, and runoff areas (i.e., the arroyo); and, 4) airborne particulates/dust or gaseous materials originating from the impoundments before they were closed.

Six release mechanisms are identified within the SCEM as follows:

1. Hydraulic Pressure. This release mechanism is most applicable to sources that had inadequate containment systems or poor integrity. Hazardous substances and their constituents may have leaked from the unit to the soils beneath or downhill from the source. Under this release mechanism, the mass of the hazardous substances is pulled by gravity toward the subsurface strata through the path of least resistance.
2. Leaching. This release mechanism refers to the movement of soluble chemicals via infiltration into subsurface soils. As a result of waste water, precipitation, or storm runoff, leaching action removes the hazardous substances and their constituents from the source. This release mechanism could be viewed as the combined mechanisms of gravitational force, hydraulic pressure, and solubility. Leaching also serves as a migration pathway that transports the released hazardous substances and their constituents to other media or locations.
3. Runoff. This release mechanism refers to the physical force, posed by surface water moving downstream, that removes the hazardous substances and their constituents from the source. Runoff occurs when the rate of water interception is greater than the infiltration capacity of the medium. Runoff also serves as a migration pathway that transports released hazardous substances and their constituents to other media or locations. Runoff action is applicable to areas with

measurable topographic relief, and is a predominant cause of release of hazardous substances in contaminated soils along channels or arroyos.

4. Digging. This mechanism refers to human activities that cause the hazardous substance or their constituents to be exposed. Construction activities that entail soil or sediment excavation are examples of this release mechanism.
5. Volatilization. This release mechanism is dependent on the chemical characteristics of the hazardous substance (i.e., molecular weight, vapor pressure, Henry's Law constant, boiling point, etc.), ambient temperature, and wind velocity or air movement. Under this release mechanism, the hazardous substances or their constituents are released from the matrix surfaces (solid or liquid) into air (pores in soil or the ambient air). This release mechanism is most applicable to VOCs and, to a lesser extent, semi-volatile organic chemicals.
6. Wind Erosion. This release mechanism refers to the frictional force, posed by air movement near the earth surface that removes the hazardous substances and their constituents from the source to air. Under this release mechanism, the hazardous substances or their constituents are released from the matrix surface into air. This release mechanism is most applicable to metals and semi-volatile organic chemicals in dry and dusty environments.

Four potential exposure pathways are identified: 1) ingestion of groundwater; 2) incidental ingestion of soil; 3) inhalation of volatile contaminants or particulate emissions (dust); and, 4) dermal contact with soil.

Groundwater use is identified as a potential route of exposure. The shallow groundwater aquifers at WSTF host a sizeable contaminant plume. Future use of the water and potential risk to receptors are part of an ongoing site-wide evaluation and corrective actions. No water supply wells exist in the 400 Area. There are no current or future residential land use scenarios anticipated in the vicinity of the 400 Area Closure. The area is within a controlled test site on the U.S. Army White Sands Missile Range. The area is capped and managed under a RCRA permit. There are no encroaching residential areas. Therefore, there are no complete exposure pathways. A risk assessment of the groundwater itself will not be conducted as part of this investigation.

There are no commercial/industrial land use scenarios anticipated for the 400 Area Closure. The area is located outside of the 400 Area test stands. There are no industrial facilities, buildings, or test stands on or immediately adjacent to the impoundment area. The impoundments themselves have been capped with an engineered barrier. The arroyo below the impoundments is in an undeveloped area and there is no reasonable potential that this area would be developed for future industrial use. Therefore, there are no complete exposure pathways identified for a commercial/industrial receptor population.

A construction use scenario provides the best fit for the Closure. Although development of the area for industrial use is not anticipated, construction workers could encounter contaminated material when working on roads or utility conduits in the area. Therefore, inadvertent ingestion of, inhalation of, or dermal contact with soil may be considered a complete exposure pathway for this evaluation.

5.2 Fate and Transport

Constituents dissolved in test-derived wastewater discharged to the 400 Area impoundments infiltrated downward into the vadose zone through any compromised areas of the gunite lining. Additionally, any "treated and confirmed uncontaminated" test-water that had been held in the flume may have contributed contaminants to the vadose zone upon release to the unlined arroyo. During downward migration through the vadose zone, transport of some dissolved constituents would be retarded by sorption to mineral surfaces and, for hydrophobic organic constituents, sorption to natural organic carbon present in the native soil. Hence, soil beneath the former impoundments and beneath the unlined arroyo downgradient

of the discharge points has the potential of hosting contaminants both dissolved in pore water and adsorbed to the alluvium.

Wastewater would ultimately reach the groundwater zone and recharge the aquifer. Hence, constituents that were historically discharged to the wastewater impoundments may have contributed to groundwater contamination. Additionally, large volumes of uncontaminated water used in the Cassini tests (NASA, 1996a), along with rainfall events that have filled the drainages off the pediment slopes have contributed significant flushes to the vadose zone that have relocated contamination into the groundwater.

VOCs in wastewater would partition from the dissolved phase to the gas phase, resulting in volatile constituents in soil gas. The nature and extent of volatile constituents in soil gas can be determined by collecting and analyzing soil gas samples.

5.3 Data Gaps

Prior to this investigation, no borings or monitoring wells existed between 300-C-128 approximately 1,600 ft east of the impoundments and groundwater monitoring wells NASA 6 and NASA 9 west of the lower 400 Area impoundment. In particular, no borings or wells were located within either impoundment. In addition, a gap of several hundred feet existed between groundwater monitoring wells NASA 6 and NASA 9 and groundwater monitoring wells 400-C-118/147 located just west of Road G. The locations of the investigation soil borings and wells were selected to:

1. Fill in the gap between the 300 Area Boundary and groundwater monitoring wells NASA 6 and NASA 9 cluster – soil boring 400-SB-12 (MSVGM well 400-IV-123) and 400-SB-15 (MSVM well 400-SV-15).
2. Study subsurface conditions beneath the impoundments and the concrete flume leading to the upper impoundment – soil borings 400-SB-01 (MSVGM well 400-LV-125), 400-SB-02 (MSVM well 400-SV-02), 400-SB-03 (MSVM well 400-SV-03), 400-SB-04 (MSVGM well 400-EV-131), 400-SB-07 (MSVM well 400-SV-07), and 400-SB-08 (MSVGM wells 400-HV-147).
3. Investigate the lateral extent of COCs in soil vapor, soil and groundwater south of the impoundments – soil borings 400-SB-05 (MSVM 400-SV-05), 400-SB-06 (MSVGM well 400-KV-142), and 400-SB-11 (MSVGM well 400-JV-150).
4. Fill in data gaps between the impoundment and Road G – soil borings 400-SB-09 (MSVM well 400-SV-09), 400-SB-10 (MSVM well 400-SV-10), 400-SB-13 (MSVGM well 400-GV-125), and 400-SB-14 (MSVGM well 400-FV-131).

6.0 Scope of Investigation Activities

6.1 Background Information Research

Significant background research was performed in accordance with Permit Section VII.H.1.c, which requires the submittal of a historical information summary with the investigation work plan (NMED, 2016b). NASA completed the required historical research and provided the results in the HIS (NASA, 2011d).

6.2 Implemented Health and Safety Measures

The health and safety hazards for this project fell into three general categories:

1. Those common to work in the Chihuahuan Desert (e.g., venomous snakes and insects, plants with thorns or spines, adverse weather [excessive heat, lightning, flash floods], sudden drops into steep sided arroyos, etc.).
2. Those common to work at investigation sites (e.g., chemical exposure, heavy overhead loads, heavy equipment traffic, high pressure hoses, pinch points, potential for drilling into hazardous substances, etc.).
3. Those unique to the 400 Area (e.g., testing of rocket engines, accidental release of dangerous substances [liquid oxygen, hydrazine] in the vicinity, etc.).

NASA utilized the environmental contractor's approved Safety and Health Plan, which included a project-specific addendum to address potential safety concerns related to the 400 Area investigation. These and all other related safety documents were retained with the project documentation at all times during fieldwork.

Prior to beginning fieldwork, all project field personnel attended a site and project-specific safety briefing to familiarize them with the health and safety hazards applicable to the investigation. Project personnel reviewed the Safety and Health Plan and addendum and affirmed that they would comply with the requirements identified in those documents. Safety Data Sheets for all potentially hazardous substances present in the field were compiled, verified against the chemical inventory, and retained in the field documentation.

During fieldwork, the following measures were implemented:

1. An Exclusion Zone was established and maintained at each work location.
2. Each morning before entering the work area, all field personnel assembled at the 400 Area blockhouse. They were checked in, briefed on planned 400 Area test activities, and assigned badges specific to work in the 400 Area. A field radio tuned to the 400 Area frequency was assigned to the field team.
3. Upon arrival at the work location each morning, and prior to beginning work, a tailgate safety meeting was conducted, followed by an inspection of the rig and supporting equipment.
4. Every morning WSTF Emergency Services personnel were notified of the location of fieldwork and the activities being performed.
5. Proper personal protective equipment (PPE) was worn by all field personnel at all times.
6. Radio contact was maintained with the 400 Area blockhouse so that the field personnel could be notified and evacuated if mishaps occurred during testing.
7. Decontamination areas for personnel and equipment were established and utilized.
8. Proper containment, testing, characterization and disposal of all investigation-derived waste (IDW) were performed (see Section 6.8).

No health and safety incidents occurred during this project.

6.3 Investigation Drilling

NASA utilized roto-sonic (sonic) and air rotary drilling methods to install project soil borings as indicated in the ADWP (NASA, 2016a). In general, sonic drilling was utilized to advance soil borings and collect soil cores within the uncemented alluvium. Air rotary was utilized to continue advancing borings to bedrock or groundwater, as required. Additional information related to investigation drilling is provided in the discussion of field investigation results.

6.4 Well Construction Methods

MSVM and MSVGM wells were installed in soil borings as indicated in the ADWP (NASA, 2016a), which provided generalized well construction diagrams. Prior to installation of each well, a specific well construction diagram was submitted to NMED for approval. Further discussion of well construction is provided with the field investigation results presented later in this report.

6.5 Field Data Collection

During the 400 Area investigation, a variety of field data were collected. NASA evaluated the lithological conditions of each boring during its installation. Soil vapor screening was performed on soil samples recovered from most soil borings. Groundwater depths and indicator parameters were measured during the installation of soil borings and later during development and sampling of MSVGM wells. Field data measurements were recorded in field logbooks.

6.6 Survey Data Collection

The locations and elevations of the 15 installed 400 Area Closure wells were professionally surveyed on June 16, 2017 by Donohue Land Surveys of Las Cruces, New Mexico. The survey was performed utilizing laser transit and data collection Global Positioning System surveying equipment. The brass caps permanently installed on the north side of each concrete well pad were utilized as the survey points. The New Mexico State Plane Central Zone North American Datum 83 coordinate system in U.S. survey ft above mean sea level was utilized.

In addition, the top of the well casing for each of the eight MSVGM wells was surveyed using the same methods. This data is used to convert the depth to groundwater readings into elevation of the potentiometric surface.

Once the survey data was verified, each of the brass caps was inscribed with the permanent well name and its ground surface elevation. This data was also input into the NASA permanent database for all well information at WSTF. Well completion records were submitted to the New Mexico Office of the State Engineer (NMOSE) for the eight MSVGM wells that include groundwater monitoring zones. The NMOSE does not require well completion records for MSVM wells.

6.7 Chemical Analytical Testing

NASA collected soil, soil vapor, and groundwater samples, which were shipped to accredited off-site laboratories for chemical analyses necessary to quantitate the COPCs identified in the IWP (NASA, 2011d). Chemical analytical data were reviewed by qualified NASA personnel and managed in accordance with established WSTF procedures. Specific information related to soil, soil vapor, and groundwater chemical analyses is provided with the field investigation results presented later in this report.

6.8 Management of Investigation-Derived Waste

An IDW Plan for 400 Area Investigation fieldwork was provided in the 400 Area IWP (Appendix C; NASA, 2011d), as required in Permit Attachment 20 (Section 20.2.13; NMED, 2016b). The IDW Plan described anticipated waste streams that would be generated during the 400 Area Investigation, and summarized procedures for waste management, waste characterization, and waste disposition. IDW was generated, accumulated, and managed in accordance with the IDW Plan and WSTF waste management procedures that incorporate 20.4.1 NMAC and 40 CFR § 262.34(a) (2011). Procedures included, but were not limited to: appropriate container labels; accumulation time limits; and proper container specifications. The accumulation start date for all IDW was the date the waste was generated and first placed into the container.

IDW generated during the 400 Area Investigation was managed in two less-than-90-day hazardous waste accumulation areas. One accumulation area was used to manage IDW at the point of generation near each drilling site. The second area was used to consolidate and manage containers in a central location. Containers were transferred from the point of generation area to the centralized accumulation area, which was located west of the investigation area near monitoring wells 400-C-118 and 400-C-143, adjacent to WSTF Road G (Figure 2.4). Waste characterization samples were collected and final waste management activities were performed at the central accumulation area.

The following IDW was generated and managed as part of the 400 Area Investigation:

- Used PPE, plastic sheeting, and other contaminated debris were containerized in DOT-compliant drums.
- Soils, cuttings, and returns generated during drilling and sampling were containerized in 1-cubic yard Super Sack^{®4} bulk containers.
- Mixed media saturated drill cuttings and returns generated using the modified/alterd air rotary drilling method were containerized in DOT-compliant 330 gal Intermediate Bulk Container or DOT-compliant 55-gal drums.
- IDW groundwater from well development was containerized in DOT-compliant containers and a mobile 700 gal trailer, which was managed as a container in a less than 90-day hazardous waste accumulation area in accordance with 40 CFR § 262.34(a) (2011).
- Decontamination fluids were containerized in DOT-compliant drums.
- Wastes associated with equipment maintenance (e.g., grease, contaminated rags, oil, WD-40^{®5}, diesel, soil contaminated with hydraulic fluids, etc.) were managed as a hazardous waste or recyclable fluids, as appropriate.

IDW characterization was completed in accordance with Permit Attachment 12: Waste Analysis Plan (NMED, 2016b) incorporating the 400 Area IWP (NASA, 2011d). Five requests for a “contained-in” determination were submitted to the NMED Hazardous Waste Bureau (HWB) for environmental media identified as hazardous waste under the RCRA contained-in policy, carrying F001 and F002 hazardous waste codes (NASA, 2016b, 2016c; 2017a, 2017b, 2017d). Each request identified that the media did not contain listed hazardous waste above regulatory limits, and provided analytical data compared to the applicable 40 CFR § 261.24 (2011) Toxicity Characteristics, 40 CFR § 268 Subpart D (2012) Treatment Standards, and NMED residential soil screening levels (SSLs) that were applicable at the time (2015 SSLs). All analytical results indicated that the environmental media generated during 400 Area

⁴ Super Sack is a registered trademark of Better Agricultural Goals Corporation DBA/ B.A.G. Corp.

⁵ WD-40 is a registered trademark of WD-40 Manufacturing Company.

Investigation did not pose an unacceptable risk to human health or the environment. The NMED subsequently provided a contained-in determination for each request indicating the environmental media IDW and associated debris could be managed as non-hazardous waste (NMED, 2016c, 2017a, 2017b, 2017c, 2017d). Once each approved contained-in determination request was received from NMED, NASA began managing the environmental media and associated debris associated with the approved request as non-hazardous solid waste. [Appendix C](#) provides the NLCID requests and NMED contained-in determination approval letters.

The aqueous phase of the mixed-media wastes was decanted for treatment and disposal at the Mid-plume Interception and Treatment System (MPITS) in accordance with DP-1255 (NMED, 2017h). Soils directed by NMED to be disposed at an appropriate permitted waste disposal facility were shipped and disposed of at a Subtitle D landfill on April 12, 2017. Remaining soil and drill cuttings generated within the post-closure area were spread on the ground at an adjacent well pad. Soil cuttings generated outside the post-closure area that were not required to be shipped offsite were spread on the ground near the soil borings where the IDW generated. The drill cuttings were land applied away from potential storm water runoff, in accordance with the applicable NMED approved contained-in determination. IDW debris that was determined by NMED to be non-hazardous waste was disposed of as solid waste.

Decontamination water and IDW groundwater generated during development and sampling activities were characterized as hazardous waste under the EPA contained-in policy, carrying F001 and F002 hazardous waste codes. This IDW was properly containerized and managed in accordance with site procedures incorporating 40 CFR § 262. 17 (2017). Decontamination water and IDW groundwater were treated and disposed of at the MPITS, in accordance with DP-1255 (NMED, 2017h).

6.9 Equipment Decontamination Procedures

Upon first arrival on site, all drilling and support equipment was decontaminated by washing it utilizing a high pressure steam cleaner. All down hole equipment was decontaminated in the same manner in between each boring.

Rinsate samples were collected from the decontaminated equipment to confirm that proper decontamination procedures were followed. All rinsate samples were non-detect for all COCs.

7.0 Field Investigation Results

7.1 Surface Conditions

7.1.1 Topography

The detailed topographic map of WSTF indicates that the 400 Area is centrally located on an alluvial fan that originates from the mouth of Bear Canyon ([Figure 7.1](#)). In map view the fan is elongate from northeast to southwest. The long axis of the fan is approximately 11,000 ft from the origin to the toe, and at its widest point the fan spans approximately 5,000 ft. On a more local scale, this fan is composed of a series of stacked coalescent alluvial fans derived from detritus originating from the southern SAM.

The fan is bounded on the southeast by late Paleozoic carbonate sedimentary outcrops of the Pennsylvanian Panther Seep formation, the Permian Hueco formation, and by non-foliated rhyolite intrusive rocks of Oligocene age in the Quartzite Peak area. These rocks crop out at a distance of approximately 2,500 feet to the southeast. The fan is bounded on the northwest by alluvial pediment slope deposits in the form of braided stream channels of Quaternary age.

The alluvial fan is dissected by several shallow arroyos. The industrial structures of the 400 Area and the adjacent 300 Area to the east are both located on the crest of the ridge on the south side of the most prominent of these arroyos (unofficially the 300/400 Area arroyo). The 400 Area testing complex was constructed on a relatively level section of pediment at an elevation of 4,860 to 4,890 ft amsl, bounded to the north by the 300/400 Area arroyo and to the south by a smaller arroyo. Both arroyos drain west southwest toward the SJDMB. The 300/400 Area arroyo is also coincident with the 400 Area concrete lined drainage that runs along the north side of the 400 Area Propulsion facility.

7.1.2 Surficial Sediment Characterization

Surface sediments in the 400 Area are a mix of fine grained silts, fine to coarse sands, caliche, gravels, cobbles, and boulders on an alluvial fan originating from Bear Canyon in the SAM. This alluvium is poorly sorted, well drained and has a relatively low organic soil component.

7.1.3 Vegetation and Wildlife

The vegetation and wildlife in the 400 Area is typical of what has been described for the WSTF Area as a whole (Section 3.1.1).

7.1.4 Surface Water

There is no surface water in the vicinity of the 400 Area. The nearest man-made water body is the Test Stand 302 cooling water pond. There was formerly a perennial spring (Gardner Spring) located approximately 0.5 mi southeast of the 400 Area, but in recent years this has dried up. The nearest natural water body of significant scale is the ephemeral Isaacs Lake located approximately 10 mi to the southwest of WSTF within the lowest point of the SJDMB at an elevation of 4,285 ft amsl.

7.2 Exploratory Drilling Investigations

7.2.1 Soil Boring Locations

A total of 15 borings were advanced during this investigation ([Figure 2.4](#)). Seven were completed as MSVM wells and eight as MSVGM wells. Each was designed to provide soil vapor, geological and (in the case of the MSVGM wells) hydrogeological information in one of the following settings:

- Adjacent to the arroyo and upgradient of the impoundments: 400-SB-12 (MSVGM well 400-IV-123), 400-SB-15 (MSVM well 400-SV-15).
- Within the retention ponds and the concrete flume leading to the upper impoundment: 400-SB-01 (MSVGM well 400-LV-125), 400-SB-02 (MSVM well 400-SV-02), 400-SB-03 (MSVM well 400-SV-03), 400-SB-04 (MSVGM well 400-EV-131), 400-SB-07 (MSVM well 400-SV-07), and 400-SB-08 (MSVGM well 400-HV-147).
- Adjacent to and uphill from (south of) the impoundments: 400-SB-05 (MSVM well 400-SV-05), 400-SB-06 (MSVGM well 400-KV-142), 400-SB-11 (MSVGM well 400-JV-150).
- Downgradient of the impoundments: 400-SB-09 (MSVM well 400-SV-09), 400-SB-10 (MSVM well 400-SV-10), 400-SB-13 (MSVGM well 400-GV-125) and 400-SB-14 (MSVGM well 400-FV-131).

7.2.2 Drilling Activities

Drilling and well installation was performed between late September 2016 and January 2017. Cascade Drilling, LP (Cascade) was subcontracted to perform drilling services at WSTF for the 400 Area investigation. The drilling methods selected for use during the project were sonic coring with casing advance and (if needed) air rotary drilling. At WSTF, sonic coring methods have historically had difficulty advancing through bedrock. For this reason, it was planned to use sonic coring through the unconsolidated alluvium, and if possible, in the bedrock as well. Air rotary was planned for use within bedrock if sonic coring could not advance the boring effectively. The drill rig Cascade utilized could be modified to perform both sonic coring and air rotary, eliminating the need for two drilling rigs.

The sonic coring method involves driving a continuous core barrel using vibration, rotation, and downward force. The vibrational forces are generated by a hydraulically powered oscillator, which generates adjustable high-frequency vibrations. The sonic head sends vibrations down through the drill pipe to the core barrel.

Continuous core barrels allow for the entire volume of lithologic material in the boring to be captured for inspection essentially intact. This greatly facilitates the classification of soils and the inspection of much larger alluvial and bedrock features as compared to the samples recovered when employing hollow stem auger or air rotary methods of drilling.

The core barrel is advanced into the alluvium until it meets with increased resistance. The boring is then cleaned out and enlarged with a larger diameter core barrel. Cascade provided continuous 10-ft long steel core barrels in three different outside diameters (OD): 6.1-, 7.5-, and 8.3-in. OD. They also provided 9.5-in. OD drive casing. Cascade advanced the 6.1-in. core barrel until it was difficult to proceed. Then the boring was cleaned out and enlarged using the 7.5- or 8.3-in. core barrel. Core barrels were screwed together with flush threads to form a drill string. The lowermost core barrel had a cutting shoe welded in place to improve penetration and the drilling rate. The 9.5-in. OD drive casing was advanced after the core barrel. This drive casing is left in place for the duration of the drilling to prevent shallow formation collapse and jamming of the core barrels. The drive casing is gradually removed while emplacing monitoring well annular materials to reduce sloughing of the formation into the annular space.

During this investigation, Cascade initially planned to advance drive casing to the total depth of the borings, if possible. In practice, since sloughing of the formation was only an issue in the uppermost unconsolidated alluvium, and it was very difficult to drive the casing into the bedrock (cemented alluvium and andesite), casing was only driven as deep as would be necessary to keep the borehole open. Beyond that point, borehole advancement was accomplished by drilling and coring alone.

Air rotary drilling uses compressed air to clean the borehole of cuttings during advancement of the bit. A drill bit of the appropriate diameter with hardened teeth or buttons on its face is advanced into the bedrock by pressure and rotation. It breaks the bedrock into small pieces (maximum size typically less than ½ in. The drill string connecting the air rotary bit to the drilling head is hollow. Compressed air is blown down the inside of the drill string and out into the bottom of the boring through holes in the drill bit. As the air is forced up the annular space, it carries the drill cuttings with it. At the surface, a T-shaped diverter is used to direct the cuttings into a collection system for description, sample collection, and ultimately disposal.

Air rotary can be a very efficient method of advancing a boring through bedrock. However, the individual pieces in the drill cuttings are very small. This can make it difficult to distinguish between unconsolidated and cemented alluvium, to determine grain size distribution in unconsolidated or bedrock units, or to

observe fractures and other features in bedrock which may be controlling groundwater migration. For this reason, sonic coring for the entire boring is preferred.

Borings intended only for the installation of MSVM wells were to be completed to the bottom of the alluvium. Borings intended for the installation of MSVGM wells were to be advanced into bedrock until the potentiometric surface was intercepted and then far enough further into bedrock to ensure sufficient groundwater would collect in the well for efficient groundwater sampling.

During this investigation, drilling was frequently challenging. The coarse alluvium encountered caused the core barrels and drive casing to bind up on a number of occasions. As a result, numerous core barrels and drive rods connecting the uppermost barrel to the rig's drive head were damaged or destroyed during drilling.

During sonic coring of the first boring drilled (400-SB-04 or well 400-EV-131; [Figure 2.4](#)), Cascade attempted to advance the 9.5-in. drive casing to the boring total depth to explore the feasibility of sonic drilling in the area. Cascade advanced the drive casing to 144 ft below ground surface (bgs), approximately 10 ft above the total depth. However, the difficult drilling conditions led to frequent equipment breakages. For this reason, the drilling methods were changed. All subsequent borings were drilled using sonic coring throughout the unconsolidated alluvium, but the temporary 9.5-in. drive casing was only advanced as far into the alluvium as the difficult drilling conditions would allow in order to reduce equipment breakages. Cascade was able to advance the drive casing in the second boring drilled (400-SB-15 or well 400-SV-15; [Figure 2.4](#)) to 67 ft bgs. For the remaining 13 borings, the range of depth bgs for the temporary drive casing was 18 to 41 ft bgs. All sections of drive casing and drilling equipment that broke off downhole were successfully retrieved.

The ADWP (NASA, 2016a) called for the installation of five 4-in. MSVGM wells. The remaining 10 borings were originally intended to be MSVM wells. All 15 wells were drilled using sonic coring through the unconsolidated alluvium to the top of bedrock (cemented alluvium). Once bedrock was reached, for the five MSVGM wells, the drill rig was reconfigured to use air rotary drilling methods. Once these five wells were installed, the air rotary drilling equipment was demobilized to another project.

Subsequently, NMED directed that three additional MSVGM wells be installed (400-JV-150, 400-KV-142, and 400-LV-125; [Figure 2.4](#)). Returning the air rotary drilling equipment to WSTF would have required a lengthy delay, so it was determined that the three NMED-required MSVGM wells would be drilled using sonic coring to the total depth.

The only additives used during drilling were air and small amounts of non-chlorinated potable water to facilitate the removal of cuttings from boreholes. A Water Use Log was not maintained during the drilling of each borehole, because most of the water was added in the vadose zone. Based on field observations during drilling and well installation, it is believed that this water was absorbed by the dry vadose zone materials instead of infiltrating to the shallow aquifer.

7.2.3 Borehole Video Logging

Five of 15 boreholes were video logged in order to delineate potential flow zones and to better characterize lithologies: 400-SB-01 (well 400-LV-125), 400-SB-06 (well 400-KV-142), 400-SB-10 (well 400-SV-10), 400-SB-13 (well 400-GV-125), and 400-SB-14 (well 400-FV-131; [Figure 2.4](#)). Prior to logging, the standing water in each of the boreholes was pumped down as far as possible to assist in observing as much of the boring as possible.

Borehole 400-SB-10 (well 400-SV-10) was video logged on October 26, 2016. A transitional contact between the unconsolidated alluvium and the indurated conglomerate was shown between depths of 104 and 108 ft bgs. Below a depth of 108 ft, the borehole was smoothly cut through the strongly cemented alluvium. A sharp contact between the cemented alluvium and the volcanic bedrock was shown at a depth of 147.9 ft. At a depth of 154 to 157 ft, an eroded fracture zone with high angle fractures was seen in the volcanic bedrock. Water was observed seeping from this zone. During logging, the depth to water in the well was 162 ft. A recovered, static water depth was not obtained for this borehole, and a groundwater well was not installed at borehole 400-SB-10, due to groundwater production determined to be too low for groundwater sampling.

Borehole 400-SB-14 (well 400-FV-131) was video logged on November 8, 2016. A gradational contact between the unconsolidated alluvium and the indurated alluvium was noted between depths of 104 and 110 ft bgs. The cemented alluvium-volcanic bedrock contact was noted at a depth of 136 ft. Though the borehole walls were wet during logging, it was unclear where water was seeping into the borehole. During logging, the depth to water was 151 ft. A groundwater well was installed in this borehole, with a resulting static water depth of 131.75 ft (measured June 26, 2017), indicating confined conditions.

Borehole 400-SB-13 (well 400-GV-125) was video logged on November 30, 2016. Several contacts were noted: The contact between the unconsolidated alluvium and the cemented alluvium was shown at 107 ft bgs; the volcanic bedrock contact was visible at 148.5 ft bgs; and a zone which slowly produced a small amount of water was observed at a depth of 137 ft bgs within the cemented alluvium. A groundwater well was installed in this borehole and a static water depth of 127.52 ft was recorded (on June 26, 2017), indicating confined conditions.

Boreholes 400-SB-01 (well 400-LV-125) and 400-SB-06 (well 400-KV-142) were video logged on January 4, 2017. Within borehole 400-SB-01, the borehole walls become smooth at 100 ft bgs, just below the unconsolidated alluvium-cemented alluvium contact at 98 ft. At 125 ft bgs, the borehole walls appear friable, just prior to the volcanic bedrock contact at 127 ft. A groundwater well was installed in this borehole. However, static water depth equilibrated below the casing screen depth, resulting in a dry well.

Borehole 400-SB-06 (well 400-KV-142) showed the contact between the unconsolidated alluvium and the cemented alluvium bedrock to be at 115 ft bgs, and a water producing zone was observed at 147.5 ft bgs. A groundwater well was installed in this borehole, with a resulting static water depth of 151.03 ft bgs (measured on June 26, 2017).

7.3 Subsurface Conditions

7.3.1 Collection of Lithologic Samples

After advancing through each 10-ft interval, the core barrel was pulled from the boring to remove the cuttings. A plastic bag designed to hold approximately 2.5 vertical ft of soil was placed over the mouth of the core barrel. Using gravity to minimize disturbance of the soil, the barrel was vibrated to release a portion of the cuttings into the bag. After the bag was filled, it was tied off at the top, the sample interval was labeled, and it was delivered to the field geologist for lithological characterization. Typically, four bags were utilized to collect the entire sample from a 10-ft interval.

7.3.2 Soil Properties

Soil property testing was conducted on 22 soil geotechnical samples collected during the installation of soil borings. Detailed discussions of these results are provided in Section 7.7.2, and are summarized here. The results of the particle size analysis were combined with the Atterberg limits to derive the USCS

classifications for the samples. Based on results of these analyses, the soils can be divided into two USCS Groups; poorly-graded to well-graded gravels with finer grained matrix (20 samples), and; silty sand to clayey sand (2 samples).

The 22 samples were analyzed for specific gravity, moisture content, bulk and dry density and porosity. The relatively fine-grained sandy samples generally exhibited slight increase in moisture content, and had a lower bulk density and higher porosity than the samples where larger grain sizes predominated. Results of specific gravity analyses for all the samples was consistent at between 2.64 to 2.72. Soil moisture content ranged from 0.9 to 9.1 percent. Bulk density ranged from 105.2 to 125.3 pounds per cubic foot (pcf) and dry density from 96.45 to 123.4 pcf. The calculated porosities ranged from 26 to 43 percent.

The saturated hydraulic conductivity for the samples ranged from 3.0E-06 to 3.4E-03 cm/s. A complete description of unsaturated hydraulic conductivity determination, and plots of unsaturated hydraulic conductivity and relative hydraulic conductivity as a function of moisture content and pressure is provided in the soil property testing report ([Appendix D](#)).

7.3.3 Vadose Zone and Bedrock Geology

NASA's understanding of the geology underlying the 400 Area was improved through advancing the 15 investigation soil borings and installing MSVM or MSVGM wells in each of them. Two cross sections were prepared to assist in this interpretation. Their locations are shown in [Figure 7.2](#).

The lithological profiles and well completion information for ten of the well locations (400-FV-131, 400-GV-125, 400-HV-147, 400-SV-07, 400-EV-131, 400-SV-03, 400-SV-02, 400-LV-125, 400-SV-15, and 400-IV-125) were incorporated into the line of cross-section A (west)-A' (east) ([Figure 7.3](#)). Four previously installed monitoring wells (400-C-143, NASA 1, NASA 6, and 300-C-128) were also incorporated into the cross-section, which traverses the 400 Area Propulsion Facility and the 400 Area Closure as shown in [Figure 7.2](#).

Cross-section A (west) -A' (east) ([Figure 7.2](#)) shows the two distinct geological units composed of alluvium: unconsolidated Quaternary alluvium which overlies cemented Pliocene alluvium bedrock. The unconsolidated alluvium is identified as the piedmont slope facies of the Camp Rice Formation of Seager (1981). The thickness of the unconsolidated alluvium varies between 80 to 109 ft, increasing in thickness to the west (which is the downslope direction of surface topography and the bedrock pediment). The underlying cemented alluvium bedrock is highly indurated. It contains clasts of the same composition as the overlying unconsolidated alluvium. The cemented alluvium is inferred to have formed in response to infiltration of calcite rich groundwater that migrated through the initially unconsolidated alluvium during precipitation and basin recharge events.

Based on the cores recovered, NASA determined that the lithologic unit underlying the cemented alluvium is a dense, purple-gray andesite. Some indications of flow-banding (<1/4 in. thickness) were noted. No open fractures were observed; however, discrete (<1/20 in.) discontinuous traces of oxidized material may indicate where small fractures were once open but have been recemented. A single exception to the characterization of this underlying rock layer was encountered at soil boring SB-12 (MSVGM well 400-IV-123), where the bedrock underlying the cemented alluvium was hornfels. This is a contact metamorphic rock formed by thermal alteration when a sedimentary or igneous parent rock is intruded by an igneous body. A large example of such an intrusion is exposed in the northern half of Quartzite Peak, located less than a mile southeast of the 400 Area.

Cemented Pliocene alluvium increases in thickness from east to west from approximately 1 ft to over 40 ft across the approximate 2,800-ft length of the cross-section. Most of this increase occurs between boring

SB-12 (MSVGM well 400-IV-123), where the cemented alluvium is 1 ft thick, and boring SB-01 (MSVGM well 400-LV-125), where it is 29 ft thick. The increased thickness is the result of a normal fault located between these two wells, which is identified by an approximate 30-ft drop in elevation of andesite bedrock and a corresponding thickening of the cemented Quaternary alluvium unit. Based on the depth to the bottom of the cemented alluvium and the nature of the underlying bedrock, it appears the fault can be more specifically located between well 400-IV-123 (east) where cemented alluvium is 1 ft in thickness and the underlying bedrock is hornfels, and MSVM well 400-SV-15 (west), where the cemented alluvium is greater than 5 ft thick.

The 400-SB-15 soil boring penetrated into the cemented alluvium for 5 ft before total depth was reached. The fault is located proximally to the Tertiary hornfelsed andesite unit identified at MSVGM well 400-IV-123. The hornfels was first encountered in the borehole at 81 ft, continued to total depth 155 ft bgs, and was at least 74 ft in. thickness. The hornfels may be localized and specifically related to contact metamorphism along the fault zone, or may possibly be more extensive and related to a larger intrusive body at depth.

The maximum thickness of cemented Pliocene alluvium of 49.5 ft was identified within a localized graben well defined by displacements in andesite bedrock located immediately downgradient (west) of the toe of the 400 Area Closure. The graben is typical of basin-range faulting in bedrock and is bounded by the “400-West” normal fault on the east side and a reverse fault on the west side. The graben is approximately 200 ft in width ([Figure 7.3](#)). The 400-West fault displaces andesite bedrock by approximately 5 ft on the east side with a corresponding uplift of the andesite by approximately 10 ft on the west side. The displacement of the faults are well documented by four wells in the area (400-HV-147, NASA 6, 400-GV-125, and 400-FV-131).

The 400-West normal fault is located between MSVGM well 400-HV-147 to the east and groundwater monitoring well NASA 6 to the west. The fault is shown in the location provided by previous geophysical studies (Reynolds, 1988, as interpreted by Maciejewski, 1996), and is visible within seismic lines recorded in the 400 Area. The reverse fault that forms the west side of the graben is typical of the stress regime during extensional basin-range faulting, and was defined based on the increase in andesite bedrock elevation between MSVGM well 400-GV-125 to the east and MSVGM 400-FV-131 to the west.

Cross-section B (north)-B’ (south) ([Figure 7.4](#)) is perpendicular to cross-section A-A’ along the axis of the graben located west of the toe of the 400 Area Closure. The cross-section incorporates two of the new wells constructed as part of this investigation (MSVM wells 400-SV-10 and 400-SV-09), three existing groundwater monitoring wells (NASA 9, NASA 6, and 400-D), and does not traverse either of the bounding faults. The thickness of the unconsolidated Tertiary alluvium (110 ft) and cemented Tertiary alluvium bedrock (40 ft) are consistent within the graben. The unconsolidated alluvium thickens along the elevated north and south sides of the 400 Area arroyo. A subtle depression in the Tertiary Orejon andesite is defined by MSVM well 400-SV-10 where the andesite elevation declines by approximately 2 ft. Tertiary Orejon andesite extends to depth below the 400 Area with a thickness of at least 300 ft as defined by groundwater monitoring well 400-D.

The information developed during this investigation was used to infer the sequence of formation of the lithology underlying the 400 Area as follows:

1. Deposition of the andesite in a series of volcanic eruptions (44-45 million years [m.y.]
2. Thermal metamorphism due to the injection of non-foliated rhyolite created the hornfels (30-36 m.y.)

3. Development of the graben in the vicinity of 400-GV-125 (more recent than 30 m.y.; earlier than 3.1 m.y.).
4. Deposition of the Camp Rice fanglomerate facies (3.1 m.y.).
5. Cementation of the Camp Rice fanglomerate (more recent than 3.1 m.y.; earlier than 0.7 m.y.).
6. Development and down-to-the-west offset of the 400 East fault (more recent than the cementing of the Camp Rice fanglomerate; earlier than 0.7 m.y.).
7. Erosion of the Cemented Camp Rice fanglomerate, removing almost all of it east of the 400 East fault (more recent than movement on the fault; earlier than 0.7 m.y.).
8. Deposition of the Camp Rice piedmont-slope facies (starting 0.7 m.y.).
9. Development of the current topography on the surface of the alluvial fan, especially the arroyos (synchronous with the deposition of the Camp Rice piedmont-slope facies).

7.4 Monitoring Well Design and Construction

7.4.1 Multiport Soil Vapor Monitoring Well Design

MSVM well designs were based on the general requirements detailed in the NMED-Approved Drilling Work Plan (NASA, 2016a). This included four nested soil vapor sample implants installed in the borings using a guideline within the vadose zone in each well. Soil vapor implants were to be spaced 35 to 40 ft apart, depending on the geology encountered, with the expectation that the top of bedrock would be andesite located at approximately 145 ft bgs. The uppermost vapor sample inlet was planned for approximately 10 ft bgs, while the lowest port was to be just above groundwater, with the expectation that groundwater would be in unconsolidated alluvium and would be encountered approximately 125 to 130 ft bgs. Soil vapor sample implants were positioned in each borehole to provide vertical delineation of volatile organic concentrations in soil vapor within the vadose zone across the 400 Area. As designed, each soil vapor sample system is comprised of an implant consisting of a ½-in. x 12-in. cylindrical filter screen (type 304 stainless steel) connected to ¼-in. stainless steel tubing, which is routed to the surface where a port at the end of the tubing allows for sample collection.

7.4.2 Soil Vapor Monitoring Well Construction

The depth to the top of bedrock encountered during fieldwork was 80 to 113 ft bgs rather than the 145 ft bgs expected prior to beginning fieldwork. For this reason, three soil vapor sample implants were installed in MSVM wells rather than the four that would be required to effectively monitor the thicker alluvium anticipated before installing the wells. Well 400-SV-10 was originally drilled to be an MSVGM well. However, after standing open for six days, essentially no groundwater accumulated in the boring. The boring was backfilled from the total depth of 173.5 ft bgs to 127.8 ft bgs with hydrated bentonite chips. A fourth soil vapor port was installed at 125 ft bgs.

The annular space adjacent to each soil vapor sampling port was filled with 10/20 mesh Colorado Silica sand (or equivalent) filter pack. For the deepest port the filter pack extended from the bottom of the boring (modified in wells 400-SV-10 and 400-GV-125) to a distance 2.5 ft above the port. The remaining implants were installed in the middle of a five ft thickness of filter pack. Above and below each section of filter pack, approximately 10 ft of hydrated bentonite was installed to isolate each vapor monitoring zone.

The remaining portions of the annular space were filled with cement containing five percent bentonite by weight.

Upon the completion of well construction, permanent aluminum tags inscribed with the well ID and the depth of the port were affixed to each vapor sampling port. These were used to ensure the appropriate ports are sampled, and the analytical results were appropriately assigned to the correct depth.

7.4.3 Multiport Soil Vapor and Groundwater Monitoring Well Design

In accordance with the IWP (NASA, 2011d) and ADWP (NASA, 2016a) each well was individually designed based on the stratigraphy encountered in each boring. All individual well designs were submitted to NMED for approval prior to installation. In each case, concurrence was received before the wells were installed.

MSVGM wells were originally intended to be installed in five of the 15 borings. The anticipated well design consisted of 4-in. diameter schedule 40 PVC casing with one 15 ft 0.010 slot screen that straddled the water table with 5 ft of screen located above the water table and 10 ft of screen below the water table. However, NASA located sufficient 4 in. ID, Type 316, Schedule 10 stainless steel casing leftover from another project at WSTF, which was used to construct the first five MSVGM wells installed (400-EV-131, 400-FV-131, 400-GV-125, 400, HV-147, and 400-IV-123). It was expected that the vapor monitoring portions of MSVGM wells would be installed in a manner to that planned for MSVM wells.

7.4.4 Soil Vapor/Groundwater Monitoring Well Construction

Following the guidance in the IWP and ADWP (NASA, 2016a), each well was individually designed based on the stratigraphy and the depth to the potentiometric surface that were encountered in each boring. All individual well designs were submitted to NMED for approval prior to installation. In each case, concurrence was received before the wells were installed.

Five MSVGM wells were included in the IWP (NASA, 2011d). However, on December 12, 2016, NMED recommended three additional MSVGM wells. This occurred after the five original wells had been installed and the air rotary equipment had been demobilized. The three additional wells were installed in borings advanced by sonic coring equipment, which did not have a large enough diameter to provide a sufficient annular space for 4 in. well casing. As a result, these wells were completed with 2 in. PVC screen and casing. Each of the eight wells was also equipped with soil vapor sample implants, located at intervals as indicated in the ADWP (NASA, 2016a) and approved by NMED prior to well installation.

Well construction diagrams are included in [Appendix E](#).

7.4.5 MSVGM Well Development

The rate and amount of production from each of the wells varied due to the productivity of the water-bearing zones intersected. Well 400-LV-125 (borehole 400-SB-01; [Figure 2.4](#)) was dry upon completion and was not developed or sampled. Well 400-KV-142 (400-SB-06; [Figure 2.4](#)) was very slow to recover after initial purging, so only produced 1.5 gallons (gal) prior to sampling. Some of the other wells initially produced water easily, but tapered off in productivity, presumably as readily available water in fractures and cavities was depleted.

During development, the parameters of pH, temperature, specific conductance, and turbidity were measured and recorded. As stated in the ADWP (NASA, 2016a), purging progressed (as well conditions

allowed) until the first three parameters stabilized (<10% variability) and turbidity was below 5 NTUs. The development records for each of the wells are included in [Appendix F](#).

7.4.6 Soil Boring Abandonment

No soil borings were abandoned during this investigation. Boring SB-10 (MSVM 400-SV-10) was backfilled with hydrated bentonite pellets from its total depth of 173.5 ft bgs to 127.8 ft bgs to ensure that the lowest soil vapor port was collecting samples from a discrete interval. Boring SB-13 (MSVGM 400-GV-125) was backfilled with hydrated bentonite pellets from its total depth of 166.5 ft bgs to 149.8 ft bgs for the same reason.

7.4.7 Monitoring Well Surface Completion

A locking steel well vault was installed to protect each monitoring well. Wells installed at locations where traffic was expected to drive directly over the well were equipped with flush-mounted well vaults ([Appendix A](#)). This included wells 400-SV-02, 400-SV-03, 400-SV-05, and 400-SV-07. The remaining wells were equipped with above-grade protective surface casing. If nearby traffic posed a threat to surface casing, steel bollards filled with cement were installed around the well pad for additional protection ([Appendix A](#)).

MSVM and MSVGM wells were completed by installing a circular concrete pad with a diameter of 4 ft centered on each well. Each pad is approximately 4-in. thick and sloped to direct precipitation off the well pad. During installation of the concrete pads, a brass cap was permanently installed on the north side of each pad. Each of these 15 caps was installed as a survey point to represent the location of each well. They were subsequently engraved with the permanent well name and survey information for identification purposes.

7.5 Groundwater Conditions

No perched groundwater was encountered in any of the borings during this investigation, nor has any been reported from previous investigations in the 400 Area.

Eight of the 15 soil borings advanced during the 400 Area Closure investigation intercepted the water table. The potentiometric surface was encountered below the top of bedrock (cemented alluvium and andesite) in each boring. The groundwater is inferred to be derived from recharge from the upgradient catchment area within Bear Canyon that migrates along bedrock fractures and the cemented alluvium-andesite contact zone, with additional components inferred to be derived from 400 Area Propulsion Facility testing activities and from precipitation directly on the 400 Area. Rainfall typically averages 10 in. per year (Jornada, n.d.), most of which is provided by intense summer monsoon thunderstorms.

In wells 400-IV-123 and 300-C-128 at the eastern edge of the 400 Area, groundwater is hosted within fractured andesite and hornfels bedrock. Beneath and downgradient of the 400 Area Closure, the top of groundwater is encountered in the cemented Tertiary alluvial bedrock. [Figure 7.5](#) provides a potentiometric surface map of the 400 Area generated using groundwater elevations measured in new and existing groundwater monitoring wells. Because 400-KV-142 recharges so slowly, it does not appear to be fully interconnected to the fracture network that allows groundwater containing COCs to migrate from the 400 Area. As a result, groundwater elevation data from 400-KV-142 were not utilized to develop the potentiometric surface map.

The groundwater surface slopes from east to west, which is also the inferred direction of groundwater movement. Based on the geology and hydrogeology of the area, it is believed that groundwater has moved in a similar manner throughout the operational history of WSTF.

The new groundwater monitoring wells installed as part of the 400 Area investigation do not recharge quickly when purged. NASA observed a relatively high degree of variability in the rate of recharge in different borings and monitoring wells. Soil boring SB-10 did not produce enough groundwater recharge to be completed as a groundwater well, despite the boring being advanced to 173 ft bgs. MSVGM well 400-KV-142 only recharges at a rate of approximately 1 in. per day. Based on observations during purging and sampling, MSVGM well 400-EV-131 produced groundwater at approximately 50 percent of the rate that it was produced from MSVGM well 400-HV-147. Open fractures were infrequently observed in borehole video logs, and free-flowing groundwater was not observed in any of the fractures.

The slow rate of groundwater recovery during MSVGM well development activities and the poorly-fractured nature of the bedrock suggests that the bedrock aquifer three dimensional matrix is highly variable and that the shallow aquifer is under semi-confined to confined conditions (NASA, 2017c). In two soil borings there was a discrepancy between the depth to the potentiometric surface first encountered during drilling and the equilibrated static water level measured following well development. In soil boring 400-SB-04 (MSVGM well 400-EV-131; [Figure 2.4](#)), groundwater was first encountered during drilling between 143 and 146 ft bgs and subsequently measured following well development at 139.04 ft bgs (NASA, 2017c). In soil boring 400-SB-12 (MSVGM well 400-IV-123) groundwater was encountered within a fracture zone between 153.5 and 154.4 ft and measured at 130.76 ft bgs following well development.

During the installation of dedicated sampling equipment, pressure transducers were installed in MSVGM wells 400-GV-125, 400-HV-147, and 400-IV-123 ([Figure 2.4](#)) in order to record changes in the potentiometric surface elevation over time. Groundwater elevation data from 400-GV-125 and 400-IV-123 were collected from July 24 until September 12, 2017. Groundwater elevation data from 400-HV-147 was collected from July 24 until September 7, 2017.

This data was compared to precipitation events as recorded at the WSTF rain gauge, located in the 700 Area approximately 1 mi north of the 400 Area Closure. It was also compared to the timing of discharges of test water from 400 Area test locations over this same period. Test-related discharges ranged in volume from 7,500 to 25,000 gallons. [Figure 7.6](#) displays the potentiometric surface elevation changes compared to the timing and magnitude of both potential inputs, graphed on a common timeline.

There are three observations based upon this data. The first is that during the period when all three piezometers were in operation, the magnitude of the rise in the potentiometric surface was similar in all three wells: 4 ft in 400-GV-125, 3.8 ft in 400-HV-147, and 3 ft in 400-IV-123. The second is that the timing of the rise in the potentiometric surface is almost identical in all three wells. This suggests that it was responding to the same input. Given the disparity between the two inputs, it appears that most of the potentiometric surface rise was due to the precipitation.

The third observation is that there is a very large response (3 to 4 ft) in the elevation of the potentiometric surface to the precipitation. If all of the rain was able to infiltrate to groundwater the response would be approximately 5 ½ to 1. As some of the precipitation will run off or be captured by evapotranspiration, the ratio is even greater. It indicates that the bedrock aquifer has very little storativity.

7.6 Subsurface Vapor Conditions

Headspace was analyzed on 86 samples from 11 of the 15 soil borings using the Altair^{®6} 5X Multigas Detector equipped with an integrated PID sensor for VOC detection ([Table 7.1](#)). Field headspace analyses were not performed during the installation of soil borings 400-SB-01, 400-SB-2, 400-SB-05, and 400-SB-11 due to required maintenance and repair of the detector by the manufacturer while these borings were being installed.

The PID identified the volume percentage range for combustible gases, oxygen, carbon dioxide, and methane, as well ppm levels for carbon monoxide and VOCs. The PID sensor is capable of detecting VOCs in the range of 0 to 2,000 ppm with a resolution of 0.1 ppm. Soil vapor headspace samples were evaluated on samples from soil borings 400-SB-03, 400-SB-04, 400-SB-06, 400-SB-07, 400-SB-08, 400-SB-09, 400-SB-10, 400-SB-12, 400-SB-13, 400-SB-15, and 400-SB-15. Soil samples from the 5-in. diameter cores were collected and sealed in resealable plastic bags. Soil samples were agitated and broken within the bag, which was then allowed to sit for approximately five minutes before the detector was inserted into the bag for approximately 15 seconds for headspace evaluation. Where headspace samples were collected across intervals utilized for chemical laboratory soil samples, those samples were collected contemporaneously.

7.7 Materials Testing Results

7.7.1 Collection of Soil Samples for Materials Testing

Geotechnical soil property testing was performed on soil samples collected during 400 boring installation in order to provide an engineering evaluation of the subsurface soil conditions in the vadose zone. The results of the soil property testing provided data that will support any design requirements for site preparation, foundation design, drainage, and earthwork construction related to future activities.

The 400 Area Closure IWP (NASA, 2011d) indicated that a minimum of one and a maximum of three soil geotechnical soil samples would be collected within each soil boring for each significant change in soil lithology, where feasible. The ability to collect geotechnical soil samples within discreet lithological units was impeded by: the limited occurrence of soil that was sufficiently fine-grained to be retained in the sampling device; the need to advance the outer drive casing to the end of the drive casing lengths prior to the ability to attempt a sample; and, limited soil sample recovery. Relatively finer and coarser-grained lithological horizons were sometimes identified in compromised samples discharged from the rig cyclone, and driller's observations regarding rate of advancement and degree of bit chatter. Several attempts were occasionally made to collect a sample using the core sample barrel at the completion of the casing length, and discreet finer-grained horizons had frequently been penetrated prior to soil sample collection.

If limited soil sample volume was retrieved from the sample barrel, chemical analysis samples were prioritized, then, if sufficient soil volume remained, geotechnical samples were collected. A total of 22 soil samples were collected for geotechnical analysis from the 15 soil borings installed during the investigation. A summary of the sample locations, depths, and test results is included in [Table 7.2](#). At least one geotechnical sample was collected from 13 of the 15 soil borings. Geotechnical samples were not collected from 400-SB-01 and 400-SB-07 because of insufficient soil sample volume or sample refusal.

⁶ Altair is a registered trademark of MSA Technology, LLC.

Soil samples were extruded from the sampling core barrel on the Rotosonic drilling rig into PVC liners that were used to preserve the sample during transport from the rig to the soil sample processing area. Because soil samples were agitated and compromised during extrusion from the core barrel, it was impossible to retrieve a geotechnical sample that was fully representative of in situ conditions. Geotechnical samples were logged by project geologists and transferred to project technicians who collected the samples in two 12-in. square resealable plastic bags. There were no sample preservation or holding time requirements for the geotechnical soil samples. The samples were held in storage (in a temperature controlled building) until several samples could be shipped together. Shipments were sent from the WSTF shipping facility to the Geotesting Express laboratory in Acton, MA via overnight carrier for analysis.

Soil geotechnical samples were collected for the following soil property testing: USCS (ASTM D2487); particle size analysis (ASTM D422); specific gravity (ASTM D854); moisture content (ASTM D2216); density (ASTM D7263); porosity calculation (ASTM D7263); Atterberg limits (ASTM D4318); fixed wall permeability (ASTM D2434); flexible wall permeability and saturated/unsaturated hydraulic conductivity (ASTM D5084); and, soil water characteristic curve (ASTM D6836).

7.7.2 Soil Geotechnical Sample Analysis Results

Soil property testing was conducted on 22 soil geotechnical samples collected during the installation of 400 Area Closure investigation soil borings. Soil physical properties were determined through the analyses of geotechnical samples performed at the GeoTesting Express laboratory in Acton, MA. The soil property testing report is included as [Appendix D](#), and a summary of the soil property data is provided in [Table 7.3](#).

7.7.2.1 Soil Classification and Particle Size Analysis

The results of the particle size analysis (ASTM D422) were combined with the Atterberg limits (ASTM D4318) to derive the USCS classifications for the 22 samples. A particle-size distribution curve for each soil sample is included in the laboratory report provided in [Appendix D](#). Particle size distribution data showing the percentage of each soil sample that falls within a USCS size category (cobble, gravel, sand, silt/clay) is provided in [Table 7.3](#).

Based on the analyses performed, the 400 Area soil samples can be divided into two USCS Groups:

- 20 of the 22 (90%) samples were classified as poorly-graded to well-graded gravels with a finer grained matrix (GC, GM, GW-GM, GW-GC, GC-GM, GP-GM, and GP-GC) comprising between 39.3 and 68.5 percent gravel.
- Two of the 22 (10%) samples were classified as silty sand (SM) to clayey sand (SC) with lesser amounts of gravel, silt and clay in the matrix with between 43.8 and 46.9 percent sand. These relatively finer samples were collected from the shallow section of the vadose zone at soil borings 400-SB-02 (0-10 ft) and 400-SB-08 (5-10 ft) where finer wind-transported material is prevalent.

Two of the gravel samples, from borings 400-SB-08 (10-15 ft) and 400-SB-15 (15-20 ft) were observed to contain a cobble-sized clast fraction. The USCS classifications correspond well with the lithologic field observations documented within lithologic logs ([Appendix B](#)) and account for the difficulties encountered during the recovery of coarse-grained gravel samples in core barrels. The coarse grained and unsorted nature of the soil samples promotes significant porosity, which is conducive to the infiltration of dissolved phase contaminants through the vadose zone to the local aquifer.

Atterberg limits were determined for 13 of the 22 samples that exhibited plastic behavior; the remaining nine samples were classified as “non-plastic”. The plasticity index (PI) is a measure of the plasticity of a soil and is the difference between the liquid limit and the plastic limit. The samples that exhibited plastic behavior ranged between slightly plastic in boring 400-SB-10 (20-25 ft; PI = 5) to medium plastic in boring 400-SB-05 (0-10 ft; PI = 13) due to a greater percentage of silt and clay in the matrix.

7.7.2.2 Specific Gravity, Moisture Content, Density, and Porosity

All geotechnical samples were analyzed for mass/volume relationships: specific gravity (ASTM D854); moisture content (ASTM D2216); bulk and dry density (ASTM D7263); and, porosity (ASTM D7263). There was relatively little variation in the mass/volume testing data between the samples ([Table 7.3](#)). The relatively fine-grained sandy samples were generally slightly moister, and had a lower bulk density and higher porosity than the coarser-textured samples. Coarse-texture samples with larger gravel clasts were potentially biased low relative to moisture as a result of drying due to elevated temperatures generated during sample collection.

The specific gravity of the samples is defined as the ratio of the weight in air of a given volume to the weight in air of an equal volume of distilled water at the same temperature. The specific gravity for all the samples was consistent at between 2.64 to 2.72 ([Table 7.3](#)). Soil moisture contents ranged from 0.9 to 9.1 percent. The highest moisture content was identified in a sample from boring 400-SB-08 (5 to 10 ft) near the northwest corner of the west former impoundment near an open portion of the 400 Area arroyo. This sample may have been subject to increased runoff and infiltration during precipitation events that occurred during the November 2016 fieldwork. Bulk density ranged from 105.2 to 125.3 pounds per cubic foot (pcf) and dry density from 96.45 to 123.4 pcf. The calculated porosities ranged from 26 to 43 percent. Both of the relatively fine-grained sandy samples from borings 400-SB-02 (0-10 ft) and 400-SB-05 (0-10 ft) had relatively high porosities at 36 and 42 percent, respectively.

7.7.2.3 Saturated and Unsaturated Hydraulic Conductivity

All geotechnical soil samples were analyzed for hydraulic properties (saturated and unsaturated hydraulic conductivity [ASTM D5084]). The saturated hydraulic conductivity for the samples ranged from 3.0E-06 to 3.4E-03 cm/s ([Table 7.2](#)). The lowest saturated hydraulic conductivity was encountered in a sample from boring 400-SB-10 (20-25 ft), which was classified as a silty, clayey gravel with sand (GC-GM). The presence of a relatively high clay fraction (12.4%) reflects the limiting effect that the fine fraction of a soil has on hydraulic conductivity.

The unsaturated hydraulic conductivity properties as a function of the degree of saturation was calculated for each sample. A complete description of unsaturated hydraulic conductivity determination, and plots of unsaturated hydraulic conductivity and relative hydraulic conductivity as a function of moisture content and pressure is provided in the soil property testing report ([Appendix D](#)).

8.0 Regulatory Criteria

Environmental media evaluated during this investigation comprised soil, groundwater, and soil vapor. Wherever possible, regulatory criteria were applied to the evaluation process for each of the media in order to identify areas of potential concern. The applicable regulatory screening levels for soil, groundwater, and soil vapor samples collected as part of the investigation are discussed within the following sections. Regulatory criteria consist of EPA Regional Screening Levels (RSLs; EPA, 2017), groundwater cleanup levels developed in accordance Permit Attachment 15 (NMED, 2016b) and presented in the GMP (NASA, 2017f), and NMED SSLs and VISLs (NMED, 2017e), site specific RBCs (NASA, 2017c). The numerical screening level values are provided within the summary results tables

provided in Section 9.0, and are included within the comprehensive results tables provided in the report appendices.

8.1 Soil

Soil analytical data were evaluated with respect to the most current NMED SSLs provided in NMED's Risk Assessment Guidance for Site Investigation and Remediation (NMED, 2017e). The guidance includes the NMED SSLs for residential and construction worker soil exposures that are both considered as part of the regulatory criteria evaluation. For constituents without available NMED SSL values, concentrations were compared to the EPA RSLs (EPA, 2017).

8.2 Groundwater

Groundwater contamination is the primary focus for monitoring and remedial activities at WSTF and two sets of regulatory criteria were applied. The latest NMED-approved GMP update provides a comprehensive list of the cleanup levels for hazardous wastes and hazardous constituents detected in WSTF groundwater (NASA, 2017f). In addition, tap water screening levels included in NMED's Risk Assessment Guidance (NMED, 2017e) were utilized. These levels were developed for residential land-use, but can be utilized where commercial/industrial receptors are potentially exposed to contaminated water.

8.3 Soil Vapor

The latest soil VISLs provided within NMED's Risk Assessment Guidance for Site Investigation and Remediation (NMED, 2017e) were used to define areas of concern. In addition to the VISLs, NASA has also developed site-specific RBCs that are reviewed and updated annually for WSTF (NASA, 2017c). The use of RBCs in conjunction with VISLs has been approved by NMED (NMED, 2017f). Conclusions derived from the use of the RBCs are required to be supported by characterization of the subsurface vapor sources and an evaluation of the vapor intrusion pathway.

9.0 Site Contamination

9.1 Soil and Rock Sampling

As described in Section 7.3.1, when utilizing rotosonic drilling, the lithologic samples were delivered to the site geologist in sealed 2 ½ ft long bags of plastic tubing. The geologist would use an indelible marker to label the ends of the tubing with top and bottom depths of the sample interval (Appendix A). The bag was then slit open.

Where appropriate, representative samples for headspace analysis (9.2) and laboratory analysis for VOCs utilizing Terra Core samplers were immediately collected to minimize the loss of any volatiles that might be present. Next, any required samples for geotechnical analysis were collected. After that, any other soil samples for laboratory analysis were placed in the appropriate sample containers.

Once all samples for soil vapor, geotechnical and soil chemistry were collected, the geologist would examine the remaining sample and write a description of the lithology in the field logbook. Representative portions of the samples were retained for the permanent record. The remainder of the sample was then placed in a Super Sack for characterization as IDW (Section 6.8).

Air rotary drilling was limited to the portion of some borings that were advanced through bedrock. As such, no sampling for soil vapor, geotechnical analysis, or soil chemistry were collected. Samples were

collected for lithologic description as described in Section 7.2.2. The geologist would consult with the driller to ensure that each sample description corresponded to its correct depth bgs.

9.2 Soil and Rock Field Screening Results

During borehole drilling activities, soil vapors derived from soil samples were collected and analyzed as described in Section 7.6. [Table 7.1](#) presents the results headspace screening. No VOCs were detected in any of the 86 samples that were tested (limit of detection 0.1 ppm).

9.3 Soil and Rock Chemical Analytical Results

9.3.1 Collection of Soil Samples for Chemical Analysis

Soil chemistry samples were collected at approximately 10 ft bgs and at two to three other depths as indicated in the ADWP. Soil samples for chemical analyses were collected directly from the sampler or tool and placed directly into clean sample containers provided by the laboratory in accordance with the 400 Area Closure IWP (NASA, 2011d). Unconsolidated alluvial soil samples were extracted from boreholes using sonic drilling methods and a 10-ft long core barrel. After advancing through each 10-ft depth interval, the core barrel containing the soils was pulled from the boring, and a plastic bag designed to hold approximately 2.5 vertical ft of soil was placed over the mouth of the core barrel. Using gravity to minimize disturbance of the soil, the barrel was vibrated to release a portion of the soil into the core bag. After the core bag was filled, it was tied off at the top, the sample interval was labeled, and transferred to the field geologist for collection of samples for chemical analyses and for lithological characterization.

Terra Core Sampling Kits were used to collect soil samples for VOC analyses. The field sampling team collected the VOC samples immediately after opening (cutting) the core bag. Once the VOC samples were collected, the remaining sample aliquots were collected from the core bag in descending order of volatility. Collected soil samples were immediately placed in sample coolers on ice and the chain-of-custody documents were completed. Samples were shipped via overnight courier to off-site accredited laboratories for chemical analysis on the day of collection or the following day. A summary of the soil sampling intervals and sample information is provided in [Table 7.2](#).

Chemical soil samples were collected from specific locations within soil borings 400-SB-01 through 400-SB-15 to determine whether 400 Area COPCs were present in the soil, and if so, to quantify their concentrations and distribution. Soil chemical samples were collected during the drilling process using decontaminated core barrels between September 2016 and January 2017. The location of soil samples are provided within soil boring lithologic logs ([Appendix B](#)) and are summarized in [Table 7.2](#).

9.3.2 Soil General Chemistry

Soils are composed of varying amounts of four primary components: minerals, air, water, and organic matter. Geotechnical results from previous soil boring investigations in the 400 Area (NASA, 1996b) indicate that minerals comprise between 40 to 60% of the volume of the soil. The remaining three components were reported in the following approximate ranges: air 33 to 37%; water 1 to 15%; and, organic matter 2 to 6%. Mineral content is the source all the major and minor elements that are presented in the chemical soil samples. Alluvial fan source areas to the east of WSTF in the adjacent SAM provide significant amounts of calcium and magnesium from limestones, aluminum and silica from volcanic rocks, and a variety of other enriched metals derived from volcanic rocks and mineralization related to the Organ Mountains intrusive complex (Seager, 1981). These includes arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, selenium, silver, and zinc.

9.3.3 Soil Chemical Analytical Methods

Soil samples from the 400 Area soil borings were analyzed for the list of COPCs provided in the original NMED-approved 400 Area Closure IWP (NASA, 2011d). Standardized analytical methods were used to analyze for the COPCs that were determined based on the historic site activities and known results from previous soil borings installed in the 400 Area (NASA, 1996b). The analytical methods utilized are listed below in the order they were collected in the field.

- VOCs by SW-846 Method 8260B.
- SVOCs by SW-846 Method 8270D.
- Perchlorate by EPA Method 6850.
- Dioxins & furans by SW-846 Method 8290A.
- Total metals by SW-846 6010C (mercury by 7471B).
- Total cyanide by SW-846 Method 9012.
- Nitrate/Nitrite by EPA Method 353.2.
- Hexavalent chromium by SW-846 Method 7196A.
- Chloride by EPA Method 300.0.
- Nitrosamines by Modified EPA Method 607.
- Hydrazine by SW-846 Method 8315.
- Bromacil by SW-846 Method 8321.

9.3.4 Soil Analytical Results above Laboratory Detection Limits

Thirty-five of the 65 COPCs for the 400 Area (NASA, 2011d) were identified above detection limits in samples collected from soil borings 400-SB-1 to 400-SB-15:

- VOCs (9 constituents): Freon 11; Freon 21; TCE; PCE; 2-propanol; toluene; methylene chloride; chlorobenzene; and, 2-hexanone.
- Metals (20 constituents): aluminum; antimony; arsenic; barium; beryllium; cadmium; calcium; chromium; hexavalent chromium; cobalt; copper; lead; mercury; molybdenum; nickel; selenium; strontium; tin; vanadium; and, zinc.
- Cyanide (1 constituent).
- Nitrate and nitrite (2 constituents).
- Chloride (1 constituent).
- Nitrosamines (2 constituents): NDMA and DMN.

9.3.5 Soil Chemical Analytical Results and Comparison to Regulatory Criteria

A summary of soil chemical analytical results for hazardous constituents above NMED residential soil screening levels (RSSLs) and construction worker soil screening levels (CWSSLs; NMED, 2017e) is provided in [Table 7.4](#). The more conservative (lower concentration) of the cancer or non-cancer SSLs was used when selecting the NMED RSSL and CWSSL. Where no NMED SSL was available for a hazardous

constituent, the New Mexico Groundwater (NMGW) or MCL-based SSL, Dilution Attenuation Factor (DAF) 20 was used. A comprehensive set of all soil analytical results and a summary of soil analytical detections is provided in the Soil Analytical Results Workbook included on the DVD submitted with this report. Original laboratory reports for soil chemical analyses are also included on a DVD submitted with this report.

9.3.6 Soil Chemical Analytical Results above NMED RSSLs and CWSSLs

A total of 54 chemical soil samples were collected from soil borings 400-SB-01 through 400-SB-15, from 46 discrete soil sampling locations ([Table 7.2](#)). Eight quality control soil samples collected comprised five duplicate samples and three matrix spike samples. Soil chemical analytical results were compared to NMED RSSLs and NMED CWSSLs (NMED, 2017e). A total of three of the original COPCs (NASA, 2011d) were detected in chemical soil samples at concentrations above NMED screening levels: arsenic (above RSSL); lead (above RSSL and CWSSL); and, NDMA (above RSSL).

9.3.6.1 SVOCs

NDMA was detected above the NMED RSSL (0.0234 milligram per kilogram [mg/kg]) in one sample from 400-SB-08 at 77 ft bgs at a concentration of 0.071 mg/kg ([Table 7.4](#)). This concentration is below the NMED CWSSL (2.14 mg/kg).

9.3.6.2 Metals

Arsenic was detected above the NMED RSSL (7.07 mg/kg) in three samples from soil borings 400-SB-06 (12.7 mg/kg), 400-SB-07 (9.1 mg/kg), and 400-SB-13 (10.9 mg/kg; [Table 7.4](#)). All concentrations were below the NMED CWSSL (41.2 mg/kg). Lead was detected at concentrations above the NMGW or MCL-based SSL, DAF 20 (0.052 mg/kg) in all 15 soil borings in a total of 42 samples. With the exception of one soil sample, lead concentrations ranged from 3.41 mg/kg in 400-SB-03/400-SV-03 at 44 ft bgs to 17.8 mg/kg in 400-SB-04/400-EV-131 at 79 ft bgs. The sample in 400-SB-02/400-SV-02/ wells at 40 ft bgs had a higher concentration of 32.4 mg/kg.

9.3.7 Potential Bias due to Sample Collection Conditions

There was no apparent bias due to soil sample conditions in the field for the 400 Area Closure investigation. The drilling process utilized relatively wide 6.1-in. OD and 5-in. ID steel core barrels. The 5-in. cores tend to reduce the amount of heat transmitted to the central core sample relative to narrower diameter cores, thereby reducing the potential loss of VOCs and SVOCs from the soil sample.

9.4 Groundwater Sampling

Groundwater sampling was performed during the installation of 400 Area soil borings (grab sampling) and following installation and development of MSVGM wells within several borings.

9.4.1 Groundwater Grab Samples

Groundwater was encountered during the installation of soil borings 400-SB-04, 400-SB-08, 400-SB-10, 400-SB-12, and 400-SB-14 ([Figure 2.4](#)). Following removal of downhole drilling equipment from each boring, groundwater was allowed to recover sufficiently for sample collection. A decontaminated stainless steel bailer was lowered into the boring to collect groundwater samples for analysis of VOCs by method 8260, SVOCs by method 8270, and NDMA by EPA method 607. Groundwater samples were

managed in accordance with site-specific procedures and shipped to off-site accredited laboratories for chemical analysis.

9.4.2 Groundwater Sampling at MSVGM Wells

Following the successful development of the 400 Area MSVGM wells, dedicated bladder pumps were installed in six of the eight wells. Sampling equipment was not installed in 400-KV-142 due to its low recharge rate or in 400-LV-125 because the potentiometric surface had declined below the screened interval. Groundwater samples were collected using the dedicated pumps at MSVGM wells 400-FV-131, 400-GV-125, 400-HV-147, 400-IV-123, and 400-JV-150 between July 15 and August 8, 2017. The bladder pump in well 400-EV-131 failed during this period and could not be repaired. The sampling system was removed from the well and it was purged with a non-dedicated piston pump which was first decontaminated by steam cleaning. It was then sampled with a stainless steel bailer which was first decontaminated by steam cleaning. Groundwater samples were collected from 400-KV-142 using a decontaminated stainless steel bailer. The well was not purged prior to sampling due to the extremely slow recovery rate measured during well development. Groundwater samples were not collected from well 400-LV-125 because there was inadequate groundwater in the well.

Groundwater sampling was performed in accordance with established site-specific procedures for low-flow sampling and for traditional purge and sample methods. Groundwater samples were collected for analysis of VOCs, SVOCs, NDMA, inorganic compounds, and several metals in accordance with the NMED-approved Groundwater Monitoring Plan (NASA, 2017f).

9.5 Groundwater General Chemistry

During well development, four water quality field parameters were tested to determine if sufficient development had been performed: temperature; pH; specific conductivity; and turbidity. Development continued until the first three parameters had stabilized (less than 10% variation in results between three consecutive measurements) and the turbidity had declined to less than five nephelometric turbidity units (NTUs). The well development logs are included in Appendix F.

As part groundwater sample collection for laboratory chemical analyses, the same field parameters were measured prior to and following sampling to ensure that sufficient groundwater was purged and that samples were representative of conditions in the formation. The total volume purged prior to sampling was also recorded to demonstrate that all groundwater within the well and gravel pack surrounding the screened zone had been removed.

9.6 Groundwater Chemical Analytical Results

9.6.1 Groundwater Chemical Analytical Methods

Groundwater samples collected from the MSVGM wells were analyzed for the COPCs listed in the original NMED-approved 400 Area Closure IWP (NASA, 2011d) using currently available analytical methods. Hexavalent chromium was not analyzed in wells outside the footprint of the 400 Area Closure cells because it was not historically used for operations in the 400 Area (NASA, 2011d). The following analytical methods were used to analyze for the COPCs identified from historical site activities and the results from existing groundwater monitoring wells.

- VOCs by SW-846 Method 8260C.
- SVOCs by SW-846 Method 8270D.

- Dioxins and furans by SW-846 Method 8290A.
- Metals by the laboratory's most appropriate method.
- Perchlorate by EPA Method 6850.
- Total cyanide by SW-846 Method 9012B.
- Hexavalent chromium by EPA Method 218.6.
- Nitrate/Nitrite by EPA Method 300.
- Anions by EPA Method 300.0 and alkalinity by Standard Method 2320B.
- Total dissolved solids by Standard Method 2540C.
- NDMA/Bromacil by Modified EPA Method 607.
- Hydrazine by SW-846 Method 8315.

9.6.2 Groundwater Analytical Results above Laboratory Detection Limits

Twenty-eight of the 65 COPCs for the 400 Area (NASA, 2011d) were identified above detection limits in groundwater samples collected from MSVGM wells installed in 400 Area soil borings:

- VOCs (9 constituents): Freon 11; Freon 21; Freon 113; Freon 123a; TCE; 2-propanol; acetone; chloroform; and, chloromethane.
- SVOCs (1 constituent): bis(2-ethylhexyl) phthalate (BEHP).
- Nitrosamines (2 constituents): NDMA; and, DMN.
- Bromacil (1 constituent).
- Perchlorate (1 constituent).
- Anion: chloride (1 constituent).
- Metals (13 constituents): arsenic; barium; boron; calcium; chromium; cobalt; lead; molybdenum; selenium; strontium; thallium; vanadium; and, zinc.

9.6.3 Groundwater Chemical Analytical Results and Comparison to Regulatory Criteria

Groundwater analytical results above detection limits were compared to WSTF cleanup levels (NASA, 2017f) and NMED tap water screening levels (NMED, 2017e). In the six MSVGM wells sampled using dedicated low-flow bladder pumps, TCE, BEHP, NDMA, and arsenic were detected at concentrations above WSTF cleanup levels and/or NMED tap water screening levels. Barium, chromium, cobalt, lead, thallium, and vanadium were detected at concentrations above the WSTF groundwater cleanup level in MSVGM well 400-KV-142, which produced highly turbid groundwater that likely impacted sample quality.

9.6.3.1 VOCs

TCE was the only VOC identified above the WSTF cleanup level of 4.9 micrograms per liter ($\mu\text{g/L}$). TCE was reported within a single groundwater sample collected from well 400-EV-131 at a concentration of 13 $\mu\text{g/L}$.

9.6.3.2 SVOCs

BEHP was detected at relatively low concentrations between 3.2 µg/L and 7.3 µg/L in six wells: 400-EV-131, 400-FV-131, 400-GV-125, 400-HV-147, 400-IV-123, and 400-JV-150. At four of these wells (400-FV-131, 400-GV-125, and 400-JV-150), BEHP was detected above the WSTF cleanup level of 6 µg/L at concentrations between 6.6 µg/L and 7.3 µg/L. All BEHP detections are below the NMED tap water screening level of 55 µg/L.

NDMA was the most frequently detected COPC in groundwater samples above the WSTF cleanup level of 0.0011 µg/L. NDMA was detected in groundwater samples collected from all seven MSVGM wells using Modified EPA Method 607 and SW-846 Method 8270. Because Modified EPA Method 607 is the primary analytical method utilized to quantitate NDMA in the WSTF groundwater plume, results from this method are presented in this report. NDMA concentrations generally ranged between 0.036 µg/L in the sample from well 400-IV-123 to 3.9 µg/L in the sample from well 400-JV-150. The NDMA concentration in well 400-HV-147 was 66 µg/L, an order of magnitude higher than concentrations in other new 400 Area MSVGM wells.

9.6.3.3 Metals

Arsenic was the only metal from the COPC list that was detected on a regular basis and was reported in all seven wells at concentrations above the NMED screening level of 0.00052 mg/L. Concentrations ranged from 0.0007 mg/L at 400-GV-125 to 0.0107 mg/L at 400-KV-142.

Six additional metals were identified above WSTF groundwater cleanup levels in the sample collected from well 400-KV-142. Concentrations of barium (1.36 mg/L), chromium (0.228 mg/L), cobalt (0.022 mg/L), lead (0.05 mg/L), thallium (0.0005 mg/L), and vanadium (0.108 mg/L) exceeded WSTF groundwater cleanup levels of 1.0 mg/L, 0.05 mg/L, 0.006 mg/L, 0.05 mg/L, 0.0002 mg/L, and 0.086 mg/L, respectively. These detections of metals were all within an order of magnitude of the WSTF cleanup level. Due to the very low available volume of groundwater in the well, it could not be purged prior to sampling. As a result, groundwater samples exhibited higher turbidity than is typical for WSTF groundwater. It is believed that higher concentrations of metals in the sample from this well result from sediment collected in the groundwater sample while using the bailer.

A summary of results for hazardous constituents above the WSTF cleanup levels (NASA, 2017f) and above NMED tap water screening levels (NMED, 2017e) is provided in [Table 7.5](#). A comprehensive set of analytical results and a summary of detection in groundwater samples is provided in the Groundwater Analytical Results Excel workbook included on the DVD submitted with this report. Original laboratory reports for groundwater chemical analyses are also included on a DVD submitted with this report.

9.6.4 Potential Bias due to Field Sampling Conditions

The turbidity of the groundwater sample collected from well 400-KV-142 was 31.8 NTUs. Following sampling, significantly increased turbidity promoted by disturbance of the sediment in the bottom of the well during sampling was off the scale at >1,000 NTUs. In accordance with established groundwater sampling procedures, samples for analysis of VOCs, SVOCs, and NDMA were collected prior to the sample for analysis of metals, thus the metals sample was subject to the most severe turbidity of >1,000 NTUs. This turbidity was well above the laboratory recommended guideline of 5 NTU and is believed to have biased this sample for the metals barium, chromium, cobalt, lead, thallium, and vanadium, which did not exceed WSTF cleanup levels in other groundwater samples collected during the investigation.

9.7 Soil Vapor Sampling

Soil vapor samples were collected and analyzed to determine the concentration and distribution of VOCs in the subsurface. Soil vapor sampling of the 400 Area MSVM and MSVGM wells was performed following well installation and development (if applicable) between July 15 and August 8, 2017. Samples were collected from each soil vapor implant in all 15 MSVM and MSVGM wells except 400-FV-131-104, 400-FV-131-130 and 400-JV-150-145. Implants 400-FV-131-130 and 400-JV-150-145 were beneath the potentiometric surface at their respective locations. Soil vapor port 400-FV-131-104 could not be opened for sample collection despite the use of all WSTF approved protocols for attempting to open blocked implants.

Soil vapor sampling was performed in accordance with established WSTF procedures. At each MSVM or MSVGM well, the sampling sequence began with the shallowest implant and continued sequentially until the deepest implant had been sampled. Each port was connected to a vacuum pump, which was then operated for three minutes to purge the vapor implant and connecting stainless steel tubing. This process ensures that samples are representative of the portion of the formation adjacent to the sample port at that depth in the well. The samples were collected in one-liter stainless steel Summa canisters and shipped to the laboratory for analysis for VOCs by EPA Method TO-15.

During the vapor sampling event, each vapor port was affixed with an aluminum tag engraved with the ID of that port to ensure each port can be identified in the future.

Soil vapor samples were analyzed for volatile organic compounds (VOCs) using Environmental Protection Agency (EPA) Method TO-15. [Table 7.6](#) lists all analytes that were tested.

9.8 Soil Vapor Field Screening Results

Headspace was analyzed on 86 samples from 11 of the 15 soil borings using the Altair 5X Multigas Detector equipped with an integrated PID sensor for VOC detection ([Table 7.1](#)). Field headspace analyses were not performed during the installation of soil borings 400-SB-01, 400-SB-2, 400-SB-05, and 400-SB-11 due to required maintenance and repair of the detector by the manufacturer while these borings were being installed.

The PID identified the volume percentage range for combustible gases, oxygen, carbon dioxide, and methane, as well ppm levels for carbon monoxide and VOCs. The PID sensor is capable of detecting VOCs in the range of 0 to 2,000 ppm with a resolution of 0.1 ppm. Soil vapor headspace samples were evaluated on samples from soil borings 400-SB-03, 400-SB-04, 400-SB-06, 400-SB-07, 400-SB-08, 400-SB-09, 400-SB-10, 400-SB-12, 400-SB-13, 400-SB-15, and 400-SB-15. Soil samples from the 5-in. diameter cores were collected and sealed in resealable plastic bags. Soil samples were agitated and broken within the bag, which was then allowed to sit for approximately five minutes before the detector was inserted into the bag for approximately 15 seconds for headspace evaluation. Where headspace samples were collected across intervals utilized for chemical laboratory soil samples, those samples were collected contemporaneously. [Table 7.1](#) presents a summary of the field headspace analysis. No VOCs were detected above the instrument detection limit of 0.1 ppm in any of the headspace samples collected.

9.9 Soil Vapor Chemical Analytical Results

9.9.1 Soil Vapor Chemical Analytical Methods

Soil vapor chemical samples were collected from discrete zones within the 400 Area MSVM and MSVGM wells to evaluate as many COPCs as possible from the list provided in the original NMED-

approved 400 Area Closure IWP (NASA, 2011d). A total of 68 soil vapor samples (including field quality control samples) were collected and analyzed for VOCs using EPA Method TO-15. Seventeen field quality control samples were collected:

- Duplicates (6): 400-EV-130; 400-GV-120; 400-HV-130; 400-IV-118; 400-SV-03-092; and, 400-SV-07-100.
- Field blanks (8): 400-EV-130; 400-GV-120; 400-JV-100; 400-KV-137; 400-SV-03-092; 400-SV-05-100; 400-SV-09-104; and, 400-SV-10-125.
- Trip Blanks (3): 400-FV-063; 400-SV-03-010; and, 400-SV-05-100.

Twenty three of the analytes analyzed by Method TO-15 are COPCs defined for the 400 Area Closure investigation (NASA, 2011d): 1,1,1-trichloroethane; 1,1-dichloroethane; 2-butanone; 2-hexanone; 2-propanol; acetone; bromodichloromethane; bromoform; chlorobenzene; chloroform; chloromethane; dibromochloromethane; Freon 11; Freon 113; Freon 123; Freon 21; m,p-Xylene; methyl tert-butyl ether; methylene chloride; PCE; toluene; trans-1,2-dichloroethene; and TCE.

9.9.2 Soil Vapor Analytical Results Above Laboratory Detection Limits

Of the 65 COPCs analyzed by EPA Method TO-15, detections were reported for 41 of the compounds within the soil vapor dataset. These compounds are identified in [Table 7.6](#). Detections within the soil vapor sampling zones were reported for 17 of the 23 COPC analytes. Of the 17 COPCs detected, 12 were also detected in field and/or trip blanks.

9.9.3 Soil Vapor Chemical Analytical Results and Comparison to Regulatory Criteria

Soil vapor samples were collected from individual soil vapor sample ports in MSVM and MSVGM wells between July 5 and August 8, 2017. A total of 51 sampling zones in the 15 wells were sampled. Soil vapor sample zones are shown on the well completion reports ([Appendix F](#)), and are summarized in [Table 7.2](#).

Soil vapor analytical results above detection limits were compared to WSTF site-specific residential RBCs (NASA, 2017c) and NMED VISLs (NMED, 2017e) to identify any locations of potential concern. A total of 15 detections for three analytes (all of which were COPCs) were identified in concentrations exceeding their VISLs ([Table 7.7](#)) within the soil vapor dataset.

- Freon 11 (11 detections): 400-EV-131-130 (2 samples including duplicate); 400-GV-125-105; 400-GV-125-120; 400-HV-147-130 (2 samples including duplicate); 400-IV-123-45; 400-IV-123-80; 400-KV-142-137; 400-LV-125-122; and, 400-SV-10-125. The maximum detection was 1,800,000 ug/m³ in well 400-KV-142-137 and the NMED VISL is 24,300 ug/m³.
- Freon 113 (3 detections): 400-EV-131-130 (2 samples including duplicate); and, 400-KV-142-137. The maximum detection was 2,900,000 ug/m³ also in well 400-KV-142-137 and the NMED VISL is 1,040,000 ug/m³.
- Chloroform (1 detection): 400-SV-10-50. The detection of 130 ug/m³ was the only above the NMED VISL of 40.7 ug/m³.

Soil vapor concentrations exceeding the NMED VISLs were usually present at depth within MSVM and MSVGM wells. The shallowest sample to include a VOC exceeding the NMED VISL was for Freon 11- in well 400-IV-123 at a depth of 45 ft bgs.

The 15 detections for VOCs above NMED VISLs were subsequently compared to the equivalent depth sensitive WSTF site specific RBCs ([Table 7.7](#)). None of the compounds that exceeded NMED VISLs exceeded the equivalent RBCs. The RBCs were between two to four orders of magnitude larger than the VOC analytical results for Freon 11, two orders of magnitude larger for Freon 113, and four orders of magnitude larger for chloroform.

Soil vapor SVOCs were not analyzed as part of this investigation. They are not part of the EPA Method TO-15 analytical suite, and cannot be collected in a SUMMA canisters because their low vapor pressures cause them to attach to the inside of the canister surfaces. A summary of results for hazardous constituents above NMED VISLs (NMED, 2017) and a comparison to WSTF site-specific residential RBCs (NASA, 2017c) is provided in [Table 7.7](#). Comprehensive soil vapor analytical results and a summary of soil vapor analytical results above ND are provided in Excel workbook Soil Vapor Analytical Results included on the DVD submitted with this report. Original laboratory reports for soil vapor chemical analyses are also included on a DVD submitted with this report.

The ranges of VOCs reported for the soil vapor sampling event for soil vapor samples collected from sampling zones and from the field blank/trip blank samples is presented. [Table 7.6](#) provides a list of the 65 soil vapor analytes evaluated using EPA Method TO-15 analyses. A comparison is made between the range of concentrations for samples taken from soil vapor monitoring well samples and field blank/trip blank samples from canisters opened to ambient air or unopened, respectively.

9.9.4 Potential Bias due to Field Sampling Conditions

A bias appears to exist due to soil vapor sample conditions in the field for the 400 Area Closure investigation. Twelve of the 17 COPC analytes detected within soil vapor sampling zones were also detected in field and/or trip blanks as follows: MEK; 2-Hexanone; 2-Propanol; acetone; chloromethane; Freon 11; Freon 113; m,p-Xylene; methylene chloride; PCE; toluene; and, TCE ([Table 7.7](#)).

10.0 Deviations

During investigation fieldwork, NASA encountered various unexpected conditions or circumstances that required field personnel to deviate from expected processes or procedures as identified in the *400 Area Investigation Work Plan* (NASA, 2011d) and the *400 Area Investigation Abbreviated Drilling Work Plan* (NASA, 2016a). A summary of the specific requirements and their implemented deviations are listed in [Table 10.1](#).

11.0 Conclusions

11.1 Summary of Investigation Fieldwork

During fieldwork at the 400 Area investigation, NASA complied with all applicable health and safety requirements identified during project planning. NASA advanced 15 soil borings. Borings were advanced using sonic coring and air rotary drilling methods as previously described in this report. NASA collected and evaluated field data such as soil lithology, soil vapor screening results, and groundwater depths and indicator parameters. Soil samples for geotechnical evaluation and chemical analysis were collected at specific intervals within each boring. Soil samples were shipped to qualified off-site laboratories for testing and analysis.

MSVGM wells were installed in eight of the soil borings. The wells were subsequently developed for groundwater sampling and dedicated sampling systems were installed in six of the wells in which groundwater production was adequate for sampling. Groundwater samples were collected from the six

wells, and from one well in which a sampling system was not installed, and submitted to off-site laboratories for chemical analysis. MSVM wells were installed in the remaining seven borings. Soil vapor samples were collected from all 15 monitoring wells and submitted to an off-site laboratory for chemical analysis.

11.2 Comparison to Previous Investigations

11.2.1 Previous 400 Area Investigations

Soil samples were collected in the vicinity of the 400 Area Closure in 1987 (NASA, 1996a). Three constituents were detected above the detection limits at that time. The three detections of COPCs at concentrations above screening levels in soil samples during this investigation are consistent with previous investigations. Specifically, very few COPCs were detected in the soils in the investigation area that are the result of operational activities at WSTF.

The concentrations of NDMA in groundwater are generally consistent with samples collected previously from existing wells in the vicinity. The NDMA detection in groundwater at monitoring well 400-HV-147 (66 µg/L), however, was the highest NDMA concentration reported in WSTF groundwater. Despite the elevated concentration at that location, NDMA concentrations are within the same order of magnitude as concentrations from previously installed wells further downgradient in the 400 Area.

11.2.2 300 Area Investigation

Soil and soil vapor samples were collected in the vicinity of the 300 Area Closure in 2011 (NASA, 2011d). Concentrations of constituents in soil vapor were not high enough to cause dissolved concentrations to exceed groundwater cleanup standards, and therefore soil vapor was not considered a source of groundwater contamination. Concentrations of constituents in soil vapor were not high enough for intrusion of hazardous vapors into indoor air to cause indoor air concentrations above evaluation criteria used at the time of the 300 Area investigation.

Arsenic, cobalt, NDMA, and conservatively-estimated nitrite concentrations exceeded the groundwater protection soil screening levels in some samples. Arsenic and cobalt exceedances, which were observed in almost all samples, are thought to represent background conditions. The measured concentrations of nitrate/nitrite exceeded the groundwater protection screening criteria for nitrite in two soil samples. The evaluation criteria for nitrate were not exceeded. Data for concentrations of nitrate and nitrite individually were not available. Based on site soil conditions, it is likely that nitrite concentrations are below the nitrite screening level.

NDMA concentrations in two soil samples collected beneath the eastern former impoundment exceeded the groundwater protection screening level. NASA has continued PCC activities as an effective interim measure to maintain the low permeability liner of the 300 Area Closure and inhibit moisture transport through the vadose zone. NASA proposed that a final remedy be selected and implemented after the 400 Area Closure Investigation and Report were completed given that the 300 and 400 Areas are geographically contiguous, part of the same hydrologic unit, and received similar waste streams.

11.3 Potential Receptors

The preliminary SCEM identifies the construction worker scenario as the only scenario with a complete exposure pathway for soils in the vadose zone. There are no current or future residential and commercial/industrial land use scenarios for the 400 Area Closure, as detailed in Section 5.2. A construction worker scenario provides the best fit for the Closure as construction workers could encounter

contaminated material when working on roads or utility conduits in the area. Therefore, inadvertent ingestion of, inhalation of, or dermal contact with soil may be considered a complete exposure pathway for this evaluation

Groundwater beneath and to the west of the 400 Area is contaminated as a result of historical operations (NASA, 2011d). The conceptualized groundwater contaminant plume extends approximately 3 mi westward from the WSTF propulsion test areas. Currently, there are no complete exposure pathways or human or ecological receptors of contaminated groundwater. Downgradient public and WSTF water supply wells comprise potential future pathways for exposure to groundwater contamination. Under current conditions, the nearest downgradient water wells are NASA WSTF water supply wells, the closest of which is approximately 4,000 ft from the western edge of the conceptualized groundwater contaminant plume. Routine sampling of drinking water from the NASA supply wells indicates that the WSTF water supply has not been impacted by WSTF groundwater contaminants. NASA also performed groundwater sampling at six off-site water supply wells in 2010. There was no evidence that these wells had been impacted by NASA's groundwater contaminant plume (NASA, 2010b). NASA is actively remediating and monitoring contaminated groundwater at WSTF (NASA, 2017g).

11.4 Interpretation of Soil Analytical Results

11.4.1 SVOCs

The only SVOC detected in soil above the applicable NMED RSSL (0.0234 mg/kg) was NDMA at 0.071 mg/kg in the sample collected from soil boring 400-SB-08 at 77 ft bgs. Soil boring 400-SB-08 is the westernmost boring in the 400 Area Closure west cell, and was converted to MSVGM well 400-HV-147. NASA notes the correlation between the detection of NDMA in soil boring 400-SB-08 and MSVGM wells subsequently installed in that boring. However, other locations of relatively high NDMA concentration in groundwater are not overlain by corresponding detections of NDMA in soil, indicating that, in general, NDMA has likely passed through the soil to the groundwater. Relatively recent abundant rainfall and historical artificial recharge created by WSTF testing activities are believed to have carried highly soluble NDMA through the vadose zone in the local and regional groundwater. See also Section 11.6.

Based on analytical data from SVOC samples collected from soil during the investigation, NASA concludes that there are no SVOCs in soil that present an ongoing risk to human health or the environment. There is no indication of a significant continuing source of contamination to the local or regional groundwater from SVOCs in soils beneath and adjacent to the 400 Area Closures. The concentrations of NDMA in groundwater samples from 400-HV-147 and NASA 6, and the high concentrations in the groundwater grab sample from boring 400-SB-08, suggest that a small amount of residual NDMA may exist in the vadose zone in the immediate vicinity of these locations. The depth of the NDMA detection in soil does not pose a risk to human health.

11.4.2 Metals

Arsenic detections reported from three samples in soil borings 400-SB-06, 400-SB-07, and 400-SB-13 had concentrations ranging between 9.1 mg/kg to 12.7 mg/kg. These are above NMED RSSL (7.07 mg/kg) but below the CWSSL (41.2 mg/kg). The three arsenic results are all within the range reported for Background Area #2 of the NMED-approved WSTF Soil Background Study Investigation (NASA, 2015). Background Area #2 includes the WSTF 400 Area propulsion facility and comprises soils derived from the hilly flanks of the Bear Canyon alluvial fan upgradient of the WSTF 300 and 400 Areas. The range of arsenic concentrations from 36 background samples collected was between 3.6 mg/kg and 13.1 mg/kg. Of

the 54 soil samples analyzed for this study, the three arsenic sample concentrations above the NMED RSSL all fell within this range.

Lead concentrations were reported from all 15 boreholes installed, with results from 42 of the 54 soil samples collected exceeding the NMGW or MCL-based SSL, DAF 20 (0.052 mg/kg). With the exception of one sample, the concentrations ranged between 3.41 mg/kg and 17.8 mg/kg. These concentrations were again compared to Background Area #2. The range of lead concentrations from 36 background samples collected was between 6.5 mg/kg and 23.6 mg/kg. Of the 54 soil samples analyzed for this study, 41 of the 42 lead sample concentrations above the NMGW or MCL-based SSL, DAF 20 fell within this range. One soil sample in 400-SB-02 at 40 ft bgs with a concentration of 32.4 mg/kg was above the background range but within the same order of magnitude.

The range of soil arsenic and lead concentrations were also compared to the ranges obtained for historic background soil samples collected in 1987 and 1995 for the RFI (NASA, 1996) and the two separate datasets were found to be compatible. The one exception is the high concentration of lead of 2,420 mg/kg obtained from a 1995 background soil boring sample, which significantly exceeds the 400 Area maximum concentration of 32.4 mg/kg. Elevated concentrations of lead are common throughout soils adjacent to the southern SAM. Lead occurs as a product of intrusive metamorphism within the area, and the “outer lead zone” includes the Bear Canyon area to the east (Seager, 1981) that is the source of much of the alluvial fan deposits within the WSTF test areas.

The concentrations of arsenic and lead also fall well within the regional concentration ranges for the surficial soil materials in the conterminous United States (Schackette and Boerngen, 1984; Table 4.1), with the greatest abundance and highest concentrations for heavy metals occurring within surface materials from the Western United States.

Based on the available data, NASA concludes that concentrations of metals in soil beneath and adjacent to the 400 Area Closures are consistent with local and regional background concentrations. Metals in the soils at the 400 Area Closures do not present a source of contamination to the groundwater.

11.5 Interpretation of Soil Vapor Analytical Results

Soil vapor analytical results for 400 Area VOCs are all between two to four orders of magnitude below WSTF site-specific RBCs and locally exceed VISLs primarily for Freon 11 and Freon 113. For 13 of the 17 detections of VOCs above NMED VISLs, concentrations are from sampling zones toward the base of the wells at depths of over 100 ft bgs and in close proximity to the local groundwater table.

Previous investigations in the WSTF 200, 300, and 600 Areas have indicated two relationships; 1) a strong correlation between the distribution of soil vapor COPCs and their presence in the groundwater directly below; and, 2) a strong correlation between maximum soil vapor concentrations typically observed at depth near the water table and the corresponding calculated concentrations for soil vapor in equilibrium with contaminated groundwater. As a result, significant parts of the soil vapor plume in the vadose zone are attributed to the underlying groundwater plume.

Calculations have been previously performed to determine the equivalent soil vapor VOC concentrations that represent equilibrium with groundwater VOC concentrations. Comparisons of measured soil vapor concentrations to calculated equivalent soil vapor concentrations from groundwater for the 600 Area Closure IR (NASA, 2011), subsequent semi-annual soil vapor and groundwater evaluations (e.g. NASA, 2013), and the 200 Area Phase II IR (NASA, 2015) are well documented. A similar comparison was performed for the 400 Area.

[Table 7.7](#) provides a summary of the two primary soil vapor VOCs detected above NMED VISLs (Freon 11 and Freon 113) with a comparison to calculated concentrations in equilibrium with the corresponding groundwater samples collected from the same MSVGM well. The comparison was made utilizing Henry's Law to calculate the soil vapor concentrations for Freon 11 and Freon 113 that would be in equilibrium with measured groundwater concentrations. The calculation was performed by multiplying the groundwater concentration in units of $\mu\text{g/L}$ by 1,000 to convert to units of $\mu\text{g/m}^3$, and then multiplying by the Henry's Law coefficient for that compound to yield a vapor phase concentration in units of $\mu\text{g/m}^3$. The Henry's Law coefficients utilized for the calculations were obtained from the latest NMED Risk Assessment guidance (NMED, 2017e).

The maximum soil vapor concentrations for Freon 11 and Freon 113 that exceeded NMED VISLs were identified in MSVGM wells 400-EV-131 and 400-KV-142. A generalized vertical delineation of soil vapor was evident for all MSVM and MSVGM wells, with the highest concentrations of soil vapor being identified in the deepest (and most proximal to the groundwater table) vapor implants. This was the case for the maximum Freon 11 and Freon 113 concentrations that were reported from the deepest implants; 400-EV-131 at 130 ft bgs, and 400-KV-142 at 137 ft bgs.

Soil vapor samples and the corresponding groundwater samples were collected within a two-day timeframe for MSVGM well 400-EV-131 (July 24 and July 26, 2017), and on the same day for MSVGM well 400-KV-142 (August 7, 2017). The results for the calculated soil vapor concentrations for Freon 11 and Freon 113 in equilibrium with groundwater ([Table 11.1](#)) shows that they are within the same order of magnitude as the actual maximum concentrations and are between 1.4 to 2.4 times higher in concentration. This indicates that the maximum concentrations identified in the deepest soil vapor implants may be derived from the groundwater. The maximum concentration of Freon 11 in well 400-EV-131 at 130 ft bgs is $1,100,000 \mu\text{g/m}^3$, which is below the calculated concentration in equilibrium with groundwater of $2,069,000 \mu\text{g/m}^3$. The maximum concentration of Freon 11 in well 400-KV-142 at 137 ft bgs is $1,700,000 \mu\text{g/m}^3$, which is below the calculated concentration in equilibrium with groundwater of $2,427,800 \mu\text{g/m}^3$. The maximum concentration of Freon 113 in well 400-EV-131 at 130 ft bgs is $1,800,000 \mu\text{g/m}^3$, which falls below the calculated concentration in equilibrium with groundwater of $3,240,000 \mu\text{g/m}^3$. The maximum concentration of Freon 11 in well 400-KV-131 at 137 ft bgs is $2,900,000 \mu\text{g/m}^3$, which falls well below the calculated concentration in equilibrium with groundwater of $6,912,000 \mu\text{g/m}^3$.

The maximum measured soil vapor concentrations and the calculated soil vapor concentrations in equilibrium with groundwater for Freon 11 and 113 within wells 400-EV-131 and 400-KV-131 were all above NMED VISLs and below WSTF site-specific RBCs. However, the corresponding groundwater concentrations for Freon 11 and Freon 113 within the two wells were all one to two orders of magnitude below the applicable WSTF GMP or NMED tap water screening levels. The Freon 11 and Freon 113 soil vapor concentrations in the vadose zone that exceeded NMED VISLs could therefore conceivably be derived from underlying groundwater significantly below the applicable groundwater cleanup standard.

None of the COCs in the vapor phase were present in concentrations exceeding 1 percent of their residential RBCs. Detected VOCs at concentrations above NMED VISLs are from sampling zones toward the base of the well at depths of over 100 ft bgs in proximity to the local groundwater table. In addition, there are no occupied buildings in the 400 Area Closure, as the nearest regularly occupied buildings are several hundred feet south of the impoundments and adjacent arroyo, therefore the vapor exposure pathway is considered incomplete. Given all these factors, the result of the preliminary assessment is that there is no potential for vapor intrusion for the 400 Area Closure.

11.6 Interpretation of Groundwater Analytical Results

11.6.1 VOCs

Low concentrations of TCE above the laboratory detection limit in the 0.65 to 1.8 µg/L range were identified in MSVGM wells 400-FV-131, 400-GV-125, and 400-HV-147. Only one detection for TCE of 13 µg/L in well 400-EV-131 exceeded the WSTF cleanup level of 4.9 µg/L. TCE is currently present in existing 400 Area monitoring wells 400-A-151, 400-C-118, 400-C-143, NASA 6, and NASA 9, though concentrations at these wells do not exceed the WSTF cleanup level. Results are typically at the method detection limit or associated with a qualifier flag indicating the result is an estimate (greater than the method detection limit but less than the practical quantitation limit). NASA concludes that the one detection of TCE at MSVGM well 400-EV-131 in excess of the WSTF cleanup level is a localized occurrence and, based on analytical data from other 400 Area groundwater monitoring wells, not representative of the local groundwater. Additional groundwater sampling at the new 400 Area monitoring wells will allow NASA to refine the understanding of TCE concentrations in this area.

11.6.2 SVOCs

BEHP is a common chemical added to PVC and other plastics to increase flexibility, and is also a common laboratory contaminant. Concentrations of BEHP above WSTF cleanup levels were observed in MSVGM wells 400-FV-131 (6.6 µg/L), 400-GV-125 (7.3 µg/L), and 400-JV-150 (7.1 µg/L). These relatively low concentrations of BEHP, combined with the limited scope of detection within the 400 Area, indicate that the detections may be the result of laboratory contamination. Continued groundwater sampling of new monitoring wells will provide additional data.

NDMA concentrations in groundwater within the 300 and 400 Areas are historically well documented. These areas represent the primary source for the WSTF NDMA groundwater plume. Existing wells in the 400 Area are all located within the footprint of the NDMA plume with concentrations significantly above the WSTF cleanup level of 1.1 ng/L (NASA, 2017i). Elevated NDMA in groundwater is focused along the axis of the NDMA plume and characterized by existing groundwater wells located within the 400 Area arroyo, including 400-A-151, 400-C-118, 400-C-143, NASA 6, and NASA 9 ([Figure 11.1](#)). NDMA concentrations currently range between 2 µg/L at NASA 9 and 10.5 µg/L at NASA 6. [Table 11.2](#) includes the latest NDMA values from new and existing groundwater wells.

The maximum NDMA concentration identified in groundwater during this investigation was 66 µg/L at well 400-HV-147. This well is located directly beneath the west cell of the 400 Area Closure, and in the vicinity of historically elevated NDMA concentrations ([Figure 11.2](#)), which range from 18.3 µg/L. to 283.3 µg/L. Historically elevated concentrations of NDMA in 300 and 400 Area groundwater are depicted in [Figure 11.2](#). NDMA concentrations at these wells located outside of the 400 Area Closure are for the most part gradually declining.

Groundwater beneath and downgradient of the 400 Area is contaminated with NDMA. Based on the elevated concentration of NDMA in MSVGM well 400-HV-147, NASA concludes that concentrations of NDMA may be higher in the groundwater immediately beneath the 400 Area Closure than elsewhere in the plume. Ongoing groundwater monitoring at WSTF indicates that overall levels of NDMA are declining in the source areas as a result of natural groundwater movement to the southwest and west. Additional groundwater monitoring at existing and recently installed groundwater monitoring wells will continue to improve NASA's understanding of groundwater in this area and provide information for potential future investigations or corrective action.

11.6.3 Metals

Low concentrations of arsenic in groundwater at WSTF are common and derived from arsenic particulates sourced from naturally occurring mineral deposits that are subsequently incorporated into alluvial fan deposits on the western pediment of the southern SAM. Arsenic occurs commonly in sulfide-bearing mineral deposits and within volcanic rocks of rhyolitic composition, both of which have been identified upgradient of the 400 Area. Groundwater and infiltration from precipitation flowing through these deposits can dissolve and mobilize arsenic, increasing its concentrations in soil and groundwater. The dissolution of the sulfide minerals pyrite and arsenopyrite, contributes arsenic to ground and surface water in many parts of the United States. Other common sulfide minerals found in the southern SAM can contain significant arsenic as an impurity (e.g., galena, sphalerite, marcasite, and chalcopyrite).

In addition to arsenic, six additional metals detected above WSTF cleanup levels from the partial groundwater sample collected with the steam cleaned stainless steel bailer in 400-KV-142 (barium, chromium, cobalt, lead, thallium, and vanadium). These are inferred to have been the result of particulates derived from upgradient bedrock lithology's at WSTF known to host several mineral deposits in the Quartzite Mountain fault zone area. These base and precious metal sulfide deposits are related to the Organ batholith and are summarized in Seager (1981).

Concentrations of arsenic in the 400 Area groundwater are consistent with concentrations at other source monitoring wells at WSTF and result from background geological materials. NASA concludes that the single elevated detections of barium, chromium, cobalt, lead, thallium, and vanadium result from bias introduced during sample collection and are not representative of the concentrations of these metals in 400 Area groundwater. Additional monitoring is expected to support this conclusion. NASA does not believe that groundwater in the 400 Area is contaminated with metals as a result of historical operations.

12.0 Recommendations

Chemical analytical results from soil samples collected from 400 Area borings indicate that it is unlikely there is a continuing source of contamination of groundwater within the vadose zone. The single NDMA concentration above the RSSL does not appear to represent significant soil contamination, though minimal residual NDMA may be present at approximately 77 ft bgs in the vicinity of MSVGM well 400-HV-147. The depth of this single exceedance does not pose a risk to human health. Concentrations of VOCs in soil vapor were below WSTF RBCs at all sampling locations. Two VOCs, Freon 11 and Freon 113, exceeded VISLs at several sampling locations just above the local groundwater table. The maximum concentration of these two Freons were lower than the calculated concentration in equilibrium with groundwater located beneath the VOC sample locations. There is no completed pathway for soil vapor intrusion in the vicinity of the 400 Area Closures.

NASA recommends no further investigation of the vadose zone beneath and adjacent to the 400 Area Closures at this time. A thorough evaluation of available soil and soil vapor analytical data should be conducted for the 300 Area and 400 Area utilizing the most recent NMED Risk Assessment Guidance (NMED, 2017e) to determine if the Corrective Measures Study (CMS) recommended in the 300 Area Closure Investigation Report (NASA, 2011c) is the best option for these areas.

Concentrations of NDMA exceed the groundwater cleanup level in the 400 Area. In order to continue evaluating the apparent natural decline in NDMA concentrations, NASA will continue groundwater monitoring in the 300 Area and 400 Area in accordance with the NMED-approved GMP (NASA, 2017f). Groundwater contaminants migrating downgradient from the 400 Area are intercepted and treated at the MPITS or the Plume Front Treatment System. NASA will continue to operate these groundwater remediation systems to provide proven capture of groundwater impacted by the historic operations at the

400 Area. Downgradient groundwater monitoring will continue in accordance with the GMP (NASA, 2017f). Finally, NASA recommends a CMS for the 300 Area and 400 Area to determine if there are technically and financially feasible options for accelerating the ongoing natural decline in residual NDMA in the groundwater underlying these areas.

In accordance with Permit Section V (NMED, 2016b), NASA will continue to perform the necessary post-closure care that has not been completed. Planned activities include continued groundwater monitoring in accordance with Permit Section V.B.2, surface impoundment requirements of Section V.B.3, landfill requirements of Section V.B.4, and the security measures described in Section V.B.5. NASA will continue to perform inspections and maintenance as specified in Permit Section V.C.

13.0 References

Accumulation Time, 40 C.F.R. 262.34(a) (2011).

EPA. (2006, February). Guidance on Systematic Planning Using the Data Quality Objectives Process. Washington, D.C.: U.S. Environmental Protection Agency. Retrieved from <https://www.epa.gov/quality/guidance-systematic-planning-using-data-quality-objectives-process-epa-qag-4>

EPA. (2017, November). Regional Screening Levels (RSLs). Washington, D.C.: U.S. Environmental Protection Agency. Retrieved from <https://www.epa.gov/risk/regional-screening-levels-rsls>

Jornada Rangeland Research Programs. (n.d.) Local Climate. Retrieved from <https://jornada.nmsu.edu/jornada/climate>

Hazardous Waste Management, Environmental Improvement Board, 20.4.1 NMAC (6-14-2000).

Maciejewski, T.J. (1996, December). *Integrated Geophysical Interpretation of Bedrock Geology, San Andres Mountains, New Mexico*. Master's Thesis, University of Texas El Paso, 123 pp.

NASA Johnson Space Center White Sands Test Facility. (1986, January 1). *400 Area Closure and Post-Closure Care Plan NASA JSC WSTF*. Las Cruces, NM.

NASA Johnson Space Center White Sands Test Facility. (1988, March 17). *200 Area and 400 Area Closure and Post-Closure Care Plan NASA JSC WSTF*. Las Cruces, NM.

NASA Johnson Space Center White Sands Test Facility. (1989a, May 11). *Certification of Closures, 200 and 400 Areas*. Las Cruces, NM.

NASA Johnson Space Center White Sands Test Facility. (1989b, November 30). *Shallow Soil Gas Investigation at the NASA-Johnson Space Center White Sands Test Facility Final Report*. Las Cruces, NM.

NASA Johnson Space Center White Sands Test Facility. (1990, March 9). *Final Soil Gas Well Investigation Report*. Las Cruces, NM.

NASA Johnson Space Center White Sands Test Facility. (1996a, January 8). *400 Area Closure Groundwater Monitoring Well Contaminant and Water Level Increases*. Internal Memo. Las Cruces, NM.

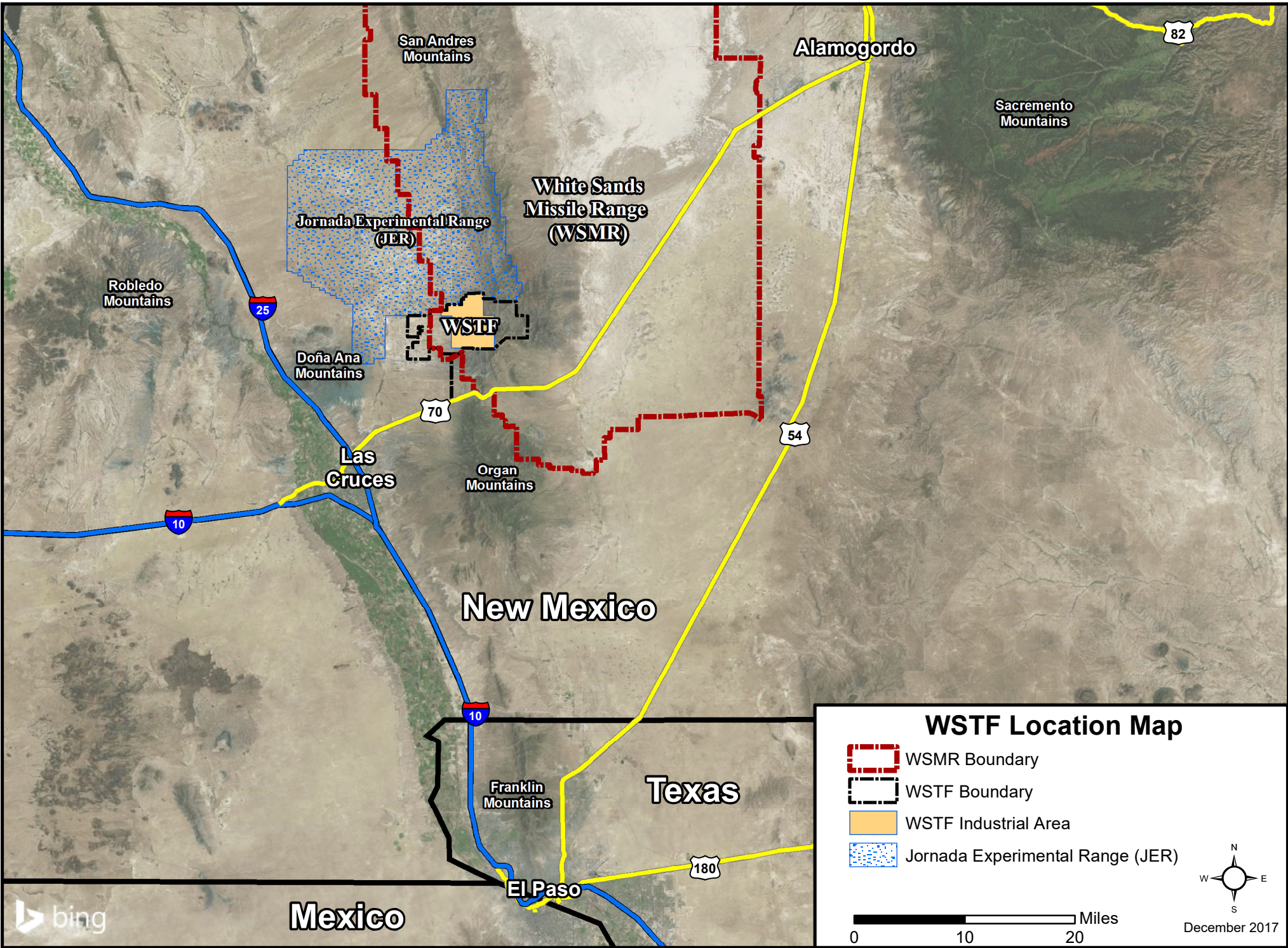
- NASA Johnson Space Center White Sands Test Facility. (1996b, May 2). *Draft RCRA Facility Investigation (RFI) and Corrective Measures Study (CMS) for NASA WSTF*. Las Cruces, NM.
- NASA Johnson Space Center White Sands Test Facility. (2009, April 27). *2008 Annual Post-Closure Care Report for the NASA White Sands Test Facility*. Las Cruces, NM.
- NASA Johnson Space Center White Sands Test Facility, (2010a, June 8). *Groundwater Monitoring Plan*. Las Cruces, NM.
- NASA Johnson Space Center White Sands Test Facility, (2010b, December 21). *Investigation Report for NASA WSTF Required Interim Measures Work Plan for Sampling Off-site Water Supply Wells*. Las Cruces, NM.
- NASA Johnson Space Center White Sands Test Facility, (2011a, March 30). *600 Area Closure Investigation Report Provided in Response to a NMED Notice of Disapproval*. Las Cruces, NM.
- NASA Johnson Space Center White Sands Test Facility. (2011b, June 27). *NASA White Sands Test Facility (WSTF) 400 Area Closure Investigation Work Plan, 400 Area Historical Information Summary (HIS), 400 Aspirator Discharge Pipes HIS, and 500 Fuel Storage Area HIS*. Las Cruces, NM.
- NASA Johnson Space Center White Sands Test Facility. (2011c, August 30). *NASA White Sands Test Facility (WSTF) 300 Area Closure Investigation Report*. Las Cruces, NM.
- NASA Johnson Space Center White Sands Test Facility. (2011d, October 24). *NASA White Sands Test Facility (WSTF) 400 Area Closure Investigation Work Plan, 400 Area Historical Information Summary (HIS), 400 Aspirator Discharge Pipes HIS, and 500 Fuel Storage Area HIS*. Las Cruces, NM.
- NASA Johnson Space Center White Sands Test Facility. (2013, June 14). *200/600 Area Semi-annual Soil Vapor and Groundwater Data Summary (Fourth Report - March 2013 Data)*. Las Cruces, NM.
- NASA Johnson Space Center White Sands Test Facility. (2015a, June 29). *NASA WSTF 200 Area HWTL (SWMU 10) Investigation Work Plan and Historical Information Summary*. Las Cruces, NM.
- NASA Johnson Space Center White Sands Test Facility. (2015b, August 26). *Response to Notice of Disapproval for the Soil Background Study Investigation Report*. Las Cruces, NM.
- NASA Johnson Space Center White Sands Test Facility. (2016a, August 2). *400 Area Investigation Abbreviated Drilling Work Plan and Notification of Field Work Commencement*. Las Cruces, NM.
- NASA Johnson Space Center White Sands Test Facility. (2016b, November 29). *Request for a "Contained-In" Determination for 400 Area Investigation-Derived Waste (IDW)*. Las Cruces, NM.
- NASA Johnson Space Center White Sands Test Facility. (2016c, December 23). *Request for a Second "Contained-In" Determination for 400 Area Investigation-Derived Waste (IDW)*. Las Cruces, NM.

- NASA Johnson Space Center White Sands Test Facility. (2017a, January 1). *Request for a Third “Contained-In” Determination for 400 Area Investigation-Derived Waste (IDW)*. Las Cruces, NM.
- NASA Johnson Space Center White Sands Test Facility. (2017b, January 13). *Request for a Fifth “Contained-In” Determination for 400 Area Investigation-Derived Waste (IDW)*. Las Cruces, NM.
- NASA Johnson Space Center White Sands Test Facility. (2017c, January 26). *NASA White Sands Test Facility (WSTF) Updated Soil Vapor Risk-Based Concentrations (RBCs) Memorandum*. Las Cruces, NM.
- NASA Johnson Space Center White Sands Test Facility. (2017d, January 26). *Request for a Fourth “Contained-In” Determination for 400 Area Investigation-Derived Waste (IDW)*. Las Cruces, NM.
- NASA Johnson Space Center White Sands Test Facility. (2017e, May 10). *Request for Extension of Time for Submittal of 400 Area Investigation Report*. Las Cruces, NM.
- NASA Johnson Space Center White Sands Test Facility. (2017f, April 27). *NASA WSTF Groundwater Monitoring Plan Update for 2017*. Las Cruces, NM.
- NASA Johnson Space Center White Sands Test Facility. (2017g, July 27). *Annual Remediation System Monitoring Plan 2017*. Las Cruces, NM.
- NASA Johnson Space Center White Sands Test Facility. (2017h, September 25). *Request for Extension of Time for Submittal of 400 Area Investigation Report*. Las Cruces, NM.
- NASA Johnson Space Center White Sands Test Facility. (2017i, October 30). *NASA WSTF Periodic Monitoring Report – Third Quarter 2017*. Las Cruces, NM.
- NMED Hazardous Waste Bureau. (2013, November 8). *Approval with Modifications of WSTF Septic Tanks (SWMU 21-27) Historical Information Summary and Investigation Work Plan*. Santa Fe, NM.
- NMED Hazardous Waste Bureau. (2016a, August 30). *Approval Drilling Work Plan for 400 Area Closure Investigation Wells*. Santa Fe, NM.
- NMED Hazardous Waste Bureau. (2016b, November 10). *Administrative Completeness and Fee Assessment Transmittal of Class 1 Permit Modification Without Prior Approval*. Santa Fe, NM.
- NMED Hazardous Waste Bureau. (2016c, December 15). *Approval Request for a “Contained-In” Determination for 400 Area Investigation-Derived Waste (IDW)*. Santa Fe, NM.
- NMED Hazardous Waste Bureau. (2017a, January 6). *Approval Request for Second “Contained-In” Determination for 400 Area Investigation-Derived Waste (IDW)*. Santa Fe, NM.
- NMED Hazardous Waste Bureau. (2017b, January 27). *Approval Request for Third “Contained-In” Determination for 400 Area Investigation-Derived Waste (IDW)*. Santa Fe, NM.

- NMED Hazardous Waste Bureau. (2017c, February 6). *Approval Request for Fourth “Contained-In” Determination for 400 Area Investigation-Derived Waste (IDW)*. Santa Fe, NM.
- NMED Hazardous Waste Bureau. (2017d, February 27). *Approval Request for Fifth “Contained-In” Determination for 400 Area Investigation-Derived Waste (IDW)*. Santa Fe, NM.
- NMED. Hazardous Waste Bureau and Ground Water Quality Bureau. (2017e, March). *Risk Assessment Guidance for Site Investigations and Remediation*. Santa Fe, NM.
- NMED Hazardous Waste Bureau. (2017f, April 12). *Approval Updated Soil Vapor Risk Based Concentrations (RBCs) Memorandum*. Santa Fe, NM.
- NMED Hazardous Waste Bureau. (2017g, May 24). *Approval Request for Extension of Time for Submittal of 400 Area Investigation Report*. Santa Fe, NM.
- NMED Ground Water Quality Bureau. (2017h, July 14). *Discharge Permit Renewal and Modification, DP-1255, NASA White Sands Testing Facility*. Santa Fe, NM.
- NMED Hazardous Waste Bureau. (2017i, October 18). *Approval Request for Extension of Time for Submittal of 400 Area Investigation Report*. Santa Fe, NM.
- Seager, W. R. (1981, May). *Geology of Organ Mountains and Southern San Andres Mountains, New Mexico*. New Mexico Bureau of Mines & Mineral Resources, Memoir 36. Socorro, NM.
- Shacklette, H. T., & Boerngen, J. G., (1984). *Element concentrations in soils and other surficial materials of the conterminous United States: U.S. Geological Survey Professional Paper 1270*. Washington D.C.
- Standards Applicable to Generators of Hazardous Waste, 40 C.F.R. 262 (2017).
- Sullivan, R.M.& Houde-Nethers, D.L. (1996, July 1). *Threatened and Endangered Species Survey of the National Aeronautics and Space Administration’s White Sands Test Facility (WSTF), New Mexico*. New Mexico State University Physical Science Laboratory. Las Cruces, NM.

Figures

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STGT Area

700 Area

500 Area

300 Area

400 Area

Apollo Boulevard

800 Area

200 Area

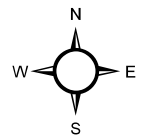
600 Area

100 Area

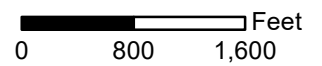
STGT Access Road

Well Road

WSTF Industrial Areas

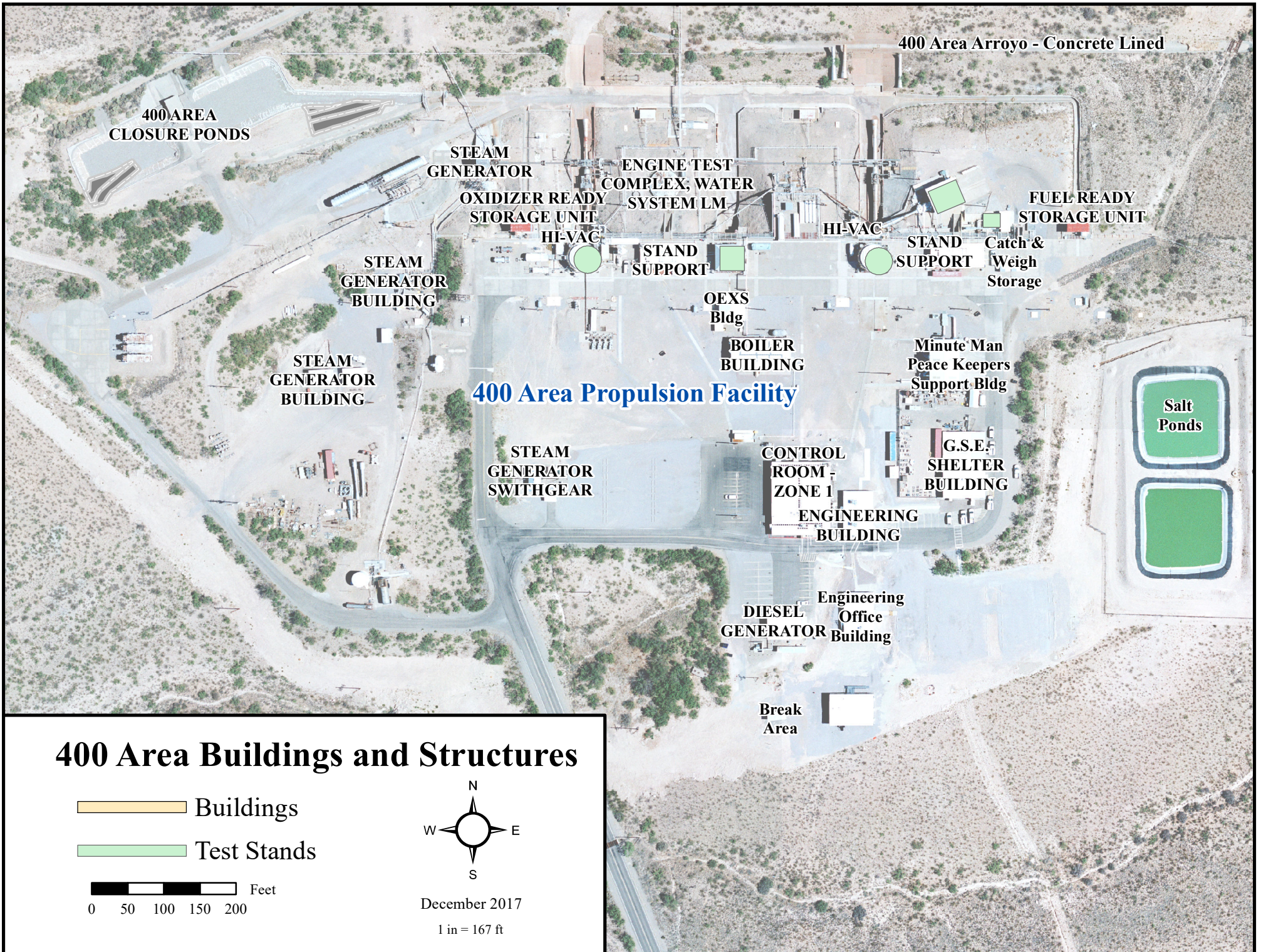


December 2017

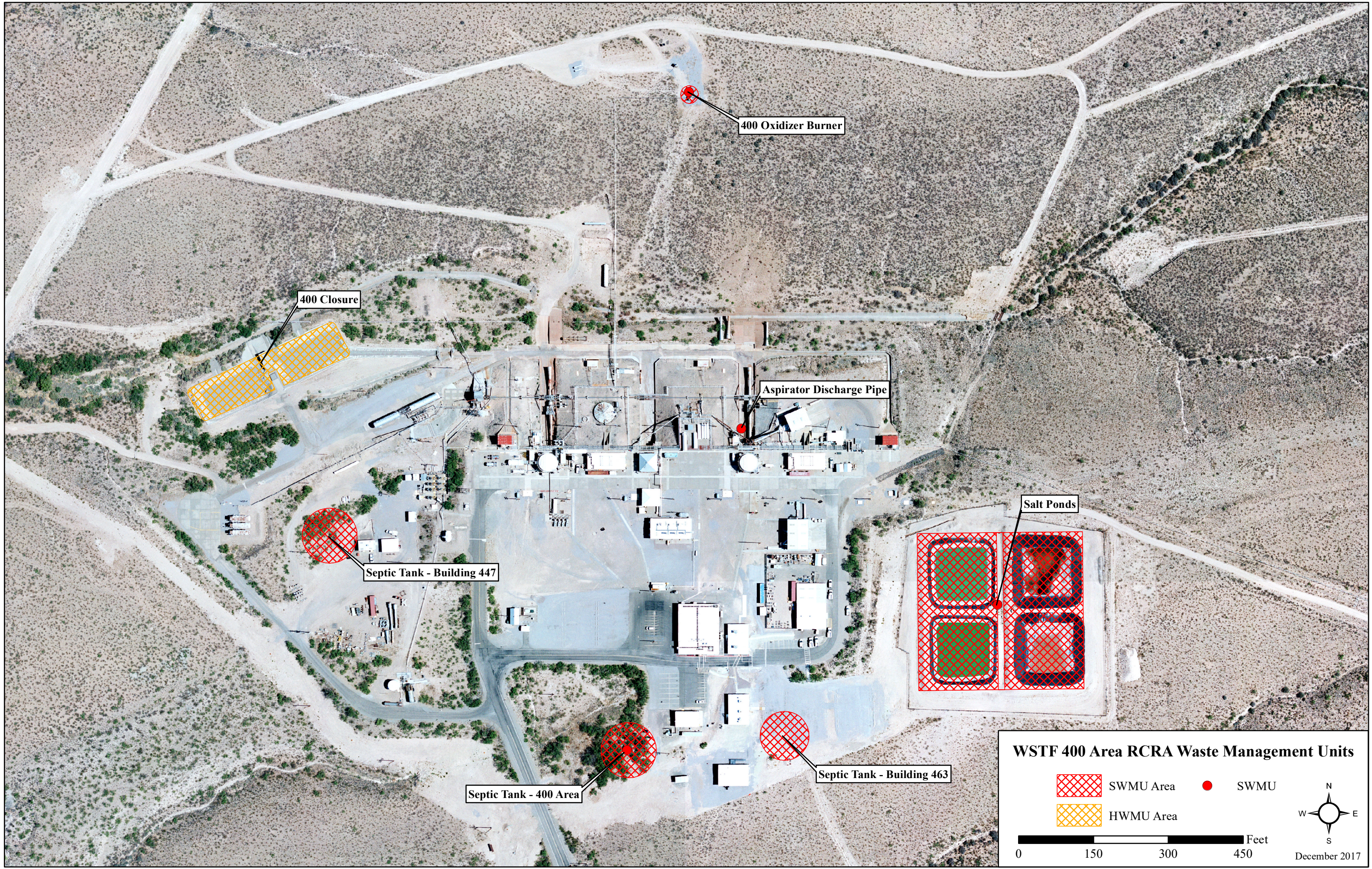


1 in = 1,375 ft

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400 Oxidizer Burner

400 Closure

Aspirator Discharge Pipe

Salt Ponds

Septic Tank - Building 447

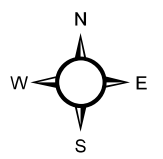
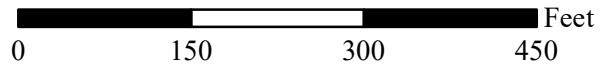
Septic Tank - 400 Area

Septic Tank - Building 463

WSTF 400 Area RCRA Waste Management Units

-  SWMU Area
-  HWMU Area

 SWMU



December 2017

Figure 2.4 400 Area Soil Vapor and Groundwater Monitoring Well Locations

(SEE NEXT PAGE)

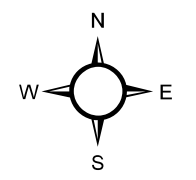


For MSVGM wells:
 400-EV-131 was soil boring 400-SB-04
 400-FV-131 was soil boring 400-SB-14
 400-GV-125 was soil boring 400-SB-13
 400-HV-147 was soil boring 400-SB-08
 400-IV-123 was soil boring 400-SB-12
 400-JV-150 was soil boring 400-SB-11
 400-KV-142 was soil boring 400-SB-06
 400-LV-125 was soil boring 400-SB-01

For MSVM Wells:
 400-SV-02 was soil boring 400-SB-02
 400-SV-03 was soil boring 400-SB-03
 400-SV-05 was soil boring 400-SB-05
 400-SV-07 was soil boring 400-SB-07
 400-SV-09 was soil boring 400-SB-09
 400-SV-10 was soil boring 400-SB-10
 400-SV-15 was soil boring 400-SB-15

400 Area Soil Vapor and Groundwater Monitoring Well Locations

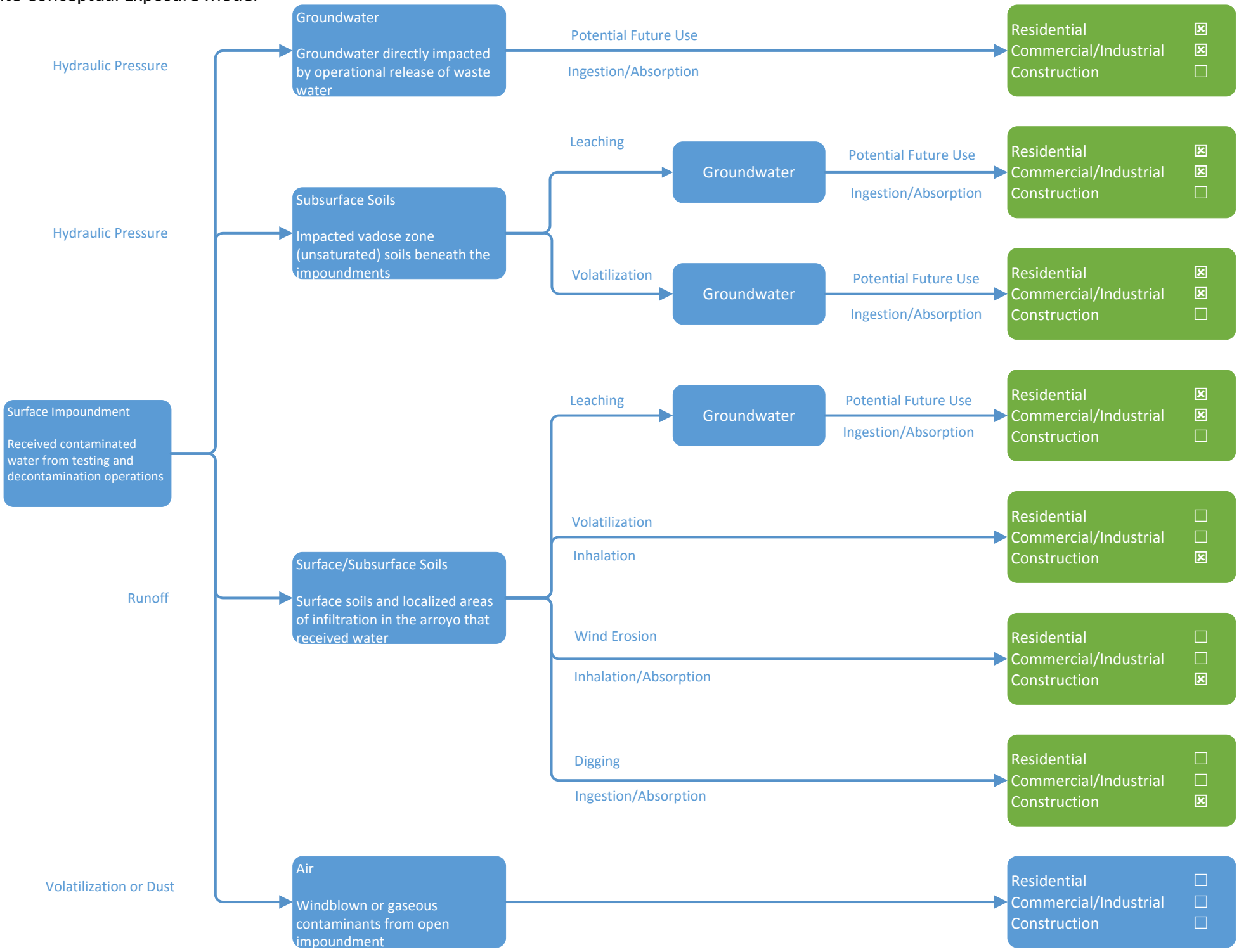
- 1987 Soil Vapor Wells
- Conventional Well
- Multipoint Well
- MSVGM Well
- MSVM Well
- ▬ 400 Area HWMU Closure Ramp
- Inferred Fault
- 0 200 400 Feet



December 2017
 1 in = 125 ft

(SEE NEXT PAGE)

Site Conceptual Exposure Model



Surface Impoundment
Received contaminated water from testing and decontamination operations

Groundwater
Groundwater directly impacted by operational release of waste water

Subsurface Soils
Impacted vadose zone (unsaturated) soils beneath the impoundments

Surface/Subsurface Soils
Surface soils and localized areas of infiltration in the arroyo that received water

Air
Windblown or gaseous contaminants from open impoundment

Groundwater

Groundwater

Groundwater

Groundwater

Residential
Commercial/Industrial
Construction

Residential
Commercial/Industrial
Construction

Residential
Commercial/Industrial
Construction

Residential
Commercial/Industrial
Construction

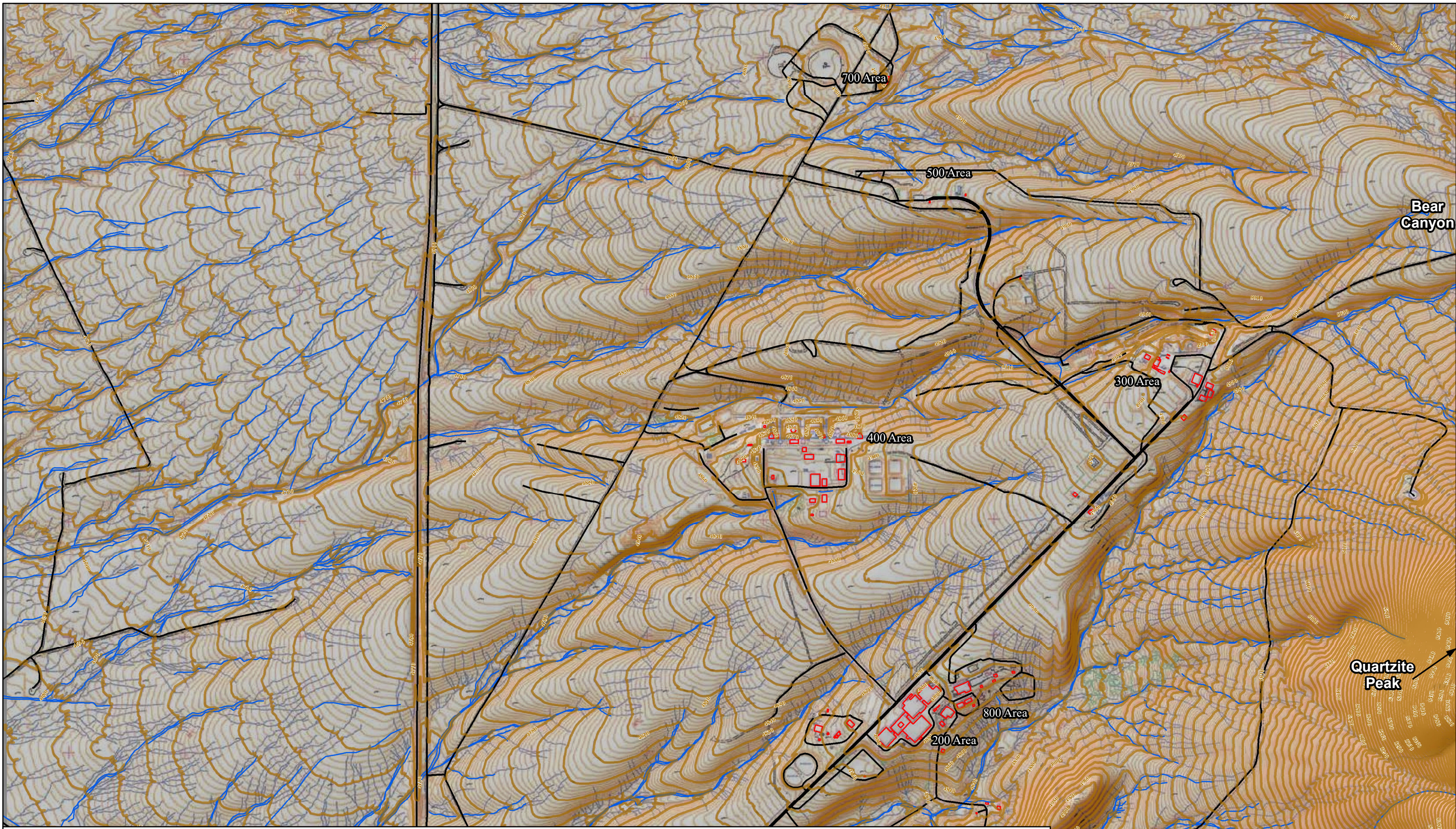
Residential
Commercial/Industrial
Construction

Residential
Commercial/Industrial
Construction

Residential
Commercial/Industrial
Construction

Residential
Commercial/Industrial
Construction

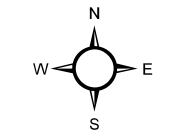
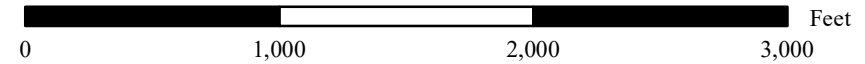
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Topographic Map of the WSTF Industrial Areas

— Roads — Ephemeral Streams □ Buildings

Contour Interval = 2



December 2017

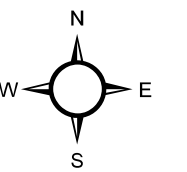
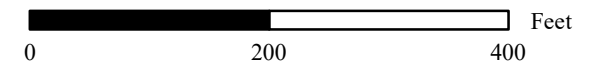
Figure 7.2 **Geological Cross-Section Lines Through the 400 Area**

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Geologic Cross-Section Lines Through the 400 Area

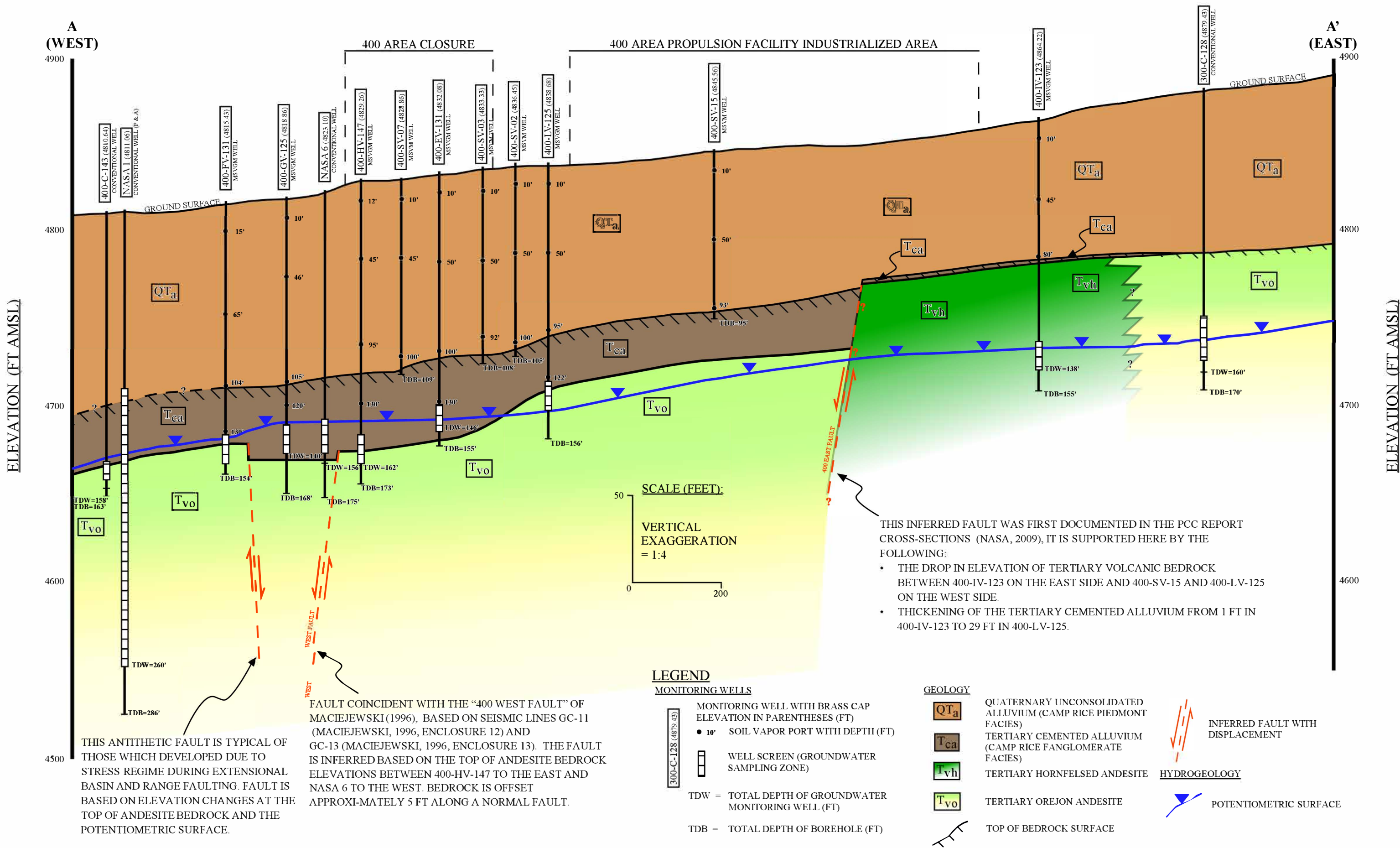
- 1987 Soil Vapor Wells
- MSVM Well
- Multiport Well
- ▭ 400 Area HWMU Closure
- MSVGM Well
- Conventional Well
- Inferred Fault
- ▭ 400 Closure Ramp



December 2017
1 in = 160 ft

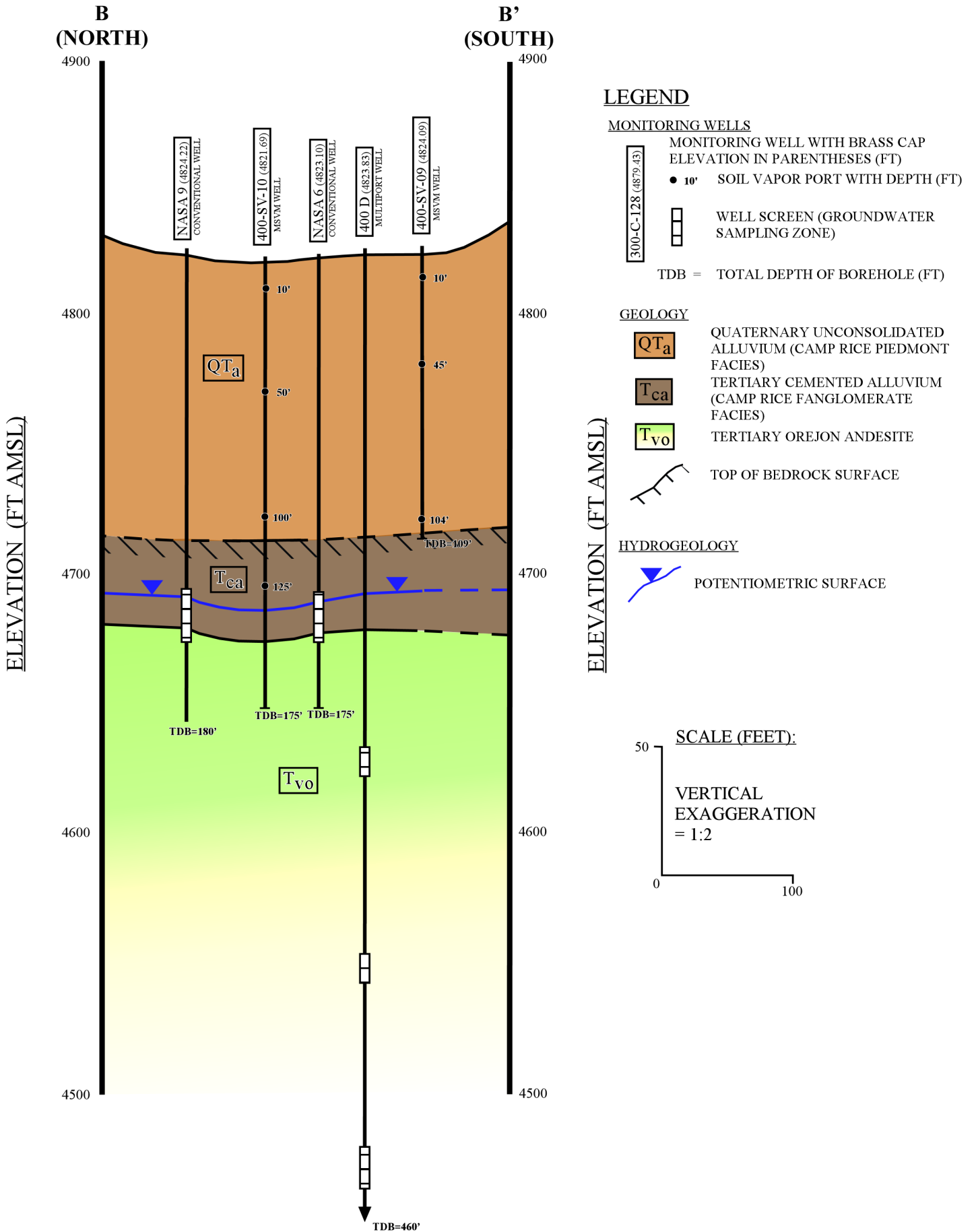
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400 AREA GEOLOGIC CROSS-SECTION A-A'

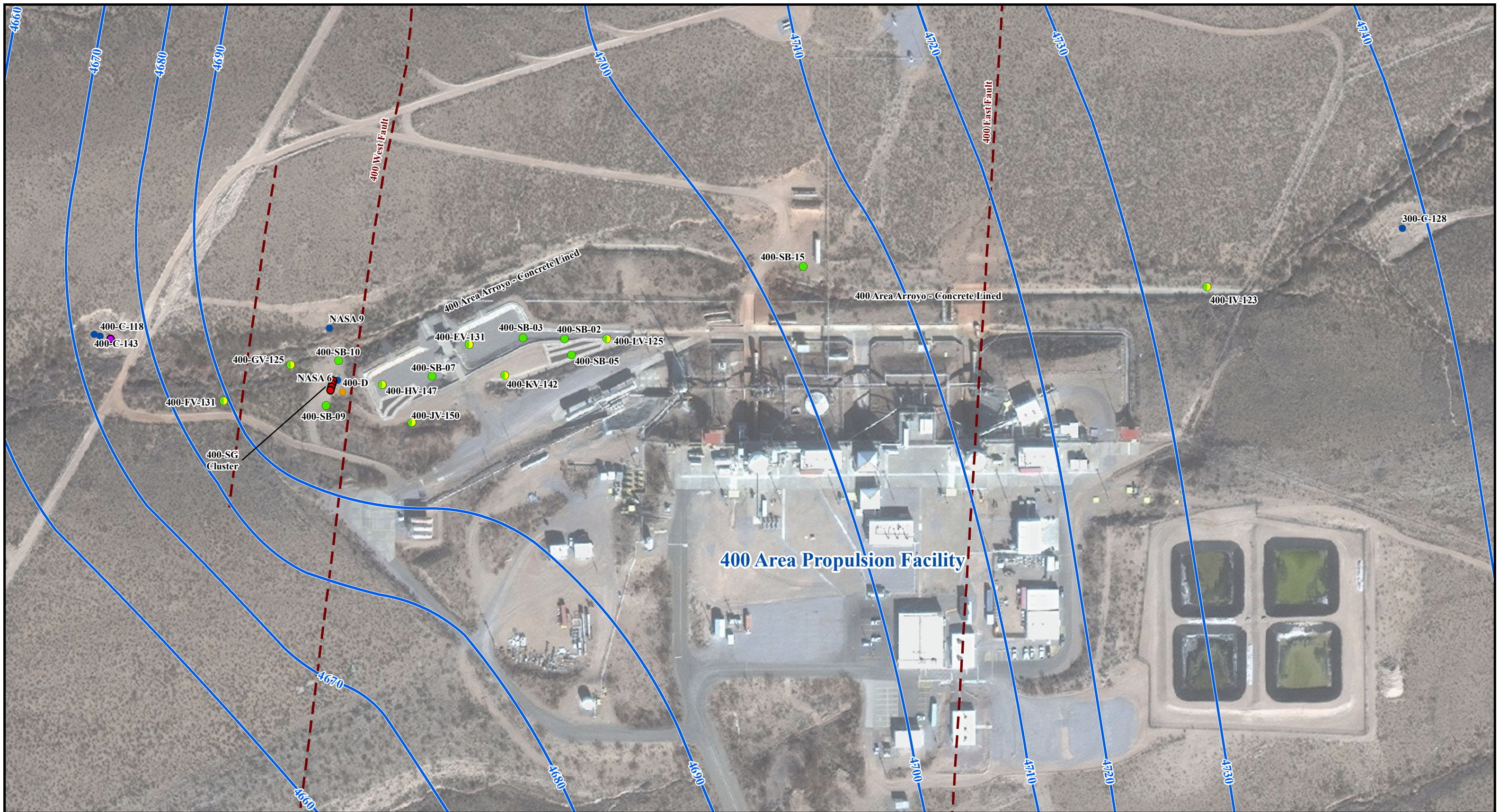


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400 AREA GEOLOGIC CROSS-SECTION B-B'

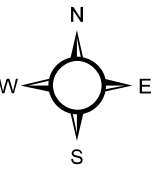


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400 Area Potentiometric Surface Map

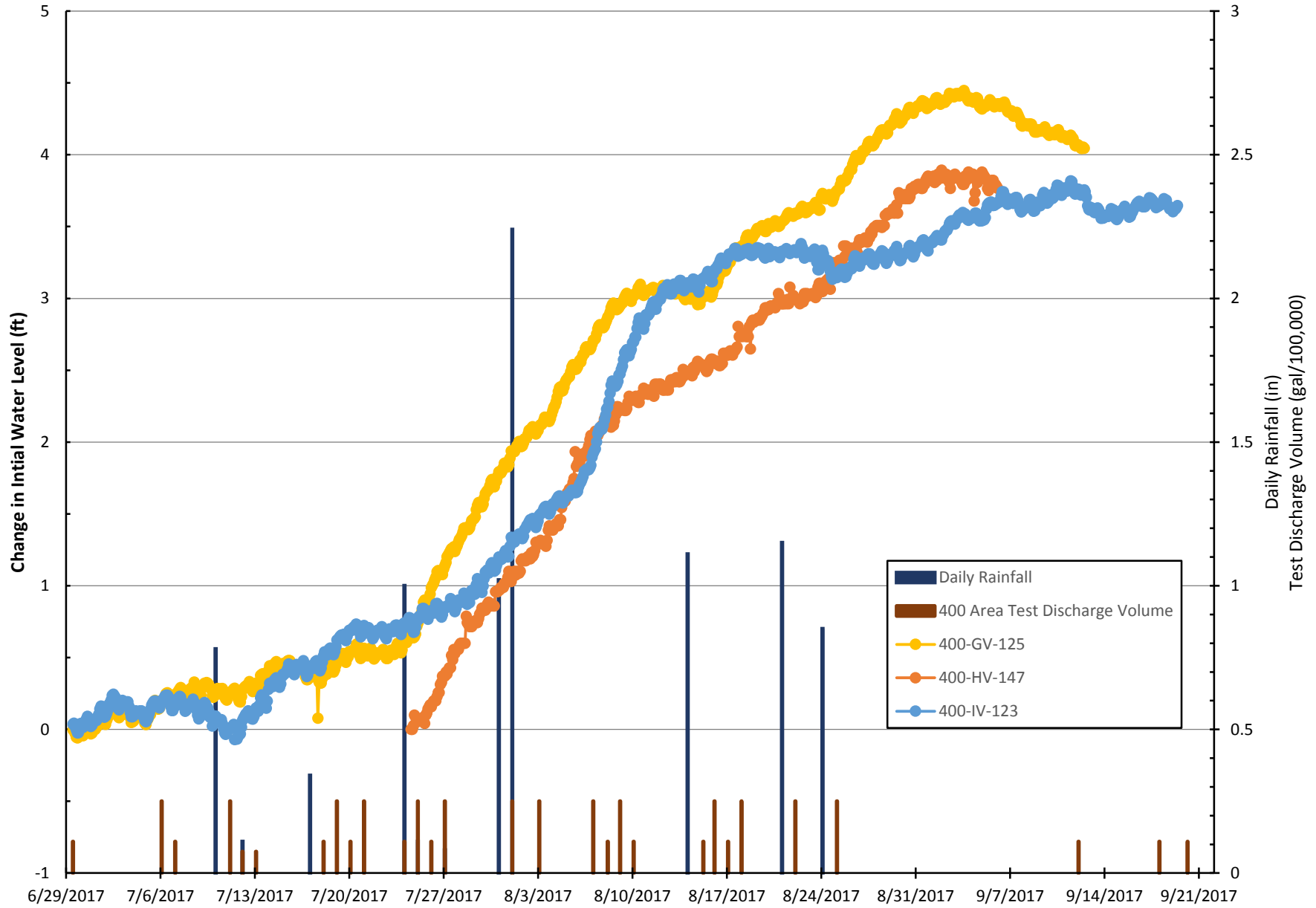
- | | | | |
|-------------------------|---------------------|----------------------|---|
| ● 1987 Soil Vapor Wells | ● MSVM Well | ● Multiport Well | — Groundwater Elevation Contour (10 ft Intervals) |
| ● MSVGM Well | ● Conventional Well | - - - Inferred Fault | ▬ 400 Closure Ramp |



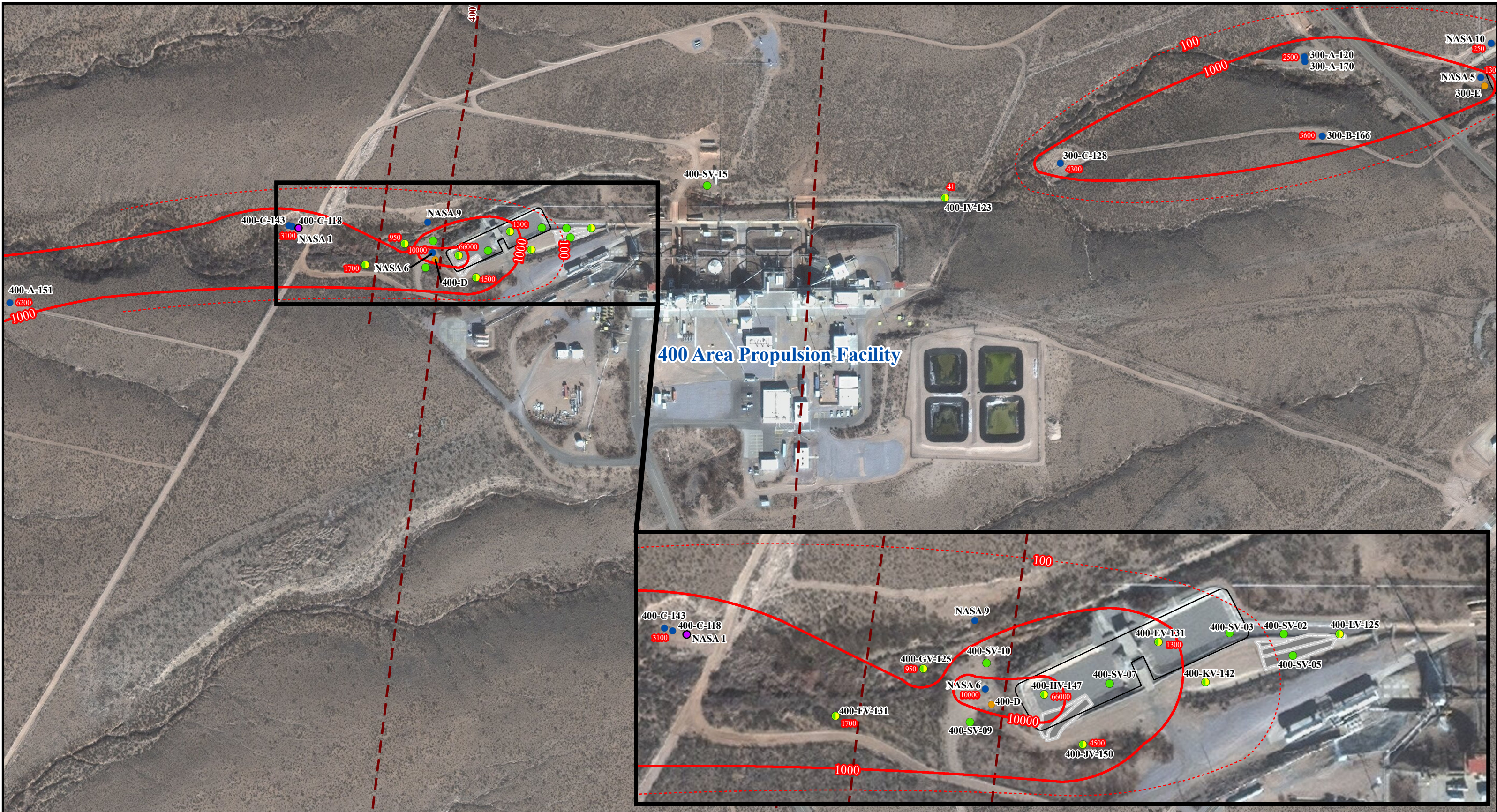
December 2017
1 in = 166 ft

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Potentiometric Surface Change with Rainfall Events



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● MSVGM Well
● MSVM Well

● 1987 Soil Vapor Wells
● Conventional Well

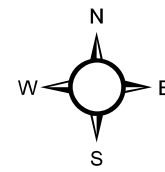
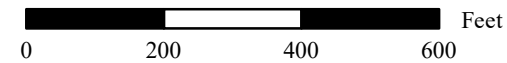
● Multiport Well

— NDMA Equiconcentration Line (ng/L)

--- Inferred Fault

▭ 400 Area HWMU Closure

▭ 400 Closure Ramp



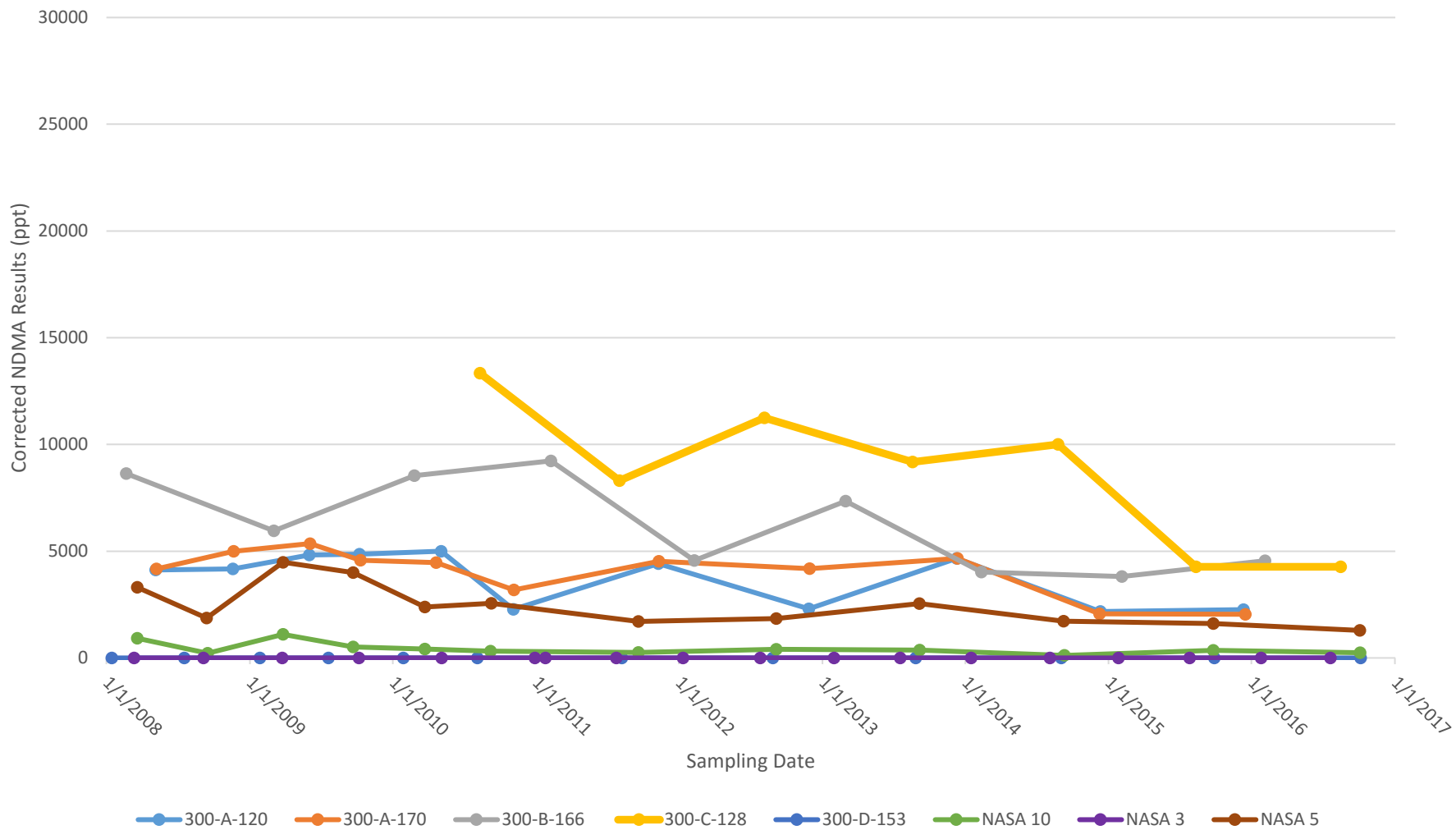
December 2017

1 in = 279 ft

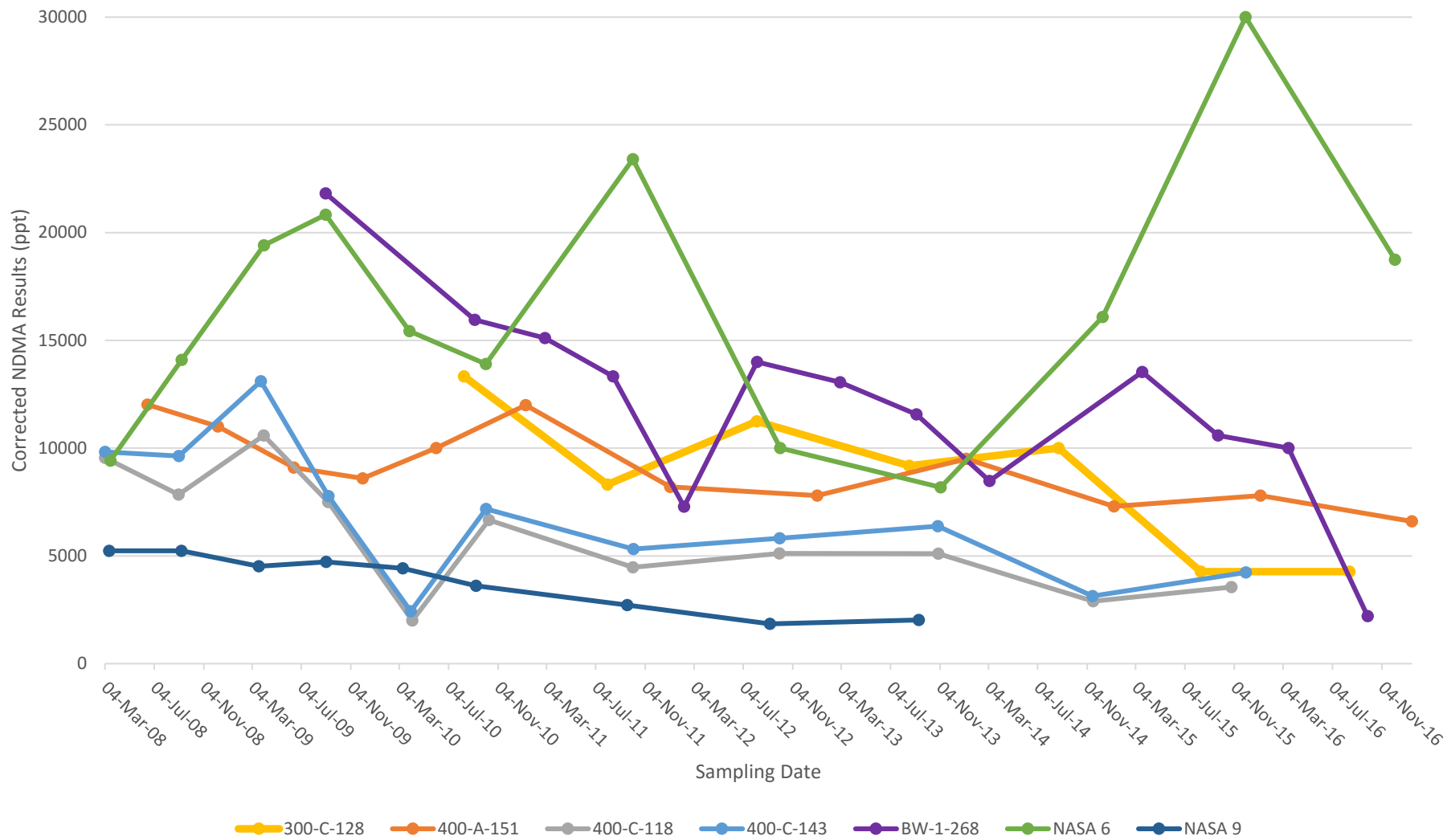
Note:
Method 607 NDMA results corrected for extraction efficiency.
+ - Data value has a QA flag. See Appendix A.2 for specific flags.
ND - Non-detect values <1,100 ng/L (8270) or <4.7 ng/L (607)

(SEE NEXT PAGE)

300 Well Comparisons



400 Well Comparisons



Tables

Table 2.1 List of Contaminants of Potential Concern for the 400 Area Closure

Constituent	Sample Type
Chloride	ANION
Cyanide	CYANIDE
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	DIOXINS/FURANS
Heptachlorodibenzo-p-dioxins (HpCDD), Total	DIOXINS/FURANS
Octachlorodibenzofuran (OCDF)	DIOXINS/FURANS
Octachlorodibenzo-p-dioxin (OCDD)	DIOXINS/FURANS
Hydrazine	HYDRAZINE
Monomethylhydrazine (MMH)	HYDRAZINE
Unsymmetrical Dimethylhydrazine (UDMH)	HYDRAZINE
Aluminum	METALS
Antimony	METALS
Arsenic	METALS
Barium	METALS
Beryllium	METALS
Boron	METALS
Cadmium	METALS
Calcium	METALS
Chromium (Total)	METALS
Chromium (VI)	METALS
Cobalt	METALS
Copper	METALS
Lead	METALS
Mercury	METALS
Molybdenum	METALS
Nickel	METALS
Selenium	METALS
Silver	METALS
Strontium	METALS
Thallium	METALS
Tin	METALS
Vanadium	METALS
Zinc	METALS
Bromacil	BROMACIL
N-Nitrodimethylamine	NITROSAMINES
N-Nitrosodimethylamine	NITROSAMINES
Nitrate	NITROGEN
Nitrite	NITROGEN
Perchlorate	PERCHLORATE
Bis(2-ethylhexyl) Phthalate	SVOA
Di-n-butyl Phthalate	SVOA
1,1,1-Trichloroethane	VOA
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	VOA
1,1-Dichloroethene	VOA
1,2-Dichloro-1,1,2-trifluoroethane (Freon 123a)	VOA
1,2-Dichloroethane	VOA
2,2-Dichloro-1,1,1-trifluoroethane (Freon 123)	VOA
2-Butanone (Methyl Ethyl Ketone)	VOA

NASA White Sands Test Facility

Constituent	Sample Type
2-Hexanone	VOA
2-Propanol	VOA
Acetone	VOA
Bromodichloromethane	VOA
Bromoform	VOA
Chlorobenzene	VOA
Chloroform	VOA
Chloromethane	VOA
Dibromochloromethane	VOA
Dichlorofluoromethane (Freon 21)	VOA
Methyl tert-Butyl Ether	VOA
Methylene Chloride	VOA
m-Xylene & p-Xylene	VOA
Tetrachloroethene (PCE)	VOA
Toluene	VOA
trans-1,2-Dichloroethene	VOA
Trichloroethene (TCE)	VOA
Trichlorofluoromethane (Freon 11)	VOA

NASA White Sands Test Facility

Table 7.1 Field VOC Screening Results

Item	Date	Time	Boring	Depth (ft)	Logbook/ Page	Results (ppm)
1	9/22/2016	1409	SB-04	0-10	1/4	0.0
2	9/22/2016	1409	SB-04	10-20	1/4	0.0
3	9/22/2016	1409	SB-04	20-30	1/4	0.0
4	9/22/2016	1555	SB-04	30-40	1/5	0.0
5	9/22/2016	1640	SB-04	40-50	1/5	0.0
6	9/22/2016	1700	SB-04	50-60	1/5	0.0
7	9/23/2016	1335	SB-04	60-70	1/7	0.0
8	9/23/2016	1450	SB-04	70-80	1/7	0.0
9	9/23/2016	1640	SB-04	80-90	1/7	0.0
10	9/25/2016	1120	SB-04	106.5-110	1/13	0.0
11	9/25/2016	1120	SB-04	116-120	1/13	0.0
12	10/5/2016	1105	SB-15	0-10	1/33	0.0
13	10/5/2016	1211	SB-15	10-20	1/33	0.0
14	10/5/2016	1437	SB-15	20-30	1/34	0.0
15	10/5/2016	1715	SB-15	30-40	1/35	0.0
16	10/6/2016	1550	SB-15	80-90	1/37	0.0
17	10/8/2016	1535	SB-12	0-10	1/43	0.0
18	10/9/2016	1030	SB-12	20-30	1/46	0.0
19	10/9/2016	1220	SB-12	30-40	1/46	0.0
20	10/9/2016	1455	SB-12	50-60	1/46	0.0
21	10/10/2016	1803	SB-03	0-10	1/50	0.0
22	10/11/2016	0845	SB-03	10-20	1/51	0.0
23	10/11/2016	1204	SB-03	20-30	1/52	0.0
24	10/11/2016	1318	SB-03	30-40	1/52	0.0
25	10/11/2016	1514	SB-03	40-50	1/53	0.0
26	10/11/2016	1514	SB-03	50-60	1/53	0.0
27	10/11/2016	1514	SB-03	60-70	1/53	0.0
28	10/11/2016	1514	SB-03	70-80	1/53	0.0
29	10/11/2016	1514	SB-03	80-90	1/53	0.0
30	10/19/2016	0928	SB-10	0-10	1/61	0.0
31	10/19/2016	1600	SB-10	10-20	1/63	0.0
32	10/19/2016	1600	SB-10	20-30	1/63	0.0
33	10/19/2016	1600	SB-10	30-40	1/63	0.0
34	10/19/2016	1710	SB-10	40-50	1/63	0.0
35	10/19/2016	1710	SB-10	50-60	1/63	0.0
36	10/19/2016	1710	SB-10	60-70	1/63	0.0
37	10/19/2016	1710	SB-10	70-80	1/63	0.0
39	10/19/2016	1710	SB-10	80-90	1/63	0.0

NASA White Sands Test Facility

Item	Date	Time	Boring	Depth (ft)	Logbook/ Page	Results (ppm)
40	11/2/2016	1320	SB-14	0-10	1/88	0.0
41	11/2/2016	1320	SB-14	10-20	1/88	0.0
42	11/2/2016	1550	SB-14	20-30	1/88	0.0
43	11/2/2016	1550	SB-14	30-40	1/88	0.0
44	11/2/2016	1550	SB-14	40-50	1/88	0.0
45	11/2/2016	1635	SB-14	50-60	1/89	0.0
46	11/3/2016	0831	SB-14	60-70	1/90	0.0
47	11/3/2016	1600	SB-14	90-100	1/92	0.0
48	11/3/2016	1600	SB-14	100-110	1/92	0.0
49	11/16/2016	0720	SB-09	0-10	2/12	0.0
50	11/16/2016	0720	SB-09	10-20	2/12	0.0
51	11/16/2016	1025	SB-09	20-30	2/13	0.0
52	11/16/2016	1025	SB-09	30-40	2/13	0.0
53	11/16/2016	1025	SB-09	40-50	2/13	0.0
54	11/16/2016	1145	SB-09	50-60	2/13	0.0
55	11/16/2016	Not given	SB-09	60-70	2/15	0.0
56	11/16/2016	Not given	SB-09	70-80	2/15	0.0
57	11/16/2016	Not given	SB-09	80-90	2/15	0.0
58	11/16/2016	Not given	SB-09	90-100	2/15	0.0
59	11/16/2016	Not given	SB-09	100-108.5	2/15	0.0
60	11/18/2016	1615	SB-13	50-60	2/20	0.0
61	11/20/2016	1230	SB-08	0-10	2/26	0.0
62	11/20/2016	1230	SB-08	10-20	2/26	0.0
63	11/20/2016	1230	SB-08	20-30	2/27	0.0
64	11/20/2016	1230	SB-08	30-40	2/27	0.0
65	11/20/2016	1230	SB-08	40-50	2/27	0.0
66	11/20/2016	1500	SB-08	50-60	2/27	0.0
67	11/20/2016	1610	SB-08	60-70	2/27	0.0
68	11/21/2016	1610	SB-08	60-70	2/27	0.0
69	11/21/2016	0925	SB-08	70-80	2/29	0.0
70	11/21/2016	0925	SB-08	80-90	2/29	0.0
71	11/21/2016	0925	SB-08	90-100	2/29	0.0
72	11/21/2016	1105	SB-08	100-109.5	2/29	0.0
73	12/4/2016	0955	SB-07	0-10	2/50	0.0
74	12/4/2016	0955	SB-07	10-20	2/50	0.0
75	12/4/2016	0955	SB-07	20-30	2/50	0.0
76	12/4/2016	0955	SB-07	30-40	2/50	0.0
77	12/4/2016	0955	SB-07	40-50	2/50	0.0
78	12/4/2016	0955	SB-07	50-60	2/50	0.0

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Item	Date	Time	Boring	Depth (ft)	Logbook/ Page	Results (ppm)
79	12/4/2016	0955	SB-07	60-70	2/50	0.0
80	12/4/2016	0955	SB-07	60-70	2/50	0.0
81	12/4/2016	0955	SB-07	70-80	2/50	0.0
82	12/4/2016	0815	SB-07	80-90	2/50	0.0
83	12/4/2016	0845	SB-07	90-100	2/50	0.0
84	12/4/2016	1555	SB-06	20-30	2/52	0.0
85	12/4/2016	1555	SB-06	30-40	2/52	0.0
86	12/4/2016	1618	SB-06	40-50	2/52	0.0

Note: On 12/8/16 the PID was non-functional. Field repairs were unsuccessful.
The unit was shipped to the factory for repairs.

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Table 7.2 Sampling Summary for Chemical Analyses

Well ID	Soil Boring Name	Boring Depth (ft bgs)	Alluvium-Cemented alluvium contact (ft bgs)	Sample Collection Summary								
				Boring Depth (ft bgs)	Soil Chemical	Boring Depth (ft bgs)	Soil Vapor	Boring Depth (ft bgs)	Groundwater Chemical	Duplicates	Matrix Spike	Waste Management and Blanks
					Sample ID		Sample ID		Sample ID			
400-LV-125	400-SB-01	156	98	9-10	1612190950 - 0955	10	1707060735					Soil Equip Rinsate: 1612190700 - 0710
				44-45	1612191130 - 1135, 1140 - 1145	50	1707060739			Soil		
				79-80	1612191440 - 1445	95	1707060745					
						122	1707060750					
400-SV-02	400-SB-02	105	103	0-2.5	1701071515 - 1520	10	1707060804					Soil Equip Rinsate: 1701071400 - 1410, 1701080814 - 0824
				42-45	1701081000 - 1005	50	1707060810					
				75-80	1701081630 - 1635	100	1707060815					
400-SV-03	400-SB-03	108	105	1-2	1610101600 - 1605	10	1707060828					Soil Equip Rinsate: 1610101340 - 1351, 1610110800 - 0811 Vapor Field Blank: 1707060845 Vapor Trip Blank: 1707180635
				40-45	1610111030 - 1041	50	1707060833			Soil		
				80-81	1610111415 - 1420	92	1707060838, 0840			Vapor		
400-EV-131	400-SB-04	154.5	102.5	9-10	1609221100 - 1105	10	1707240820	143-146	1609251733 - 1734, 1750 (Grab Sample)			Soil Equip Rinsate: 1609221030 - 1041, 1609230750 - 0801, 1609240750 - 0800 Vapor Field Blank: 1707240840 Water Field Blank: 1707260736, 0738
				35-40	1609221415 - 1420, 1425 - 1430	47.5	1707240827	141-142	1707260735, 0737, 0739 - 0744	Soil		
				79-80	1609231324 - 1329	100	1707240832					
				124-125	1609251200 - 1205	130	1707240836 - 0837			Vapor		
400-SV-05	400-SB-05	110	106	5-10	1701100800 - 0805	10	1708081410				Soil Equip Rinsate: 1701100740 - 0750	

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Well ID	Soil Boring Name	Boring Depth (ft bgs)	Alluvium-Cemented alluvium contact (ft bgs)	Sample Collection Summary								
				Boring Depth (ft bgs)	Soil Chemical	Boring Depth (ft bgs)	Soil Vapor	Boring Depth (ft bgs)	Groundwater Chemical	Duplicates	Matrix Spike	Waste Management and Blanks
					Sample ID		Sample ID		Sample ID			
				45-50	1701101030 - 1035, 1040 - 1045	50	1708081415			Soil		Vapor Field Blank: 1708081421 Vapor Trip Blank: 1708161342
				80-85	1701101350 - 1355	100	1708081420			Vapor		
400-KV-142	400-SB-06	163	113	13.5-14.5	1612041420 - 1425	12.5	1708070815	152-155	1708071320, 1322 - 1328 (Grab Sample)			Soil Equip Rinsate: 1612041230 - 1240, 1612050800 - 0810 Vapor Field Blank: 1708070850 Water Field Blank: 1708071321
				42.5-43.5	1612041615 - 1620	50	1708070822					
				86.5 - 87.5	1612051330 - 1335	100	1708070840					
						137	1708070845					
400-SV-07	400-SB-07	109	108.5	1-2	1612031200 - 1205	10	1708080903					Soil Equip Rinsate: 1612030900 - 0911 Trip Blank:
				48-50	1612031430 - 1435	45	1708080907					
				75-76	1612031640 - 1645	100	1708080910 - 0911			Vapor		
400-HV-147	400-SB-08	173	109	1-2	1611201130 - 1135	12	1707190738	148-150	1611290930 - 0932 (Grab Sample)			Soil Equip Rinsate: 1611200800 - 0811 Water Field Blank: 1707191016
				41-42	1611201415 - 1426	45	1707190745	139-140	1707191012, 1015, 1020, 1310, 1340, 1707200810, 0825, 0840, 0915, 0922, 0927	Water	Soil	
				77-77.5	1611201620 - 1625	95	1707190750					
						130	1707190755 - 0756			Vapor		
400-SV-09	400-SB-09	108.5	108	2.5-3.5	1611151610 - 1615	10	1707201400					Soil Equip Rinsate: 1611151240 - 1250, 1611160820 - 0830 Vapor Field Blank: 1707201415
				52.5-53.5	1611161000 - 1011	45	1707201405			Soil		
				86.5-87.5	1611161505 - 1510	104	1707201410					
400-SV-10	400-SB-10	173.5	101	9-10	1610190900 - 0905	10	1707210835	150-152	1610260930 - 0932 (Grab Sample)			Soil Equip Rinsate: 1610190815 - 0825

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Well ID	Soil Boring Name	Boring Depth (ft bgs)	Alluvium-Cemented alluvium contact (ft bgs)	Sample Collection Summary										
				Boring Depth (ft bgs)	Soil Chemical	Boring Depth (ft bgs)	Soil Vapor	Boring Depth (ft bgs)	Groundwater Chemical	Duplicates	Matrix Spike	Waste Management and Blanks		
					Sample ID		Sample ID		Sample ID					
				39-40	1610191205 - 1210	50	1707210840						Vapor Field Blank: 1707210855	
				79-80	1610191640 - 1645	100	1707210845							
						125	1707210850							
400-JV-150	400-SB-11	175	113	12.5-13	1612080830 - 0835	12.5	1708011020	144-146	1708020955, 0957, 1011, 1335, 1342, 1349, 1352, 1355			Soil Equip Rinsate: 1612080750 - 0801 Vapor Field Blank: 1708011040 Water Field Blank: 1708020956		
				46.5-47.5	1612081020 - 1025, 1030-1035	50	1708011025						Soil	Soil
				87-87.5	1612081415 - 1420	100	1708011030							
						145	Not Sampled - plugged port							
400-IV-123	400-SB-12	154	N/A	14-15	1610081512 - 1517	10	1707050947	127-129	1610230830 - 0832 (Grab Sample)			Soil Equip Rinsate: 1610081500 - 1507, 1509 - 1511 1610090755 - 0802, 0804 - 0806 Water Trip Blank: 1707110705, 1341		
				43-44	1610091224 - 1229	45	1707050955	133-134	1707111007, 1010, 1030, 1340, 1343, 1345, 1347, 1350					
				78-79	1610091630 - 1635	80	1707051001							
						118	1707051014-1015						Vapor	
400-GV-125	400-SB-13	167.5	107	9-10	1611171140 - 1145	10	1707170912			126-128	1611210831 - 0833 (Grab Sample)			Soil Equip Rinsate: 1611170940 - 0951, 1611181640 - 1651 Vapor Field Blank: 1707170930 Water Field Blank: 1707171336
				47.5-48.5	1611181330 - 1341	46	1707170918	129-131	1707171335 - 1338, 1345, 1356, 1418, 1707180725, 0730, 0738, 0741, 0745	Water	Soil			
				75-77	1611181700 - 1705	105	1707170924							
						120	1707170928 - 0929			Vapor				
400-FV-131	400-SB-14	153.5	104	11-12	1611021240 - 1245	15	1707180828			144-146	1611070815 - 0817 (Grab Sample)			Soil Equip Rinsate: 1611020920 - 0931, 1611030815 - 0826 Vapor Trip Blank: 1707180850
				43-44	1611021530 - 1535, 1545 - 1550	63	1707180835	128-130	1707180700, 1016 - 1017, 1026, 1325,	Soil				

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Well ID	Soil Boring Name	Boring Depth (ft bgs)	Alluvium-Cemented alluvium contact (ft bgs)	Sample Collection Summary								
				Boring Depth (ft bgs)	Soil Chemical	Boring Depth (ft bgs)	Soil Vapor	Boring Depth (ft bgs)	Groundwater Chemical	Duplicates	Matrix Spike	Waste Management and Blanks
					Sample ID		Sample ID		Sample ID			
400-SV-15	400-SB-15	95	92	83-84	1611031000 - 1005	104	Not Sampled - No Air Flow		1330, 1335, 1340, 1345			Soil Equip Rinsate: 1610050915 - 0925, 1610060730 - 0740
						130	Not Sampled - No Air Flow					
				9-10	1610051020 - 1025	10	1707051358					
				41.5-42.5	1610051650 - 1655	50	1707051403					
				86-87	1610061540 - 1545	90	1707051409					

Analytical Methods: VOCs – SW-846 Method 8260C; SVOCs – SW-846 Method 8270D – including low-level PAH; Perchlorate – SW-846 Method 6850; Dioxins/Furans – SW-846 Method 8290; Total Metals – most appropriate methods; Cyanide – SW-846 Method 9012B; Nitrate/Nitrite – SW-846 Method 300; Hexavalent Chromium – SW-846 Method 7199; Chloride – SW-846 Method 300; pH – SW-846 Method 9045D; NDMA – SW-846 Method 607M; Hydrazines – SW-846 Method 8315.

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Table 7.3 400 Area Geotechnical Soil Property Testing Results

Sample ID and Depth (ft)	Group Name and USCS Symbol by ASTM D2487	Particle Size Analysis by ASTM D422 (%)	Specific Gravity by ASTM D854	Moisture Content by ASTM D2216 (%)	Bulk Density and Dry Density by ASTM D7263 (pcf)	Porosity Calculation by ASTM D7263 (%)	Atterberg Plasticity Index by ASTM D4318	Saturated Hydraulic Conductivity by ASTM D5084 (cm/sec)
400-SB-02 0-10	Silty sand with gravel (SM)	Gravel 32.4, sand 43.8, silt/clay 23.8	2.69	3.7	111.7 107.8	36	0 (non-plastic)	5.2E-05
400-SB-03 30-35	Silty gravel with sand (GM)	Gravel 58.8, sand 30.0, silt/clay 11.2	2.68	1.2	121.6 120.2	28	10 (medium plastic)	8.3E-05
400-SB-03 35-40	Clayey gravel with sand (GC)	Gravel 58.8, sand 25.3, silt/clay 15.9	2.64	1.7	122.4 120.3	27	11 (medium plastic)	6.2E-06
400-SB-04 90-93	Clayey gravel with sand (GC)	Gravel 43.9, sand 42.8, silt/clay 13.3	2.67	3.5	115.1 111.2	33	8 (medium plastic)	4.0E-04
400-SB-05 0-10	Clayey sand with gravel (SC)	Gravel 32.0, sand 41.2, silt/clay 26.8	2.70	8.0	105.4 97.59	42	13 (medium plastic)	6.0E-05
400-SB-06 20-24	Well-graded gravel with silty clay and sand (GW-GC)	Gravel 56.5, sand 33.7, silt/clay 9.8	2.70	2.2	116.5 114.1	32	7 (medium plastic)	1.6E-04
400-SB-06 25-30	Well-graded gravel with silty clay and sand (GW-GC)	Gravel 60.4, sand 31.1, silt/clay 8.5	2.70	2.2	116.9 114.4	32	7 (medium plastic)	3.9E-05
400-SB-08 5-10	Clayey sand with gravel (SC)	Gravel 22.0, sand 46.9, silt/clay 31.1	2.68	9.1	105.2 96.45	28	9 (medium plastic)	1.5E-04
400-SB-08 10-15	Well-graded gravel with silt and sand (GW-GM)	Cobble 26.7, gravel 39.3, sand 26.2, silt/clay 7.8	2.69	3.3	107.7 104.2	43	0 (non-plastic)	1.6E-04
400-SB-09 12.5-15	Well-graded gravel with clay and sand (GW-GC)	Gravel 60.5, sand 30.3, silt/clay 9.2	2.64	1.4	113.4 111.9	37	12 (medium plastic)	1.4E-04

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Sample ID and Depth (ft)	Group Name and USCS Symbol by ASTM D2487	Particle Size Analysis by ASTM D422 (%)	Specific Gravity by ASTM D854	Moisture Content by ASTM D2216 (%)	Bulk Density and Dry Density by ASTM D7263 (pcf)	Porosity Calculation by ASTM D7263 (%)	Atterberg Plasticity Index by ASTM D4318	Saturated Hydraulic Conductivity by ASTM D5084 (cm/sec)
400-SB-09 20-25	Well-graded gravel with clay and sand (GW-GC)	Gravel 57.1, sand 31.5, silt/clay 11.4	2.63	1.0	120.6 119.4	32	8 (medium plastic)	4.7E-05
400-SB-10 15-20	Silty gravel with sand (GM)	Gravel 49.5, sand 38.2, silt/clay 12.3	2.69	1.9	125.3 123.0	27	0 (non-plastic)	3.8E-05
400-SB-10 20-25	Silty, clayey gravel with sand (GC-GM)	Gravel 51.7, sand 35.9, silt/clay 12.4	2.69	1.5	121.9 120.2	28	5 (slightly plastic)	3.0E-06
400-SB-11 15-20	Poorly graded gravel with silt and sand (GP-GM)	Gravel 53.8, sand 39.8, silt/clay 6.4	2.68	0.9	124.4 123.4	26	0 (non-plastic)	4.7E-04
400-SB-11 20-25	Poorly graded gravel with clay and sand (GP-GC)	Gravel 68.5, sand 22.5, silt/clay 9.0	2.70	1.5	110.1 108.5	36	9 (medium plastic)	6.9E-06
400-SB-12 40-45	Poorly graded gravel with silt and sand (GP-GM)	Gravel 51.8, sand 41.8, silt/clay 6.4	2.72	1.5	124.5 122.7	28	0 (non-plastic)	3.4E-03
400-SB-12 45-50	Well-graded gravel with silt and sand (GW-GM)	Gravel 59.9, sand 32.3, silt/clay 7.8	2.66	1.7	123.2 121.2	27	0 (non-plastic)	1.3E-04
400-SB-13 60-65	Well-graded gravel with clay and sand (GW-GC)	Gravel 59.2, sand 29.2, silt/clay 11.6	2.69	2.4	120.2 117.4	29	8 (medium plastic)	1.1E-04
400-SB-14 65-70	Poorly graded gravel with silt and sand (GP-GM)	Gravel 67.8, sand 22.6, silt/clay 9.6	2.70	7.2	125.0 116.6	31	0 (non-plastic)	1.1E-04
400-SB-14 70-75	Clayey gravel with sand (GC)	Gravel 60.8, sand 24.7, silt/clay 14.5	2.69	3.7	110.1 106.2	37	10 (medium plastic)	1.8E-04
400-SB-15 15-20	Well-graded gravel with silt and sand (GW-GM)	Cobble 10.2, gravel 56.4,	2.68	1.2	122.3 120.8	28	0 (non-plastic)	9.0E-05

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Sample ID and Depth (ft)	Group Name and USCS Symbol by ASTM D2487	Particle Size Analysis by ASTM D422 (%)	Specific Gravity by ASTM D854	Moisture Content by ASTM D2216 (%)	Bulk Density and Dry Density by ASTM D7263 (pcf)	Porosity Calculation by ASTM D7263 (%)	Atterberg Plasticity Index by ASTM D4318	Saturated Hydraulic Conductivity by ASTM D5084 (cm/sec)
		sand 26.8, silt/clay 6.6						
400-SB-15 15-20 #2	Well-graded gravel with silt and sand (GW-GM)	Gravel 60.2, sand 30.9, silt/clay 8.9	2.70	1.8	119.0 116.9	31	0 (non-plastic)	6.8E-05

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Table 7.4 Soil Analytical Results Above NMED SSLs

Borehole	Sample Depth (Ft Bgs)	Sampling Date	Analyte	Result (mg/kg)	QA Flag	Residential SSL (mg/kg)	Construction Worker SSL (mg/kg)	NMGW or MCL-based SSL, DAF 20 (mg/kg)
400-SB-01	9	12/19/16	Lead	6.64	J			0.052
400-SB-01	44	12/19/16	Lead	11.9				0.052
400-SB-01	44	12/19/16	Lead	5.1	J			0.052
400-SB-02	40	1/8/17	Lead	32.4				0.052
400-SB-03	1	10/10/16	Lead	3.43	J			0.052
400-SB-03	44	10/11/16	Lead	3.41	J			0.052
400-SB-03	80	10/11/16	Lead	10.4				0.052
400-SB-04	9	9/22/16	Lead	9.16				0.052
400-SB-04	35	9/22/16	Lead	6.82	QD			0.052
400-SB-04	35	9/22/16	Lead	9.1	QD			0.052
400-SB-04	79	9/23/16	Lead	17.8				0.052
400-SB-04	124	9/25/16	Lead	4.06				0.052
400-SB-05	45	1/10/17	Lead	4.15	J			0.052
400-SB-05	80	1/10/17	Lead	4.14	J			0.052
400-SB-06	42	12/4/16	Arsenic	12.7		7.07	41.2	
400-SB-06	13	12/4/16	Lead	8.56				0.052
400-SB-06	42	12/4/16	Lead	5.72				0.052
400-SB-06	86	12/5/16	Lead	6.08				0.052
400-SB-07	1	12/3/16	Arsenic	9.1		7.07	41.2	
400-SB-07	1	12/3/16	Lead	7.15				0.052
400-SB-07	48	12/3/16	Lead	8.48				0.052
400-SB-07	75	12/3/16	Lead	8.82				0.052
400-SB-08	1	11/20/16	Lead	7.2				0.052
400-SB-08	41	11/20/16	Lead	8.76				0.052
400-SB-08	77	11/20/16	Lead	7.07				0.052
400-SB-08	77	11/20/16	NDMA	0.071	D	0.0234	2.14	
400-SB-09	2	11/15/16	Lead	5.74				0.052
400-SB-09	52	11/16/16	Lead	5.94				0.052
400-SB-09	86	11/16/16	Lead	9.05				0.052
400-SB-10	9	10/19/16	Lead	11.9				0.052
400-SB-10	39	10/19/16	Lead	5.87	J			0.052
400-SB-10	79	10/19/16	Lead	6	J			0.052
400-SB-11	12	12/8/16	Lead	6.94				0.052
400-SB-11	46	12/8/16	Lead	6.41	J			0.052
400-SB-11	87	12/8/16	Lead	4.41	J RB			0.052

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Borehole	Sample Depth (Ft Bgs)	Sampling Date	Analyte	Result (mg/kg)	QA Flag	Residential SSL (mg/kg)	Construction Worker SSL (mg/kg)	NMGW or MCL-based SSL, DAF 20 (mg/kg)
400-SB-12	14	10/8/16	Lead	4.78	J			0.052
400-SB-12	78	10/9/16	Lead	5.49	J			0.052
400-SB-13	75	11/18/16	Arsenic	10.9		7.07	41.2	
400-SB-13	9	11/17/16	Lead	6.46				0.052
400-SB-13	47	11/18/16	Lead	8.4				0.052
400-SB-13	75	11/18/16	Lead	14.4				0.052
400-SB-14	11	11/2/16	Lead	6.13				0.052
400-SB-14	43	11/2/16	Lead	4.03	J			0.052
400-SB-14	43	11/2/16	Lead	6.15				0.052
400-SB-14	83	11/3/16	Lead	8.12				0.052
400-SB-15	86	10/6/16	Lead	5.06	J			0.052

Notes:

D = The reported result is from a dilution.

J = The result is an estimated value less than the quantitation limit, but greater than or equal to the detection limit.

RB = The analyte was detected in the method blank.

QD = The relative percent difference for a field duplicate was outside standard limits. In these cases, the higher concentration was used as the basis for comparison.

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Table 7.5 Groundwater Analytical Results Above WSTF Cleanup-Screening Levels

Well Name	Sampling Date	Analytical Method	Analyte	Result (ug/L)	NDMA (607) Extraction Efficiency	QA Flag	WSTF GMP Cleanup Level (ug/L)	NMED Tap Water (ug/L)
400-EV-131	7/26/17	METALS	Arsenic	0.8		J	0.520	0.86
400-EV-131	7/26/17	607	NDMA	0.85	105		0.001	0.16
400-EV-131	7/26/17	8270	NDMA	1.3		J	0.001	0.16
400-EV-131	7/26/17	8260	TCE	13			4.900	2.59
400-FV-131	7/18/17	METALS	Arsenic	1.3			0.520	0.86
400-FV-131	7/18/17	8270	BEHP	6.6		RB	6.000	55.64
400-FV-131	7/18/17	607	NDMA	1.4	87		0.001	0.16
400-FV-131	7/18/17	8270	NDMA	1.7		J	0.001	0.16
400-GV-125	7/17/17	METALS	Arsenic	0.7		J	0.520	0.86
400-GV-125	7/17/17	METALS	Arsenic	0.9		J	0.520	0.86
400-GV-125	7/17/17	8270	BEHP	7.3		RB	6.000	55.64
400-GV-125	7/17/17	607	NDMA	0.8	87		0.001	0.16
400-GV-125	7/17/17	607	NDMA	0.83	87		0.001	0.16
400-HV-147	7/19/17	METALS	Arsenic	1.3		*	0.520	0.86
400-HV-147	7/19/17	METALS	Arsenic	0.9		J	0.520	0.86
400-HV-147	7/19/17	607	NDMA	47	87	D	0.001	0.16
400-HV-147	7/19/17	607	NDMA	48	87	D	0.001	0.16
400-HV-147	7/19/17	8270	NDMA	66			0.001	0.16
400-IV-123	7/11/17	METALS	Arsenic	7.7			0.520	0.86
400-IV-123	7/11/17	607	NDMA	0.036	87		0.001	0.16
400-JV-150	8/2/17	METALS	Arsenic	0.8		J	0.520	0.86
400-JV-150	8/2/17	8270	BEHP	7.1		RB A	6.000	55.64
400-JV-150	8/2/17	607	NDMA	3.9	104		0.001	0.16
400-JV-150	8/2/17	8270	NDMA	4.5		J	0.001	0.16
400-KV-142	8/7/17	METALS	Arsenic	10.7			0.520	0.86
400-KV-142	8/7/17	METALS	Barium	1360			1000.000	3277.35
400-KV-142	8/7/17	METALS	Chromium	228			50.000	11695.90
400-KV-142	8/7/17	METALS	Cobalt	22		J	6.000	5.98
400-KV-142	8/7/17	METALS	Lead	50			50.000	N/A

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Well Name	Sampling Date	Analytical Method	Analyte	Result (ug/L)	NDMA (607) Extraction Efficiency	QA Flag	WSTF GMP Cleanup Level (ug/L)	NMED Tap Water (ug/L)
400-KV-142	8/7/17	607	NDMA	0.17	103		0.001	0.16
400-KV-142	8/7/17	METALS	Thallium	0.5		J	0.200	0.20
400-KV-142	8/7/17	METALS	Vanadium	108			86.000	63.07

Notes:

J = The result is an estimated value less than the quantitation limit, but greater than or equal to the detection limit.

RB = The analyte was detected in the method blank.

A = The result of an analyte for a laboratory control sample (LCS), initial calibration verification (ICV), or continuing calibration verification (CCV) was outside standard limits.

Table 7.6 Soil Vapor Analytes and Concentration Ranges

Analyte	Concentration Range Within Soil Vapor Monitoring Well Sampling Zones		Concentration Range Within Field Blank and Trip Blank Samples	
	Minimum ($\mu\text{g}/\text{M}^3$)	Maximum ($\mu\text{g}/\text{M}^3$)	Minimum ($\mu\text{g}/\text{M}^3$)	Maximum ($\mu\text{g}/\text{M}^3$)
1,1,1-Trichloroethane*	0	0	0	0
1,1,2,2-Tetrachloroethane	0	0	0	0
1,1,2-Trichloroethane	0	0	0	0
1,1-Dichloroethane*	0	0	0	0
1,1-Dichloroethene	0	0	0	0
1,2,4-Trichlorobenzene	0	0	0	0
1,2,4-Trimethylbenzene	0	1	0	1.6
1,2-Dibromoethane (EDB)	0	0	0	0
1,2-Dichlorobenzene	0	0	0	0
1,2-Dichloroethane	0	0	0	0
1,2-Dichloropropane	0	1.4	0	0
1,3,5-Trimethylbenzene	0	0.7	0	0
1,3-Butadiene	0	0	0	0
1,3-Dichlorobenzene	0	0	0	0
1,4-Dichlorobenzene	0	0	0	0
1,4-Dioxane	0	0.66	0	1
2,2,4-Trimethylpentane	0	20	0	0.78
2-Butanone (MEK)*	0	29	0	14
2-Hexanone*	0	1.7	0	1.8
2-Propanol*	0	63	0	14
3-Chloropropene	0	0	0	0
4-Ethyltoluene	0	0	0	0
4-Methyl-2-pentanone	0	0	0	0.73
Acetone*	0	97	0	34
alpha-Chlorotoluene	0	0	0	0
Benzene	0	15	0	1.4
Bromodichloromethane*	0	18	0	0
Bromoform*	0	0.9	0	0
Bromomethane	0	0	0	0
Carbon Disulfide	0	94	0	4.7
Carbon Tetrachloride	0	0	0	0
Chlorobenzene*	0	0	0	0
Chloroethane	0	0	0	0
Chloroform*	0	130	0	0
Chloromethane*	0	6.3	0	0.72
cis-1,2-Dichloroethene	0	0	0	0
cis-1,3-Dichloropropene	0	0	0	0
Cumene	0	0.83	0	0

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Analyte	Concentration Range Within Soil Vapor Monitoring Well Sampling Zones		Concentration Range Within Field Blank and Trip Blank Samples	
	Minimum ($\mu\text{g}/\text{M}^3$)	Maximum ($\mu\text{g}/\text{M}^3$)	Minimum ($\mu\text{g}/\text{M}^3$)	Maximum ($\mu\text{g}/\text{M}^3$)
Cyclohexane	0	18	0	3.4
Dibromochloromethane*	0	4.2	0	0
Ethanol	0	27	0	21
Ethyl Benzene	0	12	0	1.4
Freon 11*	24	1,800,000	0	3.4
Freon 113*	31	2,900,000	0	4.3
Freon 114	0	0	0	0
Freon 12	0	2.3	0	2.1
Freon 123*	0	17,000	0	0
Freon 123a	0	11,000	0	0
Freon 21*	0	19,000	0	0
Heptane	0	190	0	1.6
Hexachlorobutadiene	0	0	0	0
Hexane	0	570	0	2.5
m,p-Xylene*	0	11	0	4.6
Methyl tert-butyl ether*	0	0	0	0
Methylene Chloride*	0	4	0	4
o-Xylene	0	5.1	0	1.7
Propylbenzene	0	0	0	0.56
Styrene	0	8.2	0	1.2
Tetrachloroethene (PCE)*	0	430	0	1.6
Tetrahydrofuran	0	0	0	0
Toluene*	0	36	0	19
trans-1,2-Dichloroethene*	0	0	0	0
trans-1,3-Dichloropropene	0	0	0	0
Trichloroethene (TCE)*	0	15	0	0.64
Vinyl Chloride	0	0	0	0

Notes:

Shaded analytes are non-detect for sampling zone and field blank/trip blank samples for dataset.

* = Analyte is on list of 400 Area COPCs (NASA, 2011b – 400 Area IWP).

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Table 7.7 Soil Vapor Analytical Results Above NMED VISLs and WSTF RBCs

Well ID	Vapor Implant Sample Depth	Sampling Date	Analyte	Result (ug/m3)	QA Flag	NMED Residential VISLs (ug/M ³)	WSTF RBCs Residential (ug/M3)
400-EV-131	130	7/24/17	Freon 11	1,100,000		24,300	150,000,000 @ 100' bgs
400-EV-131	130	7/24/17	Freon 11	1,100,000		24,300	150,000,000 @ 100' bgs
400-EV-131	130	7/24/17	Freon 113	1,700,000		1,040,000	250,000,000 @ 100' bgs
400-EV-131	130	7/24/17	Freon 113	1,600,000		1,040,000	250,000,000 @ 100' bgs
400-GV-125	105	7/17/17	Freon 11	82,000		24,300	150,000,000 @ 100' bgs
400-GV-125	120	7/17/17	Freon 11	29,000	QD	24,300	150,000,000 @ 100' bgs
400-HV-147	130	7/19/17	Freon 11	220,000		24,300	150,000,000 @ 100' bgs
400-HV-147	130	7/19/17	Freon 11	280,000		24,300	150,000,000 @ 100' bgs
400-IV-123	45	7/5/17	Freon 11	36,000		24,300	41,000,000 @ 25' bgs
400-IV-123	80	7/5/17	Freon 11	830,000		24,300	77,000,000 @ 50' bgs
400-KV-142	137	8/7/17	Freon 11	1,800,000		24,300	150,000,000 @ 100' bgs
400-KV-142	137	8/7/17	Freon 113	2,900,000		1,040,000	250,000,000 @ 100' bgs
400-LV-125	122	7/6/17	Freon 11	540,000		24,300	150,000,000 @ 100' bgs
400-SV-10	50	7/21/17	Chloroform	130		40.7	210,000 @ 50' bgs
400-SV-10	125	7/21/17	Freon 11	64,000		24,300	150,000,000 @ 100' bgs

Notes:

QD = The relative percent difference for a field duplicate was outside standard limits. In this case, the two results were 21,000 ug/M3 and 29,000 ug/M3 - a difference of 32%. The higher value was used in the evaluation.

The values are above their respective NMED VISL but below their respective WSTF RSL.

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Table 10.1 Summary of Deviations

Source	Section	Requirement (from source document)	Deviations
400 Area IWP	Executive Summary	It was stated that "ten primary soil borings and up to four supplemental borings will be advanced from ground surface to the alluvium-bedrock interface".	The actual number of borings was 15.
400 Area IWP	Executive Summary	It was stated that "these wells are considered temporary and will be designated for plugging and abandonment upon completion of the site investigation".	Instead, the wells will be maintained beyond the completion of the site investigation. The MSVGM wells have been added to the GMP (NASA, 2017f).
400 Area IWP	Other Considerations	It was stated that "NASA will minimize damage caused to the caps by using portable equipment mats beneath driving routes in the interior of the Closure".	Drilling at 400-SB-04 (the first boring advanced within the Closure) was initiated without using the portable equipment mats. No damage was incurred to the cap due to the absence of the mats. Subsequent borings within the Closure were drilled utilizing the portable equipment mats.
400 Area IWP	Other Considerations	It was stated that "six small (approximately one square foot) holes will be cut through the concrete cap to provide access for the subsurface drilling and coring equipment."	Instead, the sonic core barrel was used to drill directly through the cement of the closure cap, minimizing the disturbance to the surface closure materials or damage that would have been incurred by cutting six one square foot areas originally planned.
400 Area IWP	Other Considerations	It was stated that "these planned closure breaches will be repaired to restore the integrity of the structures following fieldwork completion.	Closure breaches did not occur in the planned manner and were therefore not repaired in the same manner. Cement was placed in the top 2-3 ft in the annular space to hold the casing monument in place. This maintained the integrity of the closure.
400 Area IWP	Soil Sampling Plan	No borings upgradient of the 400 Area Closure were planned.	During the investigation, two additional borings were drilled upgradient of the Closure.
400 Area IWP	Soil Sampling Plan and Rotary Drilling with Air	Only air-rotary drilling or Stratex were anticipated.	During the investigation, NASA utilized roto-sonic (sonic) within the uncemented alluvium and a combination of air-rotary and sonic coring within the cemented alluvium and bedrock.
400 Area IWP	Soil Sampling Plan	It was proposed that analytical results obtained from samples from borings 400-SB-09 and 400-SB-10 be used to locate three additional borings downgradient of the Closure.	In actuality, ten MSVM wells corresponding to the original boring locations provided in the NMED-approved IWP (NASA, 2011d) and five proposed locations for the MSVGM wells were drilled in locations presented in Figure 1 of the 400 Area ADWP (NASA, 2016a). The locations of these wells were not moved according to analytical results.
400 Area IWP	Soil Sampling Plan	It was proposed that wells (except for 400-SB-09 and 400-SB-10) be drilled in numerical order.	This proved to be impractical and the wells were instead drilled in an order to accommodate the 400 Area test schedules.

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Source	Section	Requirement (from source document)	Deviations
400 Area IWP	Soil Sampling Plan	It was stated that "two intermediate samples of the boring will be collected over the depth range from 30 to 50 ft bgs and 75 to 100 ft bgs."	In general, with the exception of 400-SB-04, one intermediate sample was collected over the depth range from 30 to 50 ft., due to the presence of the cemented alluvium overlying andesite, as described in earlier sections of this report.
400 Area IWP	Soil Sampling Plan	It was stated that "the lower sample will be collected between 120 ft (36.58 m) bgs and the bottom of the boring at bedrock, taking into account the position of the water table (if encountered), where allowed by sample quality and recovery."	In general, with the exception of 400-SB-04, the lower sample was collected over the depth range from 75 to 90 ft.
400 Area IWP	Soil Sampling Plan	It was stated that "hexavalent chromium was not historically used for operations in the 400 Area and, therefore, will not be analyzed in borings outside the Closure cell footprint."	In actuality, three additional borings (400 SB-11, 400 SB-13, and 400 SB-14) were analyzed for hexivalent chromium in their soil samples.
400 Area IWP	Soil Vapor Well Installation	It was stated that "each well will comprise four sample ports (implants) that will be placed with the objective of providing vertical delineation of gas concentrations in the vadose zone."	In the investigation, in order to provide vertical delineation of gas concentrations in the vadose zone the MSVM wells were installed with three sampling implants, with the exception to 400-SB-10. This well (which was originally planned to be an MSVGM well), has four soil vapor implants. The MSVGM wells were completed with four implants.
400 Area IWP	Soil Vapor Well Installation	It was stated that "sample ports (implants) will be located at approximately 35- to 40-foot intervals. The uppermost port (implant) will be located at approximately 10 ft bgs, immediately below the level of the former impoundment cells. The lowest port (implant) will be located above groundwater at approximately 125 feet. The remaining well ports (implants) will be strategically placed at intermediate intervals or at horizons of specific interest as identified during lithological logging of the borehole."	In general, with the exception of 400-SB-10, the lowest implant in the MSVM wells was located at depths slightly above the alluvial-bedrock interface (approximately 100 ft bgs).
400 Area IWP	Soil Vapor Well Installation	It was stated that following well and annular material installation, "a four-foot-square cement pad that slopes away from the well will be constructed at ground level and surrounded by bollards for those wells outside the footprint of the Closure. A brass cap will be installed at each well."	Instead, MSVM and MSVGM wells were completed by installing a circular concrete pad with a diameter of 4 ft centered on each well and sloped away from the well. Brass caps and protective bollards were installed as required.
400 Area IWP	Groundwater Sampling Plan	It was stated that "if water is encountered, a bailer will be lowered into the borehole and a water grab sample will be collected."	No groundwater grab samples were collected at 400-SB-01, 400-SB-06, or 400-SB-11 from the borings prior to well construction.
400 Area IWP	Groundwater Sampling Plan	It was stated that "following the advancement of the soil borings, up to five small diameter groundwater monitoring wells will be installed with the proposed soil vapor well borings."	In addition to the five MSVGM wells specified in the IWP (NASA, 2011d), three additional MSVGM wells were installed as subsequently requested by NMED.

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Source	Section	Requirement (from source document)	Deviations
400 Area IWP	Groundwater Sampling Plan	A two-inch Schedule 40 PVC groundwater monitoring well with a 15 ft (4.57 m, 0.010-inch slot) screen straddling the water table, five feet (1.52 m) above and ten feet (3.05m) below will be installed in conjunction with the soil vapor well. Colorado Silica sand (10/20 mesh) will be placed in the bottom of the boring to two and a half feet (0.76 m) above the deepest soil vapor monitoring zone, covering the screen emplacement of the remaining annular materials and well completion will follow the procedures for the MSVM installation described above.	Sufficient 4-in. stainless steel casing and screen was available at WSTF for the planned five MSVGM wells. However, casing was not available for the three additional MSVGM wells requested by NMED. To ensure sufficient annular space surrounding the additional three MSVGM wells with the use of a smaller 7.5-in. OD sonic core, the decision was made to construct the wells utilizing 2-in. PVC casing and well screen.
400 Area IWP	Rotary Drilling with Air	It was stated that "to collect samples at specific depths, the borehole will be cleaned of cuttings and a sampling core barrel will be driven between two to five feet, depending on the length of the core barrel, into the undisturbed formation at the bottom of the open borehole using a pneumatic driver head or drop hammer."	In general, sonic drilling was utilized to advance soil borings and collect soil cores at discrete intervals.
400 Area IWP	Field Screening Procedures	It was stated that "during borehole installation activities, soil vapors derived from soil samples will be analyzed via the headspace method for total ionizable volatile compounds (TIVCs) with a portable photoionization detector (PID).	This was performed, except in borings 400-SB-01, 400-SB-02, 400-SB-05, and 400-SB-11. The PID was non-functional during the drilling of these boreholes and was returned to the manufacturer for repairs.
400 Area IWP	Soil Sampling Procedures	It was stated that "soil sampling for chemical and geotechnical parameters will be carried out via the modified sonic core barrel sampling technique" advanced with an air rotary drill rig.	In the investigation, soil sampling for chemical and geotechnical parameters was primarily collected via the sonic core barrel advanced with a sonic drill rig.
400 Area Investigation ADWP	Primary Purpose - Figure 1	Soil boring 400-SB-10 (Figure 2.4) was originally intended to be completed as a MSVGM well.	However, due to insufficient groundwater production, this well was completed as a MSVM well. To ensure adequate groundwater monitoring coverage, the closest downgradient boring, 400-SB-13 was completed as a MSVGM well (400-GV-125; Figure 2.4).
400 Area Investigation ADWP	Primary Purpose - Figure 2	Soil boring 400-SB-15 was originally intended to be located approximately 75 ft west of its current location (Figure 2.4).	Prior to mobilization of the drilling company, NASA determined that the planned location was in the direct path of potential gaseous discharges from rocket engine testing. The boring was relocated to ensure personnel safety and to avoid the potential for introducing contamination into the completed MSVM well (400-SV-15) as a result of this testing.

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Source	Section	Requirement (from source document)	Deviations
400 Area Investigation ADWP	Drilling Approach	When sonic drilling was used, “Once the core barrel has been advanced, a secondary casing will be advanced down to the same depth as the inner core barrel.”	NASA attempted to advance the drive casing to the total depth of the first boring (400-SB-04 or well 400-EV-131; Figure 2.4); however, difficult drilling conditions in the alluvium resulted in frequent drilling equipment failure and breakage. Therefore, for the remaining 14 wells, the drive casing was not advanced to the same depth as the inner core barrel, but only as far into the alluvium as drilling conditions would allow. Additional information was provided in Section 4.2.
400 Area Investigation ADWP	Lithologic Sampling	“Four soil samples are anticipated to be collected in each boring to address the 400 Area Closure Investigation data quality objectives.” These samples were to be collected from similar depth intervals in each borehole.	Since bedrock was encountered at a shallower depth than anticipated, three samples, instead of four, were collected from all borings, except for 400-SB-04. In addition, there was some variation in the sample depths when the field geologist avoided specific intervals in which the temperature of the recovered soil cuttings or core was elevated. A listing of samples collected from each borehole is included as Table 7.2.
400 Area Investigation ADWP	Well Completion	“Each well will comprise four sample ports (implants)...”	Following drilling and prior to installation, the seven wells completed as MSVM wells were designed with three soil vapor sample implants, rather than four. This was due to the discovery of bedrock at only 81 to 109 ft bgs, rather than 145 ft bgs as was expected (ADWP, NASA, 2016a, Primary Purpose Section). The presence of this cemented alluvium above volcanic bedrock reduced the available thickness of unconsolidated alluvium in which to install soil vapor implants by 30 to 50 ft. With the designed distances between implants, fewer implants were required to fully characterize soil vapor in the vadose zone. All of the wells with three soil vapor implants were MSVM wells and were completed shallower than the MSVGM wells. Maintaining the original designed port distances for the MSVM wells allowed for correlation of sampling zones between the MSVM wells and the MSVGM wells. These changes were approved by NMED prior to well construction. Well Completion Diagrams are included as Appendix B.

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Source	Section	Requirement (from source document)	Deviations
400 Area Investigation ADWP	Well Completion	4-in. diameter, Schedule 40, PVC well casing with a 15-ft (0.010-in. slot) screen was the specified for groundwater monitoring wells.	Actual groundwater monitoring well construction utilized 2-in. Schedule 40 PVC with 0.020 slot screens and 4-in. Type 316/316L schedule 10 stainless steel casing with 0.010 slot screens. The stainless steel casing and screen were substituted in order to utilize well materials already present at WSTF. The 2-in. PVC casing and screen were utilized to ensure that sufficient annular space was available for well completion within the three additional MSVGM wells that NMED requested NASA to install subsequent to demobilization of the air rotary equipment. The three additional wells were drilled with sonic coring with a diameter of 7.5-in. OD. These well completion changes had no impact on sampling methods and were approved by NMED prior to well construction.
400 Area Investigation ADWP	Well Completion	The generalized well construction design shows one stainless steel guideline being used per well.	Actual MSVM well installations included the use of one or more stainless steel guidelines with weights to assist with soil vapor port placement and installation. Individual well completion diagrams are provided in Appendix B show details of the guidelines per well. The additional stainless steel guidelines do not affect the collection of samples from MSVM wells.
400 Area Investigation ADWP	Groundwater Sampling	"MSVGM wells will be purged sufficiently to ensure samples are representative of formation water. Groundwater monitoring wells will subsequently be managed in accordance with the NMED-approved Groundwater Monitoring Plan (NASA, 2015)."	Well 400-KV-142 was sampled with a bailer due to low rate of recharge. This process generated a significant amount of sediment being included in the samples, especially in those bottles which were collected last (for analysis for metals). The high concentration of metals in the sample from this well are believed to have resulted from the suspended sediment.

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Table 11.1 Comparison of Vapor COCs to Their Groundwater Concentrations

Constituent	Location for Max. Measured Concent. (Well & Port) with Sampling Date	Soil Vapor Concent. ($\mu\text{g}/\text{m}^3$)	Location of Equivalent Groundwater Sample with Sampling Date	Groundwater Concent. ($\mu\text{g}/\text{L}$)	Henry's Law Coefficient ¹	Calculated Soil Vapor Concent. in Equilibrium with Groundwater ($\mu\text{g}/\text{m}^3$)	Equivalent Residential VISL from NMED (2017) ($\mu\text{g}/\text{m}^3$)	WSTF Site-Specific Risk-Based Concent. (RBC) ¹ ($\mu\text{g}/\text{m}^3$)	WSTF GMP or Equivalent NMED Tap Water Screening Level ($\mu\text{g}/\text{L}$)
Freon 11	400-EV-131 @ 130 ft bgs 7/24/17	1,100,000	400-EV-131 screened at 131-146 ft bgs 7/26/17	520	3.98E+00	2,069,000	24,300	150,000,000 @ 100 ft bgs	5,200
Freon 11	400-KV-142 @ 137 ft bgs 8/7/17	1,700,000	400-KV-142 screened at 142-157 ft bgs 8/7/17	610	3.98E+00	2,427,800	24,300	150,000,000 @ 100 ft bgs	5,200
Freon 113	400-EV-131 @ 130 ft bgs 7/24/17	1,800,000	400-EV-131 screened at 131-146 ft bgs 7/26/16	150	2.16E+01	3,240,000	1,040,000	250,000,000 @ 100 ft bgs	54,987
Freon 113	400-KV-142 @ 137 ft bgs 8/7/17	2,900,000	400-KV-142 screened at 142-157 ft bgs 8/7/17	320	2.16E+01	6,912,000	1,040,000	250,000,000 @ 100 ft bgs	54,987

Notes:

¹ Dimensionless, volumetric basis; taken from NMED, 2017e.

² (RBC) – The RBC is conservatively high due to use of the value for the depth above the actual sampling depth for the maximum concentration (NASA, 2017c).

Table 11.2 NDMA Concentrations in Groundwater

Well	Date Sampled	Analytical Method	Results (ppt)	Results Corrected for Extraction Efficiency for Method 607
400-EV-131	7/26/2017	8270	1,300	1,300
400-FV-131	7/18/2017	8270	1,700	1,700
400-GV-125	7/17/2017	607	830	950
400-HV-147	7/19/2017	8270	66,000	66,000
400-IV-123	7/11/2017	607	36	41
400-JV-150	8/2/2017	8270	4,500	4,500
400-KV-142	8/7/2017	607	170	165
300-C-128	8/10/2017	607	3,500	4,300
NASA 6	7/27/2017	607	11,000	10,000
400-C-143	4/3/2017	607	2,200	3,100
400-D-195	8/23/2017	607	ND (<5)	ND (<5)

Appendix A
Photographic Documentation

Figure A.1

View into the 400 Area Western Impoundment



View of the 400 Area Western Impoundment prior to advancing borings SB-07 and SB08. Looking west from the central berm. The drill rig is set up on SB-10, just west of the northwest corner of the impoundment.

Figure A.2

Drilling at SB-15 (400-SV-15)



Set up for drilling on SB-15. The white support truck (facing left) is backed up to the drill rig, with the drilling platform supported between them. The core barrels are staged in the support truck. The drill rig has a rotating head which picks up the core barrels and screws them together.

Figure A.3

SB-04 (400-EV-131) Set Up



SB-04 (400-EV-131) was the boring/MSVGM well in the northwestern corner of the eastern impoundment. Looking west toward the central berm. Note the Exclusion Zone sign in the foreground.

Figure A.4

Health and Safety Placard



This placard was set up at each drilling location before drilling commenced. All visitors had to check in with the geologist conducting oversight, receive a tailgate safety briefing, and don appropriate PPE before being allowed to approach drilling operations

Figure A.5

Detail of the Drilling Area



The drilling platform (steel grate) is set up between the drill rig and the support truck and supported by both. The top of a core barrel that has just been advanced can be seen above the surface.

Figure A.6

Examining the Sample for Lithologic Description and Sample Location



Each bag was cut open for inspection of the contents, lithologic description, and collection of representative soil samples for field and laboratory analysis. If samples for analysis of VOCs were to be collected, the Terra Core samplers were utilized as soon as the bags were opened to minimize the loss of volatiles.

Figure A.7

Soil Sample Collected from the Core Barrel



The samples collected in the core barrel during sonic coring were extruded into plastic bags. Each bag was marked with the boring number and the interval from which the sample was collected.

Figure A.8

400-EV-131 Prepared for Well Completion



MSVGM well 400-EV-131 has been drilled, installed, and is ready for surface completion. The yellow steel protective stick up casing is lying to the right of the well. The 4 ft diameter cardboard tubing will be used to hold the concrete that will form the well pad.

Figure A.9

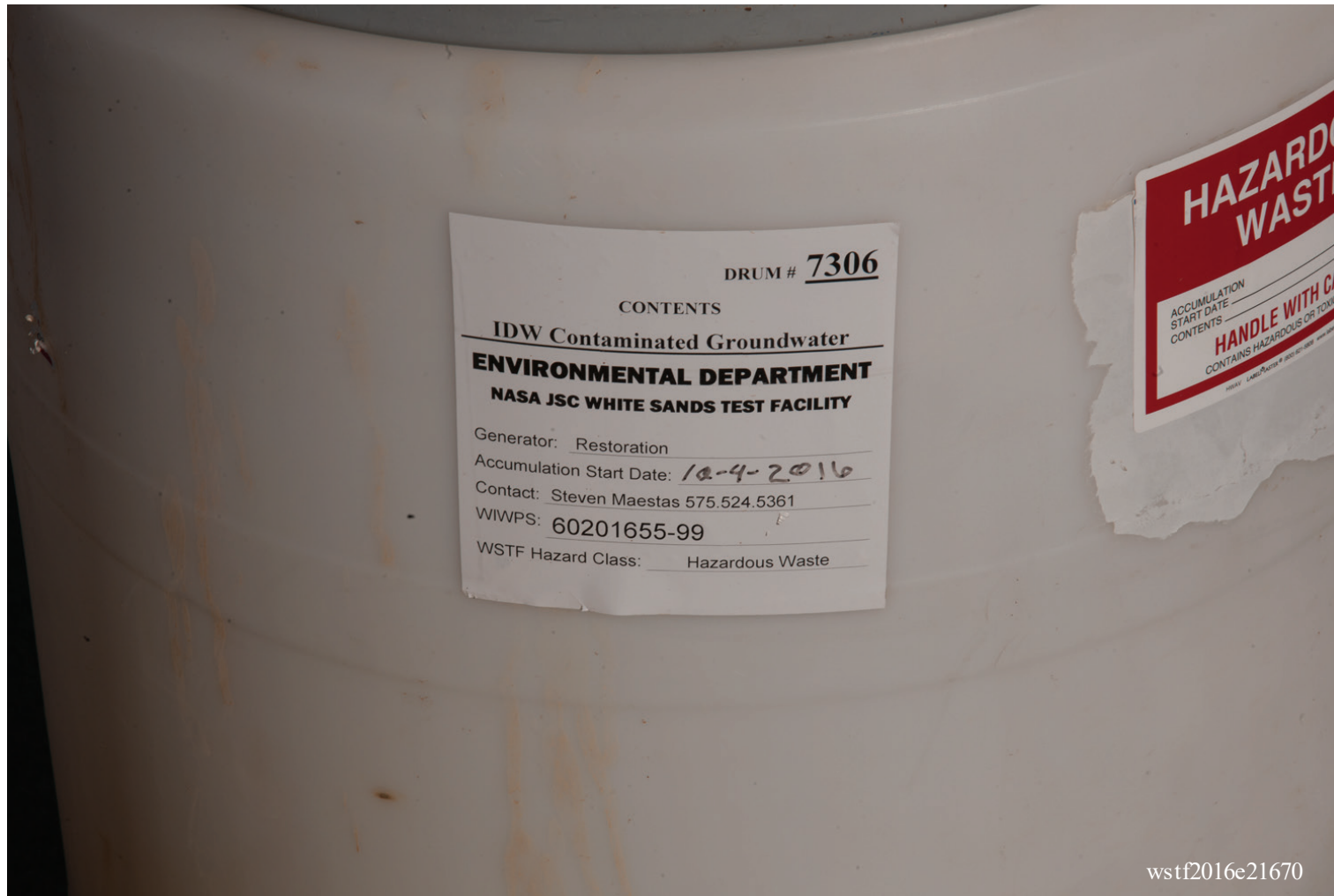
Detail of Well Completion: 400-EV-131



This shows the 4 in. diameter steel casing for sampling groundwater, and the four soil vapor ports. Note each port is labeled with the depth of its associated soil vapor implant. The green tape was later replaced with permanent engraved aluminum tags.

Figure A.10

Properly Labeled Container for IDW

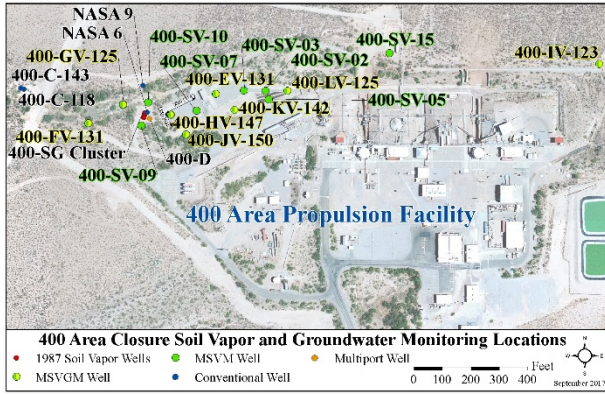


An Investigation Derived Waste container with appropriate labeling. All soil IDW was initially managed as hazardous waste until analytical results were received. Upon review of the results, the classification was downgraded to Solid Waste or a No Longer Contained In determination and disposed of appropriately. All groundwater IDW was properly disposed of at the WSTF Mid-Plume treatment system.

Appendix B
Lithologic Logs

SOIL BORING LITHOLOGIC LOG – 400-SB-01 (Became 400-LV-125)

LOCATION MAP:



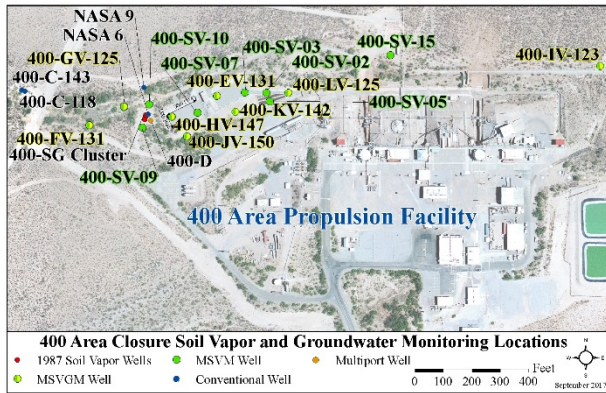
SITE ID: NASA-WSTF, Doña Ana County, NM
LOCATION COORDINATES (ft) N: 554,893.87 E: 1,530,873.50
GROUND ELEVATION (ft AMSL): 4,838.68
DRILLING METHOD: Rotosonic with casing advance
DRILLING CONTR./DRILLER: Cascade Drilling / Joe Lary
BOREHOLE DIAMETER: 9; 7; 6 in. **TOTAL DEPTH:** 156 ft
DATE DRILLING STARTED/COMPLETED: 12/19/2016 / 12/21/2016
FIELD REPS.: Michael Narup, Tom McCrory
DEPTH GROUNDWATER ENCOUNTERED: Not encountered during drilling/Interval from 142' to 150' reported wet.
STATIC WATER LEVEL (DATE): No water
BEDROCK TYPE: Cemented alluvium / andesite
BEDROCK DEPTH: 98 ft / 127 ft
COMMENTS:

DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE			LITHOLOGIC DESCRIPTION
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yrmmdtmtt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
0								
10	0.0				Composite (Soil grab)	9-10': 1612190950-0955	SW	Well graded gravelly sand with silt and clay; 5% coarse gravel, 20% fine gravel, 20% coarse sand, 25% medium sand, 15% fine sand, 10% silt, 5% clay. Color is pink (7.5 yr 7/3). Subangular to subrounded. Gravel mainly silt/mud/stone.
20	0.0				Composite (Soil grab)		GW	Well graded sandy gravel with silt and clay; 25% coarse gravel, 20% fine gravel, 30% medium sand, 15% fine sand, 7.5% silt, 2.5% clay. Color is light red brown (5 Yr 6/4). Subangular to subrounded. Clasts are mostly limestone and quartzite.
30	0.0				Composite (Soil grab)		SW	Well graded silty, gravelly sand with clay; 5% coarse gravel, 25% fine gravel, 20% coarse sand, 25% medium sand, 10% fine sand, 20% silt, 5% clay. Color is light brown (7.5 YR 6/4). Subangular to subrounded. Approximately 75% of the gravel is limestone.
40	0.0				Composite (Soil grab)		SW	Well graded gravelly sand with silt and clay; 5% coarse gravel, 25% fine gravel, 15% coarse sand, 25% med sand, 15% fine sand, 10% silt, 5% clay. Matrix is light red brown (5 Yr 6/4). Subangular. Clasts are predominantly limestone with some granite and quartzite.
50	0.0				Composite (soil grab)	44-45': 1612190950-1135 Duplicate: 1612191140-1145	SW	Well graded gravelly sand with silt and clay; 15% coarse gravel, 20% fine gravel, 20% coarse sand, 30% med. sand, 10% fine sand, 2.5% silt, 2.5% clay. Matrix is light brown (7.5 YR 7/3). Angular to subangular. Clasts are approximately 90% limestone.
60	0.0				Composite (soil grab)		SW	Well graded silty, gravelly sand; 5% coarse gravel, 20% fine gravel, 15% coarse sand, 25% medium sand, 15% fine sand, 20% silt. Matrix is pink (7.5 YR 6/3). Subangular to subrounded.
70	0.0				Composite (soil grab)		SW	Well graded gravelly sand with silt and clay; 5% coarse gravel, 20% fine gravel, 10% coarse sand, 30% medium sand, 10% fine sand, 10% silt, 10% clay. Matrix is pinkish gray (7.5 YR 7/2). Subangular. Clasts are dominated by limestone ~ 60% with ~ 20% being cemented alluvium.

DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yymmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
80	0.0				Composite (soil grab)	79-80': 1612191440- 1445	SW	Well graded gravely sand with silt and clay; 5% coarse gravel, 15% fine gravel, 10% coarse sand, 35% medium sand, 15% fine sand, 15% silt, 5% clay. Matrix is lt. brown (7.5 YR 6/3). Subangular. Clasts are ~ 80% limestone and ~ 20% cemented alluvium.
90	0.0				Composite (soil grab)		SW	Well graded gravely sand with silt and clay; 5% coarse gravel, 25% fine gravel, 15% coarse sand, 30% medium sand, 10% fine sand, 15% silt, 10% clay. Matrix is pinkish gray (7.5 YR 7/2). Subangular. Clasts are dominated by limestone ~ 60% with ~ 20% being cemented alluvium.
100	0.0				Composite (soil grab)		SW-GW	Well graded sand and gravel with silt; 10% coarse gravel, 30% fine gravel, 10% coarse sand, 30% medium sand, 10% fine sand, 10% silt. Matrix is lt. brown (7.5 YR 6/3). Clasts are 60% limestone with quartzite & granite. Cemented alluvium bedrock contact = 98 ft.
110								Cemented Alluvium
120								Cemented Alluvium
130								Cemented Alluvium Orejon Andesite contact = 127 ft.
140								Andesite
150								Andesite
156								Andesite

SOIL BORING LITHOLOGIC LOG – 400-SB-02 (Became 400-SV-02)

LOCATION MAP:



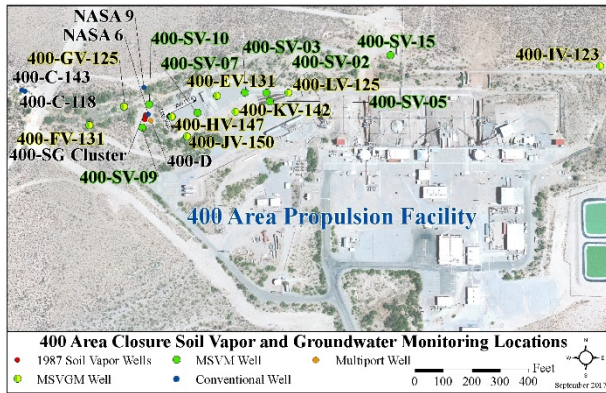
SITE ID: NASA-WSTF, Doña Ana County, NM
LOCATION COORDINATES (ft) N: 554,895.09 **E:** 1,530,796.47
GROUND ELEVATION (ft AMSL): 4,836.95
DRILLING METHOD: Rotosonic with casing advance
DRILLING CONTR./DRILLER: Cascade Drilling / Joe Lary
BOREHOLE DIAMETER: 9.5; 7 in. **TOTAL DEPTH:** 105' bgs
DATE DRILLING STARTED/COMPLETED: 1/7/2017 / 1/9/2017
FIELD REPS.: Michael Narup, Tom McCrory
BEDROCK TYPE: Cemented alluvium **BEDROCK DEPTH:** 103 ft
COMMENTS:

DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		USCS Group	LITHOLOGIC DESCRIPTION Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yrmddtttt)		
0								
10	0.0				Composite (Soil grab)	0-2.5': 1701071515-1520	SW	Well graded gravely sand with silt; 5% coarse gravel, 15% fine gravel, 20% coarse sand, 50% medium sand, 5% fine sand, 5% silt. Matrix is reddish yellow (7.5 yr 6/6). Subangular to subrounded. Pebbles are approximately 50% limestone with granite, quartzite and mudstone.
20	0.0				Composite (Soil grab)		SW	Well graded gravely sand; 5% coarse gravel, 25% fine gravel, 25% coarse sand, 30% medium sand, 15% fine sand. Matrix is dark straw brown (wet)(7.5 YR 5/6). Subangular to subrounded. Pebbles ~60% limestone.
30	0.0				Composite (Soil grab)		SW	Well graded gravely sand with silt; 10% coarse gravel, 20% fine gravel, 20% coarse sand, 35% medium sand, 10% fine sand, 5% silt. Matrix is dark yellowish brown (wet) (10 YR 4/6). Subrounded. Approximately 50% limestone (including one large piece of oolitic limestone) with granite, granodiorite, dorte, quartzite and mudstone.
40	0.0				Composite (Soil grab)	40-45': 1701081000-1005	SW	Well graded gravely sand with silt; 5% coarse gravel, 25% fine gravel, 15% coarse sand, 25% medium sand, 20% fine sand, 10% silt. Matrix is dark yellowish brown (wet) (10 YR 4/6). Subangular. Pebbles are ~50% limestone, 20% marble, 10% granite, 10% quartzite w/calcite, 10% mudstone & siltstone.
50	0.0				Composite (soil grab)		SW	Well graded gravely sand with silt; 10% coarse gravel, 25% fine gravel, 10% coarse sand, 25% medium sand, 15% fine sand, 15% silt. Matrix very pale brown (10 YR 7/3). Sands are subangular to subrounded. 80% limestone w/small amounts of marble, quartzite and mudstone.
60	0.0				Composite (soil grab)		SW	Well graded gravely sand with silt; 5% coarse gravel, 25% fine gravel, 20% coarse sand, 25% medium sand, 15% fine sand, 10% silt. Matrix is lt. brown (7.5 YR 6/4). Subangular. Pebbles are ~70% limestone, 20% mudstone w/siltstone, with the balnce being granite, quartzile and lepidolite.

DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yrmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
70	0.0				Composite (soil grab)		SW	Well graded gravelly sand with silt and clay; 1% coarse gravel, 25% fine gravel, 10% coarse sand, 25% med. sand, 20% fine sand, 14% silt, 5% clay. Matrix is pink (7.5 YR 7/3). Subrounded. Pebbles are ~50% limestone, 25% cemented alluvium, small amounts of quartzite.
80	0.0				Composite (soil grab)	75-80': 1701081630- 1635	SW	Well graded gravelly sand with silt; ~2% coarse gravel, 30% fine gravel, 15% coarse sand, 30% medium sand, 20% fine sand, ~3% silt. Matrix is light brown (7.5 YR 6/4). Subangular to subrounded. Pebbles are ~50% limestone, 15% granite, 15% quartzite, small amounts of marble, calcite, and mudstone.
90	0.0				Composite (soil grab)		SW	Well graded sand with gravel; 5% coarse gravel, 30% fine gravel, 20% coarse sand, 30% medium sand, 15% fine sand, minimal silt and clay. Matrix is dark yellowish brown (damp) (10 YR 4/4) ~ 60% limestone, ~15% granite, monozite diorite.
100	0.0				Composite (soil grab)		SW	Well graded gravelly sand with silt; 5% coarse gravel, 25% fine gravel, 20% coarse sand, 25% medium sand, 10% fine sand, 15% silt. Matrix is very pale brown (10 YR 7/3). Pebbles are ~ 75% limestone, 20% quartzite with minor granite and mudstone.
105							GW	Well graded sandy gravel; 35% coarse gravel, 35% fine gravel, 10% coarse sand, 15% med. sand, 5% fine sand. Matrix is pink (7.5 YR 7/4). Angular. Pebbles are ~30% limestone, ~60% cemented alluvium. Cemented Alluvium bedrock contact = 103'.

SOIL BORING LITHOLOGIC LOG – 400-SB-03 (Became 400-SV-03)

LOCATION MAP:



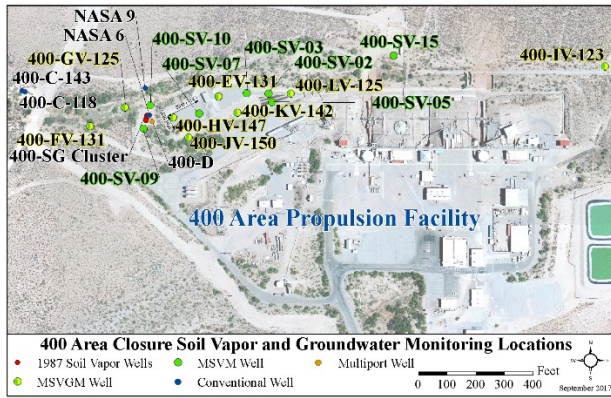
SITE ID: NASA-WSTF, Doña Ana County, NM
SITE COORDINATES (ft) N: 554,896.16 **E:** 1,530,719.28
GROUND ELEVATION (ft AMSL): 4,833.33
DRILLING METHOD: Rotosonic with casing advance
DRILLING CONTR./DRILLER: Cascade Drilling / Joe Lary
BOREHOLE DIAMETER: 9.5; 7.5; 6.1 in. **TOTAL DEPTH:** 108 ft
DATE DRILLING STARTED/COMPLETED: 10/10/2016 / 10/11/2016
FIELD REPS.: Michael Pitterle
BEDROCK TYPE: Cemented alluvium **BEDROCK DEPTH:** 105 ft
COMMENTS:

DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yrmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
0								
10	0.0				Composite (Soil grab)	1': 1610101600-1605	GW	Well graded silty, clayey, sandy gravel; 20% coarse gravel, 20% fine gravel, 30% sand; 30% silt and clay. Matrix is light reddish brown (5 YR 6/3). Angular to sub-angular to subrounded. Clasts are limestone, mudstone. Caliche present.
20	0.0				Composite (Soil grab)		ML	Well graded clayey, sandy, gravely silt; 10% coarse gravel, 25% fine gravel, 15% coarse sand, 40% silt, 10% clay. Matrix is light brown (7.5 YR 6/3). Clasts as above.
30	0.0				Composite (Soil grab)		SW-ML	Well graded gravely silt and sand; 30% gravel 35% coarse sand, 35% fines. Cobbles abundant. Angular to subangular. Little to no caliche.
40	0.0				Composite (Soil grab)		GW	Well graded silty gravel with sand; 40% coarse gravel, 20% fine gravel, 15% coarse sand, 25% fines. Matrix is light brown (7.5 YR 6/3). Angular to sub angular. The Clasts are 10% cemented alluvium. Minor caliche.
50	0.0				Composite (soil grab)	44-45': 1610111030-1041	SW	Well graded gravely sand with silt; 25% coarse gravel, 35% coarse sand, 35% medium and fine sand, 5% silt. Matrix light brown (7.5 Yr 6/3). Primarily angular to subangular, with some subrounded. Minor caliche.
60	0.0				Composite (soil grab)		SW	Well graded sand with gravel 20% coarse gravel, 15% fine gravel, 35% fines, 30% coarse sand, limestone, siltstone, mudstone, quartzite and minor crystalline rocks. No Volcanics. Angular to subangular, minor rounding.
70	0.0				Composite (soil grab)		SW-GW	Silty sand and gravel; 35% coarse gravel and cobbles, 25% coarse sand, 15% fine sand, 25% silt. Matrix is light brown (7.5 Yr 6/3). Angular to subangular. Clasts include tuffs and tephras.
80	0.0				Composite (soil grab)		GW	Well graded sandy gravel with silt; 30% coarse gravel, 35% fine gravel, 10% coarse sand, 20% medium to fine sand, 5% fines. Matrix is pinkish grey. Angular to subangular with minor rounding. Clasts are mostly limestone and quartzite with some non-welded pyroclasts. Caliche coatings common.

D E P T H (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yymmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
90	0.0				Composite (soil grab)	80-81': 1619111415- 1420	GW	Well graded gravel with sand and minor clay. Clasts include several pieces of moderately indurated alluvium. No volcanics observed.
100	0.0				Composite (soil grab)		SW-SM	Well graded sand with silt and gravel; 25% coarse gravel, 20% fine gravel, 25% coarse sand, 30% medium sand to sand. Matrix is pinkish grey to brown (7.5 YR 6/2). Angular to subrounded. Clasts are mostly siltstone, mudstone, limestone, quartzite. Minor caliche coatings. Cemented Alluvium bedrock contact = 105'.
108					Composite (soil grab)			Cemented Alluvium

SOIL BORING LITHOLOGIC LOG – 400-SB-04 (Became 400-EV-131)

LOCATION MAP:



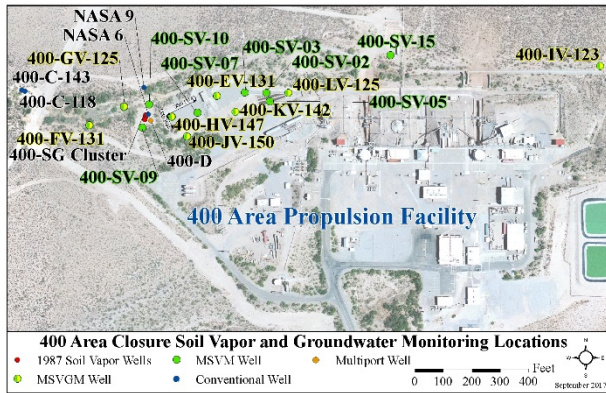
SITE ID: NASA-WSTF, Doña Ana County, NM
LOCATION COORDINATES (ft) N: 554,883.91 **E:** 1,530,620.93
GROUND ELEVATION (ft AMSL): 4,832.08
DRILLING METHOD: Sonic coring with casing advance
DRILLING CONTR./DRILLER: Cascade Drilling / Joe Lary
BOREHOLE DIAMETER: 9.5" (144' bgs); 7.5" (154.5' bgs)
TOTAL DEPTH: 154.5 ft
DATE DRILLING STARTED/COMPLETED: 9/21/2016 / 9/28/2016
FIELD REPS.: Michael Pitterle, JR Hennessey
DEPTH GROUNDWATER ENCOUNTERED: Between 143-146 ft
STATIC WATER LEVEL (DATE): 135.95 ft (9/29/2016); 139.04 ft (6/26/2017)
BEDROCK TYPE: Cemented alluvium / andesite
BEDROCK DEPTH: 102.5 ft / 152 ft
COMMENTS: Note: Using a sieve with 2 mm screen size sieves out silt to medium sand.

DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yrmmdtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
0					Composite (Soil grab)		CL	Lean clay with sand/gravel, 50-60% clay/silt. Matrix reddish brown to brown (5 YR – 7.5 YR 4/3) (wet) 20% clasts are consolidated silt and clay w/sand, 5% fine gravel, 5% coarse gravel. Clasts are limestone, feldspar, volcanics, some with caliche coatings. Low plasticity.
10	0.0				Grab	9-10': 1609221100-1105	SW	Well graded gravely sand with silt. 40% gravel (equal parts fine and coarse), 45% fine to coarse sand, well graded, 15% silt and clay. Matrix pink (7.5 YR 7/3-4) to Lt brown 7.5 YR 6/4 (dry). Predominantly angular and subangular, some subrounded. Predominantly black limestone, lesser siltstone. Caliche coatings common.
20	0.0				Composite (Soil grab)		SW	Well graded gravely, silty sand. 5% coarse gravel, 25% fine gravel, 30% med to coarse sand, 40% silt to med sand. Matrix pink (7.5 YR 7/3-4) to Lt brown (7.5 YR 6/4). Angular to sub-angular with a few rounded clasts.
30	0.0				Composite (Soil grab)		GW-GM	Well graded sandy, silty gravel. 20% coarse gravel, 20% fine gravel, 30% coarse and medium sand, 30% fine sand and silt. Matrix pink (7.5 YR 7/3). Predominantly angular to subangular, some subrounded, rarely rounded. Clasts are predominantly limestone and siltstone/mudstone, rare rhyolitic volcanics.
40	0.0				Composite (Soil grab)	35-40': 1609221415-1420 Duplicate: 1609221425-1430	GW	Well graded sandy gravel with silt. 60% coarse gravel, 30% coarse to medium sand, 10% fine sand to silt. Matrix pink (7.5 YR 7/3) (dry). Clasts are predominantly sedimentary rocks including about 10% cemented alluvium, but also includes minor mixed volcanics.

DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yymmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
50	0.0				Composite (soil grab)		GW-GM	Well graded silty sandy gravel. 15% coarse gravel, 30% fine gravel, 20% coarse sand, 10% medium to fine sand, 25% silt. Matrix is light brown (7.5 YR 6/4) (dry). Angular to subrounded. Clasts are mostly limestone, siltstone and clay, but volcanics are more abundant than above. Abundant and thick caliche coatings.
60	0.0				Composite (soil grab)		SW	Well graded gravelly sand with silt. 10% coarse gravel, 15% fine gravel, 50% coarse sand, 20% fine to medium sand, 5% fines. Most are subangular but a few are subrounded. 50% of the clasts are sediments, 40% volcanic, 10% igneous/metamorphic. Caliche coatings common.
70	0.0				Composite (soil grab)		SW	Well graded gravelly sand with silt. 10% coarse gravel and cobbles, 20% fine gravel, 30% coarse sand, 30% fine to medium sand, 10% silt. Matrix is pinkish gray (7.5 YR 7/2) (dry). Clasts as above.
80	0.0				Composite (soil grab)	79-80': 1609231324- 1329	GW-SW	Well graded gravel and sand with silt. 20% coarse gravel and cobbles, 20% fine gravel, 20% coarse sand, 35% fine to med sand and 5% silt. Matrix light brown (7.5 YR 6/3)(dry). Mostly angular to sub-angular, rare sub-rounded. Clasts as above. Minor caliche coatings,
90	0.0				Composite (soil grab)		GW	Well graded sandy gravel. 60% gravel, 40% fine sand. Matrix light brown (7.5 YR 6/3). Angular to subrounded. Clasts are mostly volcanic with minor limestone. Abundant caliche coating on clasts.
95	0.0				Composite (soil grab)		GW	Same as above. Increase in moisture towards 100'. Clasts are mostly volcanic.
100- 102.5					Composite (soil grab)		SW	Decrease in gravel to 10-15%. Volcanic clasts dominate. Significant moisture increase @101 ft. --- Cemented Alluvium bedrock contact = 102.5'.
110								Cemented Alluvium.
120								Cemented Alluvium.
130						124-125': 1609251200-1205		Cemented Alluvium.
140								Cemented Alluvium.
150- 152								Cemented Alluvium Orejon Andesite contact = 152 ft.
154								Orejon Andesite. Pyroclastic flows mod. Welded crystallized matrix, abndt phenocrysts of feldspare (white, altered?) and quartz. Matrix color lt. grey N/7, includes some red alteration 5R 5/6; no pumice noted. Andesite at contact is brecciated, shows evidence of fractures.

SOIL BORING LITHOLOGIC LOG – 400-SB-05 (Became 400-SV-05)

LOCATION MAP:



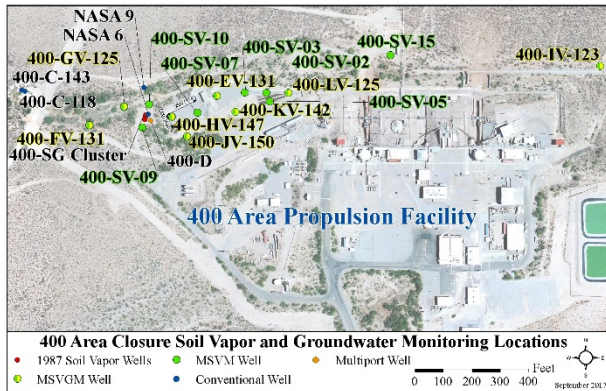
SITE ID: NASA-WSTF, Doña Ana County, NM
LOCATION COORDINATES (ft) N: 554,884.41 E: 1,530,808.73
GROUND ELEVATION (ft AMSL): 4,839.33
DRILLING METHOD: Rotosonic with casing advance
DRILLING CONTR./DRILLER: Cascade Drilling / Joe Lary
BOREHOLE DIAMETER: 9.5; 7; 6 in. **TOTAL DEPTH:** 110 ft
DATE DRILLING STARTED/COMPLETED: 1/10/2017 / 1/11/2017
FIELD REPS.: Michael Narup, Tom McCrory
BEDROCK TYPE: Cemented alluvium **BEDROCK DEPTH:** 106 ft
COMMENTS:

DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yrrmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
0								
10	0.0				Composite (Soil grab)	5-10': 1701100800-0805	SW	Well graded gravely sand with silt. 1% coarse gravel, 25% fine gravel, 25% coarse sand, 25% medium sand, 20% fine sand, 4% silt. Matrix reddish-yellow, damp (7.5 YR 6/6). Subangular to subrounded. Clasts ~50% limestone, ~30% quartz rich granite.
20	0.0				Composite (Soil grab)		SW	Well graded gravely sand with silt. 5% coarse gravel, 25% fine gravel, 20% coarse sand, 25% med. sand, 18% fine sand, 5% silt, 2% clay. Matrix light brown (7.5 YR 6/4). Angular to subangular. Clasts ~55% limestone, ~25% granite
30	0.0				Composite (Soil grab)		SW	Well graded gravely sand with silt and clay. 25% fine gravel, 20% coarse sand, 30% medium sand, 15% fine sand, 5% silt, 5% clay. Matrix brown (7.5 YR 5/6) Subangular to subrounded. Clasts ~75% limestone w/quartzite, mudstone & siltstone.
40	0.0				Composite (Soil grab)		SW	Well graded gravely sand with silt. ~2% coarse gravel, 23% fine gravel, 25% coarse sand, 35% med. sand, 13% fine sand, 2% silt. Matrix light brown (7.5 YR 6/4). Subrounded. Clasts ~70% limestone, ~15% quartzite, ~15% mudstone & siltstone.
50	0.0				Composite (soil grab)	45-50': 1701101030-1035 Duplicate: 1701101040-1045	SW	Well graded gravely sand with silt. ~1% coarse gravel, 25% fine gravel, 20% coarse sand, 24% medium sand, 15% fine sand, 15% silt. Matrix light brown (7.5 YR 6/4). Subangular to subrounded. Clasts ~65% limestone, ~30% quartzite.
60	0.0				Composite (soil grab)		SW	Well graded gravely sand with silt. ~2% coarse gravel, 25% fine gravel, 15% coarse sand, 30% medium sand, 14% fine sand, 14% silt. Matrix pink (7.5 YR 7/3). Subangular to subrounded. Clasts ~80% limestone w/granite, mudstone.
70	0.0				Composite (soil grab)		SW	Well graded gravely sand with silt and clay. ~1% coarse gravel, 20% fine gravel, 25% coarse sand, 25% medium sand, 20% fine sand, 8% silt, 1% clay. Matrix pinkish gray (7.5 YR 7/2). Subangular to subrounded. Clasts ~60% limestone with mudstone, siltstone and quartzite.

D E P T H (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yrmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
80	0.0				Composite (soil grab)		SW	Well graded gravely sand with silt and clay. ~2% coarse gravel, 25% fine gravel, 20% coarse sand, 25% medium sand, 20% fine sand, ~8% silt and clay. Matrix light brown (7.5 YR 6/3). Subrounded. Clasts ~75% limestone with granite, quartzite and siltstone.
90	0.0				Composite (soil grab)	80-85': 1701101350- 1355	SW	Well graded gravely sand with silt and clay. ~2% coarse gravel, 28% fine gravel, 15% coarse sand, 30% medium sand, 12% fine sand, 12% silt, ~1% clay. Matrix light brown (7.5 YR 6/4). Subrounded. Clasts ~50% limestone, ~20% quartzite, ~20% granite, w/mudstone, siltstone.
100	0.0				Composite (soil grab)		SW	Well graded gravely sand with silt. ~1% coarse gravel, 20% fine gravel, 15% coarse sand, 35% medium sand, 15% fine sand, 14% silt. Matrix pink (7.5 YR 7/4). Subangular to subrounded. Clasts ~80% limestone with small amounts of quartzite, granite and mudstone.
110					Composite (soil grab)		GW	Well graded sandy gravel with silt. 25% coarse gravel, 35% fine gravel, 10% coarse sand, 15% medium sand, 10% fine sand, 5% silt. Matrix pink (7.5 YR 7/3). Angular to subangular. Clasts ~50% limestone, ~20% andesite, ~30% cemented alluvium. 104' - Andesite boulder Cemented Alluvium bedrock contact = 106'.

SOIL BORING LITHOLOGIC LOG – 400-SB-06 (Became 400-KV-142)

LOCATION MAP:



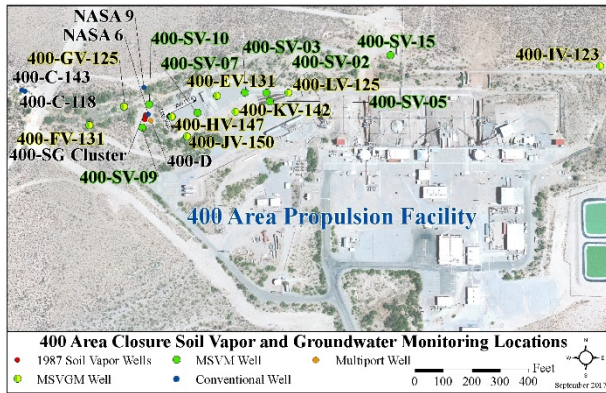
SITE ID: NASA-WSTF, Doña Ana County, NM
LOCATION COORDINATES (ft) N: 554,831.80 E: 1,530,686.14
GROUND ELEVATION (ft AMSL): 4,839.53
DRILLING METHOD: Rotosonic with casing advance / Air rotary
DRILLING CONTR./DRILLER: Cascade Drilling / Joe Lary
BOREHOLE DIAMETER: 9; 7; 6 in. **TOTAL DEPTH:** 163 ft
DATE DRILLING STARTED/COMPLETED: 12/4/2016 / 12/18/2016
FIELD REPS.: Michael Narup, Michael Pitterle, Tom McCrory
DEPTH GROUNDWATER ENCOUNTERED: Not noted in field
STATIC WATER LEVEL (DATE): 147.5 ft (from video log 1/4/2017);
151.03 ft (6/26/2017)
BEDROCK TYPE: Cemented alluvium / andesite
BEDROCK DEPTH: 113 ft / 154 ft
COMMENTS:

DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE			LITHOLOGIC DESCRIPTION
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yymmddttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
0								
10	0.0				Composite (Soil grab)		SW-GW	Well graded gravel and sand. 20% coarse gravel, 25% fine gravel, 15% coarse sand, 10% medium sand, 30% fine sand. Angular to subangular, minor subrounded. Clasts limestone, marble, mudstone, siltstone and hornfels. Abundant caliche.
20	0.0				Composite (Soil grab)	13.5-14.5': 1612041420-1425	GW	Well graded silty and sandy gravel. 25% coarse gravel, 25% fine gravel, 10% coarse sand, 15% fine sand, 25% silt. Matrix pink (5 YR 7/3). Angular to subangular. Clasts cemented alluvium. Caliche common.
30	0.0				Composite (Soil grab)		GW	Well graded sandy gravel. 40% coarse gravel, 30% fine gravel, 15% coarse sand, 5% medium sand, 10% fine sand. Matrix pink (5 YR 7/3) Angular to subangular with some subrounded.
40	0.0				Composite (Soil grab)		GW	Well graded sandy gravel with silt. 30% coarse gravel, 30% fine gravel, 10% coarse sand, 15% medium sand, 10% fine sand, 5% silt. Matrix light brown (7.5 YR 6/4). Subangular to subrounded. Clasts ~70% limestone with some quartzite, granite, siltstone.
50	0.0				Composite (soil grab)	42.5-43.5': 1612041615-1620	GW	Well graded sandy gravel with silt and clay. 15% coarse gravel, 30% fine gravel, 15% coarse sand, 20% medium sand, 5% fine sand, 10% silt, 5% clay. Matrix very pale brown (10 YR 7/3). Subangular. Clasts ~60% limestone with siltstone, quartzite and granite.
60	0.0				Composite (soil grab)		GW	Well graded sandy gravel. 20% coarse gravel, 35% fine gravel, 15% coarse sand, 25% medium sand, 5% fine sand. No silt or clay. Matrix very pale brown (10 YR 7/3). Subangular. Clasts ~75% limestone with some quartzite and granite.
70	0.0				Composite (soil grab)		SW	Well graded gravelly sand with silt and clay. 10% coarse gravel, 25% fine gravel, 15% coarse sand, 25% medium sand, 10% fine sand, 10% silt, 5% clay. Matrix pale brown (10 YR 6/3). Subangular to subrounded. Clasts ~65% limestone w/small amounts of granite, quartzite.

DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yymmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
80	0.0				Composite (soil grab)		SW	Well graded gravely sand with silt. ~5% coarse gravel, 15% fine gravel, 20% coarse sand, 35% medium sand, 20% fine sand, ~5% silt. Matrix pinkish grey (7.5 YR 7/2). Subangular. Clasts ~50% cemented clases, ~30% limestone with small amounts of siltstone, granite and quartzite.
90	0.0				Composite (soil grab)	86.5-87.5': 1612051330-1335	SW	Well graded gravely sand with silt. 5% coarse gravel, 30% fine gravel, 20% coarse sand, 30% medium sand. 10% fine sand, 5% silt. Matrix light brown (7.5 YR 6/3). Subangular. Clasts ~40% limestone, ~30% mudstone and siltstone and ~30% quartzite and granite.
100	0.0				Composite (soil grab)		SW-GW	Well graded gravel and sand with silt. 10% coarse gravel, 35% fine gravel, 20% coarse sand, 25% medium sand, 5% fine sand, 5% silt. Matrix light brown (7.5 YR 6/3). Subangular. Clasts ~70% limestone with minimal amounts of quartzite and siltstone.
110	0.0				Composite (soil grab)		GW	Well graded sandy gravel with silt. 35% coarse gravel, 25% fine gravel, 10% coarse sand, 20% medium sand, 5% fine sand, 5% silt. Matrix light brown (7.5 YR 6/3). Subangular. Clasts ~60% limestone and ~30% granite.
120	0.0				Composite (soil grab)		GW	Well graded sandy gravel. ~40% coarse gravel to 113 ft. Clasts are ~50% granite, ~40% limestone, ~10% quartzite and siltstone. Cemented Alluvium bedrock contact = 113'.
130								Cemented Alluvium
140								Cemented Alluvium
150								Cemented Alluvium
160								Cemented Alluvium Orejon Andesite contact = 154'.
163								Andesite

SOIL BORING LITHOLOGIC LOG – 400-SB-07 (Became 400-SV-07)

LOCATION MAP:



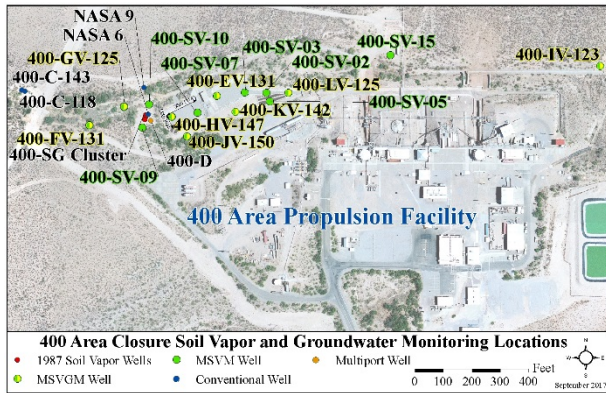
SITE ID: NASA-WSTF, Doña Ana County, NM
LOCATION COORDINATES (ft) N: 554,818.66 **E:** 1,530,548.22
GROUND ELEVATION (ft AMSL): 4,828.86
DRILLING METHOD: Rotosonic with casing advance
DRILLING CONTR./DRILLER: Cascade Drilling / Joe Lary
BOREHOLE DIAMETER: 9.5; 8.25; 6 in. **TOTAL DEPTH:** 109 ft
DATE DRILLING STARTED/COMPLETED: 12/3/2016 / 12/4/2016
FIELD REPS.: Michael Pitterle, Tom McCrory
BEDROCK TYPE: Cemented alluvium **BEDROCK DEPTH:** 108.5 ft
COMMENTS:

DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yrmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
0								
10	0.0				Composite (Soil grab)	1-2': 1612031200-1205	SW	Well graded gravely sand with silt and clay. 5% coarse gravel, 20% fine gravel, 20% coarse sand, 35% med. sand, 10% fine sand, 5% silt, 5% clay. Matrix pink (7.5 YR 7/4). Subangular. Clasts ~50% quartzite, ~20% limestone with one large large quartz clast.
20	0.0				Composite (Soil grab)		SW	Well graded gravely sand with silt and clay. 5% coarse gravel, 20% fine gravel, 20% coarse sand, 30% medium sand, 10% fine sand, 10% silt, 5% clay. Matrix reddish-yellow (7.5 YR 6/6). Subangular to subrounded. Clasts ~50% limestone with quartzite and mudstone.
30	0.0				Composite (Soil grab)		SW	Well graded gravely sand with silt and clay. 2% coarse gravel, 25% fine gravel, 20% coarse sand, 33% medium sand, 10% fine sand, 5% silt, 5% clay. Matrix light brown (7.5 YR 6/4). Angular to subangular. Clasts ~50% limestone with small amounts of quartzite, siltstone and granite.
40	0.0				Composite (Soil grab)		SW	Well graded gravely sand with silt and clay. 2% coarse gravel, 25% fine gravel, 20% coarse sand, 38% medium sand, 5% fine sand, 5% silt, 5% clay. Matrix light brown (7.5 YR 6/3) Subangular. Clasts ~80% limestone with quartzite, granite, mudstone and siltstone.
50	0.0				Composite (soil grab)	48-50': 1612031430-1435	SW	Well graded gravely sand with silt. 5% coarse gravel, 25% fine gravel, 20% coarse sand, 35% medium sand, 10% fine sand, 10% silt. Matrix pink (7.5 YR 7/3). Subangular. Clasts ~60% limestone with mudstone, quartzite and siltstone.
60	0.0				Composite (soil grab)		SW	Well graded gravely sand with silt. 5% coarse gravel, 20% fine gravel, 25% coarse sand, 35% medium sand, 10% fine sand, 5% silt. Matrix light brown (7.5 YR 6/3). Angular to subangular. Clasts ~85% limestone with small amounts of quartzite, siltstone.
70	0.0				Composite (soil grab)		SW	Well graded gravely sand with silt and clay. 30% fine gravel, 15% coarse sand, 35% medium sand, 5% fine sand, 10% silt, 5% clay. Matrix pink (10 YR 7/3). Subangular to subrounded. Clasts ~55% limestone with quartzite, mudstone and siltstone.

D E P T H (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yymmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
80	0.0				Composite (soil grab)	75-76': 1612031640- 1645	SW	Well graded gravelly sand with silt and clay. 2% coarse gravel, 23% fine gravel, 25% coarse sand, 30% medium sand, 8% fine sand, 8% silt, 4% clay. Matrix light brown (7.5 YR 6/3). Angular to subangular. Clasts ~75% limestone with quartzite, granite, mudstone & siltstone.
90	0.0				Composite (soil grab)		SW	Well graded gravelly sand with silt. 5% coarse gravel, 25% fine gravel, 25% coarse sand, 30% medium sand, 10% fine sand, 5% silt. Matrix light brown (7.5 YR 6/3). Subangular. Clasts ~75% limestone with granite, siltstone and mudstone.
100	0.0				Composite (soil grab)		GW	Well graded sandy gravel with silt and clay. 20% coarse gravel, 30% fine gravel, 15% coarse sand, 15% medium sand, 5% fine sand, 10% silt, 5% clay. Matrix pinkish gray (7.5 YR 6/4). Subangular to subrounded. Clasts ~90% limestone w/minimal amounts of mudstone and quartzite.
109					Composite (soil grab)		GW	Well graded sandy gravel with silt and clay. 30% coarse gravel, 30% fine gravel, 10% coarse sand, 10% medium sand, 5% fine sand, 10% silt, 5% clay. Matrix pink (7.5 YR 7/2). Angular to subangular. Clasts ~80% cemented alluvium Cemented alluvium bedrock contact = 108.5'

SOIL BORING LITHOLOGIC LOG – 400-SB-08 (Became 400-HV-147)

LOCATION MAP:



SITE ID: NASA-WSTF, Doña Ana County, NM
LOCATION COORDINATES (ft) N: 554,813.50 E: 1,530,474.81
GROUND ELEVATION (ft AMSL): 4,829.26
DRILLING METHOD: Rotosonic with casing advance / Air rotary
DRILLING CONTR./DRILLER: Cascade Drilling / Joe Lary
BOREHOLE DIAMETER: 9.5; 8.25 in. **TOTAL DEPTH:** 172.9 ft
DATE DRILLING STARTED/COMPLETED: 11/20/2016 / 11/22/2016
FIELD REPS.: Michael Pitterle
DEPTH GROUNDWATER ENCOUNTERED: Not noted in field; Very little water
STATIC WATER LEVEL (DATE): 148.5 ft (11/29/2016); 136.61 ft (6/26/2017)
BEDROCK TYPE: Cemented alluvium / andesite
BEDROCK DEPTH: 109 ft / 157 ft
COMMENTS:

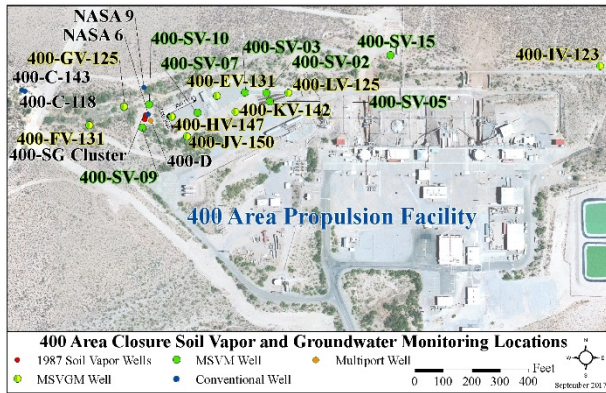
DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yymmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
0								Well graded sand with silt and gravel. 5% coarse gravel and cobbles, 15% fine gravel, 30% coarse sand, 20% medium sand, 20% fine sand, 10% silt. Matrix pinkish gray to light reddish brown (5 YR 6/3-7/2)(dry). Clasts are 25-30% poorly consolidated alluvium clasts, with limestone, quartzite, silt/mudstone and minor intrusives (crystalline); granite. Thick caliche or clay/mud coatings on clasts. ---
10	0.0				Composite (Soil grab)	1-2': 1611201130-1135	SW	Well graded gravelly sand. 15% coarse gravel and cobbles, 25% fine gravel, 30% coarse sand, 15% medium sand, 15% fine sand. Matrix light brown (7.5 YR 6/4) (damp). Angular to subangular with minor subrounded. Lithologies include predominantly limestone with lesser amounts of silt/mud stones, quartzite, mafic intrusives, possible rhyolite. Abundant caliche coatings.
20	0.0				Composite (Soil grab)		SW	Well graded gravelly sand with silt. 10% coarse gravel with rare cobbles, 20% fine gravel, 30% coarse sand, 20% medium sand, 20% fine sand, minor silt. Matrix pinkish gray (5 YR 7/2)(dry). Angular to subangular. Lithologies predominantly gray to dark gray limestone, lesser silt stone, mudstone, some mafic intrusives, quartzite. Common caliche coatings up to several mm
30	0.0				Composite (Soil grab)		GW	Well graded gravel with sand. 10% cobbles, 15% coarse gravel, 60% fine gravel, 15% coarse sand, 15% medium sand to silt. Matrix pink (7.5 YR 7/4)(dry). Angular to subangular with subangular ~75% of sample. Clasts mainly dark limestone with crystallized calcite and some quartzite.

DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yrmmdtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
40	0.0				Composite (Soil grab)		GW-SW	Well graded gravel and sand. 15% coarse gravel, 35% fine gravel, 35% coarse sand, 15% medium sand to silt. Matrix brown (7.5 YR 5/4)(dry). Subangular to subrounded with subangular ~60%. Cobble composed of about half dark limestone and half quartzite with minor rhyolite present
50	0.0				Composite (soil grab)	41-42': 1611201415-1420 Matrix Spike: 1611201421-1426	GW	Well graded sandy, cobbly gravel. 30% cobbles, 25% coarse gravel, 25% fine gravel, 10% coarse sand, 10% medium sand to silt. Matrix light reddish Brown (5 YR 6/3)(dry). Subangular to subrounded with ~70% subrounded. Clasts are primarily black limestone with some light grey quartzite and some marble similar in color to the limestone present.
60	0.0				Composite (soil grab)		SW	Well graded gravelly sand with cobbles. 10% cobbles, 15% coarse gravel, 15% fine gravel, 10% coarse sand, and 50% medium sand to silt. Matrix light brown (7.5 YR 6/3)(dry). Subangular to subrounded with ~75% subangular. Clasts are an even mix of quartzite, marble and limestone. The quartzite is a dark brown color, distinctive from the samples taken at shallows internals in this borehole.
70	0.0				Composite (soil grab)		SW	Well graded gravelly sand with silt and cobbles. 5% cobbles, 10% coarse gravel, 25% fine gravel, 15% coarse sand, 45% medium sand to silt. Matrix light brown (7.5 YR 6/3)(dry). Subangular to rounded with ~60% subrounded. Clasts mostly black to dark grey limestone, with 10% white quartzite with rust-orange layering on one side.
80	0.0				Composite (soil grab)	77-77.5': 1611201620-1625	GW	Well graded sandy gravel with silt. 30% coarse gravel, 30% fine gravel, 10% coarse sand, 15% medium sand, 10% fine sand, 5% silt. Matrix is light brown (7.5 YR 6/3). Subangular to subrounded. Clasts ~60% limestone with mudstone, quartzite and granite.
90	0.0				Composite (soil grab)		SW	Well graded gravelly sand with silt. 10% coarse gravel, 30% fine gravel, 20% coarse sand, 25% med sand, 10% fine sand, 5% silt. Matrix is light brown (7.5 YR 6/4). Subangular. Clasts ~50% limestone with mudstone quartzite, tuffs and granite.
100	0.0				Composite (soil grab)		GW	Well graded sandy gravel with silt. 20% coarse gravel, 35% fine gravel, 15% coarse sand, 25% medium sand, 5% fine sand, 5% silt. Matrix pinkish gray (7.5 YR 7/2). Subangular. Clasts ~60% limestone with some mudstone, quartzite and granite. Cemented alluvium bedrock contact = 109'
110								Cemented alluvium
120								Cemented alluvium
130								Cemented alluvium
140								Cemented alluvium
150								Cemented alluvium
160								Cemented alluvium Orejon Andesite contact = 157'. Andesite is reddish gray (5 R 5/1) fresh and light gray (N 7/1) weathered.

D E P T H (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yrmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
170								Andesite: Some of the light gray is friable or altered to clay, only moderately welded, or altered. Many clasts can be broken by hand. 3-5% felsic phenocrysts, but no distinct crystal form. Appear to be altered or re-sorbed. Rare biotite.
173								Andesite

SOIL BORING LITHOLOGIC LOG – 400-SB-09 (Became 400-SV-09)

LOCATION MAP:



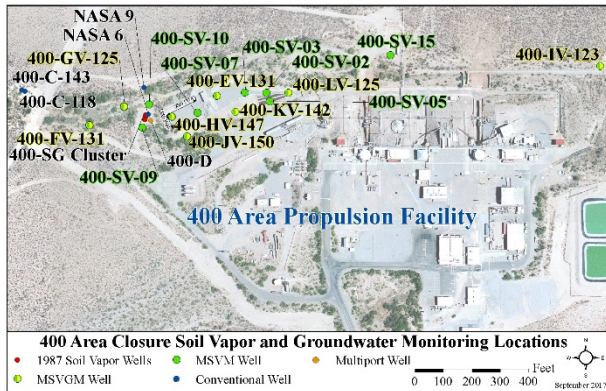
SITE ID: NASA-WSTF, Doña Ana County, NM
LOCATION COORDINATES (ft) N: 554,772.01 **E:** 1,530.363.39
GROUND ELEVATION (ft AMSL): 4,824.09
DRILLING METHOD: Rotosonic with casing advance
DRILLING CONTR./DRILLER: Cascade Drilling / Joe Lary
BOREHOLE DIAMETER: 9.5; 8.25 in. **TOTAL DEPTH:** 108.5 ft
DATE DRILLING STARTED/COMPLETED: 11/15/2016 / 11/16/2016
FIELD REPS.: Michael Pitterle
BEDROCK TYPE: Cemented alluvium **BEDROCK DEPTH:** 108 ft
COMMENTS:

DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yrmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
0								
10	0.0				Composite (Soil grab)	2.5-3.5': 1611151610-1615	SW-ML	Well graded sand and silt with gravel. 15% coarse gravel, 25% medium sand, 60% fine sand and silt. Matrix reddish yellow (7.5 YR 7/8). Angular to subangular. Clasts are primarily limestone and quartzite minor recrystallized metamorphic.
20	0.0				Composite (Soil grab)		SW	Well graded gravelly sand with silt. 30% coarse gravel, 15% fine gravel, 15% coarse sand, 40% medium to fine sand, <5% silt. Matrix pinkish white (7.5 YR 8/2) Angular to subangular. Clasts of limestone, quartzite, crystalline intrusive granites. Thin caliche coatings.
30	0.0				Composite (Soil grab)		GW	Well graded sandy gravel with silt. 30% coarse gravel, 25% fine gravel, 10% coarse sand, 30% medium to fine sand, 5% silt, Matrix pink white (7.5 YR 8/2) Angular to subangular, minor rounding. Clasts are mostly limestone, siltstone, mudstone and quartzite. Some caliche present.
40	0.0				Composite (Soil grab)		SW	Well graded gravelly sand with silt. 30% coarse gravel, 15% fine gravel, 15% coarse sand, 35% medium to fine sand, 5% silt. Clasts include ~20% of poorly consolidated alluvium clasts.
50	0.0				Composite (soil grab)		GW	Well graded gravel with sand. 65% coarse gravel, 16% fine gravel, 10% coarse sand, 3% medium sand, 3% fine sand, 2% silt, 1% clay. Matrix pink (7.5 YR 7/3). Angular to subangular.
60	0.0				Composite (soil grab)	52.5-53.5': 1611161000-1005 Matrix Spike: 1611201421-1426	SW	Well graded gravelly sand with silt and clay. 40% gravel, 15% coarse sand, 15% medium sand, 25% fine sand, 5% silt, minimal clay. Matrix light gray (10 YR 7/2) Subangular to subrounded.
70	0.0				Composite (soil grab)		GW	Well graded sandy gravel with clay. 60% gravel, 10% coarse sand, 15% medium sand, 10% fine sand, 5% clay. Matrix light-brown (7.5 YR 6/3). Subangular to subrounded.
80	0.0				Composite (soil grab)		GW	Well graded sandy gravel with silt. 20% coarse gravel, 40% fine gravel, 10% coarse sand, 10% medium sand, 10% fine sand, 10% silt. Matrix very pale brown (10 YR 7/3). Angular to subangular.
90	0.0				Composite (soil grab)	86.5-87.5': 1611161505-1510	SW-SM	Silty, gravelly sand with clay. 15% coarse gravel, 25% fine gravel, 10% coarse sand, 15% med. sand, 10% fine sand, 20% silt, 5% clays, Matrix light red brown (5 YR 6/3). Subangular to subrounded. Clasts mainly limestone (around 80%) with ~10% quartzite

D E P T H (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yrmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
100	0.0				Composite (soil grab)		SW-SM	Well graded grvaelly sand with silt and clay. 10% coarse gravel, 20% fine gravel, 15% coarse sand, 20% medium sand, 15% fine sand, 10% silt, 10% clay. Matrix light red-brown (5 YR 6/3). Subangular to subrounded Clasts ~60% limestone.
108.5					Composite (soil grab)		SW-SM	Silty, gravely sand with clay. 5% coarse gravel, 15% fine gravel, 20% coarse sand, 25% medium sand, 15% fine sand, 20% silt, 5% clay, Matrix light brown (7.5 YR 6/3). Subangular to subrounded. Clasts ~50% limestone. Cemented Alluvium bedrock contact = 108'.

SOIL BORING LITHOLOGIC LOG – 400-SB-10 (Became 400-SV-10)

LOCATION MAP:



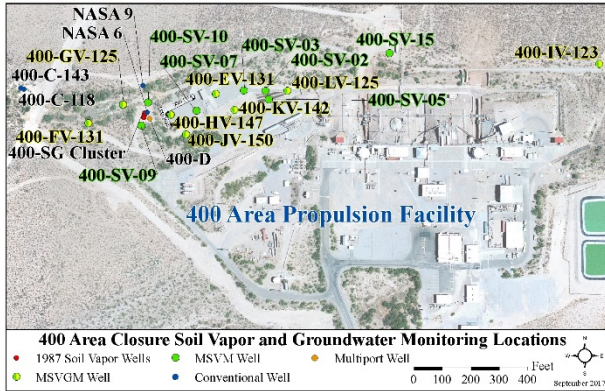
SITE ID: NASA-WSTF, Doña Ana County, NM
LOCATION COORDINATES (ft) N: 554,854.24 E: 1,530,383.56
GROUND ELEVATION (ft AMSL): 4,821.69
DRILLING METHOD: Rotosonic with casing advance / Air rotary
DRILLING CONTR./DRILLER: Cascade Drilling / Joe Lary
BOREHOLE DIAMETER: 9.5; 8.25 in. **TOTAL DEPTH:** 173.5 ft
DATE DRILLING STARTED/COMPLETED: 10/19/2016 / 10/25/2016
FIELD REPS.: Michael Pitterle
DEPTH GROUNDWATER ENCOUNTERED: Not encountered during drilling/Very little water
STATIC WATER LEVEL (DATE): 151.5 FT (10/26/2016)
BEDROCK TYPE: Cemented alluvium / Andesite
BEDROCK DEPTH: 106 ft / 147.9 ft
COMMENTS: Determined production was insufficient for groundwater well, so completed as a soil vapor only well.

DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yrrmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
0							SW	Well graded gravelly sand with silt. 20% coarse gravel and cobbles up to 5" diameter, 20% fine gravel, 30% coarse sand, 25% medium to fine, 5% silt. Matrix brown to light brown (7.5 YR 5-6/3). Angular to subangular with minor rounding. Clasts are predom. limestone, mudstone, siltstone and quartzite. Rare crystalline intrusive, volcanic tephna and hornfel, as recognized from 400-SB-12. Thin caliche coatings common. ---
10	0.0				Composite (Soil grab)	9-10': 1610190900-0905	SW-SM	Well graded gravelly sand with silt. 5% coarse gravel and cobbles, 25% fine gravel, 35% coarse sand, 35% medium to fine sand, ~10% silt. Matrix light brown (7.5 YR 6/3). Angular to subangular with minor rounding. Lithologies as above but crystalline rocks more common. Some unusual quartzites with red sand mixed in with quartz. Caliche coatings common.
20	0.0				Composite (Soil grab)		SW-GW	Well graded sand and gravel with silt. 20% coarse gravel with rare cobbles, 25% fine gravel, 25% coarse sand, 20% medium to fine sand, ~10% silt. Matrix light brown (7.5 YR 6/3). Angular to subangular, rarely subrounded, Components predominantly sedimentary, as above, with both fine and coarse crystalline intrusives, and contact metamorphic rocks. Clay coatings observed on some clasts. Caliche coatings common.
30	0.0				Composite (Soil grab)		GW	Well graded sandy gravel with silt. 35% coarse gravel & cobbles, 15% fine gravel, 15% coarse sand, 15% medium to fine sand, 10% silt. Matrix light brown (7.5 YR 6/3). Lithologies as above plus rare pyroclastic volcanics. Angular to sub angular, minor rounding
40	0.0				Composite (Soil grab)	39-40': 1610191205-1210	GW	Well graded sandy gravel with silt. 60% coarse gravel and cobbles, 15% fine gravel, 10% coarse sand, 10% medium to fine sand, 5% silt. Angular to subangular, very minor rounding. Typical sedimentary clasts of limestone, siltstone, mudstone and quartzite. Rare crystalline rocks, no metamorphics noted. Clay coatings observed on many clasts. Minor caliche coatings.

DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yymmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
50	0.0				Composite (soil grab)		GW	Well graded sandy gravel. 50% coarse gravel and cobbles, 20% fine gravel, 10% coarse sand, 20% medium to fine sand, trace silt. Same lithology as above plus rare pyroclastics. Some clay balls and clay coatings noted. Minor caliche coatings.
60	0.0				Composite (soil grab)		GW	Well graded sandy gravel with silt and clay. 30% coarse gravel with rare cobbles, 30% fine gravel, 15% coarse sand, 15% medium to fine sand, 10% silt and clay. Angular to subangular with minor rounding. Clasts are primarily sedimentary with minor crystalline intrusives. ~10% of sample is poorly consolidated clay-rich alluvium. Many clasts have thick caliche coatings.
70	0.0				Composite (soil grab)		GW	Well graded sandy gravel with silt and clay. 70% coarse gravel with cobbles, 5% coarse sand, 20% medium to fine sand, 5% silt/clay. No changes in lithologies or color of matrix. Poorly consolidated alluvial clasts present. Minor caliche coatings.
80	0.0				Composite (soil grab)	79-80': 1610191640- 1645	SW-GW	Well graded gravel and sand. 20% coarse gravel and rare cobbles, 30% fine gravel, 20% coarse sand, 30% medium to fine sand, trace silt. Matrix light brown (7.5 YR 6/3). Angular to subrounded. Clasts primarily limestone, siltstone, quartzite, mudstone and rare intrusives (crystalline). 5% of clasts are weakly cemented alluvium. No caliche coatings.
90	0.0				Composite (soil grab)		GW	Well graded sandy gravel with silt. 30% coarse gravel with cobbles, 30% fine gravel, 20% coarse sand, 15% medium to fine sand, 5% silt. Matrix color and components as above. Angular to subangular with only minor rounding. Noted one clast of extrusive volcanics. ~5% clasts are weakly consolidated alluvium. Minor clay coatings observed on some fragments
100	0.0				Composite (soil grab)		SW	Well graded gravelly sand. 15% coarse gravel and cobbles, 15% fine gravel, 35% coarse sand, 35% medium and fine sand. Lithologies as above, but volcanics (pyroclastics) more common. Angular to subangular with only minor rounding. Sample includes both poorly and well consolidated (cemented) alluvium fragments. Caliche coatings rare, thin. Cemented Alluvium bedrock contact = 106'.
110					10' composite from discharge cyclone			Cemented Alluvium
120								Cemented Alluvium
130								Cemented Alluvium
140								Cemented Alluvium
150								Cemented Alluvium Orejon Andesite contact = 148'.
160								153 – 163': Abundant clay alteration of matrix. Coincides with fault/fracture zone from 154-157' which was producing water on video.
170								163 – 173', 14 min. Medium welded pyroclastic, andesite? Matrix weak red (1 or 5/2), reddish gray (7.5R 5/1-6/1) and gray 5 YR 6/1). Variable phenocrysts of felsies and mafics, very altered. Approx. 40-45% of cutting are of altered matrix, pale brown (10 YR 8/4), pink (7.5 YR 8/5), microcrystalline or recrystallized. In some fragments, phenocrysts are so abundant looks like sand in a tuff matrix. NOTE: The lighter colored rock may have come from the fractures noted in the down-hole video.
173.5							T.O.	

SOIL BORING LITHOLOGIC LOG – 400-SB-11 (Became 400-JV-150)

LOCATION MAP:



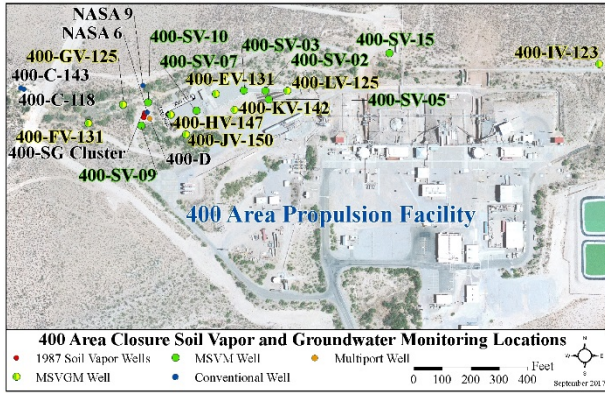
SITE ID: NASA-WSTF, Doña Ana County, NM
LOCATION COORDINATES (ft) N: 554,745.84 E: 1,530,515.12
GROUND ELEVATION (ft AMSL): 4,835.71
DRILLING METHOD: Rotosonic with casing advance / Air rotary
DRILLING CONTR./DRILLER: Cascade Drilling / Joe Lary
BOREHOLE DIAMETER: 9; 7; 6 in. **TOTAL DEPTH:** 175 ft
DATE DRILLING STARTED/COMPLETED: 12/8/2016 / 12/10/2016
FIELD REPS.: Michael Narup, Michael Pitterle
DEPTH GROUNDWATER ENCOUNTERED: Not noted in field; Very little water
STATIC WATER LEVEL (DATE): Not recorded prior to casing installation; 143.23 ft (6/26/2017)
BEDROCK TYPE: Cemented alluvium / andesite
BEDROCK DEPTH: 113 ft / 162 ft
COMMENTS:

DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yymmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
0								
10	0.0				Composite (Soil grab)		SW-SM	Well graded gravely silty sand. 5% coarse gravel, 15% fine gravel, 15% coarse sand, 25% medium sand, 20% fine sand, 20% silt. Matrix pink (7.5 YR 7/3). Sands are subangular to subrounded. Clasts ~30% limestone, ~30% quartzite.
20	0.0				Composite (Soil grab)	12.5-13': 1612080830-0835	SW	Well graded gravely sand with silt. 10% coarse gravel, 25% fine gravel, 15% coarse sand, 30% medium sand, 15% fine sand, 5% silt. Matrix light brown (7.5 YR 6/3). Angular to subangular. Clasts ~40% limestone, ~40% quartzite w/granite.
30	0.0				Composite (Soil grab)		SW	Well graded gravely sand with silt. 10% coarse gravel, 25% fine gravel, 20% coarse sand, 30% medium sand, 8% fine sand, 7% silt. Matrix pink (7.5 YR 7/3) Subangular. Clasts ~40% mudstone, ~30% limestone w/ some granite, diorite, and quartzite.
40	0.0				Composite (Soil grab)		GW	Well graded sandy gravel with silt. 30% coarse gravel, 30% fine gravel, 15% coarse sand, 15% medium sand, 5% fine sand, 5% silt. Matrix light reddish brown (5 YR 6/3). Subangular to subrounded. Clasts ~50% limestone, ~20% quartzite with granite and mudstone.
50	0.0				Composite (soil grab)	46.5-47.5': 1612081020-1025 Duplicate: 1612081030-1035	GW	Well graded sandy gravel with silt. 35% coarse gravel, 30% fine gravel, 10% coarse sand, 15% medium sand, 5% fine sand, 5% silt. Matrix pinkish gray (7.5 YR 7/2). Subangular. Clasts ~50% limestone, ~30% quartzite w/granite and mudstone.
60	0.0				Composite (soil grab)		GW	Well graded sandy gravel with silt, 25% coarse gravel, 25% fine gravel, 10% coarse sand, 25% medium sand, 10% fine sand, 5% silt. Matrix light brown (7.5 YR 6/3). Subangular. ~60% limestone w/granite, quartzite, small amounts of anorthosite.

DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yymmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
70	0.0				Composite (soil grab)		SW	Well graded gravelly sand with silt. 20% coarse gravel, 20% fine gravel, 20% coarse sand, 25% medium sand, 5% fine sand, 5% silt, 5% clay. Matrix pink (7.5 YR 7/3). Angular to subangular. Clasts ~40% limestone, ~30% quartzite with one large quartz containing iron oxide.
80	0.0				Composite (soil grab)		GW	Well graded sandy gravel with silt and clay. 25% coarse gravel, 30% fine gravel, 15% coarse sand, 15% medium sand, 10% fine sand, 5% silt and clay. Matrix light brown (7.5 YR 6/4). Subangular. Clasts ~70% limestone with quartzite, granite, siltstone and mudstone.
90	0.0				Composite (soil grab)	87-87.5': 1612081415-1420	GW	Well graded sandy gravel with silt and clay. 30% coarse gravel, 25% fine gravel, 10% coarse sand, 15% medium sand, 10% fine sand, 5% silt, 5% clay. Matrix light brown (7.5 YR 6/3). Angular to subangular. Clasts ~80% limestone w/granite and quartzite.
100	0.0				Composite (soil grab)		GW	Well graded sandy gravel with silt and clay. 25% coarse gravel, 25% fine gravel, 15% coarse gravel, 20% medium sand, 10% fine sand, 5% silt and clay. Matrix light brown (7.5 YR 6/4). Angular to subangular. Clasts ~60% limestone, ~30% quartzite.
110	0.0				Composite (soil grab)		GW	Well graded sandy gravel with silt and clay. 30% coarse gravel, 30% fine gravel, 10% coarse sand, 15% medium sand, 10% fine sand, 5% silt and clay. Matrix light brown (7.5 YR 6/4). Subangular to subrounded. Clasts ~70% limestone w/quartzite.
113								
120	0.0				Composite (soil grab)		SW-GW	Well graded sand and gravel. 25% coarse gravel, 25% fine gravel, 15% coarse sand, 25% medium sand, 10% fine sand. Matrix light gray (10 YR 7/1). Angular. Clasts ~90% limestone and cemented alluvium. Cemented Alluvium bedrock contact = 113'.
130								Cemented Alluvium
140								Cemented Alluvium
150								Cemented Alluvium
160								Cemented Alluvium
170								Cemented Alluvium Orejon Andesite Contact = 162 ft.
175								Andesite

SOIL BORING LITHOLOGIC LOG – 400-SB-12 (Became 400-IV-123)

LOCATION MAP:



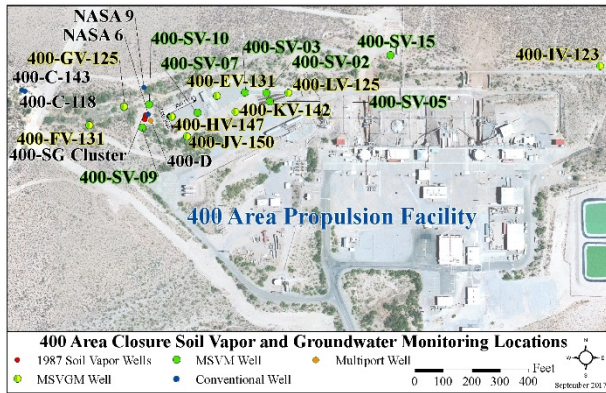
SITE ID: NASA-WSTF, Doña Ana County, NM
LOCATION COORDINATES (ft) N: 554,995.63 E: 1,531,966.75
GROUND ELEVATION (ft AMSL): 4,864.22
DRILLING METHOD: Rotosonic with casing advance / Air rotary
DRILLING CONTR./DRILLER: Cascade Drilling / Joe Lary
BOREHOLE DIAMETER: 9.5; 8.3 in. **TOTAL DEPTH:** 154.4 ft
DATE DRILLING STARTED/COMPLETED: 10/8/2016 / 10/22/2016
FIELD REPS.: Michael Pitterle, Geoff Giles
DEPTH GROUNDWATER ENCOUNTERED: Between 153.5-154.4 ft
STATIC WATER LEVEL (DATE): 127.87 ft (10/23/2016); 130.76 ft (6/26/2017)
BEDROCK TYPE: Cemented Alluvium/Hornfels **BEDROCK DEPTH:** 80/81 ft
COMMENTS:

DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yymmddttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
0							SW-GW	Well graded gravel and sand with silt. 30% coarse gravel and cobbles up to 5", 15% fine gravel, 20% coarse sand, 25% medium to fine sand, 10% silt. Matrix light brown to pink (7.5 YR 6-7/3) (dry). Angular to subrounded. Clasts predominantly limestone, siltstone, mudstone, and quartzite with minor crystalline rocks. Caliche coatings are common. ---
10	0.0				Composite (Soil grab)		SW	Well graded gravelly sand with silt. 5% coarse gravel and rare cobbles, 35% fine gravel, 30% coarse sand, 20% medium to fine sand, 10% silt. Matrix pink (7.5 YR 7/3). Lithology and other characteristics as above.
20	0.0				Composite (Soil grab)	14-15': 1610081512-1517	GW	Well graded sandy gravel with silt. 10% coarse gravel and cobbles, 40% fine gravel, 10% coarse sand, 35% medium to fine sand, 5% silt. Matrix light brown (7.5 YR 6/3). Angular to subrounded. Lithologies as above. Caliche coatings common.
30	0.0				Composite (Soil grab)		GW	Well graded sandy gravel with silt and clay. 20% coarse gravel, 40% fine gravel, 10% coarse sand, 15% medium to fine sand, 10% silt and clay. Matrix light brown (7.5 YR 6/3). Angular to subangular with minor rounding. Clasts predominantly mixed sedimentary units but an increase in crystalline (granite) clasts. Caliche coatings common.
40	0.0				Composite (Soil grab)		GW	Well graded sandy gravel with silt. 25% coarse gravel, 30% fine gravel, 20% coarse sand, 20% medium to fine sand, 5% silt. Matrix pinkish gray to pink (7.5 YR 6/2-7/3). Angular to subangular with minor rounding. Lithologies as above with only minor crystalline rocks. Some caliche coatings.
50	0.0				Composite (soil grab)	43-44': 1610091224-1229	GW	Well graded sandy gravel with silt. 25% coarse gravel, 40% fine gravel, 20% coarse sand, 10% medium to fine sand, 5% silt. All other characteristics as above. Crystalline rocks rare.

DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yrmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
60	0.0				Composite (soil grab)		GW	Well graded sandy gravel with silt. 20% coarse gravel with minor cobbles, 30% fine gravel, 20% coarse sand, 25% medium to fine sand, 5% silt). Other characteristics as above.
70	0.0				Composite (soil grab)		GW	No changes – as above
80	0.0				Composite (soil grab)	78-79': 1610091630- 1635	GW	No changes – as above
90	0.0				Grab sample from cyclone Composite (soil grab)		Bedrock contact	Cemented Alluvium bedrock contact = 80'. Hornfels contact = 81'. Dense, dark gray to very dark gray (N3-4) and dark greenish gray (10 Y4/1). Some olive gray (5 Y 4/2) and gray to grayish brown (2.5 Y 5/2.1) chips observed. They appear to represent alteration of the matrix adjacent to fractures, as seen in sonic cores. They comprise ~10% of all the chips.
100							Bedrock	
110							Bedrock	
120							Bedrock	
130							Bedrock	
140							Bedrock	
150							Bedrock	
154.5							Bedrock	

SOIL BORING LITHOLOGIC LOG – 400-SB-13 (Became 400-GV-125)

LOCATION MAP:



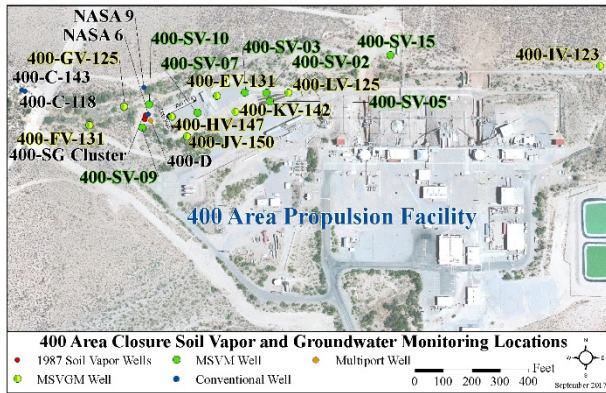
SITE ID: NASA-WSTF, Doña Ana County, NM
LOCATION COORDINATES (ft) N: 554,838.22 E: 1,530,296.59
GROUND ELEVATION (ft AMSL): 4,818.86
DRILLING METHOD: Sonic coring to bedrock / Air rotary in bedrock
DRILLING CONTR./DRILLER: Cascade Drilling / Joe Lary
BOREHOLE DIAMETER: 9.5; 8.25 in. **TOTAL DEPTH:** 167.5 ft
DATE DRILLING STARTED/COMPLETED: 11/17/2016 / 11/19/2016
FIELD REPS.: Michael Pitterle, Tom McCrory
DEPTH GROUNDWATER ENCOUNTERED: Not noted in field; Very little water
STATIC WATER LEVEL (DATE): 124.9 ft (11/20/2016); 127.52 ft (6/26/2017)
BEDROCK TYPE: Cemented alluvium / andesite
BEDROCK DEPTH: 107 ft / 148.5 ft
COMMENTS:

DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yrrmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
0								
10	0.0				Composite (Soil grab)	9-10': 1611171140-1145	SW	Well graded gravely sand with silt and clay. 15% coarse gravel, 15% fine gravel, 25% coarse sand, 30% fine sand, 15% silt and clay. Matrix reddish brown (5 YR 6/3). Angular to subangular with some subrounded. Clasts include limestone, siltstone, mudstone and quartzite. Some caliche coatings.
20	0.0				Composite (Soil grab)		SW	Well graded gravely sand with silt and clay. 15% coarse gravel, 25% fine gravel, 20% coarse sand, 15% medium sand, 20% fine sand, 5% silt and clay. Matrix light reddish brown (5 YR 6/4). Angular to subangular. Clasts are limestone, quartzite, siltstone with minor intrusives.
30	0.0				Composite (Soil grab)		SW	Well graded gravely sand with silt. 15% coarse gravel, 15% fine gravel, 25% coarse sand, 20% medium sand, 20% fine sand, 5% silt. Matrix brown to light brown (7.5 YR 6/3 – 5/4). Angular to subangular. 5% of the clasts are moderately cemented alluvium. Some caliche.
40	0.0				Composite (Soil grab)		SW	Well graded gravely sand with silt. 15% coarse gravel, 15% fine gravel, 25% coarse sand, 20% medium sand, 20% fine sand, 5% silt and clay. Matrix Brown to light brown (7.5 YR 5/4-6/3). Angular to subangular. Minor caliche coatings.
50	0.0				Composite (soil grab)	47.5-48.5': 1611181330-1335 Matrix spike: 1611181336-1341	SW-GW	Well graded gravel and sand. 25% coarse gravel, 25% fine gravel, 20% coarse sand, 15% medium sand, 15% fine sand. Matrix pinkish grey to light brown (7.5 YR 6/2). Clasts include more crystalline rocks and fragments of cemented alluvium.
60	0.0				Composite (soil grab)		SW-GW	Well graded gravel and sand, 25% coarse gravel, 25% fine gravel, 40% coarse to medium sand, 10% fine sand. Matrix is yellowish red (5 YR 5/6). Clasts are primarily limestone fragments with lesser amounts of quartzite and some volcanics.

D E P T H (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yrmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
70	0.0				Composite (soil grab)		GW	Well graded sandy gravel with silt, 30% coarse gravel, 30% fine gravel, 15% coarse sand, 15% medium sand, 5% fine sand, 5% silt. Matrix light brown (7.5 YR 6/3). Subangular to subrounded. Clasts ~80% limestone with some granite and quartzite.
80	0.0				Composite (soil grab)	75'-77': 1611181700-1705	SW	Well graded gravelly sand with silt and clay. 20% coarse gravel, 20% fine gravel, 15% coarse sand, 25% medium sand, 10% fine sand, 5% silt, 5% clay. Matrix orange brown (7.5 YR 6/4). Angular to subangular. Clasts ~85% limestone with small amounts of quartzite and granite.
90	0.0				Composite (soil grab)		GW	Well graded sandy gravel with silt. 20% coarse gravel, 30% fine gravel, 20% coarse sand, 20% medium sand, 5% fine sand, 5% silt. Matrix light brown (7.5 YR 6/3). Subangular. Clasts ~85% limestone, with the balance being a mix of mudstone and quartzite and large piece of calcite.
100	0.0				Composite (soil grab)		SW	Well graded gravelly sand with silt. 10% coarse gravel, 25% fine gravel, 15% coarse sand, 25% med. sand, 15% fine sand, 10% silt. Matrix pinkish gray (7.5 YR 6/2). Subangular. Clasts ~90% limestone with some quartzite, quartz and granite.
110	0.0				Composite (soil grab)		SW	Well graded sand with gravel, 10% coarse gravel, 30% fine gravel, 20% coarse sand, 30% medium sand, 5% fine sand, 5% silt. Matrix light brown (7.5 YR 6/3). Subangular. Clasts ~60% limestone, ~20% quartzite with the balance granite and mudstone. Cemented Alluvium bedrock contact = 107.'
110								Cement Alluvium
120								Cement Alluvium
130								Cement Alluvium
140								Cement Alluvium
150								Cement Alluvium Orejon Andesite Contact = 148.5'
160								Andesite
167.5								Andesite

SOIL BORING LITHOLOGIC LOG – 400-SB-14 (Became 400-FV-131)

LOCATION MAP:



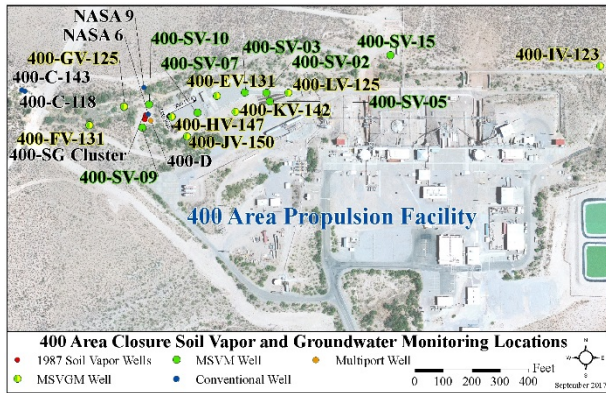
SITE ID: NASA-WSTF, Doña Ana County, NM
LOCATION COORDINATES (ft) N: 554,783.24 E: 1,530,181.02
GROUND ELEVATION (ft AMSL): 4,815.43
DRILLING METHOD: Sonic coring to bedrock / Air rotary in bedrock
DRILLING CONTR./DRILLER: Cascade Drilling / Joe Lary
BOREHOLE DIAMETER: 9.5; 8.25 in. **TOTAL DEPTH:** 153.5 ft
DATE DRILLING STARTED/COMPLETED: 11/2/2016 / 11/6/2016
FIELD REPS.: Michael Pitterle
DEPTH GROUNDWATER ENCOUNTERED: Not noted in field; Very little water
STATIC WATER LEVEL (DATE): 138.3 ft (11/8/2016); 131.75 ft (6/26/2017)
BEDROCK TYPE: Cemented alluvium / andesite
BEDROCK DEPTH: 104.3 ft / 136 ft
COMMENTS:

DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yymmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
0							SW	Well graded gravely sand. 30% coarse gravel, cobbles abundant, 10% fine gravel, 20% coarse sand, 40% medium and fine sand. A couple of thin intervals (1 ft) of well developed soil and some clay balls were observed. Matrix is pink (7.5 YR 7/3)(dry). Angular to subangular with minor rounding. Clasts are limestone, siltstone, mudstone, quartzite and minor crystalline intrusive. Thick caliche coatings were observed on some fragments. ---
10	0.0				Composite (Soil grab)		SW-GW	Well graded sand and gravel. 35% coarse gravel, 15% fine gravel, 30% coarse sand, 20% medium to fine sand. Angular to subangular; very little rounding. Composition and color same as above, but crystalline rocks (granite) more common. One fragment of tuff identified.
20	0.0				Composite (Soil grab)	11-12': 1611021240-1245	GW	Well graded sandy gravel with silt. 30% coarse gravel & cobbles (including clasts of alluvium), 40% fine gravel, 15% coarse sand, 10% medium to fine sand, 5% silt. Matrix light reddish brown (5 YR 6/3). Angular to subangular, minor rounding. Lithologies the same (limestone, silt st, mudstone, qtzite) but crystalline (granite) rocks more abundant. Also some recrystallized (hornfels?) rocks.
30	0.0				Composite (Soil grab)		GW	Well graded sandy gravel with silt. 35% coarse gravel and cobbles, 30% fine gravel, 20% coarse sand, 10% medium to fine sand, 5% silt. Matrix light reddish brown (5 YR 6/3). Angular to subangular, some subrounded clasts. Lithologies predominantly limestone, siltstone, mudstone, lesser quartzite. Crystalline (granitic) also common and some recrystallized rocks (hornfels).

DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yymmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
40	0.0				Composite (Soil grab)		SW	Well graded gravely sand. 20% coarse gravel, 25% fine gravel, 25% coarse sand, 30% medium to fine sand. Matrix light reddish brown (5 YR 6/3). Angular to subangular, some subrounded. Typical sedimentary clasts, but recrystallized rocks are common (hornfels?). Few caliche coatings.
50	0.0				Composite (soil grab)	43-44: 1611021530- 1535 Duplicate: 1611021545-1550	SW	Well graded gravely sand. 15% coarse gravel and cobbles, 15% fine gravel, 30% coarse sand, 40% medium to fine sand. Matrix color same. Angular to subangular, only minor rounding. Typical lithologies, but recrystallized rocks (hornfels) and poorly consolidated alluvium common, no intrusive crystalline rocks noted. Minor caliche coatings observed.
60	0.0				Composite (soil grab)		GW	Well graded sandy gravel with silt. 25% coarse gravel, 40% fine gravel, 15% coarse sand, 15% medium to fine sand, 5% silt. Matrix pale brown (10 YR 6/3). Angular to subangular with very minor rounding. Dark gray limestone most abundant with lesser silt and mud stores. Minor quartzite and recrystallized hornfels (?). Minor caliche coatings.
70	0.0				Composite (soil grab)		SW-SM	Well graded gravely sand with silt and clay. 15% coarse gravel, 20% fine gravel, 40% coarse sand, 20% medium to fine sand, ~5% silt and clay (clay coatings on many fragments). Matrix pinkish gray (7.5 YR 7/2). Angular to subangular, rare subrounded. Clasts predominantly limestone, siltstone, mudstone, minor crystalline and metamorphic.
80	0.0				Composite (soil grab)		GW	Well graded sandy gravel. 50% coarse gravel and cobbles, 25% fine gravel, 10% coarse sand, 15% medium to fine sand. Matrix pale brown (10 YR 6/3). Angular and subangular. Lithology as above but recrystallized rocks (metamorphic) are more common. Abundant caliche/clay coatings.
90	0.0				Composite (soil grab)	83-84': 1611031000- 1005	GW	Well graded sandy gravel with silt. 25% coarse gravel and cobbles, 45% fine gravel, 10% coarse sand, 15% medium to fine sand, 5% silt. Matrix pinkish gray (7.5 YR 7/2). Angular to subangular. Lithology as above. Minor caliche coatings.
100	0.0				Composite (soil grab)		GW	Well graded sandy gravel. 30% coarse gravel and cobbles, 30% fine gravel, 10% coarse sand, 30% medium to fine sand. Matrix pink (7.5 YR 7/3). Angular to subrounded. Lithologies the same. Caliche coatings common.
110	0.0				Composite (soil grab)		GW	As above. Cemented Alluvium bedrock contact = 104'.
120					Grab sample from cyclone			Cemented Alluvium
130								Cemented Alluvium
140								Cemented Alluvium Orejon Andesite = 136'. Pyroclastic flow: Densely welded, reddish gray (SR 5/1), 2-5% pherocrysts of feldspar (?), no obvious crystal form, 5% mafics, black tabular or prismatic. No pumice noted, no lithics, some siliceous coatings.
150								Andesite
156								Andesite

SOIL BORING LITHOLOGIC LOG – 400-SB-15 (Became 400-SV-15)

LOCATION MAP:



SITE ID: NASA-WSTF, Doña Ana County, NM

LOCATION COORDINATES (ft) N: 555,033.95 **E:** 1,531,234.96

GROUND ELEVATION (ft AMSL): 4,845.56

DRILLING METHOD: Rotosonic with casing advance

DRILLING CONTR./DRILLER: Cascade Drilling / Joe Lary

BOREHOLE DIAMTER: 9.5; 7 in. **TOTAL DEPTH:** 95 ft

DATE DRILLING STARTED/COMPLETED: 10/5/2016 /

10/6/2016 **FIELD REPS.:** Michael Pitterle

BEDROCK TYPE: Cemented alluvium **BEDROCK DEPTH:** 90 ft

COMMENTS:

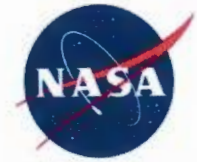
DEPTH (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yrmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
0								
10	0.0				Composite (Soil grab)	9-10': 1610051020-1025	SW	Well graded gravelly sand. 10% coarse gravel, 10% fine gravel, 30% coarse sand, 50% medium to fine sand. Matrix pale red (5 YR 7/3). Angular to subangular, small amount of subrounded.
20	0.0				Composite (Soil grab)		SW	Well graded gravelly sand with silt. 20% coarse gravel 60% coarse sand, 15% medium to fine sand, 5% silt. Matrix light brown (7.5 YR 6/4). Angular to subangular with less subrounded. Caliche coatings common.
30	0.0				Composite (Soil grab)		GW	Well graded sandy gravel with silt. 40% coarse gravel, 15% fine gravel, 15% coarse sand, 20% medium to fine sand, 10% silt. Matrix is pink (7.5 YR 7/3). Angular to subangular. No change in lithology. Crystalline rock more common, including granite and diorite.
40	0.0				Composite (Soil grab)		SW	Well graded sand with silt and gravel. 10% coarse gravel, 10% fine gravel 35% coarse sand, 35% medium to fine sand, 10% silt. Matrix light brown to pink (7.5 YR 7/3). Angular to subangular. No change in lithologies.
50	0.0				Composite (soil grab)	41.5-42.5': 1610051650-1655	SW	Well graded gravelly sand with silt, consistent with the 30-40' interval. Matrix light brown (7.5 YR 6/4) (dry).
60	0.0				Composite (soil grab)		SW	Well graded gravelly sand with silt, consistent with 30-40 interval. Matrix light yellowish brown (10 YR 6/4)(dry).
70	0.0				Composite (soil grab)		SW	Well graded gravelly sand with silt. 15% coarse gravel, 10% fine gravel, 30% coarse sand, 35% medium to fine sand, 10% silt. Matrix very pale brown (10 YR 7/3)(dry). Subangular to subrounded with minor rounding. Clasts are limestone, siltstone, mudstone, quartzite, volcanics. Caliche coatings present.
80	0.0				Composite (soil grab)		GW	Well graded sandy gravel with silt. 20% coarse gravel, 30% fine gravel, 20% coarse sand, 25% medium to fine sand, 5% silt. Matrix light brown to pink (7.5 YR 7/3). Angular to subangular with minor rounding. Lithology shows a decrease in volcanics,

D E P T H (ft. bgs)	P I D (ppm)	SOIL CORE			SOIL SAMPLE		LITHOLOGIC DESCRIPTION	
		Sample Depth (ft) From To	Blow Counts per 6" Core	% Core Rec.	TYPE (Soil Grab, Soil Gas, Soil Chemical, Soil Geotechnical, Hex. Chrom.)	WSTF 10-DIGIT SAMPLE NUMBER(S) (yrmddtttt)	USCS Group	Color, sorting/grading, consistency/density, grain size proportions (%), rounding/shape, consolidation/cementation, moisture content, distinguishing features
90	0.0				Composite (soil grab)	86-87': 1610061540- 1545	SW	Well graded gravely sand with silt. 20% coarse gravel, 25% fine gravel, 20% coarse sand, 30% medium to fine sand, 5% silt. Matrix pinkish gray (5 YR 7/2). Angular to subangular with minor rounding. Clasts are limestone, quartzite and mudstone, no volcanics. Cemented Alluvium bedrock contact = 90'.
95	0.0				Composite (soil grab)			Cemented Alluvium

Appendix C
No Longer Contained-In Requests for the 400 Area Investigation

National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
White Sands Test Facility
P.O. Box 20
Las Cruces, NM 88004-0020



November 29, 2016

Reply to Attn of:

RE-16-155

Mr. John E. Kieling, Chief
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505

Subject: Request for a "Contained-In" Determination for 400 Area Investigation-Derived Waste (IDW)

NASA is requesting a "No Longer Contained-In" Determination (NLCID) for the investigation-derived waste (IDW soil and IDW debris) initially generated during activities associated with the 400 Area Closure Investigation Work Plan (IWP), which was approved by NMED on November 8, 2011. This "Contained-In" Determination is applicable to the IDW generated from soil boring locations 400-SB-03, 400-SB-04, 400-SB-10, 400-SB-12, and 400-SB-15. Currently, IDW soil and IDW debris are being managed as listed hazardous waste carrying EPA Waste Codes F001 and F002 in accordance with the 400 Area IWP Investigation-Derived Waste Management Plan (Appendix C) and 40 CFR §262.34. The earliest 90-day accumulation time limit expiration date for the IDW associated with this NLCID will expire on December 21, 2016.

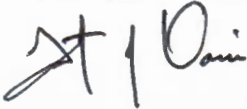
NASA received, reviewed, and compared analytical data generated from the IDW soil to the applicable 40 CFR §268 Subpart D Treatment Standards and to the Soil Screening Levels (SSLs) provided in the NMED Risk Assessment Guidance for Site Investigations and Remediation (2015). For all IDW soil generated, F001 and F002 contaminants of concern were not detected above regulatory limits. NASA is requesting a NLCID for the F001 and F002 hazardous waste listing. NASA also compared N-Nitrosodimethylamine (NDMA) data to the SSLs identified in the NMED Risk Assessment Guidance for Site Investigations and Remediation (2015) for Industrial/ Occupational and Construction Worker Soil. NDMA was not detected in the IDW soil at concentrations above these SSLs.

If NMED finds the IDW soil meets the applicable standards and clean-up levels, NASA requests concurrence from the NMED to place the soil on the ground in the area of borings, as identified in the IDW disposition procedures of the NMED approved 400 Area IWP (Appendix C). Upon receipt of an approved NLCID and concurrence from the NMED, NASA will transport the containers of soil back to their point of generation and evenly land apply the environmental media to the ground and away from potential storm water run-off. Final disposal location of all environmental media will be documented. The remaining IDW debris will be disposed of as solid waste.

Enclosure 1 provides a background and basis for the NLCID. Enclosure 2 provides detection summary tables of the analytical results and a comparison to applicable regulatory limits. Enclosure 3 provides a CD-ROM containing analytical summaries, laboratory analytical reports, and chain of custody documentation.

I certify under penalty of law that this document and attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have any questions or comments, please contact me at 575-524-5024, or Antonette Sanchez of my staff, at 575-524-5497.



Timothy J. Davis
Chief, Environmental Office

Enclosures (3)

cc: (w/enclosures)
Mr. Gabriel Acevedo
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505

Background

Various propulsion systems have been tested in the WSTF 400 Area since the mid-1960s. Two impoundments in the 400 Area received diluted hypergolic propellants in aqueous solution and spent solvents through the mid-1980s. Aqueous solutions of hydrazine based propellants (hydrazine, monomethylhydrazine, unsymmetrical dimethylhydrazine, Aerozine 50) were received at the impoundments and treated through a preconditioning and oxidation (neutralization) process. This process included the addition of caustic soda and either calcium hypochlorite trihydrate or peroxide to the hydrazine/water solution. Once contained in the impoundments, the hydrazine/water mixtures were drawn into mixing tanks, neutralized, and then reintroduced back to the surface impoundments. The wastes were subsequently discharged into an adjacent arroyo when the concentrations of hydrazine species fell below existing detection limits. Research conducted for the historical investigation summary (HIS) associated with the 400 Area Investigation Work Plan (IWP) found chemicals meeting the listing descriptions of spent F001 and F002 per 40 CFR §261 Subpart D were used as solvents and referee propellants in the 400 Area. These F001 and F002 listed wastes were included in the waste streams managed within the 400 Area impoundments, but were not treated before discharge to the adjacent arroyo.

The 400 Area impoundments last received waste in 1985, and were closed in accordance with an approved Closure Plan. Closure activities concluded in March 1989. The impoundments have remained in Post Closure Care (PCC) since that time. The current WSTF Resource Conservation and Recovery Act (RCRA) Hazardous Waste Operating Permit (NMED, 2009; Permit) required an investigation of soil directly beneath and adjacent to the 400 Area impoundments. The NMED Hazardous Waste Bureau approved the 400 Area IWP and an associated abbreviated drilling work plan, which identified 15 soil boring locations. Five of the soil borings were designated to be completed as combination soil vapor/groundwater monitoring wells, while the remainder were designated as soil vapor monitoring wells only. The purpose of the monitoring wells are to provide additional vertical delineation of the soil, soil vapor, and groundwater chemistry around the 400 Area Closure. This information will be used to determine if there is a continuing source of contamination.

NASA initiated the 400 Area Investigation in September 2016. The sonic drilling method was used to advance investigation boreholes through pediment alluvium, which overlies conglomerate and volcanic bedrock. Alluvium encountered thus far has been in the vadose zone, and was unconsolidated to moderately consolidated fine to coarse grain sand and gravel with limestone, dolomite, and quartzite clasts. Groundwater was encountered in discrete fractures in the volcanic bedrock in boreholes that have been advanced beyond the alluvium/bedrock contact. But, the hardness and consolidated nature of the conglomerate and volcanic bedrock made the sonic drilling method ineffective at advancing boreholes to the required depth. After encountering these issues at 400-SB-04, the drilling method was switched to air hammer at the alluvium/bedrock contact in subsequent boreholes designated for completion as a groundwater/soil vapor well. The air hammer drilling method allowed for more efficient advancement of the borings through the conglomerate and volcanic bedrock, where groundwater was encountered.

Investigation-derived waste (IDW) generated to date includes IDW soil (from the sonic drilling method), IDW drill cuttings (from the air hammer drilling method), contact contaminated debris, decontamination water, and contaminated groundwater. The 400 Area Investigation location is within the known boundaries of the WSTF groundwater contamination plume and includes areas near the 400 Area impoundments, which are known to have previously contained F001 and F002 listed hazardous waste. Environmental media, such as soil and groundwater, are considered to meet the definition of a RCRA solid waste at the time it becomes actively managed. Therefore, IDW generated as part of 400 Area Investigation are subject to regulation under the “contained-in” policy carrying EPA Waste Codes F001 and F002 per 40 CFR §261 Subpart D with constituents of concern (COCs): trichloroethene, tetrachloroethene, trichlorofluoromethane, and 1,1,2-trichloro-1,2,2-trifluoroethane.

Waste characterization and hazardous waste determination for 400 Area Investigation IDW is being conducted in accordance with Permit Attachment 12 (Waste Analysis Plan) and 40 CFR §260 and 261. NASA has received analytical results from waste characterization samples collected from 400 Area Investigation IDW soil generated through October 19, 2016, and is requesting that the NMED perform a “contained-in” determination to determine whether the material poses an unacceptable risk for the 17 one-cubic yard containers of IDW soil and two containers, one cubic yard and one 55-gallon, of contact contaminated debris included in this request.

Basis for “Contained-In” Determination

NASA is requesting that NMED perform a NLCID for environmental media (IDW soil) and associated contaminated IDW contact debris. Aqueous IDW, such as decontamination water and contaminated groundwater, is being managed as hazardous waste and treated at the Mid-plume Interception and Treatment System. Aqueous IDW is not part of this request. Analytical data for the IDW drill cuttings, generated during air hammer drilling, will be included in a subsequent request. IDW drill cuttings are also not part of this current NLCID. Analytical sampling data have been received and reviewed for the IDW soil that originated from the 400 Area Investigation boreholes 400-SB-03, 400-SB-04, 400-SB-10, 400-SB-12, and 400-SB-15 using the sonic drilling technique. Waste characterization for the IDW was completed in accordance with Attachment 12 of the Permit: Waste Analysis Plan. Analytical summary tables are provided in Enclosure 2 and the analytical reports are provided in Enclosure 3. Analytical data may be compared to the applicable 40 CFR §268 Subpart D Treatment Standards and the 2015 NMED Soil Screening Levels (SSLs). If the environmental media IDW is found not to pose an unacceptable risk, then NMED may determine the soil and associated contact IDW can be managed as no-longer containing listed hazardous waste.

F001 and F002 Constituents of Concern

F001 and F002 COCs were not detected above the laboratory’s method detection reporting limits in the waste characterization samples, which in all cases were below the regulatory limits included in the 40 CFR §268 Subpart D Treatment Standards and the 2015 NMED SSLs. Of the listed COCs, only Tetrachloroethene (PCE) was detected at a concentration of 1.1 mg/Kg with a J flag data qualifier, which indicated the reported result was an estimated concentration between the method detection limit and reporting limit.

Other Constituents

Metals

Native soils located at WSTF are known to have the potential to contain metals at concentrations that exceed regulatory limits. Metals sampling was performed based on the potential for land application of any environmental media that no longer contains listed hazardous waste. The sampling was performed to address the 40 CFR §261.24 Toxicity Characteristic incorporating the 40 CFR §268 Land Disposal Restrictions and the 2015 NMED SSLs. Based on the sampling results, metals were not detected in the IDW soil at concentrations exceeding the 40 CFR §261.24 Toxicity Characteristic limits, 40 CFR §268 40 Treatment Standard Limits, or the NMED SSLs.

N-Nitrosodimethylamine (NDMA)

NDMA is a constituent that can be present in hydrazine based propellants as an impurity. It is also a byproduct generated from treating hydrazine based propellants by oxidation (neutralization), which was known to have occurred at the 400 Area impoundments. The 400 Area Investigation location is within the known boundaries of the WSTF groundwater contamination plume, which is also known to contain NDMA. As with all total concentration results provided with this request, NASA compared the reported total concentration of NDMA with the NMED SSL for Industrial/Occupational Soil and Construction Worker Soil. The comparison was made to the SSL for Industrial/Occupation Soil in accordance with the waste disposition procedures identified in Appendix C (400 Area Closure Investigation Derived Waste Procedures) of the NMED approved 400 Area IWP. A comparison of results to the SSL for Construction Worker Soil was provided as a conservative measure, based on the potential for land application of the IDW soil if NMED finds it does not contain listed hazardous waste. Based on the waste characterization sampling results, NDMA was not detected above 40 CFR §268 40 Treatment Standard Limit, or the 2015 NMED SSLs.

Other Volatile Organics

In addition to the F001 and F002 COCs, the laboratory's target analyte list for SW-846 Method 8260C includes the majority of volatile organics typically analyzed for by SW-846 Method 8260C. Acetone and dichloromethane were detected at trace concentrations (< 10 ppb). Acetone and dichloromethane are known lab contaminants. Carbon disulfide was detected at a concentration of 1.7 ppb and included a J flag data qualifier indicating the reported result was between the method reporting limit and the method detection limit.

Other Semi-Volatile Organics

N-Nitrodimethylamine (DMN) and bromacil are analytes included in EPA Method 607M with the reported NDMA results. The maximum observed concentrations for these constituents were 0.07058 mg/Kg and 0.0002 mg/Kg, respectively. The bromacil result included a J flag data qualifier indicating the reported result was between the method reporting limit and the method detection limit. The 40 CFR §268 40 Treatment Standards do not include a treatment limit for N-Nitrodimethylamine or bromacil. Also, the NMED SSLs, in addition to the U.S. EPA Regional Screening Levels (RSLs) do not include a cleanup level for these constituents.

Analytical Reports and Chain of Custodies

Analytical reports are provided in Enclosure 3 for waste characterization samples collected from individual waste containers. Analytical data sheets specific to each analyses are included in the laboratory reports for each sampling event. The complete analytical report includes the laboratory case narrative and supporting documentation.

Other Considerations

If NMED finds the IDW soil does not contain hazardous waste, NASA is requesting concurrence from the NMED to dispose of this environmental media in accordance with the waste disposition procedures identified in Appendix C of the NMED approved 400 Area IWP (400 Area Closure Investigation Derived Waste Procedures). In addition to the comparison of results to the SSL for Industrial Soils that was identified in the waste disposition procedures of the 400 Area IWP, NASA has included the SSL for Construction Worker Soil in the analytical summary tables to allow a comparison of total concentrations to this limit. NASA believes that the SSL for Construction Worker Soil is the most conservative relevant SSL that would apply in the unlikely scenario that the ground where the IDW soil is applied is disturbed in the future.

Upon NMED approval of the NLCID, NASA will land apply the IDW soil on the ground near the point of generation away from potential storm water run-off. NASA will document the final disposal locations of all land applied environmental media. The remaining IDW contact debris identified in this request will be disposed of as solid waste.

Enclosure 2

Table 1 400-SB-03 IDW Soil VOC Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
1610140835 #7329 1/8/17	8260C	Acetone	0.0032J	N/A	160	9.60E+05	2.42E+05
1610140830 #7330 1/8/17		None	ND	N/A	N/A	N/A	N/A
1610140840 #7338 1/9/17		Acetone	0.0032J	N/A	160	9.60E+05	2.42E+05

Table 2 400-SB-03 IDW Soil Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
1610140836 #7329 1/8/17	607M	N-Nitrosodimethylamine	ND	N/A	2.3	5.03E-01	2.14E+00
		N-Nitrodimethylamine	ND	N/A	N/A	N/A	N/A
		Bromacil	ND	N/A	N/A	N/A	N/A
1610140831 #7330 1/8/17		N-Nitrosodimethylamine	ND	N/A	2.3	5.03E-01	2.14E+00
		N-Nitrodimethylamine	0.00033	N/A	N/A	N/A	N/A
		Bromacil	ND	N/A	N/A	N/A	N/A
1610140841 #7338 1/9/17		N-Nitrosodimethylamine	ND	N/A	2.3	5.03E-01	2.14E+00
		N-Nitrodimethylamine	ND	N/A	N/A	N/A	N/A
		Bromacil	ND	N/A	N/A	N/A	N/A

Enclosure 2

Table 3 400-SB-03 IDW Soil TCLP Metals Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	TCLP Results (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters (mg/L TCLP)
1610140838 #7329 1/8/17	1311/6010C	None	ND	N/A	N/A
1610140833 #7330 1/8/17		Chromium Zinc	0.064 0.31	5.0 N/A	0.60 4.3
1610140843 #7338 1/9/17		Zinc	0.12	N/A	4.3

Table 4 400-SB-03 IDW Soil Total Metals Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
1610140832 #7330 1/8/17	6010C	Antimony	0.7BJ	5.19E+02	1.42E+02
		Arsenic	3.6	2.15E+01	5.74E+01
		Barium	105	2.55E+05	4.39E+03
		Beryllium	0.40	2.58E+03	1.48E+02
		Cadmium	0.27J	1.11E+03	7.21E+01
		Chromium	6.6	5.05E+02	1.34E+02
		Lead	7.0	8.00E+02	8.00E+02
		Nickel	8.0	2.57E+04	7.53E+02
		Selenium	0.7J	6.49E+03	1.75E+03
		Thallium	4.7	1.30E+01	3.54E+00
		Vanadium	11.9	6.53E+03	6.14E+02
Zinc	40.7	3.89E+05	1.06E+05		
1610140837 #7329 1/8/17	6010C	Arsenic	4.49	2.15E+01	5.74E+01
		Barium	83.3	2.55E+05	4.39E+03
		Beryllium	0.48	2.58E+03	1.48E+02
		Cadmium	0.30J	1.11E+03	7.21E+01
		Chromium	9.03	5.05E+02	1.34E+02
		Lead	8.7	8.00E+02	8.00E+02
		Nickel	8.8	2.57E+04	7.53E+02
		Thallium	1.92	1.30E+01	3.54E+00
		Vanadium	15.1	6.53E+03	6.14E+02
Zinc	38.1	3.89E+05	1.06E+05		
1610140842 #7338 1/9/17	6010C	Arsenic	5.5	2.15E+01	5.74E+01
		Barium	86.4	2.55E+05	4.39E+03
		Beryllium	0.47	2.58E+03	1.48E+02

Enclosure 2

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
1610140842 #7338 1/9/17 cont.		Cadmium	0.35J	1.11E+03	7.21E+01
		Chromium	10.9	5.05E+02	1.34E+02
		Lead	8.4	8.00E+02	8.00E+02
		Nickel	9.7	2.57E+04	7.53E+02
		Silver	0.7J	6.49E+03	1.77E+03
		Thallium	2.0	1.30E+01	3.54E+00
		Vanadium	13.5	6.53E+03	6.14E+02
		Zinc	43.8	3.89E+05	1.06E+05

Enclosure 2

Table 5 400-SB-04 IDW Soil VOC Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
<u>1610040800</u> #7287 12/21/16	8260C	Dichloromethane	0.00099J	N/A	30	N/A	N/A
<u>1610040801</u> #7287 12/21/16		Dichloromethane	0.0008J	N/A	30	N/A	N/A
<u>1610040820</u> #7288 12/21/16		Acetone Dichloromethane	0.0032J 0.00067J	N/A N/A	160 30	9.60E+05 N/A	2.42E+05 N/A
<u>1610040840</u> #7294 12/22/16		Acetone Dichloromethane	0.0073J 0.00077J	N/A N/A	160 30	9.60E+05 N/A	2.42E+05 N/A
<u>1610040850</u> #7295 12/23/16		Acetone Dichloromethane	0.0044J 0.0008J	N/A N/A	160 30	9.60E+05 N/A	2.42E+05 N/A
<u>1610040900</u> #7296 12/25/2016		Acetone Carbon Disulfide Dichloromethane	0.0082 0.0017J 0.0011J	N/A N/A N/A	160 2.6 30	9.60E+05 8.54E+03 N/A	2.42E+05 1.62E+03 N/A

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Table 6 400-SB-04 IDW Soil Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Analyte	Total Results (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
1610040803 #7287 12/21/16	607M	N-Nitrosodimethylamine	0.00153	N/A	2.3	5.03E-01	2.14E+00
		N-Nitrodimethylamine	0.00421	N/A	N/A	N/A	N/A
		Bromacil	0.0002J	N/A	N/A	N/A	N/A
1610040804 #7287 12/21/16		N-Nitrosodimethylamine	0.00166	N/A	2.3	5.03E-01	2.14E+00
		N-Nitrodimethylamine	0.00421	N/A	N/A	N/A	N/A
		Bromacil	ND	N/A	N/A	N/A	N/A
1610040821 #7288 12/21/16		N-Nitrosodimethylamine	0.07261	N/A	2.3	5.03E-01	2.14E+00
	N-Nitrodimethylamine	0.07058	N/A	N/A	N/A	N/A	
	Bromacil	ND	N/A	N/A	N/A	N/A	
1610040841 #7294 12/22/16	N-Nitrosodimethylamine	0.05540	N/A	2.3	5.03E-01	2.14E+00	
	N-Nitrodimethylamine	0.01649	N/A	N/A	N/A	N/A	
	Bromacil	ND	N/A	N/A	N/A	N/A	
1610040851 #7295 12/23/16	N-Nitrosodimethylamine	0.00199	N/A	2.3	5.03E-01	2.14E+00	
	N-Nitrodimethylamine	0.00083	N/A	N/A	N/A	N/A	
	Bromacil	ND	N/A	N/A	N/A	N/A	
1610040901 #7296 12/25/16	N-Nitrosodimethylamine	ND	N/A	2.3	5.03E-01	2.14E+00	
	N-Nitrodimethylamine	ND	N/A	N/A	N/A	N/A	
	Bromacil	ND	N/A	N/A	N/A	N/A	

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Table 7 400-SB-04 IDW Soil TCLP Metals Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	TCLP Results (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters (mg/L TCLP)
<u>1610040809</u> #7287 12/21/16	1311/6010C	None	ND	N/A	N/A
<u>1610040810</u> #7287 12/21/16		None	ND	N/A	N/A
<u>1610040823</u> #7288 12/21/16		None	ND	N/A	N/A
<u>1610040843</u> #7294 12/22/16		Zinc	0.13	N/A	4.3
<u>1610040853</u> #7295 12/23/16		None	ND	N/A	N/A
<u>1610040903</u> #7296 12/25/16		Nickel Zinc	0.13 0.22	N/A N/A	11 4.3

Table 8 400-SB-04 IDW Soil Total Metals Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
1610040806 #7287 12/21/16	6010C	Arsenic	3.5	2.15E+01	5.74E+01
		Barium	68.5	2.55E+05	4.39E+03
		Beryllium	0.43	2.58E+03	1.48E+02
		Cadmium	0.11J	1.11E+03	7.21E+01
		Chromium	9.5	5.05E+02	1.34E+02
		Lead	7.4	8.00E+02	8.00E+02
		Nickel	8.1	2.57E+04	7.53E+02
		Vanadium	16.8	6.53E+03	6.14E+02
		Zinc	33.8	3.89E+05	1.06E+05
1610040807 #7287 12/21/16	6010C/7471B	Arsenic	4.3	2.15E+01	5.74E+01
		Barium	81.4	2.55E+05	4.39E+03
		Beryllium	0.44	2.58E+03	1.48E+02
		Cadmium	0.11J	1.11E+03	7.21E+01
		Chromium	10.4	5.05E+02	1.34E+02
		Lead	7.6	8.00E+02	8.00E+02
		Mercury	0.004J	1.12E+02	2.07E+01
		Nickel	8.8	2.57E+04	7.53E+02
		Thallium	1.1	1.30E+01	3.54E+00
		Vanadium	18.5	6.53E+03	6.14E+02
		Zinc	32.1	3.89E+05	1.06E+05
1610040822 #7288 12/21/16	6010C/7471B	Arsenic	4.1	2.15E+01	5.74E+01
		Barium	72.3	2.55E+05	4.39E+03
		Beryllium	0.30 J	2.58E+03	1.48E+02
		Cadmium	0.10J	1.11E+03	7.21E+01
		Chromium	10.5	5.05E+02	1.34E+02
		Lead	8.0	8.00E+02	8.00E+02
		Mercury	0.005J	1.12E+02	2.07E+01
		Nickel	6.1	2.57E+04	7.53E+02
		Thallium	1.0	1.30E+01	3.54E+00
		Vanadium	10.7	6.53E+03	6.14E+02
Zinc	29.6	3.89E+05	1.06E+05		
1610040842 #7294 12/22/16	6010C	Arsenic	5.7	2.15E+01	5.74E+01
		Barium	115	2.55E+05	4.39E+03
		Beryllium	0.46	2.58E+03	1.48E+02
		Cadmium	0.14J	1.11E+03	7.21E+01
		Chromium	37.5	5.05E+02	1.34E+02
		Lead	8.1	8.00E+02	8.00E+02
		Nickel	9.6	2.57E+04	7.53E+02

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Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
		Vanadium	15.9	6.53E+03	6.14E+02
		Zinc	44.0	3.89E+05	1.06E+05
1610040852 #7295 12/23/16	6010C/7471B	Arsenic	3.8	2.15E+01	5.74E+01
		Barium	58.5	2.55E+05	4.39E+03
		Beryllium	0.27J	2.58E+03	1.48E+02
		Cadmium	0.09J	1.11E+03	7.21E+01
		Chromium	8.3	5.05E+02	1.34E+02
		Lead	4.3J	8.00E+02	8.00E+02
		Mercury	0.004J	1.12E+02	2.07E+01
		Nickel	6.0	2.57E+04	7.53E+02
		Thallium	1.0	1.30E+01	3.54E+00
		Vanadium	9.3	6.53E+03	6.14E+02
		Zinc	30.1	3.89E+05	1.06E+05
1610040902 #7296 12/25/16	6010C	Arsenic	4.8	2.15E+01	5.74E+01
		Barium	106	2.55E+05	4.39E+03
		Beryllium	0.41	2.58E+03	1.48E+02
		Cadmium	0.13J	1.11E+03	7.21E+01
		Chromium	23.8	5.05E+02	1.34E+02
		Lead	7.7	8.00E+02	8.00E+02
		Nickel	7.5	2.57E+04	7.53E+02
		Thallium	2.5	1.30E+01	3.54E+00
		Vanadium	11.5	6.53E+03	6.14E+02
		Zinc	45.6	3.89E+05	1.06E+05

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Table 9 400-SB-10 IDW Soil VOC Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
1610231100 #7350 1/17/17	8260C	Acetone	0.0037J	N/A	30	9.60E+05	2.42E+05
1610231104 #7349 1/17/17		Acetone	0.0046J	N/A	30	9.60E+05	2.42E+05
1610231120 #7351 1/17/17		Acetone Tetrachloroethene	0.0043J 0.0011J	N/A 0.7	30 6.0	9.60E+05 6.29E+02	2.42E+05 1.20E+02
1610231121 #7351 1/17/17		Acetone Tetrachloroethene	0.0049J 0.0011J	N/A 0.7	30 6.0	9.60E+05 6.29E+02	2.42E+05 1.20E+02

Table 10 400-SB-10 IDW Soil Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
1610231101 #7350 1/17/17	607M	N-Nitrosodimethylamine	ND	N/A	2.3	5.03E-01	2.14E+00
1610231105 #7349 1/17/17		N-Nitrodimethylamine	ND	N/A	N/A	N/A	N/A
		Bromacil	ND	N/A	N/A	N/A	N/A
		N-Nitrosodimethylamine	ND	N/A	2.3	5.03E-01	2.14E+00
1610231123 #7351 1/17/17		N-Nitrodimethylamine	ND	N/A	N/A	N/A	N/A
		Bromacil	ND	N/A	N/A	N/A	N/A
		N-Nitrosodimethylamine	ND	N/A	2.3	5.03E-01	2.14E+00
1610231105 #7349 1/17/17		N-Nitrodimethylamine	ND	N/A	N/A	N/A	N/A
		Bromacil	ND	N/A	N/A	N/A	N/A
	N-Nitrosodimethylamine	ND	N/A	2.3	5.03E-01	2.14E+00	
1610231123 #7351 1/17/17	N-Nitrodimethylamine	ND	N/A	N/A	N/A	N/A	
	Bromacil	ND	N/A	N/A	N/A	N/A	
	N-Nitrosodimethylamine	ND	N/A	2.3	5.03E-01	2.14E+00	

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Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
1610231124 #7351 1/17/17		N-Nitrosodimethylamine N-Nitrodimethylamine Bromacil	ND ND ND	N/A N/A N/A	2.3 N/A N/A	5.03E-01 N/A N/A	2.14E+00 N/A N/A

Table 11 400-SB-10 IDW Soil TCLP Metals Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	TCLP Results (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters (mg/L TCLP)
1610231103 #7350 1/17/17	1311/6010C	None	ND	N/A	N/A
1610231107 #7349 1/17/17		None	ND	N/A	N/A
1610231129 #7351 1/17/17		Barium	3.6	100	21
1610231130 #7351 1/17/17		Barium	3.1	100	21

Table 12 400-SB-10 IDW Soil Total Metals Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
1610231102 #7350 1/17/17	6010C	Arsenic	4.0	2.15E+01	5.74E+01
		Barium	78.2	2.55E+05	4.39E+03
		Beryllium	0.41	2.58E+03	1.48E+02
		Cadmium	0.48J	1.11E+03	7.21E+01
		Chromium	8.0	5.05E+02	1.34E+02
		Lead	11.4	8.00E+02	8.00E+02
		Nickel	7.4	2.57E+04	7.53E+02
		Selenium	1.3	6.49E+03	1.75E+03
		Vanadium	15.0	6.53E+03	6.14E+02
Zinc	51.6	3.89E+05	1.06E+05		
1610231106 #7349 1/17/17	6010C	Arsenic	4.1	2.15E+01	5.74E+01
		Barium	141	2.55E+05	4.39E+03
		Beryllium	0.41	2.58E+03	1.48E+02
		Cadmium	0.31J	1.11E+03	7.21E+01
		Chromium	12.9	5.05E+02	1.34E+02
		Lead	11.2	8.00E+02	8.00E+02
		Nickel	9.3	2.57E+04	7.53E+02
		Selenium	1.1	6.49E+03	1.75E+03
		Vanadium	12.4	6.53E+03	6.14E+02
Zinc	40.4	3.89E+05	1.06E+05		

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Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
<u>1610231126</u> #7351 1/17/17	6010C	Arsenic	5.8	2.15E+01	5.74E+01
		Barium	204	2.55E+05	4.39E+03
		Beryllium	0.45	2.58E+03	1.48E+02
		Cadmium	0.34J	1.11E+03	7.21E+01
		Chromium	12.9	5.05E+02	1.34E+02
		Lead	9.7	8.00E+02	8.00E+02
		Nickel	10.1	2.57E+04	7.53E+02
		Vanadium	12.5	6.53E+03	6.14E+02
		Zinc	44.3	3.89E+05	1.06E+05
<u>1610231127</u> #7351 1/17/17	6010C	Arsenic	4.85	2.15E+01	5.74E+01
		Barium	237	2.55E+05	4.39E+03
		Beryllium	0.47	2.58E+03	1.48E+02
		Cadmium	0.41J	1.11E+03	7.21E+01
		Chromium	12.3	5.05E+02	1.34E+02
		Lead	12.1	8.00E+02	8.00E+02
		Nickel	10.3	2.57E+04	7.53E+02
		Vanadium	12.5	6.53E+03	6.14E+02
		Zinc	44.5	3.89E+05	1.06E+05

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Table 13 400-SB-12 IDW Soil VOC Analytical Detection Summary (400-SB-12)

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration in (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
1610130940 #7327 1/6/17	8260C	None	ND	N/A	N/A	N/A	N/A
1610130950 #7328 1/7/17		Acetone	0.0033J	N/A	30	9.60E+05	2.42E+05
1610130945 #7331 1/6/17		None	ND	N/A	N/A	N/A	N/A

Table 14 400-SB-12 IDW Soil Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
1610130941 #7327 1/6/17	607M	N- Nitrosodimethylamine	ND	N/A	2.3	5.03E-01	2.14E+00
1610130951 #7328 1/7/17		N-Nitrodimethylamine	ND	N/A	N/A	N/A	N/A
		Bromacil	ND	N/A	N/A	N/A	N/A
		N- Nitrosodimethylamine	ND	N/A	2.3	5.03E-01	2.14E+00
1610130946 #7331 1/6/17		N-Nitrodimethylamine	ND	N/A	N/A	N/A	N/A
		Bromacil	ND	N/A	N/A	N/A	N/A
		N- Nitrosodimethylamine	ND	N/A	2.3	5.03E-01	2.14E+00
1610130946 #7331 1/6/17		N-Nitrodimethylamine	ND	N/A	N/A	N/A	N/A
		Bromacil	ND	N/A	N/A	N/A	N/A
	N- Nitrosodimethylamine	ND	N/A	2.3	5.03E-01	2.14E+00	

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Table 15 400-SB-12 IDW Soil TCLP Metals Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	TCLP Results (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters (mg/L TCLP)
<u>1610130943</u> #7327 1/6/17	1311/6010C	Barium	4.6	100	21
<u>1610130953</u> #7328 1/7/16		None	ND	N/A	N/A
<u>1610130948</u> #7331 1/6/17		Lead	0.084	5.0	0.7

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Table 16 400-SB-12 IDW Soil Total Metals Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
1610130942 #7327 1/6/17	6010C	Arsenic	5.7	2.15E+01	5.74E+01
		Barium	643	2.55E+05	4.39E+03
		Beryllium	0.46	2.58E+03	1.48E+02
		Cadmium	0.41J	1.11E+03	7.21E+01
		Chromium	8.4	5.05E+02	1.34E+02
		Lead	9.0	8.00E+02	8.00E+02
		Nickel	9.3	2.57E+04	7.53E+02
		Thallium	2.9	1.30E+01	3.54E+00
		Vanadium	17.8	6.53E+03	6.14E+02
		Zinc	43.1	3.89E+05	1.06E+05
1610130952 #7328 1/7/16	6010C	Arsenic	5.91	2.15E+01	5.74E+01
		Barium	63.1	2.55E+05	4.39E+03
		Beryllium	0.46	2.58E+03	1.48E+02
		Cadmium	0.41J	1.11E+03	7.21E+01
		Chromium	11.9	5.05E+02	1.34E+02
		Lead	10.3	8.00E+02	8.00E+02
		Nickel	9.9	2.57E+04	7.53E+02
		Thallium	2.49	1.30E+01	3.54E+00
		Vanadium	14.2	6.53E+03	6.14E+02
		Zinc	41.3	3.89E+05	1.06E+05
1610130947 #7331 1/6/17	6010C	Arsenic	4.24	2.15E+01	5.74E+01
		Barium	53.4	2.55E+05	4.39E+03
		Beryllium	0.42	2.58E+03	1.48E+02
		Cadmium	0.40J	1.11E+03	7.21E+01
		Chromium	10.3	5.05E+02	1.34E+02
		Lead	9.5	8.00E+02	8.00E+02
		Nickel	9.0	2.57E+04	7.53E+02
		Thallium	2.11	1.30E+01	3.54E+00
		Vanadium	14.8	6.53E+03	6.14E+02
		Zinc	37.3	3.89E+05	1.06E+05

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Table 17 400-SB-15 IDW Soil VOC Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
<u>1610130850</u> #7321 1/3/17	8260C	None	ND	N/A	N/A	N/A	N/A
<u>1610130851</u> #7321 1/3/17		Acetone	0.0032J	N/A	30	9.60E+05	2.42E+05
<u>1610130905</u> #7322 1/3/17		None	ND	N/A	N/A	N/A	N/A
<u>1610130915</u> #7326 1/4/17		None	ND	N/A	N/A	N/A	N/A

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Table 18 400-SB-15 IDW Soil Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Analyte	Total Results (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
<u>1610130853</u> #7321 1/3/17	607M	N-Nitrosodimethylamine	ND	N/A	2.3	5.03E-01	2.14E+00
		N-Nitrodimethylamine	ND	N/A	N/A	N/A	N/A
		Bromacil	ND	N/A	N/A	N/A	N/A
<u>1610130854</u> #7321 1/3/17		N-Nitrosodimethylamine	ND	N/A	2.3	5.03E-01	2.14E+00
		N-Nitrodimethylamine	ND	N/A	N/A	N/A	N/A
		Bromacil	ND	N/A	N/A	N/A	N/A
<u>1610130906</u> #7322 1/3/17		N-Nitrosodimethylamine	ND	N/A	2.3	5.03E-01	2.14E+00
		N-Nitrodimethylamine	ND	N/A	N/A	N/A	N/A
		Bromacil	ND	N/A	N/A	N/A	N/A
<u>1610130916</u> #7326 1/4/17		N-Nitrosodimethylamine	ND	N/A	2.3	5.03E-01	2.14E+00
		N-Nitrodimethylamine	ND	N/A	N/A	N/A	N/A
		Bromacil	ND	N/A	N/A	N/A	N/A

Table 19 400-SB-15 IDW Soil TCLP Metals Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	TCLP Results (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters (mg/L TCLP)
1610130859 #7321 1/3/17	1311/6010C	Barium	3.8	100	21
1610130900 #7321 1/3/17		Barium	3.5	100	21
1610130908 #7322 1/3/17		None	ND	N/A	N/A
1610130918 #7326 1/4/17		None	ND	N/A	N/A

Table 20 400-SB-15 IDW Soil Total Metals Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
1610130856 #7321 1/3/17	6010C	Arsenic	5.8	2.15E+01	5.74E+01
		Barium	178	2.55E+05	4.39E+03
		Beryllium	0.47	2.58E+03	1.48E+02
		Cadmium	0.53	1.11E+03	7.21E+01
		Chromium	7.2	5.05E+02	1.34E+02
		Lead	9.8	8.00E+02	8.00E+02
		Nickel	9.1	2.57E+04	7.53E+02
		Thallium	3.9	1.30E+01	3.54E+00
		Vanadium	14.1	6.53E+03	6.14E+02
		Zinc	49.4	3.89E+05	1.06E+05
1610130857 #7321 1/3/17		Arsenic	5.5	2.15E+01	5.74E+01
		Barium	170	2.55E+05	4.39E+03
		Beryllium	0.47	2.58E+03	1.48E+02
		Cadmium	0.38J	1.11E+03	7.21E+01
		Chromium	6.5	5.05E+02	1.34E+02
		Lead	16.3	8.00E+02	8.00E+02
		Nickel	8.2	2.57E+04	7.53E+02
		Thallium	3.1	1.30E+01	3.54E+00
1610130907 #7322 1/3/17		Vanadium	12.7	6.53E+03	6.14E+02
		Zinc	44.7	3.89E+05	1.06E+05
	Arsenic	4.20	2.15E+01	5.74E+01	
	Barium	89.0	2.55E+05	4.39E+03	
		Beryllium	0.41	2.58E+03	1.48E+02

Enclosure 2

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
1610130907 #7322 1/3/17 cont.		Cadmium	0.33J	1.11E+03	7.21E+01
		Chromium	8.41	5.05E+02	1.34E+02
		Lead	6.4	8.00E+02	8.00E+02
		Nickel	6.6	2.57E+04	7.53E+02
		Thallium	2.48	1.30E+01	3.54E+00
		Vanadium	13.7	6.53E+03	6.14E+02
		Zinc	29.9	3.89E+05	1.06E+05
1610130917 #7326 1/4/17		Arsenic	5.2	2.15E+01	5.74E+01
		Barium	127	2.55E+05	4.39E+03
		Beryllium	0.43	2.58E+03	1.48E+02
		Cadmium	0.40J	1.11E+03	7.21E+01
		Chromium	9.7	5.05E+02	1.34E+02
		Lead	9.4	8.00E+02	8.00E+02
		Nickel	8.4	2.57E+04	7.53E+02
	Selenium	0.9J	6.49E+03	1.75E+03	
	Thallium	2.7	1.30E+01	3.54E+00	
	Vanadium	12.9	6.53E+03	6.14E+02	
	Zinc	46.6	3.89E+05	1.06E+05	

Table Notes:

J: Indicates result concentration is between the method reporting limit and the method detection limit.

ND: Indicates not detected.

N/A: Indicates not applicable.



October 20, 2016

Service Request No:R1610541

Mr. Tom Hall
NASA/WSTF/Navarro
P.O. Box 20
Las Cruces, NM 88004

Laboratory Results for: White Sands Test Facility

Dear Mr.Hall,

Enclosed are the results of the sample(s) submitted to our laboratory October 05, 2016
For your reference, these analyses have been assigned our service request number **R1610541**.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAP standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report. The measurement uncertainty of the results included in this report is within that expected when using the prescribed method(s) for analysis of these samples, and represented by Laboratory Control Sample control limits. Any events, such as QC failures, which may add to the uncertainty are explained in the report narrative.

Please contact me if you have any questions. My extension is 7472. You may also contact me via email at Janice.Jaeger@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Janice Jaeger
Project Manager

ADDRESS 1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
PHONE +1 585 288 5380 | **FAX** +1 585 288 8475
ALS Group USA, Corp.
dba ALS Environmental



Narrative Documents

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com



Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request:R1610541
Date Received:10/5/16

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables, including results of QC samples analyzed from this delivery group. Analytical procedures performed by the lab are validated in accordance with NELAC standards. Any parameters that are not included in the lab's NELAC accreditation are identified on a "Non-Certified Analytes" report in the Miscellaneous Forms Section of this report. Individual analytical results requiring further explanation are flagged with qualifiers and/or discussed below. The flags are explained in the Report Qualifiers and Definitions page in the Miscellaneous Forms section of this report.

Sample Receipt

Eighteen soil samples were received for analysis at ALS Environmental on 10/5/16. Any discrepancies noted upon initial sample inspection are noted on the cooler receipt and preservation form included in this data package. The samples were received in good condition and consistent with the accompanying chain of custody form. Samples are refrigerated at $\leq 6^{\circ}\text{C}$ upon receipt at the lab except for aqueous samples designated for metals analyses, which are stored at room temperature.

Volatile Organic Analyses:

No significant anomalies were noted with this analysis.

Metals Analyses:

No significant anomalies were noted with this analysis.

General Chemistry Analyses:

No significant anomalies were noted with this analysis.

Approved by  Date 10/20/2016



SAMPLE DETECTION SUMMARY

CLIENT ID: 1610040800 IBC 7287 Lab ID: R1610541-001

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	95.1				Percent	ALS SOP
Dichloromethane	0.99	J	0.60	5.3	ug/Kg	8260C

CLIENT ID: 1610040801 IBC 7287 Lab ID: R1610541-002

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	96.1				Percent	ALS SOP
Dichloromethane	0.80	J	0.60	5.2	ug/Kg	8260C

CLIENT ID: 1610040806 IBC 7287 Lab ID: R1610541-003

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	96.0				Percent	ALS SOP
Arsenic, Total	3.5		0.3	1.0	mg/Kg	6010C
Barium, Total	68.5		0.2	2.1	mg/Kg	6010C
Beryllium, Total	0.43		0.02	0.31	mg/Kg	6010C
Cadmium, Total	0.11	J	0.04	0.52	mg/Kg	6010C
Chromium, Total	9.5		0.2	1.0	mg/Kg	6010C
Lead, Total	7.4		0.3	5.2	mg/Kg	6010C
Nickel, Total	8.1		0.2	4.2	mg/Kg	6010C
Vanadium, Total	16.8		0.2	5.2	mg/Kg	6010C
Zinc, Total	33.8		0.2	2.1	mg/Kg	6010C

CLIENT ID: 1610040807 IBC 7287 Lab ID: R1610541-004

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	95.4				Percent	ALS SOP
Arsenic, Total	4.3		0.3	1.0	mg/Kg	6010C
Barium, Total	81.4		0.2	2.1	mg/Kg	6010C
Beryllium, Total	0.44		0.02	0.31	mg/Kg	6010C
Cadmium, Total	0.11	J	0.04	0.52	mg/Kg	6010C
Chromium, Total	10.4		0.2	1.0	mg/Kg	6010C
Lead, Total	7.6		0.3	5.2	mg/Kg	6010C
Mercury, Total	0.004	J	0.003	0.033	mg/Kg	7471B
Nickel, Total	8.8		0.2	4.2	mg/Kg	6010C
Thallium, Total	1.1		0.6	1.0	mg/Kg	6010C
Vanadium, Total	18.5		0.2	5.2	mg/Kg	6010C
Zinc, Total	32.1		0.2	2.1	mg/Kg	6010C

CLIENT ID: 1610040820 IBC 7288 Lab ID: R1610541-007

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.0				Percent	ALS SOP
Acetone	3.2	J	2.9	5.2	ug/Kg	8260C
Dichloromethane	0.67	J	0.59	5.2	ug/Kg	8260C



SAMPLE DETECTION SUMMARY

CLIENT ID: 1610040822 IBC 7288 **Lab ID: R1610541-008**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.0				Percent	ALS SOP
Arsenic, Total	4.1		0.3	1.0	mg/Kg	6010C
Barium, Total	72.3		0.2	2.1	mg/Kg	6010C
Beryllium, Total	0.30	J	0.02	0.31	mg/Kg	6010C
Cadmium, Total	0.10	J	0.04	0.52	mg/Kg	6010C
Chromium, Total	10.5		0.2	1.0	mg/Kg	6010C
Lead, Total	8.0		0.3	5.2	mg/Kg	6010C
Mercury, Total	0.005	J	0.003	0.033	mg/Kg	7471B
Nickel, Total	6.1		0.2	4.1	mg/Kg	6010C
Thallium, Total	1.0		0.6	1.0	mg/Kg	6010C
Vanadium, Total	10.7		0.2	5.2	mg/Kg	6010C
Zinc, Total	29.6		0.2	2.1	mg/Kg	6010C

CLIENT ID: 1610040840 IBC 7294 **Lab ID: R1610541-010**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	96.9				Percent	ALS SOP
Acetone	7.3		2.9	5.2	ug/Kg	8260C
Dichloromethane	0.77	J	0.59	5.2	ug/Kg	8260C

CLIENT ID: 1610040842 IBC 7294 **Lab ID: R1610541-011**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	96.7				Percent	ALS SOP
Arsenic, Total	5.7		0.3	1.0	mg/Kg	6010C
Barium, Total	115		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.46		0.02	0.31	mg/Kg	6010C
Cadmium, Total	0.14	J	0.04	0.51	mg/Kg	6010C
Chromium, Total	37.5		0.2	1.0	mg/Kg	6010C
Lead, Total	8.1		0.3	5.1	mg/Kg	6010C
Nickel, Total	9.6		0.2	4.1	mg/Kg	6010C
Vanadium, Total	15.9		0.2	5.1	mg/Kg	6010C
Zinc, Total	44.0		0.2	2.0	mg/Kg	6010C

CLIENT ID: 1610040850 IBC 7295 **Lab ID: R1610541-013**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	96.1				Percent	ALS SOP
Acetone	4.4	J	3.0	5.2	ug/Kg	8260C
Dichloromethane	0.80	J	0.60	5.2	ug/Kg	8260C

CLIENT ID: 1610040852 IBC 7295 **Lab ID: R1610541-014**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	95.5				Percent	ALS SOP
Arsenic, Total	3.8		0.3	1.0	mg/Kg	6010C
Barium, Total	58.5		0.2	2.1	mg/Kg	6010C



SAMPLE DETECTION SUMMARY

CLIENT ID: 1610040852 IBC 7295 **Lab ID: R1610541-014**

Analyte	Results	Flag	MDL	PQL	Units	Method
Beryllium, Total	0.27	J	0.02	0.31	mg/Kg	6010C
Cadmium, Total	0.09	J	0.04	0.52	mg/Kg	6010C
Chromium, Total	8.3		0.2	1.0	mg/Kg	6010C
Lead, Total	4.3	J	0.3	5.2	mg/Kg	6010C
Mercury, Total	0.004	J	0.003	0.033	mg/Kg	7471B
Nickel, Total	6.0		0.2	4.2	mg/Kg	6010C
Thallium, Total	1.0		0.6	1.0	mg/Kg	6010C
Vanadium, Total	9.3		0.2	5.2	mg/Kg	6010C
Zinc, Total	30.1		0.2	2.1	mg/Kg	6010C

CLIENT ID: 1610040900 IBC 7296 **Lab ID: R1610541-016**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	87.3				Percent	ALS SOP
Acetone	8.2		3.3	5.8	ug/Kg	8260C
Carbon Disulfide	1.7	J	1.5	5.8	ug/Kg	8260C
Dichloromethane	1.1	J	0.66	5.8	ug/Kg	8260C

CLIENT ID: 1610040902 IBC 7296 **Lab ID: R1610541-017**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	90.7				Percent	ALS SOP
Arsenic, Total	4.8		0.3	1.1	mg/Kg	6010C
Barium, Total	106		0.2	2.2	mg/Kg	6010C
Beryllium, Total	0.41		0.02	0.33	mg/Kg	6010C
Cadmium, Total	0.13	J	0.04	0.55	mg/Kg	6010C
Chromium, Total	23.8		0.2	1.1	mg/Kg	6010C
Lead, Total	7.7		0.4	5.5	mg/Kg	6010C
Nickel, Total	7.5		0.2	4.4	mg/Kg	6010C
Thallium, Total	2.5		0.6	1.1	mg/Kg	6010C
Vanadium, Total	11.5		0.2	5.5	mg/Kg	6010C
Zinc, Total	45.6		0.2	2.2	mg/Kg	6010C



Sample Receipt Information

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request:R1610541

SAMPLE CROSS-REFERENCE

<u>SAMPLE #</u>	<u>CLIENT SAMPLE ID</u>	<u>DATE</u>	<u>TIME</u>
R1610541-001	1610040800 IBC 7287	10/4/2016	
R1610541-002	1610040801 IBC 7287	10/4/2016	
R1610541-003	1610040806 IBC 7287	10/4/2016	
R1610541-004	1610040807 IBC 7287	10/4/2016	
R1610541-005	1610040809 IBC 7287	10/4/2016	
R1610541-006	1610040810 IBC 7287	10/4/2016	
R1610541-007	1610040820 IBC 7288	10/4/2016	
R1610541-008	1610040822 IBC 7288	10/4/2016	
R1610541-009	1610040823 IBC 7288	10/4/2016	
R1610541-010	1610040840 IBC 7294	10/4/2016	
R1610541-011	1610040842 IBC 7294	10/4/2016	
R1610541-012	1610040843 IBC 7294	10/4/2016	
R1610541-013	1610040850 IBC 7295	10/4/2016	
R1610541-014	1610040852 IBC 7295	10/4/2016	
R1610541-015	1610040853 IBC 7295	10/4/2016	
R1610541-016	1610040900 IBC 7296	10/4/2016	
R1610541-017	1610040902 IBC 7296	10/4/2016	
R1610541-018	1610040903 IBC 7296	10/4/2016	

Laboratory: ALS Group USA, Corp. dba ALS Environmental		PO #15EC092B <i>07B 25 per Tom Hall</i>		Analytical Requirements			Special Instructions Return coolers and reusable packaging materials within 14 days as required in statement of work to: Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Lori Minnick	
Address shipping questions to: <input type="checkbox"/> Lori Minnick, 575-524-5119 <input checked="" type="checkbox"/> Other <u>Tom Hall</u> , 575-524-5453		<i>WMS 10/5/16</i>		Total Volatile Organics SW-846 Method 8260B 4 oz. Glass Jar, Ice	Total Metals SW-846-6010C and 7470A 4 oz. Glass Jar, Ice	TCLP Metals EPA Method 1311 incorporating SW-846-6010C and 7470A 8 oz. Glass Jar, Ice		Charge Number (WTSF Use Only)
Send sample receipt confirmation and analytical reports to: <input type="checkbox"/> Carlyn Tufts, carlyn.a.tufts@nasa.gov <input type="checkbox"/> Shelly Hernandez, shelly.j.hernandez@nasa.gov <input checked="" type="checkbox"/> Tom Hall, tom.a.hall@nasa.gov		# of Containers	Sample Matrix*				Comments	
Sample Number	Sample Location							
1610040800	IBC 7287	1	S	X			16EEE4IFW	
1610040801	IBC 7287	1	S	X			16EEE4IFW	
1610040802	IBC 7287	1	S	X			16EEE4IFW	Matrix Spike for 1610040800
1610040806	IBC 7287	1	S		X		16EEE4IFW	
1610040807	IBC 7287	1	S		X		16EEE4IFW	
1610040808	IBC 7287	1	S		X		16EEE4IFW	Matrix Spike for 1610040806
1610040809	IBC 7287	1	S			X	16EEE4IFW	
1610040810	IBC 7287	1	S			X	16EEE4IFW	
1610040811	IBC 7287	1	S			X	16EEE4IFW	Matrix Spike for 1610040809
1610040820	IBC 7288	1	S	X			16EEE4IFW	
1610040822	IBC 7288	1	S		X		16EEE4IFW	
1610040823	IBC 7288	1	S			X	16EEE4IFW	
1610040840	IBC 7294	1	S	X			16EEE4IFW	
1610040842	IBC 7294	1	S		X		16EEE4IFW	
1610040843	IBC 7294	1	S			X	16EEE4IFW	

* Sample Matrix: A – Aqueous; G – Gaseous; S – Solid

R1610541

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NASA/WSTF/Navarro
White Sands Test Facility



Laboratory: ALS Group USA, Corp. dba ALS Environmental		PO #15EC092B		Analytical Requirements			Special Instructions Return coolers and reusable packaging materials within 14 days as required in statement of work to: Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Lori Minnick	
Address shipping questions to: <input type="checkbox"/> Lori Minnick, 575-524-5119 <input checked="" type="checkbox"/> Other <u>Tom Hall, 575-524-5453</u>				Total Volatile Organics SW-846 Method 8260B 4 oz. Glass Jar, Ice	Total Metals SW-846-6010C and 7470A 4 oz. Glass Jar, Ice	TCPLP Metals EPA Method 1311 incorporating SW-846-6010C and 7470A 8 oz. Glass Jar, Ice		Charge Number (WTSF Use Only)
Send sample receipt confirmation and analytical reports to: <input type="checkbox"/> Carlyn Tufts, carlyn.a.tufts@nasa.gov <input type="checkbox"/> Shelly Hernandez, shelly.j.hernandez@nasa.gov <input checked="" type="checkbox"/> Tom Hall, tom.a.hall@nasa.gov		# of Containers	Sample Matrix*					
Sample Number	Sample Location	# of Containers	Sample Matrix*	Total Volatile Organics SW-846 Method 8260B 4 oz. Glass Jar, Ice	Total Metals SW-846-6010C and 7470A 4 oz. Glass Jar, Ice	TCPLP Metals EPA Method 1311 incorporating SW-846-6010C and 7470A 8 oz. Glass Jar, Ice	Charge Number (WTSF Use Only)	Comments
1610040850	IBC 7295	1	S	X			16EEE4IFW	
1610040852	IBC 7295	1	S		X		16EEE4IFW	
1610040853	IBC 7295	1	S			X	16EEE4IFW	
1610040900	IBC 7296	1	S	X			16EEE4IFW	
1610040902	IBC 7296	1	S		X		16EEE4IFW	
1610040903	IBC 7296	1	S			X	16EEE4IFW	
Relinquished By: <i>[Signature]</i>		Date/Time: <i>10-4-2016 (1030)</i>		Accepted By: <i>[Signature]</i>			Date/Time: <i>10-5-16 09:50</i>	

* Sample Matrix: A – Aqueous; G – Gaseous; S – Solid

R1610541
NASA/WSTF/Navarro
White Sands Test Facility

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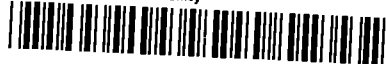


Cooler Receipt and Preservation Check Form

R1610541

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NASA/WSTF/Navarro
White Sands Test Facility



Project/Client NASA Folder Number _____

Cooler received on 10-5-16 by: HE

COURIER: ALS UPS FEDEX VELOCITY CLIENT

1	Were Custody seals on outside of cooler?	<u>Y</u> N
2	Custody papers properly completed (ink, signed)?	<u>Y</u> N
3	Did all bottles arrive in good condition (unbroken)?	<u>Y</u> N
4	Circle: <u>Wet Ice</u> Dry Ice Gel packs present?	<u>Y</u> N

5a	Perchlorate samples have required headspace?	<u>Y</u> N NA
5b	Did VOA vials, Alk, or Sulfide have sig* bubbles?	Y <u>N</u> NA
6	Where did the bottles originate?	<u>ALS/ROC</u> <u>CLIENT</u>
7	Soil VOA received as: Bulk Encore 5035set	<u>NA</u>

8. Temperature Readings Date: 10-5-16 Time: 10:10 ID: IR#7 IR#8 From: Temp Blank Sample Bottle

Observed Temp (°C)	<u>2.3</u>	<u>3.6</u>						
Correction Factor (°C)	<u>0</u>	<u>0</u>						
Corrected Temp (°C)	<u>2.3</u>	<u>3.6</u>						
Within 0-6°C?	<u>Y</u> N	<u>Y</u> N	Y N	Y N	Y N	Y N	Y N	Y N
If <0°C, were samples frozen?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N

If out of Temperature, note packing/ice condition: _____ Ice melted Poorly Packed Same Day Rule

& Client Approval to Run Samples: _____ Standing Approval Client aware at drop-off Client notified by: _____

All samples held in storage location: ROC by HE on 10-5-16 at 10:17
5035 samples placed in storage location: _____ by _____ on _____ at _____

Cooler Breakdown: Date: 10-6-16 Time: 11:15 by: TS

- Were all bottle labels complete (i.e. analysis, preservation, etc.)? YES NO
- Did all bottle labels and tags agree with custody papers? YES NO
- Were correct containers used for the tests indicated? YES NO
- Were 5035 vials acceptable (no extra labels, not leaking)? YES NO
- Air Samples: Cassettes / Tubes Intact Canisters Pressurized Tedlar® Bags Inflated NA NA

Explain any discrepancies:

pH	Reagent	Yes	No	Lot Received	Exp	Sample ID	Vol. Added	Lot Added	Final pH
≥12	NaOH								
≤2	HNO ₃								
≤2	H ₂ SO ₄								
<4	NaHSO ₄								
Residual Chlorine (-)	For CN Phenol and 522			If +, contact PM to add Na ₂ S ₂ O ₃ (CN), ascorbic (phenol).					
	Na ₂ S ₂ O ₃	-	-						
	ZnAcetate	-	-						
	HCl	**	**						

Yes=All samples OK

No=Samples were preserved at The lab as listed

PM OK to Adjust:

**Not to be tested before analysis – pH tested and recorded by VOAs on a separate worksheet

Bottle lot numbers: Client work
Other Comments:

CLRES	<u>BULK</u>
DO	FLDT
HPROD	HGFB
HTR	LL3541
PH	<u>SUB</u>
SO3	MARRS
ALS	REV

PC Secondary Review: AMW 10/10/16 *significant air bubbles: VOA > 5-6 mm : WC > 1 in. diameter

ALS Environmental Chain of Custody

1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX: 585-288-8475

ALS Contact: Janice Jaeger

Project Number: R1610541
Project Manager: Janice Jaeger
QAP: LAB QAP

Lab Code	Sample ID	# of Cont.	Matrix	Sample		Lab ID	Ag TCLP 6010C	As TCLP 6010C	Ba TCLP 6010C	Be TCLP 6010C	Cd TCLP 6010C	Cr TCLP 6010C	Hg TCLP 7470A	Ni TCLP 6010C	Pb TCLP 6010C	
				Date	Time											
1610541-005	1610040809 IBC 7287	QC	2	Soil	10/4/16		Middletown ALS	X	X	X	X	X	X	X	X	X
1610541-006	1610040810 IBC 7287		1	Soil	10/4/16		Middletown ALS	X	X	X	X	X	X	X	X	X
1610541-007	1610040823 IBC 7288		1	Soil	10/4/16		Middletown ALS	X	X	X	X	X	X	X	X	X
1610541-008	1610040843 IBC 7294		1	Soil	10/4/16		Middletown ALS	X	X	X	X	X	X	X	X	X
1610541-009	1610040853 IBC 7295		1	Soil	10/4/16		Middletown ALS	X	X	X	X	X	X	X	X	X
1610541-010	1610040903 IBC 7296		1	Soil	10/4/16		Middletown ALS	X	X	X	X	X	X	X	X	X

Folder Comments:
ND U

Special Instructions/Comments <p style="font-size: 1.2em; font-family: cursive;">NABA/WSTF EDD</p> <p>H - Test is On Hold P - Test is Authorized for Prep Only</p>	Turnaround Requirements <input type="checkbox"/> RUSH (Surcharges Apply) PLEASE CIRCLE WORK DAYS 1 2 3 4 5 <input checked="" type="checkbox"/> STANDARD Requested FAX Date: _____ Requested Report Date: <u>10/14/16</u>	Report Requirements <input type="checkbox"/> I. Results Only <input checked="" type="checkbox"/> II. Results + QC Summaries <input type="checkbox"/> III. Results + QC and Calibration Summaries <input type="checkbox"/> IV. Data Validation Report with Raw Data PQL/MDL/J <u>Y</u> EDD <u>Y</u>	Invoice Information <hr/> PO# 58R1610541 <hr/> Bill to
---	--	---	--

Relinquished By: 10-10-16 12:50

Received By: _____

Airbill Number: _____



Miscellaneous Forms

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

REPORT QUALIFIERS AND DEFINITIONS

<p>U Analyte was analyzed for but not detected. The sample quantitation limit has been corrected for dilution and for percent moisture, unless otherwise noted in the case narrative.</p> <p>J Estimated value due to either being a Tentatively Identified Compound (TIC) or that the concentration is between the MRL and the MDL. Concentrations are not verified within the linear range of the calibration. For DoD: concentration >40% difference between two GC columns (pesticides/Aroclors).</p> <p>B Analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.</p> <p>E Inorganics- Concentration is estimated due to the serial dilution was outside control limits.</p> <p>E Organics- Concentration has exceeded the calibration range for that specific analysis.</p> <p>D Concentration is a result of a dilution, typically a secondary analysis of the sample due to exceeding the calibration range or that a surrogate has been diluted out of the sample and cannot be assessed.</p> <p>* Indicates that a quality control parameter has exceeded laboratory limits. Under the “Notes” column of the Form I, this qualifier denotes analysis was performed out of Holding Time.</p> <p>H Analysis was performed out of hold time for tests that have an “immediate” hold time criteria.</p> <p># Spike was diluted out.</p>	<p>+ Correlation coefficient for MSA is <0.995.</p> <p>N Inorganics- Matrix spike recovery was outside laboratory limits.</p> <p>N Organics- Presumptive evidence of a compound (reported as a TIC) based on the MS library search.</p> <p>S Concentration has been determined using Method of Standard Additions (MSA).</p> <p>W Post-Digestion Spike recovery is outside control limits and the sample absorbance is <50% of the spike absorbance.</p> <p>P Concentration >40% (25% for CLP) difference between the two GC columns.</p> <p>C Confirmed by GC/MS</p> <p>Q DoD reports: indicates a pesticide/Aroclor is not confirmed (≥100% Difference between two GC columns).</p> <p>X See Case Narrative for discussion.</p> <p>MRL Method Reporting Limit. Also known as: LOQ Limit of Quantitation (LOQ) The lowest concentration at which the method analyte may be reliably quantified under the method conditions.</p> <p>MDL Method Detection Limit. A statistical value derived from a study designed to provide the lowest concentration that will be detected 99% of the time. Values between the MDL and MRL are estimated (see J qualifier).</p> <p>LOD Limit of Detection. A value at or above the MDL which has been verified to be detectable.</p> <p>ND Non-Detect. Analyte was not detected at the concentration listed. Same as U qualifier.</p>
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Rochester Lab ID # for State Certifications¹

Connecticut ID # PH0556	Maine ID #NY0032	New Hampshire ID #
Delaware Accredited	Nebraska Accredited	294100 A/B
DoD ELAP #65817	New Jersey ID # NY004	Pennsylvania ID# 68-786
Florida ID # E87674	New York ID # 10145	Rhode Island ID # 158
Illinois ID #200047	North Carolina #676	Virginia #460167

¹ Analyses were performed according to our laboratory’s NELAP-approved quality assurance program and any applicable state or agency requirements. The test results meet requirements of the current NELAP/TNI standards or state or agency requirements, where applicable, except as noted in the case narrative. Since not all analyte/method/matrix combinations are offered for state/NELAC accreditation, this report may contain results which are not accredited. For a specific list of accredited analytes, contact the laboratory or go to <http://www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads/North-America-Downloads>

ALS Laboratory Group

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1610541

Sample Name: 1610040800 IBC 7287
Lab Code: R1610541-001
Sample Matrix: Soil

Date Collected: 10/4/16
Date Received: 10/5/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
MLAMBRECHT

Sample Name: 1610040801 IBC 7287
Lab Code: R1610541-002
Sample Matrix: Soil

Date Collected: 10/4/16
Date Received: 10/5/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
MLAMBRECHT

Sample Name: 1610040806 IBC 7287
Lab Code: R1610541-003
Sample Matrix: Soil

Date Collected: 10/4/16
Date Received: 10/5/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CGILDAY

Analyzed By
CGILDAY
CGILDAY
MLAMBRECHT

Sample Name: 1610040807 IBC 7287
Lab Code: R1610541-004
Sample Matrix: Soil

Date Collected: 10/4/16
Date Received: 10/5/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CGILDAY

Analyzed By
CGILDAY
CGILDAY
MLAMBRECHT

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1610541

Sample Name: 1610040820 IBC 7288
Lab Code: R1610541-007
Sample Matrix: Soil

Date Collected: 10/4/16
Date Received: 10/5/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
MLAMBRECHT

Sample Name: 1610040822 IBC 7288
Lab Code: R1610541-008
Sample Matrix: Soil

Date Collected: 10/4/16
Date Received: 10/5/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CGILDAY

Analyzed By
CGILDAY
CGILDAY
MLAMBRECHT

Sample Name: 1610040840 IBC 7294
Lab Code: R1610541-010
Sample Matrix: Soil

Date Collected: 10/4/16
Date Received: 10/5/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
MLAMBRECHT

Sample Name: 1610040842 IBC 7294
Lab Code: R1610541-011
Sample Matrix: Soil

Date Collected: 10/4/16
Date Received: 10/5/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CGILDAY

Analyzed By
CGILDAY
CGILDAY
MLAMBRECHT

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Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1610541

Sample Name: 1610040850 IBC 7295
Lab Code: R1610541-013
Sample Matrix: Soil

Date Collected: 10/4/16
Date Received: 10/5/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
MLAMBRECHT

Sample Name: 1610040852 IBC 7295
Lab Code: R1610541-014
Sample Matrix: Soil

Date Collected: 10/4/16
Date Received: 10/5/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CGILDAY

Analyzed By
CGILDAY
CGILDAY
MLAMBRECHT

Sample Name: 1610040900 IBC 7296
Lab Code: R1610541-016
Sample Matrix: Soil

Date Collected: 10/4/16
Date Received: 10/5/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
MLAMBRECHT

Sample Name: 1610040902 IBC 7296
Lab Code: R1610541-017
Sample Matrix: Soil

Date Collected: 10/4/16
Date Received: 10/5/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CGILDAY

Analyzed By
CGILDAY
CGILDAY
MLAMBRECHT



INORGANIC PREPARATION METHODS

The preparation methods associated with this report are found in these tables unless discussed in the case narrative.

Water/Liquid Matrix

Analytical Method	Preparation Method
200.7	200.2
200.8	200.2
6010C	3005A/3010A
6020A	ILM05.3
9014 Cyanide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Acid Soluble	9030B
9056A Bomb (Halogens)	5050A
9066 Manual Distillation	9065
SM 4500-CN-E Residual Cyanide	SM 4500-CN-G
SM 4500-CN-E WAD Cyanide	SM 4500-CN-I

Solid/Soil/Non-Aqueous Matrix

Analytical Method	Preparation Method
6010C	3050B
6020A	3050B
6010C TCLP (1311) extract	3005A/3010A
6010 SPLP (1312) extract	3005A/3010A
7196A	3060A
7199	3060A
9056A Halogens/Halides	5050
300.0 Anions/ 350.1/ 353.2/ SM 2320B/ SM 5210B/ 9056A Anions	DI extraction

For analytical methods not listed, the preparation method is the same as the analytical method reference.



Sample Results

ALS Environmental—Rochester Laboratory
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Volatile Organic Compounds by GC/MS

ALS Environmental—Rochester Laboratory

1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623

Phone (585) 288-5380 Fax (585) 288-8475

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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50

Sample Name: 1610040800 IBC 7287
Lab Code: R1610541-001

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.3	0.88	1	10/07/16 17:50	
1,1,1-Trichloroethane (TCA)	ND U	5.3	0.77	1	10/07/16 17:50	
1,1,2,2-Tetrachloroethane	ND U	5.3	0.86	1	10/07/16 17:50	
1,1,2-Trichloroethane	ND U	5.3	0.77	1	10/07/16 17:50	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.3	1.4	1	10/07/16 17:50	
1,1-Dichloroethene (1,1-DCE)	ND U	5.3	1.4	1	10/07/16 17:50	
1,2,3-Trichloropropane	ND U	5.3	1.4	1	10/07/16 17:50	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.3	2.0	1	10/07/16 17:50	
1,2-Dibromoethane	ND U	5.3	1.3	1	10/07/16 17:50	
1,2-Dichlorobenzene	ND U	5.3	0.65	1	10/07/16 17:50	
1,2-Dichloroethane	ND U	5.3	0.65	1	10/07/16 17:50	
1,2-Dichloropropane	ND U	5.3	1.1	1	10/07/16 17:50	
1,3-Dichlorobenzene	ND U	5.3	0.67	1	10/07/16 17:50	
1,4-Dioxane	ND U	110	21	1	10/07/16 17:50	
2-Butanone (MEK)	ND U	5.3	2.5	1	10/07/16 17:50	
2-Chloro-1,3-butadiene	ND U	5.3	1.6	1	10/07/16 17:50	
2-Chloroethyl Vinyl Ether	ND U	5.3	1.8	1	10/07/16 17:50	
Isobutyl Alcohol	ND U	110	24	1	10/07/16 17:50	
Allyl Chloride	ND U	5.3	1.8	1	10/07/16 17:50	
4-Methyl-2-pentanone	ND U	5.3	1.1	1	10/07/16 17:50	
Acetone	ND U	5.3	3.0	1	10/07/16 17:50	
Acetonitrile	ND U	26	18	1	10/07/16 17:50	
Acrolein	ND U	26	3.7	1	10/07/16 17:50	
Acrylonitrile	ND U	26	6.8	1	10/07/16 17:50	
Benzene	ND U	5.3	0.31	1	10/07/16 17:50	
Bromodichloromethane	ND U	5.3	0.65	1	10/07/16 17:50	
Bromoform	ND U	5.3	0.98	1	10/07/16 17:50	
Bromomethane	ND U	5.3	1.5	1	10/07/16 17:50	
Carbon Disulfide	ND U	5.3	1.4	1	10/07/16 17:50	
Carbon Tetrachloride	ND U	5.3	0.97	1	10/07/16 17:50	
Chlorobenzene	ND U	5.3	0.31	1	10/07/16 17:50	
Chloroethane	ND U	5.3	3.1	1	10/07/16 17:50	
Chloroform	ND U	5.3	1.4	1	10/07/16 17:50	
Chloromethane	ND U	5.3	0.43	1	10/07/16 17:50	
Dibromochloromethane	ND U	5.3	0.77	1	10/07/16 17:50	
Dibromomethane	ND U	5.3	0.67	1	10/07/16 17:50	
Dichlorodifluoromethane (CFC 12)	ND U	5.3	2.0	1	10/07/16 17:50	
Dichloromethane	0.99 J	5.3	0.60	1	10/07/16 17:50	
Ethyl Methacrylate	ND U	5.3	0.79	1	10/07/16 17:50	
Ethylbenzene	ND U	5.3	0.25	1	10/07/16 17:50	
Iodomethane	ND U	11	1.2	1	10/07/16 17:50	
Methacrylonitrile	ND U	5.3	1.6	1	10/07/16 17:50	
Methyl Methacrylate	ND U	5.3	0.77	1	10/07/16 17:50	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040800 IBC 7287
Lab Code: R1610541-001

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.3	0.54	1	10/07/16 17:50	
Propionitrile	ND U	26	6.9	1	10/07/16 17:50	
Tetrachloroethene (PCE)	ND U	5.3	0.93	1	10/07/16 17:50	
Toluene	ND U	5.3	1.1	1	10/07/16 17:50	
Trichloroethene (TCE)	ND U	5.3	1.1	1	10/07/16 17:50	
Trichlorofluoromethane (CFC 11)	ND U	5.3	0.70	1	10/07/16 17:50	
Vinyl Chloride	ND U	5.3	2.0	1	10/07/16 17:50	
cis-1,3-Dichloropropene	ND U	5.3	0.95	1	10/07/16 17:50	
m,p-Xylenes	ND U	11	1.2	1	10/07/16 17:50	
o-Xylene	ND U	5.3	0.51	1	10/07/16 17:50	
trans-1,2-Dichloroethene	ND U	5.3	0.91	1	10/07/16 17:50	
trans-1,3-Dichloropropene	ND U	5.3	0.22	1	10/07/16 17:50	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	100	51 - 136	10/07/16 17:50	
Dibromofluoromethane	95	63 - 138	10/07/16 17:50	
Toluene-d8	96	66 - 138	10/07/16 17:50	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000104-76-7	1-Hexanol, 2-ethyl-	13.57	120	JN

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50

Sample Name: 1610040801 IBC 7287
Lab Code: R1610541-002

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.2	0.87	1	10/07/16 18:14	
1,1,1-Trichloroethane (TCA)	ND U	5.2	0.76	1	10/07/16 18:14	
1,1,2,2-Tetrachloroethane	ND U	5.2	0.85	1	10/07/16 18:14	
1,1,2-Trichloroethane	ND U	5.2	0.76	1	10/07/16 18:14	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.2	1.3	1	10/07/16 18:14	
1,1-Dichloroethene (1,1-DCE)	ND U	5.2	1.4	1	10/07/16 18:14	
1,2,3-Trichloropropane	ND U	5.2	1.4	1	10/07/16 18:14	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.2	2.0	1	10/07/16 18:14	
1,2-Dibromoethane	ND U	5.2	1.3	1	10/07/16 18:14	
1,2-Dichlorobenzene	ND U	5.2	0.64	1	10/07/16 18:14	
1,2-Dichloroethane	ND U	5.2	0.64	1	10/07/16 18:14	
1,2-Dichloropropane	ND U	5.2	1.1	1	10/07/16 18:14	
1,3-Dichlorobenzene	ND U	5.2	0.66	1	10/07/16 18:14	
1,4-Dioxane	ND U	100	20	1	10/07/16 18:14	
2-Butanone (MEK)	ND U	5.2	2.4	1	10/07/16 18:14	
2-Chloro-1,3-butadiene	ND U	5.2	1.6	1	10/07/16 18:14	
2-Chloroethyl Vinyl Ether	ND U	5.2	1.8	1	10/07/16 18:14	
Isobutyl Alcohol	ND U	100	24	1	10/07/16 18:14	
Allyl Chloride	ND U	5.2	1.8	1	10/07/16 18:14	
4-Methyl-2-pentanone	ND U	5.2	1.1	1	10/07/16 18:14	
Acetone	ND U	5.2	3.0	1	10/07/16 18:14	
Acetonitrile	ND U	26	18	1	10/07/16 18:14	
Acrolein	ND U	26	3.7	1	10/07/16 18:14	
Acrylonitrile	ND U	26	6.8	1	10/07/16 18:14	
Benzene	ND U	5.2	0.31	1	10/07/16 18:14	
Bromodichloromethane	ND U	5.2	0.64	1	10/07/16 18:14	
Bromoform	ND U	5.2	0.97	1	10/07/16 18:14	
Bromomethane	ND U	5.2	1.5	1	10/07/16 18:14	
Carbon Disulfide	ND U	5.2	1.3	1	10/07/16 18:14	
Carbon Tetrachloride	ND U	5.2	0.96	1	10/07/16 18:14	
Chlorobenzene	ND U	5.2	0.31	1	10/07/16 18:14	
Chloroethane	ND U	5.2	3.0	1	10/07/16 18:14	
Chloroform	ND U	5.2	1.4	1	10/07/16 18:14	
Chloromethane	ND U	5.2	0.42	1	10/07/16 18:14	
Dibromochloromethane	ND U	5.2	0.76	1	10/07/16 18:14	
Dibromomethane	ND U	5.2	0.66	1	10/07/16 18:14	
Dichlorodifluoromethane (CFC 12)	ND U	5.2	2.0	1	10/07/16 18:14	
Dichloromethane	0.80 J	5.2	0.60	1	10/07/16 18:14	
Ethyl Methacrylate	ND U	5.2	0.79	1	10/07/16 18:14	
Ethylbenzene	ND U	5.2	0.24	1	10/07/16 18:14	
Iodomethane	ND U	10	1.2	1	10/07/16 18:14	
Methacrylonitrile	ND U	5.2	1.6	1	10/07/16 18:14	
Methyl Methacrylate	ND U	5.2	0.76	1	10/07/16 18:14	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040801 IBC 7287
Lab Code: R1610541-002

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.2	0.54	1	10/07/16 18:14	
Propionitrile	ND U	26	6.8	1	10/07/16 18:14	
Tetrachloroethene (PCE)	ND U	5.2	0.92	1	10/07/16 18:14	
Toluene	ND U	5.2	1.1	1	10/07/16 18:14	
Trichloroethene (TCE)	ND U	5.2	1.1	1	10/07/16 18:14	
Trichlorofluoromethane (CFC 11)	ND U	5.2	0.69	1	10/07/16 18:14	
Vinyl Chloride	ND U	5.2	2.0	1	10/07/16 18:14	
cis-1,3-Dichloropropene	ND U	5.2	0.94	1	10/07/16 18:14	
m,p-Xylenes	ND U	10	1.2	1	10/07/16 18:14	
o-Xylene	ND U	5.2	0.50	1	10/07/16 18:14	
trans-1,2-Dichloroethene	ND U	5.2	0.90	1	10/07/16 18:14	
trans-1,3-Dichloropropene	ND U	5.2	0.21	1	10/07/16 18:14	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	98	51 - 136	10/07/16 18:14	
Dibromofluoromethane	93	63 - 138	10/07/16 18:14	
Toluene-d8	96	66 - 138	10/07/16 18:14	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	unknown	13.57	150	J

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040820 IBC 7288
Lab Code: R1610541-007

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.2	0.86	1	10/07/16 18:38	
1,1,1-Trichloroethane (TCA)	ND U	5.2	0.76	1	10/07/16 18:38	
1,1,2,2-Tetrachloroethane	ND U	5.2	0.84	1	10/07/16 18:38	
1,1,2-Trichloroethane	ND U	5.2	0.76	1	10/07/16 18:38	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.2	1.3	1	10/07/16 18:38	
1,1-Dichloroethene (1,1-DCE)	ND U	5.2	1.4	1	10/07/16 18:38	
1,2,3-Trichloropropane	ND U	5.2	1.4	1	10/07/16 18:38	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.2	2.0	1	10/07/16 18:38	
1,2-Dibromoethane	ND U	5.2	1.3	1	10/07/16 18:38	
1,2-Dichlorobenzene	ND U	5.2	0.63	1	10/07/16 18:38	
1,2-Dichloroethane	ND U	5.2	0.63	1	10/07/16 18:38	
1,2-Dichloropropane	ND U	5.2	1.0	1	10/07/16 18:38	
1,3-Dichlorobenzene	ND U	5.2	0.65	1	10/07/16 18:38	
1,4-Dioxane	ND U	100	20	1	10/07/16 18:38	
2-Butanone (MEK)	ND U	5.2	2.4	1	10/07/16 18:38	
2-Chloro-1,3-butadiene	ND U	5.2	1.6	1	10/07/16 18:38	
2-Chloroethyl Vinyl Ether	ND U	5.2	1.8	1	10/07/16 18:38	
Isobutyl Alcohol	ND U	100	24	1	10/07/16 18:38	
Allyl Chloride	ND U	5.2	1.8	1	10/07/16 18:38	
4-Methyl-2-pentanone	ND U	5.2	1.1	1	10/07/16 18:38	
Acetone	3.2 J	5.2	2.9	1	10/07/16 18:38	
Acetonitrile	ND U	26	18	1	10/07/16 18:38	
Acrolein	ND U	26	3.7	1	10/07/16 18:38	
Acrylonitrile	ND U	26	6.7	1	10/07/16 18:38	
Benzene	ND U	5.2	0.30	1	10/07/16 18:38	
Bromodichloromethane	ND U	5.2	0.63	1	10/07/16 18:38	
Bromoform	ND U	5.2	0.96	1	10/07/16 18:38	
Bromomethane	ND U	5.2	1.5	1	10/07/16 18:38	
Carbon Disulfide	ND U	5.2	1.3	1	10/07/16 18:38	
Carbon Tetrachloride	ND U	5.2	0.95	1	10/07/16 18:38	
Chlorobenzene	ND U	5.2	0.30	1	10/07/16 18:38	
Chloroethane	ND U	5.2	3.0	1	10/07/16 18:38	
Chloroform	ND U	5.2	1.3	1	10/07/16 18:38	
Chloromethane	ND U	5.2	0.42	1	10/07/16 18:38	
Dibromochloromethane	ND U	5.2	0.76	1	10/07/16 18:38	
Dibromomethane	ND U	5.2	0.65	1	10/07/16 18:38	
Dichlorodifluoromethane (CFC 12)	ND U	5.2	2.0	1	10/07/16 18:38	
Dichloromethane	0.67 J	5.2	0.59	1	10/07/16 18:38	
Ethyl Methacrylate	ND U	5.2	0.78	1	10/07/16 18:38	
Ethylbenzene	ND U	5.2	0.24	1	10/07/16 18:38	
Iodomethane	ND U	10	1.2	1	10/07/16 18:38	
Methacrylonitrile	ND U	5.2	1.6	1	10/07/16 18:38	
Methyl Methacrylate	ND U	5.2	0.76	1	10/07/16 18:38	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040820 IBC 7288
Lab Code: R1610541-007

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.2	0.53	1	10/07/16 18:38	
Propionitrile	ND U	26	6.8	1	10/07/16 18:38	
Tetrachloroethene (PCE)	ND U	5.2	0.91	1	10/07/16 18:38	
Toluene	ND U	5.2	1.1	1	10/07/16 18:38	
Trichloroethene (TCE)	ND U	5.2	1.1	1	10/07/16 18:38	
Trichlorofluoromethane (CFC 11)	ND U	5.2	0.69	1	10/07/16 18:38	
Vinyl Chloride	ND U	5.2	1.9	1	10/07/16 18:38	
cis-1,3-Dichloropropene	ND U	5.2	0.93	1	10/07/16 18:38	
m,p-Xylenes	ND U	10	1.2	1	10/07/16 18:38	
o-Xylene	ND U	5.2	0.50	1	10/07/16 18:38	
trans-1,2-Dichloroethene	ND U	5.2	0.89	1	10/07/16 18:38	
trans-1,3-Dichloropropene	ND U	5.2	0.21	1	10/07/16 18:38	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	98	51 - 136	10/07/16 18:38	
Dibromofluoromethane	94	63 - 138	10/07/16 18:38	
Toluene-d8	95	66 - 138	10/07/16 18:38	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50

Sample Name: 1610040840 IBC 7294
Lab Code: R1610541-010

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.2	0.86	1	10/07/16 19:03	
1,1,1-Trichloroethane (TCA)	ND U	5.2	0.76	1	10/07/16 19:03	
1,1,2,2-Tetrachloroethane	ND U	5.2	0.84	1	10/07/16 19:03	
1,1,2-Trichloroethane	ND U	5.2	0.76	1	10/07/16 19:03	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.2	1.3	1	10/07/16 19:03	
1,1-Dichloroethene (1,1-DCE)	ND U	5.2	1.4	1	10/07/16 19:03	
1,2,3-Trichloropropane	ND U	5.2	1.4	1	10/07/16 19:03	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.2	2.0	1	10/07/16 19:03	
1,2-Dibromoethane	ND U	5.2	1.3	1	10/07/16 19:03	
1,2-Dichlorobenzene	ND U	5.2	0.63	1	10/07/16 19:03	
1,2-Dichloroethane	ND U	5.2	0.63	1	10/07/16 19:03	
1,2-Dichloropropane	ND U	5.2	1.1	1	10/07/16 19:03	
1,3-Dichlorobenzene	ND U	5.2	0.66	1	10/07/16 19:03	
1,4-Dioxane	ND U	100	20	1	10/07/16 19:03	
2-Butanone (MEK)	ND U	5.2	2.4	1	10/07/16 19:03	
2-Chloro-1,3-butadiene	ND U	5.2	1.6	1	10/07/16 19:03	
2-Chloroethyl Vinyl Ether	ND U	5.2	1.8	1	10/07/16 19:03	
Isobutyl Alcohol	ND U	100	24	1	10/07/16 19:03	
Allyl Chloride	ND U	5.2	1.8	1	10/07/16 19:03	
4-Methyl-2-pentanone	ND U	5.2	1.1	1	10/07/16 19:03	
Acetone	7.3	5.2	2.9	1	10/07/16 19:03	
Acetonitrile	ND U	26	18	1	10/07/16 19:03	
Acrolein	ND U	26	3.7	1	10/07/16 19:03	
Acrylonitrile	ND U	26	6.7	1	10/07/16 19:03	
Benzene	ND U	5.2	0.30	1	10/07/16 19:03	
Bromodichloromethane	ND U	5.2	0.63	1	10/07/16 19:03	
Bromoform	ND U	5.2	0.96	1	10/07/16 19:03	
Bromomethane	ND U	5.2	1.5	1	10/07/16 19:03	
Carbon Disulfide	ND U	5.2	1.3	1	10/07/16 19:03	
Carbon Tetrachloride	ND U	5.2	0.95	1	10/07/16 19:03	
Chlorobenzene	ND U	5.2	0.30	1	10/07/16 19:03	
Chloroethane	ND U	5.2	3.0	1	10/07/16 19:03	
Chloroform	ND U	5.2	1.4	1	10/07/16 19:03	
Chloromethane	ND U	5.2	0.42	1	10/07/16 19:03	
Dibromochloromethane	ND U	5.2	0.76	1	10/07/16 19:03	
Dibromomethane	ND U	5.2	0.66	1	10/07/16 19:03	
Dichlorodifluoromethane (CFC 12)	ND U	5.2	2.0	1	10/07/16 19:03	
Dichloromethane	0.77 J	5.2	0.59	1	10/07/16 19:03	
Ethyl Methacrylate	ND U	5.2	0.78	1	10/07/16 19:03	
Ethylbenzene	ND U	5.2	0.24	1	10/07/16 19:03	
Iodomethane	ND U	10	1.2	1	10/07/16 19:03	
Methacrylonitrile	ND U	5.2	1.6	1	10/07/16 19:03	
Methyl Methacrylate	ND U	5.2	0.76	1	10/07/16 19:03	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040840 IBC 7294
Lab Code: R1610541-010

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.2	0.53	1	10/07/16 19:03	
Propionitrile	ND U	26	6.8	1	10/07/16 19:03	
Tetrachloroethene (PCE)	ND U	5.2	0.91	1	10/07/16 19:03	
Toluene	ND U	5.2	1.1	1	10/07/16 19:03	
Trichloroethene (TCE)	ND U	5.2	1.1	1	10/07/16 19:03	
Trichlorofluoromethane (CFC 11)	ND U	5.2	0.69	1	10/07/16 19:03	
Vinyl Chloride	ND U	5.2	1.9	1	10/07/16 19:03	
cis-1,3-Dichloropropene	ND U	5.2	0.93	1	10/07/16 19:03	
m,p-Xylenes	ND U	10	1.2	1	10/07/16 19:03	
o-Xylene	ND U	5.2	0.50	1	10/07/16 19:03	
trans-1,2-Dichloroethene	ND U	5.2	0.89	1	10/07/16 19:03	
trans-1,3-Dichloropropene	ND U	5.2	0.21	1	10/07/16 19:03	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	97	51 - 136	10/07/16 19:03	
Dibromofluoromethane	89	63 - 138	10/07/16 19:03	
Toluene-d8	93	66 - 138	10/07/16 19:03	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000104-76-7	1-Hexanol, 2-ethyl-	13.57	46	JN

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50

Sample Name: 1610040850 IBC 7295
Lab Code: R1610541-013

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.2	0.87	1	10/07/16 19:27	
1,1,1-Trichloroethane (TCA)	ND U	5.2	0.76	1	10/07/16 19:27	
1,1,2,2-Tetrachloroethane	ND U	5.2	0.85	1	10/07/16 19:27	
1,1,2-Trichloroethane	ND U	5.2	0.76	1	10/07/16 19:27	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.2	1.3	1	10/07/16 19:27	
1,1-Dichloroethene (1,1-DCE)	ND U	5.2	1.4	1	10/07/16 19:27	
1,2,3-Trichloropropane	ND U	5.2	1.4	1	10/07/16 19:27	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.2	2.0	1	10/07/16 19:27	
1,2-Dibromoethane	ND U	5.2	1.3	1	10/07/16 19:27	
1,2-Dichlorobenzene	ND U	5.2	0.64	1	10/07/16 19:27	
1,2-Dichloroethane	ND U	5.2	0.64	1	10/07/16 19:27	
1,2-Dichloropropane	ND U	5.2	1.1	1	10/07/16 19:27	
1,3-Dichlorobenzene	ND U	5.2	0.66	1	10/07/16 19:27	
1,4-Dioxane	ND U	100	20	1	10/07/16 19:27	
2-Butanone (MEK)	ND U	5.2	2.4	1	10/07/16 19:27	
2-Chloro-1,3-butadiene	ND U	5.2	1.6	1	10/07/16 19:27	
2-Chloroethyl Vinyl Ether	ND U	5.2	1.8	1	10/07/16 19:27	
Isobutyl Alcohol	ND U	100	24	1	10/07/16 19:27	
Allyl Chloride	ND U	5.2	1.8	1	10/07/16 19:27	
4-Methyl-2-pentanone	ND U	5.2	1.1	1	10/07/16 19:27	
Acetone	4.4 J	5.2	3.0	1	10/07/16 19:27	
Acetonitrile	ND U	26	18	1	10/07/16 19:27	
Acrolein	ND U	26	3.7	1	10/07/16 19:27	
Acrylonitrile	ND U	26	6.8	1	10/07/16 19:27	
Benzene	ND U	5.2	0.31	1	10/07/16 19:27	
Bromodichloromethane	ND U	5.2	0.64	1	10/07/16 19:27	
Bromoform	ND U	5.2	0.97	1	10/07/16 19:27	
Bromomethane	ND U	5.2	1.5	1	10/07/16 19:27	
Carbon Disulfide	ND U	5.2	1.3	1	10/07/16 19:27	
Carbon Tetrachloride	ND U	5.2	0.96	1	10/07/16 19:27	
Chlorobenzene	ND U	5.2	0.31	1	10/07/16 19:27	
Chloroethane	ND U	5.2	3.0	1	10/07/16 19:27	
Chloroform	ND U	5.2	1.4	1	10/07/16 19:27	
Chloromethane	ND U	5.2	0.42	1	10/07/16 19:27	
Dibromochloromethane	ND U	5.2	0.76	1	10/07/16 19:27	
Dibromomethane	ND U	5.2	0.66	1	10/07/16 19:27	
Dichlorodifluoromethane (CFC 12)	ND U	5.2	2.0	1	10/07/16 19:27	
Dichloromethane	0.80 J	5.2	0.60	1	10/07/16 19:27	
Ethyl Methacrylate	ND U	5.2	0.79	1	10/07/16 19:27	
Ethylbenzene	ND U	5.2	0.24	1	10/07/16 19:27	
Iodomethane	ND U	10	1.2	1	10/07/16 19:27	
Methacrylonitrile	ND U	5.2	1.6	1	10/07/16 19:27	
Methyl Methacrylate	ND U	5.2	0.76	1	10/07/16 19:27	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040850 IBC 7295
Lab Code: R1610541-013

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.2	0.54	1	10/07/16 19:27	
Propionitrile	ND U	26	6.8	1	10/07/16 19:27	
Tetrachloroethene (PCE)	ND U	5.2	0.92	1	10/07/16 19:27	
Toluene	ND U	5.2	1.1	1	10/07/16 19:27	
Trichloroethene (TCE)	ND U	5.2	1.1	1	10/07/16 19:27	
Trichlorofluoromethane (CFC 11)	ND U	5.2	0.69	1	10/07/16 19:27	
Vinyl Chloride	ND U	5.2	2.0	1	10/07/16 19:27	
cis-1,3-Dichloropropene	ND U	5.2	0.94	1	10/07/16 19:27	
m,p-Xylenes	ND U	10	1.2	1	10/07/16 19:27	
o-Xylene	ND U	5.2	0.50	1	10/07/16 19:27	
trans-1,2-Dichloroethene	ND U	5.2	0.90	1	10/07/16 19:27	
trans-1,3-Dichloropropene	ND U	5.2	0.21	1	10/07/16 19:27	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	101	51 - 136	10/07/16 19:27	
Dibromofluoromethane	93	63 - 138	10/07/16 19:27	
Toluene-d8	96	66 - 138	10/07/16 19:27	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000123-05-7	Hexanal, 2-ethyl-	12.49	49	JN
	unknown	13.57	550	J

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50

Sample Name: 1610040900 IBC 7296
Lab Code: R1610541-016

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.8	0.97	1.01	10/07/16 19:51	
1,1,1-Trichloroethane (TCA)	ND U	5.8	0.85	1.01	10/07/16 19:51	
1,1,2,2-Tetrachloroethane	ND U	5.8	0.94	1.01	10/07/16 19:51	
1,1,2-Trichloroethane	ND U	5.8	0.85	1.01	10/07/16 19:51	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.8	1.5	1.01	10/07/16 19:51	
1,1-Dichloroethene (1,1-DCE)	ND U	5.8	1.5	1.01	10/07/16 19:51	
1,2,3-Trichloropropane	ND U	5.8	1.6	1.01	10/07/16 19:51	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.8	2.2	1.01	10/07/16 19:51	
1,2-Dibromoethane	ND U	5.8	1.4	1.01	10/07/16 19:51	
1,2-Dichlorobenzene	ND U	5.8	0.71	1.01	10/07/16 19:51	
1,2-Dichloroethane	ND U	5.8	0.71	1.01	10/07/16 19:51	
1,2-Dichloropropane	ND U	5.8	1.2	1.01	10/07/16 19:51	
1,3-Dichlorobenzene	ND U	5.8	0.73	1.01	10/07/16 19:51	
1,4-Dioxane	ND U	120	23	1.01	10/07/16 19:51	
2-Butanone (MEK)	ND U	5.8	2.7	1.01	10/07/16 19:51	
2-Chloro-1,3-butadiene	ND U	5.8	1.8	1.01	10/07/16 19:51	
2-Chloroethyl Vinyl Ether	ND U	5.8	2.0	1.01	10/07/16 19:51	
Isobutyl Alcohol	ND U	120	27	1.01	10/07/16 19:51	
Allyl Chloride	ND U	5.8	2.0	1.01	10/07/16 19:51	
4-Methyl-2-pentanone	ND U	5.8	1.2	1.01	10/07/16 19:51	
Acetone	8.2	5.8	3.3	1.01	10/07/16 19:51	
Acetonitrile	ND U	29	20	1.01	10/07/16 19:51	
Acrolein	ND U	29	4.1	1.01	10/07/16 19:51	
Acrylonitrile	ND U	29	7.5	1.01	10/07/16 19:51	
Benzene	ND U	5.8	0.34	1.01	10/07/16 19:51	
Bromodichloromethane	ND U	5.8	0.71	1.01	10/07/16 19:51	
Bromoform	ND U	5.8	1.1	1.01	10/07/16 19:51	
Bromomethane	ND U	5.8	1.6	1.01	10/07/16 19:51	
Carbon Disulfide	1.7 J	5.8	1.5	1.01	10/07/16 19:51	
Carbon Tetrachloride	ND U	5.8	1.1	1.01	10/07/16 19:51	
Chlorobenzene	ND U	5.8	0.34	1.01	10/07/16 19:51	
Chloroethane	ND U	5.8	3.4	1.01	10/07/16 19:51	
Chloroform	ND U	5.8	1.5	1.01	10/07/16 19:51	
Chloromethane	ND U	5.8	0.47	1.01	10/07/16 19:51	
Dibromochloromethane	ND U	5.8	0.85	1.01	10/07/16 19:51	
Dibromomethane	ND U	5.8	0.73	1.01	10/07/16 19:51	
Dichlorodifluoromethane (CFC 12)	ND U	5.8	2.2	1.01	10/07/16 19:51	
Dichloromethane	1.1 J	5.8	0.66	1.01	10/07/16 19:51	
Ethyl Methacrylate	ND U	5.8	0.87	1.01	10/07/16 19:51	
Ethylbenzene	ND U	5.8	0.27	1.01	10/07/16 19:51	
Iodomethane	ND U	12	1.3	1.01	10/07/16 19:51	
Methacrylonitrile	ND U	5.8	1.8	1.01	10/07/16 19:51	
Methyl Methacrylate	ND U	5.8	0.85	1.01	10/07/16 19:51	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040900 IBC 7296
Lab Code: R1610541-016

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.8	0.60	1.01	10/07/16 19:51	
Propionitrile	ND U	29	7.6	1.01	10/07/16 19:51	
Tetrachloroethene (PCE)	ND U	5.8	1.1	1.01	10/07/16 19:51	
Toluene	ND U	5.8	1.2	1.01	10/07/16 19:51	
Trichloroethene (TCE)	ND U	5.8	1.2	1.01	10/07/16 19:51	
Trichlorofluoromethane (CFC 11)	ND U	5.8	0.77	1.01	10/07/16 19:51	
Vinyl Chloride	ND U	5.8	2.2	1.01	10/07/16 19:51	
cis-1,3-Dichloropropene	ND U	5.8	1.1	1.01	10/07/16 19:51	
m,p-Xylenes	ND U	12	1.3	1.01	10/07/16 19:51	
o-Xylene	ND U	5.8	0.56	1.01	10/07/16 19:51	
trans-1,2-Dichloroethene	ND U	5.8	1.0	1.01	10/07/16 19:51	
trans-1,3-Dichloropropene	ND U	5.8	0.24	1.01	10/07/16 19:51	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	96	51 - 136	10/07/16 19:51	
Dibromofluoromethane	92	63 - 138	10/07/16 19:51	
Toluene-d8	95	66 - 138	10/07/16 19:51	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			



Metals

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040806 IBC 7287
Lab Code: R1610541-003

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.3	0.5	1	10/17/16 12:07	10/14/16	
Arsenic, Total	6010C	3.5	mg/Kg	1.0	0.3	1	10/17/16 12:07	10/14/16	
Barium, Total	6010C	68.5	mg/Kg	2.1	0.2	1	10/17/16 12:07	10/14/16	
Beryllium, Total	6010C	0.43	mg/Kg	0.31	0.02	1	10/17/16 12:07	10/14/16	
Cadmium, Total	6010C	0.11 J	mg/Kg	0.52	0.04	1	10/17/16 12:07	10/14/16	
Chromium, Total	6010C	9.5	mg/Kg	1.0	0.2	1	10/17/16 12:07	10/14/16	
Lead, Total	6010C	7.4	mg/Kg	5.2	0.3	1	10/17/16 12:07	10/14/16	
Mercury, Total	7471B	ND U	mg/Kg	0.034	0.004	1	10/17/16 15:02	10/17/16	
Nickel, Total	6010C	8.1	mg/Kg	4.2	0.2	1	10/17/16 12:07	10/14/16	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.7	1	10/17/16 12:07	10/14/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	10/17/16 12:07	10/14/16	
Thallium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	10/17/16 12:07	10/14/16	
Vanadium, Total	6010C	16.8	mg/Kg	5.2	0.2	1	10/17/16 12:07	10/14/16	
Zinc, Total	6010C	33.8	mg/Kg	2.1	0.2	1	10/17/16 12:07	10/14/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040807 IBC 7287
Lab Code: R1610541-004

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.2	0.5	1	10/17/16 12:34	10/14/16	
Arsenic, Total	6010C	4.3	mg/Kg	1.0	0.3	1	10/17/16 12:34	10/14/16	
Barium, Total	6010C	81.4	mg/Kg	2.1	0.2	1	10/17/16 12:34	10/14/16	
Beryllium, Total	6010C	0.44	mg/Kg	0.31	0.02	1	10/17/16 12:34	10/14/16	
Cadmium, Total	6010C	0.11 J	mg/Kg	0.52	0.04	1	10/17/16 12:34	10/14/16	
Chromium, Total	6010C	10.4	mg/Kg	1.0	0.2	1	10/17/16 12:34	10/14/16	
Lead, Total	6010C	7.6	mg/Kg	5.2	0.3	1	10/17/16 12:34	10/14/16	
Mercury, Total	7471B	0.004 J	mg/Kg	0.033	0.003	1	10/17/16 15:10	10/17/16	
Nickel, Total	6010C	8.8	mg/Kg	4.2	0.2	1	10/17/16 12:34	10/14/16	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.7	1	10/17/16 12:34	10/14/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	10/17/16 12:34	10/14/16	
Thallium, Total	6010C	1.1	mg/Kg	1.0	0.6	1	10/17/16 12:34	10/14/16	
Vanadium, Total	6010C	18.5	mg/Kg	5.2	0.2	1	10/17/16 12:34	10/14/16	
Zinc, Total	6010C	32.1	mg/Kg	2.1	0.2	1	10/17/16 12:34	10/14/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040822 IBC 7288
Lab Code: R1610541-008

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.2	0.5	1	10/17/16 12:38	10/14/16	
Arsenic, Total	6010C	4.1	mg/Kg	1.0	0.3	1	10/17/16 12:38	10/14/16	
Barium, Total	6010C	72.3	mg/Kg	2.1	0.2	1	10/17/16 12:38	10/14/16	
Beryllium, Total	6010C	0.30 J	mg/Kg	0.31	0.02	1	10/17/16 12:38	10/14/16	
Cadmium, Total	6010C	0.10 J	mg/Kg	0.52	0.04	1	10/17/16 12:38	10/14/16	
Chromium, Total	6010C	10.5	mg/Kg	1.0	0.2	1	10/17/16 12:38	10/14/16	
Lead, Total	6010C	8.0	mg/Kg	5.2	0.3	1	10/17/16 12:38	10/14/16	
Mercury, Total	7471B	0.005 J	mg/Kg	0.033	0.003	1	10/17/16 15:12	10/17/16	
Nickel, Total	6010C	6.1	mg/Kg	4.1	0.2	1	10/17/16 12:38	10/14/16	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.7	1	10/17/16 12:38	10/14/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	10/17/16 12:38	10/14/16	
Thallium, Total	6010C	1.0	mg/Kg	1.0	0.6	1	10/19/16 10:37	10/14/16	
Vanadium, Total	6010C	10.7	mg/Kg	5.2	0.2	1	10/17/16 12:38	10/14/16	
Zinc, Total	6010C	29.6	mg/Kg	2.1	0.2	1	10/17/16 12:38	10/14/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040842 IBC 7294
Lab Code: R1610541-011

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.1	0.5	1	10/17/16 12:41	10/14/16	
Arsenic, Total	6010C	5.7	mg/Kg	1.0	0.3	1	10/17/16 12:41	10/14/16	
Barium, Total	6010C	115	mg/Kg	2.0	0.2	1	10/17/16 12:41	10/14/16	
Beryllium, Total	6010C	0.46	mg/Kg	0.31	0.02	1	10/17/16 12:41	10/14/16	
Cadmium, Total	6010C	0.14 J	mg/Kg	0.51	0.04	1	10/17/16 12:41	10/14/16	
Chromium, Total	6010C	37.5	mg/Kg	1.0	0.2	1	10/17/16 12:41	10/14/16	
Lead, Total	6010C	8.1	mg/Kg	5.1	0.3	1	10/17/16 12:41	10/14/16	
Mercury, Total	7471B	ND U	mg/Kg	0.034	0.004	1	10/17/16 15:14	10/17/16	
Nickel, Total	6010C	9.6	mg/Kg	4.1	0.2	1	10/17/16 12:41	10/14/16	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.7	1	10/17/16 12:41	10/14/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	10/17/16 12:41	10/14/16	
Thallium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	10/17/16 12:41	10/14/16	
Vanadium, Total	6010C	15.9	mg/Kg	5.1	0.2	1	10/17/16 12:41	10/14/16	
Zinc, Total	6010C	44.0	mg/Kg	2.0	0.2	1	10/17/16 12:41	10/14/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040852 IBC 7295
Lab Code: R1610541-014

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.3	0.5	1	10/17/16 12:45	10/14/16	
Arsenic, Total	6010C	3.8	mg/Kg	1.0	0.3	1	10/17/16 12:45	10/14/16	
Barium, Total	6010C	58.5	mg/Kg	2.1	0.2	1	10/17/16 12:45	10/14/16	
Beryllium, Total	6010C	0.27 J	mg/Kg	0.31	0.02	1	10/17/16 12:45	10/14/16	
Cadmium, Total	6010C	0.09 J	mg/Kg	0.52	0.04	1	10/17/16 12:45	10/14/16	
Chromium, Total	6010C	8.3	mg/Kg	1.0	0.2	1	10/17/16 12:45	10/14/16	
Lead, Total	6010C	4.3 J	mg/Kg	5.2	0.3	1	10/17/16 12:45	10/14/16	
Mercury, Total	7471B	0.004 J	mg/Kg	0.033	0.003	1	10/17/16 15:15	10/17/16	
Nickel, Total	6010C	6.0	mg/Kg	4.2	0.2	1	10/17/16 12:45	10/14/16	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.7	1	10/17/16 12:45	10/14/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	10/17/16 12:45	10/14/16	
Thallium, Total	6010C	1.0	mg/Kg	1.0	0.6	1	10/17/16 12:45	10/14/16	
Vanadium, Total	6010C	9.3	mg/Kg	5.2	0.2	1	10/17/16 12:45	10/14/16	
Zinc, Total	6010C	30.1	mg/Kg	2.1	0.2	1	10/17/16 12:45	10/14/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040902 IBC 7296
Lab Code: R1610541-017

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.6	0.5	1	10/17/16 12:49	10/14/16	
Arsenic, Total	6010C	4.8	mg/Kg	1.1	0.3	1	10/17/16 12:49	10/14/16	
Barium, Total	6010C	106	mg/Kg	2.2	0.2	1	10/17/16 12:49	10/14/16	
Beryllium, Total	6010C	0.41	mg/Kg	0.33	0.02	1	10/17/16 12:49	10/14/16	
Cadmium, Total	6010C	0.13 J	mg/Kg	0.55	0.04	1	10/17/16 12:49	10/14/16	
Chromium, Total	6010C	23.8	mg/Kg	1.1	0.2	1	10/17/16 12:49	10/14/16	
Lead, Total	6010C	7.7	mg/Kg	5.5	0.4	1	10/17/16 12:49	10/14/16	
Mercury, Total	7471B	ND U	mg/Kg	0.035	0.004	1	10/17/16 15:17	10/17/16	
Nickel, Total	6010C	7.5	mg/Kg	4.4	0.2	1	10/17/16 12:49	10/14/16	
Selenium, Total	6010C	ND U	mg/Kg	1.1	0.7	1	10/17/16 12:49	10/14/16	
Silver, Total	6010C	ND U	mg/Kg	1.1	0.5	1	10/17/16 12:49	10/14/16	
Thallium, Total	6010C	2.5	mg/Kg	1.1	0.6	1	10/17/16 12:49	10/14/16	
Vanadium, Total	6010C	11.5	mg/Kg	5.5	0.2	1	10/17/16 12:49	10/14/16	
Zinc, Total	6010C	45.6	mg/Kg	2.2	0.2	1	10/17/16 12:49	10/14/16	



General Chemistry

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040800 IBC 7287
Lab Code: R1610541-001

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	95.1	Percent	-	1	10/12/16 16:20	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040801 IBC 7287
Lab Code: R1610541-002

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	96.1	Percent	-	1	10/12/16 16:20	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040806 IBC 7287
Lab Code: R1610541-003

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	96.0	Percent	-	-	1	10/12/16 16:20	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040807 IBC 7287
Lab Code: R1610541-004

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	95.4	Percent	-	-	1	10/12/16 16:20	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040820 IBC 7288
Lab Code: R1610541-007

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	97.0	Percent	-	1	10/12/16 16:20	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040822 IBC 7288
Lab Code: R1610541-008

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	97.0	Percent	-	-	1	10/12/16 16:20	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040840 IBC 7294
Lab Code: R1610541-010

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	96.9	Percent	-	1	10/12/16 16:20	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040842 IBC 7294
Lab Code: R1610541-011

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	96.7	Percent	-	-	1	10/12/16 16:20	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040850 IBC 7295
Lab Code: R1610541-013

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	96.1	Percent	-	1	10/12/16 16:20	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040852 IBC 7295
Lab Code: R1610541-014

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	95.5	Percent	-	-	1	10/12/16 16:20	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040900 IBC 7296
Lab Code: R1610541-016

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	87.3	Percent	-	1	10/12/16 16:20	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610040902 IBC 7296
Lab Code: R1610541-017

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	90.7	Percent	-	-	1	10/12/16 16:20	



QC Summary Forms

ALS Environmental—Rochester Laboratory
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Volatile Organic Compounds by GC/MS

ALS Environmental—Rochester Laboratory
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Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1610541

SURROGATE RECOVERY SUMMARY
Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Extraction Method: EPA 5030C

Sample Name	Lab Code	4-Bromofluorobenzene	Dibromofluoromethane	Toluene-d8
		51 - 136	63 - 138	66 - 138
1610040800 IBC 7287	R1610541-001	100	95	96
1610040801 IBC 7287	R1610541-002	98	93	96
1610040820 IBC 7288	R1610541-007	98	94	95
1610040840 IBC 7294	R1610541-010	97	89	93
1610040850 IBC 7295	R1610541-013	101	93	96
1610040900 IBC 7296	R1610541-016	96	92	95
Method Blank	RQ1612062-01	102	94	97
Lab Control Sample	RQ1612062-02	102	97	97
1610040800 IBC 7287 MS	RQ1612062-05	106	98	98
1610040800 IBC 7287 DMS	RQ1612062-06	102	98	96

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16
Date Analyzed: 10/7/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1610040800 IBC 7287
Lab Code: R1610541-001
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1612062-05			Duplicate Matrix Spike RQ1612062-06			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
1,1,1,2-Tetrachloroethane	ND U	44.4	52.6	84	45.5	52.6	87	52-133	4	30
1,1,1-Trichloroethane (TCA)	ND U	44.9	52.6	85	45.5	52.6	86	51-132	1	30
1,1,2,2-Tetrachloroethane	ND U	47.8	52.6	91	47.3	52.6	90	53-134	1	30
1,1,2-Trichloroethane	ND U	49.6	52.6	94	50.1	52.6	95	62-126	1	30
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	42.2	52.6	80	42.4	52.6	81	45-136	1	30
1,1-Dichloroethene (1,1-DCE)	ND U	47.6	52.6	90	46.9	52.6	89	61-139	1	30
1,2,3-Trichloropropane	ND U	47.9	52.6	91	48.0	52.6	91	22-167	<1	30
1,2-Dibromo-3-chloropropane (DBCP)	ND U	44.8	52.6	85	46.0	52.6	87	27-163	2	30
1,2-Dibromoethane	ND U	48.5	52.6	92	48.7	52.6	93	52-137	1	30
1,2-Dichlorobenzene	ND U	44.0	52.6	84	45.5	52.6	87	22-156	4	30
1,2-Dichloroethane	ND U	49.5	52.6	94	48.8	52.6	93	59-125	1	30
1,2-Dichloropropane	ND U	47.2	52.6	90	46.8	52.6	89	67-126	1	30
1,3-Dichlorobenzene	ND U	43.6	52.6	83	44.2	52.6	84	29-146	1	30
1,4-Dioxane	ND U	901	1050	86	878	1050	84	50-148	2	30
2-Butanone (MEK)	ND U	52.0	52.6	99	51.4	52.6	98	43-134	1	30
2-Chloro-1,3-butadiene	ND U	51.8	52.6	99	50.8	52.6	97	45-134	2	30
2-Chloroethyl Vinyl Ether	ND U	38.9	52.6	74	35.8	52.6	68	37-150	8	30
Isobutyl Alcohol	ND U	904	1050	86	891	1050	85	39-146	1	30
Allyl Chloride	ND U	44.8	52.6	85	45.2	52.6	86	34-135	1	30
4-Methyl-2-pentanone	ND U	50.8	52.6	97	50.8	52.6	97	47-145	<1	30
Acetone	ND U	71.9	52.6	137	81.1	52.6	154	11-183	12	30
Acetonitrile	ND U	305	263	116	307	263	117	28-146	<1	30
Acrolein	ND U	115	105	109	124	105	118	10-172	8	30
Acrylonitrile	ND U	261	263	99	257	263	98	46-139	1	30
Benzene	ND U	46.6	52.6	89	45.5	52.6	87	63-126	2	30
Bromodichloromethane	ND U	46.2	52.6	88	46.3	52.6	88	47-141	<1	30
Bromoform	ND U	50.3	52.6	96	51.5	52.6	98	26-157	2	30
Bromomethane	ND U	52.2	52.6	99	51.4	52.6	98	10-137	1	30
Carbon Disulfide	ND U	51.7	52.6	98	52.6	52.6	100	35-135	2	30
Carbon Tetrachloride	ND U	41.0	52.6	78	41.0	52.6	78	46-137	<1	30
Chlorobenzene	ND U	44.7	52.6	85	45.3	52.6	86	51-132	1	30
Chloroethane	ND U	56.5	52.6	107	57.5	52.6	109	45-132	2	30
Chloroform	ND U	49.0	52.6	93	48.6	52.6	92	61-124	1	30
Chloromethane	ND U	48.8	52.6	93	48.5	52.6	92	50-136	1	30
Dibromochloromethane	ND U	47.2	52.6	90	48.3	52.6	92	40-146	2	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16
Date Analyzed: 10/7/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1610040800 IBC 7287
Lab Code: R1610541-001
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1612062-05			Duplicate Matrix Spike RQ1612062-06			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Dibromomethane	ND U	49.3	52.6	94	49.0	52.6	93	61-122	1	30
Dichlorodifluoromethane (CFC 12)	ND U	48.1	52.6	91	46.3	52.6	88	44-138	3	30
Dichloromethane	0.99 J	49.9	52.6	93	50.3	52.6	94	64-120	1	30
Ethyl Methacrylate	ND U	47.2	52.6	90	46.8	52.6	89	17-166	1	30
Ethylbenzene	ND U	43.9	52.6	83	44.0	52.6	84	44-131	1	30
Iodomethane	ND U	47.6	52.6	90	52.3	52.6	100	10-160	11	30
Methacrylonitrile	ND U	52.2	52.6	99	52.2	52.6	99	44-149	<1	30
Methyl Methacrylate	ND U	50.9	52.6	97	51.6	52.6	98	41-162	1	30
Naphthalene	ND U	45.6	52.6	87	47.2	52.6	90	10-187	3	30
Propionitrile	ND U	269	263	102	263	263	100	46-144	2	30
Tetrachloroethene (PCE)	ND U	41.4	52.6	79	42.3	52.6	80	45-141	1	30
Toluene	ND U	45.0	52.6	86	44.8	52.6	85	50-140	1	30
Trichloroethene (TCE)	ND U	48.6	52.6	93	48.3	52.6	92	54-136	1	30
Trichlorofluoromethane (CFC 11)	ND U	45.9	52.6	87	46.6	52.6	89	47-129	2	30
Vinyl Chloride	ND U	55.5	52.6	106	55.8	52.6	106	53-128	<1	30
cis-1,3-Dichloropropene	ND U	46.1	52.6	88	46.1	52.6	88	31-150	<1	30
m,p-Xylenes	ND U	88.7	105	84	90.3	105	86	45-141	2	30
o-Xylene	ND U	44.6	52.6	85	45.9	52.6	87	46-139	2	30
trans-1,2-Dichloroethene	ND U	47.8	52.6	91	48.3	52.6	92	52-128	1	30
trans-1,3-Dichloropropene	ND U	47.8	52.6	91	47.8	52.6	91	23-160	<1	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1610541
Date Collected: NA
Date Received: NA

Sample Name: Method Blank
Lab Code: RQ1612062-01

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.0	0.83	1	10/07/16 15:49	
1,1,1-Trichloroethane (TCA)	ND U	5.0	0.73	1	10/07/16 15:49	
1,1,2,2-Tetrachloroethane	ND U	5.0	0.81	1	10/07/16 15:49	
1,1,2-Trichloroethane	ND U	5.0	0.73	1	10/07/16 15:49	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.0	1.3	1	10/07/16 15:49	
1,1-Dichloroethene (1,1-DCE)	ND U	5.0	1.3	1	10/07/16 15:49	
1,2,3-Trichloropropane	ND U	5.0	1.4	1	10/07/16 15:49	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.0	1.9	1	10/07/16 15:49	
1,2-Dibromoethane	ND U	5.0	1.3	1	10/07/16 15:49	
1,2-Dichlorobenzene	ND U	5.0	0.61	1	10/07/16 15:49	
1,2-Dichloroethane	ND U	5.0	0.61	1	10/07/16 15:49	
1,2-Dichloropropane	ND U	5.0	0.97	1	10/07/16 15:49	
1,3-Dichlorobenzene	ND U	5.0	0.63	1	10/07/16 15:49	
1,4-Dioxane	ND U	100	20	1	10/07/16 15:49	
2-Butanone (MEK)	ND U	5.0	2.3	1	10/07/16 15:49	
2-Chloro-1,3-butadiene	ND U	5.0	1.6	1	10/07/16 15:49	
2-Chloroethyl Vinyl Ether	ND U	5.0	1.8	1	10/07/16 15:49	
Isobutyl Alcohol	ND U	100	23	1	10/07/16 15:49	
Allyl Chloride	ND U	5.0	1.7	1	10/07/16 15:49	
4-Methyl-2-pentanone	ND U	5.0	0.98	1	10/07/16 15:49	
Acetone	ND U	5.0	2.9	1	10/07/16 15:49	
Acetonitrile	ND U	25	17	1	10/07/16 15:49	
Acrolein	ND U	25	3.5	1	10/07/16 15:49	
Acrylonitrile	ND U	25	6.5	1	10/07/16 15:49	
Benzene	ND U	5.0	0.29	1	10/07/16 15:49	
Bromodichloromethane	ND U	5.0	0.61	1	10/07/16 15:49	
Bromoform	ND U	5.0	0.93	1	10/07/16 15:49	
Bromomethane	ND U	5.0	1.4	1	10/07/16 15:49	
Carbon Disulfide	ND U	5.0	1.3	1	10/07/16 15:49	
Carbon Tetrachloride	ND U	5.0	0.92	1	10/07/16 15:49	
Chlorobenzene	ND U	5.0	0.29	1	10/07/16 15:49	
Chloroethane	ND U	5.0	2.9	1	10/07/16 15:49	
Chloroform	ND U	5.0	1.3	1	10/07/16 15:49	
Chloromethane	ND U	5.0	0.40	1	10/07/16 15:49	
Dibromochloromethane	ND U	5.0	0.73	1	10/07/16 15:49	
Dibromomethane	ND U	5.0	0.63	1	10/07/16 15:49	
Dichlorodifluoromethane (CFC 12)	ND U	5.0	1.9	1	10/07/16 15:49	
Dichloromethane	ND U	5.0	0.57	1	10/07/16 15:49	
Ethyl Methacrylate	ND U	5.0	0.75	1	10/07/16 15:49	
Ethylbenzene	ND U	5.0	0.23	1	10/07/16 15:49	
Iodomethane	ND U	10	1.2	1	10/07/16 15:49	
Methacrylonitrile	ND U	5.0	1.6	1	10/07/16 15:49	
Methyl Methacrylate	ND U	5.0	0.73	1	10/07/16 15:49	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: RQ1612062-01

Service Request: R1610541
Date Collected: NA
Date Received: NA

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.0	0.51	1	10/07/16 15:49	
Propionitrile	ND U	25	6.5	1	10/07/16 15:49	
Tetrachloroethene (PCE)	ND U	5.0	0.88	1	10/07/16 15:49	
Toluene	ND U	5.0	1.0	1	10/07/16 15:49	
Trichloroethene (TCE)	ND U	5.0	1.1	1	10/07/16 15:49	
Trichlorofluoromethane (CFC 11)	ND U	5.0	0.66	1	10/07/16 15:49	
Vinyl Chloride	ND U	5.0	1.9	1	10/07/16 15:49	
cis-1,3-Dichloropropene	ND U	5.0	0.90	1	10/07/16 15:49	
m,p-Xylenes	ND U	10	1.1	1	10/07/16 15:49	
o-Xylene	ND U	5.0	0.48	1	10/07/16 15:49	
trans-1,2-Dichloroethene	ND U	5.0	0.86	1	10/07/16 15:49	
trans-1,3-Dichloropropene	ND U	5.0	0.20	1	10/07/16 15:49	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	102	51 - 136	10/07/16 15:49	
Dibromofluoromethane	94	63 - 138	10/07/16 15:49	
Toluene-d8	97	66 - 138	10/07/16 15:49	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1610541
Date Analyzed: 10/07/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Units:ug/Kg
Basis:Dry

Lab Control Sample
RQ1612062-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
1,1,1,2-Tetrachloroethane	8260C	21.1	20.0	105	40-140
1,1,1-Trichloroethane (TCA)	8260C	22.7	20.0	113	40-140
1,1,2,2-Tetrachloroethane	8260C	21.3	20.0	106	40-140
1,1,2-Trichloroethane	8260C	21.0	20.0	105	40-140
1,1,2-Trichloro-1,2,2-trifluoroethane	8260C	22.8	20.0	114	40-140
1,1-Dichloroethene (1,1-DCE)	8260C	23.7	20.0	118	40-140
1,2,3-Trichloropropane	8260C	19.9	20.0	100	40-140
1,2-Dibromo-3-chloropropane (DBCP)	8260C	18.3	20.0	92	40-140
1,2-Dibromoethane	8260C	20.1	20.0	101	40-140
1,2-Dichlorobenzene	8260C	22.2	20.0	111	40-140
1,2-Dichloroethane	8260C	21.1	20.0	106	40-140
1,2-Dichloropropane	8260C	21.6	20.0	108	40-140
1,3-Dichlorobenzene	8260C	22.8	20.0	114	40-140
1,4-Dioxane	8260C	380	400	95	40-140
2-Butanone (MEK)	8260C	18.5	20.0	93	40-140
2-Chloro-1,3-butadiene	8260C	19.7	20.0	98	40-140
2-Chloroethyl Vinyl Ether	8260C	13.7	20.0	69	40-140
Isobutyl Alcohol	8260C	338	400	84	40-140
Allyl Chloride	8260C	21.1	20.0	105	40-140
4-Methyl-2-pentanone	8260C	17.6	20.0	88	40-140
Acetone	8260C	23.9	20.0	120	40-140
Acetonitrile	8260C	88.2	100	88	40-140
Acrolein	8260C	42.9	40.0	107	40-140
Acrylonitrile	8260C	96.2	100	96	40-140
Benzene	8260C	22.1	20.0	111	40-140
Bromodichloromethane	8260C	20.9	20.0	105	40-140
Bromoform	8260C	22.4	20.0	112	40-140
Bromomethane	8260C	25.6	20.0	128	40-140
Carbon Disulfide	8260C	20.4	20.0	102	40-140
Carbon Tetrachloride	8260C	22.4	20.0	112	40-140
Chlorobenzene	8260C	22.1	20.0	111	40-140
Chloroethane	8260C	25.5	20.0	127	40-140
Chloroform	8260C	21.8	20.0	109	40-140

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1610541
Date Analyzed: 10/07/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Units:ug/Kg
Basis:Dry

Lab Control Sample
RQ1612062-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Chloromethane	8260C	23.0	20.0	115	40-140
Dibromochloromethane	8260C	20.6	20.0	103	40-140
Dibromomethane	8260C	20.7	20.0	103	40-140
Dichlorodifluoromethane (CFC 12)	8260C	24.2	20.0	121	40-140
Dichloromethane	8260C	22.0	20.0	110	40-140
Ethyl Methacrylate	8260C	18.4	20.0	92	40-140
Ethylbenzene	8260C	22.7	20.0	114	40-140
Iodomethane	8260C	20.2	20.0	101	40-140
Methacrylonitrile	8260C	19.4	20.0	97	40-140
Methyl Methacrylate	8260C	18.5	20.0	92	40-140
Naphthalene	8260C	21.0	20.0	105	40-140
Propionitrile	8260C	101	100	101	40-140
Tetrachloroethene (PCE)	8260C	23.0	20.0	115	40-140
Toluene	8260C	22.3	20.0	112	40-140
Trichloroethene (TCE)	8260C	22.3	20.0	111	40-140
Trichlorofluoromethane (CFC 11)	8260C	24.9	20.0	124	40-140
Vinyl Chloride	8260C	27.0	20.0	135	40-140
cis-1,3-Dichloropropene	8260C	20.7	20.0	104	40-140
m,p-Xylenes	8260C	46.3	40.0	116	40-140
o-Xylene	8260C	22.3	20.0	111	40-140
trans-1,2-Dichloroethene	8260C	23.2	20.0	116	40-140
trans-1,3-Dichloropropene	8260C	20.9	20.0	104	40-140



Metals

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: R1610541-MB

Service Request: R1610541
Date Collected: NA
Date Received: NA
Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.0	0.4	1	10/17/16 10:53	10/14/16	
Arsenic, Total	6010C	ND U	mg/Kg	1.0	0.3	1	10/17/16 10:53	10/14/16	
Barium, Total	6010C	ND U	mg/Kg	2.0	0.2	1	10/17/16 10:53	10/14/16	
Beryllium, Total	6010C	ND U	mg/Kg	0.30	0.02	1	10/17/16 10:53	10/14/16	
Cadmium, Total	6010C	ND U	mg/Kg	0.50	0.04	1	10/17/16 10:53	10/14/16	
Chromium, Total	6010C	ND U	mg/Kg	1.0	0.2	1	10/17/16 10:53	10/14/16	
Lead, Total	6010C	ND U	mg/Kg	5.0	0.3	1	10/17/16 10:53	10/14/16	
Mercury, Total	7471B	ND U	mg/Kg	5.5	0.5	1	10/17/16 14:33	10/17/16	
Nickel, Total	6010C	ND U	mg/Kg	4.0	0.2	1	10/17/16 10:53	10/14/16	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	10/17/16 10:53	10/14/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	10/17/16 10:53	10/14/16	
Thallium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	10/17/16 10:53	10/14/16	
Vanadium, Total	6010C	ND U	mg/Kg	5.0	0.2	1	10/17/16 10:53	10/14/16	
Zinc, Total	6010C	1.2 J	mg/Kg	2.0	0.2	1	10/17/16 10:53	10/14/16	

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request:R1610541
Date Collected:10/04/16
Date Received:10/05/16
Date Analyzed:10/17/16

Matrix Spike Summary
Inorganic Parameters

Sample Name: 1610040806 IBC 7287
Lab Code: R1610541-003

Units:mg/Kg
Basis:Dry

Matrix Spike
R1610541-003MS

Analyte Name	Method	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Silver, Total	6010C	ND U	4.8	5.1	95	75-125
Arsenic, Total	6010C	3.5	8.5	4.0	123	75-125
Barium, Total	6010C	68.5	252	202	91	75-125
Beryllium, Total	6010C	0.43	5.00	5.06	90	75-125
Cadmium, Total	6010C	0.11 J	4.50	5.06	87	75-125
Chromium, Total	6010C	9.5	29.3	20.2	98	75-125
Mercury, Total	7471B	ND U	ND U	0.2	96	75-125
Nickel, Total	6010C	8.1	52.8	50.6	88	75-125
Lead, Total	6010C	7.4	52.5	50.6	89	75-125
Antimony, Total	6010C	ND U	39.2	50.6	77	75-125
Selenium, Total	6010C	ND U	91.7	102	90	75-125
Thallium, Total	6010C	ND U	191	202	94	75-125
Vanadium, Total	6010C	16.8	67.0	50.6	99	75-125
Zinc, Total	6010C	33.8	79.7	50.6	91	75-125

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16
Date Analyzed: 10/17/16

Replicate Sample Summary
Inorganic Parameters

Sample Name: 1610040806 IBC 7287
Lab Code: R1610541-003

Units: mg/Kg
Basis: Dry

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate	Average	RPD	RPD Limit
					Sample R1610541-003DUP Result			
Antimony, Total	6010C	6.2	0.5	ND U	ND U	NC	NC	20
Arsenic, Total	6010C	1.0	0.3	3.5	7.4	5.44	71 *	20
Barium, Total	6010C	2.1	0.2	68.5	78.6	73.5	14	20
Beryllium, Total	6010C	0.31	0.02	0.43	0.46	0.446	8	20
Cadmium, Total	6010C	0.52	0.04	0.11 J	0.11 J	0.114	<1	20
Chromium, Total	6010C	1.0	0.2	9.5	10	9.75	4	20
Lead, Total	6010C	5.2	0.3	7.4	9.3	8.32	23 *	20
Mercury, Total	7471B	5.5	0.5	ND U	ND U	NC	NC	35
Nickel, Total	6010C	4.1	0.2	8.1	9.7	8.92	18	20
Selenium, Total	6010C	1.0	0.7	ND U	ND U	NC	NC	20
Silver, Total	6010C	1.0	0.5	ND U	ND U	NC	NC	20
Thallium, Total	6010C	1.0	0.6	ND U	1 J	NC	NC	20
Vanadium, Total	6010C	5.2	0.2	16.8	19.1	17.9	13	20
Zinc, Total	6010C	2.1	0.2	33.8	35.4	34.6	5	20

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1610541
Date Analyzed: 10/17/16

Lab Control Sample Summary
Inorganic Parameters

Units:mg/Kg
Basis:Dry

Lab Control Sample
R1610541-LCS

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Antimony, Total	6010C	46.8	50.0	94	80-120
Arsenic, Total	6010C	3.93	4.0	98	80-120
Barium, Total	6010C	199	200	99	80-120
Beryllium, Total	6010C	4.72	5.00	94	80-120
Cadmium, Total	6010C	4.94	5.00	99	80-120
Chromium, Total	6010C	19.9	20.0	99	80-120
Lead, Total	6010C	49.3	50.0	99	80-120
Mercury, Total	7471B	ND U	0.2	93	80-120
Nickel, Total	6010C	49.1	50.0	98	80-120
Selenium, Total	6010C	90.3	101	89	80-120
Silver, Total	6010C	4.58	5.0	92	80-120
Thallium, Total	6010C	173	200	87	80-120
Vanadium, Total	6010C	47.9	50.0	96	80-120
Zinc, Total	6010C	46.8	50.0	94	80-120



General Chemistry

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16
Date Analyzed: 10/12/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1610040800 IBC 7287
Lab Code: R1610541-001

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>Sample Result</u>	<u>Duplicate Sample R1610541-001DUP Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	95.1	95.5	95.3	<1	20

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ALS Group USA, Corp.

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QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1610541
Date Collected: 10/04/16
Date Received: 10/05/16
Date Analyzed: 10/12/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1610040806 IBC 7287
Lab Code: R1610541-003

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>MDL</u>	<u>Sample Result</u>	<u>Duplicate Sample R1610541-003DUP Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	-	96.0	94.9	95.4	1	20

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Subcontracted Analytical Parameters

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October 14, 2016

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Certificate of Analysis

Project Name:	TCLP Metals - no J values	Workorder:	2181306
Purchase Order:	58R1610541	Workorder ID:	R1610541

Dear Reports Invoices:

Enclosed are the analytical results for samples received by the laboratory on Tuesday, October 11, 2016.

The ALS Environmental laboratory in Middletown, Pennsylvania is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Mr. Brad W Kintzer (Project Coordinator) at (717) 944-5541.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state requirements. The test results meet requirements of the current NELAP standards or state requirements, where applicable. For a specific list of accredited analytes, refer to the certifications section of the ALS website at www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads.

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ALS Spring City: 10 Riverside Drive, Spring City, PA 19475 610-948-4903

CC: Ms. Ellen Smith , Ms. Janice Jaeger

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.


Mr. Brad W Kintzer
Project Coordinator

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SAMPLE SUMMARY

Workorder: 2181306 R1610541

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
2181306001	1610040809 IBC 7287	Solid	10/4/2016 00:00	10/11/2016 09:16	Collected by Client
2181306002	1610040810 IBC 7287	Solid	10/4/2016 00:00	10/11/2016 09:16	Collected by Client
2181306003	1610040823 IBC 7288	Solid	10/4/2016 00:00	10/11/2016 09:16	Collected by Client
2181306004	1610040843 IBC 7294	Solid	10/4/2016 00:00	10/11/2016 09:16	Collected by Client
2181306005	1610040853 IBC 7295	Solid	10/4/2016 00:00	10/11/2016 09:16	Collected by Client
2181306006	1610040903 IBC 7296	Solid	10/4/2016 00:00	10/11/2016 09:16	Collected by Client

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Mexico: Monterrey

SAMPLE SUMMARY

Workorder: 2181306 R1610541

Notes

- Samples collected by ALS personnel are done so in accordance with the procedures set forth in the ALS Field Sampling Plan (20 - Field Services Sampling Plan).
- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
- The Chain of Custody document is included as part of this report.
- All Library Search analytes should be regarded as tentative identifications based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.
- Parameters identified as "analyze immediately" require analysis within 15 minutes of collection. Any "analyze immediately" parameters not listed under the header "Field Parameters" are performed in the laboratory and are therefore analyzed out of hold time.
- Method references listed on this report beginning with the prefix "S" followed by a method number (such as S2310B-97) refer to methods from "Standard Methods for the Examination of Water and Wastewater".
- For microbiological analyses, the "Prepared" value is the date/time into the incubator and the "Analyzed" value is the date/time out the incubator.

Standard Acronyms/Flags

J	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
N	Indicates presumptive evidence of the presence of a compound
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference
LOD	DoD Limit of Detection
LOQ	DoD Limit of Quantitation
DL	DoD Detection Limit
I	Indicates reported value is greater than or equal to the Method Detection Limit (MDL) but less than the Report Detection Limit (RDL)
(S)	Surrogate Compound
NC	Not Calculated
*	Result outside of QC limits

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ANALYTICAL RESULTS

Workorder: 2181306 R1610541

Lab ID: **2181306001** Date Collected: 10/4/2016 00:00 Matrix: Solid
Sample ID: **1610040809 IBC 7287** Date Received: 10/11/2016 09:16

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	5.2		%	0.1	S2540G-11			10/13/16 08:57	VKB	
Total Solids	94.8		%	0.1	S2540G-11			10/13/16 08:57	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Barium, Total	ND		mg/L	2.8	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Chromium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Lead, Total	ND		mg/L	0.033	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	10/14/16 11:00	MNP	10/14/16 14:39	MNP	B1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Selenium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Silver, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Thallium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Zinc, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2


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Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2181306 R1610541

Lab ID: **2181306002** Date Collected: 10/4/2016 00:00 Matrix: Solid
Sample ID: **1610040810 IBC 7287** Date Received: 10/11/2016 09:16

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	4.7		%	0.1	S2540G-11			10/13/16 09:55	VKB	
Total Solids	95.3		%	0.1	S2540G-11			10/13/16 09:55	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Barium, Total	ND		mg/L	2.8	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Chromium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Lead, Total	ND		mg/L	0.033	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	10/14/16 11:00	MNP	10/14/16 14:42	MNP	B1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Selenium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Silver, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Thallium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Zinc, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2


Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2181306 R1610541

Lab ID: **2181306003** Date Collected: 10/4/2016 00:00 Matrix: Solid
Sample ID: **1610040823 IBC 7288** Date Received: 10/11/2016 09:16

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	4.1		%	0.1	S2540G-11			10/13/16 09:55	VKB	
Total Solids	95.9		%	0.1	S2540G-11			10/13/16 09:55	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Barium, Total	ND		mg/L	2.8	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Chromium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Lead, Total	ND		mg/L	0.033	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	10/14/16 11:00	MNP	10/14/16 14:44	MNP	B1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Selenium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Silver, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Thallium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Zinc, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2


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ANALYTICAL RESULTS

Workorder: 2181306 R1610541

Lab ID: **2181306004** Date Collected: 10/4/2016 00:00 Matrix: Solid
Sample ID: **1610040843 IBC 7294** Date Received: 10/11/2016 09:16

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	3.7		%	0.1	S2540G-11			10/13/16 09:55	VKB	
Total Solids	96.3		%	0.1	S2540G-11			10/13/16 09:55	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Barium, Total	ND		mg/L	2.8	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Chromium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Lead, Total	ND		mg/L	0.033	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	10/14/16 11:00	MNP	10/14/16 14:45	MNP	B1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Selenium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Silver, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Thallium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Zinc, Total	0.13		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2


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ANALYTICAL RESULTS

Workorder: 2181306 R1610541

Lab ID: **2181306005** Date Collected: 10/4/2016 00:00 Matrix: Solid
Sample ID: **1610040853 IBC 7295** Date Received: 10/11/2016 09:16

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	5.0		%	0.1	S2540G-11			10/13/16 09:55	VKB	
Total Solids	95.0		%	0.1	S2540G-11			10/13/16 09:55	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Barium, Total	ND		mg/L	2.8	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Chromium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Lead, Total	ND		mg/L	0.033	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	10/14/16 11:00	MNP	10/14/16 14:46	MNP	B1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Selenium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Silver, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Thallium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Zinc, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2


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ANALYTICAL RESULTS

Workorder: 2181306 R1610541

Lab ID: **2181306006** Date Collected: 10/4/2016 00:00 Matrix: Solid
Sample ID: **1610040903 IBC 7296** Date Received: 10/11/2016 09:16

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	12.6		%	0.1	S2540G-11			10/13/16 09:55	VKB	
Total Solids	87.4		%	0.1	S2540G-11			10/13/16 09:55	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Barium, Total	ND		mg/L	2.8	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Chromium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Lead, Total	ND		mg/L	0.033	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	10/14/16 11:00	MNP	10/14/16 14:47	MNP	B1
Nickel, Total	0.13		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Selenium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Silver, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Thallium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Zinc, Total	0.22		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2


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QUALITY CONTROL DATA

Workorder: 2181306 R1610541

QC Batch: MDIG/60238 **Analysis Method:** SW846 7470A

QC Batch Method: SW846 7470A

Associated Lab Samples: 2181306001, 2181306002, 2181306003, 2181306004, 2181306005, 2181306006

METHOD BLANK: 2423798

Parameter	Blank Result	Units	Reporting Limit
Mercury, Total	ND	mg/L	0.0020

LABORATORY CONTROL SAMPLE: 2423799

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Mercury, Total	102	mg/L	.002	0.0020	85 - 115

MATRIX SPIKE: 2423811 DUPLICATE: 2423812 ORIGINAL: 2181306001

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Mercury, Total	0	mg/L	.005	.00442	.00473	88.4	94.6	70 - 130	6.78	20

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QUALITY CONTROL DATA

Workorder: 2181306 R1610541

QC Batch: MDIG/60239 **Analysis Method:** SW846 6010C

QC Batch Method: SW846 3015

Associated Lab Samples: 2181306001, 2181306002, 2181306003, 2181306004, 2181306005, 2181306006

METHOD BLANK: 2423801

Parameter	Blank Result	Units	Reporting Limit
Antimony, Total	ND	mg/L	0.030
Arsenic, Total	ND	mg/L	0.028
Barium, Total	ND	mg/L	0.56
Beryllium, Total	ND	mg/L	0.0044
Cadmium, Total	ND	mg/L	0.0022
Chromium, Total	ND	mg/L	0.0056
Lead, Total	ND	mg/L	0.0067
Nickel, Total	ND	mg/L	0.022
Selenium, Total	ND	mg/L	0.022
Silver, Total	ND	mg/L	0.0044
Thallium, Total	ND	mg/L	0.022
Vanadium, Total	ND	mg/L	0.0056
Zinc, Total	ND	mg/L	0.022

LABORATORY CONTROL SAMPLE: 2423802

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Antimony, Total	101	mg/L	.22	0.22	80 - 120
Arsenic, Total	104	mg/L	.11	0.12	80 - 120
Barium, Total	108	mg/L	1.1	1.2	80 - 120
Beryllium, Total	104	mg/L	.22	0.23	80 - 120
Cadmium, Total	106	mg/L	.11	0.12	80 - 120
Chromium, Total	110	mg/L	.11	0.12	80 - 120
Lead, Total	106	mg/L	.11	0.12	80 - 120
Nickel, Total	106	mg/L	1.1	1.2	80 - 120
Selenium, Total	100	mg/L	1.1	1.1	80 - 120
Silver, Total	110	mg/L	.11	0.12	80 - 120
Thallium, Total	100	mg/L	.11	0.11	80 - 120
Vanadium, Total	108	mg/L	.056	0.060	80 - 120
Zinc, Total	105	mg/L	.56	0.58	80 - 120

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QUALITY CONTROL DATA

Workorder: 2181306 R1610541

MATRIX SPIKE: 2423809 DUPLICATE: 2423810 ORIGINAL: 2181306001

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Arsenic, Total	.015	mg/L	5	6.28327	5.89439	125	118	50 - 150	6.39	20
Barium, Total	1.01332	mg/L	10	12.83876	12.2221	118	112	50 - 150	4.92	20
Cadmium, Total	0	mg/L	1	1.23888	1.1611	124	116	50 - 150	6.48	20
Chromium, Total	.00278	mg/L	5	5.94439	5.54939	119	111	50 - 150	6.87	20
Lead, Total	0	mg/L	5	6.0055	5.64439	120	113	50 - 150	6.2	20
Selenium, Total	0	mg/L	1	1.22554	1.15666	123	116	50 - 150	5.78	20
Silver, Total	0	mg/L	1	1.3361	1.25832	134	126	50 - 150	6	20

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QUALITY CONTROL DATA

Workorder: 2181306 R1610541

QC Batch: WETC/177390 **Analysis Method:** S2540G-11
QC Batch Method: S2540G-11
Associated Lab Samples: 2181306001

SAMPLE DUPLICATE: 2423004 ORIGINAL: 2181015001					
Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	13.2052	%	9.3228	34.5*	10
Total Solids	86.7947	%	90.6771	4.38	5

SAMPLE DUPLICATE: 2423005 ORIGINAL: 2181016005					
Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	9.5801	%	9.5088	.75	10
Total Solids	90.4198	%	90.4911	.08	5

SAMPLE DUPLICATE: 2423006 ORIGINAL: 2181059003					
Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	21.4041	%	15.7093	30.7*	10
Total Solids	78.5958	%	84.2906	6.99*	5

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QUALITY CONTROL DATA

Workorder: 2181306 R1610541

QC Batch: WETC/177393 **Analysis Method:** S2540G-11

QC Batch Method: S2540G-11

Associated Lab Samples: 2181306002, 2181306003, 2181306004, 2181306005, 2181306006

SAMPLE DUPLICATE: 2423058 ORIGINAL: 2181306002

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	4.6966	%	5.5124	16*	10
Total Solids	95.3033	%	94.4875	.86	5

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Workorder: 2181306 R1610541

Lab ID	Sample ID	Prep Method	Prep Batch	Analysis Method	Analysis Batch
2181306001	1610040809 IBC 7287			S2540G-11	WETC/177390
2181306002	1610040810 IBC 7287			S2540G-11	WETC/177393
2181306003	1610040823 IBC 7288			S2540G-11	WETC/177393
2181306004	1610040843 IBC 7294			S2540G-11	WETC/177393
2181306005	1610040853 IBC 7295			S2540G-11	WETC/177393
2181306006	1610040903 IBC 7296			S2540G-11	WETC/177393
2181306001	1610040809 IBC 7287	SW846 7470A	MDIG/60238	SW846 7470A	META/54586
2181306002	1610040810 IBC 7287	SW846 7470A	MDIG/60238	SW846 7470A	META/54586
2181306003	1610040823 IBC 7288	SW846 7470A	MDIG/60238	SW846 7470A	META/54586
2181306004	1610040843 IBC 7294	SW846 7470A	MDIG/60238	SW846 7470A	META/54586
2181306005	1610040853 IBC 7295	SW846 7470A	MDIG/60238	SW846 7470A	META/54586
2181306006	1610040903 IBC 7296	SW846 7470A	MDIG/60238	SW846 7470A	META/54586
2181306001	1610040809 IBC 7287	SW846 3015	MDIG/60239	SW846 6010C	META/54581
2181306002	1610040810 IBC 7287	SW846 3015	MDIG/60239	SW846 6010C	META/54581
2181306003	1610040823 IBC 7288	SW846 3015	MDIG/60239	SW846 6010C	META/54581
2181306004	1610040843 IBC 7294	SW846 3015	MDIG/60239	SW846 6010C	META/54581
2181306005	1610040853 IBC 7295	SW846 3015	MDIG/60239	SW846 6010C	META/54581
2181306006	1610040903 IBC 7296	SW846 3015	MDIG/60239	SW846 6010C	META/54581

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ALS Corp

Project Number: R1610541
 Project Manager: Janice Jaeger
 QAP: LAB QAP



Lab Code	Sample ID	# of Cont.	Matrix	Sample		Date	Time	Lab ID	Test Results								
				Ag TCLP 6010C	As TCLP 6010C				Ba TCLP 6010C	Be TCLP 6010C	Ca TCLP 6010C	Cr TCLP 6010C	Hg TCLP 7471	Ni TCLP 6010C	Pb TCLP 6010C		
[Redacted]	1610040809 IBC 7287	2	Soil	10/4/16	Middletown ALS	X		X	X	X	X	X	X	X	X	X	X
[Redacted]	1610040810 IBC 7287		Soil	10/4/16	Middletown ALS	X		X	X	X	X	X	X	X	X	X	X
[Redacted]	1610040823 IBC 7288		Soil	10/4/16	Middletown ALS	X		X	X	X	X	X	X	X	X	X	X
[Redacted]	1610040843 IBC 7294		Soil	10/4/16	Middletown ALS	X		X	X	X	X	X	X	X	X	X	X
[Redacted]	1610040853 IBC 7295		Soil	10/4/16	Middletown ALS	X		X	X	X	X	X	X	X	X	X	X
[Redacted]	1610040903 IBC 7296		Soil	10/4/16	Middletown ALS	X		X	X	X	X	X	X	X	X	X	X

Y N Initials Cooler Temp: 3 °C
 Custody Seals Present? AY
 (if present) Seals Intact? AY
 Received on Ice? AY
 COC/ILBis Complete AY
 Cont in Good Cond? AY
 Correct Containers? AY
 Correct Samp Vol? AY
 Correct Preservation? AY
 Headspace/Volatiles? AY
 Therm ID: PH552
 Ship Carrier: FedEx UPS
 Tracking #: 682680165640
 DHL

A-802
AS 10/16/16
AS
10/16/16

Folder Comments:
 ND U

Special Instructions/Comments <i>NABA/WSTF EDW</i>	Turnaround Requirements ___ RUSH (Surcharges Apply) PLEASE CIRCLE WORK DAYS 1 2 3 4 5 <input checked="" type="checkbox"/> STANDARD Requested FAX Date: _____ Requested Report Date: <u>10/14/16</u>	Report Requirements ___ I. Results Only <input checked="" type="checkbox"/> II. Results + QC Summaries ___ III. Results + QC and Calibration Summaries ___ IV. Data Validation Report with Raw Data PQL/MDL/ <u>Y</u> EDD <u>Y</u>	Invoice Information PO# <u>58R1610541</u> Bill to _____
	H - Test is On Hold P - Test is Authorized for Prep Only Relinquished By: <u>[Signature]</u> <u>10-10-16</u> <u>12:50</u> Received By: <u>[Signature]</u> <u>10/16/16</u> Airbill Number: _____		

2181306

1610040809	1610040809 IBC 7287	2	Soil	10/4/16	Middletown ALS	Sb TCLP 6010C	X	Sa TCLP 6010C	X	TCLP EPA 1311	X	Ti TCLP 6010C	X	V TCLP 6010C	X	Zn TCLP 6010C	X
1610040810	1610040810 IBC 7287	1	Soil	10/4/16	Middletown ALS		X		X		X		X		X		X
1610040823	1610040823 IBC 7288	1	Soil	10/4/16	Middletown ALS		X		X		X		X		X		X
1610040843	1610040843 IBC 7294	1	Soil	10/4/16	Middletown ALS		X		X		X		X		X		X
1610040853	1610040853 IBC 7295	1	Soil	10/4/16	Middletown ALS		X		X		X		X		X		X
1610040903	1610040903 IBC 7296	1	Soil	10/4/16	Middletown ALS		X		X		X		X		X		X

ALS Environmental Chain of Custody


1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475

ALS Contact: Janice Jaeger

Project Number: R1610541
Project Manager: Janice Jaeger
QAP: LAB QAP

Run QC on sample R1610541-005 for 6010C/Ag TCLP, As TCLP, Ba TCLP, Be TCLP, Cd TCLP, Cr TCLP, Ni TCLP, Pb TCLP, Se TCLP, Ti TCLP, V TCLP, Zn TCLP, 7470A/Hg TCLP

R1610541

 Ship To: Middletown ALS
ALS Laboratory Group
34 Dogwood Lane
Middletown, PA 17057

PC YJW Date 10/10/16
SMO JE Date 10-10-16

Instructions:

Ice X
Dry Ice _____
No Ice _____
Bill to Client Account _____

Shipping:

Overnight X
2nd Day _____
Ground _____

Comments:

ALS Group USA, Corp.
www.alsglobal.com
An ALS Limited Company

October 14, 2016

Ms. Ellen Smith
ALS Environmental-Rochester NY
1565 Jefferson Road, Bldg. 300
Suite 360
Rochester, NY 14623

Certificate of Analysis

Project Name:	TCLP Metals - no J values	Workorder:	2181306
Purchase Order:	58R1610541	Workorder ID:	R1610541

Dear Ms. Smith:

Enclosed are the analytical results for samples received by the laboratory on Tuesday, October 11, 2016.

The ALS Environmental laboratory in Middletown, Pennsylvania is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Mr. Brad W Kintzer (Project Coordinator) at (717) 944-5541.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state requirements. The test results meet requirements of the current NELAP standards or state requirements, where applicable. For a specific list of accredited analytes, refer to the certifications section of the ALS website at www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads.

This laboratory report may not be reproduced, except in full, without the written approval of ALS Environmental.

ALS Spring City: 10 Riverside Drive, Spring City, PA 19475 610-948-4903

CC: Reports and Invoices , Ms. Janice Jaeger

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.


Mr. Brad W Kintzer
Project Coordinator

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SAMPLE SUMMARY

Workorder: 2181306 R1610541

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
2181306001	1610040809 IBC 7287	Solid	10/4/2016 00:00	10/11/2016 09:16	Collected by Client
2181306002	1610040810 IBC 7287	Solid	10/4/2016 00:00	10/11/2016 09:16	Collected by Client
2181306003	1610040823 IBC 7288	Solid	10/4/2016 00:00	10/11/2016 09:16	Collected by Client
2181306004	1610040843 IBC 7294	Solid	10/4/2016 00:00	10/11/2016 09:16	Collected by Client
2181306005	1610040853 IBC 7295	Solid	10/4/2016 00:00	10/11/2016 09:16	Collected by Client
2181306006	1610040903 IBC 7296	Solid	10/4/2016 00:00	10/11/2016 09:16	Collected by Client

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SAMPLE SUMMARY

Workorder: 2181306 R1610541

Notes

- Samples collected by ALS personnel are done so in accordance with the procedures set forth in the ALS Field Sampling Plan (20 - Field Services Sampling Plan).
- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
- The Chain of Custody document is included as part of this report.
- All Library Search analytes should be regarded as tentative identifications based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.
- Parameters identified as "analyze immediately" require analysis within 15 minutes of collection. Any "analyze immediately" parameters not listed under the header "Field Parameters" are performed in the laboratory and are therefore analyzed out of hold time.
- Method references listed on this report beginning with the prefix "S" followed by a method number (such as S2310B-97) refer to methods from "Standard Methods for the Examination of Water and Wastewater".
- For microbiological analyses, the "Prepared" value is the date/time into the incubator and the "Analyzed" value is the date/time out the incubator.

Standard Acronyms/Flags

J	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
N	Indicates presumptive evidence of the presence of a compound
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference
LOD	DoD Limit of Detection
LOQ	DoD Limit of Quantitation
DL	DoD Detection Limit
I	Indicates reported value is greater than or equal to the Method Detection Limit (MDL) but less than the Report Detection Limit (RDL)
(S)	Surrogate Compound
NC	Not Calculated
*	Result outside of QC limits

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ANALYTICAL RESULTS

Workorder: 2181306 R1610541

Lab ID: **2181306001** Date Collected: 10/4/2016 00:00 Matrix: Solid
Sample ID: **1610040809 IBC 7287** Date Received: 10/11/2016 09:16

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	5.2		%	0.1	S2540G-11			10/13/16 08:57	VKB	
Total Solids	94.8		%	0.1	S2540G-11			10/13/16 08:57	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Barium, Total	ND		mg/L	2.8	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Chromium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Lead, Total	ND		mg/L	0.033	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	10/14/16 11:00	MNP	10/14/16 14:39	MNP	B1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Selenium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Silver, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Thallium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2
Zinc, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:34	TSS	B2



Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2181306 R1610541

Lab ID: **2181306002** Date Collected: 10/4/2016 00:00 Matrix: Solid
Sample ID: **1610040810 IBC 7287** Date Received: 10/11/2016 09:16

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	4.7		%	0.1	S2540G-11			10/13/16 09:55	VKB	
Total Solids	95.3		%	0.1	S2540G-11			10/13/16 09:55	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Barium, Total	ND		mg/L	2.8	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Chromium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Lead, Total	ND		mg/L	0.033	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	10/14/16 11:00	MNP	10/14/16 14:42	MNP	B1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Selenium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Silver, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Thallium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2
Zinc, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:47	TSS	B2


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ANALYTICAL RESULTS

Workorder: 2181306 R1610541

Lab ID: **2181306003** Date Collected: 10/4/2016 00:00 Matrix: Solid
Sample ID: **1610040823 IBC 7288** Date Received: 10/11/2016 09:16

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	4.1		%	0.1	S2540G-11			10/13/16 09:55	VKB	
Total Solids	95.9		%	0.1	S2540G-11			10/13/16 09:55	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Barium, Total	ND		mg/L	2.8	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Chromium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Lead, Total	ND		mg/L	0.033	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	10/14/16 11:00	MNP	10/14/16 14:44	MNP	B1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Selenium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Silver, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Thallium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2
Zinc, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:51	TSS	B2


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ANALYTICAL RESULTS

Workorder: 2181306 R1610541

 Lab ID: **2181306004** Date Collected: 10/4/2016 00:00 Matrix: Solid
 Sample ID: **1610040843 IBC 7294** Date Received: 10/11/2016 09:16

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	3.7		%	0.1	S2540G-11			10/13/16 09:55	VKB	
Total Solids	96.3		%	0.1	S2540G-11			10/13/16 09:55	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Barium, Total	ND		mg/L	2.8	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Chromium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Lead, Total	ND		mg/L	0.033	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	10/14/16 11:00	MNP	10/14/16 14:45	MNP	B1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Selenium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Silver, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Thallium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2
Zinc, Total	0.13		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 12:56	TSS	B2


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ANALYTICAL RESULTS

Workorder: 2181306 R1610541

Lab ID: **2181306005** Date Collected: 10/4/2016 00:00 Matrix: Solid
Sample ID: **1610040853 IBC 7295** Date Received: 10/11/2016 09:16

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	5.0		%	0.1	S2540G-11			10/13/16 09:55	VKB	
Total Solids	95.0		%	0.1	S2540G-11			10/13/16 09:55	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Barium, Total	ND		mg/L	2.8	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Chromium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Lead, Total	ND		mg/L	0.033	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	10/14/16 11:00	MNP	10/14/16 14:46	MNP	B1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Selenium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Silver, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Thallium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2
Zinc, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:15	TSS	B2



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ANALYTICAL RESULTS

Workorder: 2181306 R1610541

Lab ID: **2181306006** Date Collected: 10/4/2016 00:00 Matrix: Solid
Sample ID: **1610040903 IBC 7296** Date Received: 10/11/2016 09:16

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	12.6		%	0.1	S2540G-11			10/13/16 09:55	VKB	
Total Solids	87.4		%	0.1	S2540G-11			10/13/16 09:55	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Barium, Total	ND		mg/L	2.8	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Chromium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Lead, Total	ND		mg/L	0.033	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	10/14/16 11:00	MNP	10/14/16 14:47	MNP	B1
Nickel, Total	0.13		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Selenium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Silver, Total	ND		mg/L	0.022	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Thallium, Total	ND		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2
Zinc, Total	0.22		mg/L	0.11	SW846 6010C	10/14/16 10:14	TSS	10/14/16 13:20	TSS	B2



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QUALITY CONTROL DATA

Workorder: 2181306 R1610541

QC Batch: MDIG/60238 **Analysis Method:** SW846 7470A

QC Batch Method: SW846 7470A

Associated Lab Samples: 2181306001, 2181306002, 2181306003, 2181306004, 2181306005, 2181306006

METHOD BLANK: 2423798

Parameter	Blank Result	Units	Reporting Limit
Mercury, Total	ND	mg/L	0.0020

LABORATORY CONTROL SAMPLE: 2423799

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Mercury, Total	102	mg/L	.002	0.0020	85 - 115

MATRIX SPIKE: 2423811 DUPLICATE: 2423812 ORIGINAL: 2181306001

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Mercury, Total	0	mg/L	.005	.00442	.00473	88.4	94.6	70 - 130	6.78	20

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QUALITY CONTROL DATA

Workorder: 2181306 R1610541

QC Batch: MDIG/60239 **Analysis Method:** SW846 6010C

QC Batch Method: SW846 3015

Associated Lab Samples: 2181306001, 2181306002, 2181306003, 2181306004, 2181306005, 2181306006

METHOD BLANK: 2423801

Parameter	Blank Result	Units	Reporting Limit
Antimony, Total	ND	mg/L	0.030
Arsenic, Total	ND	mg/L	0.028
Barium, Total	ND	mg/L	0.56
Beryllium, Total	ND	mg/L	0.0044
Cadmium, Total	ND	mg/L	0.0022
Chromium, Total	ND	mg/L	0.0056
Lead, Total	ND	mg/L	0.0067
Nickel, Total	ND	mg/L	0.022
Selenium, Total	ND	mg/L	0.022
Silver, Total	ND	mg/L	0.0044
Thallium, Total	ND	mg/L	0.022
Vanadium, Total	ND	mg/L	0.0056
Zinc, Total	ND	mg/L	0.022

LABORATORY CONTROL SAMPLE: 2423802

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Antimony, Total	101	mg/L	.22	0.22	80 - 120
Arsenic, Total	104	mg/L	.11	0.12	80 - 120
Barium, Total	108	mg/L	1.1	1.2	80 - 120
Beryllium, Total	104	mg/L	.22	0.23	80 - 120
Cadmium, Total	106	mg/L	.11	0.12	80 - 120
Chromium, Total	110	mg/L	.11	0.12	80 - 120
Lead, Total	106	mg/L	.11	0.12	80 - 120
Nickel, Total	106	mg/L	1.1	1.2	80 - 120
Selenium, Total	100	mg/L	1.1	1.1	80 - 120
Silver, Total	110	mg/L	.11	0.12	80 - 120
Thallium, Total	100	mg/L	.11	0.11	80 - 120
Vanadium, Total	108	mg/L	.056	0.060	80 - 120
Zinc, Total	105	mg/L	.56	0.58	80 - 120

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QUALITY CONTROL DATA

Workorder: 2181306 R1610541

MATRIX SPIKE: 2423809 DUPLICATE: 2423810 ORIGINAL: 2181306001

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Arsenic, Total	.015	mg/L	5	6.28327	5.89439	125	118	50 - 150	6.39	20
Barium, Total	1.01332	mg/L	10	12.83876	12.2221	118	112	50 - 150	4.92	20
Cadmium, Total	0	mg/L	1	1.23888	1.1611	124	116	50 - 150	6.48	20
Chromium, Total	.00278	mg/L	5	5.94439	5.54939	119	111	50 - 150	6.87	20
Lead, Total	0	mg/L	5	6.0055	5.64439	120	113	50 - 150	6.2	20
Selenium, Total	0	mg/L	1	1.22554	1.15666	123	116	50 - 150	5.78	20
Silver, Total	0	mg/L	1	1.3361	1.25832	134	126	50 - 150	6	20

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QUALITY CONTROL DATA

Workorder: 2181306 R1610541

QC Batch: WETC/177390 **Analysis Method:** S2540G-11

QC Batch Method: S2540G-11

Associated Lab Samples: 2181306001

SAMPLE DUPLICATE: 2423004 ORIGINAL: 2181015001

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	13.2052	%	9.3228	34.5*	10
Total Solids	86.7947	%	90.6771	4.38	5

SAMPLE DUPLICATE: 2423005 ORIGINAL: 2181016005

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	9.5801	%	9.5088	.75	10
Total Solids	90.4198	%	90.4911	.08	5

SAMPLE DUPLICATE: 2423006 ORIGINAL: 2181059003

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	21.4041	%	15.7093	30.7*	10
Total Solids	78.5958	%	84.2906	6.99*	5

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QUALITY CONTROL DATA

Workorder: 2181306 R1610541

QC Batch: WETC/177393 **Analysis Method:** S2540G-11

QC Batch Method: S2540G-11

Associated Lab Samples: 2181306002, 2181306003, 2181306004, 2181306005, 2181306006

SAMPLE DUPLICATE: 2423058 ORIGINAL: 2181306002

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	4.6966	%	5.5124	16*	10
Total Solids	95.3033	%	94.4875	.86	5

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Workorder: 2181306 R1610541

Lab ID	Sample ID	Prep Method	Prep Batch	Analysis Method	Analysis Batch
2181306001	1610040809 IBC 7287			S2540G-11	WETC/177390
2181306002	1610040810 IBC 7287			S2540G-11	WETC/177393
2181306003	1610040823 IBC 7288			S2540G-11	WETC/177393
2181306004	1610040843 IBC 7294			S2540G-11	WETC/177393
2181306005	1610040853 IBC 7295			S2540G-11	WETC/177393
2181306006	1610040903 IBC 7296			S2540G-11	WETC/177393
2181306001	1610040809 IBC 7287	SW846 7470A	MDIG/60238	SW846 7470A	META/54586
2181306002	1610040810 IBC 7287	SW846 7470A	MDIG/60238	SW846 7470A	META/54586
2181306003	1610040823 IBC 7288	SW846 7470A	MDIG/60238	SW846 7470A	META/54586
2181306004	1610040843 IBC 7294	SW846 7470A	MDIG/60238	SW846 7470A	META/54586
2181306005	1610040853 IBC 7295	SW846 7470A	MDIG/60238	SW846 7470A	META/54586
2181306006	1610040903 IBC 7296	SW846 7470A	MDIG/60238	SW846 7470A	META/54586
2181306001	1610040809 IBC 7287	SW846 3015	MDIG/60239	SW846 6010C	META/54581
2181306002	1610040810 IBC 7287	SW846 3015	MDIG/60239	SW846 6010C	META/54581
2181306003	1610040823 IBC 7288	SW846 3015	MDIG/60239	SW846 6010C	META/54581
2181306004	1610040843 IBC 7294	SW846 3015	MDIG/60239	SW846 6010C	META/54581
2181306005	1610040853 IBC 7295	SW846 3015	MDIG/60239	SW846 6010C	META/54581
2181306006	1610040903 IBC 7296	SW846 3015	MDIG/60239	SW846 6010C	META/54581

ALS Environmental Laboratory Locations Across North America

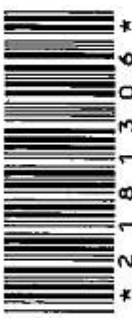
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ALS Environmental Chain of Custody

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ALS Corp

Project Number: R1610541
 Project Manager: Janice Jaeger
 QAP: LAB QAP



Lab Code	Sample ID	# of Cont.	Matrix	Sample		Lab ID	Test Results									
				Date	Time		Ag TCLP 6010C	As TCLP 6010C	Ba TCLP 6010C	Be TCLP 6010C	Ca TCLP 6010C	Cr TCLP 6010C	Hg TCLP 6010C	Ni TCLP 6010C	Pb TCLP 6010C	
[REDACTED]	1610040809 IBC 7287	2	Soil	10/4/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X
[REDACTED]	1610040810 IBC 7287	1	Soil	10/4/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X
[REDACTED]	1610040823 IBC 7288	1	Soil	10/4/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X
[REDACTED]	1610040843 IBC 7294	1	Soil	10/4/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X
[REDACTED]	1610040853 IBC 7295	1	Soil	10/4/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X
[REDACTED]	1610040903 IBC 7296	1	Soil	10/4/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X

Y N Initials Cooler Temp: 3 °C
 Custody Seals Present? AY
 (if present) Seals Intact? AY
 Received on Ice? AY
 COC/ILBis Complete AY
 Cont in Good Cond? AY
 Correct Containers? AY
 Correct Samp Vol? AY
 Correct Preservation? AY
 Headspace/Volatiles? AY
 Tracking #: 682680165640
 Therm ID: TH552
 Ship Carrier: FedEx UPS
 DHL

A-802
AS 10/16/16
AS
10/16/16

Folder Comments:
 ND U

Special Instructions/Comments <i>NABA/WSTF EDW</i>	Turnaround Requirements ___ RUSH (Surcharges Apply) PLEASE CIRCLE WORK DAYS 1 2 3 4 5 <u>A</u> STANDARD Requested FAX Date: _____ Requested Report Date: <u>10/14/16</u>	Report Requirements ___ I. Results Only <u>A</u> II. Results + QC Summaries ___ III. Results + QC and Calibration Summaries ___ IV. Data Validation Report with Raw Data PQL/MDL/ <u>Y</u> EDD <u>Y</u>	Invoice Information PO# 58R1610541 Bill to _____
	H - Test is On Hold P - Test is Authorized for Prep Only Relinquished By: <u>[Signature]</u> 10-10-16 12:50 Received By: <u>[Signature]</u> 10/16/16 Airbill Number: _____		

2181306

1610040809	1610040809 IBC 7287	2	Soil	10/4/16	Middletown ALS	Sb TCLP 6010C	X	Sa TCLP 6010C	X	TCLP EPA 1311	Ti TCLP 6010C	V TCLP 6010C	Zn TCLP 6010C
1610040810	1610040810 IBC 7287	1	Soil	10/4/16	Middletown ALS		X		X				
1610040823	1610040823 IBC 7288	1	Soil	10/4/16	Middletown ALS		X		X				
1610040843	1610040843 IBC 7294	1	Soil	10/4/16	Middletown ALS		X		X				
1610040853	1610040853 IBC 7295	1	Soil	10/4/16	Middletown ALS		X		X				
1610040903	1610040903 IBC 7296	1	Soil	10/4/16	Middletown ALS		X		X				

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ALS Contact: Janice Jaeger

Project Number: R1610541
Project Manager: Janice Jaeger
QAP: LAB QAP

Run QC on sample R1610541-005 for 6010C/Ag TCLP, As TCLP, Ba TCLP, Be TCLP, Cd TCLP, Cr TCLP, Ni TCLP, Pb TCLP, Se TCLP, Ti TCLP, V TCLP, Zn TCLP, 7470A/Hg TCLP

R1610541

 Ship To: Middletown ALS
ALS Laboratory Group
34 Dogwood Lane
Middletown, PA 17057

PC YJW Date 10/10/16
SMO AE Date 10-10-16

Instructions:

Ice X
Dry Ice _____
No Ice _____

Shipping:

Overnight X
2nd Day _____
Ground _____

Bill to Client Account _____

Comments:

ALS Group USA, Corp.
www.alsglobal.com
An ALS Limited Company



November 01, 2016

Service Request No:R1611059

Mr. Tom Hall
NASA/WSTF/Navarro
P.O. Box 20
Las Cruces, NM 88004

Laboratory Results for: White Sands Test Facility

Dear Mr.Hall,

Enclosed are the results of the sample(s) submitted to our laboratory October 18, 2016
For your reference, these analyses have been assigned our service request number **R1611059**.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAP standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report. The measurement uncertainty of the results included in this report is within that expected when using the prescribed method(s) for analysis of these samples, and represented by Laboratory Control Sample control limits. Any events, such as QC failures, which may add to the uncertainty are explained in the report narrative.

Please contact me if you have any questions. My extension is 7472. You may also contact me via email at Janice.Jaeger@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Janice Jaeger
Project Manager

ADDRESS 1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
PHONE +1 585 288 5380 | **FAX** +1 585 288 8475
ALS Group USA, Corp.
dba ALS Environmental



Narrative Documents

ALS Environmental—Rochester Laboratory
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Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com



Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611059
Date Received: 10/18/16

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables, including results of QC samples analyzed from this delivery group. Analytical procedures performed by the lab are validated in accordance with NELAC standards. Any parameters that are not included in the lab's NELAC accreditation are identified on a "Non-Certified Analytes" report in the Miscellaneous Forms Section of this report. Individual analytical results requiring further explanation are flagged with qualifiers and/or discussed below. The flags are explained in the Report Qualifiers and Definitions page in the Miscellaneous Forms section of this report.

Sample Receipt

Thirty soil samples were received for analysis at ALS Environmental on 10/18/2016. Any discrepancies noted upon initial sample inspection are noted on the cooler receipt and preservation form included in this data package. The samples were received in good condition and consistent with the accompanying chain of custody form. Samples are refrigerated at $\leq 6^{\circ}\text{C}$ upon receipt at the lab except for aqueous samples designated for metals analyses, which are stored at room temperature.

Volatile Organic Analyses:

Method 8260C, 10/25/16: The lower control limit was exceeded for one or more analytes in the Continuing Calibration Verification (CCV). Since there were no detections of the analyte(s) in the associated field samples, the quantitation is not affected. The data quality was not significantly affected and no further corrective action was taken.

Metals Analyses:

No significant anomalies were noted with this analysis.

General Chemistry Analyses:

No significant anomalies were noted with this analysis.

Sample Receiving Notes:

Method 8260C: soil samples included in this report were received in jars and not collected using one of the EPA method 5035A low level options. In accordance with the NYSDOH technical notice of October 2012 all results or reporting limits $< 200 \text{ ug/kg}$ should be considered as estimated due to potential low bias.

One or more samples were subcontracted to another laboratory for testing. The certified analytical report from the subcontractor has been included in its entirety at the end of this report and includes the name and address of the subcontracted laboratory.

Approved by  Date 11/1/2016



SAMPLE DETECTION SUMMARY

CLIENT ID: 1610140830 IBC 7330 **Lab ID: R1611059-001**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.2				Percent	ALS SOP

CLIENT ID: 1610140832 IBC 7330 **Lab ID: R1611059-002**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.6				Percent	ALS SOP
Antimony, Total	0.7	BJ	0.5	6.1	mg/Kg	6010C
Arsenic, Total	3.6		0.3	1.0	mg/Kg	6010C
Barium, Total	105		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.40		0.02	0.31	mg/Kg	6010C
Cadmium, Total	0.27	J	0.04	0.51	mg/Kg	6010C
Chromium, Total	6.6		0.2	1.0	mg/Kg	6010C
Lead, Total	7.0		0.3	5.1	mg/Kg	6010C
Nickel, Total	8.0		0.2	4.1	mg/Kg	6010C
Selenium, Total	0.7	J	0.7	1.0	mg/Kg	6010C
Thallium, Total	4.7		0.6	1.0	mg/Kg	6010C
Vanadium, Total	11.9		0.2	5.1	mg/Kg	6010C
Zinc, Total	40.7		0.2	2.0	mg/Kg	6010C

CLIENT ID: 1610140835 IBC 7329 **Lab ID: R1611059-004**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.2				Percent	ALS SOP
Acetone	3.2	J	2.9	5.1	ug/Kg	8260C

CLIENT ID: 1610140837 IBC 7329 **Lab ID: R1611059-005**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.1				Percent	ALS SOP
Arsenic, Total	4.49		0.24	0.98	mg/Kg	6010C
Barium, Total	83.3		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.48		0.02	0.29	mg/Kg	6010C
Cadmium, Total	0.30	J	0.04	0.49	mg/Kg	6010C
Chromium, Total	9.03		0.13	0.98	mg/Kg	6010C
Lead, Total	8.7		0.3	4.9	mg/Kg	6010C
Nickel, Total	8.8		0.2	3.9	mg/Kg	6010C
Thallium, Total	1.92		0.51	0.98	mg/Kg	6010C
Vanadium, Total	15.1		0.2	4.9	mg/Kg	6010C
Zinc, Total	38.1		0.2	2.0	mg/Kg	6010C

CLIENT ID: 1610140840 IBC 7338 **Lab ID: R1611059-007**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	95.8				Percent	ALS SOP
Acetone	3.2	J	3.0	5.2	ug/Kg	8260C



SAMPLE DETECTION SUMMARY

CLIENT ID: 1610140842 IBC 7338	Lab ID: R1611059-008
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	96.1				Percent	ALS SOP
Arsenic, Total	5.5		0.3	1.0	mg/Kg	6010C
Barium, Total	86.4		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.47		0.02	0.30	mg/Kg	6010C
Cadmium, Total	0.35	J	0.04	0.50	mg/Kg	6010C
Chromium, Total	10.9		0.2	1.0	mg/Kg	6010C
Lead, Total	8.4		0.3	5.0	mg/Kg	6010C
Nickel, Total	9.7		0.2	4.0	mg/Kg	6010C
Silver, Total	0.7	J	0.5	1.0	mg/Kg	6010C
Thallium, Total	2.0		0.6	1.0	mg/Kg	6010C
Vanadium, Total	13.5		0.2	5.0	mg/Kg	6010C
Zinc, Total	43.8		0.2	2.0	mg/Kg	6010C

CLIENT ID: 1610130850 IBC 7321	Lab ID: R1611059-010
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	98.0				Percent	ALS SOP

CLIENT ID: 1610130851 IBC 7321	Lab ID: R1611059-011
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.8				Percent	ALS SOP
Acetone	3.2	J	2.9	5.1	ug/Kg	8260C

CLIENT ID: 1610130856 IBC 7321	Lab ID: R1611059-012
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.9				Percent	ALS SOP
Arsenic, Total	5.8		0.3	1.0	mg/Kg	6010C
Barium, Total	178		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.47		0.02	0.31	mg/Kg	6010C
Cadmium, Total	0.53		0.04	0.51	mg/Kg	6010C
Chromium, Total	7.2		0.2	1.0	mg/Kg	6010C
Lead, Total	9.8		0.3	5.1	mg/Kg	6010C
Nickel, Total	9.1		0.2	4.1	mg/Kg	6010C
Thallium, Total	3.9		0.6	1.0	mg/Kg	6010C
Vanadium, Total	14.1		0.2	5.1	mg/Kg	6010C
Zinc, Total	49.4		0.2	2.0	mg/Kg	6010C

CLIENT ID: 1610130857 IBC 7321	Lab ID: R1611059-013
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.7				Percent	ALS SOP
Arsenic, Total	5.5		0.3	1.0	mg/Kg	6010C
Barium, Total	170		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.47		0.02	0.31	mg/Kg	6010C
Cadmium, Total	0.38	J	0.04	0.51	mg/Kg	6010C



SAMPLE DETECTION SUMMARY

CLIENT ID: 1610130857 IBC 7321 **Lab ID: R1611059-013**

Analyte	Results	Flag	MDL	PQL	Units	Method
Chromium, Total	6.5		0.2	1.0	mg/Kg	6010C
Lead, Total	16.3		0.3	5.1	mg/Kg	6010C
Nickel, Total	8.2		0.2	4.1	mg/Kg	6010C
Thallium, Total	3.1		0.6	1.0	mg/Kg	6010C
Vanadium, Total	12.7		0.2	5.1	mg/Kg	6010C
Zinc, Total	44.7		0.2	2.0	mg/Kg	6010C

CLIENT ID: 1610130905 IBC 7322 **Lab ID: R1611059-016**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	98.7				Percent	ALS SOP

CLIENT ID: 1610130907 IBC 7322 **Lab ID: R1611059-017**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	98.2				Percent	ALS SOP
Arsenic, Total	4.20		0.24	0.97	mg/Kg	6010C
Barium, Total	89.0		0.2	1.9	mg/Kg	6010C
Beryllium, Total	0.41		0.02	0.29	mg/Kg	6010C
Cadmium, Total	0.33	J	0.04	0.48	mg/Kg	6010C
Chromium, Total	8.41		0.13	0.97	mg/Kg	6010C
Lead, Total	6.4		0.3	4.8	mg/Kg	6010C
Nickel, Total	6.6		0.2	3.9	mg/Kg	6010C
Thallium, Total	2.48		0.51	0.97	mg/Kg	6010C
Vanadium, Total	13.7		0.2	4.8	mg/Kg	6010C
Zinc, Total	29.9		0.2	1.9	mg/Kg	6010C

CLIENT ID: 1610130915 IBC 7326 **Lab ID: R1611059-019**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	96.5				Percent	ALS SOP

CLIENT ID: 1610130917 IBC 7326 **Lab ID: R1611059-020**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	96.2				Percent	ALS SOP
Arsenic, Total	5.2		0.3	1.0	mg/Kg	6010C
Barium, Total	127		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.43		0.02	0.31	mg/Kg	6010C
Cadmium, Total	0.40	J	0.04	0.51	mg/Kg	6010C
Chromium, Total	9.7		0.2	1.0	mg/Kg	6010C
Lead, Total	9.4		0.3	5.1	mg/Kg	6010C
Nickel, Total	8.4		0.2	4.1	mg/Kg	6010C
Selenium, Total	0.9	J	0.7	1.0	mg/Kg	6010C
Thallium, Total	2.7		0.6	1.0	mg/Kg	6010C
Vanadium, Total	12.9		0.2	5.1	mg/Kg	6010C
Zinc, Total	46.6		0.2	2.0	mg/Kg	6010C



SAMPLE DETECTION SUMMARY

CLIENT ID: 1610130940 IBC 7327 Lab ID: R1611059-022

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.9				Percent	ALS SOP

CLIENT ID: 1610130942 IBC 7327 Lab ID: R1611059-023

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	98.0				Percent	ALS SOP
Arsenic, Total	5.7		0.3	1.0	mg/Kg	6010C
Barium, Total	643		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.46		0.02	0.31	mg/Kg	6010C
Cadmium, Total	0.41	J	0.04	0.51	mg/Kg	6010C
Chromium, Total	8.4		0.2	1.0	mg/Kg	6010C
Lead, Total	9.0		0.3	5.1	mg/Kg	6010C
Nickel, Total	9.3		0.2	4.1	mg/Kg	6010C
Thallium, Total	2.9		0.6	1.0	mg/Kg	6010C
Vanadium, Total	17.8		0.2	5.1	mg/Kg	6010C
Zinc, Total	43.1		0.2	2.0	mg/Kg	6010C

CLIENT ID: 1610130945 IBC 7331 Lab ID: R1611059-025

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.7				Percent	ALS SOP

CLIENT ID: 1610130947 IBC 7331 Lab ID: R1611059-026

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.5				Percent	ALS SOP
Arsenic, Total	4.24		0.24	0.99	mg/Kg	6010C
Barium, Total	53.4		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.42		0.02	0.30	mg/Kg	6010C
Cadmium, Total	0.40	J	0.04	0.49	mg/Kg	6010C
Chromium, Total	10.3		0.13	0.99	mg/Kg	6010C
Lead, Total	9.5		0.3	4.9	mg/Kg	6010C
Nickel, Total	9.0		0.2	3.9	mg/Kg	6010C
Thallium, Total	2.11		0.51	0.99	mg/Kg	6010C
Vanadium, Total	14.8		0.2	4.9	mg/Kg	6010C
Zinc, Total	37.3		0.2	2.0	mg/Kg	6010C

CLIENT ID: 1610130950 IBC 7328 Lab ID: R1611059-028

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.8				Percent	ALS SOP
Acetone	3.3	J	2.9	5.1	ug/Kg	8260C

CLIENT ID: 1610130952 IBC 7328 Lab ID: R1611059-029

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.5				Percent	ALS SOP
Arsenic, Total	5.91		0.24	1.0	mg/Kg	6010C
Barium, Total	63.1		0.2	2.0	mg/Kg	6010C



SAMPLE DETECTION SUMMARY

CLIENT ID: 1610130952 IBC 7328 **Lab ID: R1611059-029**

Analyte	Results	Flag	MDL	PQL	Units	Method
Beryllium, Total	0.46		0.02	0.30	mg/Kg	6010C
Cadmium, Total	0.41	J	0.04	0.50	mg/Kg	6010C
Chromium, Total	11.9		0.13	1.0	mg/Kg	6010C
Lead, Total	10.3		0.3	5.0	mg/Kg	6010C
Nickel, Total	9.9		0.2	4.0	mg/Kg	6010C
Thallium, Total	2.49		0.51	1.0	mg/Kg	6010C
Vanadium, Total	14.2		0.2	5.0	mg/Kg	6010C
Zinc, Total	41.3		0.2	2.0	mg/Kg	6010C



Sample Receipt Information

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request:R1611059

SAMPLE CROSS-REFERENCE

<u>SAMPLE #</u>	<u>CLIENT SAMPLE ID</u>	<u>DATE</u>	<u>TIME</u>
R1611059-001	1610140830 IBC 7330	10/14/2016	
R1611059-002	1610140832 IBC 7330	10/14/2016	
R1611059-003	1610140833 IBC 7330	10/14/2016	
R1611059-004	1610140835 IBC 7329	10/14/2016	
R1611059-005	1610140837 IBC 7329	10/14/2016	
R1611059-006	1610140838 IBC 7329	10/14/2016	
R1611059-007	1610140840 IBC 7338	10/14/2016	
R1611059-008	1610140842 IBC 7338	10/14/2016	
R1611059-009	1610140843 IBC 7338	10/14/2016	
R1611059-010	1610130850 IBC 7321	10/13/2016	
R1611059-011	1610130851 IBC 7321	10/13/2016	
R1611059-012	1610130856 IBC 7321	10/13/2016	
R1611059-013	1610130857 IBC 7321	10/13/2016	
R1611059-014	1610130859 IBC 7321	10/13/2016	
R1611059-015	1610130900 IBC 7321	10/13/2016	
R1611059-016	1610130905 IBC 7322	10/13/2016	
R1611059-017	1610130907 IBC 7322	10/13/2016	
R1611059-018	1610130908 IBC 7322	10/13/2016	
R1611059-019	1610130915 IBC 7326	10/13/2016	
R1611059-020	1610130917 IBC 7326	10/13/2016	
R1611059-021	1610130918 IBC 7326	10/13/2016	
R1611059-022	1610130940 IBC 7327	10/13/2016	
R1611059-023	1610130942 IBC 7327	10/13/2016	
R1611059-024	1610130943 IBC 7327	10/13/2016	
R1611059-025	1610130945 IBC 7331	10/13/2016	
R1611059-026	1610130947 IBC 7331	10/13/2016	
R1611059-027	1610130948 IBC 7331	10/13/2016	
R1611059-028	1610130950 IBC 7328	10/13/2016	
R1611059-029	1610130952 IBC 7328	10/13/2016	
R1611059-030	1610130953 IBC 7328	10/13/2016	


WSTF CHAIN OF CUSTODY RECORD

Date OCTOBER 17, 2016

Page 1 of 1

Laboratory: ALS Group USA, Corp. dba PO#15EC092B Address shipping questions to: <input type="checkbox"/> Lori Minnick, 575-524-5119 <input checked="" type="checkbox"/> Other <u>Tom Hall, 575-524-5453</u>		Analytical Requirements SW-846 Method 8260B 4 oz Glass Jar, Ice Total Metals 4 oz Glass Jar, Ice TCLP Metals 16 oz Glass Jar, Ice		Special Instructions Return coolers and reusable packaging materials within 14 days as required in statement of work to: Return Address: NASA WSTF Environmental Department 12600 NASA Road; Bldg. 120 Las Cruces, NM 88012 Attn: Lori Minnick	
Send sample receipt confirmation and analytical reports to: <input type="checkbox"/> Carlyn Tufts, carlyn.a.tufts@nasa.gov <input type="checkbox"/> Shelly Hernandez, shelly.j.hernandez@nasa.gov <input checked="" type="checkbox"/> Tom Hall, tom.a.hall@nasa.gov		# of Containers	Sample Matrix*	Charge Number (WSTF Use Only)	Comments
Sample Number	Sample Location				
1610140830	IBC 7330	1	S	16EE41FW	
1610140832	IBC 7330	1	S	16EE41FW	
1610140833	IBC 7330	1	S	16EE41FW	
1610140835	IBC 7329	1	S	16EE41FW	
1610140837	IBC 7329	1	S	16EE41FW	
1610140838	IBC 7329	1	S	16EE41FW	
1610140840	IBC 7338	1	S	16EE41FW	
1610140842	IBC 7338	1	S	16EE41FW	
1610140843	IBC 7338	1	S	16EE41FW	
Relinquished By: <i>[Signature]</i>		Date/Time: 10-14-16 (0900)		Accepted By: <i>[Signature]</i>	
				Date/Time: 10-18-16 09:50	

* Sample Matrix: A – Aqueous; G – Gaseous; S – Solid


R1611059
 NASA/WSTF/Navarro
 White Sands Test Facility

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Date OCTOBER 17, 2016

WSTF CHAIN OF CUSTODY RECORD

Laboratory: ALS Group USA, Corp. dba PO#15EC092B				Analytical Requirements				Special Instructions
Address shipping questions to: <input type="checkbox"/> Lori Minnick, 575-524-5119 <input checked="" type="checkbox"/> Other <u>Tom Hall</u> , 575-524-5453		# of Containers	Sample Matrix*	SW-846 Method 8260B 4 oz Glass Jar, Ice	Total Metals 4 oz Glass Jar, Ice	ICLP Metals 16 oz Glass Jar, Ice	Charge Number (WSTF Use Only)		Return coolers and reusable packaging materials within 14 days as required in statement of work to: Return Address: NASA WSTF Environmental Department 12600 NASA Road; Bldg. 120 Las Cruces, NM 88012 Attn: Lori Minnick
Sample Number	Sample Location							Comments
1610130850	IBC 7321	1	S	X			16EE41FW	
— 0851	IBC 7321	1	S	X			16EE41FW	
— 0852	IBC 7321	1	S	X			16EE41FW	MATRIX SPIKE for 1610130850
1610130856	IBC 7321	1	S		X		16EE41FW	
— 0857	IBC 7321	1	S		X		16EE41FW	
— 0858	IBC 7321	1	S		X		16EE41FW	MATRIX SPIKE for 1610130856
1610130859	IBC 7321	1	S			X	16EE41FW	
— 0900	IBC 7321	1	S			X	16EE41FW	
— 0901	IBC-7321	1	S			X	16EE41FW	MATRIX SPIKE for 1610130859
Relinquished By: <u>[Signature]</u>		Date/Time: <u>10-13-2016 (1030)</u>		Accepted By: <u>[Signature]</u>		Date/Time: <u>10-18-16 09:50</u>		

* Sample Matrix: A – Aqueous; G – Gaseous; S – Solid

R1611059 **5**
 NASA/WSTF/Navarro
 White Sands Test Facility


WSTF CHAIN OF CUSTODY RECORD

Date OCTOBER 13, 2016

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Laboratory: ALS Group USA, Corp. dba PO#15EC092B		Analytical Requirements						Charge Number (WSTF Use Only)	Special Instructions
Address shipping questions to: <input type="checkbox"/> Lori Minnick, 575-524-5119 <input checked="" type="checkbox"/> Other <u>Tom Hall</u> , 575-524-5453		# of Containers	Sample Matrix*	SW-846 Method 8260B 4 oz Glass Jar, Ice	Total Metals 4 oz Glass Jar, Ice	TCLP Metals 16 oz Glass Jar, Ice	Return coolers and reusable packaging materials within 14 days as required in statement of work to: Return Address: NASA WSTF Environmental Department 12600 NASA Road; Bldg. 120 Las Cruces, NM 88012 Attn: Lori Minnick		
Sample Number	Sample Location									Comments
1610130905	IBC 7322	1	S	X				16EE41FW	
1610130907	IBC 7322	1	S		X			16EE91FW	
1610130908	IBC 7322	1	S			X		16EE41FW	
1610130915	IBC 7326	1	S	X				16EE41FW	
1610130917	IBC 7326	1	S		X			16EE41FW	
1610130918	IBC 7326	1	S			X		16EE91FW	
1610130940	IBC 7327	1	S	X				16EE41FW	
— 0942	IBC 7327	1	S		X			16EE41FW	
— 0943	IBC 7327	1	S			X		16EE41FW	
Relinquished By: <u>[Signature]</u>		Date/Time: <u>10-13-2016(1030)</u>		Accepted By: <u>[Signature]</u>		Date/Time: <u>10-18-16 09:50</u>			

* Sample Matrix: A – Aqueous; G – Gaseous; S – Solid


R1611059 **5**
NASA/WSTF/Navarro
 White Sands Test Facility


WSTF CHAIN OF CUSTODY RECORD

Date OCTOBER 17, 2016

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Laboratory: ^{ALS} SWRI PO#15EC092B		Analytical Requirements						Special Instructions Return coolers and reusable packaging materials within 14 days as required in statement of work to: Return Address: NASA WSTF Environmental Department 12600 NASA Road: Bldg. 120 Las Cruces, NM 88012 Attn: Lori Minnick
Address shipping questions to: <input type="checkbox"/> Lori Minnick, 575-524-5119 <input checked="" type="checkbox"/> Other Tom Hall, 575-524-5453		SW-846 Method 8260B 4 oz Glass Jar, Ice	Total Metals 4 oz Glass Jar, Ice	TCLP Metals 16 oz Glass Jar, Ice			Charge Number (WSTF Use Only)	
Send sample receipt confirmation and analytical reports to: <input type="checkbox"/> Carlyn Tufts, carlyn.a.tufts@nasa.gov <input type="checkbox"/> Shelly Hernandez, shelly.j.hernandez@nasa.gov <input checked="" type="checkbox"/> Tom Hall, tom.a.hall@nasa.gov								
Sample Number	Sample Location	# of Containers	Sample Matrix*				Comments	
161013 0945	IBC 7331	1	S	X			16EEE41FW	
161013 0947	IBC 7331	1	S		X		16EE41FW	
161013 0948	IBC 7331	1	S			X	16EEE41FW	
161013 0950	IBC 7328	1	S	X			16EEE41FW	
161013 0952	IBC 7328	1	S		X		16EE41FW	
161013 0953	IBC 7328	1	S			X	16EE41FW	
Relinquished By: <i>[Signature]</i>		Date/Time: <u>10-13-2016 (1030)</u>		Accepted By: <i>[Signature]</i>		Date/Time: <u>10-13-2016</u>		

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 NASA/WSTF/Navarro
 White Sands Test Facility


* Sample Matrix: A - Aqueous; G - Gaseous; S - Solid



R1611059

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NASA/WSTF/Navarro
White Sands Test Facility



Cooler Receipt and Preservation Check Form

Project/Client NASA Folder Number _____

Cooler received on 10-18-16 by: ME

COURIER: ALS UPS FEDEX VELOCITY CLIENT

1	Were Custody seals on outside of cooler?	<input checked="" type="radio"/> Y	<input type="radio"/> N
2	Custody papers properly completed (ink, signed)?	<input checked="" type="radio"/> Y	<input type="radio"/> N
3	Did all bottles arrive in good condition (unbroken)?	<input checked="" type="radio"/> Y	<input type="radio"/> N
4	Circle: <u>Wet Ice</u> Dry Ice Gel packs present?	<input checked="" type="radio"/> Y	<input type="radio"/> N

5a	Perchlorate samples have required headspace?	<input type="radio"/> Y	<input type="radio"/> N	<input checked="" type="radio"/> NA
5b	Did VOA vials, Alk, or Sulfide have sig* bubbles?	<input type="radio"/> Y	<input type="radio"/> N	<input checked="" type="radio"/> NA
6	Where did the bottles originate?	<u>ALS/ROC</u> CLIENT		
7	Soil VOA received as: Bulk Encore 5035set	<input checked="" type="radio"/> NA		

8. Temperature Readings Date: 10-18-16 Time: 10:12 ID: IR#7 IR#8 From: Temp Blank Sample Bottle

Observed Temp (°C)	<u>3.3</u>						
Correction Factor (°C)	<u>0</u>						
Corrected Temp (°C)	<u>3.3</u>						
Within 0-6°C?	<input checked="" type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N
If <0°C, were samples frozen?	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N

If out of Temperature, note packing/ice condition: _____ Ice melted _____ Poorly Packed _____ Same Day Rule _____

& Client Approval to Run Samples: _____ Standing Approval _____ Client aware at drop-off _____ Client notified by: _____

All samples held in storage location: R-002 by ME on 10-18-16 at 10:15
 5035 samples placed in storage location: _____ by _____ on _____ at _____

Cooler Breakdown: Date: 10-19 Time: 1200 by: TS

- Were all bottle labels complete (i.e. analysis, preservation, etc.)? YES NO
- Did all bottle labels and tags agree with custody papers? YES NO
- Were correct containers used for the tests indicated? YES NO
- Were 5035 vials acceptable (no extra labels, not leaking)? YES NO
- Air Samples: Cassettes / Tubes Intact _____ Canisters Pressurized _____ Tedlar® Bags Inflated YES NO

Explain any discrepancies:

pH	Reagent	Yes	No	Lot Received	Exp	Sample ID	Vol. Added	Lot Added	Final pH
≥12	NaOH								
≤2	HNO ₃								
≤2	H ₂ SO ₄								
<4	NaHSO ₄								
Residual Chlorine (-)	For CN Phenol and 522			If +, contact PM to add Na ₂ S ₂ O ₃ (CN), ascorbic (phenol).					
	Na ₂ S ₂ O ₃	-	-						
	ZnAcetate	-	-						
	HCl	**	**						

Yes=All samples OK
 No=Samples were preserved at The lab as listed
 PM OK to Adjust: _____

**Not to be tested before analysis – pH tested and recorded by VOAs on a separate worksheet

Bottle lot numbers: 041116-13NS
Other Comments:

CLRES	<u>BULK</u>
DO	FLDT
HPROD	HGFB
HTR	LL3541
PH	<u>SUB</u>
SO3	MARRS
ALS	REV

PC Secondary Review: JMM 10/20/16 *significant air bubbles: VOA > 5-6 mm : WC > 1 in. diameter



Miscellaneous Forms

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

REPORT QUALIFIERS AND DEFINITIONS

<p>U Analyte was analyzed for but not detected. The sample quantitation limit has been corrected for dilution and for percent moisture, unless otherwise noted in the case narrative.</p> <p>J Estimated value due to either being a Tentatively Identified Compound (TIC) or that the concentration is between the MRL and the MDL. Concentrations are not verified within the linear range of the calibration. For DoD: concentration >40% difference between two GC columns (pesticides/Aroclors).</p> <p>B Analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.</p> <p>E Inorganics- Concentration is estimated due to the serial dilution was outside control limits.</p> <p>E Organics- Concentration has exceeded the calibration range for that specific analysis.</p> <p>D Concentration is a result of a dilution, typically a secondary analysis of the sample due to exceeding the calibration range or that a surrogate has been diluted out of the sample and cannot be assessed.</p> <p>* Indicates that a quality control parameter has exceeded laboratory limits. Under the “Notes” column of the Form I, this qualifier denotes analysis was performed out of Holding Time.</p> <p>H Analysis was performed out of hold time for tests that have an “immediate” hold time criteria.</p> <p># Spike was diluted out.</p>	<p>+ Correlation coefficient for MSA is <0.995.</p> <p>N Inorganics- Matrix spike recovery was outside laboratory limits.</p> <p>N Organics- Presumptive evidence of a compound (reported as a TIC) based on the MS library search.</p> <p>S Concentration has been determined using Method of Standard Additions (MSA).</p> <p>W Post-Digestion Spike recovery is outside control limits and the sample absorbance is <50% of the spike absorbance.</p> <p>P Concentration >40% (25% for CLP) difference between the two GC columns.</p> <p>C Confirmed by GC/MS</p> <p>Q DoD reports: indicates a pesticide/Aroclor is not confirmed ($\geq 100\%$ Difference between two GC columns).</p> <p>X See Case Narrative for discussion.</p> <p>MRL Method Reporting Limit. Also known as:</p> <p>LOQ Limit of Quantitation (LOQ) The lowest concentration at which the method analyte may be reliably quantified under the method conditions.</p> <p>MDL Method Detection Limit. A statistical value derived from a study designed to provide the lowest concentration that will be detected 99% of the time. Values between the MDL and MRL are estimated (see J qualifier).</p> <p>LOD Limit of Detection. A value at or above the MDL which has been verified to be detectable.</p> <p>ND Non-Detect. Analyte was not detected at the concentration listed. Same as U qualifier.</p>
--	--



Rochester Lab ID # for State Certifications¹

Connecticut ID # PH0556	Maine ID #NY0032	New Hampshire ID #
Delaware Accredited	Nebraska Accredited	294100 A/B
DoD ELAP #65817	New Jersey ID # NY004	Pennsylvania ID# 68-786
Florida ID # E87674	New York ID # 10145	Rhode Island ID # 158
Illinois ID #200047	North Carolina #676	Virginia #460167

¹ Analyses were performed according to our laboratory’s NELAP-approved quality assurance program and any applicable state or agency requirements. The test results meet requirements of the current NELAP/TNI standards or state or agency requirements, where applicable, except as noted in the case narrative. Since not all analyte/method/matrix combinations are offered for state/NELAC accreditation, this report may contain results which are not accredited. For a specific list of accredited analytes, contact the laboratory or go to <http://www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads/North-America-Downloads>

ALS Laboratory Group

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1611059

Sample Name: 1610140830 IBC 7330
Lab Code: R1611059-001
Sample Matrix: Soil

Date Collected: 10/14/16
Date Received: 10/18/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1610140832 IBC 7330
Lab Code: R1611059-002
Sample Matrix: Soil

Date Collected: 10/14/16
Date Received: 10/18/16

Analysis Method
6010C
6010C
7471B
ALS SOP

Extracted/Digested By

Analyzed By
CGILDAY
NMANSEN
SDIRKX
KWONG

Sample Name: 1610140835 IBC 7329
Lab Code: R1611059-004
Sample Matrix: Soil

Date Collected: 10/14/16
Date Received: 10/18/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1610140837 IBC 7329
Lab Code: R1611059-005
Sample Matrix: Soil

Date Collected: 10/14/16
Date Received: 10/18/16

Analysis Method
6010C
6010C
7471B
ALS SOP

Extracted/Digested By

Analyzed By
CGILDAY
NMANSEN
SDIRKX
KWONG

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1611059

Sample Name: 1610140840 IBC 7338
Lab Code: R1611059-007
Sample Matrix: Soil

Date Collected: 10/14/16
Date Received: 10/18/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1610140842 IBC 7338
Lab Code: R1611059-008
Sample Matrix: Soil

Date Collected: 10/14/16
Date Received: 10/18/16

Analysis Method
6010C
6010C
7471B
ALS SOP

Extracted/Digested By

Analyzed By
CGILDAY
NMANSEN
SDIRKX
KWONG

Sample Name: 1610130850 IBC 7321
Lab Code: R1611059-010
Sample Matrix: Soil

Date Collected: 10/13/16
Date Received: 10/18/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1610130851 IBC 7321
Lab Code: R1611059-011
Sample Matrix: Soil

Date Collected: 10/13/16
Date Received: 10/18/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1611059

Sample Name: 1610130856 IBC 7321
Lab Code: R1611059-012
Sample Matrix: Soil

Date Collected: 10/13/16
Date Received: 10/18/16

Analysis Method	Extracted/Digested By	Analyzed By
6010C	SDIRKX	CGILDAY
6010C	SDIRKX	NMANSEN
7471B	SDIRKX	SDIRKX
ALS SOP		KWONG

Sample Name: 1610130857 IBC 7321
Lab Code: R1611059-013
Sample Matrix: Soil

Date Collected: 10/13/16
Date Received: 10/18/16

Analysis Method	Extracted/Digested By	Analyzed By
6010C	SDIRKX	CGILDAY
6010C	SDIRKX	NMANSEN
7471B	SDIRKX	SDIRKX
ALS SOP		KWONG

Sample Name: 1610130905 IBC 7322
Lab Code: R1611059-016
Sample Matrix: Soil

Date Collected: 10/13/16
Date Received: 10/18/16

Analysis Method	Extracted/Digested By	Analyzed By
8260C		FNAEGLER
ALS SOP		KWONG

Sample Name: 1610130907 IBC 7322
Lab Code: R1611059-017
Sample Matrix: Soil

Date Collected: 10/13/16
Date Received: 10/18/16

Analysis Method	Extracted/Digested By	Analyzed By
6010C	SDIRKX	CGILDAY
6010C	SDIRKX	NMANSEN
7471B	SDIRKX	SDIRKX

ALS Group USA, Corp.
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Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1611059

Sample Name: 1610130907 IBC 7322
Lab Code: R1611059-017
Sample Matrix: Soil

Date Collected: 10/13/16
Date Received: 10/18/16

Analysis Method
ALS SOP

Extracted/Digested By

Analyzed By
KWONG

Sample Name: 1610130915 IBC 7326
Lab Code: R1611059-019
Sample Matrix: Soil

Date Collected: 10/13/16
Date Received: 10/18/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1610130917 IBC 7326
Lab Code: R1611059-020
Sample Matrix: Soil

Date Collected: 10/13/16
Date Received: 10/18/16

Analysis Method
6010C
6010C
7471B
ALS SOP

Extracted/Digested By
SDIRKX
SDIRKX
SDIRKX

Analyzed By
CGILDAY
NMANSEN
SDIRKX
KWONG

Sample Name: 1610130940 IBC 7327
Lab Code: R1611059-022
Sample Matrix: Soil

Date Collected: 10/13/16
Date Received: 10/18/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1611059

Sample Name: 1610130942 IBC 7327
Lab Code: R1611059-023
Sample Matrix: Soil

Date Collected: 10/13/16
Date Received: 10/18/16

Analysis Method	Extracted/Digested By	Analyzed By
6010C	SDIRKX	CGILDAY
6010C	SDIRKX	NMANSEN
7471B	SDIRKX	SDIRKX
ALS SOP		KWONG

Sample Name: 1610130945 IBC 7331
Lab Code: R1611059-025
Sample Matrix: Soil

Date Collected: 10/13/16
Date Received: 10/18/16

Analysis Method	Extracted/Digested By	Analyzed By
8260C		FNAEGLER
ALS SOP		KWONG

Sample Name: 1610130947 IBC 7331
Lab Code: R1611059-026
Sample Matrix: Soil

Date Collected: 10/13/16
Date Received: 10/18/16

Analysis Method	Extracted/Digested By	Analyzed By
6010C	SDIRKX	CGILDAY
6010C	SDIRKX	NMANSEN
7471B	SDIRKX	SDIRKX
ALS SOP		KWONG

Sample Name: 1610130950 IBC 7328
Lab Code: R1611059-028
Sample Matrix: Soil

Date Collected: 10/13/16
Date Received: 10/18/16

Analysis Method	Extracted/Digested By	Analyzed By
8260C		FNAEGLER
ALS SOP		KWONG

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Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1611059

Sample Name: 1610130952 IBC 7328
Lab Code: R1611059-029
Sample Matrix: Soil

Date Collected: 10/13/16
Date Received: 10/18/16

Analysis Method

6010C
6010C
7471B
ALS SOP

Extracted/Digested By

SDIRKX
SDIRKX
SDIRKX

Analyzed By

CGILDAY
NMANSEN
SDIRKX
KWONG



INORGANIC PREPARATION METHODS

The preparation methods associated with this report are found in these tables unless discussed in the case narrative.

Water/Liquid Matrix

Analytical Method	Preparation Method
200.7	200.2
200.8	200.2
6010C	3005A/3010A
6020A	ILM05.3
9014 Cyanide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Acid Soluble	9030B
9056A Bomb (Halogens)	5050A
9066 Manual Distillation	9065
SM 4500-CN-E Residual Cyanide	SM 4500-CN-G
SM 4500-CN-E WAD Cyanide	SM 4500-CN-I

Solid/Soil/Non-Aqueous Matrix

Analytical Method	Preparation Method
6010C	3050B
6020A	3050B
6010C TCLP (1311) extract	3005A/3010A
6010 SPLP (1312) extract	3005A/3010A
7196A	3060A
7199	3060A
9056A Halogens/Halides	5050
300.0 Anions/ 350.1/ 353.2/ SM 2320B/ SM 5210B/ 9056A Anions	DI extraction

For analytical methods not listed, the preparation method is the same as the analytical method reference.



Sample Results

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1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
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Volatile Organic Compounds by GC/MS

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610140830 IBC 7330
Lab Code: R1611059-001

Service Request: R1611059
Date Collected: 10/14/16
Date Received: 10/18/16 09:50

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.1	0.86	1	10/25/16 15:56	
1,1,1-Trichloroethane (TCA)	ND U	5.1	0.76	1	10/25/16 15:56	
1,1,2,2-Tetrachloroethane	ND U	5.1	0.84	1	10/25/16 15:56	
1,1,2-Trichloroethane	ND U	5.1	0.76	1	10/25/16 15:56	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.1	1.3	1	10/25/16 15:56	
1,1-Dichloroethene (1,1-DCE)	ND U	5.1	1.4	1	10/25/16 15:56	
1,2,3-Trichloropropane	ND U	5.1	1.4	1	10/25/16 15:56	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.1	2.0	1	10/25/16 15:56	
1,2-Dibromoethane	ND U	5.1	1.3	1	10/25/16 15:56	
1,2-Dichlorobenzene	ND U	5.1	0.63	1	10/25/16 15:56	
1,2-Dichloroethane	ND U	5.1	0.63	1	10/25/16 15:56	
1,2-Dichloropropane	ND U	5.1	1.0	1	10/25/16 15:56	
1,3-Dichlorobenzene	ND U	5.1	0.65	1	10/25/16 15:56	
1,4-Dioxane	ND U	100	20	1	10/25/16 15:56	
2-Butanone (MEK)	ND U	5.1	2.4	1	10/25/16 15:56	
2-Chloro-1,3-butadiene	ND U	5.1	1.6	1	10/25/16 15:56	
2-Chloroethyl Vinyl Ether	ND U	5.1	1.8	1	10/25/16 15:56	
Isobutyl Alcohol	ND U	100	24	1	10/25/16 15:56	
Allyl Chloride	ND U	5.1	1.8	1	10/25/16 15:56	
4-Methyl-2-pentanone	ND U	5.1	1.1	1	10/25/16 15:56	
Acetone	ND U	5.1	2.9	1	10/25/16 15:56	
Acetonitrile	ND U	26	18	1	10/25/16 15:56	
Acrolein	ND U	26	3.7	1	10/25/16 15:56	
Acrylonitrile	ND U	26	6.7	1	10/25/16 15:56	
Benzene	ND U	5.1	0.30	1	10/25/16 15:56	
Bromodichloromethane	ND U	5.1	0.63	1	10/25/16 15:56	
Bromoform	ND U	5.1	0.96	1	10/25/16 15:56	
Bromomethane	ND U	5.1	1.5	1	10/25/16 15:56	
Carbon Disulfide	ND U	5.1	1.3	1	10/25/16 15:56	
Carbon Tetrachloride	ND U	5.1	0.95	1	10/25/16 15:56	
Chlorobenzene	ND U	5.1	0.30	1	10/25/16 15:56	
Chloroethane	ND U	5.1	3.0	1	10/25/16 15:56	
Chloroform	ND U	5.1	1.3	1	10/25/16 15:56	
Chloromethane	ND U	5.1	0.42	1	10/25/16 15:56	
Dibromochloromethane	ND U	5.1	0.76	1	10/25/16 15:56	
Dibromomethane	ND U	5.1	0.65	1	10/25/16 15:56	
Dichlorodifluoromethane (CFC 12)	ND U	5.1	2.0	1	10/25/16 15:56	
Dichloromethane	ND U	5.1	0.59	1	10/25/16 15:56	
Ethyl Methacrylate	ND U	5.1	0.78	1	10/25/16 15:56	
Ethylbenzene	ND U	5.1	0.24	1	10/25/16 15:56	
Iodomethane	ND U	10	1.2	1	10/25/16 15:56	
Methacrylonitrile	ND U	5.1	1.6	1	10/25/16 15:56	
Methyl Methacrylate	ND U	5.1	0.76	1	10/25/16 15:56	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610140830 IBC 7330
Lab Code: R1611059-001

Service Request: R1611059
Date Collected: 10/14/16
Date Received: 10/18/16 09:50

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.1	0.53	1	10/25/16 15:56	
Propionitrile	ND U	26	6.7	1	10/25/16 15:56	
Tetrachloroethene (PCE)	ND U	5.1	0.91	1	10/25/16 15:56	
Toluene	ND U	5.1	1.1	1	10/25/16 15:56	
Trichloroethene (TCE)	ND U	5.1	1.1	1	10/25/16 15:56	
Trichlorofluoromethane (CFC 11)	ND U	5.1	0.68	1	10/25/16 15:56	
Vinyl Chloride	ND U	5.1	1.9	1	10/25/16 15:56	
cis-1,3-Dichloropropene	ND U	5.1	0.93	1	10/25/16 15:56	
m,p-Xylenes	ND U	10	1.2	1	10/25/16 15:56	
o-Xylene	ND U	5.1	0.50	1	10/25/16 15:56	
trans-1,2-Dichloroethene	ND U	5.1	0.89	1	10/25/16 15:56	
trans-1,3-Dichloropropene	ND U	5.1	0.21	1	10/25/16 15:56	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	99	51 - 136	10/25/16 15:56	
Dibromofluoromethane	95	63 - 138	10/25/16 15:56	
Toluene-d8	96	66 - 138	10/25/16 15:56	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000124-19-6	Nonanal	14.39	14	JN

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610140835 IBC 7329
Lab Code: R1611059-004

Service Request: R1611059
Date Collected: 10/14/16
Date Received: 10/18/16 09:50

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.1	0.86	1	10/25/16 16:20	
1,1,1-Trichloroethane (TCA)	ND U	5.1	0.76	1	10/25/16 16:20	
1,1,2,2-Tetrachloroethane	ND U	5.1	0.84	1	10/25/16 16:20	
1,1,2-Trichloroethane	ND U	5.1	0.76	1	10/25/16 16:20	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.1	1.3	1	10/25/16 16:20	
1,1-Dichloroethene (1,1-DCE)	ND U	5.1	1.4	1	10/25/16 16:20	
1,2,3-Trichloropropane	ND U	5.1	1.4	1	10/25/16 16:20	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.1	2.0	1	10/25/16 16:20	
1,2-Dibromoethane	ND U	5.1	1.3	1	10/25/16 16:20	
1,2-Dichlorobenzene	ND U	5.1	0.63	1	10/25/16 16:20	
1,2-Dichloroethane	ND U	5.1	0.63	1	10/25/16 16:20	
1,2-Dichloropropane	ND U	5.1	1.0	1	10/25/16 16:20	
1,3-Dichlorobenzene	ND U	5.1	0.65	1	10/25/16 16:20	
1,4-Dioxane	ND U	100	20	1	10/25/16 16:20	
2-Butanone (MEK)	ND U	5.1	2.4	1	10/25/16 16:20	
2-Chloro-1,3-butadiene	ND U	5.1	1.6	1	10/25/16 16:20	
2-Chloroethyl Vinyl Ether	ND U	5.1	1.8	1	10/25/16 16:20	
Isobutyl Alcohol	ND U	100	24	1	10/25/16 16:20	
Allyl Chloride	ND U	5.1	1.8	1	10/25/16 16:20	
4-Methyl-2-pentanone	ND U	5.1	1.1	1	10/25/16 16:20	
Acetone	3.2 J	5.1	2.9	1	10/25/16 16:20	
Acetonitrile	ND U	26	18	1	10/25/16 16:20	
Acrolein	ND U	26	3.7	1	10/25/16 16:20	
Acrylonitrile	ND U	26	6.7	1	10/25/16 16:20	
Benzene	ND U	5.1	0.30	1	10/25/16 16:20	
Bromodichloromethane	ND U	5.1	0.63	1	10/25/16 16:20	
Bromoform	ND U	5.1	0.96	1	10/25/16 16:20	
Bromomethane	ND U	5.1	1.5	1	10/25/16 16:20	
Carbon Disulfide	ND U	5.1	1.3	1	10/25/16 16:20	
Carbon Tetrachloride	ND U	5.1	0.95	1	10/25/16 16:20	
Chlorobenzene	ND U	5.1	0.30	1	10/25/16 16:20	
Chloroethane	ND U	5.1	3.0	1	10/25/16 16:20	
Chloroform	ND U	5.1	1.3	1	10/25/16 16:20	
Chloromethane	ND U	5.1	0.42	1	10/25/16 16:20	
Dibromochloromethane	ND U	5.1	0.76	1	10/25/16 16:20	
Dibromomethane	ND U	5.1	0.65	1	10/25/16 16:20	
Dichlorodifluoromethane (CFC 12)	ND U	5.1	2.0	1	10/25/16 16:20	
Dichloromethane	ND U	5.1	0.59	1	10/25/16 16:20	
Ethyl Methacrylate	ND U	5.1	0.78	1	10/25/16 16:20	
Ethylbenzene	ND U	5.1	0.24	1	10/25/16 16:20	
Iodomethane	ND U	10	1.2	1	10/25/16 16:20	
Methacrylonitrile	ND U	5.1	1.6	1	10/25/16 16:20	
Methyl Methacrylate	ND U	5.1	0.76	1	10/25/16 16:20	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610140835 IBC 7329
Lab Code: R1611059-004

Service Request: R1611059
Date Collected: 10/14/16
Date Received: 10/18/16 09:50

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.1	0.53	1	10/25/16 16:20	
Propionitrile	ND U	26	6.7	1	10/25/16 16:20	
Tetrachloroethene (PCE)	ND U	5.1	0.91	1	10/25/16 16:20	
Toluene	ND U	5.1	1.1	1	10/25/16 16:20	
Trichloroethene (TCE)	ND U	5.1	1.1	1	10/25/16 16:20	
Trichlorofluoromethane (CFC 11)	ND U	5.1	0.68	1	10/25/16 16:20	
Vinyl Chloride	ND U	5.1	1.9	1	10/25/16 16:20	
cis-1,3-Dichloropropene	ND U	5.1	0.93	1	10/25/16 16:20	
m,p-Xylenes	ND U	10	1.2	1	10/25/16 16:20	
o-Xylene	ND U	5.1	0.50	1	10/25/16 16:20	
trans-1,2-Dichloroethene	ND U	5.1	0.89	1	10/25/16 16:20	
trans-1,3-Dichloropropene	ND U	5.1	0.21	1	10/25/16 16:20	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	97	51 - 136	10/25/16 16:20	
Dibromofluoromethane	96	63 - 138	10/25/16 16:20	
Toluene-d8	96	66 - 138	10/25/16 16:20	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	unknown	13.57	9.5	J
	unknown	14.39	8.1	J
018829-56-6	2-Nonenal, (E)-	15.18	12	JN

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611059
Date Collected: 10/14/16
Date Received: 10/18/16 09:50

Sample Name: 1610140840 IBC 7338
Lab Code: R1611059-007

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.2	0.87	1	10/25/16 16:44	
1,1,1-Trichloroethane (TCA)	ND U	5.2	0.77	1	10/25/16 16:44	
1,1,2,2-Tetrachloroethane	ND U	5.2	0.85	1	10/25/16 16:44	
1,1,2-Trichloroethane	ND U	5.2	0.77	1	10/25/16 16:44	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.2	1.3	1	10/25/16 16:44	
1,1-Dichloroethene (1,1-DCE)	ND U	5.2	1.4	1	10/25/16 16:44	
1,2,3-Trichloropropane	ND U	5.2	1.4	1	10/25/16 16:44	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.2	2.0	1	10/25/16 16:44	
1,2-Dibromoethane	ND U	5.2	1.3	1	10/25/16 16:44	
1,2-Dichlorobenzene	ND U	5.2	0.64	1	10/25/16 16:44	
1,2-Dichloroethane	ND U	5.2	0.64	1	10/25/16 16:44	
1,2-Dichloropropane	ND U	5.2	1.1	1	10/25/16 16:44	
1,3-Dichlorobenzene	ND U	5.2	0.66	1	10/25/16 16:44	
1,4-Dioxane	ND U	100	20	1	10/25/16 16:44	
2-Butanone (MEK)	ND U	5.2	2.4	1	10/25/16 16:44	
2-Chloro-1,3-butadiene	ND U	5.2	1.6	1	10/25/16 16:44	
2-Chloroethyl Vinyl Ether	ND U	5.2	1.8	1	10/25/16 16:44	
Isobutyl Alcohol	ND U	100	24	1	10/25/16 16:44	
Allyl Chloride	ND U	5.2	1.8	1	10/25/16 16:44	
4-Methyl-2-pentanone	ND U	5.2	1.1	1	10/25/16 16:44	
Acetone	3.2 J	5.2	3.0	1	10/25/16 16:44	
Acetonitrile	ND U	26	18	1	10/25/16 16:44	
Acrolein	ND U	26	3.7	1	10/25/16 16:44	
Acrylonitrile	ND U	26	6.8	1	10/25/16 16:44	
Benzene	ND U	5.2	0.31	1	10/25/16 16:44	
Bromodichloromethane	ND U	5.2	0.64	1	10/25/16 16:44	
Bromoform	ND U	5.2	0.98	1	10/25/16 16:44	
Bromomethane	ND U	5.2	1.5	1	10/25/16 16:44	
Carbon Disulfide	ND U	5.2	1.3	1	10/25/16 16:44	
Carbon Tetrachloride	ND U	5.2	0.97	1	10/25/16 16:44	
Chlorobenzene	ND U	5.2	0.31	1	10/25/16 16:44	
Chloroethane	ND U	5.2	3.0	1	10/25/16 16:44	
Chloroform	ND U	5.2	1.4	1	10/25/16 16:44	
Chloromethane	ND U	5.2	0.42	1	10/25/16 16:44	
Dibromochloromethane	ND U	5.2	0.77	1	10/25/16 16:44	
Dibromomethane	ND U	5.2	0.66	1	10/25/16 16:44	
Dichlorodifluoromethane (CFC 12)	ND U	5.2	2.0	1	10/25/16 16:44	
Dichloromethane	ND U	5.2	0.60	1	10/25/16 16:44	
Ethyl Methacrylate	ND U	5.2	0.79	1	10/25/16 16:44	
Ethylbenzene	ND U	5.2	0.25	1	10/25/16 16:44	
Iodomethane	ND U	10	1.2	1	10/25/16 16:44	
Methacrylonitrile	ND U	5.2	1.6	1	10/25/16 16:44	
Methyl Methacrylate	ND U	5.2	0.77	1	10/25/16 16:44	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610140840 IBC 7338
Lab Code: R1611059-007

Service Request: R1611059
Date Collected: 10/14/16
Date Received: 10/18/16 09:50

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.2	0.54	1	10/25/16 16:44	
Propionitrile	ND U	26	6.8	1	10/25/16 16:44	
Tetrachloroethene (PCE)	ND U	5.2	0.92	1	10/25/16 16:44	
Toluene	ND U	5.2	1.1	1	10/25/16 16:44	
Trichloroethene (TCE)	ND U	5.2	1.1	1	10/25/16 16:44	
Trichlorofluoromethane (CFC 11)	ND U	5.2	0.69	1	10/25/16 16:44	
Vinyl Chloride	ND U	5.2	2.0	1	10/25/16 16:44	
cis-1,3-Dichloropropene	ND U	5.2	0.94	1	10/25/16 16:44	
m,p-Xylenes	ND U	10	1.2	1	10/25/16 16:44	
o-Xylene	ND U	5.2	0.51	1	10/25/16 16:44	
trans-1,2-Dichloroethene	ND U	5.2	0.90	1	10/25/16 16:44	
trans-1,3-Dichloropropene	ND U	5.2	0.21	1	10/25/16 16:44	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	95	51 - 136	10/25/16 16:44	
Dibromofluoromethane	92	63 - 138	10/25/16 16:44	
Toluene-d8	93	66 - 138	10/25/16 16:44	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	unknown	13.57	23	J

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50

Sample Name: 1610130850 IBC 7321
Lab Code: R1611059-010

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.2	0.86	1.01	10/25/16 17:08	
1,1,1-Trichloroethane (TCA)	ND U	5.2	0.76	1.01	10/25/16 17:08	
1,1,2,2-Tetrachloroethane	ND U	5.2	0.84	1.01	10/25/16 17:08	
1,1,2-Trichloroethane	ND U	5.2	0.76	1.01	10/25/16 17:08	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.2	1.3	1.01	10/25/16 17:08	
1,1-Dichloroethene (1,1-DCE)	ND U	5.2	1.4	1.01	10/25/16 17:08	
1,2,3-Trichloropropane	ND U	5.2	1.4	1.01	10/25/16 17:08	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.2	2.0	1.01	10/25/16 17:08	
1,2-Dibromoethane	ND U	5.2	1.3	1.01	10/25/16 17:08	
1,2-Dichlorobenzene	ND U	5.2	0.63	1.01	10/25/16 17:08	
1,2-Dichloroethane	ND U	5.2	0.63	1.01	10/25/16 17:08	
1,2-Dichloropropane	ND U	5.2	1.0	1.01	10/25/16 17:08	
1,3-Dichlorobenzene	ND U	5.2	0.65	1.01	10/25/16 17:08	
1,4-Dioxane	ND U	100	20	1.01	10/25/16 17:08	
2-Butanone (MEK)	ND U	5.2	2.4	1.01	10/25/16 17:08	
2-Chloro-1,3-butadiene	ND U	5.2	1.6	1.01	10/25/16 17:08	
2-Chloroethyl Vinyl Ether	ND U	5.2	1.8	1.01	10/25/16 17:08	
Isobutyl Alcohol	ND U	100	24	1.01	10/25/16 17:08	
Allyl Chloride	ND U	5.2	1.8	1.01	10/25/16 17:08	
4-Methyl-2-pentanone	ND U	5.2	1.1	1.01	10/25/16 17:08	
Acetone	ND U	5.2	2.9	1.01	10/25/16 17:08	
Acetonitrile	ND U	26	18	1.01	10/25/16 17:08	
Acrolein	ND U	26	3.7	1.01	10/25/16 17:08	
Acrylonitrile	ND U	26	6.7	1.01	10/25/16 17:08	
Benzene	ND U	5.2	0.30	1.01	10/25/16 17:08	
Bromodichloromethane	ND U	5.2	0.63	1.01	10/25/16 17:08	
Bromoform	ND U	5.2	0.96	1.01	10/25/16 17:08	
Bromomethane	ND U	5.2	1.5	1.01	10/25/16 17:08	
Carbon Disulfide	ND U	5.2	1.3	1.01	10/25/16 17:08	
Carbon Tetrachloride	ND U	5.2	0.95	1.01	10/25/16 17:08	
Chlorobenzene	ND U	5.2	0.30	1.01	10/25/16 17:08	
Chloroethane	ND U	5.2	3.0	1.01	10/25/16 17:08	
Chloroform	ND U	5.2	1.3	1.01	10/25/16 17:08	
Chloromethane	ND U	5.2	0.42	1.01	10/25/16 17:08	
Dibromochloromethane	ND U	5.2	0.76	1.01	10/25/16 17:08	
Dibromomethane	ND U	5.2	0.65	1.01	10/25/16 17:08	
Dichlorodifluoromethane (CFC 12)	ND U	5.2	2.0	1.01	10/25/16 17:08	
Dichloromethane	ND U	5.2	0.59	1.01	10/25/16 17:08	
Ethyl Methacrylate	ND U	5.2	0.78	1.01	10/25/16 17:08	
Ethylbenzene	ND U	5.2	0.24	1.01	10/25/16 17:08	
Iodomethane	ND U	10	1.2	1.01	10/25/16 17:08	
Methacrylonitrile	ND U	5.2	1.6	1.01	10/25/16 17:08	
Methyl Methacrylate	ND U	5.2	0.76	1.01	10/25/16 17:08	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130850 IBC 7321
Lab Code: R1611059-010

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.2	0.53	1.01	10/25/16 17:08	
Propionitrile	ND U	26	6.7	1.01	10/25/16 17:08	
Tetrachloroethene (PCE)	ND U	5.2	0.91	1.01	10/25/16 17:08	
Toluene	ND U	5.2	1.1	1.01	10/25/16 17:08	
Trichloroethene (TCE)	ND U	5.2	1.1	1.01	10/25/16 17:08	
Trichlorofluoromethane (CFC 11)	ND U	5.2	0.69	1.01	10/25/16 17:08	
Vinyl Chloride	ND U	5.2	1.9	1.01	10/25/16 17:08	
cis-1,3-Dichloropropene	ND U	5.2	0.93	1.01	10/25/16 17:08	
m,p-Xylenes	ND U	10	1.2	1.01	10/25/16 17:08	
o-Xylene	ND U	5.2	0.50	1.01	10/25/16 17:08	
trans-1,2-Dichloroethene	ND U	5.2	0.89	1.01	10/25/16 17:08	
trans-1,3-Dichloropropene	ND U	5.2	0.21	1.01	10/25/16 17:08	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	94	51 - 136	10/25/16 17:08	
Dibromofluoromethane	94	63 - 138	10/25/16 17:08	
Toluene-d8	94	66 - 138	10/25/16 17:08	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000124-19-6	Nonanal	14.39	14	JN

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130851 IBC 7321
Lab Code: R1611059-011

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.1	0.85	1	10/25/16 17:33	
1,1,1-Trichloroethane (TCA)	ND U	5.1	0.75	1	10/25/16 17:33	
1,1,2,2-Tetrachloroethane	ND U	5.1	0.83	1	10/25/16 17:33	
1,1,2-Trichloroethane	ND U	5.1	0.75	1	10/25/16 17:33	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.1	1.3	1	10/25/16 17:33	
1,1-Dichloroethene (1,1-DCE)	ND U	5.1	1.4	1	10/25/16 17:33	
1,2,3-Trichloropropane	ND U	5.1	1.4	1	10/25/16 17:33	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.1	2.0	1	10/25/16 17:33	
1,2-Dibromoethane	ND U	5.1	1.3	1	10/25/16 17:33	
1,2-Dichlorobenzene	ND U	5.1	0.63	1	10/25/16 17:33	
1,2-Dichloroethane	ND U	5.1	0.63	1	10/25/16 17:33	
1,2-Dichloropropane	ND U	5.1	1.0	1	10/25/16 17:33	
1,3-Dichlorobenzene	ND U	5.1	0.65	1	10/25/16 17:33	
1,4-Dioxane	ND U	100	20	1	10/25/16 17:33	
2-Butanone (MEK)	ND U	5.1	2.4	1	10/25/16 17:33	
2-Chloro-1,3-butadiene	ND U	5.1	1.6	1	10/25/16 17:33	
2-Chloroethyl Vinyl Ether	ND U	5.1	1.8	1	10/25/16 17:33	
Isobutyl Alcohol	ND U	100	24	1	10/25/16 17:33	
Allyl Chloride	ND U	5.1	1.8	1	10/25/16 17:33	
4-Methyl-2-pentanone	ND U	5.1	1.1	1	10/25/16 17:33	
Acetone	3.2 J	5.1	2.9	1	10/25/16 17:33	
Acetonitrile	ND U	26	18	1	10/25/16 17:33	
Acrolein	ND U	26	3.6	1	10/25/16 17:33	
Acrylonitrile	ND U	26	6.7	1	10/25/16 17:33	
Benzene	ND U	5.1	0.30	1	10/25/16 17:33	
Bromodichloromethane	ND U	5.1	0.63	1	10/25/16 17:33	
Bromoform	ND U	5.1	0.96	1	10/25/16 17:33	
Bromomethane	ND U	5.1	1.5	1	10/25/16 17:33	
Carbon Disulfide	ND U	5.1	1.3	1	10/25/16 17:33	
Carbon Tetrachloride	ND U	5.1	0.95	1	10/25/16 17:33	
Chlorobenzene	ND U	5.1	0.30	1	10/25/16 17:33	
Chloroethane	ND U	5.1	3.0	1	10/25/16 17:33	
Chloroform	ND U	5.1	1.3	1	10/25/16 17:33	
Chloromethane	ND U	5.1	0.41	1	10/25/16 17:33	
Dibromochloromethane	ND U	5.1	0.75	1	10/25/16 17:33	
Dibromomethane	ND U	5.1	0.65	1	10/25/16 17:33	
Dichlorodifluoromethane (CFC 12)	ND U	5.1	2.0	1	10/25/16 17:33	
Dichloromethane	ND U	5.1	0.59	1	10/25/16 17:33	
Ethyl Methacrylate	ND U	5.1	0.77	1	10/25/16 17:33	
Ethylbenzene	ND U	5.1	0.24	1	10/25/16 17:33	
Iodomethane	ND U	10	1.2	1	10/25/16 17:33	
Methacrylonitrile	ND U	5.1	1.6	1	10/25/16 17:33	
Methyl Methacrylate	ND U	5.1	0.75	1	10/25/16 17:33	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130851 IBC 7321
Lab Code: R1611059-011

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.1	0.53	1	10/25/16 17:33	
Propionitrile	ND U	26	6.7	1	10/25/16 17:33	
Tetrachloroethene (PCE)	ND U	5.1	0.90	1	10/25/16 17:33	
Toluene	ND U	5.1	1.1	1	10/25/16 17:33	
Trichloroethene (TCE)	ND U	5.1	1.1	1	10/25/16 17:33	
Trichlorofluoromethane (CFC 11)	ND U	5.1	0.68	1	10/25/16 17:33	
Vinyl Chloride	ND U	5.1	1.9	1	10/25/16 17:33	
cis-1,3-Dichloropropene	ND U	5.1	0.93	1	10/25/16 17:33	
m,p-Xylenes	ND U	10	1.2	1	10/25/16 17:33	
o-Xylene	ND U	5.1	0.50	1	10/25/16 17:33	
trans-1,2-Dichloroethene	ND U	5.1	0.88	1	10/25/16 17:33	
trans-1,3-Dichloropropene	ND U	5.1	0.21	1	10/25/16 17:33	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	92	51 - 136	10/25/16 17:33	
Dibromofluoromethane	92	63 - 138	10/25/16 17:33	
Toluene-d8	94	66 - 138	10/25/16 17:33	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000124-19-6	Nonanal	14.39	17	JN

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50

Sample Name: 1610130905 IBC 7322
Lab Code: R1611059-016

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.1	0.85	1	10/25/16 17:57	
1,1,1-Trichloroethane (TCA)	ND U	5.1	0.74	1	10/25/16 17:57	
1,1,2,2-Tetrachloroethane	ND U	5.1	0.83	1	10/25/16 17:57	
1,1,2-Trichloroethane	ND U	5.1	0.74	1	10/25/16 17:57	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.1	1.3	1	10/25/16 17:57	
1,1-Dichloroethene (1,1-DCE)	ND U	5.1	1.3	1	10/25/16 17:57	
1,2,3-Trichloropropane	ND U	5.1	1.4	1	10/25/16 17:57	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.1	1.9	1	10/25/16 17:57	
1,2-Dibromoethane	ND U	5.1	1.3	1	10/25/16 17:57	
1,2-Dichlorobenzene	ND U	5.1	0.62	1	10/25/16 17:57	
1,2-Dichloroethane	ND U	5.1	0.62	1	10/25/16 17:57	
1,2-Dichloropropane	ND U	5.1	0.99	1	10/25/16 17:57	
1,3-Dichlorobenzene	ND U	5.1	0.64	1	10/25/16 17:57	
1,4-Dioxane	ND U	100	20	1	10/25/16 17:57	
2-Butanone (MEK)	ND U	5.1	2.4	1	10/25/16 17:57	
2-Chloro-1,3-butadiene	ND U	5.1	1.6	1	10/25/16 17:57	
2-Chloroethyl Vinyl Ether	ND U	5.1	1.8	1	10/25/16 17:57	
Isobutyl Alcohol	ND U	100	24	1	10/25/16 17:57	
Allyl Chloride	ND U	5.1	1.8	1	10/25/16 17:57	
4-Methyl-2-pentanone	ND U	5.1	1.0	1	10/25/16 17:57	
Acetone	ND U	5.1	2.9	1	10/25/16 17:57	
Acetonitrile	ND U	25	17	1	10/25/16 17:57	
Acrolein	ND U	25	3.6	1	10/25/16 17:57	
Acrylonitrile	ND U	25	6.6	1	10/25/16 17:57	
Benzene	ND U	5.1	0.30	1	10/25/16 17:57	
Bromodichloromethane	ND U	5.1	0.62	1	10/25/16 17:57	
Bromoform	ND U	5.1	0.95	1	10/25/16 17:57	
Bromomethane	ND U	5.1	1.4	1	10/25/16 17:57	
Carbon Disulfide	ND U	5.1	1.3	1	10/25/16 17:57	
Carbon Tetrachloride	ND U	5.1	0.94	1	10/25/16 17:57	
Chlorobenzene	ND U	5.1	0.30	1	10/25/16 17:57	
Chloroethane	ND U	5.1	3.0	1	10/25/16 17:57	
Chloroform	ND U	5.1	1.3	1	10/25/16 17:57	
Chloromethane	ND U	5.1	0.41	1	10/25/16 17:57	
Dibromochloromethane	ND U	5.1	0.74	1	10/25/16 17:57	
Dibromomethane	ND U	5.1	0.64	1	10/25/16 17:57	
Dichlorodifluoromethane (CFC 12)	ND U	5.1	2.0	1	10/25/16 17:57	
Dichloromethane	ND U	5.1	0.58	1	10/25/16 17:57	
Ethyl Methacrylate	ND U	5.1	0.76	1	10/25/16 17:57	
Ethylbenzene	ND U	5.1	0.24	1	10/25/16 17:57	
Iodomethane	ND U	10	1.2	1	10/25/16 17:57	
Methacrylonitrile	ND U	5.1	1.6	1	10/25/16 17:57	
Methyl Methacrylate	ND U	5.1	0.74	1	10/25/16 17:57	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130905 IBC 7322
Lab Code: R1611059-016

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.1	0.52	1	10/25/16 17:57	
Propionitrile	ND U	25	6.6	1	10/25/16 17:57	
Tetrachloroethene (PCE)	ND U	5.1	0.90	1	10/25/16 17:57	
Toluene	ND U	5.1	1.1	1	10/25/16 17:57	
Trichloroethene (TCE)	ND U	5.1	1.1	1	10/25/16 17:57	
Trichlorofluoromethane (CFC 11)	ND U	5.1	0.67	1	10/25/16 17:57	
Vinyl Chloride	ND U	5.1	1.9	1	10/25/16 17:57	
cis-1,3-Dichloropropene	ND U	5.1	0.92	1	10/25/16 17:57	
m,p-Xylenes	ND U	10	1.2	1	10/25/16 17:57	
o-Xylene	ND U	5.1	0.49	1	10/25/16 17:57	
trans-1,2-Dichloroethene	ND U	5.1	0.88	1	10/25/16 17:57	
trans-1,3-Dichloropropene	ND U	5.1	0.21	1	10/25/16 17:57	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	96	51 - 136	10/25/16 17:57	
Dibromofluoromethane	93	63 - 138	10/25/16 17:57	
Toluene-d8	94	66 - 138	10/25/16 17:57	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000106-35-4	3-Heptanone	11.52	7.9	JN
	unknown	11.74	11	J
	unknown	12.48	12	J
000104-76-7	1-Hexanol, 2-ethyl-	13.57	51	JN
000124-19-6	Nonanal	14.39	11	JN
018829-56-6	2-Nonenal, (E)-	15.18	32	JN

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50

Sample Name: 1610130915 IBC 7326
Lab Code: R1611059-019

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.2	0.87	1	10/25/16 18:21	
1,1,1-Trichloroethane (TCA)	ND U	5.2	0.76	1	10/25/16 18:21	
1,1,2,2-Tetrachloroethane	ND U	5.2	0.84	1	10/25/16 18:21	
1,1,2-Trichloroethane	ND U	5.2	0.76	1	10/25/16 18:21	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.2	1.3	1	10/25/16 18:21	
1,1-Dichloroethene (1,1-DCE)	ND U	5.2	1.4	1	10/25/16 18:21	
1,2,3-Trichloropropane	ND U	5.2	1.4	1	10/25/16 18:21	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.2	2.0	1	10/25/16 18:21	
1,2-Dibromoethane	ND U	5.2	1.3	1	10/25/16 18:21	
1,2-Dichlorobenzene	ND U	5.2	0.64	1	10/25/16 18:21	
1,2-Dichloroethane	ND U	5.2	0.64	1	10/25/16 18:21	
1,2-Dichloropropane	ND U	5.2	1.1	1	10/25/16 18:21	
1,3-Dichlorobenzene	ND U	5.2	0.66	1	10/25/16 18:21	
1,4-Dioxane	ND U	100	20	1	10/25/16 18:21	
2-Butanone (MEK)	ND U	5.2	2.4	1	10/25/16 18:21	
2-Chloro-1,3-butadiene	ND U	5.2	1.6	1	10/25/16 18:21	
2-Chloroethyl Vinyl Ether	ND U	5.2	1.8	1	10/25/16 18:21	
Isobutyl Alcohol	ND U	100	24	1	10/25/16 18:21	
Allyl Chloride	ND U	5.2	1.8	1	10/25/16 18:21	
4-Methyl-2-pentanone	ND U	5.2	1.1	1	10/25/16 18:21	
Acetone	ND U	5.2	3.0	1	10/25/16 18:21	
Acetonitrile	ND U	26	18	1	10/25/16 18:21	
Acrolein	ND U	26	3.7	1	10/25/16 18:21	
Acrylonitrile	ND U	26	6.7	1	10/25/16 18:21	
Benzene	ND U	5.2	0.31	1	10/25/16 18:21	
Bromodichloromethane	ND U	5.2	0.64	1	10/25/16 18:21	
Bromoform	ND U	5.2	0.97	1	10/25/16 18:21	
Bromomethane	ND U	5.2	1.5	1	10/25/16 18:21	
Carbon Disulfide	ND U	5.2	1.3	1	10/25/16 18:21	
Carbon Tetrachloride	ND U	5.2	0.96	1	10/25/16 18:21	
Chlorobenzene	ND U	5.2	0.31	1	10/25/16 18:21	
Chloroethane	ND U	5.2	3.0	1	10/25/16 18:21	
Chloroform	ND U	5.2	1.4	1	10/25/16 18:21	
Chloromethane	ND U	5.2	0.42	1	10/25/16 18:21	
Dibromochloromethane	ND U	5.2	0.76	1	10/25/16 18:21	
Dibromomethane	ND U	5.2	0.66	1	10/25/16 18:21	
Dichlorodifluoromethane (CFC 12)	ND U	5.2	2.0	1	10/25/16 18:21	
Dichloromethane	ND U	5.2	0.60	1	10/25/16 18:21	
Ethyl Methacrylate	ND U	5.2	0.78	1	10/25/16 18:21	
Ethylbenzene	ND U	5.2	0.24	1	10/25/16 18:21	
Iodomethane	ND U	10	1.2	1	10/25/16 18:21	
Methacrylonitrile	ND U	5.2	1.6	1	10/25/16 18:21	
Methyl Methacrylate	ND U	5.2	0.76	1	10/25/16 18:21	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130915 IBC 7326
Lab Code: R1611059-019

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.2	0.53	1	10/25/16 18:21	
Propionitrile	ND U	26	6.8	1	10/25/16 18:21	
Tetrachloroethene (PCE)	ND U	5.2	0.92	1	10/25/16 18:21	
Toluene	ND U	5.2	1.1	1	10/25/16 18:21	
Trichloroethene (TCE)	ND U	5.2	1.1	1	10/25/16 18:21	
Trichlorofluoromethane (CFC 11)	ND U	5.2	0.69	1	10/25/16 18:21	
Vinyl Chloride	ND U	5.2	2.0	1	10/25/16 18:21	
cis-1,3-Dichloropropene	ND U	5.2	0.94	1	10/25/16 18:21	
m,p-Xylenes	ND U	10	1.2	1	10/25/16 18:21	
o-Xylene	ND U	5.2	0.50	1	10/25/16 18:21	
trans-1,2-Dichloroethene	ND U	5.2	0.90	1	10/25/16 18:21	
trans-1,3-Dichloropropene	ND U	5.2	0.21	1	10/25/16 18:21	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	95	51 - 136	10/25/16 18:21	
Dibromofluoromethane	94	63 - 138	10/25/16 18:21	
Toluene-d8	93	66 - 138	10/25/16 18:21	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000104-76-7	1-Hexanol, 2-ethyl-	13.57	54	JN

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50

Sample Name: 1610130940 IBC 7327
Lab Code: R1611059-022

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.1	0.85	1	10/25/16 18:45	
1,1,1-Trichloroethane (TCA)	ND U	5.1	0.75	1	10/25/16 18:45	
1,1,2,2-Tetrachloroethane	ND U	5.1	0.83	1	10/25/16 18:45	
1,1,2-Trichloroethane	ND U	5.1	0.75	1	10/25/16 18:45	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.1	1.3	1	10/25/16 18:45	
1,1-Dichloroethene (1,1-DCE)	ND U	5.1	1.4	1	10/25/16 18:45	
1,2,3-Trichloropropane	ND U	5.1	1.4	1	10/25/16 18:45	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.1	2.0	1	10/25/16 18:45	
1,2-Dibromoethane	ND U	5.1	1.3	1	10/25/16 18:45	
1,2-Dichlorobenzene	ND U	5.1	0.63	1	10/25/16 18:45	
1,2-Dichloroethane	ND U	5.1	0.63	1	10/25/16 18:45	
1,2-Dichloropropane	ND U	5.1	1.0	1	10/25/16 18:45	
1,3-Dichlorobenzene	ND U	5.1	0.65	1	10/25/16 18:45	
1,4-Dioxane	ND U	100	20	1	10/25/16 18:45	
2-Butanone (MEK)	ND U	5.1	2.4	1	10/25/16 18:45	
2-Chloro-1,3-butadiene	ND U	5.1	1.6	1	10/25/16 18:45	
2-Chloroethyl Vinyl Ether	ND U	5.1	1.8	1	10/25/16 18:45	
Isobutyl Alcohol	ND U	100	24	1	10/25/16 18:45	
Allyl Chloride	ND U	5.1	1.8	1	10/25/16 18:45	
4-Methyl-2-pentanone	ND U	5.1	1.1	1	10/25/16 18:45	
Acetone	ND U	5.1	2.9	1	10/25/16 18:45	
Acetonitrile	ND U	26	18	1	10/25/16 18:45	
Acrolein	ND U	26	3.6	1	10/25/16 18:45	
Acrylonitrile	ND U	26	6.6	1	10/25/16 18:45	
Benzene	ND U	5.1	0.30	1	10/25/16 18:45	
Bromodichloromethane	ND U	5.1	0.63	1	10/25/16 18:45	
Bromoform	ND U	5.1	0.95	1	10/25/16 18:45	
Bromomethane	ND U	5.1	1.5	1	10/25/16 18:45	
Carbon Disulfide	ND U	5.1	1.3	1	10/25/16 18:45	
Carbon Tetrachloride	ND U	5.1	0.94	1	10/25/16 18:45	
Chlorobenzene	ND U	5.1	0.30	1	10/25/16 18:45	
Chloroethane	ND U	5.1	3.0	1	10/25/16 18:45	
Chloroform	ND U	5.1	1.3	1	10/25/16 18:45	
Chloromethane	ND U	5.1	0.41	1	10/25/16 18:45	
Dibromochloromethane	ND U	5.1	0.75	1	10/25/16 18:45	
Dibromomethane	ND U	5.1	0.65	1	10/25/16 18:45	
Dichlorodifluoromethane (CFC 12)	ND U	5.1	2.0	1	10/25/16 18:45	
Dichloromethane	ND U	5.1	0.59	1	10/25/16 18:45	
Ethyl Methacrylate	ND U	5.1	0.77	1	10/25/16 18:45	
Ethylbenzene	ND U	5.1	0.24	1	10/25/16 18:45	
Iodomethane	ND U	10	1.2	1	10/25/16 18:45	
Methacrylonitrile	ND U	5.1	1.6	1	10/25/16 18:45	
Methyl Methacrylate	ND U	5.1	0.75	1	10/25/16 18:45	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130940 IBC 7327
Lab Code: R1611059-022

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.1	0.53	1	10/25/16 18:45	
Propionitrile	ND U	26	6.7	1	10/25/16 18:45	
Tetrachloroethene (PCE)	ND U	5.1	0.90	1	10/25/16 18:45	
Toluene	ND U	5.1	1.1	1	10/25/16 18:45	
Trichloroethene (TCE)	ND U	5.1	1.1	1	10/25/16 18:45	
Trichlorofluoromethane (CFC 11)	ND U	5.1	0.68	1	10/25/16 18:45	
Vinyl Chloride	ND U	5.1	1.9	1	10/25/16 18:45	
cis-1,3-Dichloropropene	ND U	5.1	0.92	1	10/25/16 18:45	
m,p-Xylenes	ND U	10	1.2	1	10/25/16 18:45	
o-Xylene	ND U	5.1	0.50	1	10/25/16 18:45	
trans-1,2-Dichloroethene	ND U	5.1	0.88	1	10/25/16 18:45	
trans-1,3-Dichloropropene	ND U	5.1	0.21	1	10/25/16 18:45	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	97	51 - 136	10/25/16 18:45	
Dibromofluoromethane	92	63 - 138	10/25/16 18:45	
Toluene-d8	94	66 - 138	10/25/16 18:45	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000104-76-7	1-Hexanol, 2-ethyl-	13.57	7.7	JN
	unknown	14.39	5.8	J

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50

Sample Name: 1610130945 IBC 7331
Lab Code: R1611059-025

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.1	0.85	1	10/25/16 19:09	
1,1,1-Trichloroethane (TCA)	ND U	5.1	0.75	1	10/25/16 19:09	
1,1,2,2-Tetrachloroethane	ND U	5.1	0.83	1	10/25/16 19:09	
1,1,2-Trichloroethane	ND U	5.1	0.75	1	10/25/16 19:09	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.1	1.3	1	10/25/16 19:09	
1,1-Dichloroethene (1,1-DCE)	ND U	5.1	1.4	1	10/25/16 19:09	
1,2,3-Trichloropropane	ND U	5.1	1.4	1	10/25/16 19:09	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.1	2.0	1	10/25/16 19:09	
1,2-Dibromoethane	ND U	5.1	1.3	1	10/25/16 19:09	
1,2-Dichlorobenzene	ND U	5.1	0.63	1	10/25/16 19:09	
1,2-Dichloroethane	ND U	5.1	0.63	1	10/25/16 19:09	
1,2-Dichloropropane	ND U	5.1	1.0	1	10/25/16 19:09	
1,3-Dichlorobenzene	ND U	5.1	0.65	1	10/25/16 19:09	
1,4-Dioxane	ND U	100	20	1	10/25/16 19:09	
2-Butanone (MEK)	ND U	5.1	2.4	1	10/25/16 19:09	
2-Chloro-1,3-butadiene	ND U	5.1	1.6	1	10/25/16 19:09	
2-Chloroethyl Vinyl Ether	ND U	5.1	1.8	1	10/25/16 19:09	
Isobutyl Alcohol	ND U	100	24	1	10/25/16 19:09	
Allyl Chloride	ND U	5.1	1.8	1	10/25/16 19:09	
4-Methyl-2-pentanone	ND U	5.1	1.1	1	10/25/16 19:09	
Acetone	ND U	5.1	2.9	1	10/25/16 19:09	
Acetonitrile	ND U	26	18	1	10/25/16 19:09	
Acrolein	ND U	26	3.6	1	10/25/16 19:09	
Acrylonitrile	ND U	26	6.7	1	10/25/16 19:09	
Benzene	ND U	5.1	0.30	1	10/25/16 19:09	
Bromodichloromethane	ND U	5.1	0.63	1	10/25/16 19:09	
Bromoform	ND U	5.1	0.96	1	10/25/16 19:09	
Bromomethane	ND U	5.1	1.5	1	10/25/16 19:09	
Carbon Disulfide	ND U	5.1	1.3	1	10/25/16 19:09	
Carbon Tetrachloride	ND U	5.1	0.95	1	10/25/16 19:09	
Chlorobenzene	ND U	5.1	0.30	1	10/25/16 19:09	
Chloroethane	ND U	5.1	3.0	1	10/25/16 19:09	
Chloroform	ND U	5.1	1.3	1	10/25/16 19:09	
Chloromethane	ND U	5.1	0.41	1	10/25/16 19:09	
Dibromochloromethane	ND U	5.1	0.75	1	10/25/16 19:09	
Dibromomethane	ND U	5.1	0.65	1	10/25/16 19:09	
Dichlorodifluoromethane (CFC 12)	ND U	5.1	2.0	1	10/25/16 19:09	
Dichloromethane	ND U	5.1	0.59	1	10/25/16 19:09	
Ethyl Methacrylate	ND U	5.1	0.77	1	10/25/16 19:09	
Ethylbenzene	ND U	5.1	0.24	1	10/25/16 19:09	
Iodomethane	ND U	10	1.2	1	10/25/16 19:09	
Methacrylonitrile	ND U	5.1	1.6	1	10/25/16 19:09	
Methyl Methacrylate	ND U	5.1	0.75	1	10/25/16 19:09	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130945 IBC 7331
Lab Code: R1611059-025

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.1	0.53	1	10/25/16 19:09	
Propionitrile	ND U	26	6.7	1	10/25/16 19:09	
Tetrachloroethene (PCE)	ND U	5.1	0.91	1	10/25/16 19:09	
Toluene	ND U	5.1	1.1	1	10/25/16 19:09	
Trichloroethene (TCE)	ND U	5.1	1.1	1	10/25/16 19:09	
Trichlorofluoromethane (CFC 11)	ND U	5.1	0.68	1	10/25/16 19:09	
Vinyl Chloride	ND U	5.1	1.9	1	10/25/16 19:09	
cis-1,3-Dichloropropene	ND U	5.1	0.93	1	10/25/16 19:09	
m,p-Xylenes	ND U	10	1.2	1	10/25/16 19:09	
o-Xylene	ND U	5.1	0.50	1	10/25/16 19:09	
trans-1,2-Dichloroethene	ND U	5.1	0.89	1	10/25/16 19:09	
trans-1,3-Dichloropropene	ND U	5.1	0.21	1	10/25/16 19:09	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	95	51 - 136	10/25/16 19:09	
Dibromofluoromethane	92	63 - 138	10/25/16 19:09	
Toluene-d8	95	66 - 138	10/25/16 19:09	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000104-76-7	1-Hexanol, 2-ethyl-	13.57	230	JN

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50

Sample Name: 1610130950 IBC 7328
Lab Code: R1611059-028

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.1	0.85	1	10/25/16 19:34	
1,1,1-Trichloroethane (TCA)	ND U	5.1	0.75	1	10/25/16 19:34	
1,1,2,2-Tetrachloroethane	ND U	5.1	0.83	1	10/25/16 19:34	
1,1,2-Trichloroethane	ND U	5.1	0.75	1	10/25/16 19:34	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.1	1.3	1	10/25/16 19:34	
1,1-Dichloroethene (1,1-DCE)	ND U	5.1	1.4	1	10/25/16 19:34	
1,2,3-Trichloropropane	ND U	5.1	1.4	1	10/25/16 19:34	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.1	2.0	1	10/25/16 19:34	
1,2-Dibromoethane	ND U	5.1	1.3	1	10/25/16 19:34	
1,2-Dichlorobenzene	ND U	5.1	0.63	1	10/25/16 19:34	
1,2-Dichloroethane	ND U	5.1	0.63	1	10/25/16 19:34	
1,2-Dichloropropane	ND U	5.1	1.0	1	10/25/16 19:34	
1,3-Dichlorobenzene	ND U	5.1	0.65	1	10/25/16 19:34	
1,4-Dioxane	ND U	100	20	1	10/25/16 19:34	
2-Butanone (MEK)	ND U	5.1	2.4	1	10/25/16 19:34	
2-Chloro-1,3-butadiene	ND U	5.1	1.6	1	10/25/16 19:34	
2-Chloroethyl Vinyl Ether	ND U	5.1	1.8	1	10/25/16 19:34	
Isobutyl Alcohol	ND U	100	24	1	10/25/16 19:34	
Allyl Chloride	ND U	5.1	1.8	1	10/25/16 19:34	
4-Methyl-2-pentanone	ND U	5.1	1.1	1	10/25/16 19:34	
Acetone	3.3 J	5.1	2.9	1	10/25/16 19:34	
Acetonitrile	ND U	26	18	1	10/25/16 19:34	
Acrolein	ND U	26	3.6	1	10/25/16 19:34	
Acrylonitrile	ND U	26	6.7	1	10/25/16 19:34	
Benzene	ND U	5.1	0.30	1	10/25/16 19:34	
Bromodichloromethane	ND U	5.1	0.63	1	10/25/16 19:34	
Bromoform	ND U	5.1	0.96	1	10/25/16 19:34	
Bromomethane	ND U	5.1	1.5	1	10/25/16 19:34	
Carbon Disulfide	ND U	5.1	1.3	1	10/25/16 19:34	
Carbon Tetrachloride	ND U	5.1	0.95	1	10/25/16 19:34	
Chlorobenzene	ND U	5.1	0.30	1	10/25/16 19:34	
Chloroethane	ND U	5.1	3.0	1	10/25/16 19:34	
Chloroform	ND U	5.1	1.3	1	10/25/16 19:34	
Chloromethane	ND U	5.1	0.41	1	10/25/16 19:34	
Dibromochloromethane	ND U	5.1	0.75	1	10/25/16 19:34	
Dibromomethane	ND U	5.1	0.65	1	10/25/16 19:34	
Dichlorodifluoromethane (CFC 12)	ND U	5.1	2.0	1	10/25/16 19:34	
Dichloromethane	ND U	5.1	0.59	1	10/25/16 19:34	
Ethyl Methacrylate	ND U	5.1	0.77	1	10/25/16 19:34	
Ethylbenzene	ND U	5.1	0.24	1	10/25/16 19:34	
Iodomethane	ND U	10	1.2	1	10/25/16 19:34	
Methacrylonitrile	ND U	5.1	1.6	1	10/25/16 19:34	
Methyl Methacrylate	ND U	5.1	0.75	1	10/25/16 19:34	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130950 IBC 7328
Lab Code: R1611059-028

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.1	0.53	1	10/25/16 19:34	
Propionitrile	ND U	26	6.7	1	10/25/16 19:34	
Tetrachloroethene (PCE)	ND U	5.1	0.90	1	10/25/16 19:34	
Toluene	ND U	5.1	1.1	1	10/25/16 19:34	
Trichloroethene (TCE)	ND U	5.1	1.1	1	10/25/16 19:34	
Trichlorofluoromethane (CFC 11)	ND U	5.1	0.68	1	10/25/16 19:34	
Vinyl Chloride	ND U	5.1	1.9	1	10/25/16 19:34	
cis-1,3-Dichloropropene	ND U	5.1	0.93	1	10/25/16 19:34	
m,p-Xylenes	ND U	10	1.2	1	10/25/16 19:34	
o-Xylene	ND U	5.1	0.50	1	10/25/16 19:34	
trans-1,2-Dichloroethene	ND U	5.1	0.88	1	10/25/16 19:34	
trans-1,3-Dichloropropene	ND U	5.1	0.21	1	10/25/16 19:34	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	94	51 - 136	10/25/16 19:34	
Dibromofluoromethane	90	63 - 138	10/25/16 19:34	
Toluene-d8	91	66 - 138	10/25/16 19:34	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000104-76-7	1-Hexanol, 2-ethyl-	13.57	14	JN



Metals

ALS Environmental—Rochester Laboratory
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610140832 IBC 7330
Lab Code: R1611059-002

Service Request: R1611059
Date Collected: 10/14/16
Date Received: 10/18/16 09:50

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	0.7 BJ	mg/Kg	6.1	0.5	1	10/25/16 23:32	10/21/16	
Arsenic, Total	6010C	3.6	mg/Kg	1.0	0.3	1	10/29/16 14:37	10/21/16	
Barium, Total	6010C	105	mg/Kg	2.0	0.2	1	10/25/16 23:32	10/21/16	
Beryllium, Total	6010C	0.40	mg/Kg	0.31	0.02	1	10/25/16 23:32	10/21/16	
Cadmium, Total	6010C	0.27 J	mg/Kg	0.51	0.04	1	10/25/16 23:32	10/21/16	
Chromium, Total	6010C	6.6	mg/Kg	1.0	0.2	1	10/25/16 23:32	10/21/16	
Lead, Total	6010C	7.0	mg/Kg	5.1	0.3	1	10/25/16 23:32	10/21/16	
Mercury, Total	7471B	ND U	mg/Kg	5.3	0.5	1	10/25/16 13:52	10/21/16	
Nickel, Total	6010C	8.0	mg/Kg	4.1	0.2	1	10/25/16 23:32	10/21/16	
Selenium, Total	6010C	0.7 J	mg/Kg	1.0	0.7	1	10/25/16 23:32	10/21/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	10/25/16 23:32	10/21/16	
Thallium, Total	6010C	4.7	mg/Kg	1.0	0.6	1	10/29/16 14:37	10/21/16	
Vanadium, Total	6010C	11.9	mg/Kg	5.1	0.2	1	10/25/16 23:32	10/21/16	
Zinc, Total	6010C	40.7	mg/Kg	2.0	0.2	1	10/25/16 23:32	10/21/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610140837 IBC 7329
Lab Code: R1611059-005

Service Request: R1611059
Date Collected: 10/14/16
Date Received: 10/18/16 09:50

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	5.9	0.4	1	10/25/16 23:38	10/21/16	
Arsenic, Total	6010C	4.49	mg/Kg	0.98	0.24	1	10/29/16 14:40	10/21/16	
Barium, Total	6010C	83.3	mg/Kg	2.0	0.2	1	10/25/16 23:38	10/21/16	
Beryllium, Total	6010C	0.48	mg/Kg	0.29	0.02	1	10/25/16 23:38	10/21/16	
Cadmium, Total	6010C	0.30 J	mg/Kg	0.49	0.04	1	10/25/16 23:38	10/21/16	
Chromium, Total	6010C	9.03	mg/Kg	0.98	0.13	1	10/25/16 23:38	10/21/16	
Lead, Total	6010C	8.7	mg/Kg	4.9	0.3	1	10/25/16 23:38	10/21/16	
Mercury, Total	7471B	ND U	mg/Kg	5.7	0.6	1	10/25/16 13:54	10/21/16	
Nickel, Total	6010C	8.8	mg/Kg	3.9	0.2	1	10/25/16 23:38	10/21/16	
Selenium, Total	6010C	ND U	mg/Kg	0.98	0.60	1	10/25/16 23:38	10/21/16	
Silver, Total	6010C	ND U	mg/Kg	0.98	0.44	1	10/25/16 23:38	10/21/16	
Thallium, Total	6010C	1.92	mg/Kg	0.98	0.51	1	10/29/16 14:40	10/21/16	
Vanadium, Total	6010C	15.1	mg/Kg	4.9	0.2	1	10/25/16 23:38	10/21/16	
Zinc, Total	6010C	38.1	mg/Kg	2.0	0.2	1	10/25/16 23:38	10/21/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610140842 IBC 7338
Lab Code: R1611059-008

Service Request: R1611059
Date Collected: 10/14/16
Date Received: 10/18/16 09:50

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.0	0.4	1	10/25/16 23:44	10/21/16	
Arsenic, Total	6010C	5.5	mg/Kg	1.0	0.3	1	10/29/16 14:44	10/21/16	
Barium, Total	6010C	86.4	mg/Kg	2.0	0.2	1	10/25/16 23:44	10/21/16	
Beryllium, Total	6010C	0.47	mg/Kg	0.30	0.02	1	10/25/16 23:44	10/21/16	
Cadmium, Total	6010C	0.35 J	mg/Kg	0.50	0.04	1	10/25/16 23:44	10/21/16	
Chromium, Total	6010C	10.9	mg/Kg	1.0	0.2	1	10/25/16 23:44	10/21/16	
Lead, Total	6010C	8.4	mg/Kg	5.0	0.3	1	10/25/16 23:44	10/21/16	
Mercury, Total	7471B	ND U	mg/Kg	5.3	0.5	1	10/25/16 13:55	10/21/16	
Nickel, Total	6010C	9.7	mg/Kg	4.0	0.2	1	10/25/16 23:44	10/21/16	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	10/25/16 23:44	10/21/16	
Silver, Total	6010C	0.7 J	mg/Kg	1.0	0.5	1	10/25/16 23:44	10/21/16	
Thallium, Total	6010C	2.0	mg/Kg	1.0	0.6	1	10/29/16 14:44	10/21/16	
Vanadium, Total	6010C	13.5	mg/Kg	5.0	0.2	1	10/25/16 23:44	10/21/16	
Zinc, Total	6010C	43.8	mg/Kg	2.0	0.2	1	10/25/16 23:44	10/21/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130856 IBC 7321
Lab Code: R1611059-012

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.1	0.5	1	10/25/16 23:50	10/21/16	
Arsenic, Total	6010C	5.8	mg/Kg	1.0	0.3	1	10/29/16 14:53	10/21/16	
Barium, Total	6010C	178	mg/Kg	2.0	0.2	1	10/25/16 23:50	10/21/16	
Beryllium, Total	6010C	0.47	mg/Kg	0.31	0.02	1	10/25/16 23:50	10/21/16	
Cadmium, Total	6010C	0.53	mg/Kg	0.51	0.04	1	10/25/16 23:50	10/21/16	
Chromium, Total	6010C	7.2	mg/Kg	1.0	0.2	1	10/25/16 23:50	10/21/16	
Lead, Total	6010C	9.8	mg/Kg	5.1	0.3	1	10/25/16 23:50	10/21/16	
Mercury, Total	7471B	ND U	mg/Kg	5.2	0.5	1	10/25/16 13:57	10/21/16	
Nickel, Total	6010C	9.1	mg/Kg	4.1	0.2	1	10/25/16 23:50	10/21/16	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.7	1	10/25/16 23:50	10/21/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	10/25/16 23:50	10/21/16	
Thallium, Total	6010C	3.9	mg/Kg	1.0	0.6	1	10/29/16 14:53	10/21/16	
Vanadium, Total	6010C	14.1	mg/Kg	5.1	0.2	1	10/25/16 23:50	10/21/16	
Zinc, Total	6010C	49.4	mg/Kg	2.0	0.2	1	10/25/16 23:50	10/21/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130857 IBC 7321
Lab Code: R1611059-013

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.1	0.5	1	10/26/16 00:21	10/21/16	
Arsenic, Total	6010C	5.5	mg/Kg	1.0	0.3	1	10/29/16 15:09	10/21/16	
Barium, Total	6010C	170	mg/Kg	2.0	0.2	1	10/26/16 00:21	10/21/16	
Beryllium, Total	6010C	0.47	mg/Kg	0.31	0.02	1	10/26/16 00:21	10/21/16	
Cadmium, Total	6010C	0.38 J	mg/Kg	0.51	0.04	1	10/26/16 00:21	10/21/16	
Chromium, Total	6010C	6.5	mg/Kg	1.0	0.2	1	10/26/16 00:21	10/21/16	
Lead, Total	6010C	16.3	mg/Kg	5.1	0.3	1	10/26/16 00:21	10/21/16	
Mercury, Total	7471B	ND U	mg/Kg	5.5	0.5	1	10/25/16 14:02	10/21/16	
Nickel, Total	6010C	8.2	mg/Kg	4.1	0.2	1	10/26/16 00:21	10/21/16	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.7	1	10/26/16 00:21	10/21/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	10/26/16 00:21	10/21/16	
Thallium, Total	6010C	3.1	mg/Kg	1.0	0.6	1	10/29/16 15:09	10/21/16	
Vanadium, Total	6010C	12.7	mg/Kg	5.1	0.2	1	10/26/16 00:21	10/21/16	
Zinc, Total	6010C	44.7	mg/Kg	2.0	0.2	1	10/26/16 00:21	10/21/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130907 IBC 7322
Lab Code: R1611059-017

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	5.8	0.4	1	10/26/16 00:39	10/21/16	
Arsenic, Total	6010C	4.20	mg/Kg	0.97	0.24	1	10/29/16 15:12	10/21/16	
Barium, Total	6010C	89.0	mg/Kg	1.9	0.2	1	10/26/16 00:39	10/21/16	
Beryllium, Total	6010C	0.41	mg/Kg	0.29	0.02	1	10/26/16 00:39	10/21/16	
Cadmium, Total	6010C	0.33 J	mg/Kg	0.48	0.04	1	10/26/16 00:39	10/21/16	
Chromium, Total	6010C	8.41	mg/Kg	0.97	0.13	1	10/26/16 00:39	10/21/16	
Lead, Total	6010C	6.4	mg/Kg	4.8	0.3	1	10/26/16 00:39	10/21/16	
Mercury, Total	7471B	ND U	mg/Kg	5.3	0.5	1	10/25/16 14:07	10/21/16	
Nickel, Total	6010C	6.6	mg/Kg	3.9	0.2	1	10/26/16 00:39	10/21/16	
Selenium, Total	6010C	ND U	mg/Kg	0.97	0.60	1	10/26/16 00:39	10/21/16	
Silver, Total	6010C	ND U	mg/Kg	0.97	0.44	1	10/26/16 00:39	10/21/16	
Thallium, Total	6010C	2.48	mg/Kg	0.97	0.51	1	10/29/16 15:12	10/21/16	
Vanadium, Total	6010C	13.7	mg/Kg	4.8	0.2	1	10/26/16 00:39	10/21/16	
Zinc, Total	6010C	29.9	mg/Kg	1.9	0.2	1	10/26/16 00:39	10/21/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130917 IBC 7326
Lab Code: R1611059-020

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.1	0.5	1	10/26/16 00:45	10/21/16	
Arsenic, Total	6010C	5.2	mg/Kg	1.0	0.3	1	10/29/16 15:15	10/21/16	
Barium, Total	6010C	127	mg/Kg	2.0	0.2	1	10/26/16 00:45	10/21/16	
Beryllium, Total	6010C	0.43	mg/Kg	0.31	0.02	1	10/26/16 00:45	10/21/16	
Cadmium, Total	6010C	0.40 J	mg/Kg	0.51	0.04	1	10/26/16 00:45	10/21/16	
Chromium, Total	6010C	9.7	mg/Kg	1.0	0.2	1	10/26/16 00:45	10/21/16	
Lead, Total	6010C	9.4	mg/Kg	5.1	0.3	1	10/26/16 00:45	10/21/16	
Mercury, Total	7471B	ND U	mg/Kg	5.3	0.5	1	10/25/16 14:09	10/21/16	
Nickel, Total	6010C	8.4	mg/Kg	4.1	0.2	1	10/26/16 00:45	10/21/16	
Selenium, Total	6010C	0.9 J	mg/Kg	1.0	0.7	1	10/26/16 00:45	10/21/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	10/26/16 00:45	10/21/16	
Thallium, Total	6010C	2.7	mg/Kg	1.0	0.6	1	10/29/16 15:15	10/21/16	
Vanadium, Total	6010C	12.9	mg/Kg	5.1	0.2	1	10/26/16 00:45	10/21/16	
Zinc, Total	6010C	46.6	mg/Kg	2.0	0.2	1	10/26/16 00:45	10/21/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130942 IBC 7327
Lab Code: R1611059-023

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.1	0.5	1	10/26/16 00:51	10/21/16	
Arsenic, Total	6010C	5.7	mg/Kg	1.0	0.3	1	10/29/16 15:18	10/21/16	
Barium, Total	6010C	643	mg/Kg	2.0	0.2	1	10/26/16 00:51	10/21/16	
Beryllium, Total	6010C	0.46	mg/Kg	0.31	0.02	1	10/26/16 00:51	10/21/16	
Cadmium, Total	6010C	0.41 J	mg/Kg	0.51	0.04	1	10/26/16 00:51	10/21/16	
Chromium, Total	6010C	8.4	mg/Kg	1.0	0.2	1	10/26/16 00:51	10/21/16	
Lead, Total	6010C	9.0	mg/Kg	5.1	0.3	1	10/26/16 00:51	10/21/16	
Mercury, Total	7471B	ND U	mg/Kg	5.5	0.5	1	10/25/16 14:10	10/21/16	
Nickel, Total	6010C	9.3	mg/Kg	4.1	0.2	1	10/26/16 00:51	10/21/16	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.7	1	10/26/16 00:51	10/21/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	10/26/16 00:51	10/21/16	
Thallium, Total	6010C	2.9	mg/Kg	1.0	0.6	1	10/29/16 15:18	10/21/16	
Vanadium, Total	6010C	17.8	mg/Kg	5.1	0.2	1	10/26/16 00:51	10/21/16	
Zinc, Total	6010C	43.1	mg/Kg	2.0	0.2	1	10/26/16 00:51	10/21/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130947 IBC 7331
Lab Code: R1611059-026

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	5.9	0.4	1	10/26/16 00:57	10/21/16	
Arsenic, Total	6010C	4.24	mg/Kg	0.99	0.24	1	10/29/16 15:21	10/21/16	
Barium, Total	6010C	53.4	mg/Kg	2.0	0.2	1	10/26/16 00:57	10/21/16	
Beryllium, Total	6010C	0.42	mg/Kg	0.30	0.02	1	10/26/16 00:57	10/21/16	
Cadmium, Total	6010C	0.40 J	mg/Kg	0.49	0.04	1	10/26/16 00:57	10/21/16	
Chromium, Total	6010C	10.3	mg/Kg	0.99	0.13	1	10/26/16 00:57	10/21/16	
Lead, Total	6010C	9.5	mg/Kg	4.9	0.3	1	10/26/16 00:57	10/21/16	
Mercury, Total	7471B	ND U	mg/Kg	5.2	0.5	1	10/25/16 14:12	10/21/16	
Nickel, Total	6010C	9.0	mg/Kg	3.9	0.2	1	10/26/16 00:57	10/21/16	
Selenium, Total	6010C	ND U	mg/Kg	0.99	0.60	1	10/26/16 00:57	10/21/16	
Silver, Total	6010C	ND U	mg/Kg	0.99	0.44	1	10/26/16 00:57	10/21/16	
Thallium, Total	6010C	2.11	mg/Kg	0.99	0.51	1	10/29/16 15:21	10/21/16	
Vanadium, Total	6010C	14.8	mg/Kg	4.9	0.2	1	10/26/16 00:57	10/21/16	
Zinc, Total	6010C	37.3	mg/Kg	2.0	0.2	1	10/26/16 00:57	10/21/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130952 IBC 7328
Lab Code: R1611059-029

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.0	0.4	1	10/26/16 01:04	10/21/16	
Arsenic, Total	6010C	5.91	mg/Kg	1.0	0.24	1	10/29/16 15:31	10/21/16	
Barium, Total	6010C	63.1	mg/Kg	2.0	0.2	1	10/26/16 01:04	10/21/16	
Beryllium, Total	6010C	0.46	mg/Kg	0.30	0.02	1	10/26/16 01:04	10/21/16	
Cadmium, Total	6010C	0.41 J	mg/Kg	0.50	0.04	1	10/26/16 01:04	10/21/16	
Chromium, Total	6010C	11.9	mg/Kg	1.0	0.13	1	10/26/16 01:04	10/21/16	
Lead, Total	6010C	10.3	mg/Kg	5.0	0.3	1	10/26/16 01:04	10/21/16	
Mercury, Total	7471B	ND U	mg/Kg	5.6	0.6	1	10/25/16 14:13	10/21/16	
Nickel, Total	6010C	9.9	mg/Kg	4.0	0.2	1	10/26/16 01:04	10/21/16	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.60	1	10/26/16 01:04	10/21/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.44	1	10/26/16 01:04	10/21/16	
Thallium, Total	6010C	2.49	mg/Kg	1.0	0.51	1	10/29/16 15:31	10/21/16	
Vanadium, Total	6010C	14.2	mg/Kg	5.0	0.2	1	10/26/16 01:04	10/21/16	
Zinc, Total	6010C	41.3	mg/Kg	2.0	0.2	1	10/26/16 01:04	10/21/16	



General Chemistry

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610140830 IBC 7330
Lab Code: R1611059-001

Service Request: R1611059
Date Collected: 10/14/16
Date Received: 10/18/16 09:50
Basis: As Received

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Q
Total Solids	ALS SOP	97.2	Percent	-	1	10/25/16 17:25	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610140832 IBC 7330
Lab Code: R1611059-002

Service Request: R1611059
Date Collected: 10/14/16
Date Received: 10/18/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	97.6	Percent	-	-	1	10/25/16 17:25	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610140835 IBC 7329
Lab Code: R1611059-004

Service Request: R1611059
Date Collected: 10/14/16
Date Received: 10/18/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	97.2	Percent	-	1	10/25/16 17:25	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610140837 IBC 7329
Lab Code: R1611059-005

Service Request: R1611059
Date Collected: 10/14/16
Date Received: 10/18/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	97.1	Percent	-	-	1	10/25/16 17:25	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610140840 IBC 7338
Lab Code: R1611059-007

Service Request: R1611059
Date Collected: 10/14/16
Date Received: 10/18/16 09:50
Basis: As Received

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Q
Total Solids	ALS SOP	95.8	Percent	-	1	10/25/16 17:25	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610140842 IBC 7338
Lab Code: R1611059-008

Service Request: R1611059
Date Collected: 10/14/16
Date Received: 10/18/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	96.1	Percent	-	-	1	10/25/16 17:25	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130850 IBC 7321
Lab Code: R1611059-010

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	98.0	Percent	-	1	10/25/16 17:25	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130851 IBC 7321
Lab Code: R1611059-011

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50
Basis: As Received

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Q
Total Solids	ALS SOP	97.8	Percent	-	1	10/25/16 17:25	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130856 IBC 7321
Lab Code: R1611059-012

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	97.9	Percent	-	-	1	10/25/16 17:25	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130857 IBC 7321
Lab Code: R1611059-013

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	97.7	Percent	-	-	1	10/25/16 17:25	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130905 IBC 7322
Lab Code: R1611059-016

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	98.7	Percent	-	1	10/25/16 17:25	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130907 IBC 7322
Lab Code: R1611059-017

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	98.2	Percent	-	-	1	10/25/16 17:25	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130915 IBC 7326
Lab Code: R1611059-019

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	96.5	Percent	-	1	10/25/16 17:25	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130917 IBC 7326
Lab Code: R1611059-020

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	96.2	Percent	-	-	1	10/25/16 17:25	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130940 IBC 7327
Lab Code: R1611059-022

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50
Basis: As Received

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Q
Total Solids	ALS SOP	97.9	Percent	-	1	10/25/16 17:25	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130942 IBC 7327
Lab Code: R1611059-023

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	98.0	Percent	-	-	1	10/25/16 17:25	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130945 IBC 7331
Lab Code: R1611059-025

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	97.7	Percent	-	1	10/25/16 17:25	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130947 IBC 7331
Lab Code: R1611059-026

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	97.5	Percent	-	-	1	10/25/16 17:25	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130950 IBC 7328
Lab Code: R1611059-028

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50
Basis: As Received

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Q
Total Solids	ALS SOP	97.8	Percent	-	1	10/25/16 17:25	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610130952 IBC 7328
Lab Code: R1611059-029

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16 09:50
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	97.5	Percent	-	-	1	10/25/16 17:25	



QC Summary Forms

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Volatile Organic Compounds by GC/MS

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Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611059

SURROGATE RECOVERY SUMMARY
Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Extraction Method: EPA 5030C

Sample Name	Lab Code	4-Bromofluorobenzene	Dibromofluoromethane	Toluene-d8
		51 - 136	63 - 138	66 - 138
1610140830 IBC 7330	R1611059-001	99	95	96
1610140835 IBC 7329	R1611059-004	97	96	96
1610140840 IBC 7338	R1611059-007	95	92	93
1610130850 IBC 7321	R1611059-010	94	94	94
1610130851 IBC 7321	R1611059-011	92	92	94
1610130905 IBC 7322	R1611059-016	96	93	94
1610130915 IBC 7326	R1611059-019	95	94	93
1610130940 IBC 7327	R1611059-022	97	92	94
1610130945 IBC 7331	R1611059-025	95	92	95
1610130950 IBC 7328	R1611059-028	94	90	91
Method Blank	RQ1613053-01	95	94	93
Lab Control Sample	RQ1613053-02	98	98	95
1610130850 IBC 7321 MS	RQ1613053-05	97	96	95
1610130850 IBC 7321 DMS	RQ1613053-06	96	94	92

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16
Date Analyzed: 10/25/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1610130850 IBC 7321
Lab Code: R1611059-010
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1613053-05			Duplicate Matrix Spike RQ1613053-06			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
1,1,1,2-Tetrachloroethane	ND U	37.4	51.0	73	40.4	51.0	79	52-133	8	30
1,1,1-Trichloroethane (TCA)	ND U	36.5	51.0	71	38.6	51.0	76	51-132	7	30
1,1,2,2-Tetrachloroethane	ND U	36.1	51.0	71	36.9	51.0	72	53-134	1	30
1,1,2-Trichloroethane	ND U	39.6	51.0	78	42.4	51.0	83	62-126	6	30
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	35.6	51.0	70	36.9	51.0	72	45-136	3	30
1,1-Dichloroethene (1,1-DCE)	ND U	37.3	51.0	73	39.6	51.0	78	61-139	7	30
1,2,3-Trichloropropane	ND U	39.9	51.0	78	40.3	51.0	79	22-167	1	30
1,2-Dibromo-3-chloropropane (DBCP)	ND U	40.7	51.0	80	42.5	51.0	83	27-163	4	30
1,2-Dibromoethane	ND U	40.0	51.0	78	42.0	51.0	82	52-137	5	30
1,2-Dichlorobenzene	ND U	37.5	51.0	73	38.9	51.0	76	22-156	4	30
1,2-Dichloroethane	ND U	38.2	51.0	75	40.5	51.0	79	59-125	5	30
1,2-Dichloropropane	ND U	37.7	51.0	74	39.9	51.0	78	67-126	5	30
1,3-Dichlorobenzene	ND U	36.9	51.0	72	37.9	51.0	74	29-146	3	30
1,4-Dioxane	ND U	766	1020	75	817	1020	80	50-148	6	30
2-Butanone (MEK)	ND U	44.2	51.0	87	42.9	51.0	84	43-134	4	30
2-Chloro-1,3-butadiene	ND U	36.8	51.0	72	39.1	51.0	77	45-134	7	30
2-Chloroethyl Vinyl Ether	ND U	25.5	51.0	50	30.3	51.0	59	37-150	17	30
Isobutyl Alcohol	ND U	731	1020	72	754	1020	74	39-146	3	30
Allyl Chloride	ND U	35.0	51.0	69	38.1	51.0	75	34-135	8	30
4-Methyl-2-pentanone	ND U	41.9	51.0	82	41.4	51.0	81	47-145	1	30
Acetone	ND U	60.0	51.0	118	54.5	51.0	107	11-183	10	30
Acetonitrile	ND U	253	255	99	165	255	65	28-146	41*	30
Acrolein	ND U	88.9	102	87	92.1	102	90	10-172	3	30
Acrylonitrile	ND U	206	255	81	204	255	80	46-139	1	30
Benzene	ND U	37.4	51.0	73	39.2	51.0	77	63-126	5	30
Bromodichloromethane	ND U	36.6	51.0	72	39.4	51.0	77	47-141	7	30
Bromoform	ND U	43.8	51.0	86	46.3	51.0	91	26-157	6	30
Bromomethane	ND U	37.7	51.0	74	33.5	51.0	66	10-137	11	30
Carbon Disulfide	ND U	36.1	51.0	71	40.6	51.0	80	35-135	12	30
Carbon Tetrachloride	ND U	34.9	51.0	68	38.7	51.0	76	46-137	11	30
Chlorobenzene	ND U	37.4	51.0	73	39.3	51.0	77	51-132	5	30
Chloroethane	ND U	43.3	51.0	85	39.9	51.0	78	45-132	9	30
Chloroform	ND U	37.1	51.0	73	40.0	51.0	78	61-124	7	30
Chloromethane	ND U	35.9	51.0	70	38.6	51.0	76	50-136	8	30
Dibromochloromethane	ND U	39.5	51.0	77	42.1	51.0	83	40-146	8	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16
Date Analyzed: 10/25/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1610130850 IBC 7321 **Units:** ug/Kg
Lab Code: R1611059-010 **Basis:** Dry
Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Sample Result	Matrix Spike RQ1613053-05			Duplicate Matrix Spike RQ1613053-06			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Dibromomethane	ND U	39.3	51.0	77	41.2	51.0	81	61-122	5	30
Dichlorodifluoromethane (CFC 12)	ND U	35.1	51.0	69	37.4	51.0	73	44-138	6	30
Dichloromethane	ND U	37.9	51.0	74	40.3	51.0	79	64-120	7	30
Ethyl Methacrylate	ND U	38.0	51.0	74	40.6	51.0	79	17-166	7	30
Ethylbenzene	ND U	37.6	51.0	74	39.2	51.0	77	44-131	4	30
Iodomethane	ND U	21.3	51.0	42	33.5	51.0	66	10-160	44*	30
Methacrylonitrile	ND U	40.9	51.0	80	41.6	51.0	82	44-149	2	30
Methyl Methacrylate	ND U	39.7	51.0	78	41.1	51.0	81	41-162	4	30
Naphthalene	ND U	38.6	51.0	76	40.2	51.0	79	10-187	4	30
Propionitrile	ND U	212	255	83	214	255	84	46-144	1	30
Tetrachloroethene (PCE)	ND U	37.6	51.0	74	39.2	51.0	77	45-141	4	30
Toluene	ND U	37.0	51.0	73	39.1	51.0	77	50-140	5	30
Trichloroethene (TCE)	ND U	42.8	51.0	84	44.8	51.0	88	54-136	5	30
Trichlorofluoromethane (CFC 11)	ND U	38.1	51.0	75	39.2	51.0	77	47-129	3	30
Vinyl Chloride	ND U	41.4	51.0	81	44.1	51.0	86	53-128	6	30
cis-1,3-Dichloropropene	ND U	36.0	51.0	71	39.0	51.0	76	31-150	7	30
m,p-Xylenes	ND U	75.7	102	74	78.7	102	77	45-141	4	30
o-Xylene	ND U	37.9	51.0	74	39.9	51.0	78	46-139	5	30
trans-1,2-Dichloroethene	ND U	37.2	51.0	73	39.3	51.0	77	52-128	5	30
trans-1,3-Dichloropropene	ND U	37.0	51.0	73	40.4	51.0	79	23-160	8	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611059
Date Collected: NA
Date Received: NA

Sample Name: Method Blank
Lab Code: RQ1613053-01

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.0	0.83	1	10/25/16 15:07	
1,1,1-Trichloroethane (TCA)	ND U	5.0	0.73	1	10/25/16 15:07	
1,1,2,2-Tetrachloroethane	ND U	5.0	0.81	1	10/25/16 15:07	
1,1,2-Trichloroethane	ND U	5.0	0.73	1	10/25/16 15:07	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.0	1.3	1	10/25/16 15:07	
1,1-Dichloroethene (1,1-DCE)	ND U	5.0	1.3	1	10/25/16 15:07	
1,2,3-Trichloropropane	ND U	5.0	1.4	1	10/25/16 15:07	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.0	1.9	1	10/25/16 15:07	
1,2-Dibromoethane	ND U	5.0	1.3	1	10/25/16 15:07	
1,2-Dichlorobenzene	ND U	5.0	0.61	1	10/25/16 15:07	
1,2-Dichloroethane	ND U	5.0	0.61	1	10/25/16 15:07	
1,2-Dichloropropane	ND U	5.0	0.97	1	10/25/16 15:07	
1,3-Dichlorobenzene	ND U	5.0	0.63	1	10/25/16 15:07	
1,4-Dioxane	ND U	100	20	1	10/25/16 15:07	
2-Butanone (MEK)	ND U	5.0	2.3	1	10/25/16 15:07	
2-Chloro-1,3-butadiene	ND U	5.0	1.6	1	10/25/16 15:07	
2-Chloroethyl Vinyl Ether	ND U	5.0	1.8	1	10/25/16 15:07	
Isobutyl Alcohol	ND U	100	23	1	10/25/16 15:07	
Allyl Chloride	ND U	5.0	1.7	1	10/25/16 15:07	
4-Methyl-2-pentanone	ND U	5.0	0.98	1	10/25/16 15:07	
Acetone	ND U	5.0	2.9	1	10/25/16 15:07	
Acetonitrile	ND U	25	17	1	10/25/16 15:07	
Acrolein	ND U	25	3.5	1	10/25/16 15:07	
Acrylonitrile	ND U	25	6.5	1	10/25/16 15:07	
Benzene	ND U	5.0	0.29	1	10/25/16 15:07	
Bromodichloromethane	ND U	5.0	0.61	1	10/25/16 15:07	
Bromoform	ND U	5.0	0.93	1	10/25/16 15:07	
Bromomethane	ND U	5.0	1.4	1	10/25/16 15:07	
Carbon Disulfide	ND U	5.0	1.3	1	10/25/16 15:07	
Carbon Tetrachloride	ND U	5.0	0.92	1	10/25/16 15:07	
Chlorobenzene	ND U	5.0	0.29	1	10/25/16 15:07	
Chloroethane	ND U	5.0	2.9	1	10/25/16 15:07	
Chloroform	ND U	5.0	1.3	1	10/25/16 15:07	
Chloromethane	ND U	5.0	0.40	1	10/25/16 15:07	
Dibromochloromethane	ND U	5.0	0.73	1	10/25/16 15:07	
Dibromomethane	ND U	5.0	0.63	1	10/25/16 15:07	
Dichlorodifluoromethane (CFC 12)	ND U	5.0	1.9	1	10/25/16 15:07	
Dichloromethane	ND U	5.0	0.57	1	10/25/16 15:07	
Ethyl Methacrylate	ND U	5.0	0.75	1	10/25/16 15:07	
Ethylbenzene	ND U	5.0	0.23	1	10/25/16 15:07	
Iodomethane	ND U	10	1.2	1	10/25/16 15:07	
Methacrylonitrile	ND U	5.0	1.6	1	10/25/16 15:07	
Methyl Methacrylate	ND U	5.0	0.73	1	10/25/16 15:07	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: RQ1613053-01

Service Request: R1611059
Date Collected: NA
Date Received: NA
Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.0	0.51	1	10/25/16 15:07	
Propionitrile	ND U	25	6.5	1	10/25/16 15:07	
Tetrachloroethene (PCE)	ND U	5.0	0.88	1	10/25/16 15:07	
Toluene	ND U	5.0	1.0	1	10/25/16 15:07	
Trichloroethene (TCE)	ND U	5.0	1.1	1	10/25/16 15:07	
Trichlorofluoromethane (CFC 11)	ND U	5.0	0.66	1	10/25/16 15:07	
Vinyl Chloride	ND U	5.0	1.9	1	10/25/16 15:07	
cis-1,3-Dichloropropene	ND U	5.0	0.90	1	10/25/16 15:07	
m,p-Xylenes	ND U	10	1.1	1	10/25/16 15:07	
o-Xylene	ND U	5.0	0.48	1	10/25/16 15:07	
trans-1,2-Dichloroethene	ND U	5.0	0.86	1	10/25/16 15:07	
trans-1,3-Dichloropropene	ND U	5.0	0.20	1	10/25/16 15:07	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	95	51 - 136	10/25/16 15:07	
Dibromofluoromethane	94	63 - 138	10/25/16 15:07	
Toluene-d8	93	66 - 138	10/25/16 15:07	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611059
Date Analyzed: 10/25/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Units:ug/Kg
Basis:Dry

Lab Control Sample
RQ1613053-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
1,1,1,2-Tetrachloroethane	8260C	16.2	20.0	81	40-140
1,1,1-Trichloroethane (TCA)	8260C	16.1	20.0	80	40-140
1,1,2,2-Tetrachloroethane	8260C	17.3	20.0	86	40-140
1,1,2-Trichloroethane	8260C	17.1	20.0	86	40-140
1,1,2-Trichloro-1,2,2-trifluoroethane	8260C	15.0	20.0	75	40-140
1,1-Dichloroethene (1,1-DCE)	8260C	15.9	20.0	80	40-140
1,2,3-Trichloropropane	8260C	16.1	20.0	80	40-140
1,2-Dibromo-3-chloropropane (DBCP)	8260C	16.0	20.0	80	40-140
1,2-Dibromoethane	8260C	16.9	20.0	85	40-140
1,2-Dichlorobenzene	8260C	16.7	20.0	84	40-140
1,2-Dichloroethane	8260C	16.9	20.0	84	40-140
1,2-Dichloropropane	8260C	16.4	20.0	82	40-140
1,3-Dichlorobenzene	8260C	17.3	20.0	86	40-140
1,4-Dioxane	8260C	324	400	81	40-140
2-Butanone (MEK)	8260C	16.9	20.0	84	40-140
2-Chloro-1,3-butadiene	8260C	17.0	20.0	85	40-140
2-Chloroethyl Vinyl Ether	8260C	11.9	20.0	60	40-140
Isobutyl Alcohol	8260C	282	400	71	40-140
Allyl Chloride	8260C	15.9	20.0	80	40-140
4-Methyl-2-pentanone	8260C	16.1	20.0	80	40-140
Acetone	8260C	20.1	20.0	100	40-140
Acetonitrile	8260C	99.1	100	99	40-140
Acrolein	8260C	39.5	40.0	99	40-140
Acrylonitrile	8260C	79.4	100	79	40-140
Benzene	8260C	16.4	20.0	82	40-140
Bromodichloromethane	8260C	16.4	20.0	82	40-140
Bromoform	8260C	19.2	20.0	96	40-140
Bromomethane	8260C	16.6	20.0	83	40-140
Carbon Disulfide	8260C	18.4	20.0	92	40-140
Carbon Tetrachloride	8260C	15.4	20.0	77	40-140
Chlorobenzene	8260C	16.6	20.0	83	40-140
Chloroethane	8260C	16.9	20.0	84	40-140
Chloroform	8260C	16.4	20.0	82	40-140

ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611059
Date Analyzed: 10/25/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Units:ug/Kg
Basis:Dry

Lab Control Sample
RQ1613053-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Chloromethane	8260C	16.1	20.0	81	40-140
Dibromochloromethane	8260C	16.8	20.0	84	40-140
Dibromomethane	8260C	16.6	20.0	83	40-140
Dichlorodifluoromethane (CFC 12)	8260C	15.0	20.0	75	40-140
Dichloromethane	8260C	16.7	20.0	83	40-140
Ethyl Methacrylate	8260C	15.8	20.0	79	40-140
Ethylbenzene	8260C	16.2	20.0	81	40-140
Iodomethane	8260C	17.0	20.0	85	40-140
Methacrylonitrile	8260C	16.3	20.0	81	40-140
Methyl Methacrylate	8260C	16.1	20.0	80	40-140
Naphthalene	8260C	17.3	20.0	87	40-140
Propionitrile	8260C	83.5	100	84	40-140
Tetrachloroethene (PCE)	8260C	16.0	20.0	80	40-140
Toluene	8260C	16.2	20.0	81	40-140
Trichloroethene (TCE)	8260C	16.4	20.0	82	40-140
Trichlorofluoromethane (CFC 11)	8260C	15.8	20.0	79	40-140
Vinyl Chloride	8260C	18.2	20.0	91	40-140
cis-1,3-Dichloropropene	8260C	16.4	20.0	82	40-140
m,p-Xylenes	8260C	32.8	40.0	82	40-140
o-Xylene	8260C	16.6	20.0	83	40-140
trans-1,2-Dichloroethene	8260C	16.7	20.0	83	40-140
trans-1,3-Dichloropropene	8260C	16.8	20.0	84	40-140



Metals

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: R1611059-MB

Service Request: R1611059
Date Collected: NA
Date Received: NA
Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	0.5 J	mg/Kg	6.0	0.4	1	10/25/16 21:19	10/21/16	
Arsenic, Total	6010C	ND U	mg/Kg	1.0	0.3	1	10/29/16 13:37	10/21/16	
Barium, Total	6010C	ND U	mg/Kg	2.0	0.2	1	10/25/16 21:19	10/21/16	
Beryllium, Total	6010C	ND U	mg/Kg	0.30	0.02	1	10/25/16 21:19	10/21/16	
Cadmium, Total	6010C	ND U	mg/Kg	0.50	0.04	1	10/25/16 21:19	10/21/16	
Chromium, Total	6010C	ND U	mg/Kg	1.0	0.2	1	10/25/16 21:19	10/21/16	
Lead, Total	6010C	ND U	mg/Kg	5.0	0.3	1	10/25/16 21:19	10/21/16	
Mercury, Total	7471B	ND U	mg/Kg	5.5	0.5	1	10/25/16 13:31	10/21/16	
Nickel, Total	6010C	0.6 J	mg/Kg	4.0	0.2	1	10/25/16 21:19	10/21/16	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	10/25/16 21:19	10/21/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	10/25/16 21:19	10/21/16	
Thallium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	10/29/16 13:37	10/21/16	
Vanadium, Total	6010C	ND U	mg/Kg	5.0	0.2	1	10/25/16 21:19	10/21/16	
Zinc, Total	6010C	1.5 J	mg/Kg	2.0	0.2	1	10/25/16 21:19	10/21/16	

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request:R1611059
Date Collected:10/13/16
Date Received:10/18/16
Date Analyzed:10/25/16 - 10/29/16

Matrix Spike Summary
Inorganic Parameters

Sample Name: 1610130856 IBC 7321
Lab Code: R1611059-012

Units:mg/Kg
Basis:Dry

Matrix Spike
R1611059-012MS

Analyte Name	Method	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Silver, Total	6010C	ND U	4.8	5.1	95	75-125
Arsenic, Total	6010C	5.8	9.7	4.1	95	75-125
Barium, Total	6010C	178	415	204	116	75-125
Beryllium, Total	6010C	0.47	5.04	5.11	89	75-125
Cadmium, Total	6010C	0.53	4.56	5.11	79	75-125
Chromium, Total	6010C	7.2	26.5	20.4	95	75-125
Mercury, Total	7471B	ND U	ND U	0.2	106	75-125
Nickel, Total	6010C	9.1	51.2	51.1	83	75-125
Lead, Total	6010C	9.8	51.9	51.1	82	75-125
Antimony, Total	6010C	ND U	42.9	51.1	84	75-125
Selenium, Total	6010C	ND U	93.2	103	90	75-125
Thallium, Total	6010C	3.9	199	204	95	75-125
Vanadium, Total	6010C	14.1	59.7	51.1	89	75-125
Zinc, Total	6010C	49.4	87.6	51.1	75	75-125

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16
Date Analyzed: 10/25/16 - 10/29/16

**Replicate Sample Summary
 Inorganic Parameters**

Sample Name: 1610130856 IBC 7321
Lab Code: R1611059-012

Units: mg/Kg
Basis: Dry

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate	Average	RPD	RPD Limit
					Sample R1611059-012DUP Result			
Antimony, Total	6010C	6.1	0.5	ND U	ND U	NC	NC	20
Arsenic, Total	6010C	1.0	0.3	5.8	4.8	5.31	20	20
Barium, Total	6010C	2.0	0.2	178	165	171	7	20
Beryllium, Total	6010C	0.31	0.02	0.47	0.45	0.462	5	20
Cadmium, Total	6010C	0.51	0.04	0.53	0.36 J	0.443	39 *	20
Chromium, Total	6010C	1.0	0.2	7.2	7.0	7.08	3	20
Lead, Total	6010C	5.1	0.3	9.8	9.3	9.57	5	20
Mercury, Total	7471B	5.2	0.5	ND U	ND U	NC	NC	35
Nickel, Total	6010C	4.1	0.2	9.1	8.6	8.85	5	20
Selenium, Total	6010C	1.0	0.7	ND U	ND U	NC	NC	20
Silver, Total	6010C	1.0	0.5	ND U	ND U	NC	NC	20
Thallium, Total	6010C	1.0	0.6	3.9	2.5	3.22	44 *	20
Vanadium, Total	6010C	5.1	0.2	14.1	12.6	13.3	11	20
Zinc, Total	6010C	2.0	0.2	49.4	44.0	46.7	12	20

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Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611059
Date Analyzed: 10/25/16 - 10/29/16

Lab Control Sample Summary
Inorganic Parameters

Units:mg/Kg
Basis:Dry

Lab Control Sample
R1611059-LCS

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Antimony, Total	6010C	45.7	50.0	91	80-120
Arsenic, Total	6010C	3.6	4.0	89	80-120
Barium, Total	6010C	198	200	99	80-120
Beryllium, Total	6010C	4.51	5.00	90	80-120
Cadmium, Total	6010C	4.58	5.00	92	80-120
Chromium, Total	6010C	20.0	20.0	100	80-120
Lead, Total	6010C	46.6	50.0	93	80-120
Mercury, Total	7471B	ND U	0.2	100	80-120
Nickel, Total	6010C	48.9	50.0	98	80-120
Selenium, Total	6010C	86.0	101	85	80-120
Silver, Total	6010C	4.5	5.0	90	80-120
Thallium, Total	6010C	168	200	84	80-120
Vanadium, Total	6010C	47.8	50.0	96	80-120
Zinc, Total	6010C	50.6	50.0	101	80-120



General Chemistry

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QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16
Date Analyzed: 10/25/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1610130850 IBC 7321
Lab Code: R1611059-010

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>Sample Result</u>	<u>Duplicate Sample R1611059-010DUP Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	98.0	97.8	97.9	<1	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16
Date Analyzed: 10/25/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1610130856 IBC 7321
Lab Code: R1611059-012

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>MDL</u>	<u>Sample Result</u>	<u>Duplicate Sample R1611059-012DUP Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	-	97.9	98.1	98.0	<1	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611059
Date Collected: 10/13/16
Date Received: 10/18/16
Date Analyzed: 10/25/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1610130945 IBC 7331
Lab Code: R1611059-025

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>Sample Result</u>	<u>Duplicate Sample R1611059-025DUP Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	97.7	97.6	97.7	<1	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.



Subcontracted Analytical Parameters

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

October 27, 2016

Reports and Invoices
ALS Environmental
1565 Jefferson Road
Building 300, Suite 360
Rochester, NY 14623

Certificate of Analysis

Project Name:	TCLP Metals - no J values	Workorder:	2183897
Purchase Order:	58R1611059	Workorder ID:	R1611059

Dear Reports Invoices:

Enclosed are the analytical results for samples received by the laboratory on Friday, October 21, 2016.

The ALS Environmental laboratory in Middletown, Pennsylvania is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Mr. Brad W Kintzer (Project Coordinator) at (717) 944-5541.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state requirements. The test results meet requirements of the current NELAP standards or state requirements, where applicable. For a specific list of accredited analytes, refer to the certifications section of the ALS website at www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads.

This laboratory report may not be reproduced, except in full, without the written approval of ALS Environmental.

ALS Spring City: 10 Riverside Drive, Spring City, PA 19475 610-948-4903

CC: Ms. Ellen Smith , Ms. Janice Jaeger

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.


Mr. Brad W Kintzer
Project Coordinator

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SAMPLE SUMMARY

Workorder: 2183897 R1611059

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
2183897001	1610140833 IBC 7330	Solid	10/14/2016 00:00	10/21/2016 08:58	Collected by Client
2183897002	1610140838 IBC 7329	Solid	10/14/2016 00:00	10/21/2016 08:58	Collected by Client
2183897003	1610140843 IBC 7338	Solid	10/14/2016 00:00	10/21/2016 08:58	Collected by Client
2183897004	1610130859 IBC 7321	Solid	10/13/2016 00:00	10/21/2016 08:58	Collected by Client
2183897005	1610130900 IBC 7321	Solid	10/13/2016 00:00	10/21/2016 08:58	Collected by Client
2183897006	1610130908 IBC 7322	Solid	10/13/2016 00:00	10/21/2016 08:58	Collected by Client
2183897007	1610130918 IBC 7326	Solid	10/13/2016 00:00	10/21/2016 08:58	Collected by Client
2183897008	1610130943 IBC 7327	Solid	10/13/2016 00:00	10/21/2016 08:58	Collected by Client
2183897009	1610130948 IBC 7331	Solid	10/13/2016 00:00	10/21/2016 08:58	Collected by Client
2183897010	1610130953 IBC 7328	Solid	10/13/2016 00:00	10/21/2016 08:58	Collected by Client

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SAMPLE SUMMARY

Workorder: 2183897 R1611059

Notes

- Samples collected by ALS personnel are done so in accordance with the procedures set forth in the ALS Field Sampling Plan (20 - Field Services Sampling Plan).
- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
- The Chain of Custody document is included as part of this report.
- All Library Search analytes should be regarded as tentative identifications based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.
- Parameters identified as "analyze immediately" require analysis within 15 minutes of collection. Any "analyze immediately" parameters not listed under the header "Field Parameters" are performed in the laboratory and are therefore analyzed out of hold time.
- Method references listed on this report beginning with the prefix "S" followed by a method number (such as S2310B-97) refer to methods from "Standard Methods for the Examination of Water and Wastewater".
- For microbiological analyses, the "Prepared" value is the date/time into the incubator and the "Analyzed" value is the date/time out the incubator.

Standard Acronyms/Flags

J	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
N	Indicates presumptive evidence of the presence of a compound
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference
LOD	DoD Limit of Detection
LOQ	DoD Limit of Quantitation
DL	DoD Detection Limit
I	Indicates reported value is greater than or equal to the Method Detection Limit (MDL) but less than the Report Detection Limit (RDL)
(S)	Surrogate Compound
NC	Not Calculated
*	Result outside of QC limits

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ANALYTICAL RESULTS

Workorder: 2183897 R1611059

Lab ID: **2183897001** Date Collected: 10/14/2016 00:00 Matrix: Solid
Sample ID: **1610140833 IBC 7330** Date Received: 10/21/2016 08:58

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	2.9		%	0.1	S2540G-11			10/24/16 14:23	VKB	
Total Solids	97.1		%	0.1	S2540G-11			10/24/16 14:23	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:52	TSS	A
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:52	TSS	A
Barium, Total	ND		mg/L	2.8	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:52	TSS	A
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:52	TSS	A
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:52	TSS	A
Chromium, Total	0.064		mg/L	0.028	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:52	TSS	A
Lead, Total	ND		mg/L	0.033	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:52	TSS	A
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	10/25/16 02:30	MNP	10/25/16 08:58	MNP	A1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:52	TSS	A
Selenium, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:52	TSS	A
Silver, Total	ND		mg/L	0.022	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:52	TSS	A
Thallium, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:52	TSS	A
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:52	TSS	A
Zinc, Total	0.31		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:52	TSS	A



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ANALYTICAL RESULTS

Workorder: 2183897 R1611059

 Lab ID: **2183897002** Date Collected: 10/14/2016 00:00 Matrix: Solid
 Sample ID: **1610140838 IBC 7329** Date Received: 10/21/2016 08:58

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	2.5		%	0.1	S2540G-11			10/24/16 14:23	VKB	
Total Solids	97.5		%	0.1	S2540G-11			10/24/16 14:23	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:56	TSS	A
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:56	TSS	A
Barium, Total	ND		mg/L	2.8	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:56	TSS	A
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:56	TSS	A
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:56	TSS	A
Chromium, Total	ND		mg/L	0.028	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:56	TSS	A
Lead, Total	ND		mg/L	0.033	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:56	TSS	A
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	10/25/16 02:30	MNP	10/25/16 08:59	MNP	A1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:56	TSS	A
Selenium, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:56	TSS	A
Silver, Total	ND		mg/L	0.022	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:56	TSS	A
Thallium, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:56	TSS	A
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:56	TSS	A
Zinc, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 17:56	TSS	A



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ANALYTICAL RESULTS

Workorder: 2183897 R1611059

Lab ID: **2183897003** Date Collected: 10/14/2016 00:00 Matrix: Solid
Sample ID: **1610140843 IBC 7338** Date Received: 10/21/2016 08:58

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	3.7		%	0.1	S2540G-11			10/24/16 14:23	VKB	
Total Solids	96.3		%	0.1	S2540G-11			10/24/16 14:23	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:00	TSS	A
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:00	TSS	A
Barium, Total	ND		mg/L	2.8	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:00	TSS	A
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:00	TSS	A
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:00	TSS	A
Chromium, Total	ND		mg/L	0.028	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:00	TSS	A
Lead, Total	ND		mg/L	0.033	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:00	TSS	A
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	10/25/16 02:30	MNP	10/25/16 09:00	MNP	A1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:00	TSS	A
Selenium, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:00	TSS	A
Silver, Total	ND		mg/L	0.022	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:00	TSS	A
Thallium, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:00	TSS	A
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:00	TSS	A
Zinc, Total	0.12		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:00	TSS	A



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ANALYTICAL RESULTS

Workorder: 2183897 R1611059

Lab ID: **2183897004** Date Collected: 10/13/2016 00:00 Matrix: Solid
Sample ID: **1610130859 IBC 7321** Date Received: 10/21/2016 08:58

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	2.3		%	0.1	S2540G-11			10/24/16 14:23	VKB	
Total Solids	97.7		%	0.1	S2540G-11			10/24/16 14:23	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:09	TSS	A
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:09	TSS	A
Barium, Total	3.8		mg/L	2.8	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:09	TSS	A
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:09	TSS	A
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:09	TSS	A
Chromium, Total	ND		mg/L	0.028	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:09	TSS	A
Lead, Total	ND		mg/L	0.033	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:09	TSS	A
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	10/25/16 02:30	MNP	10/25/16 09:02	MNP	A1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:09	TSS	A
Selenium, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:09	TSS	A
Silver, Total	ND		mg/L	0.022	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:09	TSS	A
Thallium, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:09	TSS	A
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:09	TSS	A
Zinc, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:09	TSS	A



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ANALYTICAL RESULTS

Workorder: 2183897 R1611059

 Lab ID: **2183897005** Date Collected: 10/13/2016 00:00 Matrix: Solid
 Sample ID: **1610130900 IBC 7321** Date Received: 10/21/2016 08:58

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	2.0		%	0.1	S2540G-11			10/24/16 14:23	VKB	
Total Solids	98.0		%	0.1	S2540G-11			10/24/16 14:23	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:04	TSS	A
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:04	TSS	A
Barium, Total	3.5		mg/L	2.8	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:04	TSS	A
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:04	TSS	A
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:04	TSS	A
Chromium, Total	ND		mg/L	0.028	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:04	TSS	A
Lead, Total	ND		mg/L	0.033	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:04	TSS	A
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	10/25/16 02:30	MNP	10/25/16 09:05	MNP	A1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:04	TSS	A
Selenium, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:04	TSS	A
Silver, Total	ND		mg/L	0.022	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:04	TSS	A
Thallium, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:04	TSS	A
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:04	TSS	A
Zinc, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:04	TSS	A



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ANALYTICAL RESULTS

Workorder: 2183897 R1611059

 Lab ID: **2183897006** Date Collected: 10/13/2016 00:00 Matrix: Solid
 Sample ID: **1610130908 IBC 7322** Date Received: 10/21/2016 08:58

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	1.7		%	0.1	S2540G-11			10/24/16 14:23	VKB	
Total Solids	98.3		%	0.1	S2540G-11			10/24/16 14:23	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:20	TSS	A
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:20	TSS	A
Barium, Total	ND		mg/L	2.8	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:20	TSS	A
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:20	TSS	A
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:20	TSS	A
Chromium, Total	ND		mg/L	0.028	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:20	TSS	A
Lead, Total	ND		mg/L	0.033	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:20	TSS	A
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	10/25/16 02:30	MNP	10/25/16 09:06	MNP	A1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:20	TSS	A
Selenium, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:20	TSS	A
Silver, Total	ND		mg/L	0.022	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:20	TSS	A
Thallium, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:20	TSS	A
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:20	TSS	A
Zinc, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 10:35	OTD	10/26/16 18:20	TSS	A



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ANALYTICAL RESULTS

Workorder: 2183897 R1611059

Lab ID: **2183897007** Date Collected: 10/13/2016 00:00 Matrix: Solid
Sample ID: **1610130918 IBC 7326** Date Received: 10/21/2016 08:58

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	3.1		%	0.1	S2540G-11			10/24/16 14:23	VKB	
Total Solids	96.9		%	0.1	S2540G-11			10/24/16 14:23	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:51	TSS	A3
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:51	TSS	A3
Barium, Total	ND		mg/L	2.8	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:51	TSS	A3
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:51	TSS	A3
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:51	TSS	A3
Chromium, Total	ND		mg/L	0.028	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:51	TSS	A3
Lead, Total	ND		mg/L	0.033	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:51	TSS	A3
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	10/25/16 02:30	MNP	10/25/16 09:07	MNP	A1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:51	TSS	A3
Selenium, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:51	TSS	A3
Silver, Total	ND		mg/L	0.022	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:51	TSS	A3
Thallium, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:51	TSS	A3
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:51	TSS	A3
Zinc, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:51	TSS	A3



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ANALYTICAL RESULTS

Workorder: 2183897 R1611059

Lab ID: **2183897008** Date Collected: 10/13/2016 00:00 Matrix: Solid
Sample ID: **1610130943 IBC 7327** Date Received: 10/21/2016 08:58

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	2.3		%	0.1	S2540G-11			10/24/16 14:23	VKB	
Total Solids	97.7		%	0.1	S2540G-11			10/24/16 14:23	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:55	TSS	A3
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:55	TSS	A3
Barium, Total	4.6		mg/L	2.8	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:55	TSS	A3
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:55	TSS	A3
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:55	TSS	A3
Chromium, Total	ND		mg/L	0.028	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:55	TSS	A3
Lead, Total	ND		mg/L	0.033	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:55	TSS	A3
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	10/25/16 02:30	MNP	10/25/16 09:08	MNP	A1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:55	TSS	A3
Selenium, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:55	TSS	A3
Silver, Total	ND		mg/L	0.022	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:55	TSS	A3
Thallium, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:55	TSS	A3
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:55	TSS	A3
Zinc, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:55	TSS	A3



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ANALYTICAL RESULTS

Workorder: 2183897 R1611059

Lab ID: **2183897009** Date Collected: 10/13/2016 00:00 Matrix: Solid
Sample ID: **1610130948 IBC 7331** Date Received: 10/21/2016 08:58

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	2.8		%	0.1	S2540G-11			10/24/16 14:23	VKB	
Total Solids	97.2		%	0.1	S2540G-11			10/24/16 14:23	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:59	TSS	A3
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:59	TSS	A3
Barium, Total	ND		mg/L	2.8	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:59	TSS	A3
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:59	TSS	A3
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:59	TSS	A3
Chromium, Total	ND		mg/L	0.028	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:59	TSS	A3
Lead, Total	0.084		mg/L	0.033	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:59	TSS	A3
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	10/25/16 02:30	MNP	10/25/16 09:11	MNP	A1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:59	TSS	A3
Selenium, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:59	TSS	A3
Silver, Total	ND		mg/L	0.022	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:59	TSS	A3
Thallium, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:59	TSS	A3
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:59	TSS	A3
Zinc, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 08:25	OTD	10/26/16 18:59	TSS	A3


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ANALYTICAL RESULTS

Workorder: 2183897 R1611059

Lab ID: **2183897010** Date Collected: 10/13/2016 00:00 Matrix: Solid
Sample ID: **1610130953 IBC 7328** Date Received: 10/21/2016 08:58

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	2.7		%	0.1	S2540G-11			10/24/16 14:23	VKB	
Total Solids	97.3		%	0.1	S2540G-11			10/24/16 14:23	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	10/25/16 08:25	OTD	10/26/16 19:03	TSS	A3
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	10/25/16 08:25	OTD	10/26/16 19:03	TSS	A3
Barium, Total	ND		mg/L	2.8	SW846 6010C	10/25/16 08:25	OTD	10/26/16 19:03	TSS	A3
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	10/25/16 08:25	OTD	10/26/16 19:03	TSS	A3
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	10/25/16 08:25	OTD	10/26/16 19:03	TSS	A3
Chromium, Total	ND		mg/L	0.028	SW846 6010C	10/25/16 08:25	OTD	10/26/16 19:03	TSS	A3
Lead, Total	ND		mg/L	0.033	SW846 6010C	10/25/16 08:25	OTD	10/26/16 19:03	TSS	A3
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	10/25/16 02:30	MNP	10/25/16 09:12	MNP	A1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 08:25	OTD	10/26/16 19:03	TSS	A3
Selenium, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 08:25	OTD	10/26/16 19:03	TSS	A3
Silver, Total	ND		mg/L	0.022	SW846 6010C	10/25/16 08:25	OTD	10/26/16 19:03	TSS	A3
Thallium, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 08:25	OTD	10/26/16 19:03	TSS	A3
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	10/25/16 08:25	OTD	10/26/16 19:03	TSS	A3
Zinc, Total	ND		mg/L	0.11	SW846 6010C	10/25/16 08:25	OTD	10/26/16 19:03	TSS	A3



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QUALITY CONTROL DATA

Workorder: 2183897 R1611059

QC Batch: MDIG/60412 **Analysis Method:** SW846 7470A

QC Batch Method: SW846 7470A

Associated Lab Samples: 2183897001, 2183897002, 2183897003, 2183897004, 2183897005, 2183897006, 2183897007, 2183897008, 2183897009, 2183897010

METHOD BLANK: 2428589

Parameter	Blank Result	Units	Reporting Limit
Mercury, Total	ND	mg/L	0.0020

LABORATORY CONTROL SAMPLE: 2428590

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Mercury, Total	107	mg/L	.002	0.0021	85 - 115

MATRIX SPIKE: 2428591 DUPLICATE: 2428592 ORIGINAL: 2183897004

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Mercury, Total	.00003	mg/L	.005	.00489	.00497	97.2	98.8	70 - 130	1.62	20

MATRIX SPIKE: 2428593 DUPLICATE: 2428594 ORIGINAL: 2183897010

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Mercury, Total	.00003	mg/L	.005	.00487	.00485	96.9	96.5	70 - 130	.41	20

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QUALITY CONTROL DATA

Workorder: 2183897 R1611059

QC Batch: MDIG/60434 **Analysis Method:** SW846 6010C

QC Batch Method: SW846 3015

Associated Lab Samples: 2183897001, 2183897002, 2183897003, 2183897004, 2183897005, 2183897006

METHOD BLANK: 2429059

Parameter	Blank Result	Units	Reporting Limit
Antimony, Total	ND	mg/L	0.030
Arsenic, Total	ND	mg/L	0.028
Barium, Total	ND	mg/L	0.56
Beryllium, Total	ND	mg/L	0.0044
Cadmium, Total	ND	mg/L	0.0022
Chromium, Total	ND	mg/L	0.0056
Lead, Total	ND	mg/L	0.0067
Nickel, Total	ND	mg/L	0.022
Selenium, Total	ND	mg/L	0.022
Silver, Total	ND	mg/L	0.0044
Thallium, Total	ND	mg/L	0.022
Vanadium, Total	ND	mg/L	0.0056
Zinc, Total	ND	mg/L	0.022

LABORATORY CONTROL SAMPLE: 2429060

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Antimony, Total	96.4	mg/L	.22	0.21	80 - 120
Arsenic, Total	95.9	mg/L	.11	0.11	80 - 120
Barium, Total	99.1	mg/L	1.1	1.1	80 - 120
Beryllium, Total	96.8	mg/L	.22	0.22	80 - 120
Cadmium, Total	98	mg/L	.11	0.11	80 - 120
Chromium, Total	101	mg/L	.11	0.11	80 - 120
Lead, Total	98.6	mg/L	.11	0.11	80 - 120
Nickel, Total	103	mg/L	1.1	1.1	80 - 120
Selenium, Total	94.4	mg/L	1.1	1.0	80 - 120
Silver, Total	97.4	mg/L	.11	0.11	80 - 120
Thallium, Total	103	mg/L	.11	0.11	80 - 120
Vanadium, Total	101	mg/L	.056	0.056	80 - 120
Zinc, Total	102	mg/L	.56	0.57	80 - 120

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QUALITY CONTROL DATA

Workorder: 2183897 R1611059

MATRIX SPIKE: 2429061 DUPLICATE: 2429062 ORIGINAL: 2183897004

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Arsenic, Total	0	mg/L	5	5.83883	5.78883	117	116	50 - 150	.86	20
Barium, Total	3.84718	mg/L	10	15.37762	15.36096	115	115	50 - 150	.11	20
Cadmium, Total	0	mg/L	1	1.15443	1.15499	115	115	50 - 150	.05	20
Chromium, Total	.00389	mg/L	5	5.94439	6.03883	119	121	50 - 150	1.58	20
Lead, Total	0	mg/L	5	5.7055	5.68328	114	114	50 - 150	.39	20
Selenium, Total	0	mg/L	1	1.10054	1.08554	110	109	50 - 150	1.37	20
Silver, Total	.00278	mg/L	1	1.14943	1.15332	115	115	50 - 150	.34	20

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QUALITY CONTROL DATA

Workorder: 2183897 R1611059

QC Batch: MDIG/60439 **Analysis Method:** SW846 6010C

QC Batch Method: SW846 3015

Associated Lab Samples: 2183897007, 2183897008, 2183897009, 2183897010

METHOD BLANK: 2429314

Parameter	Blank Result	Units	Reporting Limit
Antimony, Total	ND	mg/L	0.030
Arsenic, Total	ND	mg/L	0.028
Barium, Total	ND	mg/L	0.56
Beryllium, Total	ND	mg/L	0.0044
Cadmium, Total	ND	mg/L	0.0022
Chromium, Total	ND	mg/L	0.0056
Lead, Total	ND	mg/L	0.0067
Nickel, Total	ND	mg/L	0.022
Selenium, Total	ND	mg/L	0.022
Silver, Total	ND	mg/L	0.0044
Thallium, Total	ND	mg/L	0.022
Vanadium, Total	ND	mg/L	0.0056
Zinc, Total	ND	mg/L	0.022

LABORATORY CONTROL SAMPLE: 2429315

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Antimony, Total	95.1	mg/L	.22	0.21	80 - 120
Arsenic, Total	101	mg/L	.11	0.11	80 - 120
Barium, Total	106	mg/L	1.1	1.2	80 - 120
Beryllium, Total	103	mg/L	.22	0.23	80 - 120
Cadmium, Total	102	mg/L	.11	0.11	80 - 120
Chromium, Total	106	mg/L	.11	0.12	80 - 120
Lead, Total	102	mg/L	.11	0.11	80 - 120
Nickel, Total	107	mg/L	1.1	1.2	80 - 120
Selenium, Total	96.9	mg/L	1.1	1.1	80 - 120
Silver, Total	101	mg/L	.11	0.11	80 - 120
Thallium, Total	99.1	mg/L	.11	0.11	80 - 120
Vanadium, Total	110	mg/L	.056	0.061	80 - 120
Zinc, Total	104	mg/L	.56	0.58	80 - 120

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QUALITY CONTROL DATA

Workorder: 2183897 R1611059

MATRIX SPIKE: 2429316 DUPLICATE: 2429317 ORIGINAL: 2184020001

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Arsenic, Total	0	mg/L	5	5.58328	5.89994	112	118	50 - 150	5.52	20
Barium, Total	.71277	mg/L	10	11.88877	12.41099	112	117	50 - 150	4.3	20
Cadmium, Total	.00111	mg/L	1	1.13166	1.18054	113	118	50 - 150	4.23	20
Chromium, Total	.01	mg/L	5	5.86105	6.02216	117	120	50 - 150	2.71	20
Lead, Total	1.00332	mg/L	5	6.57771	6.86104	111	117	50 - 150	4.22	20
Selenium, Total	0	mg/L	1	1.06721	1.11277	107	111	50 - 150	4.18	20

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QUALITY CONTROL DATA

Workorder: 2183897 R1611059

QC Batch: WETC/177888 **Analysis Method:** S2540G-11

QC Batch Method: S2540G-11

Associated Lab Samples: 2183897001, 2183897002, 2183897003, 2183897004, 2183897005, 2183897006, 2183897007, 2183897008, 2183897009, 2183897010

SAMPLE DUPLICATE: 2428632 ORIGINAL: 2181835004

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	99.7883	%	99.7973	.009	10
Total Solids	.2116	%	.2026	4.35	5

SAMPLE DUPLICATE: 2428633 ORIGINAL: 2183409003

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	97.2943	%	97.2944	.0001	10
Total Solids	2.7056	%	2.7055	.004	5

SAMPLE DUPLICATE: 2428634 ORIGINAL: 2183600002

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	60.1702	%	58.9269	2.09	10
Total Solids	39.8297	%	41.073	3.07	5

SAMPLE DUPLICATE: 2428635 ORIGINAL: 2183633001

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	84.5811	%	84.5022	.09	10
Total Solids	15.4188	%	15.4977	.51	5

SAMPLE DUPLICATE: 2428636 ORIGINAL: 2183741007

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	97.0946	%	96.9205	.18	10
Total Solids	2.9053	%	3.0794	5.82*	5

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QUALITY CONTROL DATA

Workorder: 2183897 R1611059

SAMPLE DUPLICATE: 2428637 ORIGINAL: 2183767003

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	7.4393	%	7.8469	5.33	10
Total Solids	92.5606	%	92.153	.44	5

SAMPLE DUPLICATE: 2428638 ORIGINAL: 2183775001

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	97.7272	%	97.496	.24	10
Total Solids	2.2727	%	2.5039	9.68*	5

SAMPLE DUPLICATE: 2428639 ORIGINAL: 2183897005

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	2.0152	%	2.1031	4.27	10
Total Solids	97.9847	%	97.8968	.09	5

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Workorder: 2183897 R1611059

Lab ID	Sample ID	Prep Method	Prep Batch	Analysis Method	Analysis Batch
2183897001	1610140833 IBC 7330	SW846 7470A	MDIG/60412	SW846 7470A	META/54704
2183897002	1610140838 IBC 7329	SW846 7470A	MDIG/60412	SW846 7470A	META/54704
2183897003	1610140843 IBC 7338	SW846 7470A	MDIG/60412	SW846 7470A	META/54704
2183897004	1610130859 IBC 7321	SW846 7470A	MDIG/60412	SW846 7470A	META/54704
2183897005	1610130900 IBC 7321	SW846 7470A	MDIG/60412	SW846 7470A	META/54704
2183897006	1610130908 IBC 7322	SW846 7470A	MDIG/60412	SW846 7470A	META/54704
2183897007	1610130918 IBC 7326	SW846 7470A	MDIG/60412	SW846 7470A	META/54704
2183897008	1610130943 IBC 7327	SW846 7470A	MDIG/60412	SW846 7470A	META/54704
2183897009	1610130948 IBC 7331	SW846 7470A	MDIG/60412	SW846 7470A	META/54704
2183897010	1610130953 IBC 7328	SW846 7470A	MDIG/60412	SW846 7470A	META/54704
2183897001	1610140833 IBC 7330			S2540G-11	WETC/177888
2183897002	1610140838 IBC 7329			S2540G-11	WETC/177888
2183897003	1610140843 IBC 7338			S2540G-11	WETC/177888
2183897004	1610130859 IBC 7321			S2540G-11	WETC/177888
2183897005	1610130900 IBC 7321			S2540G-11	WETC/177888
2183897006	1610130908 IBC 7322			S2540G-11	WETC/177888
2183897007	1610130918 IBC 7326			S2540G-11	WETC/177888
2183897008	1610130943 IBC 7327			S2540G-11	WETC/177888
2183897009	1610130948 IBC 7331			S2540G-11	WETC/177888
2183897010	1610130953 IBC 7328			S2540G-11	WETC/177888
2183897001	1610140833 IBC 7330	SW846 3015	MDIG/60434	SW846 6010C	META/54732
2183897002	1610140838 IBC 7329	SW846 3015	MDIG/60434	SW846 6010C	META/54732
2183897003	1610140843 IBC 7338	SW846 3015	MDIG/60434	SW846 6010C	META/54732
2183897004	1610130859 IBC 7321	SW846 3015	MDIG/60434	SW846 6010C	META/54732
2183897005	1610130900 IBC 7321	SW846 3015	MDIG/60434	SW846 6010C	META/54732
2183897006	1610130908 IBC 7322	SW846 3015	MDIG/60434	SW846 6010C	META/54732
2183897007	1610130918 IBC 7326	SW846 3015	MDIG/60439	SW846 6010C	META/54732
2183897008	1610130943 IBC 7327	SW846 3015	MDIG/60439	SW846 6010C	META/54732
2183897009	1610130948 IBC 7331	SW846 3015	MDIG/60439	SW846 6010C	META/54732

ALS Environmental Laboratory Locations Across North America

Canada: Burlington · Calgary · Centre of Excellence · Edmonton · Fort McMurray · Fort St. John · Grande Prairie · London · Mississauga · Richmond Hill · Saskatoon · Thunder Bay
Vancouver Waterloo · Winnipeg · Yellowknife United States: Cincinnati · Everett · Fort Collins · Holland · Houston · Middletown · Salt Lake City · Spring City · York Mexico: Monterrey

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Workorder: 2183897 R1611059

Lab ID	Sample ID	Prep Method	Prep Batch	Analysis Method	Analysis Batch
2183897010	1610130953 IBC 7328	SW846 3015	MDIG/60439	SW846 6010C	META/54732

ALS Environmental Laboratory Locations Across North America

Canada: Burlington · Calgary · Centre of Excellence · Edmonton · Fort McMurray · Fort St. John · Grande Prairie · London · Mississauga · Richmond Hill · Saskatoon · Thunder Bay
Vancouver Waterloo · Winnipeg · Yellowknife **United States:** Cincinnati · Everett · Fort Collins · Holland · Houston · Middletown · Salt Lake City · Spring City · York **Mexico:** Monterrey

ALS Environmental Chain of Custody

1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475



ALS

Project Number: R1611059
 Project Manager: Janice Jaeger
 QAP: LAB QAP

Lab Code	Sample ID	# of Cont.	Matrix	Sample Time		Lab ID	ALS T.C.L.P. 6010C															
				Date	Time		As	As	Ba	Ba	Bc	Bc	Cd	Cd	Cf	Cf	Hg	Hg	Ni	Ni	Pb	Pb
	1610140833 IBC 7330	1	Soil	10/14/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	1610140838 IBC 7329	1	Soil	10/14/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	1610140843 IBC 7338	1	Soil	10/14/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	1610130859 IBC 7321	2	Soil	10/13/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	1610130900 IBC 7321	1	Soil	10/13/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	1610130908 IBC 7322	1	Soil	10/13/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	1610130918 IBC 7326	1	Soil	10/13/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	1610130943 IBC 7327	1	Soil	10/13/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	1610130948 IBC 7331	1	Soil	10/13/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	1610130953 IBC 7328	1	Soil	10/13/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Y N Initials Cooler Temp. °C
 Custody Seals Present? (if present) Seals Intact? Received on Ice?
 COCLabs Complete
 Cont in Good Cond?
 Correct Containers?
 Correct Samp Voi?
 Correct Preservation?
 Headspace/Volatiles?
 Tracking #:
 I. Results O
 II. Results + QC Summaries
 III. Results + QC and Calibration Summaries
 IV. Data Validation Report with Raw Data
 PQL/MDU/ EDD
 Requested FAX Date: 10/28/16
 Requested Report Date: 10/28/16

Turnaround Requirements
 RUSH (Surcharges Apply)
 PLEASE CIRCLE WORK DAYS
 1 2 3 4 5
 STANDARD
 Requested FAX Date: 10/28/16
 Requested Report Date: 10/28/16

Special Instructions/Comments
 NABA/WSTF EDD

PO# 58R1611059
 Bill to
 PQL/MDU/ EDD
 Requested FAX Date: 10/28/16
 Requested Report Date: 10/28/16
 H - Test is On Hold
 P - Test is Authorized for Prop Only
 Relinquished By: JES 10-20-16 1500 Received By: [Signature] 10-21-16 0858 Airbill Number: 10-21-16 0858

2183897

[REDACTED]	1610140833 IBC 7330	Soil	10/14/16	Middletown ALS	Sb TCLP 6010C	Sa TCLP 6010C	TCLP EPA 1311	Ti TCLP 6010C	V TCLP 6010C	Zn TCLP 6010C
[REDACTED]	1610140838 IBC 7329	Soil	10/14/16	Middletown ALS	X	X	X	X	X	X
[REDACTED]	1610140843 IBC 7338	Soil	10/14/16	Middletown ALS	X	X	X	X	X	X
[REDACTED]	1610130859 IBC 7321	Soil	10/13/16	Middletown ALS	X	X	X	X	X	X
[REDACTED]	1610130900 IBC 7321	Soil	10/13/16	Middletown ALS	X	X	X	X	X	X
[REDACTED]	1610130908 IBC 7322	Soil	10/13/16	Middletown ALS	X	X	X	X	X	X
[REDACTED]	1610130918 IBC 7326	Soil	10/13/16	Middletown ALS	X	X	X	X	X	X
[REDACTED]	1610130943 IBC 7327	Soil	10/13/16	Middletown ALS	X	X	X	X	X	X
[REDACTED]	1610130948 IBC 7331	Soil	10/13/16	Middletown ALS	X	X	X	X	X	X
[REDACTED]	1610130953 IBC 7328	Soil	10/13/16	Middletown ALS	X	X	X	X	X	X

ALS Environmental Chain of Custody

1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475

ALS Contact: Janice Jaeger

Project Number: R1611059
Project Manager: Janice Jaeger
QAP: LAB QAP

Folder Comments:
ND U

Special Instructions/Comments H - Test is On Hold P - Test is Authorized for Prep Only	Turnaround Requirements ___ RUSH (Surcharges Apply) PLEASE CIRCLE WORK DAYS 1 2 3 4 5 ___ STANDARD Requested FAX Date: _____ Requested Report Date: 10/28/16	Report Requirements ___ I. Results Only ___ II. Results + QC Summaries ___ III. Results + QC and Calibration Summaries ___ IV. Data Validation Report with Raw Data PQL/MDL/J Y EDD Y	Invoice Information
			PO# 58R1611059 Bill to

Relinquished By: _____

Received By: _____

Airbill Number: _____

ALS Environmental Chain of Custody

1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475

ALS Contact: Janice Jaeger

Project Number: R1611059
Project Manager: Janice Jaeger
QAP: LAB QAP

Run QC on sample R1611059-014 for 6010C/Ag TCLP, As TCLP, Ba TCLP, Be TCLP, Cd TCLP, Cr TCLP, Ni TCLP, Pb TCLP, Se TCLP, Ti TCLP, V TCLP, Zn TCLP, 7470A/Hg TCLP

R1611059

A Ship To: Middletown ALS
ALS Laboratory Group
34 Dogwood Lane
Middletown, PA 17057

PC *AMS* Date 10/27/14
SMO _____ Date _____

Instructions:	Shipping:
Ice _____	Overnight _____
Dry Ice _____	2nd Day _____
No Ice _____	Ground _____
Bill to Client Account _____	

Comments:

ALS Group USA, Corp.
www.alsglobal.com
An ALS Limited Company



November 07, 2016

Service Request No:R1611337

Mr. Tom Hall
NASA/WSTF/Navarro
P.O. Box 20
Las Cruces, NM 88004

Laboratory Results for: White Sands Test Facility

Dear Mr.Hall,

Enclosed are the results of the sample(s) submitted to our laboratory October 26, 2016
For your reference, these analyses have been assigned our service request number **R1611337**.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAP standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report. The measurement uncertainty of the results included in this report is within that expected when using the prescribed method(s) for analysis of these samples, and represented by Laboratory Control Sample control limits. Any events, such as QC failures, which may add to the uncertainty are explained in the report narrative.

Please contact me if you have any questions. My extension is 7472. You may also contact me via email at Janice.Jaeger@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Janice Jaeger
Project Manager

ADDRESS 1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
PHONE +1 585 288 5380 | **FAX** +1 585 288 8475
ALS Group USA, Corp.
dba ALS Environmental



Narrative Documents

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com



Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request:R1611337
Date Received:10/26/16

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables, including results of QC samples analyzed from this delivery group. Analytical procedures performed by the lab are validated in accordance with NELAC standards. Any parameters that are not included in the lab's NELAC accreditation are identified on a "Non-Certified Analytes" report in the Miscellaneous Forms Section of this report. Individual analytical results requiring further explanation are flagged with qualifiers and/or discussed below. The flags are explained in the Report Qualifiers and Definitions page in the Miscellaneous Forms section of this report.

Sample Receipt

Twelve soil samples were received for analysis at ALS Environmental on 10/26/2016. Any discrepancies noted upon initial sample inspection are noted on the cooler receipt and preservation form included in this data package. The samples were received in good condition and consistent with the accompanying chain of custody form. Samples are refrigerated at ≤6°C upon receipt at the lab except for aqueous samples designated for metals analyses, which are stored at room temperature.

Volatile Organic Analyses:

Method 8260c, 11/3/16: The upper control limit was exceeded for one or more analytes in the Continuing Calibration Verification (CCV). The field samples analyzed in this sequence did not contain the analyte(s) in question above the Method Reporting Limit (MRL). Since the exceedance equates to a potential high bias, the data quality was not significantly affected and no further corrective action was taken.

Method 8260c, 11/3/16: The lower control limit was exceeded for one or more analytes in the Continuing Calibration Verification (CCV). Since there were no detections of the analyte(s) in the associated field samples, the quantitation is not affected. The data quality was not significantly affected and no further corrective action was taken.

Method 8260c, 11/3/16: The upper control criterion was exceeded for one or more analytes in the Laboratory Control Sample (LCS). There were no detections of the analyte(s) in the associated field samples. The error associated with elevated recovery equates to a high bias. The sample data is not significantly affected. No further corrective action was appropriate.

Method 8260c, 11/3/16: The lower control limit for the spike recovery of the Laboratory Control Sample (LCS) was exceeded for one or more analyte. There were no detections of the analyte(s) in the associated field samples. The discrepancy associated with reduced recovery equates to a potential low bias. Additional analysis of the associated field samples could not be performed because holding time was up. The analytes affected are flagged in the LCS Summary.

Metals Analyses:

No significant anomalies were noted with this analysis.

General Chemistry Analyses:

No significant anomalies were noted with this analysis.

Sample Receiving Notes:

Approved by  Date 11/7/2016



Method 8260C: soil samples included in this report were received in jars and not collected using one of the EPA method 5035A low level options. In accordance with the NYSDOH technical notice of October 2012 all results or reporting limits <200 ug/kg should be considered as estimated due to potential low bias.

One or more samples were subcontracted to another laboratory for testing. The certified analytical report from the subcontractor has been included in its entirety at the end of this report and includes the name and address of the subcontracted laboratory.

Approved by  Date 11/7/2016



SAMPLE DETECTION SUMMARY

CLIENT ID: 1610231100 1BC7350 **Lab ID: R1611337-001**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.4				Percent	ALS SOP
Acetone	3.7	J	2.9	5.1	ug/Kg	8260C

CLIENT ID: 1610231102 1BC7350 **Lab ID: R1611337-002**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.6				Percent	ALS SOP
Arsenic, Total	4.0		0.3	1.0	mg/Kg	6010C
Barium, Total	78.2		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.41		0.02	0.31	mg/Kg	6010C
Cadmium, Total	0.48	J	0.04	0.51	mg/Kg	6010C
Chromium, Total	8.0		0.2	1.0	mg/Kg	6010C
Lead, Total	11.4		0.3	5.1	mg/Kg	6010C
Nickel, Total	7.4		0.2	4.1	mg/Kg	6010C
Selenium, Total	1.3		0.7	1.0	mg/Kg	6010C
Vanadium, Total	15.0		0.2	5.1	mg/Kg	6010C
Zinc, Total	51.6		0.2	2.0	mg/Kg	6010C

CLIENT ID: 1610231104 1BC7349 **Lab ID: R1611337-004**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	94.8				Percent	ALS SOP
Acetone	4.6	J	3.0	5.3	ug/Kg	8260C

CLIENT ID: 1610231106 1BC7349 **Lab ID: R1611337-005**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	96.3				Percent	ALS SOP
Arsenic, Total	4.1		0.3	1.0	mg/Kg	6010C
Barium, Total	141		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.41		0.02	0.31	mg/Kg	6010C
Cadmium, Total	0.31	J	0.04	0.51	mg/Kg	6010C
Chromium, Total	12.9		0.2	1.0	mg/Kg	6010C
Lead, Total	11.2		0.3	5.1	mg/Kg	6010C
Nickel, Total	9.3		0.2	4.1	mg/Kg	6010C
Selenium, Total	1.1		0.7	1.0	mg/Kg	6010C
Vanadium, Total	12.4		0.2	5.1	mg/Kg	6010C
Zinc, Total	40.4		0.2	2.0	mg/Kg	6010C

CLIENT ID: 1610231120 1BC7351 **Lab ID: R1611337-007**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	96.3				Percent	ALS SOP
Acetone	4.3	J	2.9	5.1	ug/Kg	8260C
Tetrachloroethene (PCE)	1.1	J	0.91	5.1	ug/Kg	8260C



SAMPLE DETECTION SUMMARY

CLIENT ID: 1610231121 1BC7351 **Lab ID: R1611337-008**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	95.8				Percent	ALS SOP
Acetone	4.9	J	3.0	5.2	ug/Kg	8260C
Tetrachloroethene (PCE)	1.3	J	0.92	5.2	ug/Kg	8260C

CLIENT ID: 1610231126 1BC7351 **Lab ID: R1611337-009**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	95.3				Percent	ALS SOP
Arsenic, Total	5.8		0.3	1.0	mg/Kg	6010C
Barium, Total	204		0.2	2.1	mg/Kg	6010C
Beryllium, Total	0.45		0.02	0.31	mg/Kg	6010C
Cadmium, Total	0.34	J	0.04	0.51	mg/Kg	6010C
Chromium, Total	12.9		0.2	1.0	mg/Kg	6010C
Lead, Total	9.7		0.3	5.1	mg/Kg	6010C
Nickel, Total	10.1		0.2	4.1	mg/Kg	6010C
Selenium, Total	1.2		0.7	1.0	mg/Kg	6010C
Vanadium, Total	12.5		0.2	5.1	mg/Kg	6010C
Zinc, Total	44.3		0.2	2.1	mg/Kg	6010C

CLIENT ID: 1610231127 1BC7351 **Lab ID: R1611337-010**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	96.1				Percent	ALS SOP
Arsenic, Total	4.85		0.24	0.99	mg/Kg	6010C
Barium, Total	237		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.47		0.02	0.30	mg/Kg	6010C
Cadmium, Total	0.41	J	0.04	0.50	mg/Kg	6010C
Chromium, Total	12.3		0.13	0.99	mg/Kg	6010C
Lead, Total	12.1		0.3	5.0	mg/Kg	6010C
Nickel, Total	10.3		0.2	4.0	mg/Kg	6010C
Selenium, Total	1.11		0.60	0.99	mg/Kg	6010C
Vanadium, Total	12.5		0.2	5.0	mg/Kg	6010C
Zinc, Total	44.5		0.2	2.0	mg/Kg	6010C



Sample Receipt Information

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request:R1611337

SAMPLE CROSS-REFERENCE

<u>SAMPLE #</u>	<u>CLIENT SAMPLE ID</u>	<u>DATE</u>	<u>TIME</u>
R1611337-001	1610231100 1BC7350	10/23/2016	
R1611337-002	1610231102 1BC7350	10/23/2016	
R1611337-003	1610231103 1BC7350	10/23/2016	
R1611337-004	1610231104 1BC7349	10/23/2016	
R1611337-005	1610231106 1BC7349	10/23/2016	
R1611337-006	1610231107 1BC7349	10/23/2016	
R1611337-007	1610231120 1BC7351	10/23/2016	
R1611337-008	1610231121 1BC7351	10/23/2016	
R1611337-009	1610231126 1BC7351	10/23/2016	
R1611337-010	1610231127 1BC7351	10/23/2016	
R1611337-011	1610231129 1BC7351	10/23/2016	
R1611337-012	1610231130 1BC7351	10/23/2016	

WSTF CHAIN OF CUSTODY RECORD

Date 10-25-2016

Page 1 of 2

Laboratory: ALS Group USA, Corp. dba PO# 15EC007B 15EC007B		Analytical Requirements				Special Instructions Return coolers and reusable packaging materials within 14 days as required in statement of work to: Return Address: NASA WSTF Environmental Department 12600 NASA Road; Bldg. 120 Las Cruces, NM 88012 Attn: Lori Minnick		
Address shipping questions to: <input type="checkbox"/> Lori Minnick, 575-524-5119 <input checked="" type="checkbox"/> Other <u>Tom Hall, 575-524-5453</u>		# of Containers	Sample Matrix*	SW-846 Method 8260B 4 oz Glass Jar, Ice	Total Metals 4 oz Glass Jar, Ice		TCLP Metals 16 oz Glass Jar, Ice	Charge Number (WSTF Use Only)
Send sample receipt confirmation and analytical reports to: <input type="checkbox"/> Carlyn Tufts, carlyn.a.tufts@nasa.gov <input type="checkbox"/> Shelly Hernandez, shelly.j.hernandez@nasa.gov <input checked="" type="checkbox"/> Tom Hall, tom.a.hall@nasa.gov								
Sample Number	Sample Location							
<u>101023 1100</u>	<u>IBC 7350</u>	<u>1</u>	<u>S</u>	<u>X</u>			<u>16EE41FW</u>	
<u>— 1102</u>	<u>IBC 7350</u>	<u>1</u>	<u>S</u>		<u>X</u>		<u>16EE41FW</u>	
<u>— 1103</u>	<u>IBC 7350</u>	<u>1</u>	<u>S</u>			<u>X</u>	<u>16EE41FW</u>	
<u>— 1104</u>	<u>IBC 7349</u>	<u>1</u>	<u>S</u>	<u>X</u>			<u>16EE41FW</u>	
<u>— 1106</u>	<u>IBC 7349</u>	<u>1</u>	<u>S</u>		<u>X</u>		<u>16EE41FW</u>	
<u>— 1107</u>	<u>IBC 7349</u>	<u>1</u>	<u>S</u>			<u>X</u>	<u>16EE41FW</u>	
Relinquished By:		Date/Time: <u>10-25-16 (1220)</u>		Accepted By:		Date/Time: <u>10/26/16 0930</u>		

* Sample Matrix: A – Aqueous; G – Gaseous; S – Solid

R1611337 **5**

NASA/WSTF/Navarro
White Sands Test Facility

WSTF CHAIN OF CUSTODY RECORD

Date 10-25-2016

Page 2 of 2

Laboratory: ALS Group USA, Corp. dba		PO# <u>15EC092B</u> <u>15EC07B</u>		Analytical Requirements				Special Instructions Return coolers and reusable packaging materials within 14 days as required in statement of work to: Return Address: NASA WSTF Environmental Department 12600 NASA Road; Bldg. 120 Las Cruces, NM 88012 Attn: Lori Minnick
Address shipping questions to: <input type="checkbox"/> Lori Minnick, 575-524-5119 <input checked="" type="checkbox"/> Other <u>Tom Hall</u> , 575-524-5453		# of Containers	Sample Matrix*	SW-846 Method 8260B 4 oz Glass Jar, Ice	Total Metals 4 oz Glass Jar, Ice	TCLP Metals 16 oz Glass Jar, Ice	Charge Number (WSTF Use Only)	
Send sample receipt confirmation and analytical reports to: <input type="checkbox"/> Carlyn Tufts, carlyn.a.tufts@nasa.gov <input type="checkbox"/> Shelly Hernandez, shelly.j.hernandez@nasa.gov <input checked="" type="checkbox"/> Tom Hall, tom.a.hall@nasa.gov								
Sample Number	Sample Location							Comments
<u>161023 1120</u>	<u>1Bc 7351</u>	<u>1</u>	<u>S</u>	<u>X</u>			<u>16EE41FW</u>	
<u>— 1121</u>	<u>1Bc 7351</u>	<u>1</u>	<u>S</u>	<u>X</u>			<u>16EE41FW</u>	
<u>— 1122</u>	<u>1Bc 7351</u>	<u>1</u>	<u>S</u>	<u>X</u>			<u>16EE41FW</u>	<u>MATRIX SPIKE FOR 1610231120</u>
<u>— 1126</u>	<u>1Bc 7351</u>	<u>1</u>	<u>S</u>		<u>X</u>		<u>16EE41FW</u>	
<u>— 1127</u>	<u>1Bc 7351</u>	<u>1</u>	<u>S</u>		<u>X</u>		<u>16EE41FW</u>	
<u>— 1128</u>	<u>1Bc 7351</u>	<u>1</u>	<u>S</u>		<u>X</u>		<u>16EE41FW</u>	<u>MATRIX SPIKE FOR 1610231126</u>
<u>— 1129</u>	<u>1Bc 7351</u>	<u>1</u>	<u>S</u>			<u>X</u>	<u>16EE41FW</u>	
<u>— 1130</u>	<u>1Bc 7351</u>	<u>1</u>	<u>S</u>			<u>X</u>	<u>16EE41FW</u>	
<u>— 1131</u>	<u>1Bc 7351</u>	<u>1</u>	<u>S</u>			<u>X</u>	<u>16EE41FW</u>	<u>MATRIX SPIKE FOR 1610231129</u>
Relinquished By: <u>[Signature]</u>		Date/Time: <u>10-25-16 (1220)</u>		Accepted By: <u>[Signature]</u>		Date/Time: <u>10/24/16 0920</u>		

* Sample Matrix: A – Aqueous; G – Gaseous; S – Solid

R1611337 **5**
NASA/WSTF/Navarro
 White Sands Test Facility




Cooler Receipt and Preservation Check Form

R1611337
NASA/WSTF/Navarro
White Sands Test Facility

5

Project/Client NASA Folder Number _____

Cooler received on 10/26/16 by: GAS

COURIER: ALS UPS FEDEX VELOCITY CLIENT

1	Were Custody seals on outside of cooler?	<u>Y</u>	N
2	Custody papers properly completed (ink, signed)?	<u>Y</u>	N
3	Did all bottles arrive in good condition (unbroken)?	<u>Y</u>	N
4	Circle: <u>Wet Ice</u> Dry Ice Gel packs present?	<u>Y</u>	N

5a	Perchlorate samples have required headspace?	Y	N	<u>NA</u>
5b	Did VOA vials, Alk, or Sulfide have sig* bubbles?	Y	N	<u>NA</u>
6	Where did the bottles originate?	ALS/ROC	<u>CLIENT</u>	
7	Soil VOA received as:	<u>Bulk</u>	Encore 5035set	<u>NA</u>

8. Temperature Readings Date: 10/26/16 Time: 0925 ID: IR# IR#8 From: Temp Blank Sample Bottle

Observed Temp (°C)	<u>2.0</u>						
Correction Factor (°C)	<u>-</u>						
Corrected Temp (°C)	<u>2.0</u>						
Within 0-6°C?	<u>Y</u> N	Y N	Y N	Y N	Y N	Y N	Y N
If <0°C, were samples frozen?	Y N	Y N	Y N	Y N	Y N	Y N	Y N

If out of Temperature, note packing/ice condition: _____ Ice melted _____ Poorly Packed _____ Same Day Rule _____
& Client Approval to Run Samples: _____ Standing Approval _____ Client aware at drop-off _____ Client notified by: _____

All samples held in storage location: 2-002 by GAS on 10/26/16 at 0925
5035 samples placed in storage location: _____ by _____ on _____ at _____

Cooler Breakdown: Date: 10/26/16 Time: 1623 by: T.S

- Were all bottle labels complete (i.e. analysis, preservation, etc.)? YES NO
- Did all bottle labels and tags agree with custody papers? YES NO
- Were correct containers used for the tests indicated? YES NO
- Were 5035 vials acceptable (no extra labels, not leaking)? YES NO
- Air Samples: Cassettes / Tubes Intact _____ Canisters Pressurized _____ Tedlar® Bags Inflated N/A

Explain any discrepancies:

pH	Reagent	Yes	No	Lot Received	Exp	Sample ID	Vol. Added	Lot Added	Final pH
≥12	NaOH								
≤2	HNO ₃								
≤2	H ₂ SO ₄								
<4	NaHSO ₄								
Residual Chlorine (-)	For CN Phenol and 522			If +, contact PM to add Na ₂ S ₂ O ₃ (CN), ascorbic (phenol).					
	Na ₂ S ₂ O ₃	-	-						
	ZnAcetate	-	-						
	HCl	**	**						

Yes=All samples OK
No=Samples were preserved at The lab as listed
PM OK to Adjust: _____

**Not to be tested before analysis – pH tested and recorded by VOAs on a separate worksheet

Bottle lot numbers: Client bottle
Other Comments: _____

CLRES	<u>BULK</u>
DO	FLDT
HPROD	HGFB
HTR	LL3541
PH	<u>SUB</u>
SO3	MARRS
ALS	REV

PC Secondary Review: MS 10/27/16 *significant air bubbles: VOA > 5-6 mm : WC > 1 in. diameter



Miscellaneous Forms

ALS Environmental—Rochester Laboratory
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Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

REPORT QUALIFIERS AND DEFINITIONS

<p>U Analyte was analyzed for but not detected. The sample quantitation limit has been corrected for dilution and for percent moisture, unless otherwise noted in the case narrative.</p> <p>J Estimated value due to either being a Tentatively Identified Compound (TIC) or that the concentration is between the MRL and the MDL. Concentrations are not verified within the linear range of the calibration. For DoD: concentration >40% difference between two GC columns (pesticides/Aroclors).</p> <p>B Analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.</p> <p>E Inorganics- Concentration is estimated due to the serial dilution was outside control limits.</p> <p>E Organics- Concentration has exceeded the calibration range for that specific analysis.</p> <p>D Concentration is a result of a dilution, typically a secondary analysis of the sample due to exceeding the calibration range or that a surrogate has been diluted out of the sample and cannot be assessed.</p> <p>* Indicates that a quality control parameter has exceeded laboratory limits. Under the “Notes” column of the Form I, this qualifier denotes analysis was performed out of Holding Time.</p> <p>H Analysis was performed out of hold time for tests that have an “immediate” hold time criteria.</p> <p># Spike was diluted out.</p>	<p>+ Correlation coefficient for MSA is <0.995.</p> <p>N Inorganics- Matrix spike recovery was outside laboratory limits.</p> <p>N Organics- Presumptive evidence of a compound (reported as a TIC) based on the MS library search.</p> <p>S Concentration has been determined using Method of Standard Additions (MSA).</p> <p>W Post-Digestion Spike recovery is outside control limits and the sample absorbance is <50% of the spike absorbance.</p> <p>P Concentration >40% (25% for CLP) difference between the two GC columns.</p> <p>C Confirmed by GC/MS</p> <p>Q DoD reports: indicates a pesticide/Aroclor is not confirmed ($\geq 100\%$ Difference between two GC columns).</p> <p>X See Case Narrative for discussion.</p> <p>MRL Method Reporting Limit. Also known as: LOQ Limit of Quantitation (LOQ) The lowest concentration at which the method analyte may be reliably quantified under the method conditions.</p> <p>MDL Method Detection Limit. A statistical value derived from a study designed to provide the lowest concentration that will be detected 99% of the time. Values between the MDL and MRL are estimated (see J qualifier).</p> <p>LOD Limit of Detection. A value at or above the MDL which has been verified to be detectable.</p> <p>ND Non-Detect. Analyte was not detected at the concentration listed. Same as U qualifier.</p>
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Rochester Lab ID # for State Certifications¹

Connecticut ID # PH0556	Maine ID #NY0032	New Hampshire ID #
Delaware Accredited	Nebraska Accredited	294100 A/B
DoD ELAP #65817	New Jersey ID # NY004	Pennsylvania ID# 68-786
Florida ID # E87674	New York ID # 10145	Rhode Island ID # 158
Illinois ID #200047	North Carolina #676	Virginia #460167

¹ Analyses were performed according to our laboratory’s NELAP-approved quality assurance program and any applicable state or agency requirements. The test results meet requirements of the current NELAP/TNI standards or state or agency requirements, where applicable, except as noted in the case narrative. Since not all analyte/method/matrix combinations are offered for state/NELAC accreditation, this report may contain results which are not accredited. For a specific list of accredited analytes, contact the laboratory or go to <http://www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads/North-America-Downloads>

ALS Laboratory Group

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1611337

Sample Name: 1610231100 1BC7350
Lab Code: R1611337-001
Sample Matrix: Soil

Date Collected: 10/23/16
Date Received: 10/26/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1610231102 1BC7350
Lab Code: R1611337-002
Sample Matrix: Soil

Date Collected: 10/23/16
Date Received: 10/26/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CBURLESON
KWONG

Sample Name: 1610231104 1BC7349
Lab Code: R1611337-004
Sample Matrix: Soil

Date Collected: 10/23/16
Date Received: 10/26/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1610231106 1BC7349
Lab Code: R1611337-005
Sample Matrix: Soil

Date Collected: 10/23/16
Date Received: 10/26/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CBURLESON
KWONG

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1611337

Sample Name: 1610231120 1BC7351
Lab Code: R1611337-007
Sample Matrix: Soil

Date Collected: 10/23/16
Date Received: 10/26/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1610231121 1BC7351
Lab Code: R1611337-008
Sample Matrix: Soil

Date Collected: 10/23/16
Date Received: 10/26/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1610231126 1BC7351
Lab Code: R1611337-009
Sample Matrix: Soil

Date Collected: 10/23/16
Date Received: 10/26/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CBURLESON
KWONG

Sample Name: 1610231127 1BC7351
Lab Code: R1611337-010
Sample Matrix: Soil

Date Collected: 10/23/16
Date Received: 10/26/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CBURLESON
KWONG



INORGANIC PREPARATION METHODS

The preparation methods associated with this report are found in these tables unless discussed in the case narrative.

Water/Liquid Matrix

Analytical Method	Preparation Method
200.7	200.2
200.8	200.2
6010C	3005A/3010A
6020A	ILM05.3
9014 Cyanide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Acid Soluble	9030B
9056A Bomb (Halogens)	5050A
9066 Manual Distillation	9065
SM 4500-CN-E Residual Cyanide	SM 4500-CN-G
SM 4500-CN-E WAD Cyanide	SM 4500-CN-I

Solid/Soil/Non-Aqueous Matrix

Analytical Method	Preparation Method
6010C	3050B
6020A	3050B
6010C TCLP (1311) extract	3005A/3010A
6010 SPLP (1312) extract	3005A/3010A
7196A	3060A
7199	3060A
9056A Halogens/Halides	5050
300.0 Anions/ 350.1/ 353.2/ SM 2320B/ SM 5210B/ 9056A Anions	DI extraction

For analytical methods not listed, the preparation method is the same as the analytical method reference.



Sample Results

ALS Environmental—Rochester Laboratory
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Volatile Organic Compounds by GC/MS

ALS Environmental—Rochester Laboratory
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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16 09:20

Sample Name: 1610231100 1BC7350
Lab Code: R1611337-001

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.1	0.86	1	11/03/16 16:06	
1,1,1-Trichloroethane (TCA)	ND U	5.1	0.75	1	11/03/16 16:06	
1,1,2,2-Tetrachloroethane	ND U	5.1	0.84	1	11/03/16 16:06	
1,1,2-Trichloroethane	ND U	5.1	0.75	1	11/03/16 16:06	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.1	1.3	1	11/03/16 16:06	
1,1-Dichloroethene (1,1-DCE)	ND U	5.1	1.4	1	11/03/16 16:06	
1,2,3-Trichloropropane	ND U	5.1	1.4	1	11/03/16 16:06	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.1	2.0	1	11/03/16 16:06	
1,2-Dibromoethane	ND U	5.1	1.3	1	11/03/16 16:06	
1,2-Dichlorobenzene	ND U	5.1	0.63	1	11/03/16 16:06	
1,2-Dichloroethane	ND U	5.1	0.63	1	11/03/16 16:06	
1,2-Dichloropropane	ND U	5.1	1.0	1	11/03/16 16:06	
1,3-Dichlorobenzene	ND U	5.1	0.65	1	11/03/16 16:06	
1,4-Dioxane	ND U	100	20	1	11/03/16 16:06	
2-Butanone (MEK)	ND U	5.1	2.4	1	11/03/16 16:06	
2-Chloro-1,3-butadiene	ND U	5.1	1.6	1	11/03/16 16:06	
2-Chloroethyl Vinyl Ether	ND U	5.1	1.8	1	11/03/16 16:06	
Isobutyl Alcohol	ND U	100	24	1	11/03/16 16:06	
Allyl Chloride	ND U	5.1	1.8	1	11/03/16 16:06	
4-Methyl-2-pentanone	ND U	5.1	1.1	1	11/03/16 16:06	
Acetone	3.7 J	5.1	2.9	1	11/03/16 16:06	
Acetonitrile	ND U	26	18	1	11/03/16 16:06	
Acrolein	ND U	26	3.6	1	11/03/16 16:06	
Acrylonitrile	ND U	26	6.7	1	11/03/16 16:06	
Benzene	ND U	5.1	0.30	1	11/03/16 16:06	
Bromodichloromethane	ND U	5.1	0.63	1	11/03/16 16:06	
Bromoform	ND U	5.1	0.96	1	11/03/16 16:06	
Bromomethane	ND U	5.1	1.5	1	11/03/16 16:06	
Carbon Disulfide	ND U	5.1	1.3	1	11/03/16 16:06	
Carbon Tetrachloride	ND U	5.1	0.95	1	11/03/16 16:06	
Chlorobenzene	ND U	5.1	0.30	1	11/03/16 16:06	
Chloroethane	ND U	5.1	3.0	1	11/03/16 16:06	
Chloroform	ND U	5.1	1.3	1	11/03/16 16:06	
Chloromethane	ND U	5.1	0.42	1	11/03/16 16:06	
Dibromochloromethane	ND U	5.1	0.75	1	11/03/16 16:06	
Dibromomethane	ND U	5.1	0.65	1	11/03/16 16:06	
Dichlorodifluoromethane (CFC 12)	ND U	5.1	2.0	1	11/03/16 16:06	
Dichloromethane	ND U	5.1	0.59	1	11/03/16 16:06	
Ethyl Methacrylate	ND U	5.1	0.78	1	11/03/16 16:06	
Ethylbenzene	ND U	5.1	0.24	1	11/03/16 16:06	
Iodomethane	ND U	10	1.2	1	11/03/16 16:06	
Methacrylonitrile	ND U	5.1	1.6	1	11/03/16 16:06	
Methyl Methacrylate	ND U	5.1	0.75	1	11/03/16 16:06	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16 09:20

Sample Name: 1610231100 1BC7350
Lab Code: R1611337-001

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.1	0.53	1	11/03/16 16:06	
Propionitrile	ND U	26	6.7	1	11/03/16 16:06	
Tetrachloroethene (PCE)	ND U	5.1	0.91	1	11/03/16 16:06	
Toluene	ND U	5.1	1.1	1	11/03/16 16:06	
Trichloroethene (TCE)	ND U	5.1	1.1	1	11/03/16 16:06	
Trichlorofluoromethane (CFC 11)	ND U	5.1	0.68	1	11/03/16 16:06	
Vinyl Chloride	ND U	5.1	1.9	1	11/03/16 16:06	
cis-1,3-Dichloropropene	ND U	5.1	0.93	1	11/03/16 16:06	
m,p-Xylenes	ND U	10	1.2	1	11/03/16 16:06	
o-Xylene	ND U	5.1	0.50	1	11/03/16 16:06	
trans-1,2-Dichloroethene	ND U	5.1	0.89	1	11/03/16 16:06	
trans-1,3-Dichloropropene	ND U	5.1	0.21	1	11/03/16 16:06	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	95	51 - 136	11/03/16 16:06	
Dibromofluoromethane	94	63 - 138	11/03/16 16:06	
Toluene-d8	94	66 - 138	11/03/16 16:06	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	unknown	13.57	14	J

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610231104 1BC7349
Lab Code: R1611337-004

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16 09:20

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.3	0.88	1	11/03/16 16:30	
1,1,1-Trichloroethane (TCA)	ND U	5.3	0.78	1	11/03/16 16:30	
1,1,2,2-Tetrachloroethane	ND U	5.3	0.86	1	11/03/16 16:30	
1,1,2-Trichloroethane	ND U	5.3	0.78	1	11/03/16 16:30	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.3	1.4	1	11/03/16 16:30	
1,1-Dichloroethene (1,1-DCE)	ND U	5.3	1.4	1	11/03/16 16:30	
1,2,3-Trichloropropane	ND U	5.3	1.4	1	11/03/16 16:30	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.3	2.0	1	11/03/16 16:30	
1,2-Dibromoethane	ND U	5.3	1.3	1	11/03/16 16:30	
1,2-Dichlorobenzene	ND U	5.3	0.65	1	11/03/16 16:30	
1,2-Dichloroethane	ND U	5.3	0.65	1	11/03/16 16:30	
1,2-Dichloropropane	ND U	5.3	1.1	1	11/03/16 16:30	
1,3-Dichlorobenzene	ND U	5.3	0.67	1	11/03/16 16:30	
1,4-Dioxane	ND U	110	21	1	11/03/16 16:30	
2-Butanone (MEK)	ND U	5.3	2.5	1	11/03/16 16:30	
2-Chloro-1,3-butadiene	ND U	5.3	1.7	1	11/03/16 16:30	
2-Chloroethyl Vinyl Ether	ND U	5.3	1.9	1	11/03/16 16:30	
Isobutyl Alcohol	ND U	110	24	1	11/03/16 16:30	
Allyl Chloride	ND U	5.3	1.8	1	11/03/16 16:30	
4-Methyl-2-pentanone	ND U	5.3	1.1	1	11/03/16 16:30	
Acetone	4.6 J	5.3	3.0	1	11/03/16 16:30	
Acetonitrile	ND U	26	18	1	11/03/16 16:30	
Acrolein	ND U	26	3.7	1	11/03/16 16:30	
Acrylonitrile	ND U	26	6.9	1	11/03/16 16:30	
Benzene	ND U	5.3	0.31	1	11/03/16 16:30	
Bromodichloromethane	ND U	5.3	0.65	1	11/03/16 16:30	
Bromoform	ND U	5.3	0.99	1	11/03/16 16:30	
Bromomethane	ND U	5.3	1.5	1	11/03/16 16:30	
Carbon Disulfide	ND U	5.3	1.4	1	11/03/16 16:30	
Carbon Tetrachloride	ND U	5.3	0.98	1	11/03/16 16:30	
Chlorobenzene	ND U	5.3	0.31	1	11/03/16 16:30	
Chloroethane	ND U	5.3	3.1	1	11/03/16 16:30	
Chloroform	ND U	5.3	1.4	1	11/03/16 16:30	
Chloromethane	ND U	5.3	0.43	1	11/03/16 16:30	
Dibromochloromethane	ND U	5.3	0.78	1	11/03/16 16:30	
Dibromomethane	ND U	5.3	0.67	1	11/03/16 16:30	
Dichlorodifluoromethane (CFC 12)	ND U	5.3	2.0	1	11/03/16 16:30	
Dichloromethane	ND U	5.3	0.61	1	11/03/16 16:30	
Ethyl Methacrylate	ND U	5.3	0.80	1	11/03/16 16:30	
Ethylbenzene	ND U	5.3	0.25	1	11/03/16 16:30	
Iodomethane	ND U	11	1.2	1	11/03/16 16:30	
Methacrylonitrile	ND U	5.3	1.6	1	11/03/16 16:30	
Methyl Methacrylate	ND U	5.3	0.78	1	11/03/16 16:30	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610231104 1BC7349
Lab Code: R1611337-004

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16 09:20

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.3	0.54	1	11/03/16 16:30	
Propionitrile	ND U	26	6.9	1	11/03/16 16:30	
Tetrachloroethene (PCE)	ND U	5.3	0.93	1	11/03/16 16:30	
Toluene	ND U	5.3	1.1	1	11/03/16 16:30	
Trichloroethene (TCE)	ND U	5.3	1.1	1	11/03/16 16:30	
Trichlorofluoromethane (CFC 11)	ND U	5.3	0.70	1	11/03/16 16:30	
Vinyl Chloride	ND U	5.3	2.0	1	11/03/16 16:30	
cis-1,3-Dichloropropene	ND U	5.3	0.95	1	11/03/16 16:30	
m,p-Xylenes	ND U	11	1.2	1	11/03/16 16:30	
o-Xylene	ND U	5.3	0.51	1	11/03/16 16:30	
trans-1,2-Dichloroethene	ND U	5.3	0.91	1	11/03/16 16:30	
trans-1,3-Dichloropropene	ND U	5.3	0.22	1	11/03/16 16:30	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	96	51 - 136	11/03/16 16:30	
Dibromofluoromethane	93	63 - 138	11/03/16 16:30	
Toluene-d8	93	66 - 138	11/03/16 16:30	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16 09:20

Sample Name: 1610231120 1BC7351
Lab Code: R1611337-007

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.1	0.86	.99	11/03/16 16:54	
1,1,1-Trichloroethane (TCA)	ND U	5.1	0.76	.99	11/03/16 16:54	
1,1,2,2-Tetrachloroethane	ND U	5.1	0.84	.99	11/03/16 16:54	
1,1,2-Trichloroethane	ND U	5.1	0.76	.99	11/03/16 16:54	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.1	1.3	.99	11/03/16 16:54	
1,1-Dichloroethene (1,1-DCE)	ND U	5.1	1.4	.99	11/03/16 16:54	
1,2,3-Trichloropropane	ND U	5.1	1.4	.99	11/03/16 16:54	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.1	2.0	.99	11/03/16 16:54	
1,2-Dibromoethane	ND U	5.1	1.3	.99	11/03/16 16:54	
1,2-Dichlorobenzene	ND U	5.1	0.63	.99	11/03/16 16:54	
1,2-Dichloroethane	ND U	5.1	0.63	.99	11/03/16 16:54	
1,2-Dichloropropane	ND U	5.1	1.0	.99	11/03/16 16:54	
1,3-Dichlorobenzene	ND U	5.1	0.65	.99	11/03/16 16:54	
1,4-Dioxane	ND U	100	20	.99	11/03/16 16:54	
2-Butanone (MEK)	ND U	5.1	2.4	.99	11/03/16 16:54	
2-Chloro-1,3-butadiene	ND U	5.1	1.6	.99	11/03/16 16:54	
2-Chloroethyl Vinyl Ether	ND U	5.1	1.8	.99	11/03/16 16:54	
Isobutyl Alcohol	ND U	100	24	.99	11/03/16 16:54	
Allyl Chloride	ND U	5.1	1.8	.99	11/03/16 16:54	
4-Methyl-2-pentanone	ND U	5.1	1.1	.99	11/03/16 16:54	
Acetone	4.3 J	5.1	2.9	.99	11/03/16 16:54	
Acetonitrile	ND U	26	18	.99	11/03/16 16:54	
Acrolein	ND U	26	3.6	.99	11/03/16 16:54	
Acrylonitrile	ND U	26	6.7	.99	11/03/16 16:54	
Benzene	ND U	5.1	0.30	.99	11/03/16 16:54	
Bromodichloromethane	ND U	5.1	0.63	.99	11/03/16 16:54	
Bromoform	ND U	5.1	0.96	.99	11/03/16 16:54	
Bromomethane	ND U	5.1	1.5	.99	11/03/16 16:54	
Carbon Disulfide	ND U	5.1	1.3	.99	11/03/16 16:54	
Carbon Tetrachloride	ND U	5.1	0.95	.99	11/03/16 16:54	
Chlorobenzene	ND U	5.1	0.30	.99	11/03/16 16:54	
Chloroethane	ND U	5.1	3.0	.99	11/03/16 16:54	
Chloroform	ND U	5.1	1.3	.99	11/03/16 16:54	
Chloromethane	ND U	5.1	0.42	.99	11/03/16 16:54	
Dibromochloromethane	ND U	5.1	0.76	.99	11/03/16 16:54	
Dibromomethane	ND U	5.1	0.65	.99	11/03/16 16:54	
Dichlorodifluoromethane (CFC 12)	ND U	5.1	2.0	.99	11/03/16 16:54	
Dichloromethane	ND U	5.1	0.59	.99	11/03/16 16:54	
Ethyl Methacrylate	ND U	5.1	0.78	.99	11/03/16 16:54	
Ethylbenzene	ND U	5.1	0.24	.99	11/03/16 16:54	
Iodomethane	ND U	10	1.2	.99	11/03/16 16:54	
Methacrylonitrile	ND U	5.1	1.6	.99	11/03/16 16:54	
Methyl Methacrylate	ND U	5.1	0.76	.99	11/03/16 16:54	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610231120 1BC7351
Lab Code: R1611337-007

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16 09:20

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.1	0.53	.99	11/03/16 16:54	
Propionitrile	ND U	26	6.7	.99	11/03/16 16:54	
Tetrachloroethene (PCE)	1.1 J	5.1	0.91	.99	11/03/16 16:54	
Toluene	ND U	5.1	1.1	.99	11/03/16 16:54	
Trichloroethene (TCE)	ND U	5.1	1.1	.99	11/03/16 16:54	
Trichlorofluoromethane (CFC 11)	ND U	5.1	0.68	.99	11/03/16 16:54	
Vinyl Chloride	ND U	5.1	1.9	.99	11/03/16 16:54	
cis-1,3-Dichloropropene	ND U	5.1	0.93	.99	11/03/16 16:54	
m,p-Xylenes	ND U	10	1.2	.99	11/03/16 16:54	
o-Xylene	ND U	5.1	0.50	.99	11/03/16 16:54	
trans-1,2-Dichloroethene	ND U	5.1	0.89	.99	11/03/16 16:54	
trans-1,3-Dichloropropene	ND U	5.1	0.21	.99	11/03/16 16:54	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	98	51 - 136	11/03/16 16:54	
Dibromofluoromethane	96	63 - 138	11/03/16 16:54	
Toluene-d8	96	66 - 138	11/03/16 16:54	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16 09:20

Sample Name: 1610231121 1BC7351
Lab Code: R1611337-008

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.2	0.87	1	11/03/16 17:19	
1,1,1-Trichloroethane (TCA)	ND U	5.2	0.77	1	11/03/16 17:19	
1,1,2,2-Tetrachloroethane	ND U	5.2	0.85	1	11/03/16 17:19	
1,1,2-Trichloroethane	ND U	5.2	0.77	1	11/03/16 17:19	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.2	1.3	1	11/03/16 17:19	
1,1-Dichloroethene (1,1-DCE)	ND U	5.2	1.4	1	11/03/16 17:19	
1,2,3-Trichloropropane	ND U	5.2	1.4	1	11/03/16 17:19	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.2	2.0	1	11/03/16 17:19	
1,2-Dibromoethane	ND U	5.2	1.3	1	11/03/16 17:19	
1,2-Dichlorobenzene	ND U	5.2	0.64	1	11/03/16 17:19	
1,2-Dichloroethane	ND U	5.2	0.64	1	11/03/16 17:19	
1,2-Dichloropropane	ND U	5.2	1.1	1	11/03/16 17:19	
1,3-Dichlorobenzene	ND U	5.2	0.66	1	11/03/16 17:19	
1,4-Dioxane	ND U	100	20	1	11/03/16 17:19	
2-Butanone (MEK)	ND U	5.2	2.4	1	11/03/16 17:19	
2-Chloro-1,3-butadiene	ND U	5.2	1.6	1	11/03/16 17:19	
2-Chloroethyl Vinyl Ether	ND U	5.2	1.8	1	11/03/16 17:19	
Isobutyl Alcohol	ND U	100	24	1	11/03/16 17:19	
Allyl Chloride	ND U	5.2	1.8	1	11/03/16 17:19	
4-Methyl-2-pentanone	ND U	5.2	1.1	1	11/03/16 17:19	
Acetone	4.9 J	5.2	3.0	1	11/03/16 17:19	
Acetonitrile	ND U	26	18	1	11/03/16 17:19	
Acrolein	ND U	26	3.7	1	11/03/16 17:19	
Acrylonitrile	ND U	26	6.8	1	11/03/16 17:19	
Benzene	ND U	5.2	0.31	1	11/03/16 17:19	
Bromodichloromethane	ND U	5.2	0.64	1	11/03/16 17:19	
Bromoform	ND U	5.2	0.98	1	11/03/16 17:19	
Bromomethane	ND U	5.2	1.5	1	11/03/16 17:19	
Carbon Disulfide	ND U	5.2	1.3	1	11/03/16 17:19	
Carbon Tetrachloride	ND U	5.2	0.97	1	11/03/16 17:19	
Chlorobenzene	ND U	5.2	0.31	1	11/03/16 17:19	
Chloroethane	ND U	5.2	3.0	1	11/03/16 17:19	
Chloroform	ND U	5.2	1.4	1	11/03/16 17:19	
Chloromethane	ND U	5.2	0.42	1	11/03/16 17:19	
Dibromochloromethane	ND U	5.2	0.77	1	11/03/16 17:19	
Dibromomethane	ND U	5.2	0.66	1	11/03/16 17:19	
Dichlorodifluoromethane (CFC 12)	ND U	5.2	2.0	1	11/03/16 17:19	
Dichloromethane	ND U	5.2	0.60	1	11/03/16 17:19	
Ethyl Methacrylate	ND U	5.2	0.79	1	11/03/16 17:19	
Ethylbenzene	ND U	5.2	0.25	1	11/03/16 17:19	
Iodomethane	ND U	10	1.2	1	11/03/16 17:19	
Methacrylonitrile	ND U	5.2	1.6	1	11/03/16 17:19	
Methyl Methacrylate	ND U	5.2	0.77	1	11/03/16 17:19	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610231121 1BC7351
Lab Code: R1611337-008

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16 09:20

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.2	0.54	1	11/03/16 17:19	
Propionitrile	ND U	26	6.8	1	11/03/16 17:19	
Tetrachloroethene (PCE)	1.3 J	5.2	0.92	1	11/03/16 17:19	
Toluene	ND U	5.2	1.1	1	11/03/16 17:19	
Trichloroethene (TCE)	ND U	5.2	1.1	1	11/03/16 17:19	
Trichlorofluoromethane (CFC 11)	ND U	5.2	0.69	1	11/03/16 17:19	
Vinyl Chloride	ND U	5.2	2.0	1	11/03/16 17:19	
cis-1,3-Dichloropropene	ND U	5.2	0.94	1	11/03/16 17:19	
m,p-Xylenes	ND U	10	1.2	1	11/03/16 17:19	
o-Xylene	ND U	5.2	0.51	1	11/03/16 17:19	
trans-1,2-Dichloroethene	ND U	5.2	0.90	1	11/03/16 17:19	
trans-1,3-Dichloropropene	ND U	5.2	0.21	1	11/03/16 17:19	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	99	51 - 136	11/03/16 17:19	
Dibromofluoromethane	98	63 - 138	11/03/16 17:19	
Toluene-d8	96	66 - 138	11/03/16 17:19	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			



Metals

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610231102 1BC7350
Lab Code: R1611337-002

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16 09:20

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.1	0.5	1	10/31/16 20:24	10/28/16	
Arsenic, Total	6010C	4.0	mg/Kg	1.0	0.3	1	11/02/16 10:40	10/28/16	
Barium, Total	6010C	78.2	mg/Kg	2.0	0.2	1	10/31/16 20:24	10/28/16	
Beryllium, Total	6010C	0.41	mg/Kg	0.31	0.02	1	10/31/16 20:24	10/28/16	
Cadmium, Total	6010C	0.48 J	mg/Kg	0.51	0.04	1	10/31/16 20:24	10/28/16	
Chromium, Total	6010C	8.0	mg/Kg	1.0	0.2	1	10/31/16 20:24	10/28/16	
Lead, Total	6010C	11.4	mg/Kg	5.1	0.3	1	10/31/16 20:24	10/28/16	
Mercury, Total	7471B	ND U	mg/Kg	0.034	0.004	1	10/31/16 10:33	10/28/16	
Nickel, Total	6010C	7.4	mg/Kg	4.1	0.2	1	10/31/16 20:24	10/28/16	
Selenium, Total	6010C	1.3	mg/Kg	1.0	0.7	1	10/31/16 20:24	10/28/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	10/31/16 20:24	10/28/16	
Thallium, Total	6010C	ND U	mg/Kg	5.1	2.6	5	11/04/16 17:53	10/28/16	
Vanadium, Total	6010C	15.0	mg/Kg	5.1	0.2	1	10/31/16 20:24	10/28/16	
Zinc, Total	6010C	51.6	mg/Kg	2.0	0.2	1	10/31/16 20:24	10/28/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610231106 1BC7349
Lab Code: R1611337-005

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16 09:20

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.1	0.5	1	10/31/16 20:30	10/28/16	
Arsenic, Total	6010C	4.1	mg/Kg	1.0	0.3	1	11/02/16 10:43	10/28/16	
Barium, Total	6010C	141	mg/Kg	2.0	0.2	1	10/31/16 20:30	10/28/16	
Beryllium, Total	6010C	0.41	mg/Kg	0.31	0.02	1	10/31/16 20:30	10/28/16	
Cadmium, Total	6010C	0.31 J	mg/Kg	0.51	0.04	1	10/31/16 20:30	10/28/16	
Chromium, Total	6010C	12.9	mg/Kg	1.0	0.2	1	10/31/16 20:30	10/28/16	
Lead, Total	6010C	11.2	mg/Kg	5.1	0.3	1	10/31/16 20:30	10/28/16	
Mercury, Total	7471B	ND U	mg/Kg	0.033	0.003	1	10/31/16 10:35	10/28/16	
Nickel, Total	6010C	9.3	mg/Kg	4.1	0.2	1	10/31/16 20:30	10/28/16	
Selenium, Total	6010C	1.1	mg/Kg	1.0	0.7	1	10/31/16 20:30	10/28/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	10/31/16 20:30	10/28/16	
Thallium, Total	6010C	ND U	mg/Kg	5.1	2.6	5	11/04/16 17:59	10/28/16	
Vanadium, Total	6010C	12.4	mg/Kg	5.1	0.2	1	10/31/16 20:30	10/28/16	
Zinc, Total	6010C	40.4	mg/Kg	2.0	0.2	1	10/31/16 20:30	10/28/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610231126 1BC7351
Lab Code: R1611337-009

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16 09:20

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.2	0.5	1	10/31/16 20:36	10/28/16	
Arsenic, Total	6010C	5.8	mg/Kg	1.0	0.3	1	11/02/16 10:47	10/28/16	
Barium, Total	6010C	204	mg/Kg	2.1	0.2	1	10/31/16 20:36	10/28/16	
Beryllium, Total	6010C	0.45	mg/Kg	0.31	0.02	1	10/31/16 20:36	10/28/16	
Cadmium, Total	6010C	0.34 J	mg/Kg	0.51	0.04	1	10/31/16 20:36	10/28/16	
Chromium, Total	6010C	12.9	mg/Kg	1.0	0.2	1	10/31/16 20:36	10/28/16	
Lead, Total	6010C	9.7	mg/Kg	5.1	0.3	1	10/31/16 20:36	10/28/16	
Mercury, Total	7471B	ND U	mg/Kg	0.035	0.004	1	10/31/16 10:37	10/28/16	
Nickel, Total	6010C	10.1	mg/Kg	4.1	0.2	1	10/31/16 20:36	10/28/16	
Selenium, Total	6010C	1.2	mg/Kg	1.0	0.7	1	10/31/16 20:36	10/28/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	10/31/16 20:36	10/28/16	
Thallium, Total	6010C	ND U	mg/Kg	5.1	2.6	5	11/04/16 18:05	10/28/16	
Vanadium, Total	6010C	12.5	mg/Kg	5.1	0.2	1	10/31/16 20:36	10/28/16	
Zinc, Total	6010C	44.3	mg/Kg	2.1	0.2	1	10/31/16 20:36	10/28/16	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610231127 1BC7351
Lab Code: R1611337-010

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16 09:20

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	5.9	0.4	1	10/31/16 21:19	10/28/16	
Arsenic, Total	6010C	4.85	mg/Kg	0.99	0.24	1	11/02/16 11:02	10/28/16	
Barium, Total	6010C	237	mg/Kg	2.0	0.2	1	10/31/16 21:19	10/28/16	
Beryllium, Total	6010C	0.47	mg/Kg	0.30	0.02	1	10/31/16 21:19	10/28/16	
Cadmium, Total	6010C	0.41 J	mg/Kg	0.50	0.04	1	10/31/16 21:19	10/28/16	
Chromium, Total	6010C	12.3	mg/Kg	0.99	0.13	1	10/31/16 21:19	10/28/16	
Lead, Total	6010C	12.1	mg/Kg	5.0	0.3	1	10/31/16 21:19	10/28/16	
Mercury, Total	7471B	ND U	mg/Kg	0.032	0.003	1	10/31/16 10:42	10/28/16	
Nickel, Total	6010C	10.3	mg/Kg	4.0	0.2	1	10/31/16 21:19	10/28/16	
Selenium, Total	6010C	1.11	mg/Kg	0.99	0.60	1	10/31/16 21:19	10/28/16	
Silver, Total	6010C	ND U	mg/Kg	0.99	0.44	1	10/31/16 21:19	10/28/16	
Thallium, Total	6010C	ND U	mg/Kg	5.0	2.6	5	11/04/16 18:35	10/28/16	
Vanadium, Total	6010C	12.5	mg/Kg	5.0	0.2	1	10/31/16 21:19	10/28/16	
Zinc, Total	6010C	44.5	mg/Kg	2.0	0.2	1	10/31/16 21:19	10/28/16	



General Chemistry

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610231100 1BC7350
Lab Code: R1611337-001

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16 09:20
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	97.4	Percent	-	1	10/28/16 12:30	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610231102 1BC7350
Lab Code: R1611337-002

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16 09:20
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	97.6	Percent	-	-	1	10/28/16 12:30	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610231104 1BC7349
Lab Code: R1611337-004

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16 09:20
Basis: As Received

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Q
Total Solids	ALS SOP	94.8	Percent	-	1	10/28/16 12:30	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610231106 1BC7349
Lab Code: R1611337-005

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16 09:20
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	96.3	Percent	-	-	1	10/28/16 12:30	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610231120 1BC7351
Lab Code: R1611337-007

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16 09:20
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	96.3	Percent	-	1	10/28/16 12:30	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610231121 1BC7351
Lab Code: R1611337-008

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16 09:20
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	95.8	Percent	-	1	10/28/16 12:30	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610231126 1BC7351
Lab Code: R1611337-009

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16 09:20
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	95.3	Percent	-	-	1	10/28/16 12:30	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1610231127 1BC7351
Lab Code: R1611337-010

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16 09:20
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	96.1	Percent	-	-	1	10/28/16 12:30	



QC Summary Forms

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Volatile Organic Compounds by GC/MS

ALS Environmental—Rochester Laboratory

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Phone (585) 288-5380 Fax (585) 288-8475

www.alsglobal.com

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611337

SURROGATE RECOVERY SUMMARY
Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Extraction Method: EPA 5030C

Sample Name	Lab Code	4-Bromofluorobenzene	Dibromofluoromethane	Toluene-d8
		51 - 136	63 - 138	66 - 138
1610231100 1BC7350	R1611337-001	95	94	94
1610231104 1BC7349	R1611337-004	96	93	93
1610231120 1BC7351	R1611337-007	98	96	96
1610231121 1BC7351	R1611337-008	99	98	96
Method Blank	RQ1613524-01	95	95	94
Lab Control Sample	RQ1613524-02	102	100	97
1610231120 1BC7351 MS	RQ1613524-05	100	98	95
1610231120 1BC7351 DMS	RQ1613524-06	100	98	95

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16
Date Analyzed: 11/3/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1610231120 1BC7351 **Units:** ug/Kg
Lab Code: R1611337-007 **Basis:** Dry
Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Sample Result	Matrix Spike RQ1613524-05			Duplicate Matrix Spike RQ1613524-06			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
1,1,1,2-Tetrachloroethane	ND U	42.3	51.9	81	42.6	51.9	82	52-133	1	30
1,1,1-Trichloroethane (TCA)	ND U	36.1	51.9	70	36.5	51.9	70	51-132	<1	30
1,1,2,2-Tetrachloroethane	ND U	37.4	51.9	72	37.2	51.9	72	53-134	<1	30
1,1,2-Trichloroethane	ND U	45.4	51.9	88	45.7	51.9	88	62-126	<1	30
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	33.8	51.9	65	34.1	51.9	66	45-136	2	30
1,1-Dichloroethene (1,1-DCE)	ND U	38.5	51.9	74	38.0	51.9	73	61-139	1	30
1,2,3-Trichloropropane	ND U	42.0	51.9	81	41.8	51.9	80	22-167	1	30
1,2-Dibromo-3-chloropropane (DBCP)	ND U	43.9	51.9	85	44.9	51.9	87	27-163	2	30
1,2-Dibromoethane	ND U	43.6	51.9	84	43.2	51.9	83	52-137	1	30
1,2-Dichlorobenzene	ND U	40.7	51.9	78	41.3	51.9	80	22-156	3	30
1,2-Dichloroethane	ND U	41.1	51.9	79	40.5	51.9	78	59-125	1	30
1,2-Dichloropropane	ND U	40.1	51.9	77	40.9	51.9	79	67-126	3	30
1,3-Dichlorobenzene	ND U	38.9	51.9	75	39.6	51.9	76	29-146	1	30
1,4-Dioxane	ND U	922	1040	89	997	1040	96	50-148	8	30
2-Butanone (MEK)	ND U	39.7	51.9	77	39.2	51.9	75	43-134	3	30
2-Chloro-1,3-butadiene	ND U	39.5	51.9	76	39.4	51.9	76	45-134	<1	30
2-Chloroethyl Vinyl Ether	ND U	38.6	51.9	74	37.9	51.9	73	37-150	1	30
Isobutyl Alcohol	ND U	746	1040	72	792	1040	76	39-146	5	30
Allyl Chloride	ND U	37.6	51.9	72	37.0	51.9	71	34-135	1	30
4-Methyl-2-pentanone	ND U	41.8	51.9	81	41.5	51.9	80	47-145	1	30
Acetone	4.3 J	50.4	51.9	89	50.6	51.9	89	11-183	<1	30
Acetonitrile	ND U	155	260	60	188	260	72	28-146	18	30
Acrolein	ND U	77.6	104	75	75.2	104	72	10-172	4	30
Acrylonitrile	ND U	200	260	77	199	260	77	46-139	<1	30
Benzene	ND U	39.7	51.9	76	39.2	51.9	75	63-126	1	30
Bromodichloromethane	ND U	39.3	51.9	76	40.1	51.9	77	47-141	1	30
Bromoform	ND U	49.1	51.9	94	49.4	51.9	95	26-157	1	30
Bromomethane	ND U	28.7	51.9	55	30.3	51.9	58	10-137	5	30
Carbon Disulfide	ND U	41.8	51.9	81	42.8	51.9	82	35-135	1	30
Carbon Tetrachloride	ND U	36.2	51.9	70	37.9	51.9	73	46-137	4	30
Chlorobenzene	ND U	41.3	51.9	79	41.1	51.9	79	51-132	<1	30
Chloroethane	ND U	38.2	51.9	74	35.3	51.9	68	45-132	8	30
Chloroform	ND U	38.9	51.9	75	39.0	51.9	75	61-124	<1	30
Chloromethane	ND U	34.7	51.9	67	34.6	51.9	67	50-136	<1	30
Dibromochloromethane	ND U	44.2	51.9	85	44.3	51.9	85	40-146	<1	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16
Date Analyzed: 11/3/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1610231120 1BC7351
Lab Code: R1611337-007
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1613524-05			Duplicate Matrix Spike RQ1613524-06			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Dibromomethane	ND U	44.1	51.9	85	44.1	51.9	85	61-122	<1	30
Dichlorodifluoromethane (CFC 12)	ND U	36.8	51.9	71	36.3	51.9	70	44-138	1	30
Dichloromethane	ND U	40.9	51.9	79	40.9	51.9	79	64-120	<1	30
Ethyl Methacrylate	ND U	42.4	51.9	82	43.4	51.9	84	17-166	1	30
Ethylbenzene	ND U	39.0	51.9	75	39.2	51.9	76	44-131	1	30
Iodomethane	ND U	66.5	51.9	128	68.0	51.9	131	10-160	2	30
Methacrylonitrile	ND U	43.9	51.9	84	43.5	51.9	84	44-149	<1	30
Methyl Methacrylate	ND U	43.3	51.9	83	44.5	51.9	86	41-162	4	30
Naphthalene	ND U	51.6	51.9	99	50.1	51.9	97	10-187	2	30
Propionitrile	ND U	208	260	80	213	260	82	46-144	2	30
Tetrachloroethene (PCE)	1.1 J	39.9	51.9	75	40.4	51.9	76	45-141	1	30
Toluene	ND U	40.7	51.9	78	39.8	51.9	77	50-140	1	30
Trichloroethene (TCE)	ND U	47.3	51.9	91	47.2	51.9	91	54-136	<1	30
Trichlorofluoromethane (CFC 11)	ND U	34.1	51.9	66	35.0	51.9	67	47-129	2	30
Vinyl Chloride	ND U	41.1	51.9	79	40.8	51.9	79	53-128	<1	30
cis-1,3-Dichloropropene	ND U	40.8	51.9	79	41.0	51.9	79	31-150	<1	30
m,p-Xylenes	ND U	79.4	104	76	78.9	104	76	45-141	<1	30
o-Xylene	ND U	40.6	51.9	78	40.3	51.9	78	46-139	<1	30
trans-1,2-Dichloroethene	ND U	39.1	51.9	75	38.9	51.9	75	52-128	<1	30
trans-1,3-Dichloropropene	ND U	41.3	51.9	80	41.7	51.9	80	23-160	<1	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: RQ1613524-01

Service Request: R1611337
Date Collected: NA
Date Received: NA

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.0	0.83	1	11/03/16 15:17	
1,1,1-Trichloroethane (TCA)	ND U	5.0	0.73	1	11/03/16 15:17	
1,1,2,2-Tetrachloroethane	ND U	5.0	0.81	1	11/03/16 15:17	
1,1,2-Trichloroethane	ND U	5.0	0.73	1	11/03/16 15:17	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.0	1.3	1	11/03/16 15:17	
1,1-Dichloroethene (1,1-DCE)	ND U	5.0	1.3	1	11/03/16 15:17	
1,2,3-Trichloropropane	ND U	5.0	1.4	1	11/03/16 15:17	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.0	1.9	1	11/03/16 15:17	
1,2-Dibromoethane	ND U	5.0	1.3	1	11/03/16 15:17	
1,2-Dichlorobenzene	ND U	5.0	0.61	1	11/03/16 15:17	
1,2-Dichloroethane	ND U	5.0	0.61	1	11/03/16 15:17	
1,2-Dichloropropane	ND U	5.0	0.97	1	11/03/16 15:17	
1,3-Dichlorobenzene	ND U	5.0	0.63	1	11/03/16 15:17	
1,4-Dioxane	ND U	100	20	1	11/03/16 15:17	
2-Butanone (MEK)	ND U	5.0	2.3	1	11/03/16 15:17	
2-Chloro-1,3-butadiene	ND U	5.0	1.6	1	11/03/16 15:17	
2-Chloroethyl Vinyl Ether	ND U	5.0	1.8	1	11/03/16 15:17	
Isobutyl Alcohol	ND U	100	23	1	11/03/16 15:17	
Allyl Chloride	ND U	5.0	1.7	1	11/03/16 15:17	
4-Methyl-2-pentanone	ND U	5.0	0.98	1	11/03/16 15:17	
Acetone	ND U	5.0	2.9	1	11/03/16 15:17	
Acetonitrile	ND U	25	17	1	11/03/16 15:17	
Acrolein	ND U	25	3.5	1	11/03/16 15:17	
Acrylonitrile	ND U	25	6.5	1	11/03/16 15:17	
Benzene	ND U	5.0	0.29	1	11/03/16 15:17	
Bromodichloromethane	ND U	5.0	0.61	1	11/03/16 15:17	
Bromoform	ND U	5.0	0.93	1	11/03/16 15:17	
Bromomethane	ND U	5.0	1.4	1	11/03/16 15:17	
Carbon Disulfide	ND U	5.0	1.3	1	11/03/16 15:17	
Carbon Tetrachloride	ND U	5.0	0.92	1	11/03/16 15:17	
Chlorobenzene	ND U	5.0	0.29	1	11/03/16 15:17	
Chloroethane	ND U	5.0	2.9	1	11/03/16 15:17	
Chloroform	ND U	5.0	1.3	1	11/03/16 15:17	
Chloromethane	ND U	5.0	0.40	1	11/03/16 15:17	
Dibromochloromethane	ND U	5.0	0.73	1	11/03/16 15:17	
Dibromomethane	ND U	5.0	0.63	1	11/03/16 15:17	
Dichlorodifluoromethane (CFC 12)	ND U	5.0	1.9	1	11/03/16 15:17	
Dichloromethane	ND U	5.0	0.57	1	11/03/16 15:17	
Ethyl Methacrylate	ND U	5.0	0.75	1	11/03/16 15:17	
Ethylbenzene	ND U	5.0	0.23	1	11/03/16 15:17	
Iodomethane	ND U	10	1.2	1	11/03/16 15:17	
Methacrylonitrile	ND U	5.0	1.6	1	11/03/16 15:17	
Methyl Methacrylate	ND U	5.0	0.73	1	11/03/16 15:17	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: RQ1613524-01

Service Request: R1611337
Date Collected: NA
Date Received: NA
Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.0	0.51	1	11/03/16 15:17	
Propionitrile	ND U	25	6.5	1	11/03/16 15:17	
Tetrachloroethene (PCE)	ND U	5.0	0.88	1	11/03/16 15:17	
Toluene	ND U	5.0	1.0	1	11/03/16 15:17	
Trichloroethene (TCE)	ND U	5.0	1.1	1	11/03/16 15:17	
Trichlorofluoromethane (CFC 11)	ND U	5.0	0.66	1	11/03/16 15:17	
Vinyl Chloride	ND U	5.0	1.9	1	11/03/16 15:17	
cis-1,3-Dichloropropene	ND U	5.0	0.90	1	11/03/16 15:17	
m,p-Xylenes	ND U	10	1.1	1	11/03/16 15:17	
o-Xylene	ND U	5.0	0.48	1	11/03/16 15:17	
trans-1,2-Dichloroethene	ND U	5.0	0.86	1	11/03/16 15:17	
trans-1,3-Dichloropropene	ND U	5.0	0.20	1	11/03/16 15:17	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	95	51 - 136	11/03/16 15:17	
Dibromofluoromethane	95	63 - 138	11/03/16 15:17	
Toluene-d8	94	66 - 138	11/03/16 15:17	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611337
Date Analyzed: 11/03/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Units:ug/Kg
Basis:Dry

Lab Control Sample
RQ1613524-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
1,1,1,2-Tetrachloroethane	8260C	15.0	20.0	75	40-140
1,1,1-Trichloroethane (TCA)	8260C	12.4	20.0	62	40-140
1,1,2,2-Tetrachloroethane	8260C	14.8	20.0	74	40-140
1,1,2-Trichloroethane	8260C	15.8	20.0	79	40-140
1,1,2-Trichloro-1,2,2-trifluoroethane	8260C	10.1	20.0	51	40-140
1,1-Dichloroethene (1,1-DCE)	8260C	13.3	20.0	67	40-140
1,2,3-Trichloropropane	8260C	14.6	20.0	73	40-140
1,2-Dibromo-3-chloropropane (DBCP)	8260C	15.0	20.0	75	40-140
1,2-Dibromoethane	8260C	15.1	20.0	75	40-140
1,2-Dichlorobenzene	8260C	14.8	20.0	74	40-140
1,2-Dichloroethane	8260C	14.1	20.0	70	40-140
1,2-Dichloropropane	8260C	13.9	20.0	69	40-140
1,3-Dichlorobenzene	8260C	14.4	20.0	72	40-140
1,4-Dioxane	8260C	303	400	76	40-140
2-Butanone (MEK)	8260C	16.3	20.0	82	40-140
2-Chloro-1,3-butadiene	8260C	18.7	20.0	94	40-140
2-Chloroethyl Vinyl Ether	8260C	6.16	20.0	31 *	40-140
Isobutyl Alcohol	8260C	235	400	59	40-140
Allyl Chloride	8260C	13.1	20.0	65	40-140
4-Methyl-2-pentanone	8260C	17.0	20.0	85	40-140
Acetone	8260C	22.1	20.0	111	40-140
Acetonitrile	8260C	57.9	100	58	40-140
Acrolein	8260C	40.7	40.0	102	40-140
Acrylonitrile	8260C	64.4	100	64	40-140
Benzene	8260C	14.1	20.0	70	40-140
Bromodichloromethane	8260C	13.9	20.0	70	40-140
Bromoform	8260C	18.4	20.0	92	40-140
Bromomethane	8260C	13.5	20.0	68	40-140
Carbon Disulfide	8260C	20.6	20.0	103	40-140
Carbon Tetrachloride	8260C	12.5	20.0	63	40-140
Chlorobenzene	8260C	15.2	20.0	76	40-140
Chloroethane	8260C	12.8	20.0	64	40-140
Chloroform	8260C	13.3	20.0	66	40-140

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611337
Date Analyzed: 11/03/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Units:ug/Kg
Basis:Dry

Lab Control Sample
RQ1613524-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Chloromethane	8260C	12.8	20.0	64	40-140
Dibromochloromethane	8260C	15.7	20.0	79	40-140
Dibromomethane	8260C	15.4	20.0	77	40-140
Dichlorodifluoromethane (CFC 12)	8260C	12.2	20.0	61	40-140
Dichloromethane	8260C	14.4	20.0	72	40-140
Ethyl Methacrylate	8260C	13.9	20.0	70	40-140
Ethylbenzene	8260C	13.1	20.0	65	40-140
Iodomethane	8260C	36.1	20.0	180 *	40-140
Methacrylonitrile	8260C	13.3	20.0	67	40-140
Methyl Methacrylate	8260C	14.2	20.0	71	40-140
Naphthalene	8260C	15.1	20.0	75	40-140
Propionitrile	8260C	70.2	100	70	40-140
Tetrachloroethene (PCE)	8260C	12.9	20.0	64	40-140
Toluene	8260C	13.9	20.0	70	40-140
Trichloroethene (TCE)	8260C	15.2	20.0	76	40-140
Trichlorofluoromethane (CFC 11)	8260C	12.3	20.0	61	40-140
Vinyl Chloride	8260C	14.3	20.0	71	40-140
cis-1,3-Dichloropropene	8260C	14.3	20.0	72	40-140
m,p-Xylenes	8260C	26.9	40.0	67	40-140
o-Xylene	8260C	13.9	20.0	70	40-140
trans-1,2-Dichloroethene	8260C	14.2	20.0	71	40-140
trans-1,3-Dichloropropene	8260C	14.6	20.0	73	40-140



Metals

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: R1611337-MB

Service Request: R1611337
Date Collected: NA
Date Received: NA
Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.0	0.4	1	10/31/16 18:30	10/28/16	
Arsenic, Total	6010C	ND U	mg/Kg	1.0	0.3	1	11/02/16 10:34	10/28/16	
Barium, Total	6010C	ND U	mg/Kg	2.0	0.2	1	10/31/16 18:30	10/28/16	
Beryllium, Total	6010C	ND U	mg/Kg	0.30	0.02	1	10/31/16 18:30	10/28/16	
Cadmium, Total	6010C	ND U	mg/Kg	0.50	0.04	1	10/31/16 18:30	10/28/16	
Chromium, Total	6010C	ND U	mg/Kg	1.0	0.2	1	10/31/16 18:30	10/28/16	
Lead, Total	6010C	ND U	mg/Kg	5.0	0.3	1	10/31/16 18:30	10/28/16	
Mercury, Total	7471B	ND U	mg/Kg	5.5	0.5	1	10/31/16 10:28	10/28/16	
Nickel, Total	6010C	0.6 J	mg/Kg	4.0	0.2	1	10/31/16 18:30	10/28/16	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	10/31/16 18:30	10/28/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	10/31/16 18:30	10/28/16	
Thallium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	10/31/16 18:30	10/28/16	
Vanadium, Total	6010C	ND U	mg/Kg	5.0	0.2	1	10/31/16 18:30	10/28/16	
Zinc, Total	6010C	0.8 J	mg/Kg	2.0	0.2	1	10/31/16 18:30	10/28/16	

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request:R1611337
Date Collected:10/23/16
Date Received:10/26/16
Date Analyzed:10/31/16 - 11/04/16

Matrix Spike Summary
Inorganic Parameters

Sample Name: 1610231126 1BC7351
Lab Code: R1611337-009

Units:mg/Kg
Basis:Dry

Matrix Spike
R1611337-009MS

Analyte Name	Method	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Silver, Total	6010C	ND U	4.5	5.1	89	75-125
Arsenic, Total	6010C	5.8	10	4.1	102	75-125
Barium, Total	6010C	204	510	204	151 *	75-125
Beryllium, Total	6010C	0.45	5.30	5.09	95	75-125
Cadmium, Total	6010C	0.34 J	4.78	5.09	87	75-125
Chromium, Total	6010C	12.9	33.7	20.4	102	75-125
Mercury, Total	7471B	ND U	ND U	0.2	109	75-125
Nickel, Total	6010C	10.1	54.1	50.9	86	75-125
Lead, Total	6010C	9.7	55.5	50.9	90	75-125
Antimony, Total	6010C	ND U	43.7	50.9	86	75-125
Selenium, Total	6010C	1.2	96.9	103	93	75-125
Thallium, Total	6010C	ND U	187	204	92	75-125
Vanadium, Total	6010C	12.5	63.9	50.9	101	75-125
Zinc, Total	6010C	44.3	86.8	50.9	83	75-125

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16
Date Analyzed: 10/31/16 - 11/04/16

Replicate Sample Summary
Inorganic Parameters

Sample Name: 1610231126 1BC7351
Lab Code: R1611337-009

Units: mg/Kg
Basis: Dry

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate	Average	RPD	RPD Limit
					Sample R1611337-009DUP Result			
Antimony, Total	6010C	6.1	0.5	ND U	0.6 J	NC	NC	20
Arsenic, Total	6010C	1.0	0.3	5.8	4.7	5.26	21 *	20
Barium, Total	6010C	2.0	0.2	204	191	197	6	20
Beryllium, Total	6010C	0.31	0.02	0.45	0.45	0.454	<1	20
Cadmium, Total	6010C	0.51	0.04	0.34 J	0.32 J	0.330	5	20
Chromium, Total	6010C	1.0	0.2	12.9	11.6	12.2	11	20
Lead, Total	6010C	5.1	0.3	9.7	8.9	9.31	9	20
Mercury, Total	7471B	5.7	0.6	ND U	ND U	NC	NC	35
Nickel, Total	6010C	4.1	0.2	10.1	10	10.0	<1	20
Selenium, Total	6010C	1.0	0.7	1.2	1.3	1.23	8	20
Silver, Total	6010C	1.0	0.5	ND U	ND U	NC	NC	20
Thallium, Total	6010C	5.1	2.6	ND U	ND U	NC	NC	20
Vanadium, Total	6010C	5.1	0.2	12.5	11.9	12.2	5	20
Zinc, Total	6010C	2.0	0.2	44.3	44.7	44.5	<1	20

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611337
Date Analyzed: 10/31/16 - 11/02/16

Lab Control Sample Summary
Inorganic Parameters

Units:mg/Kg
Basis:Dry

Lab Control Sample
R1611337-LCS

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Antimony, Total	6010C	44.8	50.0	90	80-120
Arsenic, Total	6010C	3.7	4.0	92	80-120
Barium, Total	6010C	200	200	100	80-120
Beryllium, Total	6010C	4.58	5.00	92	80-120
Cadmium, Total	6010C	4.70	5.00	94	80-120
Chromium, Total	6010C	20.3	20.0	102	80-120
Lead, Total	6010C	47.6	50.0	95	80-120
Mercury, Total	7471B	ND U	0.2	102	80-120
Nickel, Total	6010C	49.2	50.0	98	80-120
Selenium, Total	6010C	85.3	101	84	80-120
Silver, Total	6010C	4.6	5.0	92	80-120
Thallium, Total	6010C	175	200	88	80-120
Vanadium, Total	6010C	49.2	50.0	98	80-120
Zinc, Total	6010C	48.1	50.0	96	80-120



General Chemistry

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16
Date Analyzed: 10/28/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1610231120 1BC7351
Lab Code: R1611337-007

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>Sample Result</u>	<u>Duplicate Sample R1611337-007DUP Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	96.3	96.0	96.1	<1	20

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ALS Group USA, Corp.

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QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611337
Date Collected: 10/23/16
Date Received: 10/26/16
Date Analyzed: 10/28/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1610231126 1BC7351
Lab Code: R1611337-009

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>MDL</u>	<u>Sample Result</u>	<u>Duplicate Sample R1611337-009DUP Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	-	95.3	94.5	94.9	<1	20

Results flagged with an asterisk (*) indicate values outside control criteria.

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Subcontracted Analytical Parameters

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November 2, 2016

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ALS Environmental
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Certificate of Analysis

Project Name:	TCLP Metals - no J values	Workorder:	2185326
Purchase Order:	58R1611337	Workorder ID:	R1611337

Dear Reports Invoices:

Enclosed are the analytical results for samples received by the laboratory on Friday, October 28, 2016.

The ALS Environmental laboratory in Middletown, Pennsylvania is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Mr. Brad W Kintzer (Project Coordinator) at (717) 944-5541.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state requirements. The test results meet requirements of the current NELAP standards or state requirements, where applicable. For a specific list of accredited analytes, refer to the certifications section of the ALS website at www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads.

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ALS Spring City: 10 Riverside Drive, Spring City, PA 19475 610-948-4903

CC: Ms. Ellen Smith , Ms. Janice Jaeger

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.


Mr. Brad W Kintzer
Project Coordinator

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SAMPLE SUMMARY

Workorder: 2185326 R1611337

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
2185326001	1610231103 IBC7350	Solid	10/23/2016 00:00	10/28/2016 08:48	Collected by Client
2185326002	1610231107 IBC7349	Solid	10/23/2016 00:00	10/28/2016 08:48	Collected by Client
2185326003	1610231129 IBC7351	Solid	10/23/2016 00:00	10/28/2016 08:48	Collected by Client
2185326004	1610231130 IBC7351	Solid	10/23/2016 00:00	10/28/2016 08:48	Collected by Client

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SAMPLE SUMMARY

Workorder: 2185326 R1611337

Notes

- Samples collected by ALS personnel are done so in accordance with the procedures set forth in the ALS Field Sampling Plan (20 - Field Services Sampling Plan).
- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
- The Chain of Custody document is included as part of this report.
- All Library Search analytes should be regarded as tentative identifications based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.
- Parameters identified as "analyze immediately" require analysis within 15 minutes of collection. Any "analyze immediately" parameters not listed under the header "Field Parameters" are performed in the laboratory and are therefore analyzed out of hold time.
- Method references listed on this report beginning with the prefix "S" followed by a method number (such as S2310B-97) refer to methods from "Standard Methods for the Examination of Water and Wastewater".
- For microbiological analyses, the "Prepared" value is the date/time into the incubator and the "Analyzed" value is the date/time out the incubator.

Standard Acronyms/Flags

J	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
N	Indicates presumptive evidence of the presence of a compound
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference
LOD	DoD Limit of Detection
LOQ	DoD Limit of Quantitation
DL	DoD Detection Limit
I	Indicates reported value is greater than or equal to the Method Detection Limit (MDL) but less than the Report Detection Limit (RDL)
(S)	Surrogate Compound
NC	Not Calculated
*	Result outside of QC limits

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ANALYTICAL RESULTS

Workorder: 2185326 R1611337

Lab ID: **2185326001** Date Collected: 10/23/2016 00:00 Matrix: Solid
Sample ID: **1610231103 IBC7350** Date Received: 10/28/2016 08:48

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	3.1		%	0.1	S2540G-11			10/30/16 20:30	KAM	A
Total Solids	96.9		%	0.1	S2540G-11			10/30/16 20:30	KAM	A
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:18	SRT	A2
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:18	SRT	A2
Barium, Total	ND		mg/L	2.8	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:18	SRT	A2
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:18	SRT	A2
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:18	SRT	A2
Chromium, Total	ND		mg/L	0.028	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:18	SRT	A2
Lead, Total	ND		mg/L	0.033	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:18	SRT	A2
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	11/1/16 01:00	MNP	11/1/16 14:46	MNP	A1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:18	SRT	A2
Selenium, Total	ND		mg/L	0.11	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:18	SRT	A2
Silver, Total	ND		mg/L	0.022	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:18	SRT	A2
Thallium, Total	ND		mg/L	0.11	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:18	SRT	A2
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:18	SRT	A2
Zinc, Total	ND		mg/L	0.11	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:18	SRT	A2



Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2185326 R1611337

Lab ID: **2185326002** Date Collected: 10/23/2016 00:00 Matrix: Solid
Sample ID: **1610231107 IBC7349** Date Received: 10/28/2016 08:48

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	5.2		%	0.1	S2540G-11			10/30/16 20:30	KAM	A
Total Solids	94.8		%	0.1	S2540G-11			10/30/16 20:30	KAM	A
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:22	SRT	A2
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:22	SRT	A2
Barium, Total	ND		mg/L	2.8	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:22	SRT	A2
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:22	SRT	A2
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:22	SRT	A2
Chromium, Total	ND		mg/L	0.028	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:22	SRT	A2
Lead, Total	ND		mg/L	0.033	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:22	SRT	A2
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	11/1/16 01:00	MNP	11/1/16 14:49	MNP	A1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:22	SRT	A2
Selenium, Total	ND		mg/L	0.11	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:22	SRT	A2
Silver, Total	ND		mg/L	0.022	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:22	SRT	A2
Thallium, Total	ND		mg/L	0.11	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:22	SRT	A2
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:22	SRT	A2
Zinc, Total	ND		mg/L	0.11	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:22	SRT	A2



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Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2185326 R1611337

Lab ID: **2185326003** Date Collected: 10/23/2016 00:00 Matrix: Solid
Sample ID: **1610231129 IBC7351** Date Received: 10/28/2016 08:48

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	4.0		%	0.1	S2540G-11			10/30/16 20:30	KAM	A
Total Solids	96.0		%	0.1	S2540G-11			10/30/16 20:30	KAM	A
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:26	SRT	A2
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:26	SRT	A2
Barium, Total	3.6		mg/L	2.8	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:26	SRT	A2
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:26	SRT	A2
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:26	SRT	A2
Chromium, Total	ND		mg/L	0.028	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:26	SRT	A2
Lead, Total	ND		mg/L	0.033	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:26	SRT	A2
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	11/1/16 01:00	MNP	11/1/16 14:50	MNP	A1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:26	SRT	A2
Selenium, Total	ND		mg/L	0.11	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:26	SRT	A2
Silver, Total	ND		mg/L	0.022	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:26	SRT	A2
Thallium, Total	ND		mg/L	0.11	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:26	SRT	A2
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:26	SRT	A2
Zinc, Total	ND		mg/L	0.11	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:26	SRT	A2


Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2185326 R1611337

 Lab ID: **2185326004** Date Collected: 10/23/2016 00:00 Matrix: Solid
 Sample ID: **1610231130 IBC7351** Date Received: 10/28/2016 08:48

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	4.8		%	0.1	S2540G-11			10/30/16 20:30	KAM	A
Total Solids	95.2		%	0.1	S2540G-11			10/30/16 20:30	KAM	A
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:37	SRT	A1
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:37	SRT	A1
Barium, Total	3.1		mg/L	2.8	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:37	SRT	A1
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:37	SRT	A1
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:37	SRT	A1
Chromium, Total	ND		mg/L	0.028	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:37	SRT	A1
Lead, Total	ND		mg/L	0.033	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:37	SRT	A1
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	11/1/16 08:30	MNP	11/1/16 15:08	MNP	A2
Nickel, Total	ND		mg/L	0.11	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:37	SRT	A1
Selenium, Total	ND		mg/L	0.11	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:37	SRT	A1
Silver, Total	ND		mg/L	0.022	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:37	SRT	A1
Thallium, Total	ND		mg/L	0.11	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:37	SRT	A1
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:37	SRT	A1
Zinc, Total	ND		mg/L	0.11	SW846 6010C	11/1/16 05:15	TSS	11/1/16 12:37	SRT	A1



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Project Coordinator

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QUALITY CONTROL DATA

Workorder: 2185326 R1611337

QC Batch: MDIG/60546 **Analysis Method:** SW846 7470A

QC Batch Method: SW846 7470A

Associated Lab Samples: 2185326001, 2185326002, 2185326003

METHOD BLANK: 2432319

Parameter	Blank Result	Units	Reporting Limit
Mercury, Total	ND	mg/L	0.0020

LABORATORY CONTROL SAMPLE: 2432320

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Mercury, Total	99	mg/L	.002	ND	85 - 115

MATRIX SPIKE: 2432321 DUPLICATE: 2432322 ORIGINAL: 2185326003

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Mercury, Total	0	mg/L	.005	.00499	.00508	99.8	102	70 - 130	1.79	20

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QUALITY CONTROL DATA

Workorder: 2185326 R1611337

QC Batch: MDIG/60550 **Analysis Method:** SW846 6010C

QC Batch Method: SW846 3015

Associated Lab Samples: 2185326001, 2185326002, 2185326003, 2185326004

METHOD BLANK: 2432634

Parameter	Blank Result	Units	Reporting Limit
Antimony, Total	ND	mg/L	0.030
Arsenic, Total	ND	mg/L	0.028
Barium, Total	ND	mg/L	0.56
Beryllium, Total	ND	mg/L	0.0044
Cadmium, Total	ND	mg/L	0.0022
Chromium, Total	ND	mg/L	0.0056
Lead, Total	ND	mg/L	0.0067
Nickel, Total	ND	mg/L	0.022
Selenium, Total	ND	mg/L	0.022
Silver, Total	ND	mg/L	0.0044
Thallium, Total	ND	mg/L	0.022
Vanadium, Total	ND	mg/L	0.0056
Zinc, Total	ND	mg/L	0.022

LABORATORY CONTROL SAMPLE: 2432635

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Antimony, Total	98.8	mg/L	.22	0.22	80 - 120
Arsenic, Total	99.9	mg/L	.11	0.11	80 - 120
Barium, Total	104	mg/L	1.1	1.2	80 - 120
Beryllium, Total	103	mg/L	.22	0.23	80 - 120
Cadmium, Total	101	mg/L	.11	0.11	80 - 120
Chromium, Total	103	mg/L	.11	0.11	80 - 120
Lead, Total	104	mg/L	.11	0.12	80 - 120
Nickel, Total	100	mg/L	1.1	1.1	80 - 120
Selenium, Total	98.5	mg/L	1.1	1.1	80 - 120
Silver, Total	101	mg/L	.11	0.11	80 - 120
Thallium, Total	103	mg/L	.11	0.11	80 - 120
Vanadium, Total	102	mg/L	.056	0.057	80 - 120
Zinc, Total	102	mg/L	.56	0.57	80 - 120

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QUALITY CONTROL DATA

Workorder: 2185326 R1611337

MATRIX SPIKE: 2432636 DUPLICATE: 2432637 ORIGINAL: 2185326003

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Arsenic, Total	.02167	mg/L	5	4.73717	5.34161	94.3	106	50 - 150	12	20
Barium, Total	3.58385	mg/L	10	13.09987	13.88319	95.2	103	50 - 150	5.81	20
Cadmium, Total	0	mg/L	1	.95277	1.0711	95.3	107	50 - 150	11.7	20
Chromium, Total	.00056	mg/L	5	4.76106	4.97606	95.2	99.5	50 - 150	4.42	20
Lead, Total	.00333	mg/L	5	4.53051	5.05106	90.5	101	50 - 150	10.9	20
Selenium, Total	.00944	mg/L	1	.9311	1.05443	92.2	104	50 - 150	12.4	20
Silver, Total	0	mg/L	1	.96999	1.02499	97	102	50 - 150	5.51	20

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QUALITY CONTROL DATA

Workorder: 2185326 R1611337

QC Batch: MDIG/60557 **Analysis Method:** SW846 7470A
QC Batch Method: SW846 7470A
Associated Lab Samples: 2185326004

METHOD BLANK: 2432706

Parameter	Blank Result	Units	Reporting Limit
Mercury, Total	ND	mg/L	0.0020

LABORATORY CONTROL SAMPLE: 2432707

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Mercury, Total	103	mg/L	.002	0.0021	85 - 115

MATRIX SPIKE: 2432708 DUPLICATE: 2432709 ORIGINAL: 2185326004

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Mercury, Total	0	mg/L	.005	.00521	.00514	104	103	70 - 130	1.35	20

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QUALITY CONTROL DATA

Workorder: 2185326 R1611337

QC Batch: WETC/178204 **Analysis Method:** S2540G-11

QC Batch Method: S2540G-11

Associated Lab Samples: 2185326001, 2185326002, 2185326003, 2185326004

SAMPLE DUPLICATE: 2431940 ORIGINAL: 2185454001

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	1.7964	%	4.6511	88.6*	10
Total Solids	98.2035	%	95.3488	2.95	5

SAMPLE DUPLICATE: 2431941 ORIGINAL: 2184643001

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	5.1724	%	4.2682	19.2*	10
Total Solids	94.8275	%	95.7317	.95	5

SAMPLE DUPLICATE: 2431942 ORIGINAL: 2185488002

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	18.7416	%	20.8658	10.7*	10
Total Solids	81.2583	%	79.1341	2.65	5

SAMPLE DUPLICATE: 2431943 ORIGINAL: 2185439004

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	10.2877	%	10.587	2.87	10
Total Solids	89.7122	%	89.4129	.33	5

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Workorder: 2185326 R1611337

Lab ID	Sample ID	Prep Method	Prep Batch	Analysis Method	Analysis Batch
2185326001	1610231103 IBC7350			S2540G-11	WETC/178204
2185326002	1610231107 IBC7349			S2540G-11	WETC/178204
2185326003	1610231129 IBC7351			S2540G-11	WETC/178204
2185326004	1610231130 IBC7351			S2540G-11	WETC/178204
2185326001	1610231103 IBC7350	SW846 7470A	MDIG/60546	SW846 7470A	META/54808
2185326002	1610231107 IBC7349	SW846 7470A	MDIG/60546	SW846 7470A	META/54808
2185326003	1610231129 IBC7351	SW846 7470A	MDIG/60546	SW846 7470A	META/54808
2185326001	1610231103 IBC7350	SW846 3015	MDIG/60550	SW846 6010C	META/54803
2185326002	1610231107 IBC7349	SW846 3015	MDIG/60550	SW846 6010C	META/54803
2185326003	1610231129 IBC7351	SW846 3015	MDIG/60550	SW846 6010C	META/54803
2185326004	1610231130 IBC7351	SW846 3015	MDIG/60550	SW846 6010C	META/54803
2185326004	1610231130 IBC7351	SW846 7470A	MDIG/60557	SW846 7470A	META/54808

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ALS Environmental Chain of Custody

1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475



Project Number: R1611337
 Project Manager: Janice Jaeger
 QAP: LAB QAP

Lab Code	Sample ID	# of Cont.	Matrix	Sample Time		Lab ID	ALS Code									
				Date	Time		A8 TCLP 6010C	A5 TCLP 6010C	Ba TCLP 6010C	Ba TCLP 6010C	Ba TCLP 6010C	Cd TCLP 6010C	Cr TCLP 6010C	Hg TCLP 7470A	Ni TCLP 6010C	Pb TCLP 6010C
[REDACTED]	1610231103 1BC7350	1	Soil	10/23/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X
[REDACTED]	1610231107 1BC7349	1	Soil	10/23/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X
[REDACTED]	1610231129 1BC7351	2	Soil	10/23/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X
R1611337-010	1610231130 1BC7351	1	Soil	10/23/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X

Y N Initials Cooler Temp: 3 °C

Custody Seals Present? Y

(if present) Seals intact? Y

Received on Ice? Y

COC/Lbls Complete Y

Cont in Good Cond? Y

Correct Containers? Y

Correct Samp Vol? Y

Correct Preservation? Y

Headspace/Volatiles? Y

Therm ID: 77-352

Ship Carrier: FedEx UPS

Tracking # 6826 8016 8955

AG
 10/25/16

Folder Comments:
 ND U

Special Instructions/Comments H - Test is On Hold P - Test is Authorized for Prep Only	Turnaround Requirements <input type="checkbox"/> RUSH (Surcharges Apply) PLEASE CIRCLE WORK DAYS 1 2 3 4 5 <input checked="" type="checkbox"/> STANDARD Requested FAX Date: _____ Requested Report Date: <u>11/04/16</u>	Report Requirements <input type="checkbox"/> I. Results Only <input checked="" type="checkbox"/> II. Results + QC Summaries <input type="checkbox"/> III. Results + QC and Calibration Summaries <input type="checkbox"/> IV. Data Validation Report with Raw Data PQL/MDL/1 <u>Y</u> EDD <u>Y</u>	Invoice Information PO# 58R1611337 Bill to _____
--	--	--	--

Relinquished By: P-J 10-27-16 1440 Received By: [Signature] 10/28/16 0848 Airbill Number: _____

2185326

1610231103	1610231103 IBC7350		Soil	10/23/16	Middletown ALS	Sb TCLP 6010C	X	Sr TCLP 6010C	X	Tl TCLP EPA 1311	X	Pb TCLP 6010C	X	V TCLP 6010C	X	Zn TCLP 6010C	X
1610231107	1610231107 IBC7349		Soil	10/23/16	Middletown ALS		X		X		X		X		X		X
1611337-011	1610231129 IBC7351		Soil	10/23/16	Middletown ALS		X		X		X		X		X		X
1611330-012	1610231130 IBC7351		Soil	10/23/16	Middletown ALS		X		X		X		X		X		X

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Chemistry and Chemical Engineering Division
Department of Analytical & Environmental Chemistry

October 18, 2016

Navarro Research and Engineering Inc.
NASA - JSC - White Sands Test Facility
Transportation Officer, Building 120
12600 NASA Road
Las Cruces, NM 88012
Tel. 575-524-5452

Attention: Tom Hall

Subject: Reports for Batch-607-#717-IBC for NDMA/DMN Analysis of Soil Samples

SwRI Project #: 01.16988.103

SwRI Task Orders: **161005-5**

Navarro P.O. #: 15EC092B

Dear Tom,

Enclosed please find the analytical reports for Batch-607-#717-IBC-Navarro of soil samples.

Southwest Research Institute appreciates the opportunity to provide the service to Navarro Research and Engineering Inc.. If you have any questions, please do not hesitate to call me at 210-522-3954.

Sincerely,



Gang Sun, Ph.D.
Program Manager

APPROVAL:


For Michael Dammann
Director



CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161005-5
NAVARRO PO #: 15EC092B

NARRATIVE

(M-607 - #717-IBC-Navarro)

Total Page Count: 010001 -
Fraction: 1001 Pages: 010024
NDM/DMM/Orumaci

CLIENT: NAVARRO
SwRI PROJECT: 01.16988.01.103
BATCH #: Batch-607-#717-IBC
TASK ORDER: 161005-5
CLIENT PO#: 15EC092B
REPORT DATA: 10/18/2016

NARRATIVE FOR NDMA/ DMN/BROMACIL ANALYSIS

1. Samples were extracted with dichloromethane (DCM) and analyzed by GC/MS in selective ion monitoring mode for N-Nitrosodimethylamine (NDMA) and N-Nitrodimethylamine (DMN) according to the modified Method 607.
2. All samples were extracted within 14 days for soil sample of sample collection and were analyzed within 40 days after the extraction.
3. The response factor (RF) values for Calibration curve and/or for continuing calibration standard were less than 25 % for all target compounds. The sample reporting limit is 0.33 ppb for 30 g extracted soil samples.
4. Both blank spike and matrix spike samples were spiked at 17 ppb for soil sample, then extracted and analyzed. The recoveries for all target compounds were within method recovery criteria of 13-110% for NDMA, 30-150% for DMN, and 40-190% for Bromacil, respectively. The soil sample result is reported as received basis and not by dry weight.
5. Surrogate compound was spiked into every sample before sample extraction at 17 ppb for soil sample. The surrogate recoveries for all samples were within method recovery criteria of 40-160%.
6. Laboratory blanks were extracted and analyzed for every sample batch. No analytes were detected above report limits from the blanks.
7. A "J" value was reported if the associated value was below reporting limits but above the MDL value.
8. All analyte concentrations are expressed in ng/g (*ppb*). Sample calculation:

$$\text{for soil: Concentration } (\mu\text{g/kg}) = \frac{C \text{ (ng/}\mu\text{L)} \times V_{\text{extr}} \text{ (}\mu\text{L)} \times \text{DF}}{W_{\text{samp}} \text{ (g)}} \times \frac{1000 \text{ g}}{1 \text{ kg}} \times \frac{1 \mu\text{g}}{1000 \text{ ng}}$$

where:

C	=	result of GC/MS analysis, in ng/ μ L
V_{extr}	=	final volume of sample extract, in μ L
V_{samp}	=	aqueous sample volume taken for extraction, in mL
W_{samp}	=	soil sample weight taken for extraction, in gram
DF	=	dilution factor, if any

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161005-5
NAVARRO PO #: 15EC092B

TASK ORDER AND CHAIN OF CUSTODY

Southwest Research Institute

Laboratory Task Order

TO #: 161005-5 Revision: 1

SDG: 604789

SRR #'s: 58458
Client(s): NavarroProject(s): 16988.01.10X
Manager(s): SUN, GANG
To Client: 10/26/16**Instructions**

Documents Related to this task order: 208573[COC for SRR 58458], 208574[Paperwork for SRR 58458], 108294[PO #179 + #180], 113038[PO #179 + #180 Change Order #1], 113134[PO #NAV0000060], 115908[PO #NAV0000060 CO #1], 117303[PO #NAV0000060 CO #2], 118820[PO #179 + #180 Change Order #2], 120319[PO #104], 122923[PO #179 Change Order #3], 124787[PO #132], 124995[PO #179 Change Order #5]

Deliverables --> Hard Copy: no EDD: -YES- PDF: -YES-

Test: E607S

Holding: 14 days from CED

Section: EXTLAB

EXTRACTION BY METHOD 607.

Cnt: 7

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
604789		1	Soil	1610040803 IBC 7287	04 Oct 16	18 Oct 16
604790		1	Soil	1610040804 IBC 7287	04 Oct 16	18 Oct 16
604791	MS	1	Soil	1610040805 IBC 7287	04 Oct 16	18 Oct 16
604792		1	Soil	1610040821 IBC 7288	04 Oct 16	18 Oct 16
604793		1	Soil	1610040841 IBC 7294	04 Oct 16	18 Oct 16
604794		1	Soil	1610040851 IBC 7295	04 Oct 16	18 Oct 16
604795		1	Soil	1610040901 IBC 7296	04 Oct 16	18 Oct 16

Test: T607W

Holding: 40 days from VTSR

Section: TDG

NDMA/DMN ANALYSIS BY GC/MS/SIM

Cnt: 7

System ID	Type	Cont	Matrix	Customer ID	VTSR	Method Date
604789		1	Soil	1610040803 IBC 7287	05 Oct 16	14 Nov 16
604790		1	Soil	1610040804 IBC 7287	05 Oct 16	14 Nov 16
604791	MS	1	Soil	1610040805 IBC 7287	05 Oct 16	14 Nov 16
604792		1	Soil	1610040821 IBC 7288	05 Oct 16	14 Nov 16
604793		1	Soil	1610040841 IBC 7294	05 Oct 16	14 Nov 16
604794		1	Soil	1610040851 IBC 7295	05 Oct 16	14 Nov 16
604795		1	Soil	1610040901 IBC 7296	05 Oct 16	14 Nov 16



Laboratory: Southwest Research Institute		PO #15EC092B		Analytical Requirements			Charge Number (WTSF Use Only)	<u>Special Instructions</u> Return coolers and reusable packaging materials within 14 days as required in statement of work to: Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Lori Minnick
Address shipping questions to: <input type="checkbox"/> Lori Minnick, 575-524-5119 <input checked="" type="checkbox"/> Other <u>Tom Hall</u> , 575-524-5453				NDMA EPA Method 607M 8 oz. Glass Jar, Ice				
Send sample receipt confirmation and analytical reports to: <input type="checkbox"/> Carlyn Tufts, carlyn.a.tufts@nasa.gov <input type="checkbox"/> Shelly Hernandez, shelly.j.hernandez@nasa.gov <input checked="" type="checkbox"/> Tom Hall, tom.a.hall@nasa.gov		# of Containers	Sample Matrix*					
Sample Number	Sample Location							
1610040803	IBC 7287			1	S	X		16EEE4IFW
1610040804	IBC 7287	1	S	X		16EEE4IFW		
1610040805	IBC 7287	1	S	X		16EEE4IFW	Matrix Spike for 1610040803	
1610040821	IBC 7288	1	S	X		16EEE4IFW		
1610040841	IBC 7294	1	S	X		16EEE4IFW		
1610040851	IBC 7295	1	S	X		16EEE4IFW		
1610040901	IBC 7296	1	S	X		16EEE4IFW		
Relinquished By: <i>[Signature]</i>		Date/Time: <u>10-4-2016 (1030)</u>		Accepted By: <i>[Signature]</i>		Date/Time: <u>10-05-16 / 08:30</u>		

* Sample Matrix: A – Aqueous; G – Gaseous; S – Solid

Client: Navarro
 SRR # 58458
 Project # 16988.01.10X
 Case: 15EC092B
 VTSR: 10/05/16
 Sample(s) Received: Intact
 Temperature: 1.8 SN # 021055

NASA-WSTF SHIPPING DOCUMENT

① Rec MR4

SHIPPED FROM: NASA JSC WHITE SANDS TEST FACILITY 12600 NASA ROAD; BLDG. 120 LAS CRUCES, NEW MEXICO 88012		WSTF ORIGINATOR/MAIL CODE/TELEPHONE NO. Tom Hall 575-524-5453	
		ORDER OR CONTRACT NUMBER Navarro PO #15EC092B	SHIPMENT CONTROL NO
SHIP TO: (ADDRESS, PHONE#, POINT OF CONTACT) Southwest Research Institute 6220 Culebra Road San Antonio, TX 782238 Gang Sun 210-522-3954		PROJECT or TASK NUMBER CP.6EE4IFW.0.71 - 16EE4IFW	
		Contain Batteries NO	NO. PKG. 1
		Battery Type-Part # N/A	AUTHORIZED BY: Tom Hall
		DATE SHIPPED 10/4/2016	
		AirBill/ PRO #/Bol #	
		DEPT. Environmental	

ITEM NO.	EQUIPMENT CONTROL NO.	MODEL NO./ STOCK NO./ PART NO.	ITEM NAME - MANUFACTURER'S NAME AND SERIAL NO.	UNIT OF ISSUE	QTY.
1			Soil Samples Navarro PO #15EC092B Line Item #1 NDMA and Bromacil for Soil samples by method 607M	ea.	7

Client: Navarro
 SRR # 58458
 Project # 16988.01.10X
 Case: 15EC092B
 VTSR: 10/05/16
 Sample(s) Received: Intact
 Temperature: 1.8 SN # 021055

JUSTIFICATION FOR SHIPMENT: (MDR #, Return Authorization #'s, Warranty Replacement, Repair, Overage/Shortage, Damage, Recycling)
 Sample for analysis as requested (Navarro PO #15EC092B)

DOT HAZARDOUS MATERIALS INFO; EMERGENCY PHONE NUMBER AND GUIDE NUMBER:
 Not subject to regulation as a hazard material under 49 CFR.

PROPERTY REVIEW: REMOVE EQUIPMENT TAG DO NOT REMOVE EQUIPMENT TAG

PACKED BY:	# CONTAINERS	TYPE CONTAINERS	DIMENSIONS	WEIGHT
Please check off the applicable labels! <input type="checkbox"/> FRAGILE <input checked="" type="checkbox"/> GLASS <input type="checkbox"/> DELICATE <input type="checkbox"/> DO NOT XRAY <input checked="" type="checkbox"/> REFRIGERATE <input type="checkbox"/> OTHER <input checked="" type="checkbox"/> BUBBLEWRAP <input checked="" type="checkbox"/> FOAM	7	Glass Containers	7 ea. 8 oz. Glass Jars	
	TOTAL CONTAINERS			TOTAL WEIGHT
	7			

RECEIVED BY: <i>David Han</i>	SHIPPERS CERTIFICATION: This is to certify that the above named materials are properly classified, described, packaged, marked, labeled, and are in proper condition for transportation according to the regulations of the D.O.T.
REPRESENTING: SWRI	
Date _____	

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161005-5
NAVARRO PO #: 15EC092B

ANALYTICAL DATA REPORT SHEETS

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1610040803 IBC 7287

Client: Navarro
Batch: M607-#717-IBC
Task Order: NA
Matrix: Soil
Sample Wt/Vol: 30.15 g

Project: 16988.01.103
Date Received: 10/05/16
Date Extracted: 10/11/16
Date Analyzed: 10/18/16
Date Reported: 10/18/16

Lab Sample ID: 604789
Lab File Name: A1017624.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: ng/g
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	1.53	
4164-28-7	N-Nitrodimethylamine	4.21	
314-40-9	Bromacil	0.20	J

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1610040804 IBC 7287

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 604790

Batch: M607-#717-IBC

Date Received: 10/05/16

Lab File Name: A1017625.txt

Task Order: NA

Date Extracted: 10/11/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 10/18/16

Dilution Factor: 1

Sample Wt/Vol: 30.15 g

Date Reported: 10/18/16

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	1.66	
4164-28-7	N-Nitrodimethylamine	4.21	
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1610040821 IBC 7288

Client: Navarro

Batch: M607-#717-IBC

Task Order: NA

Matrix: Soil

Sample Wt/Vol: 30.05 g

Project: 16988.01.103

Date Received: 10/05/16

Date Extracted: 10/11/16

Date Analyzed: 10/18/16

Date Reported: 10/18/16

Lab Sample ID: 604792

Lab File Name: A1017627.txt

Final Extraction Vol: 1000 uL

Dilution Factor: 1

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	72.61	
4164-28-7	N-Nitrodimethylamine	70.58	
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1610040841 IBC 7294

Client: Navarro
Batch: M607-#717-IBC
 Task Order: NA
 Matrix: Soil
 Sample Wt/Vol: 30.07 g

Project: 16988.01.103
 Date Received: 10/05/16
 Date Extracted: 10/11/16
 Date Analyzed: 10/18/16
 Date Reported: 10/18/16

Lab Sample ID: 604793
 Lab File Name: A1017628.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	55.40	
4164-28-7	N-Nitrodimethylamine	16.49	
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1610040851 IBC 7295

Client: Navarro
 Batch: M607-#717-IBC
 Task Order: NA
 Matrix: Soil
 Sample Wt/Vol: 30.08 g

Project: 16988.01.103
 Date Received: 10/05/16
 Date Extracted: 10/11/16
 Date Analyzed: 10/18/16
 Date Reported: 10/18/16

Lab Sample ID: 604794
 Lab File Name: A1017629.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	1.99	
4164-28-7	N-Nitrodimethylamine	0.83	
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1610040901 IBC 7296

Client: Navarro
 Batch: M607-#717-IBC
 Task Order: NA
 Matrix: Soil
 Sample Wt/Vol: 30.11 g

Project: 16988.01.103
 Date Received: 10/05/16
 Date Extracted: 10/11/16
 Date Analyzed: 10/18/16
 Date Reported: 10/18/16

Lab Sample ID: 604795
 Lab File Name: A1017630.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161005-5
NAVARRO PO #: 15EC092B

QA DATA SHEETS

**(BLANK, MATRIX SPIKE, SURROGATE,
CALIBRATION)**

Southwest Research Institute

Method 607 Blank Summary

Blank ID: BLANK_11OCT16

Project: 16988.01.103

Client: Navarro

SDG: 604789

Matrix: Soil

This method blank applies to the following samples, MS, and MSD's

Client Sample ID	Lab Sample ID	Date Acquired	Time Acquired
LCS_11OCT16	605130 LCS	10/18/16	05:04:00
1610040803 IBC 7287	604789	10/18/16	05:38:00
1610040804 IBC 7287	604790	10/18/16	06:12:00
1610040805 IBC 7287	604791 MS	10/18/16	06:46:00
1610040821 IBC 7288	604792	10/18/16	07:19:00
1610040841 IBC 7294	604793	10/18/16	07:53:00
1610040851 IBC 7295	604794	10/18/16	08:27:00
1610040901 IBC 7296	604795	10/18/16	09:01:00

Southwest Research Institute

Method 607 Surrogate Recovery Summary

Client: Navarro

Matrix: Soil

SDG: 604789

Project: 16988.01.103

Client Sample ID	Lab Sample ID	N-Nitroso-di-n-propylamine	
		% Recovery	Recovery Limits
1 BLANK_11OCT16	605129	89	40-160
2 LCS_11OCT16	605130 LCS	87	40-160
3 1610040803 IBC 7287	604789	93	40-160
4 1610040804 IBC 7287	604790	93	40-160
5 1610040805 IBC 7287	604791 MS	91	40-160
6 1610040821 IBC 7288	604792	96	40-160
7 1610040841 IBC 7294	604793	88	40-160
8 1610040851 IBC 7295	604794	93	40-160
9 1610040901 IBC 7296	604795	93	40-160

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

BLANK_11OCT16

Client: Navarro

Project: 16988.01.103

Batch:

Date Received: NA

Task Order:

Date Extracted: 10/11/16

Matrix: Soil

Date Analyzed: 10/18/16

Sample Wt/Vol: 30.00 g

Date Reported:

Lab Sample ID: 605129

Lab File Name: A1017622.txt

Final Extraction Vol: 1000 uL

Dilution Factor: 1

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Client: Navarro
 Batch:
 Task Order:
 Matrix: Soil
 Sample Wt/Vol: 30.00 g

Project: 16988.01.103
 Date Received: NA
 Date Extracted: 10/11/16
 Date Analyzed: 10/18/16
 Date Reported:

Sample ID
LCS_11OCT16
 Lab Sample ID: 605130 L **CS**
 Lab File Name: A1017623.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	13.80	
4164-28-7	N-Nitrodimethylamine	16.00	
314-40-9	Bromacil	19.13	

U - Undetected, indicates not found above the detection limit
J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Blank Spike Recovery Report

Sample ID

LCS_11OCT16

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 605130 LCS

Batch:

Date Received: NA

Blank ID: BLANK_11OCT16

Task Order:

Date Extracted: 10/11/16

Matrix: Soil

Date Analyzed: 10/18/16

Sample Wt/Vol: 30.00 g

Date Reported:

ANALYTE	Spike Added ng/g	Blank Conc ng/g	LCS Conc ng/g	% Recovery	QC % Recovery Limits
N-Nitrosodimethylamine	17	0	14	82	13 - 110
N-Nitrodimethylamine	17	0	16	94	30 - 150
Bromacil	17	0	19	112	40 - 190

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1610040805 IBC 7287 MS

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 604791 MS

Batch: M607-#717-IBC

Date Received: 10/05/16

Lab File Name: A1017626.txt

Task Order: NA

Date Extracted: 10/11/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 10/18/16

Dilution Factor: 1

Sample Wt/Vol: 30.07 g

Date Reported: 10/18/16

Reporting Unit: ng/g

Compared Sample: 1610040803 IBC 7287

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Spike	Recovery	Recovery Limit
62-75-9	N-Nitrosodimethylamine	15.53	17.00	91%	13-110%
4164-28-7	N-Nitrodimethylamine	20.09	17.00	118%	30-150%
314-40-9	Bromacil	21.25	17.00	125%	40-190%

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Initial Calibration Data Sheet

SwRI Project #:	01.16988.01.103	Calibration Data:	10/18/16
Sponsor:	Navarro	Analytical Method:	TAP-01-0408-031
SwRI Standard ID:	202-04-120408017	Std Concentration:	0.01-10 µg/mL

ANALYTE	RRF 0.01	RRF 0.05	RRF 0.2	RRF1	RRF5	RRF10	Ave. RRF	RSD%
N-Nitrosodimethylamine	0.291	0.308	0.352	0.369	0.417	0.430	0.361	15.49
N-Nitrodimethylamine	0.109	0.115	0.128	0.134	0.147	0.148	0.13	12.44
N-Nitroso-di-n-propylamine-d14	0.114	0.111	0.124	0.127	1.143	0.145	0.127	11.03
Bromacil	1.435	1.048	1.072	1.081	1.150	1.177	1.161	12.35

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161005-5
NAVARRO PO #: 15EC092B

EXTRACTION AND INJECTION LOG

(E607S) SOIL Extraction By Soxhlet 3540C (Navarro)

SwRI Labs

Client: Navarro

Project: 16988.01.10X

Case: 15EC092B

Sample Receipt: 58458

TO#: 161005-5

DATE EXTRACTED	10/11/16
ANALYSTS INVOLVED	Christina Menn (SU,SW,Conc,QT,BD,FV) Hamed Edrisi (SU,SP,Conc) Marina Lebron (Conc)
SURROGATE SOL ID	200-01-120408017 @5.0ng/uL
MTX SPK SOL ID	201-01-120408017
EXTRACTS LOCATION	Tracked by LIMS (10/13/16 CM)
CHEMICAL, BRAND & LOT#	Sodium Sulfate ID:04-0402-004 DCM Fisher Optima Lot #164214

NOTES	Wiretol II Micropipette ID: 50&100uL ID:465673(SURR,MS) Balance #61 was used.
ADDITIONAL NOTES	Soxhlet extraction began at 5:00pm and ended the following day at 11:00am.
EXTRACTION FLOWCHART	Xg >>> FV 1000uL DCM
REFERENCE BOOK & PAGE	16-0402-032 P12
TAP(S) USED	01-0402-152

	System ID	Type	Customer ID	SOLVENT VOL DCM (ML)	SAMPLE WT	SURROGATE SOL VOL
1	604789		1610040803 IBC 7287	250	30.15 g	100 uL
2	604790		1610040804 IBC 7287	250	30.15 g	100 uL
3	604791	MS	1610040805 IBC 7287	250	30.07 g	100 uL
4	604792		1610040821 IBC 7288	250	30.05 g	100 uL
5	604793		1610040841 IBC 7294	250	30.07 g	100 uL
6	604794		1610040851 IBC 7295	250	30.08 g	100 uL
7	604795		1610040901 IBC 7296	250	30.11 g	100 uL
8	605129		BLANK_11OCT16	250	30.00 g	100 uL
9	605130		LCS_11OCT16	250	30.00 g	100 uL

	System ID	Type	Customer ID	MTX SPK SOL VOL	FV DCM
1	604789		1610040803 IBC 7287	0 uL	1000 uL
2	604790		1610040804 IBC 7287	0 uL	1000 uL
3	604791	MS	1610040805 IBC 7287	50 uL	1000 uL
4	604792		1610040821 IBC 7288	0 uL	1000 uL
5	604793		1610040841 IBC 7294	0 uL	1000 uL
6	604794		1610040851 IBC 7295	0 uL	1000 uL
7	604795		1610040901 IBC 7296	0 uL	1000 uL
8	605129		BLANK_11OCT16	0 uL	1000 uL
9	605130		LCS_11OCT16	50 uL	1000 uL

Page created Oct 11 2016 11:55AM by mlebron
 Book: EXTRACTION LAB, Volume: EXT-2016, Page: 443 (Section 1 of 1)
 Approved by HAMED EDRISI on Oct 18 2016 12:07PM

Date Printed: 10/18/2016

SOUTHWEST RESEARCH INSTITUTE®

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Chemistry and Chemical Engineering Division
Department of Analytical & Environmental Chemistry

October 27, 2016

Navarro Research and Engineering Inc.
NASA - JSC - White Sands Test Facility
Transportation Officer, Building 120
12600 NASA Road
Las Cruces, NM 88012
Tel. 575-524-5452

Attention: Tom Hall

Subject: Reports for Batch-607-#719-IBC for NDMA/DMN Analysis of Soil Samples

SwRI Project #: 01.16988.103

SwRI Task Orders: **161018-4**

Navarro P.O. #: 15EC092B

Dear Tom,

Enclosed please find the analytical reports for Batch-607-#719-IBC-Navarro of soil samples.

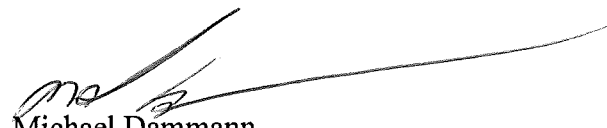
Southwest Research Institute appreciates the opportunity to provide the service to Navarro Research and Engineering Inc.. If you have any questions, please do not hesitate to call me at 210-522-3954.

Sincerely,



Gang Sun, Ph.D.
Program Manager

APPROVAL:



Michael Dammann
Director



CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161018-4
NAVARRO PO #: 15EC092B

NARRATIVE

(M-607 - #719-Navarro-IBC)

Total Page Count: 010001 -
Fraction: 007 Pages: 010032
NDMA/DMN by GC/MS/SM

CLIENT: NAVARRO
SwRI PROJECT: 01.16988.01.103
BATCH #: Batch-607-#719-IBC
TASK ORDER: 161018-4
CLIENT PO#: 15EC092B
REPORT DATA: 10/27/2016

NARRATIVE FOR NDMA/ DMN/BROMACIL ANALYSIS

1. Samples were extracted with dichloromethane (DCM) and analyzed by GC/MS in selective ion monitoring mode for N-Nitrosodimethylamine (NDMA) and N-Nitrodimethylamine (DMN) according to the modified Method 607.
2. All samples were extracted within 14 days for soil sample of sample collection and were analyzed within 40 days after the extraction.
3. The response factor (RF) values for Calibration curve and/or for continuing calibration standard were less than 25 % for all target compounds. The sample reporting limit is 0.33 ppb for 30 g extracted soil samples.
4. Both blank spike and matrix spike samples were spiked at 17 ppb for soil sample, then extracted and analyzed. The recoveries for all target compounds were within method recovery criteria of 13-110% for NDMA, 30-150% for DMN, and 40-190% for Bromacil, respectively. The soil sample result is reported as received basis and not by dry weight.
5. Surrogate compound was spiked into every sample before sample extraction at 17 ppb for soil sample. The surrogate recoveries for all samples were within method recovery criteria of 40-160%.
6. Laboratory blanks were extracted and analyzed for every sample batch. No analytes were detected above report limits from the blanks.
7. A "J" value was reported if the associated value was below reporting limits but above the MDL value.
8. All analyte concentrations are expressed in ng/g (*ppb*). Sample calculation:

$$\text{for soil: Concentration } (\mu\text{g/kg}) = \frac{C \text{ (ng/}\mu\text{L)} \times V_{\text{extr}} \text{ (}\mu\text{L)} \times \text{DF}}{W_{\text{samp}} \text{ (g)}} \times \frac{1000 \text{ g}}{1 \text{ kg}} \times \frac{1 \mu\text{g}}{1000 \text{ ng}}$$

where:

C	=	result of GC/MS analysis, in ng/μL
V _{extr}	=	final volume of sample extract, in μL
V _{samp}	=	aqueous sample volume taken for extraction, in mL
W _{samp}	=	soil sample weight taken for extraction, in gram
DF	=	dilution factor, if any

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161018-4
NAVARRO PO #: 15EC092B

TASK ORDER AND CHAIN OF CUSTODY

Southwest Research Institute

Laboratory Task Order

TO #: 161018-4 Revision: 1

SDG: 605385

SRR #s: 58534

Client(s): Navarro

Project(s): 16988.01.10X
Manager(s): SUN, GANG
To Client: 11/08/16**Instructions**

Documents Related to this task order: 209459[COC for SRR 58534], 209460[Paperwork for SRR 58534], 108294[PO #179 + #180], 113038[PO #179 + #180 Change Order #1], 113134[PO #NAV0000060], 115908[PO #NAV0000060 CO #1], 117303[PO #NAV0000060 CO #2], 118820[PO #179 + #180 Change Order #2], 120319 [PO #104], 122923[PO #179 Change Order #3], 124787[PO #132], 124995[PO #179 Change Order #5]

Deliverables --> Hard Copy: no EDD: -YES- PDF: -YES-

Test: E607S

Holding: 14 days from CED

Section: EXTLAB

EXTRACTION BY METHOD 607.

Cnt: 11

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
605385		1	Soil	1610140841 (IBC 7338)	14 Oct 16	28 Oct 16
605386		1	Soil	1610130853 (IBC 7321)	13 Oct 16	27 Oct 16
605387		1	Soil	1610130854 IBC (7321)	13 Oct 16	27 Oct 16
605388	MS	1	Soil	1610130855 (IBC 7321)	13 Oct 16	27 Oct 16
605389		1	Soil	1610130906 (IBC 7322)	13 Oct 16	27 Oct 16
605390		1	Soil	1610130916 (IBC 7326)	13 Oct 16	27 Oct 16
605391		1	Soil	1610130941 (IBC 7327)	13 Oct 16	27 Oct 16
605392		1	Soil	1610130946 (IBC 7331)	13 Oct 16	27 Oct 16
605393		1	Soil	1610130951 (IBC 7328)	13 Oct 16	27 Oct 16
605394		1	Soil	1610140831 (IBC 7330)	14 Oct 16	28 Oct 16
605395		1	Soil	1610140836 (IBC 7329)	14 Oct 16	28 Oct 16

Test: T607W

Holding: 40 days from VTSR

Section: TDG

NDMA/DMN ANALYSIS BY GC/MS/SIM

Cnt: 11

System ID	Type	Cont	Matrix	Customer ID	VTSR	Method Date
605385		1	Soil	1610140841 (IBC 7338)	18 Oct 16	27 Nov 16
605386		1	Soil	1610130853 (IBC 7321)	18 Oct 16	27 Nov 16
605387		1	Soil	1610130854 IBC (7321)	18 Oct 16	27 Nov 16
605388	MS	1	Soil	1610130855 (IBC 7321)	18 Oct 16	27 Nov 16
605389		1	Soil	1610130906 (IBC 7322)	18 Oct 16	27 Nov 16
605390		1	Soil	1610130916 (IBC 7326)	18 Oct 16	27 Nov 16
605391		1	Soil	1610130941 (IBC 7327)	18 Oct 16	27 Nov 16
605392		1	Soil	1610130946 (IBC 7331)	18 Oct 16	27 Nov 16
605393		1	Soil	1610130951 (IBC 7328)	18 Oct 16	27 Nov 16
605394		1	Soil	1610140831 (IBC 7330)	18 Oct 16	27 Nov 16
605395		1	Soil	1610140836 (IBC 7329)	18 Oct 16	27 Nov 16



WSTF CHAIN OF CUSTODY RECORD

Date OCTOBER 17 2016

Laboratory: SwRI		PO# 15EC092B		Analytical Requirements						Special Instructions Return coolers and reusable packaging materials within 14 days as required in statement of work to: Return Address: NASA WSTF Environmental Department 12600 NASA Road; Bldg. 120 Las Cruces, NM 88012 Attn: Lori Minnick	
Address shipping questions to: <input type="checkbox"/> Lori Minnick, 575-524-5119 <input checked="" type="checkbox"/> Other <u>Tom Hall, 575-524-5453</u>				EPA Method 607M 8 oz Glass Jar, Ice							Charge Number (WSTF Use Only)
Send sample receipt confirmation and analytical reports to: <input type="checkbox"/> Carlyn Tufts, carlyn.a.tufts@nasa.gov <input type="checkbox"/> Shelly Hernandez, shelly.j.hernandez@nasa.gov <input checked="" type="checkbox"/> Tom Hall, tom.a.hall@nasa.gov		# of Containers	Sample Matrix*								
Sample Number	Sample Location									Comments	
161013 0853	IBC 7321	1	S	X						16EE41FW	
~ 0854	IBC 7321	1	S	X						16EE41FW	
— 0855	IBC 7321	1	S	X						16EE41FW	Matrix Spike for 161013 0853
161013 0906	IBC 7322	1	S	X						16EE41FW	
161013 0916	IBC 7326	1	S	X						16EE41FW	
161013 0941	IBC-7327	1	S	X						16EE41FW	
161013 0946	IBC 7331	1	S	X						16EE41FW	
161013 0951	IBC 7328	1	S	X						16EE41FW	
Relinquished By: <u>[Signature]</u>		Date/Time: <u>10-13-2016 (1030)</u>			Accepted By: <u>[Signature]</u>				Date/Time: <u>10/18/16 08:45</u>		

* Sample Matrix: A – Aqueous; G – Gaseous; S – Solid

Client: Navarro
SRR # 58534
Project # 16988.01.10X
Case: 15EC092B
VTSR: 10/18/16
Sample(s) Received: Intact
Temperature: 2.0 SN # 021055

WSTF CHAIN OF CUSTODY RECORD

Date OCTOBER 17, 2016

Laboratory: SwRI		PO#15EC092B		Analytical Requirements				Special Instructions Return coolers and reusable packaging materials within 14 days as required in statement of work to: Return Address: NASA WSTF Environmental Department 12600 NASA Road; Bldg. 120 Las Cruces, NM 88012 Attn: Lori Minnick
Address shipping questions to: <input type="checkbox"/> Lori Minnick, 575-524-5119 <input checked="" type="checkbox"/> Other <u>Tom Hall, 575-524-5453</u>		# of Containers	Sample Matrix*	EPA Method 607M 8 oz Glass Jar, Ice				
Send sample receipt confirmation and analytical reports to: <input type="checkbox"/> Carlyn Tufts, carlyn.a.tufts@nasa.gov <input type="checkbox"/> Shelly Hernandez, shelly.j.hernandez@nasa.gov <input checked="" type="checkbox"/> Tom Hall, tom.a.hall@nasa.gov								Sample Number		Sample Location	Comments
1610140831	IBC7330	1	S	X				16EEE41FW
1610140836	IBC7329	1	S	X				16EEE41FW
1610140841	IBC7338	1	S	X				16EEE41FW Matrix Spike for 1616
Client: Navarro SRR # 58534 Project # 16988.01.10X Case: 15EC092B VTSR: 10/18/16 Sample(s) Received: Intact Temperature: 2.0 SN # 021055								
Relinquished By: <i>[Signature]</i>		Date/Time: <u>10-14-16 (0900)</u>		Accepted By: <i>[Signature]</i>			Date/Time: <u>10/14/16 08:45</u>	

* Sample Matrix: A – Aqueous; G – Gaseous; S – Solid

NASA-WSTF SHIPPING DOCUMENT

Obwe # -160
L ~~159~~

SHIPPED FROM: NASA JSC WHITE SANDS TEST FACILITY 12600 NASA ROAD; BLDG. 120 LAS CRUCES, NEW MEXICO 88012		WSTF ORIGINATOR/MAIL CODE/TELEPHONE NO. Tom Hall 575-524-5453	
SHIP TO: (ADDRESS, PHONE#, POINT OF CONTACT) Southwest Research Institute 6220 Culebra Road San Antonio, TX 782238 Gang Sun 210-522-3954		ORDER OR CONTRACT NUMBER Navarro PO #15EC092B	SHIPMENT CONTROL NO
		PROJECT or TASK NUMBER CP.6EE4IFW.0.71 - 16EE4IFW	SHIP VIA Fed Ex Air.
		Contain Batteries NO	NO. PKG. 1
		Battery Type-Part # N/A	DATE SHIPPED 10-17-16
		AUTHORIZED BY: Tom Hall	AirBill/ PRO #/Bot #
			DEPT. Environmental

ITEM NO.	EQUIPMENT CONTROL NO.	MODEL NO./ STOCK NO./ PART NO.	ITEM NAME - MANUFACTURER'S NAME AND SERIAL NO.	UNIT OF ISSUE	QTY.
1	Lot-Samples		Soil Samples Navarro PO #15EC092B Line Item #1 NDMA and Bromacil for Soil samples by method 607M	ea.	11

Client: Navarro
 SRR # 58534
 Project # 16988.01.10X
 Case: 15EC092B
 VTSR: 10/18/16
 Sample(s) Received: Intact
 Temperature: 2.0 SN # 021055

JUSTIFICATION FOR SHIPMENT: (MDR #, Return Authorization #'s, Warranty Replacement, Repair, Overage/Shortage, Damage, Recycling)
 Sample for analysis as requested (Navarro PO #15EC092B)

DOT HAZARDOUS MATERIALS INFO; EMERGENCY PHONE NUMBER AND GUIDE NUMBER:
 Not subject to regulation as a hazard material under 49 CFR.

PROPERTY REVIEW: REMOVE EQUIPMENT TAG DO NOT REMOVE EQUIPMENT TAG

PACKED BY:	# CONTAINERS	TYPE CONTAINERS	DIMENSIONS	WEIGHT
Please check off the applicable labels! <input type="checkbox"/> FRAGILE <input checked="" type="checkbox"/> GLASS <input type="checkbox"/> DELICATE <input type="checkbox"/> DO NOT XRAY <input checked="" type="checkbox"/> REFRIGERATE <input type="checkbox"/> OTHER <input checked="" type="checkbox"/> BUBBLEWRAP <input checked="" type="checkbox"/> FOAM		Glass Containers	ea. 8 oz. Glass Jars	
		TOTAL CONTAINERS			TOTAL WEIGHT

RECEIVED BY: <i>David Garcia</i>	SHIPPERS CERTIFICATION: This is to certify that the above named materials are properly classified, described, packaged, marked, labeled, and are in proper condition for transportation according to the regulations of the D.O.T. _____ Date _____
REPRESENTING: <i>SWRI</i>	

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161018-4
NAVARRO PO #: 15EC092B

ANALYTICAL DATA REPORT SHEETS

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1610140841 (IBC 7338)

Client: Navarro

Batch: M607-#719

Task Order: NA

Matrix: Soil

Sample Wt/Vol: 30.25 g

Project: 16988.01.103

Date Received: 10/18/16

Date Extracted: 10/18/16

Date Analyzed: 10/26/16

Date Reported: 10/27/16

Lab Sample ID: 605385

Lab File Name: A1025644.txt

Final Extraction Vol: 1000 uL

Dilution Factor: 1

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit**J - Estimated value, greater than the MDL but less than the PQL**

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1610130853 (IBC 7321)

Client: Navarro

Batch: M607-#719

Task Order: NA

Matrix: Soil

Sample Wt/Vol: 30.17 g

Project: 16988.01.103

Date Received: 10/18/16

Date Extracted: 10/18/16

Date Analyzed: 10/26/16

Date Reported: 10/27/16

Lab Sample ID: 605386

Lab File Name: A1025645.txt

Final Extraction Vol: 1000 uL

Dilution Factor: 1

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1610130854 IBC (7321)

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 605387

Batch: M607-#719

Date Received: 10/18/16

Lab File Name: A1025646.txt

Task Order: NA

Date Extracted: 10/18/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 10/26/16

Dilution Factor: 1

Sample Wt/Vol: 30.21 g

Date Reported: 10/27/16

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1610130906 (IBC 7322)

Client: Navarro
 Batch: M607-#719
 Task Order: NA
 Matrix: Soil
 Sample Wt/Vol: 30.06 g

Project: 16988.01.103
 Date Received: 10/18/16
 Date Extracted: 10/18/16
 Date Analyzed: 10/26/16
 Date Reported: 10/27/16

Lab Sample ID: 605389
 Lab File Name: A1025648.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1610130916 (IBC 7326)

Client: Navarro

Batch: M607-#719

Task Order: NA

Matrix: Soil

Sample Wt/Vol: 30.08 g

Project: 16988.01.103

Date Received: 10/18/16

Date Extracted: 10/18/16

Date Analyzed: 10/26/16

Date Reported: 10/27/16

Lab Sample ID: 605390

Lab File Name: A1025649.txt

Final Extraction Vol: 1000 uL

Dilution Factor: 1

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1610130941 (IBC 7327)

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 605391

Batch: M607-#719

Date Received: 10/18/16

Lab File Name: A1025650.txt

Task Order: NA

Date Extracted: 10/18/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 10/26/16

Dilution Factor: 1

Sample Wt/Vol: 30.03 g

Date Reported: 10/27/16

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1610130946 (IBC 7331)

Client: Navarro

Batch: M607-#719

Task Order: NA

Matrix: Soil

Sample Wt/Vol: 30.36 g

Project: 16988.01.103

Date Received: 10/18/16

Date Extracted: 10/18/16

Date Analyzed: 10/26/16

Date Reported: 10/27/16

Lab Sample ID: 605392

Lab File Name: A1025651.txt

Final Extraction Vol: 1000 uL

Dilution Factor: 1

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit**J - Estimated value, greater than the MDL but less than the PQL**

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1610130951 (IBC 7328)

Client: Navarro

Batch: M607-#719

Task Order: NA

Matrix: Soil

Sample Wt/Vol: 30.16 g

Project: 16988.01.103

Date Received: 10/18/16

Date Extracted: 10/18/16

Date Analyzed: 10/26/16

Date Reported: 10/27/16

Lab Sample ID: 605393

Lab File Name: A1025652.txt

Final Extraction Vol: 1000 uL

Dilution Factor: 1

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1610140831 (IBC 7330)

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 605394

Batch: M607-#719

Date Received: 10/18/16

Lab File Name: A1025653.txt

Task Order: NA

Date Extracted: 10/18/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 10/26/16

Dilution Factor: 1

Sample Wt/Vol: 30.08 g

Date Reported: 10/27/16

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	0.33	
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1610140836 (IBC 7329)

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 605395

Batch: M607-#719

Date Received: 10/18/16

Lab File Name: A1025654.txt

Task Order: NA

Date Extracted: 10/18/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 10/26/16

Dilution Factor: 1

Sample Wt/Vol: 30.03 g

Date Reported: 10/27/16

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161018-4
NAVARRO PO #: 15EC092B

QA DATA SHEETS

**(BLANK, MATRIX SPIKE, SURROGATE,
CALIBRATION)**

Southwest Research Institute

Method 607 Internal Standard Summary

Filename: A10256S2.txt
 Standard ID: IS=ING/UL
 Project: 16988.01.103

Date Analyzed: 10/26/2016
 Time Analyzed: 08:02:00
 Client: Navarro

		IS1		IS2	
		Area	RT	Area	RT
Mid Point Standard		282210	8.4	168312	15.01
Upper Limit		564420	8.73	336624	15.34
Lower Limit		141105	8.07	84156	14.68
Client Sample ID	Lab Sample ID				
BLANK_18OCT16	605450	247040	8.40	152246	15.01
LCS_18OCT16 LCS	605451 LCS	247038	8.40	147275	15.01
1610140841 (IBC 7338)	605385	286170	8.40	161225	15.01
1610130853 (IBC 7321)	605386	273219	8.40	166057	15.01
1610130854 IBC (7321)	605387	265615	8.40	160338	15.02
1610130855 (IBC 7321) MS	605388 MS	264404	8.40	155965	15.01
1610130906 (IBC 7322)	605389	276964	8.40	158322	15.01
1610130916 (IBC 7326)	605390	268368	8.40	156436	15.01
1610130941 (IBC 7327)	605391	275440	8.40	160358	15.01
1610130946 (IBC 7331)	605392	278933	8.40	166055	15.01
1610130951 (IBC 7328)	605393	274855	8.40	160885	15.01
1610140831 (IBC 7330)	605394	272894	8.40	164317	15.01
1610140836 (IBC 7329)	605395	273484	8.40	161243	15.01

IS1 = 1,4-Dichlorobenzene-D4

IS2 = Atrazine-D5

* Flag indicating value is outside QC limits

Southwest Research Institute

Method 607 Blank Summary

Blank ID: BLANK_18OCT16

Project: 16988.01.103

Client: Navarro

SDG: 605385

Matrix: Soil

This method blank applies to the following samples, MS, and MSD's

Client Sample ID	Lab Sample ID	Date Acquired	Time Acquired
LCS_18OCT16	605451 LCS	10/26/16	09:10:00
1610140841 (IBC 7338)	605385	10/26/16	15:27:00
1610130853 (IBC 7321)	605386	10/26/16	16:01:00
1610130854 IBC (7321)	605387	10/26/16	16:35:00
1610130855 (IBC 7321)	605388 MS	10/26/16	17:09:00
1610130906 (IBC 7322)	605389	10/26/16	17:44:00
1610130916 (IBC 7326)	605390	10/26/16	18:18:00
1610130941 (IBC 7327)	605391	10/26/16	18:52:00
1610130946 (IBC 7331)	605392	10/26/16	19:27:00
1610130951 (IBC 7328)	605393	10/26/16	20:01:00
1610140831 (IBC 7330)	605394	10/26/16	20:35:00
1610140836 (IBC 7329)	605395	10/26/16	21:10:00

Southwest Research Institute

Method 607 Surrogate Recovery Summary

Client: Navarro

Matrix: Soil

SDG: 605385

Project: 16988.01.103

Client Sample ID	Lab Sample ID	N-Nitroso-di-n-propylamine	
		% Recovery	Recovery Limits
2 BLANK_18OCT16	605450	93	40-160
3 LCS_18OCT16	605451 LCS	99	40-160
4 1610140841 (IBC 7338)	605385	102	40-160
5 1610130853 (IBC 7321)	605386	106	40-160
6 1610130854 IBC (7321)	605387	103	40-160
7 1610130855 (IBC 7321)	605388 MS	104	40-160
8 1610130906 (IBC 7322)	605389	98	40-160
9 1610130916 (IBC 7326)	605390	102	40-160
10 1610130941 (IBC 7327)	605391	104	40-160
11 1610130946 (IBC 7331)	605392	102	40-160
12 1610130951 (IBC 7328)	605393	101	40-160
13 1610140831 (IBC 7330)	605394	101	40-160
14 1610140836 (IBC 7329)	605395	100	40-160

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

BLANK_18OCT16

Client: Navarro
 Batch: M607-#719
 Task Order: NA
 Matrix: Soil
 Sample Wt/Vol: 30.00 g

Project: 16988.01.103
 Date Received: NA
 Date Extracted: 10/18/16
 Date Analyzed: 10/26/16
 Date Reported: 10/27/16

Lab Sample ID: 605450
 Lab File Name: A1025632.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

LCS_18OCT16

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 605451 LCS

Batch: M607-#719

Date Received: NA

Lab File Name: A1025633.txt

Task Order: NA

Date Extracted: 10/18/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 10/26/16

Dilution Factor: 1

Sample Wt/Vol: 30.00 g

Date Reported: 10/27/16

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	12.83	
4164-28-7	N-Nitrodimethylamine	17.53	
314-40-9	Bromacil	23.97	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Blank Spike Recovery Report

Sample ID

LCS_18OCT16

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 605451 LCS

Batch: M607-#719

Date Received: NA

Blank ID: BLANK_18OCT16

Task Order: NA

Date Extracted: 10/18/16

Matrix: Soil

Date Analyzed: 10/26/16

Sample Wt/Vol: 30.00 g

Date Reported: 10/27/16

ANALYTE	Spike Added ng/g	Blank Conc ng/g	LCS Conc ng/g	% Recovery	QC % Recovery Limits
N-Nitrosodimethylamine	17	0	13	76	13 - 110
N-Nitrodimethylamine	17	0	18	106	30 - 150
Bromacil	17	0	24	141	40 - 190

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1610130855 (IBC 7321) MS

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 605388 MS

Batch: M607-#719

Date Received: 10/18/16

Lab File Name: A1025647.txt

Task Order: NA

Date Extracted: 10/18/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 10/26/16

Dilution Factor: 1

Sample Wt/Vol: 30.17 g

Date Reported: 10/27/16

Reporting Unit: ng/g

Compared Sample: 1610130853 (IBC 7321)

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Spike	Recovery	Recovery Limit
62-75-9	N-Nitrosodimethylamine	13.42	17.00	79%	13-110%
4164-28-7	N-Nitrodimethylamine	16.54	17.00	97%	30-150%
314-40-9	Bromacil	24.13	17.00	142%	40-190%

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Continuing Calibration Check Sheet

SwRI Project #:	01.16988.01.103	Calibration Date:	10/26/16
Sponsor:	Navarro	Analytical Method:	TAP-01-0408-031
SwRI Standard ID:	202-04-120408017	Std Concentration:	1 µg/mL
File ID #:	A10256S2	Initial Calibration Date:	10/17/16

ANALYTE	Mean RRF	RRF	% Dif.
N-Nitrosodimethylamine	0.341	0.386	-6.9
N-Nitrodimethylamine	0.126	0.136	-4.1
N-Nitroso-di-n-propylamine-d14	0.12	0.132	-3.8
Bromacil	0.977	1.082	6.7

Southwest Research Institute

Initial Calibration Data Sheet

SwRI Project #:	01.16988.01.103	Calibration Data:	10/17/16
Sponsor:	Navarro	Analytical Method:	TAP-01-0408-031
SwRI Standard ID:	202-04-120408017	Std Concentration:	0.01-10 µg/mL

ANALYTE	RRF 0.01	RRF 0.05	RRF 0.2	RRF1	RRF5	RRF10	Ave. RRF	RSD%
N-Nitrosodimethylamine	0.291	0.308	0.352	0.369	0.417	0.430	0.361	15.49
N-Nitrodimethylamine	0.109	0.115	0.128	0.134	0.147	0.148	0.13	12.44
N-Nitroso-di-n-propylamine-d14	0.114	0.111	0.124	0.127	1.143	0.145	0.127	11.03
Bromacil	1.435	1.048	1.072	1.081	1.150	1.177	1.161	12.35

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161018-4
NAVARRO PO #: 15EC092B

EXTRACTION AND INJECTION LOG

(E607S) SOIL Extraction By Soxhlet 3540C (Navarro)

SwRI Labs

Client: Navarro

Project: 16988.01.10X

Case: 15EC092B

Sample Receipt: 58534

TO#: 161018-4

DATE EXTRACTED	10/18/16	ADDITIONAL NOTES	1.Soxhlet extraction began at 3:00pm and ended the following day at 8:30am. 2.BLANK(605450) and LCS(605451) are shared with page 458 of this book.
ANALYSTS INVOLVED	Christina Menn (SU,SW,Conc,QT,BD,FV) Hamed Edrisi (SU,SP,Conc) Marina Lebron (Conc)	EXTRACTION FLOWCHART	Xg >>> FV 1000uL DCM
SURROGATE SOL ID	200-01-120408017@5.0ng/uL	REFERENCE BOOK &PAGE	16-0402-032 P21
MTX SPK SOL ID	201-01-120408017@10.0ng/uL	TAP(S)USED	01-0402-152
EXTRACTS LOCATION	Tracked by LIMS (10/21/16 CM)		
CHEMICAL, BRAND & LOT#	Sodium Sulfate ID:04-0402-004 DCM Fisher Optima Lot #164214		
NOTES	Hamilton Co. Syringes: 100uL ID:462905(SURR) 50uL ID:462898(MS) Balance #61 was used.		

System ID	Type	Customer ID	SOLVENT VOL DCM (ML)	SAMPLE WT	SURROGATE SOL VOL
1		1610140841 (IBC 7338)	250	30.25 g	100 uL
2		1610130853 (IBC 7321)	250	30.17 g	100 uL
3		1610130854 IBC (7321)	250	30.21 g	100 uL
4	MS	1610130855 (IBC 7321)	250	30.17 g	100 uL
5		1610130906 (IBC 7322)	250	30.06 g	100 uL
6		1610130916 (IBC 7326)	250	30.08 g	100 uL
7		1610130941 (IBC 7327)	250	30.03 g	100 uL
8		1610130946 (IBC 7331)	250	30.36 g	100 uL
9		1610130951 (IBC 7328)	250	30.16 g	100 uL
10		1610140831 (IBC 7330)	250	30.08 g	100 uL
11		1610140836 (IBC 7329)	250	30.03 g	100 uL
12		BLANK_18OCT16	250	30.00 g	100 uL
13		LCS_18OCT16	250	30.00 g	100 uL

System ID	Type	Customer ID	MTX SPK SOL VOL	FV DCM
1		1610140841 (IBC 7338)	0 uL	1000 uL
2		1610130853 (IBC 7321)	0 uL	1000 uL
3		1610130854 IBC (7321)	0 uL	1000 uL
4	MS	1610130855 (IBC 7321)	50 uL	1000 uL
5		1610130906 (IBC 7322)	0 uL	1000 uL
6		1610130916 (IBC 7326)	0 uL	1000 uL
7		1610130941 (IBC 7327)	0 uL	1000 uL
8		1610130946 (IBC 7331)	0 uL	1000 uL
9		1610130951 (IBC 7328)	0 uL	1000 uL

SwRI Labs
Client: Navarro
Project: 16988.01.10X
Case: 15EC092B

(E607S) SOIL Extraction By Soxhlet 3540C (Navarro)

Sample Receipt: 58534
TO#: 161018-4

	System ID	Type	Customer ID	MTX SPK SOL VOL	FV DCM
10	605394		1610140831 (IBC 7330)	0 uL	1000 uL
11	605395		1610140836 (IBC 7329)	0 uL	1000 uL
12	605450		BLANK_18OCT16	0 uL	1000 uL
13	605451		LCS_18OCT16	50 uL	1000 uL

Page created Oct 18 2016 11:56AM by mlebron
Book: EXTRACTION LAB, Volume: EXT-2016, Page: 460 (Section 2 of 2)
Approved by HAMED EDRISI on Oct 24 2016 2:27PM

Date Printed: 10/27/2016

TITLE M-607

Work continued from Page

START

injlog

Southwest Research Institute GC/MS Injection Log

OPERATOR: GS SEQUENCE DATE: 10/25/16, 10/26/16 INSTRUMENT: Amidala
COLUMN: Agilent 122-0732 DB-1701, 0.25mm * 30m * 0.25um
CARRIER GAS: Helium SOLVENT: DCM
METHOD FILE: MET_607C, MET_607C.M
CLIENT NAME: NAVARRO PROJECT NUMBER: 16988.01.103
SRR: 58534 METHOD: M-607 MATRIX: soil
DATA PATH: C:\MSDCHEM\1\DATA\2016\A102516

OVEN PROGRAM

Initial temp: 40 'C (On)
Initial time: 4.00 min
Ramps:
Rate Final temp Final time
1 15.00 150 0.00
2 25.00 270 10.00
3 0.0(off)
Post temp: 270 'C
Post time: 5.00 min
Run time: 29.80 min

Maximum temp: 350 'C
Equilibration time: 0.50 min

10/27/16

FILENAME	VIAL	DATE/TIME	METHOD	SAMPLE DESCRIPTION
A10256S2	2	10/26/16 08:02	MET_607C	NDMA/DMN/BROMACIL STD 1NG/UL IS=1NG/UL
A1025632	34	10/26/16 08:36	MET_607C	BLANK_18OCT16 IS=0.2NG/L 605450
A1025633	35	10/26/16 09:10	MET_607C	LCS_18OCT16 IS=0.2NG/L 605451
A1025644	46	10/26/16 15:27	MET_607C	1610140841 IBC (7338) IS=0.2NG/L 605385
A1025645	47	10/26/16 16:01	MET_607C	1610130853 IBC (7321) IS=0.2NG/L 605386
A1025646	48	10/26/16 16:35	MET_607C	1610130854 IBC (7321) IS=0.2NG/L 605387
A1025647	49	10/26/16 17:09	MET_607C	1610130855 IBC (7321) IS=0.2NG/L 605388MS
A1025648	50	10/26/16 17:44	MET_607C	1610130906 IBC (7322) IS=0.2NG/L 605389
A1025649	51	10/26/16 18:18	MET_607C	1610130916 IBC (7326) IS=0.2NG/L 605390
A1025650	52	10/26/16 18:52	MET_607C	1610130941 IBC (7327) IS=0.2NG/L 605391
A1025651	53	10/26/16 19:27	MET_607C	1610130946 IBC (7331) IS=0.2NG/L 605392
A1025652	54	10/26/16 20:01	MET_607C	1610130951 IBC (7328) IS=0.2NG/L 605393
A1025653	55	10/26/16 20:35	MET_607C	1610140831 IBC (7330) IS=0.2NG/L 605394
A1025654	56	10/26/16 21:10	MET_607C	1610140836 IBC (7329) IS=0.2NG/L 605395

REVIEWED BY: Alice Yain

DATE: 10/27/16

SIGNATURE

DATE

10/27/16

DISCLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE

SOUTHWEST RESEARCH INSTITUTE®

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Chemistry and Chemical Engineering Division
Department of Analytical & Environmental Chemistry

November 9, 2016

Navarro Research and Engineering Inc.
NASA - JSC - White Sands Test Facility
Transportation Officer, Building 120
12600 NASA Road
Las Cruces, NM 88012
Tel. 575-524-5452

Attention: Tom Hall

Subject: Reports for Batch-607-#721-IBC for NDMA/DMN Analysis of Soil Samples

SwRI Project #: 01.16988.103

SwRI Task Orders: **161026-4**

Navarro P.O. #: 15EC092B

Dear Tom,

Enclosed please find the analytical reports for Batch-607-#721-IBC-Navarro of soil samples.

Southwest Research Institute appreciates the opportunity to provide the service to Navarro Research and Engineering Inc.. If you have any questions, please do not hesitate to call me at 210-522-3954.

Sincerely,



Gang Sun, Ph.D.
Program Manager

APPROVAL:



Michael Dammann
Director



CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161026-4
NAVARRO PO #: 15EC092B

NARRATIVE

(M-607 - #721-Navarro-IBC)

Total Page Count:
Fraction: 607 Pages: 010001-
Report 010024.

CLIENT: NAVARRO
SwRI PROJECT: 01.16988.01.103
BATCH #: Batch-607-#721-IBC
TASK ORDER: 161026-4
CLIENT PO#: 15EC092B
REPORT DATA: 11/09/2016

NARRATIVE FOR NDMA/ DMN/BROMACIL ANALYSIS

1. Samples were extracted with dichloromethane (DCM) and analyzed by GC/MS in selective ion monitoring mode for N-Nitrosodimethylamine (NDMA) and N-Nitrodimethylamine (DMN) according to the modified Method 607.
2. All samples were extracted within 14 days for soil sample of sample collection and were analyzed within 40 days after the extraction.
3. The response factor (RF) values for Calibration curve and/or for continuing calibration standard were less than 25 % for all target compounds. The sample reporting limit is 0.33 ppb for 30 g extracted soil samples.
4. Both blank spike and matrix spike samples were spiked at 17 ppb for soil sample, then extracted and analyzed. The recoveries for all target compounds were within method recovery criteria of 13-110% for NDMA, 30-150% for DMN, and 40-190% for Bromacil, respectively. The soil sample result is reported as received basis and not by dry weight.
5. Surrogate compound was spiked into every sample before sample extraction at 17 ppb for soil sample. The surrogate recoveries for all samples were within method recovery criteria of 40-160%.
6. Laboratory blanks were extracted and analyzed for every sample batch. No analytes were detected above report limits from the blanks.
7. A "J" value was reported if the associated value was below reporting limits but above the MDL value.
8. All analyte concentrations are expressed in ng/g (*ppb*). Sample calculation:

$$\text{for soil: Concentration } (\mu\text{g/kg}) = \frac{C \text{ (ng/}\mu\text{L)} \times V_{\text{extr}} \text{ (}\mu\text{L)} \times \text{DF}}{W_{\text{samp}} \text{ (g)}} \times \frac{1000 \text{ g}}{1 \text{ kg}} \times \frac{1 \mu\text{g}}{1000 \text{ ng}}$$

where:

C	=	result of GC/MS analysis, in ng/ μ L
V_{extr}	=	final volume of sample extract, in μ L
V_{samp}	=	aqueous sample volume taken for extraction, in mL
W_{samp}	=	soil sample weight taken for extraction, in gram
DF	=	dilution factor, if any

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161026-4
NAVARRO PO #: 15EC092B

TASK ORDER AND CHAIN OF CUSTODY

Southwest Research Institute

Laboratory Task Order

TO #: 161026-4 Revision: 0

SDG: 606059

SRR #'s: 58590
Client(s): NavarroProject(s): 16988.01.10X
Manager(s): SUN, GANG
To Client: 11/16/16**Instructions**

Documents Related to this task order: 210005[COC for SRR 58590], 210006[Paperwork for SRR 58590], 108294[PO #179 + #180], 113038[PO #179 + #180 Change Order #1], 113134[PO #NAV0000060], 115908[PO #NAV0000060 CO #1], 117303[PO #NAV0000060 CO #2], 118820[PO #179 + #180 Change Order #2], 120319 [PO #104], 122923[PO #179 Change Order #3], 124787[PO #132], 124995[PO #179 Change Order #5]

Deliverables --> Hard Copy: no EDD: -YES- PDF: -YES-

Test: E607S

Holding: 14 days from CED

Section: EXTLAB

EXTRACTION BY METHOD 607.

Cnt: 5

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
606059		1	Soil	1610231101 (IBC 7350)	23 Oct 16	06 Nov 16
606060		1	Soil	1610231105 (IBC 7349)	23 Oct 16	06 Nov 16
606061		1	Soil	1610231123 (IBC 7351)	23 Oct 16	06 Nov 16
606062		1	Soil	1610231124 (IBC 7351)	23 Oct 16	06 Nov 16
606063	MS	1	Soil	1610231125 (IBC 7351)	23 Oct 16	06 Nov 16

Test: T607W

Holding: 40 days from VTSR

Section: TDG

NDMA/DMN ANALYSIS BY GC/MS/SIM

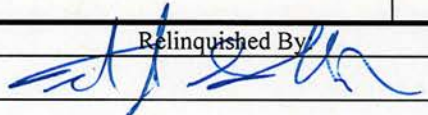
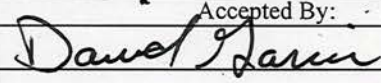
Cnt: 5

System ID	Type	Cont	Matrix	Customer ID	VTSR	Method Date
606059		1	Soil	1610231101 (IBC 7350)	26 Oct 16	05 Dec 16
606060		1	Soil	1610231105 (IBC 7349)	26 Oct 16	05 Dec 16
606061		1	Soil	1610231123 (IBC 7351)	26 Oct 16	05 Dec 16
606062		1	Soil	1610231124 (IBC 7351)	26 Oct 16	05 Dec 16
606063	MS	1	Soil	1610231125 (IBC 7351)	26 Oct 16	05 Dec 16



WSTF CHAIN OF CUSTODY RECORD

Date 10-23-2016

Laboratory: SwRI		PO# 15EC092B		Analytical Requirements				Special Instructions Return coolers and reusable packaging materials within 14 days as required in statement of work to: Return Address: NASA WSTF Environmental Department 12600 NASA Road; Bldg. 120 Las Cruces, NM 88012 Attn: Lori Minnick	
Address shipping questions to: <input type="checkbox"/> Lori Minnick, 575-524-5119 <input checked="" type="checkbox"/> Other <u>Tom Hall</u> , 575-524-5453		# of Containers	Sample Matrix*	EPA Method 607M 8 oz Glass Jar, Ice					Charge Number (WSTF Use Only)
Send sample receipt confirmation and analytical reports to: <input type="checkbox"/> Carlyn Tufts, carlyn.a.tufts@nasa.gov <input type="checkbox"/> Shelly Hernandez, shelly.j.hernandez@nasa.gov <input checked="" type="checkbox"/> Tom Hall, tom.a.hall@nasa.gov									
Sample Number	Sample Location	# of Containers	Sample Matrix*	EPA Method 607M 8 oz Glass Jar, Ice					Comments
161023 1101	IBC 7350	1	S	X				16EEE41FW	
161023 1105	IBC 7349	1	S	X				16EEE41FW	
161023 1123	IBC 7351	1	S	X				16EEE41FW	Matrix Spike for 1610
161023 1124	IBC 7351	1	S	X				16EEE41FW	
161023 1125	IBC 7351	1	S	X				16EEE41FW	MATRIX SPIKE FOR 161023 1123
Relinquished By: 		Date/Time: <u>10-23-16 (12:00)</u>			Accepted By: 			Date/Time: <u>10-26-16 | 09:10</u>	

* Sample Matrix: A - Aqueous; G - Gaseous; S - Solid

Client: Navarro
SRR # 58590
Project # 16988.01.10X
Case: 15EC092B
VTSR: 10/26/16
Sample(s) Received: Intact
Temperature: 2.0 SN # 021055

NASA-WSTF SHIPPING DOCUMENT

① Req # 4616

SHIPPED FROM: NASA JSC WHITE SANDS TEST FACILITY 12600 NASA ROAD; BLDG. 120 LAS CRUCES, NEW MEXICO 88012		WSTF ORIGINATOR/MAIL CODE/TELEPHONE NO. Tom Hall 575-524-5453				
SHIP TO: (ADDRESS, PHONE#, POINT OF CONTACT) Southwest Research Institute 6220 Culebra Raod San Antonio, TX 782238 Gang Sun 210-522-3954		ORDER OR CONTRACT NUMBER Navarro PO #15EC092B		SHIPMENT CONTROL NO WS-16-298-E		
		PROJECT or TASK NUMBER CP.6EE4IFW.0.71 - 16EE4IFW		SHIP VIA Fed Ex Air		
		Contain Batteries NO	NO. PKG. 1	DATE SHIPPED 10-25-16	AirBill/ PRO #/Bol #	
		Battery Type-Part # N/A	AUTHORIZED BY: Tom Hall		DEPT. Environmental	
ITEM NO.	EQUIPMEN CONTROL NO.	MODEL NO./ STOCK NO./ PART NO.	ITEM NAME - MANUFACTURER'S NAME AND SERIAL NO.		UNIT OF ISSUE	QTY.
1	Lot-Samples		Soil Samples Navarro PO #15EC092B Line Item #1 NDMA and Bromacil for Soil samples by method 607M		5 ea.	
Client: Navarro SRR # 58590 Project # 16988.01.10X Case: 15EC092B VTSR: 10/26/16 Sample(s) Received: Intact Temperature: 2.0 SN # 021055						
JUSTIFICATION FOR SHIPMENT: (MDR #, Return Authorization #'s, Warranty Replacement, Repair, Overage/Shortage, Damage, Recycling) Sample for analysis as requested (Navarro PO #15EC092B)						
DOT HAZARDOUS MATERIALS INFO; EMERGENCY PHONE NUMBER AND GUIDE NUMBER: Not subject to regulation as a hazard material under 49 CFR.						
PROPERTY REVIEW:		<input type="checkbox"/> REMOVE EQUIPMENT TAG		<input type="checkbox"/> DO NOT REMOVE EQUIPMENT TAG		
PACKED BY:		# CONTAINERS	TYPE CONTAINERS	DIMENSIONS		WEIGHT
Please check off the applicable labels! <input type="checkbox"/> FRAGILE <input checked="" type="checkbox"/> GLASS <input type="checkbox"/> DELICATE <input type="checkbox"/> DO NOT XRAY <input checked="" type="checkbox"/> REFRIGERATE <input type="checkbox"/> OTHER <input checked="" type="checkbox"/> BUBBLEWRAP <input checked="" type="checkbox"/> FOAM			Glass Containers	ea. 8 oz. Glass Jars		
		TOTAL CONTAINERS			TOTAL WEIGHT	
RECEIVED BY: <i>David Garner</i>		SHIPPERS CERTIFICATION: This is to certify that the above named materials are properly classified, described, packaged, marked, labeled, and are in proper condition for transportation according to the regulations of the D.O.T. _____ Date _____				
REPRESENTING: <i>SWRI</i>						

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161026-4
NAVARRO PO #: 15EC092B

ANALYTICAL DATA REPORT SHEETS

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1610231101 (IBC 7350)

Client: Navarro

Batch: M607-#721-IBC

Task Order: 161026-4

Matrix: Soil

Sample Wt/Vol: 30.31 g

Project: 16988.01.103

Date Received: 10/26/16

Date Extracted: 11/02/16

Date Analyzed: 11/09/16

Date Reported: 11/09/16

Lab Sample ID: 606059

Lab File Name: A1108630.txt

Final Extraction Vol: 1000 uL

Dilution Factor: 1

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Client: Navarro
 Batch: M607-#721-IBC
 Task Order: 161026-4
 Matrix: Soil
 Sample Wt/Vol: 30.15 g

Project: 16988.01.103
 Date Received: 10/26/16
 Date Extracted: 11/02/16
 Date Analyzed: 11/09/16
 Date Reported: 11/09/16

Sample ID

1610231105 (IBC 7349)

Lab Sample ID: 606060
 Lab File Name: A1108631.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit
 J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1610231123 (IBC 7351)

Client: Navarro

Batch: M607-#721-IBC

Task Order: 161026-4

Matrix: Soil

Sample Wt/Vol: 30.12 g

Project: 16988.01.103

Date Received: 10/26/16

Date Extracted: 11/02/16

Date Analyzed: 11/09/16

Date Reported: 11/09/16

Lab Sample ID: 606061

Lab File Name: A1108632.txt

Final Extraction Vol: 1000 uL

Dilution Factor: 1

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Client: Navarro
 Batch: M607-#721-IBC
 Task Order: 161026-4
 Matrix: Soil
 Sample Wt/Vol: 30.52 g

Project: 16988.01.103
 Date Received: 10/26/16
 Date Extracted: 11/02/16
 Date Analyzed: 11/09/16
 Date Reported: 11/09/16

Sample ID

1610231124 (IBC 7351)

Lab Sample ID: 606062
 Lab File Name: A1108633.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit
 J - Estimated value, greater than the MDL but less than the PQL

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161026-4
NAVARRO PO #: 15EC092B

QA DATA SHEETS

**(BLANK, MATRIX SPIKE, SURROGATE,
CALIBRATION)**

Southwest Research Institute

Method 607 Internal Standard Summary

Filename: A11086S1.txt
 Standard ID: IS=1NG/UL
 Project: 16988.01.103

Date Analyzed: 11/08/2016
 Time Analyzed: 01:14:00
 Client: Navarro

		IS1		IS2	
		Area	RT	Area	RT
Mid Point Standard		286890	8.41	177619	15.02
Upper Limit		573780	8.74	355238	15.35
Lower Limit		143445	8.08	88809.5	14.69
Client Sample ID	Lab Sample ID				
BLANK_02NOV16	606329	261827	8.41	159203	15.01
LCS_02NOV16 LCS	606330 LCS	270283	8.41	157556	15.02
1610231101 (IBC 7350)	606059	274747	8.41	159993	15.01
1610231105 (IBC 7349)	606060	289321	8.41	171582	15.01
1610231123 (IBC 7351)	606061	260527	8.40	157223	15.01
1610231124 (IBC 7351)	606062	274316	8.40	160417	15.01
1610231125 (IBC 7351) MS	606063 MS	266367	8.40	156942	15.01

IS1 = 1,4-Dichlorobenzene-D4

IS2 = Atrazine-D5

* Flag indicating value is outside QC limits

Southwest Research Institute

Method 607 Blank Summary

Blank ID: BLANK_02NOV16

Project: 16988.01.103

Client: Navarro

SDG: 606059

Matrix: Soil

This method blank applies to the following samples, MS, and MSD's

Client Sample ID	Lab Sample ID	Date Acquired	Time Acquired
LCS_02NOV16	606330 LCS	11/09/16	03:54:00
1610231101 (IBC 7350)	606059	11/09/16	06:09:00
1610231105 (IBC 7349)	606060	11/09/16	06:43:00
1610231123 (IBC 7351)	606061	11/09/16	07:17:00
1610231124 (IBC 7351)	606062	11/09/16	07:51:00
1610231125 (IBC 7351)	606063 MS	11/09/16	08:25:00

Southwest Research Institute

Method 607 Surrogate Recovery Summary

Client: Navarro

Matrix: Soil

SDG: 606059

Project: 16988.01.103

Client Sample ID	Lab Sample ID	N-Nitroso-di-n-propylamine	
		% Recovery	Recovery Limits
2 BLANK_02NOV16	606329	97	40-160
3 LCS_02NOV16	606330 LCS	93	40-160
4 1610231101 (IBC 7350)	606059	90	40-160
5 1610231105 (IBC 7349)	606060	92	40-160
6 1610231123 (IBC 7351)	606061	105	40-160
7 1610231124 (IBC 7351)	606062	100	40-160
8 1610231125 (IBC 7351)	606063 MS	107	40-160

Southwest Research Institute

Method 607 Analysis Data Sheet

Client: Navarro

Batch:

Task Order:

Matrix: Soil

Sample Wt/Vol: 30.21 g

Project: 16988.01.103

Date Received: NA

Date Extracted: 11/02/16

Date Analyzed: 11/09/16

Date Reported:

Sample ID

BLANK_02NOV16

Lab Sample ID: 606329

Lab File Name: A1108625.txt

Final Extraction Vol: 1000 uL

Dilution Factor: 1

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Client: Navarro

Batch:

Task Order:

Matrix: Soil

Sample Wt/Vol: 30.15 g

Project: 16988.01.103

Date Received: NA

Date Extracted: 11/02/16

Date Analyzed: 11/09/16

Date Reported:

Sample ID

LCS_02NOV16

Lab Sample ID: 606330 L

Lab File Name: A1108626.txt

Final Extraction Vol: 1000 uL

Dilution Factor: 1

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	11.24	
4164-28-7	N-Nitrodimethylamine	16.58	
314-40-9	Bromacil	23.91	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Blank Spike Recovery Report

Sample ID

LCS_02NOV16

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 606330 LCS

Batch:

Date Received: NA

Blank ID: BLANK_02NOV16

Task Order:

Date Extracted: 11/02/16

Matrix: Soil

Date Analyzed: 11/09/16

Sample Wt/Vol: 30.15 g

Date Reported:

ANALYTE	Spike Added ng/g	Blank Conc ng/g	LCS Conc ng/g	% Recovery	QC % Recovery Limits
N-Nitrosodimethylamine	17	0	11	65	13 - 110
N-Nitrodimethylamine	17	0	17	100	30 - 150
Bromacil	17	0	24	141	40 - 190

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1610231125 (IBC 7351) MS

Client: Navarro

Batch: M607-#721-IBC

Task Order: 161026-4

Matrix: Soil

Sample Wt/Vol: 30.34 g

Compared Sample: 1610231123 (IBC 7351)

Project: 16988.01.103

Date Received: 10/26/16

Date Extracted: 11/02/16

Date Analyzed: 11/09/16

Date Reported: 11/09/16

Lab Sample ID: 606063 MS

Lab File Name: A1108634.txt

Final Extraction Vol: 1000 uL

Dilution Factor: 1

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Spike	Recovery	Recovery Limit
62-75-9	N-Nitrosodimethylamine	13.41	17.00	79%	13-110%
4164-28-7	N-Nitrodimethylamine	16.51	17.00	97%	30-150%
314-40-9	Bromacil	24.09	17.00	142%	40-190%

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Continuing Calibration Check Sheet

SwRI Project #:	01.16988.01.103	Calibration Date:	11/08/16
Sponsor:	Navarro	Analytical Method:	TAP-01-0408-031
SwRI Standard ID:	202-04-120408017	Std Concentration:	1 µg/mL
File ID #:	A11086S1	Initial Calibration Date:	10/17/16

ANALYTE	Mean RRF	RRF	% Dif.
N-Nitrosodimethylamine	0.361	0.386	-6.9
N-Nitrodimethylamine	0.13	0.136	-4.6
N-Nitroso-di-n-propylamine-d14	0.127	0.132	-3.6
Bromacil	1.161	1.057	8.9

Southwest Research Institute

Initial Calibration Data Sheet

SwRI Project #:	01.16988.01.103	Calibration Data:	10/17/16
Sponsor:	Navarro	Analytical Method:	TAP-01-0408-031
SwRI Standard ID:	202-04-120408017	Std Concentration:	0.01-10 µg/mL

ANALYTE	RRF 0.01	RRF 0.05	RRF 0.2	RRF1	RRF5	RRF10	Ave. RRF	RSD%
N-Nitrosodimethylamine	0.291	0.308	0.352	0.369	0.417	0.430	0.361	15.49
N-Nitrodimethylamine	0.109	0.115	0.128	0.134	0.147	0.148	0.13	12.44
N-Nitroso-di-n-propylamine-d14	0.114	0.111	0.124	0.127	1.143	0.145	0.127	11.03
Bromacil	1.435	1.048	1.072	1.081	1.150	1.177	1.161	12.35

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161026-4
NAVARRO PO #: 15EC092B

EXTRACTION AND INJECTION LOG

(E607S) SOIL Extraction By Soxhlet 3540C (Navarro)

SwRI Labs
 Client: Navarro
 Project: 16988.01.10X
 Case: 15EC092B

Sample Receipt: 58590
 TO#: 161026-4

DATE EXTRACTED	11/02/16
ANALYSTS INVOLVED	Hamed Edrisi (SU,SP) Marina Lebron (SU,SW,Conc,QT) Christina Menn (BD,QT,FV)
SURROGATE SOL ID	203-01-120408017@5.0ng/uL
MTX SPK SOL ID	201-01-120408017@10.0ng/uL
EXTRACTS LOCATION	Tracked by LIMS (11/07/16 CM)
CHEMICAL, BRAND & LOT#	Sodium Sulfate ID:04-0402-004 DCM Fisher Optima Lot #164214
NOTES	Hamilton Co. Syringes: 100uL ID:462905(SURR) 50uL ID:462898(MS) Balance #61 was used.

ADDITIONAL NOTES	1.Soxhlet extraction began at 1:30pm and ended the following day at 8:30am. 2.BLANK(606329) and LCS(606330) are shared with page 488 of this book.
EXTRACTION FLOWCHART	Xg >>> FV 1000uL DCM
REFERENCE BOOK & PAGE	16-0402-032 P38
TAP(S) USED	01-0402-152

System ID	Type	Customer ID	SOLVENT VOL DCM (ML)	SAMPLE WT	SURROGATE SOL VOL
1	606059	1610231101 (IBC 7350)	250	30.31 g	100 uL
2	606060	1610231105 (IBC 7349)	250	30.15 g	100 uL
3	606061	1610231123 (IBC 7351)	250	30.12 g	100 uL
4	606062	1610231124 (IBC 7351)	250	30.52 g	100 uL
5	606063 MS	1610231125 (IBC 7351)	250	30.34 g	100 uL
6	606329	BLANK_02NOV16	250	30.21 g	100 uL
7	606330	LCS_02NOV16	250	30.15 g	100 uL

System ID	Type	Customer ID	MTX SPK SOL VOL	FV DCM
1	606059	1610231101 (IBC 7350)	0 uL	1000 uL
2	606060	1610231105 (IBC 7349)	0 uL	1000 uL
3	606061	1610231123 (IBC 7351)	0 uL	1000 uL
4	606062	1610231124 (IBC 7351)	0 uL	1000 uL
5	606063 MS	1610231125 (IBC 7351)	50 uL	1000 uL
6	606329	BLANK_02NOV16	0 uL	1000 uL
7	606330	LCS_02NOV16	50 uL	1000 uL

Page created Nov 2 2016 12:24PM by mlebron
 Book: EXTRACTION LAB, Volume: EXT-2016, Page: 489 (Section 1 of 1)
 Approved by HAMED EDRISI on Nov 8 2016 5:14PM

Date Printed: 11/09/2016

190 TITLE

M-607

PROJECT NO.

010024
16888.01.103

BOOK NO.

10-0408-024

Work continued from Page

injlog

Southwest Research Institute GC/MS Injection Log

OPERATOR: GS SEQUENCE DATE: 11/08/16, 11/09/16 INSTRUMENT: Amida1a
COLUMN: Agilent 122-0732 DB-1701, 0.25mm * 30m * 0.25um
CARRIER GAS: Helium SOLVENT: DCM
METHOD FILE: MET_607C, MET_607C.M
CLIENT NAME: NAVARRO PROJECT NUMBER: 16988.01.103
SRR: 58579, 58581, 58588, 58595, 58599, 58613, 58563, 58590 METHOD: M-607
DATA PATH: C:\MSDCHEM\1\DATA\2016\A110816 MATRIX: water & soil

OVEN PROGRAM

Initial temp: 40 'C (On)
Initial time: 4.00 min
Ramps:
Rate Final temp Final time
1 15.00 150 0.00
2 25.00 270 10.00
3 0.0(off)
Post temp: 270 'C
Post time: 5.00 min
Run time: 29.80 min

Maximum temp: 350 'C
Equilibration time: 0.50 min

CS
11-9

FILENAME	VIAL	DATE/TIME	METHOD	SAMPLE DESCRIPTION
A11086C1	100	11/08/16 12:32	MET_607C	SLUG
A11086C2	1	11/08/16 13:06	MET_607C	DCM
A11086S1	2	11/08/16 13:14	MET_607C	NDMA/DMN/BROMACIL STD 1NG/UL IS=1NG/UL
A1108601	3	11/08/16 13:48	MET_607C	BLANK_26OCT16 IS=0.2NG/L 606080
A1108602	4	11/08/16 14:22	MET_607C	LCS_26OCT16 IS=0.2NG/L 606081
A1108603	5	11/08/16 14:56	MET_607C	1610200851Y (700-H-350) IS=0.2NG/L 605984
A1108604	6	11/08/16 15:29	MET_607C	1610201006Z (PL-5-985) IS=0.2NG/L 605985
A1108605	7	11/08/16 16:03	MET_607C	1610210654 (B650-EFF-1) IS=0.2NG/L 605986
A1108606	8	11/08/16 16:37	MET_607C	1610210714 (B650-INF-1) IS=0.2NG/L 605987
A1108607	9	11/08/16 17:11	MET_607C	1610210755 (PFE-1) IS=0.2NG/L 605988
A1108608	10	11/08/16 17:45	MET_607C	1610210803 (PFE-2) IS=0.2NG/L 605989
A1108609	11	11/08/16 18:19	MET_607C	1610210804 (PFE-2) IS=0.2NG/L 605990
A1108610	12	11/08/16 18:52	MET_607C	1610210826 (PFE-7) IS=0.2NG/L 605991
A1108611	13	11/08/16 19:26	MET_607C	1610210848 (PFE-4A) IS=0.2NG/L 605992
A1108612	14	11/08/16 20:00	MET_607C	1610210906 (B655-EFF-2) IS=0.2NG/L 605993
A1108613	15	11/08/16 20:34	MET_607C	1610211005 (B655-INF-2) IS=0.2NG/L 605995
A1108614	16	11/08/16 21:08	MET_607C	1610230831 (400-SB-12) IS=0.2NG/L 606009
A1108615	17	11/08/16 21:42	MET_607C	1610240851Z (PL-5-495) IS=0.2NG/L 606049
A1108616	18	11/08/16 22:16	MET_607C	1610240933B (BLM-41-670) IS=0.2NG/L 606050
A1108617	19	11/08/16 22:49	MET_607C	1610241340B (BLM-41-420) IS=0.2NG/L 606051
A1108618	20	11/08/16 23:23	MET_607C	BLANK_01NOV16 IS=0.2NG/L 606333
A1108619	21	11/08/16 23:57	MET_607C	LCS_01NOV16 IS=0.2NG/L 606334
A1108620	22	11/09/16 00:31	MET_607C	1610251411B (BLM-14-327) IS=0.2NG/L 606084
A1108621	23	11/09/16 01:05	MET_607C	1610251413B (BLM-14-327) IS=0.2NG/L 606085
A1108622	24	11/09/16 01:39	MET_607C	1610260931 (400-SB-10) IS=0.2NG/L 606125
A1108623	25	11/09/16 02:12	MET_607C	1610280918B (WW-5-459) IS=0.2NG/L 606259
A1108624	26	11/09/16 02:46	MET_607C	1610280932B (WW-5-579) IS=0.2NG/L 606260
A1108625	27	11/09/16 03:20	MET_607C	BLANK_02NOV16 IS=0.2NG/L 606329
A1108626	28	11/09/16 03:54	MET_607C	LCS_02NOV16 IS=0.2NG/L 606330
A1108627	29	11/09/16 04:28	MET_607C	1610190904 (400-SB-10) 9'-10' IS=0.2NG/L 605
A1108628	30	11/09/16 05:02	MET_607C	1610191209 (400-SB-10) 39'-40' IS=0.2NG/L 60
A1108629	31	11/09/16 05:35	MET_607C	1610191644 (400-SB-10) 79'-80' IS=0.2NG/L 605
A1108630	32	11/09/16 06:09	MET_607C	1610231101 (IBC 7350) IS=0.2NG/L 606059
A1108631	33	11/09/16 06:43	MET_607C	1610231105 (IBC 7349) IS=0.2NG/L 606060
A1108632	34	11/09/16 07:17	MET_607C	1610231123 (IBC 7351) IS=0.2NG/L 606061
A1108633	35	11/09/16 07:51	MET_607C	1610231124 (IBC 7351) IS=0.2NG/L 606062
A1108634	36	11/09/16 08:25	MET_607C	1610231125 (IBC 7351) IS=0.2NG/L 606063MS

REVIEWED BY: *mzuniga*

DATE: *11/09/16*

Work continued to Page

SIGNATURE

DATE

11-9

DISCLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE



SUSANA MARTINEZ
Governor

JOHN A. SANCHEZ
Lieutenant Governor

NEW MEXICO ENVIRONMENT DEPARTMENT

2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303
Phone (505) 476-6000 Fax (505) 476-6030
www.env.nm.gov



BUTCH TONGATE
Cabinet Secretary - Designate

J. C. BORREGO
Deputy Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

December 15, 2016

Timothy J. Davis
Chief, Environmental Office
National Aeronautics and Space Administration
White Sands Test Facility
P.O. Box 20
Las Cruces, NM 88004-0020

Attention of: RE-16-155

**RE: APPROVAL
REQUEST FOR A "CONTAINED-IN" DETERMINATION
FOR 400 AREA INVESTIGATION-DERIVED WASTE (IDW)
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WHITE SANDS TEST FACILITY
DOÑA ANA COUNTY, NEW MEXICO
EPA ID #NM08800019434
HWB-NASA-MISC**

Dear Mr. Davis:

The New Mexico Environment Department (NMED) has received the National Aeronautics and Space Administration's (NASA WSTF) (Permittee) *Request for a "Contained-In" Determination for 400 Area Investigation-Derived Waste (IDW)* (Request), dated November 29, 2016.

The IDW was generated during investigation activities at the 400 Area at boring locations 400-SB-03, 400-SB-04, 400-SB-10, 400-SB-12, and 400-SB-15. The IDW material is comprised of seventeen one-cubic yard containers of IDW soil (drilling cuttings) generated during investigation activities. Additionally, one cubic yard and one 55-gallon container of contact

debris comprised of disposable personal protective equipment (gloves), plastic sheeting, wipes, and other contact waste was generated.

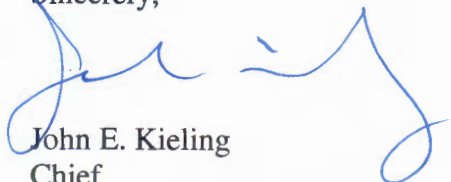
Waste characterization samples of soil were collected and analyzed to determine if applicable F001 and F002 hazardous waste constituents and other chemicals of concern were present in the waste generated during investigation activities at the 400 Area Closure.

Based on the information provided in the Request, the IDW stream does not exceed NMED soil screening levels (SSL) for construction or industrial worker exposure. However, reported concentrations of thallium and arsenic exceeded the NMED residential SSL. Toxicity Characteristic Leaching Procedure analysis sample results for metals did not exceed the applicable standard or were reported as below laboratory detection limit concentrations. No site specific background concentration information is available for thallium. Based on the provided information, the IDW does not exhibit properties of a characteristic hazardous waste per 40 CFR Part 261 Subpart C. Additionally, all applicable 40 CFR Part 261 Subpart D listed hazardous waste (F001 and F002) concentrations were either below laboratory detection limits or below the applicable NMED soil screening levels.

NMED has reviewed the Permittee's Request and determined that the IDW can be managed as a nonhazardous waste. The drilling cuttings and contact debris may be managed as a solid waste and disposed at an appropriate waste facility.

If you have any questions regarding this letter, please contact Gabriel Acevedo at (505) 476-6043.

Sincerely,



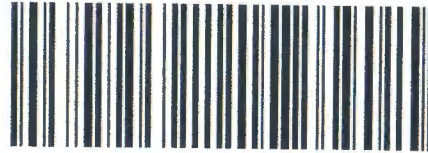
John E. Kieling
Chief
Hazardous Waste Bureau

cc: D. Cobrain, NMED HWB
B. Wear, NMED HWB
G. Acevedo, NMED HWB
L. King, EPA 6PD-N
M. Zigmond, NASA WSTF
A. Sanchez, NASA WSTF

File: NASA WSTF 2016 and Reading, NASA-MISC

HWB 3391
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Bldg. 1
Santa Fe, New Mexico 87505-6303

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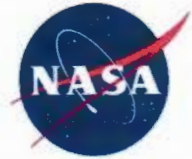
ZIP 87505
011D11641177

Timothy J. Davis
Chief, Environmental Office
NASA/WSTF
P.O. Box 20
Las Cruces, New Mexico 88004-0020

88004\$0020 8800



National Aeronautics and
Space Administration
Lyndon B. Johnson Space Center
White Sands Test Facility
P.O. Box 20
Las Cruces, NM 88004-0020



December 23, 2016

Reply to Attn of: RE-16-168

Mr. John E. Kieling, Chief
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505

Subject: Request for a Second "Contained-In" Determination for 400 Area Investigation-Derived Waste (IDW)

NASA is requesting a "No Longer Contained-In" Determination (NLCID) for the investigation-derived waste (IDW soil, IDW drill cuttings, and IDW debris) generated during activities associated with the 400 Area Closure Investigation Work Plan (IWP), which was approved by NMED on November 8, 2011. This second "Contained-In" Determination request for the 400 Area Investigation is for applicable IDW drill cuttings from soil boring locations 400-SB-10 and 400-SB-12, IDW soil generated from soil boring location 400-SB-14, and IDW contact debris associated with drilling activities. The IDW soil, IDW drill cuttings, and IDW debris are currently being managed in accordance with 40 CFR § 262.34, as listed hazardous wastes carrying EPA Waste Codes F001 and F002. The earliest 90-day accumulation time limit expiration date for the IDW associated with this NLCID will expire on January 16, 2017.

NASA received, reviewed, and compared analytical data generated from the IDW soil and IDW drill cuttings to the applicable 40 CFR § 268 Subpart D Treatment Standards and current NMED Soil Screening Levels (SSLs). F001 and F002 contaminants of concern were not detected above regulatory limits. NASA is requesting a NLCID for the F001 and F002 hazardous waste listing. NASA also compared N-Nitrosodimethylamine (NDMA) data to the SSLs identified in the NMED Risk Assessment Guidance for Site Investigations and Remediation (2015) for Industrial/ Occupational and Construction Worker Soil. NDMA was not detected in the IDW soil at concentrations above these SSLs.

If NMED finds the IDW soil does not contain hazardous waste, NASA requests concurrence from the NMED to spread the soil on the ground in the area of borings, as identified in the IDW disposition procedures of the NMED approved 400 Area IWP (Appendix C). Upon receipt of an approved NLCID and concurrence from the NMED, NASA will transport the containers of soil back to their point of generation and evenly land apply the environmental media to the ground and away from potential storm water run-off. Final disposal location of all environmental media will be documented. The remaining IDW drill cuttings and contact debris will be disposed of as solid waste.

Enclosure 1 provides a background and basis for the NLCID. Enclosure 2 provides detection summary tables of the analytical results and a comparison to applicable regulatory limits. Enclosure 3 provides a CD-ROM containing analytical summaries, laboratory analytical reports, and chain of custody documentation.

I certify under penalty of law that this document and attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have any questions or comments, please contact me at 575-524-5024, or Antonette Sanchez of my staff, at 575-524-5497.



Timothy J. Davis
Chief, Environmental Office

Enclosures (3)

cc: (w/enclosures)
Mr. Gabriel Acevedo
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505

Background

The Resource Conservation and Recovery Act (RCRA) Hazardous Waste Operating Permit (NMED, 2009; Permit) for the White Sands Test Facility (WSTF) required an investigation of soil directly beneath and adjacent to the WSTF 400 Area surface impoundments. Research conducted for the Historical Information Summary (HIS) associated with the 400 Area Investigation Work Plan (IWP) found chemicals meeting the listing descriptions of spent F001 and F002 per 40 CFR §261 Subpart D were used as solvents and referee propellants in the 400 Area. These F001 and F002 listed wastes were included in the waste streams managed within the 400 Area impoundments, but were not treated before discharge to the adjacent arroyo. The NMED Hazardous Waste Bureau approved the 400 Area IWP (November 8, 2011) and an associated abbreviated drilling work plan (August 30, 2016), which identified 15 soil boring locations. Five of the soil borings were designated to be completed as combination soil vapor/groundwater monitoring wells, while the remainder were designated as soil vapor monitoring wells only. The monitoring wells are intended to provide additional vertical delineation of the soil, soil vapor, and groundwater chemistry around the 400 Area Closure. This information will be used to determine if there is a continuing source of contamination near the 400 Area impoundments. NASA initiated the 400 Area Investigation in September 2016, and in consultation with NMED, modified the planned approach to include eight combination soil vapor/groundwater monitoring wells. The seven remaining borings have or will be completed as soil vapor monitoring wells. Investigation-derived waste (IDW) has been generated during the 400 Area Investigation, and an initial request for a “contained-in” determination was approved by NMED on December 15, 2016. The non-hazardous determination was approved for IDW soil generated from borehole locations 400-SB-03, 400-SB-04, 400-SB-10, 400-SB-12, and 400-SB-15.

Material generated during 400 Area Investigation drilling activities includes IDW soil and IDW drill cuttings. IDW soil is defined as environmental media produced using the sonic drilling technique within alluvium from ground surface to the top of cemented alluvium, or conglomerate bedrock. Water is generally not added while using the sonic drilling method in alluvium. IDW drill cuttings generated are defined as environmental media produced using the air hammer drilling process while drilling boreholes within cemented alluvium and andesite bedrock. The air hammer drilling method allowed for more efficient advancement of the borings through bedrock, where groundwater was encountered. Groundwater and water added during drilling produced slurry, or mixed media with aqueous and settleable solid phases, returns from the borehole. All IDW generated as part of the 400 Area Investigation is subject to regulation under the “contained-in” policy carrying EPA Waste Codes F001 and F002 per 40 CFR §261 Subpart D with constituents of concern (COCs): trichloroethene, tetrachloroethene, trichlorofluoromethane, and 1,1,2-trichloro-1,2,2-trifluoroethane

Waste characterization and hazardous waste determination for 400 Area Investigation IDW is being conducted in accordance with Permit Attachment 12 (Waste Analysis Plan) and 40 CFR §260 and 261. NASA is providing analytical results from waste characterization samples collected from 400 Area Investigation IDW soil and IDW drill cuttings generated through November 3, 2016, and is requesting that the NMED perform a “contained-in” determination to determine whether the fourteen 55-gallon containers of IDW drill cuttings, three 1-cubic yard containers of IDW soil, and one 1-cubic yard container of contact contaminated debris included in this request poses an unacceptable risk.

Basis for “Contained-In” Determination

NASA is requesting that NMED perform a No Longer Contained-in Determination (NLCID) for environmental media (IDW soil and IDW drill cuttings) and associated contaminated IDW contact debris. Aqueous IDW, such as decontamination water and contaminated groundwater, is being managed as hazardous waste and treated at the Mid-plume Interception and Treatment System. IDW decontamination water and groundwater is not part of this request. Analytical sampling data have been received and

reviewed for the mixed media IDW drill cuttings from 400 Area Investigation boreholes 400-SB-10 and 400-SB-12 and IDW soil that originated from 400-SB-14. Analytical summary tables are provided in Enclosure 2 and the analytical reports are provided in Enclosure 3. Analytical data may be compared to the applicable 40 CFR §268 Subpart D Treatment Standards and the 2015 NMED Industrial and Construction Worker Soil Screening Levels (SSLs). If the environmental media IDW is found not to pose an unacceptable risk, then the NMED may determine the soil, drill cuttings, and associated contact IDW can be managed as no-longer containing listed hazardous waste.

F001 and F002 Constituents of Concern

F001 and F002 COCs were not detected above the laboratory's method detection reporting limits in the waste characterization samples, which in all cases were below the regulatory limits included in the 40 CFR §268 Subpart D Treatment Standards and the 2015 NMED SSLs. Of the listed COCs, only Tetrachloroethene (PCE) was detected at a maximum concentration of 0.0024 mg/Kg in the settleable solid phase of IDW drill cuttings generated from borehole 400-SB-10 and at a concentration of 0.0014 mg/Kg in the settleable solid phase of IDW drill cuttings generated from borehole 400-SB-12. PCE was also detected at a maximum concentration of 0.0036 mg/Kg in IDW soil generated at borehole 400-SB-14. All detections of PCE included a J flag data qualifier, which indicated the reported result was an estimated concentration between the method detection limit and reporting limit. The reported PCE concentrations did not exceed the applicable regulatory limits.

Other Constituents

Metals

Native soils located at WSTF are known to have the potential to contain metals at concentrations that exceed regulatory limits. Metals sampling was performed based on the potential for land application of any environmental media that no longer contains listed hazardous waste. The shipment cooler that contained the Toxicity Characteristic Leaching Procedure (TCLP) samples had a delayed delivery, which resulted in the samples getting to the analytical laboratory out of the temperature specification. As a result, these samples were discarded and the total concentrations were used to calculate the maximum theoretical leachate concentration that could result from performing the TCLP (EPA Method 1311). The sampling was performed to address the 40 CFR §261.24 Toxicity Characteristic incorporating the 40 CFR §268 Land Disposal Restrictions and the 2015 NMED SSLs. Based on the sampling results, metals were not detected in the IDW soil at concentrations exceeding the 40 CFR §261.24 Toxicity Characteristic limits or the NMED SSLs. Chromium was detected in settleable solid phase samples obtained from borehole 400-SB-12 at concentrations of 12.1 mg/Kg and 16.4 mg/Kg. The maximum theoretical leachate concentration for these samples was calculated as 0.605 mg/L and 0.82 mg/L, which are below the 40 CFR 261.24 toxicity limit of 5.0 mg/L. The maximum theoretical leachate concentration is greater than the 40 CFR Part 268 Subpart D Treatment Standard (nonwastewaters) for chromium of 0.60 mg/L (TCLP), but this treatment standard does not apply if the drill cuttings are determined to be a non-hazardous waste. The total concentration of chromium in these samples is also considerably lower than the industrial and construction worker SSLs of 505 mg/Kg and 134 mg/Kg, respectively.

N-Nitrosodimethylamine (NDMA)

NDMA is a constituent sometimes present in hydrazine based propellants as an impurity. It is also a byproduct generated from treating hydrazine based propellants by oxidation (neutralization), which was known to have occurred at the 400 Area impoundments. The 400 Area Investigation location is within the known boundaries of the WSTF groundwater contamination plume, which is also known to contain NDMA. Based on the waste characterization sampling results, NDMA was not detected above 40 CFR §268.40 Treatment Standard Limit, or the NMED SSLs. N-Nitrosodimethylamine was detected at the maximum concentration of 0.00016 mg/Kg in the mixed media settleable solids phase, which does not

exceed any applicable regulatory limit. NASA compared the reported total concentration of NDMA with the NMED SSL for Industrial/Occupational Soil and Construction Worker Soil in accordance with the waste disposition procedures identified in Appendix C (400 Area Closure Investigation-Derived Waste Procedures) of the NMED approved 400 Area IWP. A comparison of results to the SSL for Construction Worker Soil was provided as a conservative measure, based on the potential for land application of the IDW soil.

Other Volatile Organic Compounds

In addition to the F001 and F002 COCs, the laboratory's target analyte list for SW-846 Method 8260C includes the majority of volatile organic compounds typically analyzed for by SW-846 Method 8260C. Acetone and dichloromethane were detected at trace concentrations (< 0.01 mg/Kg). Acetone and dichloromethane are known lab contaminants. Carbon disulfide was detected in the settleable solid phase of IDW drill cuttings generated at borehole 400-SB-10 at a maximum concentration of 0.0069 mg/Kg. Naphthalene was detected at a maximum concentration of 0.00089J mg/Kg in IDW soil generated from borehole 400-SB-14. Detected volatile organic compounds did not exceed any applicable regulatory limit.

Other Semi-Volatile Organics

N-Nitrodimethylamine (DMN) is included in EPA Method 607M with the reported NDMA results. The maximum observed concentration was 0.0001 mg/L in the mixed media aqueous phase. The 40 CFR §268.40 Treatment Standards do not include a treatment limit for N-Nitrodimethylamine or bromacil. Also, the NMED SSLs do not include a limit for these constituents.

Analytical Reports and Chains of Custody

Analytical reports and chains of custody are provided in Enclosure 3 for waste characterization samples collected from individual waste containers. Analytical data sheets specific to each analyses are included in the laboratory reports for each sampling event. The complete analytical report includes the laboratory case narrative and supporting documentation.

Other Considerations

If NMED concludes that the IDW soil and IDW drill cuttings do not contain hazardous waste, NASA is requesting concurrence from the NMED to dispose of this environmental media in accordance with the waste disposition procedures identified in Appendix C of the NMED approved 400 Area IWP (400 Area Closure Investigation-Derived Waste Procedures). In addition to the comparison of results to the SSL for Industrial Soils that was identified in the waste disposition procedures of the 400 Area IWP, NASA has included the SSL for Construction Worker Soil in the analytical summary tables to allow a comparison of total concentrations to this limit. NASA believes that the SSL for Construction Worker Soil is the most conservative relevant SSL that would apply in the unlikely scenario that the ground where the IDW soil is applied is disturbed in the future.

Upon NMED approval of the NLCID, NASA will land apply the IDW soil on the ground near the point of generation away from potential storm water run-off. NASA will document the final disposal locations of all land applied environmental media. The IDW drill cuttings and contact debris identified in this request will be disposed of as solid waste.

Enclosure 2

Table 1 400-SB-10 IDW Mixed Media Aqueous Phase VOC Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Wastewaters Concentration (mg/L)
<u>1611301340</u> (Composite Sample) Nos. 7374, 7375, 7376, 7377, 7378, 7379, 7380, 7381, 7382 1/23/17	8260C	Acetone	0.055	N/A	0.28
<u>1611301341</u> (Composite Sample) Nos. 7374, 7375, 7376, 7377, 7378, 7379, 7380, 7381, 7382 1/23/17		Acetone	0.050	N/A	0.28

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Table 2 400-SB-10 IDW Mixed Media Settleable Solids Phase VOC Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters in mg/Kg unless noted as "mg/L TCLP"	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
1611301343 (Composite Sample) Nos. 7374, 7375, 7376, 7377, 7378, 7379, 7380, 7381, 7382 1/23/17	8260C	Acetone Carbon Disulfide Dichloromethane Tetrachloroethene	0.0069 0.0058J 0.0013BJ 0.0018J	N/A N/A N/A 0.7	160 4.8 mg/L TCLP 30 6.0	9.60E+05 8.54E+03 N/A 6.29E+02	2.42E+05 1.62E+03 N/A 1.20E+02
1611301344 (Composite Sample) Nos. 7374, 7375, 7376, 7377, 7378, 7379, 7380, 7381, 7382 1/23/17		Acetone Carbon Disulfide Dichloromethane Tetrachloroethene	0.0095 0.0069 0.0015BJ 0.0024J	N/A N/A N/A 0.7	160 4.8 mg/L TCLP 30 6.0	9.60E+05 8.54E+03 N/A 6.29E+02	2.42E+05 1.62E+03 N/A 1.20E+02

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Table 3 400-SB-10 IDW Mixed Media Aqueous Phase Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Wastewaters Concentration (mg/L)
1611181118 (Composite Sample) Nos. 7374, 7375, 7376, 7377, 7378, 7379, 7380, 7381, 7382 1/23/17	607M	N-Nitrosodimethylamine N-Nitrodimethylamine Bromacil	ND 0.0001 ND	0.40 N/A N/A
1611181119 (Composite Sample) Nos. 7374, 7375, 7376, 7377, 7378, 7379, 7380, 7381, 7382 1/23/17		N-Nitrosodimethylamine N-Nitrodimethylamine Bromacil	ND 0.0001 ND	0.40 N/A N/A

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Table 4 400-SB-10 IDW Mixed Media Settleable Solids Phase Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
<u>1611181127</u> (Composite Sample) Nos. 7374, 7375, 7376, 7377, 7378, 7379, 7380, 7381, 7382 1/23/17	607M	N-Nitrosodimethylamine N-Nitrodimethylamine Bromacil	ND ND ND	2.3 N/A N/A	5.03E-01 N/A N/A	2.14E+00 N/A N/A
<u>1611181128</u> (Composite Sample) Nos. 7374, 7375, 7376, 7377, 7378, 7379, 7380, 7381, 7382 1/23/17		N-Nitrosodimethylamine N-Nitrodimethylamine Bromacil	ND ND ND	2.3 N/A N/A	5.03E-01 N/A N/A	2.14E+00 N/A N/A

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Table 5 400-SB-10 IDW Mixed Media Aqueous Phase Metals Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Wastewaters (mg/L)
1611181121 (Composite Sample) Nos. 7374, 7375, 7376, 7377, 7378, 7379, 7380, 7381, 7382 1/23/17	1311/6010C	Barium Chromium Vanadium ¹ Zinc ¹	0.036B 0.00003 BJ 0.002BJ 0.012BJ	100 5.0 N/A N/A	1.2 2.77 4.3 2.61
1611181122 (Composite Sample) Nos. 7374, 7375, 7376, 7377, 7378, 7379, 7380, 7381, 7382 1/23/17		Barium Chromium Vanadium ¹ Zinc ¹	0.036B 0.00004 BJ 0.002BJ 0.015BJ	100 5.0 N/A N/A	1.2 2.77 4.3 2.61

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Table 6 400-SB-10 IDW Mixed Media Settleable Solids Phase Total Metals Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	TCLP Results (mg/L)²	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters (mg/L TCLP)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
<u>1611181130</u> (Composite Sample) Nos. 7374, 7375, 7376, 7377, 7378, 7379, 7380, 7381, 7382 1/23/17	1311/6010C	Antimony	1.0J	0.05	N/A	1.15	5.19E+02	1.42E+02
		Arsenic	5.4	0.27	5.0	5.0	2.15E+01	5.74E+01
		Barium	180	9	100.0	21	2.55E+05	4.39E+03
		Beryllium	0.53	0.027	N/A	1.22	2.58E+03	1.48E+02
		Cadmium	0.05J	0.003	1.0	0.11	1.11E+03	7.21E+01
		Chromium	1.8	0.09	5.0	0.60	5.05E+02	1.34E+02
		Lead	7.5J	0.375	5.0	0.75	8.00E+02	8.00E+02
		Nickel	3.5J	0.175	N/A	11	2.57E+04	7.53E+02
		Selenium	2.1J	0.105	N/A	5.7	6.49E+03	1.75E+03
		Vanadium ¹	42.7	2.14	N/A	1.6	5.53E+03	6.14E+02
Zinc ¹	37.0	1.85	N/A	4.3	3.89E+05	1.06E+05		
<u>1611181131</u> (Composite Sample) Nos. 7374, 7375, 7376, 7377, 7378, 7379, 7380, 7381, 7382 1/23/17	1311/6010C	Arsenic	5.7	0.285	5.0	5.0	2.15E+01	5.74E+01
		Barium	147	7.35	100.0	21	2.55E+05	4.39E+03
		Beryllium	0.55	0.028	N/A	1.22	2.58E+03	1.48E+02
		Cadmium	0.06J	0.003	1.0	0.11	1.11E+03	7.21E+01
		Chromium	2.7	0.135	5.0	0.60	5.05E+02	1.34E+02
		Lead	7.3J	0.365	5.0	0.75	8.00E+02	8.00E+02
		Nickel	3.4J	0.17	N/A	11	2.57E+04	7.53E+02
		Selenium	1.7	0.085	N/A	5.7	6.49E+03	1.75E+03
		Vanadium ¹	47.1	2.36	N/A	1.6	5.53E+03	6.14E+02
		Zinc ¹	37.4	1.87	N/A	4.3	3.89E+05	1.06E+05

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Table 7 400-SB-12 IDW Mixed Media Aqueous Phase VOC Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Wastewaters Concentration (mg/L)
1611301400 (Composite Sample) Nos. 7357, 7358, 7359, 7360, 7361 1/20/17	8260C	Acetone	0.026	N/A	0.28
1611301401 (Composite Sample) Nos. 7357, 7358, 7359, 7360, 7361 1/20/17		Acetone	0.025	N/A	0.28

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Table 8 400-SB-12 IDW Mixed Media Settleable Solids Phase VOC Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
1611301403 (Composite Sample) Nos. 7357, 7358, 7359, 7360, 7361 1/20/17	8260C	Acetone Dichloromethane Tetrachloroethene	0.160 0.0014 BJ 0.0014J	N/A N/A 0.7	160 30 6.0	9.60E+05 N/A 6.29E+02	2.42E+05 N/A 1.20E+02
1611301404 (Composite Sample) Nos. 7357, 7358, 7359, 7360, 7361 1/20/17		Acetone Dichloromethane	0.130 0.0014 BJ	N/A N/A	160 30	9.60E+05 N/A	2.42E+05 N/A

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Table 9 400-SB-12 IDW Mixed Media Aqueous Phase Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/L)	40 CFR Part 268 Subpart D Treatment Standard wastewaters Concentration (mg/L)
1611181143 (Composite Sample) Nos. 7357, 7358, 7359, 7360, 7361 1/20/17	607M	N-Nitrosodimethylamine N-Nitrodimethylamine Bromacil	ND ND ND	0.40 N/A N/A
1611181144 (Composite Sample) Nos. 7357, 7358, 7359, 7360, 7361 1/20/17		N-Nitrosodimethylamine N-Nitrodimethylamine Bromacil	ND ND ND	0.40 N/A N/A

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Table 10 400-SB-12 IDW Mixed Media Settleable Solids Phase Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
1611181152 (Composite Sample) Nos. 7357, 7358, 7359, 7360, 7361 1/20/17	607M	N-Nitrosodimethylamine N-Nitrodimethylamine Bromacil	ND ND ND	2.3 N/A N/A	5.03E-01 N/A N/A	2.14E+00 N/A N/A
1611181153 (Composite Sample) Nos. 7357, 7358, 7359, 7360, 7361 1/20/17		N-Nitrosodimethylamine N-Nitrodimethylamine Bromacil	0.00016 ND ND	2.3 N/A N/A	5.03E-01 N/A N/A	2.14E+00 N/A N/A

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Table 11 400-SB-12 IDW Mixed Media Aqueous Phase Metals Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Wastewaters (mg/L)
161181146 (Composite Sample) Nos. 7357, 7358, 7359, 7360, 7361 1/20/17	1311/6010C	Barium	0.153	100	1.2
		Beryllium	0.0002BJ	N/A	0.82
		Chromium	0.004BJ	5.0	2.77
		Vanadium ¹	0.016BJ	N/A	4.3
		Zinc ¹	0.025	N/A	2.61
161181147 (Composite Sample) Nos. 7357, 7358, 7359, 7360, 7361 1/20/17	1311/6010C	Barium	0.036B	100	1.2
		Chromium	0.0004 BJ	5.0	2.77
		Vanadium ¹	0.003BJ	N/A	4.3
		Zinc ¹	0.018BJ	N/A	2.61

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Table 12 400-SB-12 IDW Mixed Media Settleable Solids Phase Total Metals Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	TCLP Results (mg/L) ²	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters (mg/L TCLP)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
1611181155 (Composite Sample) Nos. 7357, 7358, 7359, 7360, 7361 1/20/17	1311/6010C	Arsenic	0.8J	0.04	5.0	5.0	2.15E+01	5.74E+01
		Barium	237	11.85	100.0	21	2.55E+05	4.39E+03
		Beryllium	0.59	0.030	N/A	1.22	2.58E+03	1.48E+02
		Cadmium	0.71	0.036	1.0	0.11	1.11E+03	7.21E+01
		Chromium	12.1	0.605	5.0	0.60	5.05E+02	1.34E+02
		Lead	4.3J	0.215	5.0	0.75	8.00E+02	8.00E+02
		Nickel	8.8	0.44	N/A	11	2.57E+04	7.53E+02
		Vanadium ¹	59.4	2.97	N/A	1.6	5.53E+03	6.14E+02
Zinc ¹	41.4	2.07	N/A	4.3	3.89E+05	1.06E+05		
1611181156 (Composite Sample) Nos. 7357, 7358, 7359, 7360, 7361 1/20/17	1311/6010C	Arsenic	1.0J	0.05	5.0	5.0	2.15E+01	5.74E+01
		Barium	330	16.5	100.0	21	2.55E+05	4.39E+03
		Beryllium	0.57	0.0285	N/A	1.22	2.58E+03	1.48E+02
		Cadmium	0.74	0.037	1.0	0.11	1.11E+03	7.21E+01
		Chromium	16.4	0.82	5.0	0.60	5.05E+02	1.34E+02
		Lead	4.7J	0.235	5.0	0.75	8.00E+02	8.00E+02
		Nickel	9.9	0.495	N/A	11	2.57E+04	7.53E+02
		Selenium	1.5	0.075	N/A	5.7	6.49E+03	1.75E+03
Vanadium ¹	72.2	3.61	N/A	1.6	5.53E+03	6.14E+02		
Zinc ¹	43.7	2.17	N/A	4.3	3.89E+05	1.06E+05		

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Table 13 400-SB-14 IDW Soil VOC Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
1611090900 No. 7393 1/31/17 1611090901 No. 7393 1/31/17 1611090920 No. 7392 1/31/17 1611090930 No. 7394 1/31/17	8260C	Dichloromethane	0.00082J	N/A	30	5.13E+03	1.21E+03
		Naphthalene	0.00089J	N/A	5.6	2.41E+02	1.59E+02
		Tetrachloroethene	0.001J	5.0	6.0	6.29E+02	1.20E+02
		Dichloromethane	0.0015J	N/A	30	5.13E+03	1.21E+03
		Naphthalene	0.00085J	N/A	5.6	2.41E+02	1.59E+02
		Tetrachloroethene	0.0012J	5.0	6.0	6.29E+02	1.20E+02
		Dichloromethane	0.0014J	N/A	30	5.13E+03	1.21E+03
		Naphthalene	0.00067J	N/A	5.6	2.41E+02	1.59E+02
		Tetrachloroethene	0.0036J	5.0	6.0	6.29E+02	1.20E+02
		Dichloromethane	0.0016J	N/A	30	5.13E+03	1.21E+03
		Naphthalene	0.00055J	N/A	5.6	2.41E+02	1.59E+02
		Tetrachloroethene	0.00099J	5.0	6.0	6.29E+02	1.20E+02

Table 14 400-SB-14 IDW Soil Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
1611090903 No. 7393 1/31/17	607M	N-Nitrosodimethylamine	ND	N/A	2.3	5.03E-01	2.14E+00
		N-Nitrodimethylamine	ND	N/A	N/A	N/A	N/A
		Bromacil	ND	N/A	N/A	N/A	N/A
1611090904 No. 7393 1/31/17		N-Nitrosodimethylamine	ND	N/A	2.3	5.03E-01	2.14E+00
		N-Nitrodimethylamine	ND	N/A	N/A	N/A	N/A
		Bromacil	ND	N/A	N/A	N/A	N/A
1611090921 No. 7392 1/31/17		N-Nitrosodimethylamine	ND	N/A	2.3	5.03E-01	2.14E+00
		N-Nitrodimethylamine	ND	N/A	N/A	N/A	N/A
		Bromacil	ND	N/A	N/A	N/A	N/A
1611090931 No. 7394 1/31/17		N-Nitrosodimethylamine	ND	N/A	2.3	5.03E-01	2.14E+00
		N-Nitrodimethylamine	ND	N/A	N/A	N/A	N/A
		Bromacil	ND	N/A	N/A	N/A	N/A

Enclosure 2

Table 15 400-SB-14 IDW Soil TCLP Metals Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	TCLP Results (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters (mg/L TCLP)
1611090909 No. 7393 1/31/17	1311/6010C	Barium	1.2J	100	21
		Cadmium	0.0039J	1.0	0.11
		Zinc ¹	0.077J	N/A	4.3
1611090910 No. 7393 1/31/17		Arsenic	0.056J	5.0	5.0
		Barium	1.4J	100	21
	Cadmium	0.012	1.0	0.11	
	Chromium	0.047	5.0	0.6	
	Zinc ¹	0.061J	N/A	4.3	
1611090923 No. 7392 1/31/17		Barium	1.1J	100	21
	Cadmium	0.0044J	1.0	0.11	
	Chromium	0.019J	5.0	0.6	
	Vanadium ¹	0.011J	N/A	1.6	
	Zinc ¹	0.071J	N/A	4.3	
1611090933 No. 7394 1/31/17		Barium	2.4J	100	21
	Cadmium	0.0044J	1.0	0.11	
	Zinc ¹	0.055J	N/A	4.3	

Enclosure 2

Table 16 400-SB-14 IDW Soil Total Metals Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
<u>1611090906</u> No. 7393 1/31/17	6010C	Arsenic	6.3	2.15E+01	5.74E+01
		Barium	76.3	2.55E+05	4.39E+03
		Beryllium	0.58B	2.58E+03	1.48E+02
		Cadmium	0.07BJ	1.11E+03	7.21E+01
		Chromium	11.6	5.05E+02	1.34E+02
		Lead	8.6	8.00E+02	8.00E+02
		Nickel	9.9	2.57E+04	7.53E+02
		Selenium	2.0	6.49E+03	1.75E+03
		Thallium	1.6	1.30E+01	3.54E+00
		Vanadium	15.0	6.53E+03	6.14E+02
Zinc	46.6	3.89E+05	1.06E+05		
<u>1611090907</u> No. 7393 1/31/17	6010C	Arsenic	4.8	2.15E+01	5.74E+01
		Barium	60.6	2.55E+05	4.39E+03
		Beryllium	0.49B	2.58E+03	1.48E+02
		Cadmium	0.08J	1.11E+03	7.21E+01
		Chromium	18.8	5.05E+02	1.34E+02
		Lead	9.1	8.00E+02	8.00E+02
		Nickel	9.0	2.57E+04	7.53E+02
		Thallium	3.2	1.30E+01	3.54E+00
		Vanadium	15.8	6.53E+03	6.14E+02
		Zinc	46.4	3.89E+05	1.06E+05
<u>1611090922</u> No. 7392 1/31/17	6010C	Arsenic	6.1	2.15E+01	5.74E+01
		Barium	71.7	2.55E+05	4.39E+03
		Beryllium	0.49B	2.58E+03	1.48E+02
		Cadmium	0.58B	1.11E+03	7.21E+01
		Chromium	17.2	5.05E+02	1.34E+02
		Lead	7.7	8.00E+02	8.00E+02
		Nickel	8.1	2.57E+04	7.53E+02
		Thallium	3.0	1.30E+01	3.54E+00
		Vanadium	24.5	6.53E+03	6.14E+02
		Zinc	72.5	3.89E+05	1.06E+05

Enclosure 2

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	NMED Industrial Soil Screening Level (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
1611090932 No. 7394 1/31/17	6010C	Arsenic	8.4	2.15E+01	5.74E+01
		Barium	68.6	2.55E+05	4.39E+03
		Beryllium	0.43B	2.58E+03	1.48E+02
		Cadmium	0.12BJ	1.11E+03	7.21E+01
		Chromium	10.7	5.05E+02	1.34E+02
		Lead	8.3	8.00E+02	8.00E+02
		Nickel	6.8	2.57E+04	7.53E+02
		Thallium	3.2	1.30E+01	3.54E+00
		Vanadium	12.6	6.53E+03	6.14E+02
Zinc	63.4	3.89E+05	1.06E+05		

Table Notes:

B: Indicates analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result

J: Indicates result concentration is between the method reporting limit and the method detection limit.

ND: Indicates not detected.

N/A: Indicates not applicable.

¹ These constituents are not “underlying hazardous constituents” in characteristic wastes, according to the definition at 40 CFR 268.2(i).

² Indicates that total metal results were divided by 20. This represents the maximum theoretical leachate concentration that could result from performing the Toxicity Characteristic Leaching Procedure (EPA Method 1311).



December 02, 2016

Service Request No:R1611998

Mr. Tom Hall
NASA/WSTF/Navarro
P.O. Box 20
Las Cruces, NM 88004

Laboratory Results for: White Sands Test Facility

Dear Mr.Hall,

Enclosed are the results of the sample(s) submitted to our laboratory November 11, 2016
For your reference, these analyses have been assigned our service request number **R1611998**.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAP standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report. The measurement uncertainty of the results included in this report is within that expected when using the prescribed method(s) for analysis of these samples, and represented by Laboratory Control Sample control limits. Any events, such as QC failures, which may add to the uncertainty are explained in the report narrative.

Please contact me if you have any questions. My extension is 7472. You may also contact me via email at Janice.Jaeger@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Janice Jaeger
Project Manager

ADDRESS 1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
PHONE +1 585 288 5380 | **FAX** +1 585 288 8475
ALS Group USA, Corp.
dba ALS Environmental



Narrative Documents

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com



Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request:R1611998
Date Received:11/11/16

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables, including results of QC samples analyzed from this delivery group. Analytical procedures performed by the lab are validated in accordance with NELAC standards. Any parameters that are not included in the lab's NELAC accreditation are identified on a "Non-Certified Analytes" report in the Miscellaneous Forms Section of this report. Individual analytical results requiring further explanation are flagged with qualifiers and/or discussed below. The flags are explained in the Report Qualifiers and Definitions page in the Miscellaneous Forms section of this report.

Sample Receipt

Twelve soil samples were received for analysis at ALS Environmental on 11/11/2016. Any discrepancies noted upon initial sample inspection are noted on the cooler receipt and preservation form included in this data package. The samples were received in good condition and consistent with the accompanying chain of custody form. Samples are refrigerated at ≤6°C upon receipt at the lab except for aqueous samples designated for metals analyses, which are stored at room temperature.

Volatile Organic Analyses:

Method 8260c, 11/14/16: The upper control limit was exceeded for one or more analytes in the Continuing Calibration Verification (CCV). The field samples analyzed in this sequence did not contain the analyte(s) in question above the Method Reporting Limit (MRL). Since the exceedance equates to a potential high bias, the data quality was not significantly affected and no further corrective action was taken.

Metals Analyses:

No significant anomalies were noted with this analysis.

General Chemistry Analyses:

No significant anomalies were noted with this analysis.

Sample Receiving Notes:

Method 8260C: soil samples included in this report were received in jars and not collected using one of the EPA method 5035A low level options. In accordance with the NYSDOH technical notice of October 2012 all results or reporting limits <200 ug/kg should be considered as estimated due to potential low bias.

One or more samples were subcontracted to another laboratory for testing. The certified analytical report from the subcontractor has been included in its entirety at the end of this report and includes the name and address of the subcontracted laboratory.

Approved by  Date 12/2/2016



SAMPLE DETECTION SUMMARY

CLIENT ID: 1611090900 400-SB-14 (0-153.5)	Lab ID: R1611998-001
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	92.5				Percent	ALS SOP
Dichloromethane	0.82	J	0.62	5.4	ug/Kg	8260C
Naphthalene	0.89	J	0.56	5.4	ug/Kg	8260C
Tetrachloroethene (PCE)	1.0	J	0.96	5.4	ug/Kg	8260C

CLIENT ID: 1611090901 400-SB-14 (0-153.5)	Lab ID: R1611998-002
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	92.0				Percent	ALS SOP
Dichloromethane	1.5	J	0.63	5.5	ug/Kg	8260C
Naphthalene	0.85	J	0.56	5.5	ug/Kg	8260C
Tetrachloroethene (PCE)	1.2	J	0.97	5.5	ug/Kg	8260C

CLIENT ID: 1611090906 400-SB-14 (0-153.5)	Lab ID: R1611998-003
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	92.6				Percent	ALS SOP
Arsenic, Total	6.3		0.3	1.1	mg/Kg	6010C
Barium, Total	76.3		0.2	2.1	mg/Kg	6010C
Beryllium, Total	0.58	B	0.02	0.32	mg/Kg	6010C
Cadmium, Total	0.07	BJ	0.04	0.53	mg/Kg	6010C
Chromium, Total	11.6		0.2	1.1	mg/Kg	6010C
Lead, Total	8.6		0.3	5.3	mg/Kg	6010C
Nickel, Total	9.9		0.2	4.3	mg/Kg	6010C
Selenium, Total	2.0		0.7	1.0	mg/Kg	6010C
Thallium, Total	1.6		0.6	1.1	mg/Kg	6010C
Vanadium, Total	15.0		0.2	5.3	mg/Kg	6010C
Zinc, Total	46.6		0.2	2.1	mg/Kg	6010C

CLIENT ID: 1611090907 400-SB-14 (0-153.5)	Lab ID: R1611998-004
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	91.3				Percent	ALS SOP
Arsenic, Total	4.8		0.3	1.1	mg/Kg	6010C
Barium, Total	60.6		0.2	2.2	mg/Kg	6010C
Beryllium, Total	0.49	B	0.02	0.33	mg/Kg	6010C
Cadmium, Total	0.08	BJ	0.04	0.54	mg/Kg	6010C
Chromium, Total	18.8		0.2	1.1	mg/Kg	6010C
Lead, Total	9.1		0.3	5.4	mg/Kg	6010C
Nickel, Total	9.0		0.2	4.3	mg/Kg	6010C
Selenium, Total	2.0		0.7	1.1	mg/Kg	6010C
Thallium, Total	3.2		0.6	1.1	mg/Kg	6010C
Vanadium, Total	15.8		0.2	5.4	mg/Kg	6010C
Zinc, Total	46.4		0.2	2.2	mg/Kg	6010C



SAMPLE DETECTION SUMMARY

CLIENT ID: 1611090920 400-SB-14 (0-62) **Lab ID: R1611998-007**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	91.2				Percent	ALS SOP
Dichloromethane	1.4	J	0.63	5.5	ug/Kg	8260C
Naphthalene	0.67	J	0.56	5.5	ug/Kg	8260C
Tetrachloroethene (PCE)	3.6	J	0.97	5.5	ug/Kg	8260C

CLIENT ID: 1611090922 400-SB-14 (0-62) **Lab ID: R1611998-008**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	88.9				Percent	ALS SOP
Arsenic, Total	6.1		0.3	1.1	mg/Kg	6010C
Barium, Total	71.7		0.2	2.2	mg/Kg	6010C
Beryllium, Total	0.49	B	0.02	0.34	mg/Kg	6010C
Cadmium, Total	0.58	B	0.04	0.56	mg/Kg	6010C
Chromium, Total	17.2		0.2	1.1	mg/Kg	6010C
Lead, Total	7.7		0.4	5.6	mg/Kg	6010C
Mercury, Total	0.004	J	0.004	0.034	mg/Kg	7471B
Nickel, Total	8.1		0.2	4.5	mg/Kg	6010C
Selenium, Total	2.3		0.7	1.1	mg/Kg	6010C
Thallium, Total	3.0		0.6	1.1	mg/Kg	6010C
Vanadium, Total	24.5		0.2	5.6	mg/Kg	6010C
Zinc, Total	72.5		0.2	2.2	mg/Kg	6010C

CLIENT ID: 1611090930 400-SB-14 (62-153.5) **Lab ID: R1611998-010**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	94.0				Percent	ALS SOP
Dichloromethane	1.6	J	0.61	5.3	ug/Kg	8260C
Naphthalene	0.55	J	0.54	5.3	ug/Kg	8260C
Tetrachloroethene (PCE)	0.99	J	0.93	5.3	ug/Kg	8260C

CLIENT ID: 1611090932 400-SB-14 (62-153.5) **Lab ID: R1611998-011**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	92.5				Percent	ALS SOP
Arsenic, Total	8.4		0.3	1.1	mg/Kg	6010C
Barium, Total	68.6		0.2	2.2	mg/Kg	6010C
Beryllium, Total	0.43	B	0.02	0.32	mg/Kg	6010C
Cadmium, Total	0.12	BJ	0.04	0.54	mg/Kg	6010C
Chromium, Total	10.7		0.2	1.1	mg/Kg	6010C
Lead, Total	8.3		0.3	5.4	mg/Kg	6010C
Nickel, Total	6.8		0.2	4.3	mg/Kg	6010C
Selenium, Total	1.8		0.7	1.0	mg/Kg	6010C
Thallium, Total	3.2		0.6	1.1	mg/Kg	6010C
Vanadium, Total	12.6		0.2	5.4	mg/Kg	6010C
Zinc, Total	63.4		0.2	2.2	mg/Kg	6010C



Sample Receipt Information

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com


Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request:R1611998


SAMPLE CROSS-REFERENCE

<u>SAMPLE #</u>	<u>CLIENT SAMPLE ID</u>	<u>DATE</u>	<u>TIME</u>
R1611998-001	1611090900 400-SB-14 (0-153.5)	11/9/2016	
R1611998-002	1611090901 400-SB-14 (0-153.5)	11/9/2016	
R1611998-003	1611090906 400-SB-14 (0-153.5)	11/9/2016	
R1611998-004	1611090907 400-SB-14 (0-153.5)	11/9/2016	
R1611998-005	1611090909 400-SB-14 (0-153.5)	11/9/2016	
R1611998-006	1611090910 400-SB-14 (0-153.5)	11/9/2016	
R1611998-007	1611090920 400-SB-14 (0-62)	11/9/2016	
R1611998-008	1611090922 400-SB-14 (0-62)	11/9/2016	
R1611998-009	1611090923 400-SB-14 (0-62)	11/9/2016	
R1611998-010	1611090930 400-SB-14 (62-153.5)	11/9/2016	
R1611998-011	1611090932 400-SB-14 (62-153.5)	11/9/2016	
R1611998-012	1611090933 400-SB-14 (62-153.5)	11/9/2016	

Laboratory: ALS		PO #15EC007B		Analytical Requirements			Special Instructions Return coolers and reusable packaging materials within 14 days as required in statement of work to: Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Lori Minnick		
Address shipping questions to: <input type="checkbox"/> Lori Minnick, 575-524-5119 <input checked="" type="checkbox"/> Other <u>Tom Hall, 575-524-5453</u>				# of Containers	Sample Matrix*	W-846 Method 8260B 4 oz. Glass Jar, Ice		Total Metals 4 oz. Glass Jar, Ice	TCLP Metals 16 oz. Glass Jar, Ice
Send sample receipt confirmation and analytical reports to: <input type="checkbox"/> Carlyn Tufts, carlyn.a.tufts@nasa.gov <input type="checkbox"/> Shelly Hernandez, shelly.j.hernandez@nasa.gov <input checked="" type="checkbox"/> Tom Hall, tom.a.hall@nasa.gov									
Sample Number	Sample Location					Charge Number (WTSF Use Only)	Comments		
1611090900	400-SB-1410-1530 (7393)	1	S	X		43FW			
— 0901	"	1	S	X		"			
— 0902 (ms)	"	1	S	X		"	MATRIX SPIKE FOR 0900		
— 0906	"	1	S		X	"			
— 0907	"	1	S		X	"			
— 0908 (ms)	"	1	S		X	"	MATRIX SPIKE FOR 0906		
— 0909	"	1	S			X	"		
— 0910	"	1	S			X	"		
— 0911 (ms)	"	1	S			X	MATRIX SPIKE FOR 0909		
Relinquished By: <u>[Signature]</u>		Date/Time: 11-9-16 (1030)		Accepted By: <u>[Signature]</u>		Date/Time: 11/11/16 0930			

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 NASA/WSTF/Navarro
 White Sands Test Facility


Laboratory: ALS		PO #15EC007B		Analytical Requirements			Special Instructions Return coolers and reusable packaging materials within 14 days as required in statement of work to: Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Lori Minnick	
Address shipping questions to: <input type="checkbox"/> Lori Minnick, 575-524-5119 <input checked="" type="checkbox"/> Other <u>Tom Hall</u> , 575-524-5453				W-846 Method 8260B 4 oz. Glass Jar, Ice	Total Metals 4 oz. Glass Jar, Ice	TCLP Metals 16 oz. Glass Jar, Ice		
Send sample receipt confirmation and analytical reports to: <input type="checkbox"/> Carlyn Tufts, carlyn.a.tufts@nasa.gov <input type="checkbox"/> Shelly Hernandez, shelly.j.hernandez@nasa.gov <input checked="" type="checkbox"/> Tom Hall, tom.a.hall@nasa.gov		# of Containers	Sample Matrix*				Charge Number (WTSF Use Only)	Comments
Sample Number	Sample Location	# of Containers	Sample Matrix*	W-846 Method 8260B 4 oz. Glass Jar, Ice	Total Metals 4 oz. Glass Jar, Ice	TCLP Metals 16 oz. Glass Jar, Ice	Charge Number (WTSF Use Only)	Comments
1611090920	400-58-14 (0-62) (7392)	1	S	X			4IFW	
— 0922	" (0-62)	1	S		X		"	
— 0923	" (0-62) (7394)	1	S			X	"	
1611090930	400-58-14 (62-153.5) (62-153.5)	1	S	X			"	
— 0932	" (62-153.5)	1	S		X		"	
— 0933	" (62-153.5)	1	S			X	"	
Relinquished By:		Date/Time:		Accepted By:		Date/Time:		
<i>[Signature]</i>		11-9-16 (1030)		<i>[Signature]</i>		11/11/16 0930		

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 NASA/WSTF/Navarro
 White Sands Test Facility




Cooler Receipt and Preservation Check Form

R1611998

5

NASA/WSTF/Navarro
White Sands Test Facility



Project/Client NASA Folder Number _____

Cooler received on 11/11/16 by: SAS COURIER: ALS UPS FEDEX VELOCITY CLIENT

1	Were Custody seals on outside of cooler?	<u>Y</u>	N
2	Custody papers properly completed (ink, signed)?	<u>Y</u>	N
3	Did all bottles arrive in good condition (unbroken)?	<u>Y</u>	N
4	Circle <u>Wet Ice</u> Dry Ice Gel packs present?	<u>Y</u>	N

5a	Perchlorate samples have required headspace?	<u>Y</u>	N	NA
5b	Did VOA vials, Alk, or Sulfide have sig* bubbles?	Y	<u>N</u>	NA
6	Where did the bottles originate?	<u>ALS/ROC</u>	CLIENT	
7	Soil VOA received as:	Bulk	Encore	5035set <u>NA</u>

8. Temperature Readings Date: 11/11/16 Time: 0950 ID: IR#7 IR#8 From: Temp Blank Sample Bottle

Observed Temp (°C)	<u>2.9</u>							
Correction Factor (°C)	<u>+2.0</u>							
Corrected Temp (°C)	<u>2.9</u>							
Within 0-6°C?	<u>Y</u>	N	Y	N	Y	N	Y	N
If <0°C, were samples frozen?	Y	N	Y	N	Y	N	Y	N

If out of Temperature, note packing/ice condition: _____ Ice melted _____ Poorly Packed _____ Same Day Rule _____

& Client Approval to Run Samples: _____ Standing Approval _____ Client aware at drop-off _____ Client notified by: _____

All samples held in storage location: 2002 by SAS on 11/11/16 at 0950
5035 samples placed in storage location: _____ by _____ on _____ at _____

Cooler Breakdown: Date: 11/11/16 Time: 1252 by: @

- Were all bottle labels complete (i.e. analysis, preservation, etc.)? YES NO
- Did all bottle labels and tags agree with custody papers? YES NO
- Were correct containers used for the tests indicated? YES NO
- Were 5035 vials acceptable (no extra labels, not leaking)? YES NO
- Air Samples: Cassettes / Tubes Intact _____ Canisters Pressurized _____ Tedlar® Bags Inflated NA

Explain any discrepancies:

pH	Reagent	Yes	No	Lot Received	Exp	Sample ID	Vol. Added	Lot Added	Final pH
≥12	NaOH								
≤2	HNO ₃								
≤2	H ₂ SO ₄								
<4	NaHSO ₄								
Residual Chlorine (-)	For CN Phenol and 522			If +, contact PM to add Na ₂ S ₂ O ₃ (CN), ascorbic (phenol).					
	Na ₂ S ₂ O ₃	-	-						
	ZnAcetate	-	-						
	HCl	**	**						

Yes=All samples OK

No=Samples were preserved at The lab as listed

PM OK to Adjust: _____

**Not to be tested before analysis – pH tested and recorded by VOAs on a separate worksheet

Bottle lot numbers: client
Other Comments:

CLRES	<u>BULK</u>
DO	FLDT
HPROD	HGFB
HTR	LL3541
PH	<u>SUB</u>
SO3	MARRS
ALS	REV

PC Secondary Review: SMW 11/14/14 significant air bubbles: VOA > 5-6 mm : WC > 1 in. diameter



Miscellaneous Forms

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
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REPORT QUALIFIERS AND DEFINITIONS

<p>U Analyte was analyzed for but not detected. The sample quantitation limit has been corrected for dilution and for percent moisture, unless otherwise noted in the case narrative.</p> <p>J Estimated value due to either being a Tentatively Identified Compound (TIC) or that the concentration is between the MRL and the MDL. Concentrations are not verified within the linear range of the calibration. For DoD: concentration >40% difference between two GC columns (pesticides/Aroclors).</p> <p>B Analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.</p> <p>E Inorganics- Concentration is estimated due to the serial dilution was outside control limits.</p> <p>E Organics- Concentration has exceeded the calibration range for that specific analysis.</p> <p>D Concentration is a result of a dilution, typically a secondary analysis of the sample due to exceeding the calibration range or that a surrogate has been diluted out of the sample and cannot be assessed.</p> <p>* Indicates that a quality control parameter has exceeded laboratory limits. Under the “Notes” column of the Form I, this qualifier denotes analysis was performed out of Holding Time.</p> <p>H Analysis was performed out of hold time for tests that have an “immediate” hold time criteria.</p> <p># Spike was diluted out.</p>	<p>+ Correlation coefficient for MSA is <0.995.</p> <p>N Inorganics- Matrix spike recovery was outside laboratory limits.</p> <p>N Organics- Presumptive evidence of a compound (reported as a TIC) based on the MS library search.</p> <p>S Concentration has been determined using Method of Standard Additions (MSA).</p> <p>W Post-Digestion Spike recovery is outside control limits and the sample absorbance is <50% of the spike absorbance.</p> <p>P Concentration >40% (25% for CLP) difference between the two GC columns.</p> <p>C Confirmed by GC/MS</p> <p>Q DoD reports: indicates a pesticide/Aroclor is not confirmed ($\geq 100\%$ Difference between two GC columns).</p> <p>X See Case Narrative for discussion.</p> <p>MRL Method Reporting Limit. Also known as:</p> <p>LOQ Limit of Quantitation (LOQ) The lowest concentration at which the method analyte may be reliably quantified under the method conditions.</p> <p>MDL Method Detection Limit. A statistical value derived from a study designed to provide the lowest concentration that will be detected 99% of the time. Values between the MDL and MRL are estimated (see J qualifier).</p> <p>LOD Limit of Detection. A value at or above the MDL which has been verified to be detectable.</p> <p>ND Non-Detect. Analyte was not detected at the concentration listed. Same as U qualifier.</p>
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Rochester Lab ID # for State Certifications¹

Connecticut ID # PH0556	Maine ID #NY0032	New Hampshire ID #
Delaware Accredited	Nebraska Accredited	294100 A/B
DoD ELAP #65817	New Jersey ID # NY004	Pennsylvania ID# 68-786
Florida ID # E87674	New York ID # 10145	Rhode Island ID # 158
Illinois ID #200047	North Carolina #676	Virginia #460167

¹ Analyses were performed according to our laboratory’s NELAP-approved quality assurance program and any applicable state or agency requirements. The test results meet requirements of the current NELAP/TNI standards or state or agency requirements, where applicable, except as noted in the case narrative. Since not all analyte/method/matrix combinations are offered for state/NELAC accreditation, this report may contain results which are not accredited. For a specific list of accredited analytes, contact the laboratory or go to <http://www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads/North-America-Downloads>

ALS Laboratory Group

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

ALS Group USA, Corp.
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Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1611998

Sample Name: 1611090900 400-SB-14 (0-153.5)
Lab Code: R1611998-001
Sample Matrix: Soil

Date Collected: 11/9/16
Date Received: 11/11/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1611090901 400-SB-14 (0-153.5)
Lab Code: R1611998-002
Sample Matrix: Soil

Date Collected: 11/9/16
Date Received: 11/11/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1611090906 400-SB-14 (0-153.5)
Lab Code: R1611998-003
Sample Matrix: Soil

Date Collected: 11/9/16
Date Received: 11/11/16

Analysis Method
6010C
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CGILDAY
CBURLESON
KWONG

Sample Name: 1611090907 400-SB-14 (0-153.5)
Lab Code: R1611998-004
Sample Matrix: Soil

Date Collected: 11/9/16
Date Received: 11/11/16

Analysis Method
6010C
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CGILDAY
CBURLESON
KWONG

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1611998

Sample Name: 1611090920 400-SB-14 (0-62)
Lab Code: R1611998-007
Sample Matrix: Soil

Date Collected: 11/9/16
Date Received: 11/11/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1611090922 400-SB-14 (0-62)
Lab Code: R1611998-008
Sample Matrix: Soil

Date Collected: 11/9/16
Date Received: 11/11/16

Analysis Method
6010C
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CGILDAY
CBURLESON
KWONG

Sample Name: 1611090930 400-SB-14 (62-153.5)
Lab Code: R1611998-010
Sample Matrix: Soil

Date Collected: 11/9/16
Date Received: 11/11/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1611090932 400-SB-14 (62-153.5)
Lab Code: R1611998-011
Sample Matrix: Soil

Date Collected: 11/9/16
Date Received: 11/11/16

Analysis Method
6010C
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CGILDAY
CBURLESON
KWONG



INORGANIC PREPARATION METHODS

The preparation methods associated with this report are found in these tables unless discussed in the case narrative.

Water/Liquid Matrix

Analytical Method	Preparation Method
200.7	200.2
200.8	200.2
6010C	3005A/3010A
6020A	ILM05.3
9014 Cyanide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Acid Soluble	9030B
9056A Bomb (Halogens)	5050A
9066 Manual Distillation	9065
SM 4500-CN-E Residual Cyanide	SM 4500-CN-G
SM 4500-CN-E WAD Cyanide	SM 4500-CN-I

Solid/Soil/Non-Aqueous Matrix

Analytical Method	Preparation Method
6010C	3050B
6020A	3050B
6010C TCLP (1311) extract	3005A/3010A
6010 SPLP (1312) extract	3005A/3010A
7196A	3060A
7199	3060A
9056A Halogens/Halides	5050
300.0 Anions/ 350.1/ 353.2/ SM 2320B/ SM 5210B/ 9056A Anions	DI extraction

For analytical methods not listed, the preparation method is the same as the analytical method reference.



Sample Results

ALS Environmental—Rochester Laboratory
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Volatile Organic Compounds by GC/MS

ALS Environmental—Rochester Laboratory

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Phone (585) 288-5380 Fax (585) 288-8475

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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611090900 400-SB-14 (0-153.5)
Lab Code: R1611998-001

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16 09:30

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.4	0.90	1	11/14/16 20:42	
1,1,1-Trichloroethane (TCA)	ND U	5.4	0.79	1	11/14/16 20:42	
1,1,2,2-Tetrachloroethane	ND U	5.4	0.88	1	11/14/16 20:42	
1,1,2-Trichloroethane	ND U	5.4	0.79	1	11/14/16 20:42	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.4	1.4	1	11/14/16 20:42	
1,1-Dichloroethene (1,1-DCE)	ND U	5.4	1.4	1	11/14/16 20:42	
1,2,3-Trichloropropane	ND U	5.4	1.5	1	11/14/16 20:42	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.4	2.1	1	11/14/16 20:42	
1,2-Dibromoethane	ND U	5.4	1.4	1	11/14/16 20:42	
1,2-Dichlorobenzene	ND U	5.4	0.66	1	11/14/16 20:42	
1,2-Dichloroethane	ND U	5.4	0.66	1	11/14/16 20:42	
1,2-Dichloropropane	ND U	5.4	1.1	1	11/14/16 20:42	
1,3-Dichlorobenzene	ND U	5.4	0.69	1	11/14/16 20:42	
1,4-Dioxane	ND U	110	21	1	11/14/16 20:42	
2-Butanone (MEK)	ND U	5.4	2.5	1	11/14/16 20:42	
2-Chloro-1,3-butadiene	ND U	5.4	1.7	1	11/14/16 20:42	
2-Chloroethyl Vinyl Ether	ND U	5.4	1.9	1	11/14/16 20:42	
Isobutyl Alcohol	ND U	110	25	1	11/14/16 20:42	
Allyl Chloride	ND U	5.4	1.9	1	11/14/16 20:42	
4-Methyl-2-pentanone	ND U	5.4	1.1	1	11/14/16 20:42	
Acetone	ND U	5.4	3.1	1	11/14/16 20:42	
Acetonitrile	ND U	27	19	1	11/14/16 20:42	
Acrolein	ND U	27	3.8	1	11/14/16 20:42	
Acrylonitrile	ND U	27	7.0	1	11/14/16 20:42	
Benzene	ND U	5.4	0.32	1	11/14/16 20:42	
Bromodichloromethane	ND U	5.4	0.66	1	11/14/16 20:42	
Bromoform	ND U	5.4	1.1	1	11/14/16 20:42	
Bromomethane	ND U	5.4	1.5	1	11/14/16 20:42	
Carbon Disulfide	ND U	5.4	1.4	1	11/14/16 20:42	
Carbon Tetrachloride	ND U	5.4	1.0	1	11/14/16 20:42	
Chlorobenzene	ND U	5.4	0.32	1	11/14/16 20:42	
Chloroethane	ND U	5.4	3.2	1	11/14/16 20:42	
Chloroform	ND U	5.4	1.4	1	11/14/16 20:42	
Chloromethane	ND U	5.4	0.44	1	11/14/16 20:42	
Dibromochloromethane	ND U	5.4	0.79	1	11/14/16 20:42	
Dibromomethane	ND U	5.4	0.69	1	11/14/16 20:42	
Dichlorodifluoromethane (CFC 12)	ND U	5.4	2.1	1	11/14/16 20:42	
Dichloromethane	0.82 J	5.4	0.62	1	11/14/16 20:42	
Ethyl Methacrylate	ND U	5.4	0.82	1	11/14/16 20:42	
Ethylbenzene	ND U	5.4	0.25	1	11/14/16 20:42	
Iodomethane	ND U	11	1.3	1	11/14/16 20:42	
Methacrylonitrile	ND U	5.4	1.7	1	11/14/16 20:42	
Methyl Methacrylate	ND U	5.4	0.79	1	11/14/16 20:42	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611090900 400-SB-14 (0-153.5)
Lab Code: R1611998-001

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16 09:30

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	0.89 J	5.4	0.56	1	11/14/16 20:42	
Propionitrile	ND U	27	7.1	1	11/14/16 20:42	
Tetrachloroethene (PCE)	1.0 J	5.4	0.96	1	11/14/16 20:42	
Toluene	ND U	5.4	1.1	1	11/14/16 20:42	
Trichloroethene (TCE)	ND U	5.4	1.1	1	11/14/16 20:42	
Trichlorofluoromethane (CFC 11)	ND U	5.4	0.72	1	11/14/16 20:42	
Vinyl Chloride	ND U	5.4	2.0	1	11/14/16 20:42	
cis-1,3-Dichloropropene	ND U	5.4	0.98	1	11/14/16 20:42	
m,p-Xylenes	ND U	11	1.2	1	11/14/16 20:42	
o-Xylene	ND U	5.4	0.52	1	11/14/16 20:42	
trans-1,2-Dichloroethene	ND U	5.4	0.93	1	11/14/16 20:42	
trans-1,3-Dichloropropene	ND U	5.4	0.22	1	11/14/16 20:42	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	99	51 - 136	11/14/16 20:42	
Dibromofluoromethane	99	63 - 138	11/14/16 20:42	
Toluene-d8	103	66 - 138	11/14/16 20:42	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16 09:30

Sample Name: 1611090901 400-SB-14 (0-153.5)
Lab Code: R1611998-002

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.5	0.92	1.01	11/14/16 21:07	
1,1,1-Trichloroethane (TCA)	ND U	5.5	0.81	1.01	11/14/16 21:07	
1,1,2,2-Tetrachloroethane	ND U	5.5	0.89	1.01	11/14/16 21:07	
1,1,2-Trichloroethane	ND U	5.5	0.81	1.01	11/14/16 21:07	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.5	1.4	1.01	11/14/16 21:07	
1,1-Dichloroethene (1,1-DCE)	ND U	5.5	1.5	1.01	11/14/16 21:07	
1,2,3-Trichloropropane	ND U	5.5	1.5	1.01	11/14/16 21:07	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.5	2.1	1.01	11/14/16 21:07	
1,2-Dibromoethane	ND U	5.5	1.4	1.01	11/14/16 21:07	
1,2-Dichlorobenzene	ND U	5.5	0.67	1.01	11/14/16 21:07	
1,2-Dichloroethane	ND U	5.5	0.67	1.01	11/14/16 21:07	
1,2-Dichloropropane	ND U	5.5	1.1	1.01	11/14/16 21:07	
1,3-Dichlorobenzene	ND U	5.5	0.70	1.01	11/14/16 21:07	
1,4-Dioxane	ND U	110	22	1.01	11/14/16 21:07	
2-Butanone (MEK)	ND U	5.5	2.6	1.01	11/14/16 21:07	
2-Chloro-1,3-butadiene	ND U	5.5	1.7	1.01	11/14/16 21:07	
2-Chloroethyl Vinyl Ether	ND U	5.5	1.9	1.01	11/14/16 21:07	
Isobutyl Alcohol	ND U	110	25	1.01	11/14/16 21:07	
Allyl Chloride	ND U	5.5	1.9	1.01	11/14/16 21:07	
4-Methyl-2-pentanone	ND U	5.5	1.1	1.01	11/14/16 21:07	
Acetone	ND U	5.5	3.1	1.01	11/14/16 21:07	
Acetonitrile	ND U	27	19	1.01	11/14/16 21:07	
Acrolein	ND U	27	3.9	1.01	11/14/16 21:07	
Acrylonitrile	ND U	27	7.1	1.01	11/14/16 21:07	
Benzene	ND U	5.5	0.32	1.01	11/14/16 21:07	
Bromodichloromethane	ND U	5.5	0.67	1.01	11/14/16 21:07	
Bromoform	ND U	5.5	1.1	1.01	11/14/16 21:07	
Bromomethane	ND U	5.5	1.6	1.01	11/14/16 21:07	
Carbon Disulfide	ND U	5.5	1.4	1.01	11/14/16 21:07	
Carbon Tetrachloride	ND U	5.5	1.1	1.01	11/14/16 21:07	
Chlorobenzene	ND U	5.5	0.32	1.01	11/14/16 21:07	
Chloroethane	ND U	5.5	3.2	1.01	11/14/16 21:07	
Chloroform	ND U	5.5	1.4	1.01	11/14/16 21:07	
Chloromethane	ND U	5.5	0.44	1.01	11/14/16 21:07	
Dibromochloromethane	ND U	5.5	0.81	1.01	11/14/16 21:07	
Dibromomethane	ND U	5.5	0.70	1.01	11/14/16 21:07	
Dichlorodifluoromethane (CFC 12)	ND U	5.5	2.1	1.01	11/14/16 21:07	
Dichloromethane	1.5 J	5.5	0.63	1.01	11/14/16 21:07	
Ethyl Methacrylate	ND U	5.5	0.83	1.01	11/14/16 21:07	
Ethylbenzene	ND U	5.5	0.26	1.01	11/14/16 21:07	
Iodomethane	ND U	11	1.3	1.01	11/14/16 21:07	
Methacrylonitrile	ND U	5.5	1.7	1.01	11/14/16 21:07	
Methyl Methacrylate	ND U	5.5	0.81	1.01	11/14/16 21:07	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611090901 400-SB-14 (0-153.5)
Lab Code: R1611998-002

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16 09:30

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	0.85 J	5.5	0.56	1.01	11/14/16 21:07	
Propionitrile	ND U	27	7.2	1.01	11/14/16 21:07	
Tetrachloroethene (PCE)	1.2 J	5.5	0.97	1.01	11/14/16 21:07	
Toluene	ND U	5.5	1.1	1.01	11/14/16 21:07	
Trichloroethene (TCE)	ND U	5.5	1.2	1.01	11/14/16 21:07	
Trichlorofluoromethane (CFC 11)	ND U	5.5	0.73	1.01	11/14/16 21:07	
Vinyl Chloride	ND U	5.5	2.1	1.01	11/14/16 21:07	
cis-1,3-Dichloropropene	ND U	5.5	0.99	1.01	11/14/16 21:07	
m,p-Xylenes	ND U	11	1.2	1.01	11/14/16 21:07	
o-Xylene	ND U	5.5	0.53	1.01	11/14/16 21:07	
trans-1,2-Dichloroethene	ND U	5.5	0.95	1.01	11/14/16 21:07	
trans-1,3-Dichloropropene	ND U	5.5	0.22	1.01	11/14/16 21:07	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	102	51 - 136	11/14/16 21:07	
Dibromofluoromethane	99	63 - 138	11/14/16 21:07	
Toluene-d8	102	66 - 138	11/14/16 21:07	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16 09:30

Sample Name: 1611090920 400-SB-14 (0-62)
Lab Code: R1611998-007

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.5	0.92	1	11/14/16 21:31	
1,1,1-Trichloroethane (TCA)	ND U	5.5	0.81	1	11/14/16 21:31	
1,1,2,2-Tetrachloroethane	ND U	5.5	0.89	1	11/14/16 21:31	
1,1,2-Trichloroethane	ND U	5.5	0.81	1	11/14/16 21:31	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.5	1.4	1	11/14/16 21:31	
1,1-Dichloroethene (1,1-DCE)	ND U	5.5	1.5	1	11/14/16 21:31	
1,2,3-Trichloropropane	ND U	5.5	1.5	1	11/14/16 21:31	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.5	2.1	1	11/14/16 21:31	
1,2-Dibromoethane	ND U	5.5	1.4	1	11/14/16 21:31	
1,2-Dichlorobenzene	ND U	5.5	0.67	1	11/14/16 21:31	
1,2-Dichloroethane	ND U	5.5	0.67	1	11/14/16 21:31	
1,2-Dichloropropane	ND U	5.5	1.1	1	11/14/16 21:31	
1,3-Dichlorobenzene	ND U	5.5	0.70	1	11/14/16 21:31	
1,4-Dioxane	ND U	110	21	1	11/14/16 21:31	
2-Butanone (MEK)	ND U	5.5	2.6	1	11/14/16 21:31	
2-Chloro-1,3-butadiene	ND U	5.5	1.7	1	11/14/16 21:31	
2-Chloroethyl Vinyl Ether	ND U	5.5	1.9	1	11/14/16 21:31	
Isobutyl Alcohol	ND U	110	25	1	11/14/16 21:31	
Allyl Chloride	ND U	5.5	1.9	1	11/14/16 21:31	
4-Methyl-2-pentanone	ND U	5.5	1.1	1	11/14/16 21:31	
Acetone	ND U	5.5	3.1	1	11/14/16 21:31	
Acetonitrile	ND U	27	19	1	11/14/16 21:31	
Acrolein	ND U	27	3.9	1	11/14/16 21:31	
Acrylonitrile	ND U	27	7.1	1	11/14/16 21:31	
Benzene	ND U	5.5	0.32	1	11/14/16 21:31	
Bromodichloromethane	ND U	5.5	0.67	1	11/14/16 21:31	
Bromoform	ND U	5.5	1.1	1	11/14/16 21:31	
Bromomethane	ND U	5.5	1.6	1	11/14/16 21:31	
Carbon Disulfide	ND U	5.5	1.4	1	11/14/16 21:31	
Carbon Tetrachloride	ND U	5.5	1.1	1	11/14/16 21:31	
Chlorobenzene	ND U	5.5	0.32	1	11/14/16 21:31	
Chloroethane	ND U	5.5	3.2	1	11/14/16 21:31	
Chloroform	ND U	5.5	1.4	1	11/14/16 21:31	
Chloromethane	ND U	5.5	0.44	1	11/14/16 21:31	
Dibromochloromethane	ND U	5.5	0.81	1	11/14/16 21:31	
Dibromomethane	ND U	5.5	0.70	1	11/14/16 21:31	
Dichlorodifluoromethane (CFC 12)	ND U	5.5	2.1	1	11/14/16 21:31	
Dichloromethane	1.4 J	5.5	0.63	1	11/14/16 21:31	
Ethyl Methacrylate	ND U	5.5	0.83	1	11/14/16 21:31	
Ethylbenzene	ND U	5.5	0.26	1	11/14/16 21:31	
Iodomethane	ND U	11	1.3	1	11/14/16 21:31	
Methacrylonitrile	ND U	5.5	1.7	1	11/14/16 21:31	
Methyl Methacrylate	ND U	5.5	0.81	1	11/14/16 21:31	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611090920 400-SB-14 (0-62)
Lab Code: R1611998-007

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16 09:30

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	0.67 J	5.5	0.56	1	11/14/16 21:31	
Propionitrile	ND U	27	7.2	1	11/14/16 21:31	
Tetrachloroethene (PCE)	3.6 J	5.5	0.97	1	11/14/16 21:31	
Toluene	ND U	5.5	1.1	1	11/14/16 21:31	
Trichloroethene (TCE)	ND U	5.5	1.2	1	11/14/16 21:31	
Trichlorofluoromethane (CFC 11)	ND U	5.5	0.73	1	11/14/16 21:31	
Vinyl Chloride	ND U	5.5	2.1	1	11/14/16 21:31	
cis-1,3-Dichloropropene	ND U	5.5	0.99	1	11/14/16 21:31	
m,p-Xylenes	ND U	11	1.2	1	11/14/16 21:31	
o-Xylene	ND U	5.5	0.53	1	11/14/16 21:31	
trans-1,2-Dichloroethene	ND U	5.5	0.95	1	11/14/16 21:31	
trans-1,3-Dichloropropene	ND U	5.5	0.22	1	11/14/16 21:31	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	100	51 - 136	11/14/16 21:31	
Dibromofluoromethane	99	63 - 138	11/14/16 21:31	
Toluene-d8	102	66 - 138	11/14/16 21:31	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611090930 400-SB-14 (62-153.5)
Lab Code: R1611998-010

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16 09:30

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.3	0.88	.99	11/14/16 21:55	
1,1,1-Trichloroethane (TCA)	ND U	5.3	0.77	.99	11/14/16 21:55	
1,1,2,2-Tetrachloroethane	ND U	5.3	0.86	.99	11/14/16 21:55	
1,1,2-Trichloroethane	ND U	5.3	0.77	.99	11/14/16 21:55	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.3	1.4	.99	11/14/16 21:55	
1,1-Dichloroethene (1,1-DCE)	ND U	5.3	1.4	.99	11/14/16 21:55	
1,2,3-Trichloropropane	ND U	5.3	1.4	.99	11/14/16 21:55	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.3	2.0	.99	11/14/16 21:55	
1,2-Dibromoethane	ND U	5.3	1.3	.99	11/14/16 21:55	
1,2-Dichlorobenzene	ND U	5.3	0.65	.99	11/14/16 21:55	
1,2-Dichloroethane	ND U	5.3	0.65	.99	11/14/16 21:55	
1,2-Dichloropropane	ND U	5.3	1.1	.99	11/14/16 21:55	
1,3-Dichlorobenzene	ND U	5.3	0.67	.99	11/14/16 21:55	
1,4-Dioxane	ND U	110	21	.99	11/14/16 21:55	
2-Butanone (MEK)	ND U	5.3	2.5	.99	11/14/16 21:55	
2-Chloro-1,3-butadiene	ND U	5.3	1.7	.99	11/14/16 21:55	
2-Chloroethyl Vinyl Ether	ND U	5.3	1.9	.99	11/14/16 21:55	
Isobutyl Alcohol	ND U	110	24	.99	11/14/16 21:55	
Allyl Chloride	ND U	5.3	1.8	.99	11/14/16 21:55	
4-Methyl-2-pentanone	ND U	5.3	1.1	.99	11/14/16 21:55	
Acetone	ND U	5.3	3.0	.99	11/14/16 21:55	
Acetonitrile	ND U	26	18	.99	11/14/16 21:55	
Acrolein	ND U	26	3.7	.99	11/14/16 21:55	
Acrylonitrile	ND U	26	6.9	.99	11/14/16 21:55	
Benzene	ND U	5.3	0.31	.99	11/14/16 21:55	
Bromodichloromethane	ND U	5.3	0.65	.99	11/14/16 21:55	
Bromoform	ND U	5.3	0.98	.99	11/14/16 21:55	
Bromomethane	ND U	5.3	1.5	.99	11/14/16 21:55	
Carbon Disulfide	ND U	5.3	1.4	.99	11/14/16 21:55	
Carbon Tetrachloride	ND U	5.3	0.97	.99	11/14/16 21:55	
Chlorobenzene	ND U	5.3	0.31	.99	11/14/16 21:55	
Chloroethane	ND U	5.3	3.1	.99	11/14/16 21:55	
Chloroform	ND U	5.3	1.4	.99	11/14/16 21:55	
Chloromethane	ND U	5.3	0.43	.99	11/14/16 21:55	
Dibromochloromethane	ND U	5.3	0.77	.99	11/14/16 21:55	
Dibromomethane	ND U	5.3	0.67	.99	11/14/16 21:55	
Dichlorodifluoromethane (CFC 12)	ND U	5.3	2.0	.99	11/14/16 21:55	
Dichloromethane	1.6 J	5.3	0.61	.99	11/14/16 21:55	
Ethyl Methacrylate	ND U	5.3	0.79	.99	11/14/16 21:55	
Ethylbenzene	ND U	5.3	0.25	.99	11/14/16 21:55	
Iodomethane	ND U	11	1.2	.99	11/14/16 21:55	
Methacrylonitrile	ND U	5.3	1.6	.99	11/14/16 21:55	
Methyl Methacrylate	ND U	5.3	0.77	.99	11/14/16 21:55	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611090930 400-SB-14 (62-153.5)
Lab Code: R1611998-010

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16 09:30

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	0.55 J	5.3	0.54	.99	11/14/16 21:55	
Propionitrile	ND U	26	6.9	.99	11/14/16 21:55	
Tetrachloroethene (PCE)	0.99 J	5.3	0.93	.99	11/14/16 21:55	
Toluene	ND U	5.3	1.1	.99	11/14/16 21:55	
Trichloroethene (TCE)	ND U	5.3	1.1	.99	11/14/16 21:55	
Trichlorofluoromethane (CFC 11)	ND U	5.3	0.70	.99	11/14/16 21:55	
Vinyl Chloride	ND U	5.3	2.0	.99	11/14/16 21:55	
cis-1,3-Dichloropropene	ND U	5.3	0.95	.99	11/14/16 21:55	
m,p-Xylenes	ND U	11	1.2	.99	11/14/16 21:55	
o-Xylene	ND U	5.3	0.51	.99	11/14/16 21:55	
trans-1,2-Dichloroethene	ND U	5.3	0.91	.99	11/14/16 21:55	
trans-1,3-Dichloropropene	ND U	5.3	0.22	.99	11/14/16 21:55	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	102	51 - 136	11/14/16 21:55	
Dibromofluoromethane	100	63 - 138	11/14/16 21:55	
Toluene-d8	103	66 - 138	11/14/16 21:55	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000104-76-7	1-Hexanol, 2-ethyl-	13.57	6.5	JN



Metals

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611090906 400-SB-14 (0-153.5)
Lab Code: R1611998-003

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16 09:30

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.4	0.5	1	11/21/16 20:20	11/18/16	
Arsenic, Total	6010C	6.3	mg/Kg	1.1	0.3	1	11/21/16 20:20	11/18/16	
Barium, Total	6010C	76.3	mg/Kg	2.1	0.2	1	11/21/16 20:20	11/18/16	
Beryllium, Total	6010C	0.58 B	mg/Kg	0.32	0.02	1	11/21/16 20:20	11/18/16	
Cadmium, Total	6010C	0.07 BJ	mg/Kg	0.53	0.04	1	11/21/16 20:20	11/18/16	
Chromium, Total	6010C	11.6	mg/Kg	1.1	0.2	1	11/21/16 20:20	11/18/16	
Lead, Total	6010C	8.6	mg/Kg	5.3	0.3	1	11/21/16 20:20	11/18/16	
Mercury, Total	7471B	ND U	mg/Kg	0.034	0.004	1	11/17/16 14:07	11/15/16	
Nickel, Total	6010C	9.9	mg/Kg	4.3	0.2	1	11/21/16 20:20	11/18/16	
Selenium, Total	6010C	2.0	mg/Kg	1.0	0.7	1	11/29/16 15:17	11/28/16	
Silver, Total	6010C	ND U	mg/Kg	1.1	0.5	1	11/21/16 20:20	11/18/16	
Thallium, Total	6010C	1.6	mg/Kg	1.1	0.6	1	11/21/16 20:20	11/18/16	
Vanadium, Total	6010C	15.0	mg/Kg	5.3	0.2	1	11/21/16 20:20	11/18/16	
Zinc, Total	6010C	46.6	mg/Kg	2.1	0.2	1	11/21/16 20:20	11/18/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611090907 400-SB-14 (0-153.5)
Lab Code: R1611998-004

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16 09:30

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.5	0.5	1	11/21/16 20:43	11/18/16	
Arsenic, Total	6010C	4.8	mg/Kg	1.1	0.3	1	11/21/16 20:43	11/18/16	
Barium, Total	6010C	60.6	mg/Kg	2.2	0.2	1	11/21/16 20:43	11/18/16	
Beryllium, Total	6010C	0.49 B	mg/Kg	0.33	0.02	1	11/21/16 20:43	11/18/16	
Cadmium, Total	6010C	0.08 BJ	mg/Kg	0.54	0.04	1	11/21/16 20:43	11/18/16	
Chromium, Total	6010C	18.8	mg/Kg	1.1	0.2	1	11/21/16 20:43	11/18/16	
Lead, Total	6010C	9.1	mg/Kg	5.4	0.3	1	11/21/16 20:43	11/18/16	
Mercury, Total	7471B	ND U	mg/Kg	0.036	0.004	1	11/17/16 14:15	11/15/16	
Nickel, Total	6010C	9.0	mg/Kg	4.3	0.2	1	11/21/16 20:43	11/18/16	
Selenium, Total	6010C	2.0	mg/Kg	1.1	0.7	1	11/29/16 15:47	11/28/16	
Silver, Total	6010C	ND U	mg/Kg	1.1	0.5	1	11/21/16 20:43	11/18/16	
Thallium, Total	6010C	3.2	mg/Kg	1.1	0.6	1	11/21/16 20:43	11/18/16	
Vanadium, Total	6010C	15.8	mg/Kg	5.4	0.2	1	11/21/16 20:43	11/18/16	
Zinc, Total	6010C	46.4	mg/Kg	2.2	0.2	1	11/21/16 20:43	11/18/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611090922 400-SB-14 (0-62)
Lab Code: R1611998-008

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16 09:30

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.7	0.5	1	11/21/16 20:46	11/18/16	
Arsenic, Total	6010C	6.1	mg/Kg	1.1	0.3	1	11/21/16 20:46	11/18/16	
Barium, Total	6010C	71.7	mg/Kg	2.2	0.2	1	11/21/16 20:46	11/18/16	
Beryllium, Total	6010C	0.49 B	mg/Kg	0.34	0.02	1	11/21/16 20:46	11/18/16	
Cadmium, Total	6010C	0.58 B	mg/Kg	0.56	0.04	1	11/21/16 20:46	11/18/16	
Chromium, Total	6010C	17.2	mg/Kg	1.1	0.2	1	11/21/16 20:46	11/18/16	
Lead, Total	6010C	7.7	mg/Kg	5.6	0.4	1	11/21/16 20:46	11/18/16	
Mercury, Total	7471B	0.004 J	mg/Kg	0.034	0.004	1	11/17/16 14:17	11/15/16	
Nickel, Total	6010C	8.1	mg/Kg	4.5	0.2	1	11/21/16 20:46	11/18/16	
Selenium, Total	6010C	2.3	mg/Kg	1.1	0.7	1	11/29/16 16:05	11/28/16	
Silver, Total	6010C	ND U	mg/Kg	1.1	0.5	1	11/21/16 20:46	11/18/16	
Thallium, Total	6010C	3.0	mg/Kg	1.1	0.6	1	11/21/16 20:46	11/18/16	
Vanadium, Total	6010C	24.5	mg/Kg	5.6	0.2	1	11/21/16 20:46	11/18/16	
Zinc, Total	6010C	72.5	mg/Kg	2.2	0.2	1	11/21/16 20:46	11/18/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611090932 400-SB-14 (62-153.5)
Lab Code: R1611998-011

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16 09:30

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.5	0.5	1	11/21/16 20:49	11/18/16	
Arsenic, Total	6010C	8.4	mg/Kg	1.1	0.3	1	11/21/16 20:49	11/18/16	
Barium, Total	6010C	68.6	mg/Kg	2.2	0.2	1	11/21/16 20:49	11/18/16	
Beryllium, Total	6010C	0.43 B	mg/Kg	0.32	0.02	1	11/21/16 20:49	11/18/16	
Cadmium, Total	6010C	0.12 BJ	mg/Kg	0.54	0.04	1	11/21/16 20:49	11/18/16	
Chromium, Total	6010C	10.7	mg/Kg	1.1	0.2	1	11/21/16 20:49	11/18/16	
Lead, Total	6010C	8.3	mg/Kg	5.4	0.3	1	11/21/16 20:49	11/18/16	
Mercury, Total	7471B	ND U	mg/Kg	0.036	0.004	1	11/17/16 14:18	11/15/16	
Nickel, Total	6010C	6.8	mg/Kg	4.3	0.2	1	11/21/16 20:49	11/18/16	
Selenium, Total	6010C	1.8	mg/Kg	1.0	0.7	1	11/29/16 16:11	11/28/16	
Silver, Total	6010C	ND U	mg/Kg	1.1	0.5	1	11/21/16 20:49	11/18/16	
Thallium, Total	6010C	3.2	mg/Kg	1.1	0.6	1	11/21/16 20:49	11/18/16	
Vanadium, Total	6010C	12.6	mg/Kg	5.4	0.2	1	11/21/16 20:49	11/18/16	
Zinc, Total	6010C	63.4	mg/Kg	2.2	0.2	1	11/21/16 20:49	11/18/16	



General Chemistry

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611090900 400-SB-14 (0-153.5)
Lab Code: R1611998-001

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16 09:30
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	92.5	Percent	-	1	11/17/16 09:49	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611090901 400-SB-14 (0-153.5)
Lab Code: R1611998-002

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16 09:30
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	92.0	Percent	-	1	11/17/16 09:49	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611090906 400-SB-14 (0-153.5)
Lab Code: R1611998-003

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16 09:30
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	92.6	Percent	-	-	1	11/17/16 09:49	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611090907 400-SB-14 (0-153.5)
Lab Code: R1611998-004

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16 09:30
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	91.3	Percent	-	-	1	11/17/16 09:49	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611090920 400-SB-14 (0-62)
Lab Code: R1611998-007

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16 09:30
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	91.2	Percent	-	1	11/17/16 09:49	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611090922 400-SB-14 (0-62)
Lab Code: R1611998-008

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16 09:30
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	88.9	Percent	-	-	1	11/17/16 09:49	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611090930 400-SB-14 (62-153.5)
Lab Code: R1611998-010

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16 09:30
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	94.0	Percent	-	1	11/17/16 09:49	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611090932 400-SB-14 (62-153.5)
Lab Code: R1611998-011

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16 09:30
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	92.5	Percent	-	-	1	11/17/16 09:49	



QC Summary Forms

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Volatile Organic Compounds by GC/MS

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611998

SURROGATE RECOVERY SUMMARY
Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Extraction Method: EPA 5030C

Sample Name	Lab Code	4-Bromofluorobenzene	Dibromofluoromethane	Toluene-d8
		51 - 136	63 - 138	66 - 138
1611090900 400-SB-14 (0-153.5)	R1611998-001	99	99	103
1611090901 400-SB-14 (0-153.5)	R1611998-002	102	99	102
1611090920 400-SB-14 (0-62)	R1611998-007	100	99	102
1611090930 400-SB-14 (62-153.5)	R1611998-010	102	100	103
Method Blank	RQ1614029-01	102	102	102
Lab Control Sample	RQ1614029-02	106	104	102
1611090900 400-SB-14 (0-153.5)	RQ1614029-05	104	102	104
MS				
1611090900 400-SB-14 (0-153.5)	RQ1614029-06	103	104	105
DMS				

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16
Date Analyzed: 11/14/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1611090900 400-SB-14 (0-153.5) **Units:** ug/Kg
Lab Code: R1611998-001 **Basis:** Dry
Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Sample Result	Matrix Spike RQ1614029-05			Duplicate Matrix Spike RQ1614029-06			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Dibromomethane	ND U	47.1	54.6	86	48.6	54.1	90	61-122	5	30
Dichlorodifluoromethane (CFC 12)	ND U	39.5	54.6	72	40.5	54.1	75	44-138	4	30
Dichloromethane	0.82 J	46.9	54.6	84	47.9	54.1	87	64-120	4	30
Ethyl Methacrylate	ND U	45.7	54.6	84	48.6	54.1	90	17-166	7	30
Ethylbenzene	ND U	42.5	54.6	78	42.3	54.1	78	44-131	<1	30
Iodomethane	ND U	41.9	54.6	77	49.9	54.1	92	10-160	18	30
Methacrylonitrile	ND U	47.4	54.6	87	50.6	54.1	94	44-149	8	30
Methyl Methacrylate	ND U	49.8	54.6	91	53.9	54.1	100	41-162	9	30
Naphthalene	0.89 J	43.2	54.6	77	45.3	54.1	82	10-187	6	30
Propionitrile	ND U	234	273	86	263	270	97	46-144	12	30
Tetrachloroethene (PCE)	1.0 J	41.4	54.6	74	42.6	54.1	77	45-141	4	30
Toluene	ND U	43.8	54.6	80	44.4	54.1	82	50-140	2	30
Trichloroethene (TCE)	ND U	49.9	54.6	91	51.4	54.1	95	54-136	4	30
Trichlorofluoromethane (CFC 11)	ND U	41.4	54.6	76	41.5	54.1	77	47-129	1	30
Vinyl Chloride	ND U	44.5	54.6	82	46.8	54.1	87	53-128	6	30
cis-1,3-Dichloropropene	ND U	44.4	54.6	81	45.8	54.1	85	31-150	5	30
m,p-Xylenes	ND U	85.5	109	78	86.5	108	80	45-141	3	30
o-Xylene	ND U	44.6	54.6	82	44.3	54.1	82	46-139	<1	30
trans-1,2-Dichloroethene	ND U	43.5	54.6	80	44.5	54.1	82	52-128	2	30
trans-1,3-Dichloropropene	ND U	45.0	54.6	82	47.7	54.1	88	23-160	7	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611998
Date Collected: NA
Date Received: NA

Sample Name: Method Blank
Lab Code: RQ1614029-01

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.0	0.83	1	11/14/16 15:03	
1,1,1-Trichloroethane (TCA)	ND U	5.0	0.73	1	11/14/16 15:03	
1,1,2,2-Tetrachloroethane	ND U	5.0	0.81	1	11/14/16 15:03	
1,1,2-Trichloroethane	ND U	5.0	0.73	1	11/14/16 15:03	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.0	1.3	1	11/14/16 15:03	
1,1-Dichloroethene (1,1-DCE)	ND U	5.0	1.3	1	11/14/16 15:03	
1,2,3-Trichloropropane	ND U	5.0	1.4	1	11/14/16 15:03	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.0	1.9	1	11/14/16 15:03	
1,2-Dibromoethane	ND U	5.0	1.3	1	11/14/16 15:03	
1,2-Dichlorobenzene	ND U	5.0	0.61	1	11/14/16 15:03	
1,2-Dichloroethane	ND U	5.0	0.61	1	11/14/16 15:03	
1,2-Dichloropropane	ND U	5.0	0.97	1	11/14/16 15:03	
1,3-Dichlorobenzene	ND U	5.0	0.63	1	11/14/16 15:03	
1,4-Dioxane	ND U	100	20	1	11/14/16 15:03	
2-Butanone (MEK)	ND U	5.0	2.3	1	11/14/16 15:03	
2-Chloro-1,3-butadiene	ND U	5.0	1.6	1	11/14/16 15:03	
2-Chloroethyl Vinyl Ether	ND U	5.0	1.8	1	11/14/16 15:03	
Isobutyl Alcohol	ND U	100	23	1	11/14/16 15:03	
Allyl Chloride	ND U	5.0	1.7	1	11/14/16 15:03	
4-Methyl-2-pentanone	ND U	5.0	0.98	1	11/14/16 15:03	
Acetone	ND U	5.0	2.9	1	11/14/16 15:03	
Acetonitrile	ND U	25	17	1	11/14/16 15:03	
Acrolein	ND U	25	3.5	1	11/14/16 15:03	
Acrylonitrile	ND U	25	6.5	1	11/14/16 15:03	
Benzene	ND U	5.0	0.29	1	11/14/16 15:03	
Bromodichloromethane	ND U	5.0	0.61	1	11/14/16 15:03	
Bromoform	ND U	5.0	0.93	1	11/14/16 15:03	
Bromomethane	ND U	5.0	1.4	1	11/14/16 15:03	
Carbon Disulfide	ND U	5.0	1.3	1	11/14/16 15:03	
Carbon Tetrachloride	ND U	5.0	0.92	1	11/14/16 15:03	
Chlorobenzene	ND U	5.0	0.29	1	11/14/16 15:03	
Chloroethane	ND U	5.0	2.9	1	11/14/16 15:03	
Chloroform	ND U	5.0	1.3	1	11/14/16 15:03	
Chloromethane	ND U	5.0	0.40	1	11/14/16 15:03	
Dibromochloromethane	ND U	5.0	0.73	1	11/14/16 15:03	
Dibromomethane	ND U	5.0	0.63	1	11/14/16 15:03	
Dichlorodifluoromethane (CFC 12)	ND U	5.0	1.9	1	11/14/16 15:03	
Dichloromethane	ND U	5.0	0.57	1	11/14/16 15:03	
Ethyl Methacrylate	ND U	5.0	0.75	1	11/14/16 15:03	
Ethylbenzene	ND U	5.0	0.23	1	11/14/16 15:03	
Iodomethane	ND U	10	1.2	1	11/14/16 15:03	
Methacrylonitrile	ND U	5.0	1.6	1	11/14/16 15:03	
Methyl Methacrylate	ND U	5.0	0.73	1	11/14/16 15:03	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: RQ1614029-01

Service Request: R1611998
Date Collected: NA
Date Received: NA

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.0	0.51	1	11/14/16 15:03	
Propionitrile	ND U	25	6.5	1	11/14/16 15:03	
Tetrachloroethene (PCE)	ND U	5.0	0.88	1	11/14/16 15:03	
Toluene	ND U	5.0	1.0	1	11/14/16 15:03	
Trichloroethene (TCE)	ND U	5.0	1.1	1	11/14/16 15:03	
Trichlorofluoromethane (CFC 11)	ND U	5.0	0.66	1	11/14/16 15:03	
Vinyl Chloride	ND U	5.0	1.9	1	11/14/16 15:03	
cis-1,3-Dichloropropene	ND U	5.0	0.90	1	11/14/16 15:03	
m,p-Xylenes	ND U	10	1.1	1	11/14/16 15:03	
o-Xylene	ND U	5.0	0.48	1	11/14/16 15:03	
trans-1,2-Dichloroethene	ND U	5.0	0.86	1	11/14/16 15:03	
trans-1,3-Dichloropropene	ND U	5.0	0.20	1	11/14/16 15:03	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	102	51 - 136	11/14/16 15:03	
Dibromofluoromethane	102	63 - 138	11/14/16 15:03	
Toluene-d8	102	66 - 138	11/14/16 15:03	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611998
Date Analyzed: 11/14/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Units:ug/Kg
Basis:Dry

Lab Control Sample
RQ1614029-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
1,1,1,2-Tetrachloroethane	8260C	20.3	20.0	102	40-140
1,1,1-Trichloroethane (TCA)	8260C	18.8	20.0	94	40-140
1,1,2,2-Tetrachloroethane	8260C	19.6	20.0	98	40-140
1,1,2-Trichloroethane	8260C	20.2	20.0	101	40-140
1,1,2-Trichloro-1,2,2-trifluoroethane	8260C	17.3	20.0	87	40-140
1,1-Dichloroethene (1,1-DCE)	8260C	18.7	20.0	94	40-140
1,2,3-Trichloropropane	8260C	19.4	20.0	97	40-140
1,2-Dibromo-3-chloropropane (DBCP)	8260C	19.9	20.0	99	40-140
1,2-Dibromoethane	8260C	19.7	20.0	99	40-140
1,2-Dichlorobenzene	8260C	20.2	20.0	101	40-140
1,2-Dichloroethane	8260C	20.3	20.0	101	40-140
1,2-Dichloropropane	8260C	19.4	20.0	97	40-140
1,3-Dichlorobenzene	8260C	20.2	20.0	101	40-140
1,4-Dioxane	8260C	367	400	92	40-140
2-Butanone (MEK)	8260C	17.3	20.0	86	40-140
2-Chloro-1,3-butadiene	8260C	19.7	20.0	98	40-140
2-Chloroethyl Vinyl Ether	8260C	18.5	20.0	92	40-140
Isobutyl Alcohol	8260C	328	400	82	40-140
Allyl Chloride	8260C	18.4	20.0	92	40-140
4-Methyl-2-pentanone	8260C	18.2	20.0	91	40-140
Acetone	8260C	18.0	20.0	90	40-140
Acetonitrile	8260C	87.3	100	87	40-140
Acrolein	8260C	38.5	40.0	96	40-140
Acrylonitrile	8260C	90.7	100	91	40-140
Benzene	8260C	19.8	20.0	99	40-140
Bromodichloromethane	8260C	19.7	20.0	98	40-140
Bromoform	8260C	21.6	20.0	108	40-140
Bromomethane	8260C	18.3	20.0	91	40-140
Carbon Disulfide	8260C	19.5	20.0	97	40-140
Carbon Tetrachloride	8260C	19.8	20.0	99	40-140
Chlorobenzene	8260C	19.9	20.0	100	40-140
Chloroethane	8260C	19.1	20.0	95	40-140
Chloroform	8260C	19.3	20.0	97	40-140

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611998
Date Analyzed: 11/14/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Units:ug/Kg
Basis:Dry

Lab Control Sample
RQ1614029-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Chloromethane	8260C	17.0	20.0	85	40-140
Dibromochloromethane	8260C	21.1	20.0	106	40-140
Dibromomethane	8260C	20.5	20.0	103	40-140
Dichlorodifluoromethane (CFC 12)	8260C	16.9	20.0	84	40-140
Dichloromethane	8260C	19.0	20.0	95	40-140
Ethyl Methacrylate	8260C	20.0	20.0	100	40-140
Ethylbenzene	8260C	19.5	20.0	98	40-140
Iodomethane	8260C	18.4	20.0	92	40-140
Methacrylonitrile	8260C	19.5	20.0	97	40-140
Methyl Methacrylate	8260C	20.1	20.0	100	40-140
Naphthalene	8260C	19.2	20.0	96	40-140
Propionitrile	8260C	93.2	100	93	40-140
Tetrachloroethene (PCE)	8260C	18.8	20.0	94	40-140
Toluene	8260C	19.8	20.0	99	40-140
Trichloroethene (TCE)	8260C	19.9	20.0	99	40-140
Trichlorofluoromethane (CFC 11)	8260C	19.1	20.0	95	40-140
Vinyl Chloride	8260C	19.1	20.0	96	40-140
cis-1,3-Dichloropropene	8260C	19.9	20.0	99	40-140
m,p-Xylenes	8260C	39.9	40.0	100	40-140
o-Xylene	8260C	19.9	20.0	99	40-140
trans-1,2-Dichloroethene	8260C	19.1	20.0	96	40-140
trans-1,3-Dichloropropene	8260C	20.2	20.0	101	40-140



Metals

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: R1611998-MB

Service Request: R1611998
Date Collected: NA
Date Received: NA
Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.0	0.4	1	11/21/16 20:05	11/18/16	
Arsenic, Total	6010C	ND U	mg/Kg	1.0	0.3	1	11/21/16 20:05	11/18/16	
Barium, Total	6010C	3.5	mg/Kg	2.0	0.2	1	11/21/16 20:05	11/18/16	
Beryllium, Total	6010C	0.06 J	mg/Kg	0.30	0.02	1	11/21/16 20:05	11/18/16	
Cadmium, Total	6010C	0.14 J	mg/Kg	0.50	0.04	1	11/21/16 20:05	11/18/16	
Chromium, Total	6010C	0.8 J	mg/Kg	1.0	0.2	1	11/21/16 20:05	11/18/16	
Lead, Total	6010C	0.7 J	mg/Kg	5.0	0.3	1	11/21/16 20:05	11/18/16	
Mercury, Total	7471B	ND U	mg/Kg	0.033	0.003	1	11/17/16 14:02	11/15/16	
Nickel, Total	6010C	0.4 J	mg/Kg	4.0	0.2	1	11/21/16 20:05	11/18/16	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	11/29/16 14:53	11/28/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	11/21/16 20:05	11/18/16	
Thallium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	11/21/16 20:05	11/18/16	
Vanadium, Total	6010C	0.7 J	mg/Kg	5.0	0.2	1	11/21/16 20:05	11/18/16	
Zinc, Total	6010C	0.4 J	mg/Kg	2.0	0.2	1	11/21/16 20:05	11/18/16	

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request:R1611998
Date Collected:11/09/16
Date Received:11/11/16
Date Analyzed:11/17/16 - 11/29/16

**Matrix Spike Summary
Inorganic Parameters**

Sample Name: 1611090906 400-SB-14 (0-153.5)
Lab Code: R1611998-003

Units:mg/Kg
Basis:Dry

**Matrix Spike
R1611998-003MS**

Analyte Name	Method	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Silver, Total	6010C	ND U	5.1	5.3	96	75-125
Arsenic, Total	6010C	6.3	9.1	4.2	68 *	75-125
Barium, Total	6010C	76.3	263	212	88	75-125
Beryllium, Total	6010C	0.58 B	5.34	5.29	90	75-125
Cadmium, Total	6010C	0.07 BJ	4.82	5.29	90	75-125
Chromium, Total	6010C	11.6	34.0	21.2	106	75-125
Mercury, Total	7471B	ND U	0.171	0.174	98	75-125
Nickel, Total	6010C	9.9	54.7	52.9	85	75-125
Lead, Total	6010C	8.6	57.7	52.9	93	75-125
Antimony, Total	6010C	ND U	42.3	52.9	80	75-125
Selenium, Total	6010C	2.0	100	105	94	75-125
Thallium, Total	6010C	1.6	213	212	100	75-125
Vanadium, Total	6010C	15.0	66.0	52.9	96	75-125
Zinc, Total	6010C	46.6	93.5	52.9	89	75-125

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16
Date Analyzed: 11/17/16 - 11/29/16

Replicate Sample Summary
Inorganic Parameters

Sample Name: 1611090906 400-SB-14 (0-153.5)
Lab Code: R1611998-003

Units: mg/Kg
Basis: Dry

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate	Average	RPD	RPD Limit
					Sample R1611998-003DUP Result			
Antimony, Total	6010C	6.5	0.5	ND U	ND U	NC	NC	20
Arsenic, Total	6010C	1.1	0.3	6.3	3.9	5.09	46 *	20
Barium, Total	6010C	2.2	0.2	76.3	62.4	69.3	20	20
Beryllium, Total	6010C	0.32	0.02	0.58 B	0.42	0.499	31 *	20
Cadmium, Total	6010C	0.54	0.04	0.07 BJ	ND U	NC	NC	20
Chromium, Total	6010C	1.1	0.2	11.6	13.0	12.3	12	20
Lead, Total	6010C	5.4	0.3	8.6	9.1	8.84	6	20
Mercury, Total	7471B	0.034	0.004	ND U	ND U	NC	NC	35
Nickel, Total	6010C	4.3	0.2	9.9	6.7	8.31	38 *	20
Selenium, Total	6010C	1.1	0.7	2.0	1.9	1.95	8	20
Silver, Total	6010C	1.1	0.5	ND U	ND U	NC	NC	20
Thallium, Total	6010C	1.1	0.6	1.6	1 J	1.31	50 *	20
Vanadium, Total	6010C	5.4	0.2	15.0	14.5	14.8	4	20
Zinc, Total	6010C	2.2	0.2	46.6	38.3	42.4	19	20

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611998
Date Analyzed: 11/17/16 - 11/29/16

Lab Control Sample Summary
Inorganic Parameters

Units:mg/Kg
Basis:Dry

Lab Control Sample
R1611998-LCS

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Antimony, Total	6010C	46.8	50.0	94	80-120
Arsenic, Total	6010C	3.53	4.0	88	80-120
Barium, Total	6010C	206	200	103	80-120
Beryllium, Total	6010C	4.78	5.00	96	80-120
Cadmium, Total	6010C	5.06	5.00	101	80-120
Chromium, Total	6010C	20.2	20.0	101	80-120
Lead, Total	6010C	50.2	50.0	100	80-120
Mercury, Total	7471B	0.161	0.167	96	80-120
Nickel, Total	6010C	50.0	50.0	100	80-120
Selenium, Total	6010C	88.7	101	88	80-120
Silver, Total	6010C	4.63	5.0	93	80-120
Thallium, Total	6010C	174	200	87	80-120
Vanadium, Total	6010C	50.2	50.0	100	80-120
Zinc, Total	6010C	46.2	50.0	92	80-120



General Chemistry

ALS Environmental—Rochester Laboratory

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16
Date Analyzed: 11/17/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1611090900 400-SB-14 (0-153.5)
Lab Code: R1611998-001

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>Sample Result</u>	<u>Duplicate Sample R1611998-001DUP Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	92.5	92.5	92.5	<1	20

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QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1611998
Date Collected: 11/09/16
Date Received: 11/11/16
Date Analyzed: 11/17/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1611090906 400-SB-14 (0-153.5)
Lab Code: R1611998-003

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>MDL</u>	<u>Sample Result</u>	<u>Duplicate Sample R1611998-003DUP Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	-	92.6	92.4	92.5	<1	20

Results flagged with an asterisk (*) indicate values outside control criteria.

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Subcontracted Analytical Parameters

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November 23, 2016

Reports and Invoices
ALS Environmental
1565 Jefferson Road
Building 300, Suite 360
Rochester, NY 14623

Certificate of Analysis

Project Name: TCLP Metals - no J values	Workorder: 2189986
Purchase Order:	Workorder ID: R1611998

Dear Reports Invoices:

Enclosed are the analytical results for samples received by the laboratory on Thursday, November 17, 2016.

The ALS Environmental laboratory in Middletown, Pennsylvania is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Mr. Brad W Kintzer (Project Coordinator) at (717) 944-5541.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state requirements. The test results meet requirements of the current NELAP standards or state requirements, where applicable. For a specific list of accredited analytes, refer to the certifications section of the ALS website at www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads.

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ALS Spring City: 10 Riverside Drive, Spring City, PA 19475 610-948-4903

CC: Ms. Ellen Smith , Ms. Janice Jaeger

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.


Mr. Brad W Kintzer
Project Coordinator

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SAMPLE SUMMARY

Workorder: 2189986 R1611998

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
2189986001	R1611998-005	Solid	11/9/2016 00:00	11/17/2016 08:41	Collected by Client
2189986002	R1611998-006	Solid	11/9/2016 00:00	11/17/2016 08:41	Collected by Client
2189986003	R1611998-009	Solid	11/9/2016 00:00	11/17/2016 08:41	Collected by Client
2189986004	R1611998-012	Solid	11/9/2016 00:00	11/17/2016 08:41	Collected by Client

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SAMPLE SUMMARY

Workorder: 2189986 R1611998

Notes

- Samples collected by ALS personnel are done so in accordance with the procedures set forth in the ALS Field Sampling Plan (20 - Field Services Sampling Plan).
- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
- The Chain of Custody document is included as part of this report.
- All Library Search analytes should be regarded as tentative identifications based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.
- Parameters identified as "analyze immediately" require analysis within 15 minutes of collection. Any "analyze immediately" parameters not listed under the header "Field Parameters" are performed in the laboratory and are therefore analyzed out of hold time.
- Method references listed on this report beginning with the prefix "S" followed by a method number (such as S2310B-97) refer to methods from "Standard Methods for the Examination of Water and Wastewater".
- For microbiological analyses, the "Prepared" value is the date/time into the incubator and the "Analyzed" value is the date/time out the incubator.

Standard Acronyms/Flags

J	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
N	Indicates presumptive evidence of the presence of a compound
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference
LOD	DoD Limit of Detection
LOQ	DoD Limit of Quantitation
DL	DoD Detection Limit
I	Indicates reported value is greater than or equal to the Method Detection Limit (MDL) but less than the Report Detection Limit (RDL)
(S)	Surrogate Compound
NC	Not Calculated
*	Result outside of QC limits

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ANALYTICAL RESULTS

Workorder: 2189986 R1611998

Lab ID: **2189986001**
Sample ID: **R1611998-005**

Date Collected: 11/9/2016 00:00 Matrix: Solid
Date Received: 11/17/2016 08:41

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	7.9		%	0.1	0.01	S2540G-11		11/22/16 19:45	KAM	A
Total Solids	92.1		%	0.1	0.01	S2540G-11		11/22/16 19:45	KAM	A
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:04	SRT	A1
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:04	SRT	A1
Barium, Total	1.2J	J	mg/L	2.8	0.94	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:04	SRT	A1
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:04	SRT	A1
Cadmium, Total	0.0039J	J	mg/L	0.011	0.0037	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:04	SRT	A1
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:04	SRT	A1
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:04	SRT	A1
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	11/21/16 11:00 MNP	11/21/16 15:17	MNP	A2
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:04	SRT	A1
Selenium, Total	ND		mg/L	0.11	0.037	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:04	SRT	A1
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:04	SRT	A1
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:04	SRT	A1
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:04	SRT	A1
Zinc, Total	0.077J	J	mg/L	0.11	0.037	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:04	SRT	A1


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ANALYTICAL RESULTS

Workorder: 2189986 R1611998

 Lab ID: **2189986002** Date Collected: 11/9/2016 00:00 Matrix: Solid
 Sample ID: **R1611998-006** Date Received: 11/17/2016 08:41

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	6.7		%	0.1	0.01	S2540G-11		11/22/16 19:45	KAM	A
Total Solids	93.3		%	0.1	0.01	S2540G-11		11/22/16 19:45	KAM	A
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:15	SRT	A1
Arsenic, Total	0.056J	J	mg/L	0.14	0.046	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:15	SRT	A1
Barium, Total	1.4J	J	mg/L	2.8	0.94	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:15	SRT	A1
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:15	SRT	A1
Cadmium, Total	0.012		mg/L	0.011	0.0037	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:15	SRT	A1
Chromium, Total	0.047		mg/L	0.028	0.010	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:15	SRT	A1
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	11/21/16 09:45 TSS	11/21/16 15:31	SRT	A1
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	11/21/16 11:00 MNP	11/21/16 15:22	MNP	A2
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:15	SRT	A1
Selenium, Total	ND		mg/L	0.11	0.037	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:15	SRT	A1
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:15	SRT	A1
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:15	SRT	A1
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:15	SRT	A1
Zinc, Total	0.061J	J	mg/L	0.11	0.037	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:15	SRT	A1



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ANALYTICAL RESULTS

Workorder: 2189986 R1611998

 Lab ID: **2189986003**
 Sample ID: **R1611998-009**

 Date Collected: 11/9/2016 00:00 Matrix: Solid
 Date Received: 11/17/2016 08:41

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	9.1		%	0.1	0.01	S2540G-11		11/22/16 19:45	KAM	A
Total Solids	90.9		%	0.1	0.01	S2540G-11		11/22/16 19:45	KAM	A
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:19	SRT	A1
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:19	SRT	A1
Barium, Total	1.1J	J	mg/L	2.8	0.94	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:19	SRT	A1
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:19	SRT	A1
Cadmium, Total	0.0044J	J	mg/L	0.011	0.0037	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:19	SRT	A1
Chromium, Total	0.019J	J	mg/L	0.028	0.010	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:19	SRT	A1
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:19	SRT	A1
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	11/21/16 11:00 MNP	11/21/16 15:23	MNP	A2
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:19	SRT	A1
Selenium, Total	ND		mg/L	0.11	0.037	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:19	SRT	A1
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:19	SRT	A1
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:19	SRT	A1
Vanadium, Total	0.011J	J	mg/L	0.028	0.010	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:19	SRT	A1
Zinc, Total	0.071J	J	mg/L	0.11	0.037	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:19	SRT	A1



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ANALYTICAL RESULTS

Workorder: 2189986 R1611998

 Lab ID: **2189986004** Date Collected: 11/9/2016 00:00 Matrix: Solid
 Sample ID: **R1611998-012** Date Received: 11/17/2016 08:41

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	5.7		%	0.1	0.01	S2540G-11		11/22/16 19:45	KAM	A
Total Solids	94.3		%	0.1	0.01	S2540G-11		11/22/16 19:45	KAM	A
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:23	SRT	A1
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:23	SRT	A1
Barium, Total	2.4J	J	mg/L	2.8	0.94	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:23	SRT	A1
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:23	SRT	A1
Cadmium, Total	0.0044J	J	mg/L	0.011	0.0037	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:23	SRT	A1
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:23	SRT	A1
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:23	SRT	A1
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	11/21/16 11:00 MNP	11/21/16 15:24	MNP	A2
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:23	SRT	A1
Selenium, Total	ND		mg/L	0.11	0.037	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:23	SRT	A1
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:23	SRT	A1
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:23	SRT	A1
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:23	SRT	A1
Zinc, Total	0.055J	J	mg/L	0.11	0.037	SW846 6010C	11/21/16 09:45 TSS	11/21/16 13:23	SRT	A1



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QUALITY CONTROL DATA

Workorder: 2189986 R1611998

QC Batch: MDIG/60975 **Analysis Method:** SW846 6010C

QC Batch Method: SW846 3015

Associated Lab Samples: 2189986001, 2189986002, 2189986003, 2189986004

METHOD BLANK: 2443192

Parameter	Blank Result	Units	Reporting Limit
Antimony, Total	ND	mg/L	0.030
Arsenic, Total	ND	mg/L	0.028
Barium, Total	ND	mg/L	0.56
Beryllium, Total	ND	mg/L	0.0044
Cadmium, Total	ND	mg/L	0.0022
Chromium, Total	ND	mg/L	0.0056
Lead, Total	ND	mg/L	0.0067
Nickel, Total	ND	mg/L	0.022
Selenium, Total	ND	mg/L	0.022
Silver, Total	ND	mg/L	0.0044
Thallium, Total	ND	mg/L	0.022
Vanadium, Total	ND	mg/L	0.0056
Zinc, Total	ND	mg/L	0.022

LABORATORY CONTROL SAMPLE: 2443193

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Antimony, Total	107	mg/L	.22	0.24	80 - 120
Arsenic, Total	109	mg/L	.11	0.12	80 - 120
Barium, Total	108	mg/L	1.1	1.2	80 - 120
Beryllium, Total	106	mg/L	.22	0.24	80 - 120
Cadmium, Total	109	mg/L	.11	0.12	80 - 120
Chromium, Total	107	mg/L	.11	0.12	80 - 120
Lead, Total	107	mg/L	.11	0.12	80 - 120
Nickel, Total	109	mg/L	1.1	1.2	80 - 120
Selenium, Total	107	mg/L	1.1	1.2	80 - 120
Silver, Total	108	mg/L	.11	0.12	80 - 120
Thallium, Total	113	mg/L	.11	0.13	80 - 120
Vanadium, Total	109	mg/L	.056	0.061	80 - 120
Zinc, Total	110	mg/L	.56	0.61	80 - 120

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QUALITY CONTROL DATA

Workorder: 2189986 R1611998

MATRIX SPIKE: 2443196 DUPLICATE: 2443197 ORIGINAL: 2189986001

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Arsenic, Total	.02	mg/L	5	5.92772	5.76105	118	115	50 - 150	2.85	20
Barium, Total	1.2061	mg/L	10	11.83877	11.72766	106	105	50 - 150	.94	20
Cadmium, Total	.00389	mg/L	1	1.14499	1.10888	114	110	50 - 150	3.2	20
Chromium, Total	.00167	mg/L	5	5.18939	5.1705	104	103	50 - 150	.36	20
Lead, Total	0	mg/L	5	5.58328	5.43217	112	109	50 - 150	2.74	20
Selenium, Total	.00333	mg/L	1	1.17777	1.14221	117	114	50 - 150	3.07	20
Silver, Total	0	mg/L	1	1.14277	1.1361	114	114	50 - 150	.59	20

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QUALITY CONTROL DATA

Workorder: 2189986 R1611998

QC Batch: MDIG/60980 **Analysis Method:** SW846 7470A

QC Batch Method: SW846 7470A

Associated Lab Samples: 2189986001, 2189986002, 2189986003, 2189986004

METHOD BLANK: 2443294

Parameter	Blank Result	Units	Reporting Limit
Mercury, Total	ND	mg/L	0.0020

LABORATORY CONTROL SAMPLE: 2443295

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Mercury, Total	104	mg/L	.002	0.0021	85 - 115

MATRIX SPIKE: 2443296 DUPLICATE: 2443297 ORIGINAL: 2189986001

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Mercury, Total	0	mg/L	.005	.00582	.00558	116	112	70 - 130	4.21	20

MATRIX SPIKE: 2443298 DUPLICATE: 2443299 ORIGINAL: 2189986004

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Mercury, Total	0	mg/L	.005	.0053	.00534	106	107	70 - 130	.75	20

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QUALITY CONTROL DATA

Workorder: 2189986 R1611998

QC Batch: WETC/179385 **Analysis Method:** S2540G-11

QC Batch Method: S2540G-11

Associated Lab Samples: 2189986001, 2189986002, 2189986003, 2189986004

SAMPLE DUPLICATE: 2444293 ORIGINAL: 2187505002

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	41.4507	%	40.1091	3.29	10
Total Solids	58.5492	%	59.8908	2.27	5

SAMPLE DUPLICATE: 2444294 ORIGINAL: 2188802007

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	16.5887	%	16.7014	.68	10
Total Solids	83.4112	%	83.2985	.14	5

SAMPLE DUPLICATE: 2444295 ORIGINAL: 2189804002

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	4.1666	%	2.0833	66.7*	10
Total Solids	95.8333	%	97.9166	2.15	5

SAMPLE DUPLICATE: 2444296 ORIGINAL: 2189959004

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	.5964	%	.5115	15.3*	10
Total Solids	99.4035	%	99.4884	.09	5

SAMPLE DUPLICATE: 2444297 ORIGINAL: 2190139001

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	19.1091	%	19.209	.52	10
Total Solids	80.8908	%	80.7909	.12	5

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QUALITY CONTROL DATA

Workorder: 2189986 R1611998

SAMPLE DUPLICATE: 2444298 ORIGINAL: 2190151007

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	16.0569	%	14.9659	7.03	10
Total Solids	83.943	%	85.034	1.29	5

SAMPLE DUPLICATE: 2444299 ORIGINAL: 2190160001

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	21.2912	%	22.0272	3.4	10
Total Solids	78.7087	%	77.9727	.94	5

SAMPLE DUPLICATE: 2444300 ORIGINAL: 2190168001

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	8.2432	%	8.5539	3.7	10
Total Solids	91.7567	%	91.446	.34	5

SAMPLE DUPLICATE: 2444301 ORIGINAL: 2190171009

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	6.6066	%	6.5359	1.08	10
Total Solids	93.3933	%	93.464	.08	5

SAMPLE DUPLICATE: 2444302 ORIGINAL: 2190179004

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	9.1633	%	7.4257	20.9*	10
Total Solids	90.8366	%	92.5742	1.89	5

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Workorder: 2189986 R1611998

Lab ID	Sample ID	Prep Method	Prep Batch	Analysis Method	Analysis Batch
2189986001	R1611998-005	SW846 3015	MDIG/60975	SW846 6010C	META/55043
2189986002	R1611998-006	SW846 3015	MDIG/60975	SW846 6010C	META/55043
2189986003	R1611998-009	SW846 3015	MDIG/60975	SW846 6010C	META/55043
2189986004	R1611998-012	SW846 3015	MDIG/60975	SW846 6010C	META/55043
2189986001	R1611998-005	SW846 7470A	MDIG/60980	SW846 7470A	META/55048
2189986002	R1611998-006	SW846 7470A	MDIG/60980	SW846 7470A	META/55048
2189986003	R1611998-009	SW846 7470A	MDIG/60980	SW846 7470A	META/55048
2189986004	R1611998-012	SW846 7470A	MDIG/60980	SW846 7470A	META/55048
2189986001	R1611998-005			S2540G-11	WETC/179385
2189986002	R1611998-006			S2540G-11	WETC/179385
2189986003	R1611998-009			S2540G-11	WETC/179385
2189986004	R1611998-012			S2540G-11	WETC/179385

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ALS Environmental Chain of Custody

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Project Number: R1611998
 Project Manager: Janice Jaeger
 QAP: LAB QAP



Lab Code	Sample ID	# of Cont.	Matrix	Sample		Lab ID	TCLP									
				Date	Time		Ag	As	Ba	Ba	Ca	Cr	Hg	Ni	Pb	
R1611998-005	1611090909 400-SB-14 (0-153.5) <i>QC 2</i>	2	Soil	11/9/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X
R1611998-006	1611090910 400-SB-14 (0-153.5)	1	Soil	11/9/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X
R1611998-009	1611090923 400-SB-14 (0-62)	1	Soil	11/9/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X
R1611998-012	1611090933 400-SB-14 (62-153.5)	1	Soil	11/9/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X

Y M Initials Cooler Temp: 4 °C
 Custody Seals Present? (if present) Seals Intact?
 Received on Ice?
 COC/Lbls Complete
 Cont in Good Cond?
 Correct Containers?
 Correct Temp Vol?
 Correct Preservation?
 Headspace/Volatiles?
 Ship Carrier: FedEx UPS
 Therm ID: 71352
 Tracking # 6526 8019 3009

Folder Comments:
 ND U

Special Instructions/Comments <i>NAPA/WSTF ESD</i>	Turnaround Requirements <input type="checkbox"/> RUSH (Surcharges Apply) PLEASE CIRCLE WORK DAYS 1 2 3 4 5 <input checked="" type="checkbox"/> STANDARD	Report Requirements <input type="checkbox"/> I. Results Only <input checked="" type="checkbox"/> II. Results + QC Summaries <input type="checkbox"/> III. Results + QC and Calibration Summaries <input type="checkbox"/> IV. Data Validation Report with Raw Data	Invoice Information PO# 58R1611998 Bill to
	H - Test is On Hold P - Test is Authorized for Prep Only	Requested FAX Date: _____ Requested Report Date: <u>11/25/16</u>	PQL/MDUJ <u>Y</u> EDD <u>Y</u>

Relinquished By: *[Signature]* 11/6/16
 Received By: *[Signature]* 11/19/16
 Airbill Number: 0841

R1611998-005	1611090909 400-SB-14 (0-153.5)	e	Soil	11/9/16	Middletown ALS	Sb TCLP 6010C	Sr TCLP 6010C	TCLP EPA 1311	Tl TCLP 6010C	V TCLP 6010C	Zn TCLP 6010C
R1611998-006	1611090910 400-SB-14 (0-153.5)	1	Soil	11/9/16	Middletown ALS						
R1611998-009	1611090923 400-SB-14 (0-62)	1	Soil	11/9/16	Middletown ALS						
R1611998-012	1611090933 400-SB-14 (62-153.5)	1	Soil	11/9/16	Middletown ALS						

ALS Environmental Chain of Custody

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ALS Contact: Janice Jaeger

Project Number: R1611998
Project Manager: Janice Jaeger
QAP: LAB QAP

Run QC on sample R1611998-005 for 6010C/Ag TCLP, As TCLP, Ba TCLP, Be TCLP, Cd TCLP, Cr TCLP, Ni TCLP, Pb TCLP, Sb TCLP, Se TCLP, Ti TCLP, V TCLP, Zn TCLP, 7470A/Hg TCLP

R1611998

A

Ship To: Middletown ALS
ALS Laboratory Group
34 Dogwood Lane
Middletown, PA 17057

PC WJD Date 11/14/16
SMO HE Date 11-16-16

Instructions: Ice X Shipping: Overnight X
Dry Ice _____ 2nd Day _____
No Ice _____ Ground _____
Bill to Client Account _____

Comments:

ALS Group USA, Corp.
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December 06, 2016

Service Request No:R1612461

Mr. Tom Hall
NASA/WSTF/Navarro
P.O. Box 20
Las Cruces, NM 88004

Laboratory Results for: White Sands Test Facility

Dear Mr.Hall,

Enclosed are the results of the sample(s) submitted to our laboratory November 28, 2016
For your reference, these analyses have been assigned our service request number **R1612461**.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAP standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report. The measurement uncertainty of the results included in this report is within that expected when using the prescribed method(s) for analysis of these samples, and represented by Laboratory Control Sample control limits. Any events, such as QC failures, which may add to the uncertainty are explained in the report narrative.

Please contact me if you have any questions. My extension is 7472. You may also contact me via email at Janice.Jaeger@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Janice Jaeger
Project Manager

ADDRESS 1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
PHONE +1 585 288 5380 | **FAX** +1 585 288 8475
ALS Group USA, Corp.
dba ALS Environmental



Narrative Documents

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com



Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request:R1612461
Date Received:11/28/16

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables, including results of QC samples analyzed from this delivery group. Analytical procedures performed by the lab are validated in accordance with NELAC standards. Any parameters that are not included in the lab's NELAC accreditation are identified on a "Non-Certified Analytes" report in the Miscellaneous Forms Section of this report. Individual analytical results requiring further explanation are flagged with qualifiers and/or discussed below. The flags are explained in the Report Qualifiers and Definitions page in the Miscellaneous Forms section of this report.

Sample Receipt

Eight water and soil samples were received for analysis at ALS Environmental on 11/28/2016. Any discrepancies noted upon initial sample inspection are noted on the cooler receipt and preservation form included in this data package. The samples were received in good condition and consistent with the accompanying chain of custody form. Samples are refrigerated at $\leq 6^{\circ}\text{C}$ upon receipt at the lab except for aqueous samples designated for metals analyses, which are stored at room temperature.

Metals Analyses:

No significant anomalies were noted with this analysis.

General Chemistry Analyses:

No significant anomalies were noted with this analysis.

Approved by  Date 12/6/2016

SAMPLE DETECTION SUMMARY

CLIENT ID: 1611181121 400-SB-10 **Lab ID: R1612461-001**

Analyte	Results	Flag	MDL	PQL	Units	Method
Barium, Total	0.036	B	0.002	0.020	mg/L	6010C
Chromium, Total	0.0003	BJ	0.0003	0.010	mg/L	6010C
Vanadium, Total	0.002	BJ	0.0010	0.050	mg/L	6010C
Zinc, Total	0.012	BJ	0.007	0.020	mg/L	6010C

CLIENT ID: 1611181122 400-SB-10 **Lab ID: R1612461-002**

Analyte	Results	Flag	MDL	PQL	Units	Method
Barium, Total	0.036	B	0.002	0.020	mg/L	6010C
Chromium, Total	0.0004	BJ	0.0003	0.010	mg/L	6010C
Vanadium, Total	0.002	BJ	0.0010	0.050	mg/L	6010C
Zinc, Total	0.015	BJ	0.007	0.020	mg/L	6010C

CLIENT ID: 1611181130 400-SB-10 **Lab ID: R1612461-003**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	63.9				Percent	ALS SOP
Antimony, Total	1.0	J	0.7	9.3	mg/Kg	6010C
Arsenic, Total	5.4		0.4	1.5	mg/Kg	6010C
Barium, Total	180		0.2	3.1	mg/Kg	6010C
Beryllium, Total	0.53		0.03	0.46	mg/Kg	6010C
Cadmium, Total	0.05	J	0.05	0.77	mg/Kg	6010C
Chromium, Total	1.8		0.2	1.5	mg/Kg	6010C
Lead, Total	7.5	J	0.5	7.7	mg/Kg	6010C
Nickel, Total	3.5	J	0.2	6.2	mg/Kg	6010C
Selenium, Total	2.1		1.0	1.5	mg/Kg	6010C
Vanadium, Total	42.7		0.2	7.7	mg/Kg	6010C
Zinc, Total	37.0		0.3	3.1	mg/Kg	6010C

CLIENT ID: 1611181131 400-SB-10 **Lab ID: R1612461-004**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	61.2				Percent	ALS SOP
Arsenic, Total	5.7		0.4	1.6	mg/Kg	6010C
Barium, Total	147		0.2	3.1	mg/Kg	6010C
Beryllium, Total	0.55		0.03	0.47	mg/Kg	6010C
Cadmium, Total	0.06	J	0.05	0.78	mg/Kg	6010C
Chromium, Total	2.7		0.2	1.6	mg/Kg	6010C
Lead, Total	7.3	J	0.5	7.8	mg/Kg	6010C
Nickel, Total	3.4	J	0.2	6.2	mg/Kg	6010C
Selenium, Total	1.7		1.0	1.6	mg/Kg	6010C
Vanadium, Total	47.1		0.2	7.8	mg/Kg	6010C
Zinc, Total	37.4		0.3	3.1	mg/Kg	6010C



SAMPLE DETECTION SUMMARY

CLIENT ID: 1611181146 400-SB-12 Lab ID: R1612461-005

Analyte	Results	Flag	MDL	PQL	Units	Method
Barium, Total	0.153		0.002	0.020	mg/L	6010C
Beryllium, Total	0.0002	BJ	0.0002	0.0030	mg/L	6010C
Chromium, Total	0.004	BJ	0.0003	0.010	mg/L	6010C
Vanadium, Total	0.016	BJ	0.0010	0.050	mg/L	6010C
Zinc, Total	0.025		0.007	0.020	mg/L	6010C

CLIENT ID: 1611181147 400-SB-12 Lab ID: R1612461-006

Analyte	Results	Flag	MDL	PQL	Units	Method
Barium, Total	0.036	B	0.002	0.020	mg/L	6010C
Chromium, Total	0.0004	BJ	0.0003	0.010	mg/L	6010C
Vanadium, Total	0.003	BJ	0.0010	0.050	mg/L	6010C
Zinc, Total	0.018	BJ	0.007	0.020	mg/L	6010C

CLIENT ID: 1611181155 400-SB-12 Lab ID: R1612461-007

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	76.1				Percent	ALS SOP
Arsenic, Total	0.8	J	0.4	1.3	mg/Kg	6010C
Barium, Total	237		0.2	2.6	mg/Kg	6010C
Beryllium, Total	0.59		0.03	0.39	mg/Kg	6010C
Cadmium, Total	0.71		0.04	0.64	mg/Kg	6010C
Chromium, Total	12.1		0.2	1.3	mg/Kg	6010C
Lead, Total	4.3	J	0.4	6.4	mg/Kg	6010C
Nickel, Total	8.8		0.2	5.2	mg/Kg	6010C
Vanadium, Total	59.4		0.2	6.4	mg/Kg	6010C
Zinc, Total	41.4		0.2	2.6	mg/Kg	6010C

CLIENT ID: 1611181156 400-SB-12 Lab ID: R1612461-008

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	70.9				Percent	ALS SOP
Arsenic, Total	1.0	J	0.4	1.4	mg/Kg	6010C
Barium, Total	330		0.2	2.8	mg/Kg	6010C
Beryllium, Total	0.57		0.03	0.42	mg/Kg	6010C
Cadmium, Total	0.74		0.05	0.70	mg/Kg	6010C
Chromium, Total	16.4		0.2	1.4	mg/Kg	6010C
Lead, Total	4.7	J	0.4	7.0	mg/Kg	6010C
Nickel, Total	9.9		0.2	5.6	mg/Kg	6010C
Selenium, Total	1.5		0.9	1.4	mg/Kg	6010C
Vanadium, Total	72.2		0.2	7.0	mg/Kg	6010C
Zinc, Total	43.7		0.2	2.8	mg/Kg	6010C



Sample Receipt Information

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com


Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request:R1612461


SAMPLE CROSS-REFERENCE

<u>SAMPLE #</u>	<u>CLIENT SAMPLE ID</u>	<u>DATE</u>	<u>TIME</u>
R1612461-001	1611181121 400-SB-10	11/18/2016	
R1612461-002	1611181122 400-SB-10	11/18/2016	
R1612461-003	1611181130 400-SB-10	11/18/2016	
R1612461-004	1611181131 400-SB-10	11/18/2016	
R1612461-005	1611181146 400-SB-12	11/18/2016	
R1612461-006	1611181147 400-SB-12	11/18/2016	
R1612461-007	1611181155 400-SB-12	11/18/2016	
R1612461-008	1611181156 400-SB-12	11/18/2016	

Laboratory PO #15EC007B		Analytical Requirements						Special Instructions
Return Address for Analytical Reports		# of Containers	Sample Type: Aqueous (A); Slurry (S)	SW-846 Method 8260B 40 ml Amber Glass Vial, Ice	SW-846 Method 8260B 4 oz Glass Jar, Ice	Total Metals SW-846-6010C and 7470A 500 ML poly, Ice	Total Metals SW-846-6010C and 7470A 4 oz. Glass Jar, Ice	TCLP Metals EPA Method 1311 incorporating SW-846-6010C and 7470A 8 oz. Glass Jar, Ice
Sample No.	Sample Location								Comments
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012								Please return coolers and reusable packaging materials as possible. Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall
Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453								
1611181115	400-SB-10	1	A	X				
1611181116	400-SB-10	1	A	X				
1611181117	400-SB-10	1	A	X				Matrix Spike for 1611181115
1611181124	400-SB-10	1	S		X			
1611181125	400-SB-10	1	S		X			
1611181126	400-SB-10	1	S		X			Matrix Spike for 1611181124
1611181121	400-SB-10	1	A			X		
1611181122	400-SB-10	1	A			X		
1611181123	400-SB-10	1	A			X		Matrix Spike for 1611181121
1611181130	400-SB-10	1	S				X	
1611181131	400-SB-10	1	S				X	
1611181132	400-SB-10	1	S				X	Matrix Spike for 1611181130
1611181133	400-SB-10	1	S				X	
1611181134	400-SB-10	1	S				X	
1611181135	400-SB-10	1	S				X	Matrix Spike for 1611181133
Relinquished By:		Date/Time:		Accepted By:			Date/Time:	
Steven Mercedes		11/21/16 11:00		[Signature]			11/21/16 11:10	

R1612461
 NASA/WSTF/Navarro
 White Sands Test Facility

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Laboratory PO #15EC007B		Analytical Requirements						Special Instructions
Return Address for Analytical Reports		# of Containers	Sample Type: Aqueous (A); Slurry (S)	SW-846 Method 8260B 40 ml Amber Glass Vial, Ice	SW-846 Method 8260B 4 oz. Glass Jar, Ice	Total Metals SW-846-6010C and 7470A 500 ML poly, Ice	Total Metals SW-846-6010C and 7470A 4 oz. Glass Jar, Ice	TCLP Metals EPA Method 1311 incorporating SW-846-6010C and 7470A 8 oz. Glass Jar, Ice
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012 Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453	Please return coolers and reusable packaging materials as possible. Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall <i>no sampling except for metals as per Tom Hall</i>							
Sample No.	Sample Location	Comments						
1611181140	400-SB-12	1	A	X				
1611181141	400-SB-12	1	A	X				
1611181142	400-SB-12	1	A	X				Matrix Spike for 1611181140
1611181149	400-SB-12	1	S		X			
1611181150	400-SB-12	1	S		X			
1611181151	400-SB-12	1	S		X			Matrix Spike for 1611181149
1611181146	400-SB-12	1	A			X		
1611181147	400-SB-12	1	A			X		
1611181148	400-SB-12	1	A			X		Matrix Spike for 1611181146
1611181155	400-SB-12	1	S				X	
1611181156	400-SB-12	1	S				X	
1611181157	400-SB-12	1	S				X	Matrix Spike for 1611181155
1611181158	400-SB-12	1	S				X	
1611181159	400-SB-12	1	S				X	
1611181200	400-SB-12	1	S				X	Matrix Spike for 1611181158
Relinquished By:		Date/Time:		Accepted By:			Date/Time:	
Steven Mercedes		11/21/16 11:00		<i>[Signature]</i>			11-28-16 11:35	

R1612461 **5**
 NASA/WSTF/Navarro
 White Sands Test Facility




R1612461

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NASA/WSTF/Navarro
White Sands Test Facility

Cooler Receipt and Preservation Check Form

Project/Client NASA Folder Number _____

Cooler received on 11-28-16 by: HE

COURIER: ALS UPS FEDEX VELOCITY CLIENT

1	Were Custody seals on outside of cooler?	<input checked="" type="radio"/> Y	<input type="radio"/> N
2	Custody papers properly completed (ink, signed)?	<input checked="" type="radio"/> Y	<input type="radio"/> N
3	Did all bottles arrive in good condition (unbroken)?	<input checked="" type="radio"/> Y	<input type="radio"/> N
4	Circle: <u>Wet Ice</u> Dry Ice Gel packs present?	<input checked="" type="radio"/> Y	<input type="radio"/> N

5a	Perchlorate samples have required headspace?	<input type="radio"/> Y	<input type="radio"/> N	<input checked="" type="radio"/> NA
5b	Did VOA vials, Alk, or Sulfide have sig* bubbles?	<input type="radio"/> Y	<input type="radio"/> N	<input checked="" type="radio"/> NA
6	Where did the bottles originate?	ALS/ROC	<input checked="" type="radio"/> CLIENT	
7	Soil VOA received as:	Bulk	Encore	5035set <input checked="" type="radio"/> NA

8. Temperature Readings Date: 11-28-16 Time: 11:21 ID: IR#7 IR#8 From: Temp Blank Sample Bottle

Observed Temp (°C)	<u>14.5</u>							
Correction Factor (°C)	<u>0</u>							
Corrected Temp (°C)	<u>14.5</u>							
Within 0-6°C?	<input type="radio"/> Y <input checked="" type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N
If <0°C, were samples frozen?	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N

If out of Temperature, note packing/ice condition: Ice melted Poorly Packed Same Day Rule

& Client Approval to Run Samples: _____ Standing Approval Client aware at drop-off Client notified by: _____

All samples held in storage location: R-002 by HE on 11-28-16 at 11:26
 5035 samples placed in storage location: _____ by _____ on _____ at _____

Cooler Breakdown: Date: 11-28-16 Time: 12:45 by: TS

- Were all bottle labels complete (i.e. analysis, preservation, etc.)? YES NO
- Did all bottle labels and tags agree with custody papers? YES NO
- Were correct containers used for the tests indicated? YES NO
- Were 5035 vials acceptable (no extra labels, not leaking)? YES NO
- Air Samples: Cassettes / Tubes Intact Canisters Pressurized Tedlar® Bags Inflated N/A

Explain any discrepancies:

pH	Reagent	Yes	No	Lot Received	Exp	Sample ID	Vol. Added	Lot Added	Final pH
≥12	NaOH								
≤2	HNO ₃		<input checked="" type="checkbox"/>	<u>Client</u>		<u>006</u>	<u>2ml</u>	<u>B07076 (5641)</u>	<u><2</u>
≤2	H ₂ SO ₄								
<4	NaHSO ₄								
Residual Chlorine (-)	For CN Phenol and 522			If +, contact PM to add Na ₂ S ₂ O ₃ (CN), ascorbic (phenol).					
	Na ₂ S ₂ O ₃	-	-						
	ZnAcetate	-	-						
	HCl	**	**						

Yes=All samples OK
 No=Samples were preserved at The lab as listed
 PM OK to Adjust: _____

**Not to be tested before analysis – pH tested and recorded by VOAs on a separate worksheet

Bottle lot numbers: Client bottle
Other Comments:

* 1611181155 - 400-SB-12 402 Jar broken in shipment.
Sample lost.
HE 11-28-16

CLRES	BULK
DO	FLDT
HPROD	HGFB
HTR	LL3541
PH	SUB
SO3	MARRS
ALS	REV

PC Secondary Review: _____

*significant air bubbles: VOA > 5-6 mm : WC > 1 in. diameter



Miscellaneous Forms

ALS Environmental—Rochester Laboratory
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www.alsglobal.com

REPORT QUALIFIERS AND DEFINITIONS

<p>U Analyte was analyzed for but not detected. The sample quantitation limit has been corrected for dilution and for percent moisture, unless otherwise noted in the case narrative.</p> <p>J Estimated value due to either being a Tentatively Identified Compound (TIC) or that the concentration is between the MRL and the MDL. Concentrations are not verified within the linear range of the calibration. For DoD: concentration >40% difference between two GC columns (pesticides/Aroclors).</p> <p>B Analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.</p> <p>E Inorganics- Concentration is estimated due to the serial dilution was outside control limits.</p> <p>E Organics- Concentration has exceeded the calibration range for that specific analysis.</p> <p>D Concentration is a result of a dilution, typically a secondary analysis of the sample due to exceeding the calibration range or that a surrogate has been diluted out of the sample and cannot be assessed.</p> <p>* Indicates that a quality control parameter has exceeded laboratory limits. Under the “Notes” column of the Form I, this qualifier denotes analysis was performed out of Holding Time.</p> <p>H Analysis was performed out of hold time for tests that have an “immediate” hold time criteria.</p> <p># Spike was diluted out.</p>	<p>+ Correlation coefficient for MSA is <0.995.</p> <p>N Inorganics- Matrix spike recovery was outside laboratory limits.</p> <p>N Organics- Presumptive evidence of a compound (reported as a TIC) based on the MS library search.</p> <p>S Concentration has been determined using Method of Standard Additions (MSA).</p> <p>W Post-Digestion Spike recovery is outside control limits and the sample absorbance is <50% of the spike absorbance.</p> <p>P Concentration >40% (25% for CLP) difference between the two GC columns.</p> <p>C Confirmed by GC/MS</p> <p>Q DoD reports: indicates a pesticide/Aroclor is not confirmed ($\geq 100\%$ Difference between two GC columns).</p> <p>X See Case Narrative for discussion.</p> <p>MRL Method Reporting Limit. Also known as: LOQ Limit of Quantitation (LOQ) The lowest concentration at which the method analyte may be reliably quantified under the method conditions.</p> <p>MDL Method Detection Limit. A statistical value derived from a study designed to provide the lowest concentration that will be detected 99% of the time. Values between the MDL and MRL are estimated (see J qualifier).</p> <p>LOD Limit of Detection. A value at or above the MDL which has been verified to be detectable.</p> <p>ND Non-Detect. Analyte was not detected at the concentration listed. Same as U qualifier.</p>
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Rochester Lab ID # for State Certifications¹

Connecticut ID # PH0556	Maine ID #NY0032	New Hampshire ID #
Delaware Accredited	Nebraska Accredited	294100 A/B
DoD ELAP #65817	New Jersey ID # NY004	Pennsylvania ID# 68-786
Florida ID # E87674	New York ID # 10145	Rhode Island ID # 158
Illinois ID #200047	North Carolina #676	Virginia #460167

¹ Analyses were performed according to our laboratory’s NELAP-approved quality assurance program and any applicable state or agency requirements. The test results meet requirements of the current NELAP/TNI standards or state or agency requirements, where applicable, except as noted in the case narrative. Since not all analyte/method/matrix combinations are offered for state/NELAC accreditation, this report may contain results which are not accredited. For a specific list of accredited analytes, contact the laboratory or go to <http://www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads/North-America-Downloads>

ALS Laboratory Group

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

ALS Group USA, Corp.
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Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1612461

Sample Name: 1611181121 400-SB-10
Lab Code: R1612461-001
Sample Matrix: Water

Date Collected: 11/18/16
Date Received: 11/28/16

Analysis Method
6010C
7470A

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CBURLESON

Sample Name: 1611181122 400-SB-10
Lab Code: R1612461-002
Sample Matrix: Water

Date Collected: 11/18/16
Date Received: 11/28/16

Analysis Method
6010C
7470A

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CBURLESON

Sample Name: 1611181130 400-SB-10
Lab Code: R1612461-003
Sample Matrix: Soil

Date Collected: 11/18/16
Date Received: 11/28/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
CGILDAY
CBURLESON
KWONG

Sample Name: 1611181131 400-SB-10
Lab Code: R1612461-004
Sample Matrix: Soil

Date Collected: 11/18/16
Date Received: 11/28/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
CGILDAY
CBURLESON
KWONG

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1612461

Sample Name: 1611181146 400-SB-12
Lab Code: R1612461-005
Sample Matrix: Water

Date Collected: 11/18/16
Date Received: 11/28/16

Analysis Method
6010C
7470A

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CBURLESON

Sample Name: 1611181147 400-SB-12
Lab Code: R1612461-006
Sample Matrix: Water

Date Collected: 11/18/16
Date Received: 11/28/16

Analysis Method
6010C
7470A

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CBURLESON

Sample Name: 1611181155 400-SB-12
Lab Code: R1612461-007
Sample Matrix: Soil

Date Collected: 11/18/16
Date Received: 11/28/16

Analysis Method
6010C
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON
CBURLESON

Analyzed By
CGILDAY
NMANSEN
CBURLESON
KWONG

Sample Name: 1611181156 400-SB-12
Lab Code: R1612461-008
Sample Matrix: Soil

Date Collected: 11/18/16
Date Received: 11/28/16

Analysis Method
6010C
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON
CBURLESON

Analyzed By
CGILDAY
NMANSEN
CBURLESON
KWONG



INORGANIC PREPARATION METHODS

The preparation methods associated with this report are found in these tables unless discussed in the case narrative.

Water/Liquid Matrix

Analytical Method	Preparation Method
200.7	200.2
200.8	200.2
6010C	3005A/3010A
6020A	ILM05.3
9014 Cyanide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Acid Soluble	9030B
9056A Bomb (Halogens)	5050A
9066 Manual Distillation	9065
SM 4500-CN-E Residual Cyanide	SM 4500-CN-G
SM 4500-CN-E WAD Cyanide	SM 4500-CN-I

Solid/Soil/Non-Aqueous Matrix

Analytical Method	Preparation Method
6010C	3050B
6020A	3050B
6010C TCLP (1311) extract	3005A/3010A
6010 SPLP (1312) extract	3005A/3010A
7196A	3060A
7199	3060A
9056A Halogens/Halides	5050
300.0 Anions/ 350.1/ 353.2/ SM 2320B/ SM 5210B/ 9056A Anions	DI extraction

For analytical methods not listed, the preparation method is the same as the analytical method reference.



Sample Results

ALS Environmental—Rochester Laboratory
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Metals

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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water
Sample Name: 1611181121 400-SB-10
Lab Code: R1612461-001

Service Request: R1612461
Date Collected: 11/18/16
Date Received: 11/28/16 11:15
Basis: NA

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/L	0.060	0.005	1	11/30/16 20:40	11/29/16	
Arsenic, Total	6010C	ND U	mg/L	0.010	0.005	1	11/30/16 20:40	11/29/16	
Barium, Total	6010C	0.036 B	mg/L	0.020	0.002	1	11/30/16 20:40	11/29/16	
Beryllium, Total	6010C	ND U	mg/L	0.0030	0.0002	1	11/30/16 20:40	11/29/16	
Cadmium, Total	6010C	ND U	mg/L	0.0050	0.0002	1	11/30/16 20:40	11/29/16	
Chromium, Total	6010C	0.0003 BJ	mg/L	0.010	0.0003	1	11/30/16 20:40	11/29/16	
Lead, Total	6010C	ND U	mg/L	0.050	0.005	1	11/30/16 20:40	11/29/16	
Mercury, Total	7470A	ND U	mg/L	0.00020	0.00004	1	11/30/16 11:18	11/29/16	
Nickel, Total	6010C	ND U	mg/L	0.040	0.002	1	11/30/16 20:40	11/29/16	
Selenium, Total	6010C	ND U	mg/L	0.010	0.005	1	12/01/16 16:15	11/29/16	
Silver, Total	6010C	ND U	mg/L	0.010	0.0006	1	11/30/16 20:40	11/29/16	
Thallium, Total	6010C	ND U	mg/L	0.010	0.005	1	11/30/16 20:40	11/29/16	
Vanadium, Total	6010C	0.002 BJ	mg/L	0.050	0.0010	1	11/30/16 20:40	11/29/16	
Zinc, Total	6010C	0.012 BJ	mg/L	0.020	0.007	1	11/30/16 20:40	11/29/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water
Sample Name: 1611181122 400-SB-10
Lab Code: R1612461-002

Service Request: R1612461
Date Collected: 11/18/16
Date Received: 11/28/16 11:15

Basis: NA

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/L	0.060	0.005	1	11/30/16 21:02	11/29/16	
Arsenic, Total	6010C	ND U	mg/L	0.010	0.005	1	11/30/16 21:02	11/29/16	
Barium, Total	6010C	0.036 B	mg/L	0.020	0.002	1	11/30/16 21:02	11/29/16	
Beryllium, Total	6010C	ND U	mg/L	0.0030	0.0002	1	11/30/16 21:02	11/29/16	
Cadmium, Total	6010C	ND U	mg/L	0.0050	0.0002	1	11/30/16 21:02	11/29/16	
Chromium, Total	6010C	0.0004 BJ	mg/L	0.010	0.0003	1	11/30/16 21:02	11/29/16	
Lead, Total	6010C	ND U	mg/L	0.050	0.005	1	11/30/16 21:02	11/29/16	
Mercury, Total	7470A	ND U	mg/L	0.00020	0.00004	1	11/30/16 11:23	11/29/16	
Nickel, Total	6010C	ND U	mg/L	0.040	0.002	1	11/30/16 21:02	11/29/16	
Selenium, Total	6010C	ND U	mg/L	0.010	0.005	1	12/01/16 16:31	11/29/16	
Silver, Total	6010C	ND U	mg/L	0.010	0.0006	1	11/30/16 21:02	11/29/16	
Thallium, Total	6010C	ND U	mg/L	0.010	0.005	1	11/30/16 21:02	11/29/16	
Vanadium, Total	6010C	0.002 BJ	mg/L	0.050	0.0010	1	11/30/16 21:02	11/29/16	
Zinc, Total	6010C	0.015 BJ	mg/L	0.020	0.007	1	11/30/16 21:02	11/29/16	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611181130 400-SB-10
Lab Code: R1612461-003

Service Request: R1612461
Date Collected: 11/18/16
Date Received: 11/28/16 11:15

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	1.0 J	mg/Kg	9.3	0.7	1	12/02/16 17:36	12/01/16	
Arsenic, Total	6010C	5.4	mg/Kg	1.5	0.4	1	12/02/16 17:36	12/01/16	
Barium, Total	6010C	180	mg/Kg	3.1	0.2	1	12/02/16 17:36	12/01/16	
Beryllium, Total	6010C	0.53	mg/Kg	0.46	0.03	1	12/02/16 17:36	12/01/16	
Cadmium, Total	6010C	0.05 J	mg/Kg	0.77	0.05	1	12/02/16 17:36	12/01/16	
Chromium, Total	6010C	1.8	mg/Kg	1.5	0.2	1	12/02/16 17:36	12/01/16	
Lead, Total	6010C	7.5 J	mg/Kg	7.7	0.5	1	12/02/16 17:36	12/01/16	
Mercury, Total	7471B	ND U	mg/Kg	0.048	0.005	1	12/01/16 15:27	12/01/16	
Nickel, Total	6010C	3.5 J	mg/Kg	6.2	0.2	1	12/02/16 17:36	12/01/16	
Selenium, Total	6010C	2.1	mg/Kg	1.5	1.0	1	12/02/16 17:36	12/01/16	
Silver, Total	6010C	ND U	mg/Kg	1.5	0.7	1	12/02/16 17:36	12/01/16	
Thallium, Total	6010C	ND U	mg/Kg	1.5	0.8	1	12/02/16 17:36	12/01/16	
Vanadium, Total	6010C	42.7	mg/Kg	7.7	0.2	1	12/02/16 17:36	12/01/16	
Zinc, Total	6010C	37.0	mg/Kg	3.1	0.3	1	12/02/16 17:36	12/01/16	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611181131 400-SB-10
Lab Code: R1612461-004

Service Request: R1612461
Date Collected: 11/18/16
Date Received: 11/28/16 11:15
Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	9.3	0.7	1	12/02/16 18:06	12/01/16	
Arsenic, Total	6010C	5.7	mg/Kg	1.6	0.4	1	12/02/16 18:06	12/01/16	
Barium, Total	6010C	147	mg/Kg	3.1	0.2	1	12/02/16 18:06	12/01/16	
Beryllium, Total	6010C	0.55	mg/Kg	0.47	0.03	1	12/02/16 18:06	12/01/16	
Cadmium, Total	6010C	0.06 J	mg/Kg	0.78	0.05	1	12/02/16 18:06	12/01/16	
Chromium, Total	6010C	2.7	mg/Kg	1.6	0.2	1	12/02/16 18:06	12/01/16	
Lead, Total	6010C	7.3 J	mg/Kg	7.8	0.5	1	12/02/16 18:06	12/01/16	
Mercury, Total	7471B	ND U	mg/Kg	0.050	0.005	1	12/01/16 15:32	12/01/16	
Nickel, Total	6010C	3.4 J	mg/Kg	6.2	0.2	1	12/02/16 18:06	12/01/16	
Selenium, Total	6010C	1.7	mg/Kg	1.6	1.0	1	12/02/16 18:06	12/01/16	
Silver, Total	6010C	ND U	mg/Kg	1.6	0.7	1	12/02/16 18:06	12/01/16	
Thallium, Total	6010C	ND U	mg/Kg	1.6	0.8	1	12/02/16 18:06	12/01/16	
Vanadium, Total	6010C	47.1	mg/Kg	7.8	0.2	1	12/02/16 18:06	12/01/16	
Zinc, Total	6010C	37.4	mg/Kg	3.1	0.3	1	12/02/16 18:06	12/01/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water
Sample Name: 1611181146 400-SB-12
Lab Code: R1612461-005

Service Request: R1612461
Date Collected: 11/18/16
Date Received: 11/28/16 11:15

Basis: NA

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/L	0.060	0.005	1	11/30/16 21:05	11/29/16	
Arsenic, Total	6010C	ND U	mg/L	0.010	0.005	1	11/30/16 21:05	11/29/16	
Barium, Total	6010C	0.153	mg/L	0.020	0.002	1	11/30/16 21:05	11/29/16	
Beryllium, Total	6010C	0.0002 BJ	mg/L	0.0030	0.0002	1	11/30/16 21:05	11/29/16	
Cadmium, Total	6010C	ND U	mg/L	0.0050	0.0002	1	11/30/16 21:05	11/29/16	
Chromium, Total	6010C	0.004 BJ	mg/L	0.010	0.0003	1	11/30/16 21:05	11/29/16	
Lead, Total	6010C	ND U	mg/L	0.050	0.005	1	11/30/16 21:05	11/29/16	
Mercury, Total	7470A	ND U	mg/L	0.00020	0.00004	1	11/30/16 11:28	11/29/16	
Nickel, Total	6010C	ND U	mg/L	0.040	0.002	1	11/30/16 21:05	11/29/16	
Selenium, Total	6010C	ND U	mg/L	0.010	0.005	1	12/01/16 16:40	11/29/16	
Silver, Total	6010C	ND U	mg/L	0.010	0.0006	1	11/30/16 21:05	11/29/16	
Thallium, Total	6010C	ND U	mg/L	0.010	0.005	1	11/30/16 21:05	11/29/16	
Vanadium, Total	6010C	0.016 BJ	mg/L	0.050	0.0010	1	11/30/16 21:05	11/29/16	
Zinc, Total	6010C	0.025	mg/L	0.020	0.007	1	12/06/16 11:08	12/05/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water
Sample Name: 1611181147 400-SB-12
Lab Code: R1612461-006

Service Request: R1612461
Date Collected: 11/18/16
Date Received: 11/28/16 11:15
Basis: NA

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/L	0.060	0.005	1	11/30/16 21:21	11/29/16	
Arsenic, Total	6010C	ND U	mg/L	0.010	0.005	1	11/30/16 21:21	11/29/16	
Barium, Total	6010C	0.036 B	mg/L	0.020	0.002	1	11/30/16 21:21	11/29/16	
Beryllium, Total	6010C	ND U	mg/L	0.0030	0.0002	1	11/30/16 21:21	11/29/16	
Cadmium, Total	6010C	ND U	mg/L	0.0050	0.0002	1	11/30/16 21:21	11/29/16	
Chromium, Total	6010C	0.0004 BJ	mg/L	0.010	0.0003	1	11/30/16 21:21	11/29/16	
Lead, Total	6010C	ND U	mg/L	0.050	0.005	1	11/30/16 21:21	11/29/16	
Mercury, Total	7470A	ND U	mg/L	0.00020	0.00004	1	11/30/16 11:33	11/29/16	
Nickel, Total	6010C	ND U	mg/L	0.040	0.002	1	11/30/16 21:21	11/29/16	
Selenium, Total	6010C	ND U	mg/L	0.010	0.005	1	12/01/16 16:56	11/29/16	
Silver, Total	6010C	ND U	mg/L	0.010	0.0006	1	11/30/16 21:21	11/29/16	
Thallium, Total	6010C	ND U	mg/L	0.010	0.005	1	11/30/16 21:21	11/29/16	
Vanadium, Total	6010C	0.003 BJ	mg/L	0.050	0.0010	1	11/30/16 21:21	11/29/16	
Zinc, Total	6010C	0.018 BJ	mg/L	0.020	0.007	1	11/30/16 21:21	11/29/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611181155 400-SB-12
Lab Code: R1612461-007

Service Request: R1612461
Date Collected: 11/18/16
Date Received: 11/28/16 11:15
Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	7.7	0.6	1	12/02/16 18:12	12/01/16	
Arsenic, Total	6010C	0.8 J	mg/Kg	1.3	0.4	1	12/02/16 18:12	12/01/16	
Barium, Total	6010C	237	mg/Kg	2.6	0.2	1	12/02/16 18:12	12/01/16	
Beryllium, Total	6010C	0.59	mg/Kg	0.39	0.03	1	12/02/16 18:12	12/01/16	
Cadmium, Total	6010C	0.71	mg/Kg	0.64	0.04	1	12/02/16 18:12	12/01/16	
Chromium, Total	6010C	12.1	mg/Kg	1.3	0.2	1	12/02/16 18:12	12/01/16	
Lead, Total	6010C	4.3 J	mg/Kg	6.4	0.4	1	12/02/16 18:12	12/01/16	
Mercury, Total	7471B	ND U	mg/Kg	0.043	0.004	1	12/01/16 15:34	12/01/16	
Nickel, Total	6010C	8.8	mg/Kg	5.2	0.2	1	12/02/16 18:12	12/01/16	
Selenium, Total	6010C	ND U	mg/Kg	1.3	0.8	1	12/02/16 18:12	12/01/16	
Silver, Total	6010C	ND U	mg/Kg	1.3	0.6	1	12/02/16 18:12	12/01/16	
Thallium, Total	6010C	ND U	mg/Kg	1.3	0.7	1	12/05/16 18:58	12/01/16	
Vanadium, Total	6010C	59.4	mg/Kg	6.4	0.2	1	12/02/16 18:12	12/01/16	
Zinc, Total	6010C	41.4	mg/Kg	2.6	0.2	1	12/02/16 18:12	12/01/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611181156 400-SB-12
Lab Code: R1612461-008

Service Request: R1612461
Date Collected: 11/18/16
Date Received: 11/28/16 11:15

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	8.4	0.6	1	12/02/16 18:55	12/01/16	
Arsenic, Total	6010C	1.0 J	mg/Kg	1.4	0.4	1	12/02/16 18:55	12/01/16	
Barium, Total	6010C	330	mg/Kg	2.8	0.2	1	12/02/16 18:55	12/01/16	
Beryllium, Total	6010C	0.57	mg/Kg	0.42	0.03	1	12/02/16 18:55	12/01/16	
Cadmium, Total	6010C	0.74	mg/Kg	0.70	0.05	1	12/02/16 18:55	12/01/16	
Chromium, Total	6010C	16.4	mg/Kg	1.4	0.2	1	12/02/16 18:55	12/01/16	
Lead, Total	6010C	4.7 J	mg/Kg	7.0	0.4	1	12/02/16 18:55	12/01/16	
Mercury, Total	7471B	ND U	mg/Kg	0.046	0.005	1	12/01/16 15:39	12/01/16	
Nickel, Total	6010C	9.9	mg/Kg	5.6	0.2	1	12/02/16 18:55	12/01/16	
Selenium, Total	6010C	1.5	mg/Kg	1.4	0.9	1	12/02/16 18:55	12/01/16	
Silver, Total	6010C	ND U	mg/Kg	1.4	0.7	1	12/02/16 18:55	12/01/16	
Thallium, Total	6010C	ND U	mg/Kg	1.4	0.7	1	12/05/16 19:20	12/01/16	
Vanadium, Total	6010C	72.2	mg/Kg	7.0	0.2	1	12/02/16 18:55	12/01/16	
Zinc, Total	6010C	43.7	mg/Kg	2.8	0.2	1	12/02/16 18:55	12/01/16	



General Chemistry

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611181130 400-SB-10
Lab Code: R1612461-003

Service Request: R1612461
Date Collected: 11/18/16
Date Received: 11/28/16 11:15
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	63.9	Percent	-	-	1	11/28/16 11:51	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611181131 400-SB-10
Lab Code: R1612461-004

Service Request: R1612461
Date Collected: 11/18/16
Date Received: 11/28/16 11:15
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	61.2	Percent	-	-	1	11/28/16 11:51	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611181155 400-SB-12
Lab Code: R1612461-007

Service Request: R1612461
Date Collected: 11/18/16
Date Received: 11/28/16 11:15
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	76.1	Percent	-	-	1	11/28/16 11:51	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611181156 400-SB-12
Lab Code: R1612461-008

Service Request: R1612461
Date Collected: 11/18/16
Date Received: 11/28/16 11:15
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	70.9	Percent	-	-	1	11/28/16 11:51	



QC Summary Forms

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Metals

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water
Sample Name: Method Blank
Lab Code: R1612461-MB1

Service Request: R1612461
Date Collected: NA
Date Received: NA
Basis: NA

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/L	0.060	0.005	1	11/30/16 19:33	11/29/16	
Arsenic, Total	6010C	ND U	mg/L	0.010	0.005	1	11/30/16 19:33	11/29/16	
Barium, Total	6010C	0.012 J	mg/L	0.020	0.002	1	11/30/16 19:33	11/29/16	
Beryllium, Total	6010C	0.0002 J	mg/L	0.0030	0.0002	1	11/30/16 19:33	11/29/16	
Cadmium, Total	6010C	0.0006 J	mg/L	0.0050	0.0002	1	11/30/16 19:33	11/29/16	
Chromium, Total	6010C	0.002 J	mg/L	0.010	0.0003	1	11/30/16 19:33	11/29/16	
Lead, Total	6010C	ND U	mg/L	0.050	0.005	1	11/30/16 19:33	11/29/16	
Mercury, Total	7470A	ND U	mg/L	0.00020	0.00004	1	11/30/16 10:48	11/29/16	
Nickel, Total	6010C	0.003 J	mg/L	0.040	0.002	1	11/30/16 19:33	11/29/16	
Selenium, Total	6010C	ND U	mg/L	0.010	0.005	1	12/01/16 15:11	11/29/16	
Silver, Total	6010C	ND U	mg/L	0.010	0.0006	1	11/30/16 19:33	11/29/16	
Thallium, Total	6010C	ND U	mg/L	0.010	0.005	1	11/30/16 19:33	11/29/16	
Vanadium, Total	6010C	0.003 J	mg/L	0.050	0.0010	1	11/30/16 19:33	11/29/16	
Zinc, Total	6010C	ND U	mg/L	0.020	0.007	1	12/06/16 10:39	12/05/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: R1612461-MB2

Service Request: R1612461
Date Collected: NA
Date Received: NA
Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	0.7 J	mg/Kg	6.0	0.4	1	12/02/16 16:24	12/01/16	
Arsenic, Total	6010C	ND U	mg/Kg	1.0	0.3	1	12/02/16 16:24	12/01/16	
Barium, Total	6010C	0.3 J	mg/Kg	2.0	0.2	1	12/02/16 16:24	12/01/16	
Beryllium, Total	6010C	ND U	mg/Kg	0.30	0.02	1	12/02/16 16:24	12/01/16	
Cadmium, Total	6010C	ND U	mg/Kg	0.50	0.04	1	12/02/16 16:24	12/01/16	
Chromium, Total	6010C	0.2 J	mg/Kg	1.0	0.2	1	12/02/16 16:24	12/01/16	
Lead, Total	6010C	ND U	mg/Kg	5.0	0.3	1	12/02/16 16:24	12/01/16	
Mercury, Total	7471B	ND U	mg/Kg	0.033	0.003	1	12/01/16 15:08	12/01/16	
Nickel, Total	6010C	ND U	mg/Kg	4.0	0.2	1	12/02/16 16:24	12/01/16	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	12/02/16 16:24	12/01/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	12/02/16 16:24	12/01/16	
Thallium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	12/02/16 16:24	12/01/16	
Vanadium, Total	6010C	ND U	mg/Kg	5.0	0.2	1	12/02/16 16:24	12/01/16	
Zinc, Total	6010C	0.5 J	mg/Kg	2.0	0.2	1	12/02/16 16:24	12/01/16	

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water

Service Request:R1612461
Date Collected:11/18/16
Date Received:11/28/16
Date Analyzed:11/30/16 - 12/01/16

**Matrix Spike Summary
Inorganic Parameters**

Sample Name: 1611181121 400-SB-10
Lab Code: R1612461-001

Units:mg/L
Basis:NA

**Matrix Spike
R1612461-001MS**

Analyte Name	Method	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Silver, Total	6010C	ND U	0.051	0.050	102	75-125
Arsenic, Total	6010C	ND U	0.041	0.040	103	75-125
Barium, Total	6010C	0.036 B	2.21	2.00	108	75-125
Beryllium, Total	6010C	ND U	0.0529	0.0500	106	75-125
Cadmium, Total	6010C	ND U	0.0526	0.0500	105	75-125
Chromium, Total	6010C	0.0003 BJ	0.208	0.200	104	75-125
Mercury, Total	7470A	ND U	0.0010	0.00100	100	75-125
Nickel, Total	6010C	ND U	0.487	0.500	97	75-125
Lead, Total	6010C	ND U	0.522	0.500	104	75-125
Antimony, Total	6010C	ND U	0.522	0.500	104	75-125
Selenium, Total	6010C	ND U	0.942	1.01	93	75-125
Thallium, Total	6010C	ND U	2.02	2.00	101	75-125
Vanadium, Total	6010C	0.002 BJ	0.550	0.500	110	75-125
Zinc, Total	6010C	0.012 BJ	0.519	0.500	101	75-125

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1612461
Date Collected: 11/18/16
Date Received: 11/28/16
Date Analyzed: 12/01/16 - 12/02/16

**Matrix Spike Summary
Inorganic Parameters**

Sample Name: 1611181130 400-SB-10
Lab Code: R1612461-003

Units: mg/Kg
Basis: Dry

**Matrix Spike
R1612461-003MS**

Analyte Name	Method	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Silver, Total	6010C	ND U	6.0	7.5	81	75-125
Arsenic, Total	6010C	5.4	11.2	6.0	99	75-125
Barium, Total	6010C	180	449	298	90	75-125
Beryllium, Total	6010C	0.53	7.42	7.45	92	75-125
Cadmium, Total	6010C	0.05 J	6.48	7.45	86	75-125
Chromium, Total	6010C	1.8	29.0	29.8	91	75-125
Mercury, Total	7471B	ND U	0.244	0.248	98	75-125
Nickel, Total	6010C	3.5 J	67.9	74.5	86	75-125
Lead, Total	6010C	7.5 J	73.8	74.5	89	75-125
Antimony, Total	6010C	1.0 J	62.1	74.5	82	75-125
Selenium, Total	6010C	2.1	136	151	89	75-125
Thallium, Total	6010C	ND U	233	298	78	75-125
Vanadium, Total	6010C	42.7	114	74.5	95	75-125
Zinc, Total	6010C	37.0	98.3	74.5	82	75-125

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water

Service Request:R1612461
Date Collected:11/18/16
Date Received:11/28/16
Date Analyzed:11/30/16 - 12/06/16

Matrix Spike Summary
Inorganic Parameters

Sample Name: 1611181146 400-SB-12
Lab Code: R1612461-005

Units:mg/L
Basis:NA

Matrix Spike
R1612461-005MS

Analyte Name	Method	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Silver, Total	6010C	ND U	0.051	0.050	102	75-125
Arsenic, Total	6010C	ND U	0.043	0.040	109	75-125
Barium, Total	6010C	0.153	2.30	2.00	108	75-125
Beryllium, Total	6010C	0.0002 BJ	0.0530	0.0500	106	75-125
Cadmium, Total	6010C	ND U	0.0521	0.0500	104	75-125
Chromium, Total	6010C	0.004 BJ	0.208	0.200	102	75-125
Mercury, Total	7470A	ND U	0.00099	0.00100	99	75-125
Nickel, Total	6010C	ND U	0.461	0.500	92	75-125
Lead, Total	6010C	ND U	0.520	0.500	104	75-125
Antimony, Total	6010C	ND U	0.497	0.500	99	75-125
Selenium, Total	6010C	ND U	0.933	1.01	92	75-125
Thallium, Total	6010C	ND U	2.03	2.00	102	75-125
Vanadium, Total	6010C	0.016 BJ	0.561	0.500	109	75-125
Zinc, Total	6010C	0.025	0.490	0.500	93	75-125

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1612461
Date Collected: 11/18/16
Date Received: 11/28/16
Date Analyzed: 12/01/16 - 12/05/16

**Matrix Spike Summary
Inorganic Parameters**

Sample Name: 1611181155 400-SB-12
Lab Code: R1612461-007

Units: mg/Kg
Basis: Dry

**Matrix Spike
R1612461-007MS**

Analyte Name	Method	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Silver, Total	6010C	ND U	4.1	6.3	65 *	75-125
Arsenic, Total	6010C	0.8 J	5.7	5.0	97	75-125
Barium, Total	6010C	237	538	250	120	75-125
Beryllium, Total	6010C	0.59	6.16	6.26	89	75-125
Cadmium, Total	6010C	0.71	6.05	6.26	85	75-125
Chromium, Total	6010C	12.1	38.6	25.0	106	75-125
Mercury, Total	7471B	ND U	0.217	0.219	99	75-125
Nickel, Total	6010C	8.8	62.3	62.6	85	75-125
Lead, Total	6010C	4.3 J	58.5	62.6	86	75-125
Antimony, Total	6010C	ND U	49.0	62.6	78	75-125
Selenium, Total	6010C	ND U	111	126	88	75-125
Thallium, Total	6010C	ND U	234	250	93	75-125
Vanadium, Total	6010C	59.4	123	62.6	102	75-125
Zinc, Total	6010C	41.4	93.1	62.6	83	75-125

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ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water

Service Request: R1612461
Date Collected: 11/18/16
Date Received: 11/28/16
Date Analyzed: 11/30/16 - 12/01/16

Replicate Sample Summary
Inorganic Parameters

Sample Name: 1611181121 400-SB-10
Lab Code: R1612461-001

Units: mg/L
Basis: NA

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate	Average	RPD	RPD Limit
					Sample R1612461-001DUP Result			
Antimony, Total	6010C	0.060	0.005	ND U	ND U	NC	NC	20
Arsenic, Total	6010C	0.010	0.005	ND U	ND U	NC	NC	20
Barium, Total	6010C	0.020	0.002	0.036 B	0.037	0.0367	4	20
Beryllium, Total	6010C	0.0030	0.0002	ND U	ND U	NC	NC	20
Cadmium, Total	6010C	0.0050	0.0002	ND U	ND U	NC	NC	20
Chromium, Total	6010C	0.010	0.0003	0.0003 BJ	0.0005 J	0.000400	50 *	20
Lead, Total	6010C	0.050	0.005	ND U	ND U	NC	NC	20
Mercury, Total	7470A	0.00020	0.00004	ND U	ND U	NC	NC	20
Nickel, Total	6010C	0.040	0.002	ND U	ND U	NC	NC	20
Selenium, Total	6010C	0.010	0.005	ND U	ND U	NC	NC	20
Silver, Total	6010C	0.010	0.0006	ND U	ND U	NC	NC	20
Thallium, Total	6010C	0.010	0.005	ND U	ND U	NC	NC	20
Vanadium, Total	6010C	0.050	0.00096	0.002 BJ	0.002 J	0.00215	14	20
Zinc, Total	6010C	0.020	0.007	0.012 BJ	0.011 J	0.0117	12	20

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ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1612461
Date Collected: 11/18/16
Date Received: 11/28/16
Date Analyzed: 12/01/16 - 12/02/16

Replicate Sample Summary
Inorganic Parameters

Sample Name: 1611181130 400-SB-10
Lab Code: R1612461-003

Units: mg/Kg
Basis: Dry

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate	Average	RPD	RPD Limit
					Sample R1612461-003DUP Result			
Antimony, Total	6010C	9.1	0.7	1.0 J	ND U	NC	NC	20
Arsenic, Total	6010C	1.5	0.4	5.4	5.0	5.18	7	20
Barium, Total	6010C	3.0	0.2	180	159	170	12	20
Beryllium, Total	6010C	0.46	0.03	0.53	0.53	0.534	<1	20
Cadmium, Total	6010C	0.76	0.05	0.05 J	ND U	NC	NC	20
Chromium, Total	6010C	1.5	0.2	1.8	2.0	1.92	11	20
Lead, Total	6010C	7.6	0.5	7.5 J	7.6 J	7.56	<1	20
Mercury, Total	7471B	0.051	0.005	ND U	ND U	NC	NC	35
Nickel, Total	6010C	6.1	0.2	3.5 J	3.5 J	3.50	<1	20
Selenium, Total	6010C	1.5	0.9	2.1	1.9	2.03	12	20
Silver, Total	6010C	1.5	0.7	ND U	ND U	NC	NC	20
Thallium, Total	6010C	1.5	0.8	ND U	ND U	NC	NC	20
Vanadium, Total	6010C	7.6	0.2	42.7	42.5	42.6	<1	20
Zinc, Total	6010C	3.0	0.3	37.0	32.6	34.8	13	20

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water

Service Request: R1612461
Date Collected: 11/18/16
Date Received: 11/28/16
Date Analyzed: 11/30/16 - 12/06/16

Replicate Sample Summary
Inorganic Parameters

Sample Name: 1611181146 400-SB-12
Lab Code: R1612461-005

Units: mg/L
Basis: NA

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate	Average	RPD	RPD Limit
					Sample R1612461-005DUP Result			
Antimony, Total	6010C	0.060	0.005	ND U	ND U	NC	NC	20
Arsenic, Total	6010C	0.010	0.005	ND U	ND U	NC	NC	20
Barium, Total	6010C	0.020	0.002	0.153	0.147	0.150	4	20
Beryllium, Total	6010C	0.0030	0.0002	0.0002 BJ	0.0002 J	0.000200	<1	20
Cadmium, Total	6010C	0.0050	0.0002	ND U	ND U	NC	NC	20
Chromium, Total	6010C	0.010	0.0003	0.004 BJ	0.003 J	0.00360	11	20
Lead, Total	6010C	0.050	0.005	ND U	ND U	NC	NC	20
Mercury, Total	7470A	0.00020	0.00004	ND U	ND U	NC	NC	20
Nickel, Total	6010C	0.040	0.002	ND U	ND U	NC	NC	20
Selenium, Total	6010C	0.010	0.005	ND U	ND U	NC	NC	20
Silver, Total	6010C	0.010	0.0006	ND U	ND U	NC	NC	20
Thallium, Total	6010C	0.010	0.005	ND U	ND U	NC	NC	20
Vanadium, Total	6010C	0.050	0.00096	0.016 BJ	0.015 J	0.0151	7	20
Zinc, Total	6010C	0.020	0.007	0.025	0.026	0.0252	4	20

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ALS Group USA, Corp.

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1612461
Date Collected: 11/18/16
Date Received: 11/28/16
Date Analyzed: 12/01/16 - 12/05/16

Replicate Sample Summary
Inorganic Parameters

Sample Name: 1611181155 400-SB-12
Lab Code: R1612461-007

Units: mg/Kg
Basis: Dry

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate	Average	RPD	RPD Limit
					Sample R1612461-007DUP Result			
Antimony, Total	6010C	7.5	0.5	ND U	ND U	NC	NC	20
Arsenic, Total	6010C	1.3	0.3	0.8 J	0.8 J	0.811	6	20
Barium, Total	6010C	2.5	0.2	237	262	250	10	20
Beryllium, Total	6010C	0.38	0.03	0.59	0.50	0.545	18	20
Cadmium, Total	6010C	0.63	0.04	0.71	0.68	0.695	5	20
Chromium, Total	6010C	1.3	0.2	12.1	13.5	12.8	11	20
Lead, Total	6010C	6.3	0.4	4.3 J	4.4 J	4.36	<1	20
Mercury, Total	7471B	0.041	0.004	ND U	ND U	NC	NC	35
Nickel, Total	6010C	5.0	0.2	8.8	8.6	8.73	3	20
Selenium, Total	6010C	1.3	0.8	ND U	1.0 J	NC	NC	20
Silver, Total	6010C	1.3	0.6	ND U	ND U	NC	NC	20
Thallium, Total	6010C	1.3	0.7	ND U	ND U	NC	NC	20
Vanadium, Total	6010C	6.3	0.2	59.4	62.8	61.1	6	20
Zinc, Total	6010C	2.5	0.2	41.4	39.8	40.6	4	20

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1612461
Date Analyzed: 12/01/16 - 12/02/16

Lab Control Sample Summary
Inorganic Parameters

Units:mg/Kg
Basis:Dry

Lab Control Sample
R1612461-LCS1

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Antimony, Total	6010C	41.9	50.0	84	80-120
Arsenic, Total	6010C	3.76	4.0	94	80-120
Barium, Total	6010C	197	200	98	80-120
Beryllium, Total	6010C	4.63	5.00	93	80-120
Cadmium, Total	6010C	4.58	5.00	92	80-120
Chromium, Total	6010C	19.1	20.0	96	80-120
Lead, Total	6010C	47.3	50.0	95	80-120
Mercury, Total	7471B	0.162	0.167	97	80-120
Nickel, Total	6010C	47.7	50.0	95	80-120
Selenium, Total	6010C	86.5	101	86	80-120
Silver, Total	6010C	4.43	5.0	89	80-120
Thallium, Total	6010C	174	200	87	80-120
Vanadium, Total	6010C	47.8	50.0	96	80-120
Zinc, Total	6010C	46.5	50.0	93	80-120

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water

Service Request: R1612461
Date Analyzed: 11/30/16 - 12/06/16

Lab Control Sample Summary
Inorganic Parameters

Units:mg/L
Basis:NA

Lab Control Sample
R1612461-LCS2

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Antimony, Total	6010C	0.496	0.500	99	80-120
Arsenic, Total	6010C	0.0385	0.040	96	80-120
Barium, Total	6010C	2.15	2.00	107	80-120
Beryllium, Total	6010C	0.0514	0.0500	103	80-120
Cadmium, Total	6010C	0.0529	0.0500	106	80-120
Chromium, Total	6010C	0.207	0.200	104	80-120
Lead, Total	6010C	0.531	0.500	106	80-120
Mercury, Total	7470A	0.00099	0.00100	99	80-120
Nickel, Total	6010C	0.524	0.500	105	80-120
Selenium, Total	6010C	0.907	1.01	90	80-120
Silver, Total	6010C	0.0492	0.050	98	80-120
Thallium, Total	6010C	1.87	2.00	94	80-120
Vanadium, Total	6010C	0.528	0.500	106	80-120
Zinc, Total	6010C	0.471	0.500	94	80-120



General Chemistry

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dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1612461
Date Collected: 11/18/16
Date Received: 11/28/16
Date Analyzed: 11/28/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1611181130 400-SB-10
Lab Code: R1612461-003

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>MDL</u>	<u>Sample Result</u>	<u>Duplicate Sample R1612461-003DUP Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	-	63.9	65.2	64.6	2	20

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ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1612461
Date Collected: 11/18/16
Date Received: 11/28/16
Date Analyzed: 11/28/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1611181155 400-SB-12
Lab Code: R1612461-007

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>MDL</u>	<u>Sample Result</u>	<u>Duplicate Sample R1612461-007DUP Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	-	76.1	75.4	75.8	<1	20

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December 13, 2016

Service Request No:R1612673

Mr. Tom Hall
NASA/WSTF/Navarro
Las Cruces, NM 88004

Laboratory Results for: White Sands Test Facility

Dear Mr.Hall,

Enclosed are the results of the sample(s) submitted to our laboratory December 02, 2016
For your reference, these analyses have been assigned our service request number **R1612673**.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAP standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report. The measurement uncertainty of the results included in this report is within that expected when using the prescribed method(s) for analysis of these samples, and represented by Laboratory Control Sample control limits. Any events, such as QC failures, which may add to the uncertainty are explained in the report narrative.

Please contact me if you have any questions. My extension is 7472. You may also contact me via email at Janice.Jaeger@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Janice Jaeger
Project Manager

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ALS Group USA, Corp.
dba ALS Environmental



Narrative Documents

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Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request:R1612673
Date Received:12/2/16

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables, including results of QC samples analyzed from this delivery group. Analytical procedures performed by the lab are validated in accordance with NELAC standards. Any parameters that are not included in the lab's NELAC accreditation are identified on a "Non-Certified Analytes" report in the Miscellaneous Forms Section of this report. Individual analytical results requiring further explanation are flagged with qualifiers and/or discussed below. The flags are explained in the Report Qualifiers and Definitions page in the Miscellaneous Forms section of this report.

Sample Receipt

Eight soil and water samples were received for analysis at ALS Environmental on 12/02/2016. Any discrepancies noted upon initial sample inspection are noted on the cooler receipt and preservation form included in this data package. The samples were received in good condition and consistent with the accompanying chain of custody form. Samples are refrigerated at $\leq 6^{\circ}\text{C}$ upon receipt at the lab except for aqueous samples designated for metals analyses, which are stored at room temperature.

Volatile Organic Analyses:

Method 8260c, 12/7/16: The lower control limit was exceeded for one or more analytes in the Continuing Calibration Verification (CCV). Since there were no detections of the analyte(s) in the associated field samples, the quantitation is not affected. The data quality was not significantly affected and no further corrective action was taken.

Method 8260c, 12/7/16: The upper control limit was exceeded for one or more analytes in the Continuing Calibration Verification (CCV). The field samples analyzed in this sequence did not contain the analyte(s) in question above the Method Reporting Limit (MRL). Since the exceedance equates to a potential high bias, the data quality was not significantly affected and no further corrective action was taken.

Method 8260c, 12/8/16: The lower control limit was exceeded for one or more analytes in the Continuing Calibration Verification (CCV). Since there were no detections of the analyte(s) in the associated field samples, the quantitation is not affected. The data quality was not significantly affected and no further corrective action was taken.

General Chemistry Analyses:

No significant anomalies were noted with this analysis.

Sample Receiving Notes:

Method 8260C: soil samples included in this report were received in jars and not collected using one of the EPA method 5035A low level options. In accordance with the NYSDOH technical notice of October 2012 all results or reporting limits $< 200 \text{ ug/kg}$ should be considered as estimated due to potential low bias.

Approved by  Date 12/13/2016



SAMPLE DETECTION SUMMARY

CLIENT ID: 1611301340 400-SB-10	Lab ID: R1612673-001
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Analyte	Results	Flag	MDL	PQL	Units	Method
Acetone	55		1.3	5.0	ug/L	8260C

CLIENT ID: 1611301341 400-SB-10	Lab ID: R1612673-002
--	-----------------------------

Analyte	Results	Flag	MDL	PQL	Units	Method
Acetone	50		1.3	5.0	ug/L	8260C

CLIENT ID: 1611301343 400-SB-10	Lab ID: R1612673-003
--	-----------------------------

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	73.6				Percent	ALS SOP
Acetone	6.9		3.8	6.7	ug/Kg	8260C
Carbon Disulfide	5.8	J	1.7	6.7	ug/Kg	8260C
Dichloromethane	1.3	BJ	0.77	6.7	ug/Kg	8260C
Tetrachloroethene (PCE)	1.8	J	1.2	6.7	ug/Kg	8260C

CLIENT ID: 1611301344 400-SB-10	Lab ID: R1612673-004
--	-----------------------------

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	73.9				Percent	ALS SOP
Acetone	9.5		3.9	6.8	ug/Kg	8260C
Carbon Disulfide	6.9		1.7	6.8	ug/Kg	8260C
Dichloromethane	1.5	BJ	0.78	6.8	ug/Kg	8260C
Tetrachloroethene (PCE)	2.4	J	1.2	6.8	ug/Kg	8260C

CLIENT ID: 1611301400 400-SB-12	Lab ID: R1612673-005
--	-----------------------------

Analyte	Results	Flag	MDL	PQL	Units	Method
Acetone	26		1.3	5.0	ug/L	8260C

CLIENT ID: 1611301401 400-SB-12	Lab ID: R1612673-006
--	-----------------------------

Analyte	Results	Flag	MDL	PQL	Units	Method
Acetone	25		1.3	5.0	ug/L	8260C

CLIENT ID: 1611301403 400-SB-12	Lab ID: R1612673-007
--	-----------------------------

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	74.7				Percent	ALS SOP
Acetone	160		3.8	6.6	ug/Kg	8260C
Dichloromethane	1.4	BJ	0.76	6.6	ug/Kg	8260C
Tetrachloroethene (PCE)	1.4	J	1.2	6.6	ug/Kg	8260C

CLIENT ID: 1611301404 400-SB-12	Lab ID: R1612673-008
--	-----------------------------

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	74.0				Percent	ALS SOP
Acetone	130		3.8	6.8	ug/Kg	8260C
Dichloromethane	1.4	BJ	0.78	6.8	ug/Kg	8260C



Sample Receipt Information

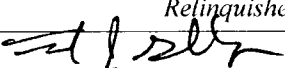
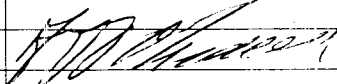
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Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request:R1612673

SAMPLE CROSS-REFERENCE

<u>SAMPLE #</u>	<u>CLIENT SAMPLE ID</u>	<u>DATE</u>	<u>TIME</u>
R1612673-001	1611301340 400-SB-10	11/30/2016	
R1612673-002	1611301341 400-SB-10	11/30/2016	
R1612673-003	1611301343 400-SB-10	11/30/2016	
R1612673-004	1611301344 400-SB-10	11/30/2016	
R1612673-005	1611301400 400-SB-12	11/30/2016	
R1612673-006	1611301401 400-SB-12	11/30/2016	
R1612673-007	1611301403 400-SB-12	11/30/2016	
R1612673-008	1611301404 400-SB-12	11/30/2016	

Laboratory PO #15EC007B		Analytical Requirements						Special Instructions
Return Address for Analytical Reports		# of Containers	Sample Type: Aqueous (A); Slurry (S)	SW-846 Method 8260B 40 ml Amber Glass Vial, Ice	SW-846 Method 8260B 4 oz Glass Jar, Ice			Please return coolers and reusable packaging materials as possible. Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Fall
Sample No.	Sample Location								Comments
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012								
Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453								
161130 1340	400-SB-10	1	A	X				
161130 1341	400-SB-10	1	A	X				
161130 1342	400-SB-10	1	A	X				Matrix Spike for 161130 1340
161130 1343	400-SB-10	1	S		X			
161130 1344	400-SB-10	1	S		X			
161130 1345	400-SB-10	1	S		X			Matrix Spike for 161130 1343
161130 1400	400-SB-12	1	A	X				
161130 1401	400-SB-12	1	A	X				
161130 1402	400-SB-12	1	A	X				Matrix Spike for 161130 1400
161130 1403	400-SB-12	1	S		X			
161130 1404	400-SB-12	1	S		X			
161130 1405	400-SB-12	1	S		X			Matrix Spike for 161130 1403
Relinquished By: 		Date/Time:	Accepted By: 			Date/Time:		
		11-30-16 (1440)				12-2-16 09:15		
						R1612673 5		





Cooler Receipt and Preservation Check Form

R1612673

5

NASA/WSTF/Navarro
White Sands Test Facility



Project/Client NASA Folder Number _____

Cooler received on 12-2-16 by: KE COURIER: ALS UPS FEDEX VELOCITY CLIENT NE 12-2-16

1	Were Custody seals on outside of cooler?	<input checked="" type="radio"/> Y <input type="radio"/> N	5a	Perchlorate samples have required headspace?	<input checked="" type="radio"/> Y <input type="radio"/> N <input checked="" type="radio"/> NA
2	Custody papers properly completed (ink, signed)?	<input checked="" type="radio"/> Y <input type="radio"/> N	5b	Did VOA vials, Alk, or Sulfide have sig* bubbles?	<input checked="" type="radio"/> Y <input type="radio"/> N <input checked="" type="radio"/> NA
3	Did all bottles arrive in good condition (unbroken)?	<input checked="" type="radio"/> Y <input type="radio"/> N *	6	Where did the bottles originate?	<u>ALS/ROC</u> <u>CLIENT</u>
4	Circle: <u>Wet Ice</u> <u>Dry Ice</u> <u>Gel packs</u> present?	<input checked="" type="radio"/> Y <input type="radio"/> N	7	Soil VOA received as: Bulk Encore 5035set	<u>NA</u>

8. Temperature Readings Date: 12-2-16 Time: 09:26 ID: IR#7 IR#8 From: Temp Blank Sample Bottle

Observed Temp (°C)	<u>0.1</u>	<u>0.4</u>						
Correction Factor (°C)	<u>0</u>	<u>4.20</u>						
Corrected Temp (°C)	<u>0.1</u>	<u>2.4</u>						
Within 0-6°C?	<input checked="" type="radio"/> Y <input type="radio"/> N	<input checked="" type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N
If <0°C, were samples frozen?	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N	<input type="radio"/> Y <input type="radio"/> N

If out of Temperature, note packing/ice condition: _____ Ice melted _____ Poorly Packed _____ Same Day Rule _____
& Client Approval to Run Samples: _____ Standing Approval _____ Client aware at drop-off _____ Client notified by: _____

All samples held in storage location: R-002 by KE on 12-2-16 at 09:31
5035 samples placed in storage location: _____ by _____ on _____ at _____

Cooler Breakdown: Date: 12-2-16 Time: 1510 by: T.S

- Were all bottle labels complete (i.e. analysis, preservation, etc.)? YES NO
- Did all bottle labels and tags agree with custody papers? YES NO
- Were correct containers used for the tests indicated? YES NO
- Were 5035 vials acceptable (no extra labels, not leaking)? YES NO
- Air Samples: Cassettes / Tubes Intact _____ Canisters Pressurized _____ Tedlar® Bags Inflated NA

Explain any discrepancies:

pH	Reagent	Yes	No	Lot Received	Exp	Sample ID	Vol. Added	Lot Added	Final pH	
>12	NaOH									Yes=All samples OK No=Samples were preserved at The lab as listed
≤2	HNO ₃									
≤2	H ₂ SO ₄									
<4	NaHSO ₄									
Residual Chlorine (-)	For CN Phenol and 522			If +, contact PM to add Na ₂ S ₂ O ₃ (CN), ascorbic (phenol).						PM OK to Adjust: _____
	Na ₂ S ₂ O ₃	-	-							
	ZnAcetate	-	-							
	HCl	**	**							

Bottle lot numbers: 042516-18015
Other Comments:

*1611301342 400-SB-10: One of 3 vials broken (Frozen)
KE, 12-2-16

CLRES	<u>BULK</u>
DO	FLDT
HPROD	HGFB
HTR	LL3541
PH	SUB
SO3	MARRS
ALS	REV

PC Secondary Review: MS 12/7/16
P:\INTRANET\QAQC\Forms Controlled\Cooler Receipt r12.doc

*significant air bubbles: VOA > 5-6 mm : WC > 1 in. diameter



Miscellaneous Forms

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

REPORT QUALIFIERS AND DEFINITIONS

<p>U Analyte was analyzed for but not detected. The sample quantitation limit has been corrected for dilution and for percent moisture, unless otherwise noted in the case narrative.</p> <p>J Estimated value due to either being a Tentatively Identified Compound (TIC) or that the concentration is between the MRL and the MDL. Concentrations are not verified within the linear range of the calibration. For DoD: concentration >40% difference between two GC columns (pesticides/Aroclors).</p> <p>B Analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.</p> <p>E Inorganics- Concentration is estimated due to the serial dilution was outside control limits.</p> <p>E Organics- Concentration has exceeded the calibration range for that specific analysis.</p> <p>D Concentration is a result of a dilution, typically a secondary analysis of the sample due to exceeding the calibration range or that a surrogate has been diluted out of the sample and cannot be assessed.</p> <p>* Indicates that a quality control parameter has exceeded laboratory limits. Under the “Notes” column of the Form I, this qualifier denotes analysis was performed out of Holding Time.</p> <p>H Analysis was performed out of hold time for tests that have an “immediate” hold time criteria.</p> <p># Spike was diluted out.</p>	<p>+ Correlation coefficient for MSA is <0.995.</p> <p>N Inorganics- Matrix spike recovery was outside laboratory limits.</p> <p>N Organics- Presumptive evidence of a compound (reported as a TIC) based on the MS library search.</p> <p>S Concentration has been determined using Method of Standard Additions (MSA).</p> <p>W Post-Digestion Spike recovery is outside control limits and the sample absorbance is <50% of the spike absorbance.</p> <p>P Concentration >40% (25% for CLP) difference between the two GC columns.</p> <p>C Confirmed by GC/MS</p> <p>Q DoD reports: indicates a pesticide/Aroclor is not confirmed ($\geq 100\%$ Difference between two GC columns).</p> <p>X See Case Narrative for discussion.</p> <p>MRL Method Reporting Limit. Also known as: LOQ Limit of Quantitation (LOQ) The lowest concentration at which the method analyte may be reliably quantified under the method conditions.</p> <p>MDL Method Detection Limit. A statistical value derived from a study designed to provide the lowest concentration that will be detected 99% of the time. Values between the MDL and MRL are estimated (see J qualifier).</p> <p>LOD Limit of Detection. A value at or above the MDL which has been verified to be detectable.</p> <p>ND Non-Detect. Analyte was not detected at the concentration listed. Same as U qualifier.</p>
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Rochester Lab ID # for State Certifications¹

Connecticut ID # PH0556	Maine ID #NY0032	New Hampshire ID #
Delaware Accredited	Nebraska Accredited	294100 A/B
DoD ELAP #65817	New Jersey ID # NY004	Pennsylvania ID# 68-786
Florida ID # E87674	New York ID # 10145	Rhode Island ID # 158
Illinois ID #200047	North Carolina #676	Virginia #460167

¹ Analyses were performed according to our laboratory’s NELAP-approved quality assurance program and any applicable state or agency requirements. The test results meet requirements of the current NELAP/TNI standards or state or agency requirements, where applicable, except as noted in the case narrative. Since not all analyte/method/matrix combinations are offered for state/NELAC accreditation, this report may contain results which are not accredited. For a specific list of accredited analytes, contact the laboratory or go to <http://www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads/North-America-Downloads>

ALS Laboratory Group

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

ALS Group USA, Corp.
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Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1612673

Sample Name: 1611301340 400-SB-10
Lab Code: R1612673-001
Sample Matrix: Water

Date Collected: 11/30/16
Date Received: 12/2/16

Analysis Method
8260C

Extracted/Digested By

Analyzed By
FNAEGLER

Sample Name: 1611301341 400-SB-10
Lab Code: R1612673-002
Sample Matrix: Water

Date Collected: 11/30/16
Date Received: 12/2/16

Analysis Method
8260C

Extracted/Digested By

Analyzed By
FNAEGLER

Sample Name: 1611301343 400-SB-10
Lab Code: R1612673-003
Sample Matrix: Soil

Date Collected: 11/30/16
Date Received: 12/2/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1611301344 400-SB-10
Lab Code: R1612673-004
Sample Matrix: Soil

Date Collected: 11/30/16
Date Received: 12/2/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1612673

Sample Name: 1611301400 400-SB-12
Lab Code: R1612673-005
Sample Matrix: Water

Date Collected: 11/30/16
Date Received: 12/2/16

Analysis Method
8260C

Extracted/Digested By

Analyzed By
FNAEGLER

Sample Name: 1611301401 400-SB-12
Lab Code: R1612673-006
Sample Matrix: Water

Date Collected: 11/30/16
Date Received: 12/2/16

Analysis Method
8260C

Extracted/Digested By

Analyzed By
FNAEGLER

Sample Name: 1611301403 400-SB-12
Lab Code: R1612673-007
Sample Matrix: Soil

Date Collected: 11/30/16
Date Received: 12/2/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1611301404 400-SB-12
Lab Code: R1612673-008
Sample Matrix: Soil

Date Collected: 11/30/16
Date Received: 12/2/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG



INORGANIC PREPARATION METHODS

The preparation methods associated with this report are found in these tables unless discussed in the case narrative.

Water/Liquid Matrix

Analytical Method	Preparation Method
200.7	200.2
200.8	200.2
6010C	3005A/3010A
6020A	ILM05.3
9014 Cyanide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Acid Soluble	9030B
9056A Bomb (Halogens)	5050A
9066 Manual Distillation	9065
SM 4500-CN-E Residual Cyanide	SM 4500-CN-G
SM 4500-CN-E WAD Cyanide	SM 4500-CN-I

Solid/Soil/Non-Aqueous Matrix

Analytical Method	Preparation Method
6010C	3050B
6020A	3050B
6010C TCLP (1311) extract	3005A/3010A
6010 SPLP (1312) extract	3005A/3010A
7196A	3060A
7199	3060A
9056A Halogens/Halides	5050
300.0 Anions/ 350.1/ 353.2/ SM 2320B/ SM 5210B/ 9056A Anions	DI extraction

For analytical methods not listed, the preparation method is the same as the analytical method reference.



Sample Results

ALS Environmental—Rochester Laboratory
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Volatile Organic Compounds by GC/MS

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www.alsglobal.com

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16 09:15

Sample Name: 1611301343 400-SB-10
Lab Code: R1612673-003

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	6.7	1.2	.99	12/08/16 12:57	
1,1,1-Trichloroethane (TCA)	ND U	6.7	0.99	.99	12/08/16 12:57	
1,1,2,2-Tetrachloroethane	ND U	6.7	1.1	.99	12/08/16 12:57	
1,1,2-Trichloroethane	ND U	6.7	0.99	.99	12/08/16 12:57	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	6.7	1.7	.99	12/08/16 12:57	
1,1-Dichloroethene (1,1-DCE)	ND U	6.7	1.8	.99	12/08/16 12:57	
1,2,3-Trichloropropane	ND U	6.7	1.8	.99	12/08/16 12:57	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	6.7	2.6	.99	12/08/16 12:57	
1,2-Dibromoethane	ND U	6.7	1.7	.99	12/08/16 12:57	
1,2-Dichlorobenzene	ND U	6.7	0.83	.99	12/08/16 12:57	
1,2-Dichloroethane	ND U	6.7	0.83	.99	12/08/16 12:57	
1,2-Dichloropropane	ND U	6.7	1.4	.99	12/08/16 12:57	
1,3-Dichlorobenzene	ND U	6.7	0.85	.99	12/08/16 12:57	
1,4-Dioxane	ND U	130	26	.99	12/08/16 12:57	
2-Butanone (MEK)	ND U	6.7	3.1	.99	12/08/16 12:57	
2-Chloro-1,3-butadiene	ND U	6.7	2.1	.99	12/08/16 12:57	
2-Chloroethyl Vinyl Ether	ND U	6.7	2.4	.99	12/08/16 12:57	
Isobutyl Alcohol	ND U	130	31	.99	12/08/16 12:57	
Allyl Chloride	ND U	6.7	2.3	.99	12/08/16 12:57	
4-Methyl-2-pentanone	ND U	6.7	1.4	.99	12/08/16 12:57	
Acetone	6.9	6.7	3.8	.99	12/08/16 12:57	
Acetonitrile	ND U	34	23	.99	12/08/16 12:57	
Acrolein	ND U	34	4.8	.99	12/08/16 12:57	
Acrylonitrile	ND U	34	8.7	.99	12/08/16 12:57	
Benzene	ND U	6.7	0.40	.99	12/08/16 12:57	
Bromodichloromethane	ND U	6.7	0.83	.99	12/08/16 12:57	
Bromoform	ND U	6.7	1.3	.99	12/08/16 12:57	
Bromomethane	ND U	6.7	1.9	.99	12/08/16 12:57	
Carbon Disulfide	5.8 J	6.7	1.7	.99	12/08/16 12:57	
Carbon Tetrachloride	ND U	6.7	1.3	.99	12/08/16 12:57	
Chlorobenzene	ND U	6.7	0.40	.99	12/08/16 12:57	
Chloroethane	ND U	6.7	3.9	.99	12/08/16 12:57	
Chloroform	ND U	6.7	1.7	.99	12/08/16 12:57	
Chloromethane	ND U	6.7	0.54	.99	12/08/16 12:57	
Dibromochloromethane	ND U	6.7	0.99	.99	12/08/16 12:57	
Dibromomethane	ND U	6.7	0.85	.99	12/08/16 12:57	
Dichlorodifluoromethane (CFC 12)	ND U	6.7	2.6	.99	12/08/16 12:57	
Dichloromethane	1.3 BJ	6.7	0.77	.99	12/08/16 12:57	
Ethyl Methacrylate	ND U	6.7	1.1	.99	12/08/16 12:57	
Ethylbenzene	ND U	6.7	0.31	.99	12/08/16 12:57	
Iodomethane	ND U	13	1.6	.99	12/08/16 12:57	
Methacrylonitrile	ND U	6.7	2.1	.99	12/08/16 12:57	
Methyl Methacrylate	ND U	6.7	0.99	.99	12/08/16 12:57	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611301343 400-SB-10
Lab Code: R1612673-003

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16 09:15
Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	6.7	0.69	.99	12/08/16 12:57	
Propionitrile	ND U	34	8.8	.99	12/08/16 12:57	
Tetrachloroethene (PCE)	1.8 J	6.7	1.2	.99	12/08/16 12:57	
Toluene	ND U	6.7	1.4	.99	12/08/16 12:57	
Trichloroethene (TCE)	ND U	6.7	1.4	.99	12/08/16 12:57	
Trichlorofluoromethane (CFC 11)	ND U	6.7	0.89	.99	12/08/16 12:57	
Vinyl Chloride	ND U	6.7	2.5	.99	12/08/16 12:57	
cis-1,3-Dichloropropene	ND U	6.7	1.3	.99	12/08/16 12:57	
m,p-Xylenes	ND U	13	1.5	.99	12/08/16 12:57	
o-Xylene	ND U	6.7	0.65	.99	12/08/16 12:57	
trans-1,2-Dichloroethene	ND U	6.7	1.2	.99	12/08/16 12:57	
trans-1,3-Dichloropropene	ND U	6.7	0.27	.99	12/08/16 12:57	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	84	51 - 136	12/08/16 12:57	
Dibromofluoromethane	98	63 - 138	12/08/16 12:57	
Toluene-d8	96	66 - 138	12/08/16 12:57	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000104-76-7	1-Hexanol, 2-ethyl-	13.57	80	JN

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16 09:15

Sample Name: 1611301344 400-SB-10
Lab Code: R1612673-004

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	6.8	1.2	1	12/08/16 13:22	
1,1,1-Trichloroethane (TCA)	ND U	6.8	0.99	1	12/08/16 13:22	
1,1,2,2-Tetrachloroethane	ND U	6.8	1.1	1	12/08/16 13:22	
1,1,2-Trichloroethane	ND U	6.8	0.99	1	12/08/16 13:22	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	6.8	1.7	1	12/08/16 13:22	
1,1-Dichloroethene (1,1-DCE)	ND U	6.8	1.8	1	12/08/16 13:22	
1,2,3-Trichloropropane	ND U	6.8	1.8	1	12/08/16 13:22	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	6.8	2.6	1	12/08/16 13:22	
1,2-Dibromoethane	ND U	6.8	1.7	1	12/08/16 13:22	
1,2-Dichlorobenzene	ND U	6.8	0.83	1	12/08/16 13:22	
1,2-Dichloroethane	ND U	6.8	0.83	1	12/08/16 13:22	
1,2-Dichloropropane	ND U	6.8	1.4	1	12/08/16 13:22	
1,3-Dichlorobenzene	ND U	6.8	0.86	1	12/08/16 13:22	
1,4-Dioxane	ND U	140	26	1	12/08/16 13:22	
2-Butanone (MEK)	ND U	6.8	3.1	1	12/08/16 13:22	
2-Chloro-1,3-butadiene	ND U	6.8	2.1	1	12/08/16 13:22	
2-Chloroethyl Vinyl Ether	ND U	6.8	2.4	1	12/08/16 13:22	
Isobutyl Alcohol	ND U	140	31	1	12/08/16 13:22	
Allyl Chloride	ND U	6.8	2.3	1	12/08/16 13:22	
4-Methyl-2-pentanone	ND U	6.8	1.4	1	12/08/16 13:22	
Acetone	9.5	6.8	3.9	1	12/08/16 13:22	
Acetonitrile	ND U	34	23	1	12/08/16 13:22	
Acrolein	ND U	34	4.8	1	12/08/16 13:22	
Acrylonitrile	ND U	34	8.8	1	12/08/16 13:22	
Benzene	ND U	6.8	0.40	1	12/08/16 13:22	
Bromodichloromethane	ND U	6.8	0.83	1	12/08/16 13:22	
Bromoform	ND U	6.8	1.3	1	12/08/16 13:22	
Bromomethane	ND U	6.8	1.9	1	12/08/16 13:22	
Carbon Disulfide	6.9	6.8	1.7	1	12/08/16 13:22	
Carbon Tetrachloride	ND U	6.8	1.3	1	12/08/16 13:22	
Chlorobenzene	ND U	6.8	0.40	1	12/08/16 13:22	
Chloroethane	ND U	6.8	3.9	1	12/08/16 13:22	
Chloroform	ND U	6.8	1.8	1	12/08/16 13:22	
Chloromethane	ND U	6.8	0.55	1	12/08/16 13:22	
Dibromochloromethane	ND U	6.8	0.99	1	12/08/16 13:22	
Dibromomethane	ND U	6.8	0.86	1	12/08/16 13:22	
Dichlorodifluoromethane (CFC 12)	ND U	6.8	2.6	1	12/08/16 13:22	
Dichloromethane	1.5 BJ	6.8	0.78	1	12/08/16 13:22	
Ethyl Methacrylate	ND U	6.8	1.1	1	12/08/16 13:22	
Ethylbenzene	ND U	6.8	0.32	1	12/08/16 13:22	
Iodomethane	ND U	14	1.6	1	12/08/16 13:22	
Methacrylonitrile	ND U	6.8	2.1	1	12/08/16 13:22	
Methyl Methacrylate	ND U	6.8	0.99	1	12/08/16 13:22	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611301344 400-SB-10
Lab Code: R1612673-004

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16 09:15

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	6.8	0.70	1	12/08/16 13:22	
Propionitrile	ND U	34	8.8	1	12/08/16 13:22	
Tetrachloroethene (PCE)	2.4 J	6.8	1.2	1	12/08/16 13:22	
Toluene	ND U	6.8	1.4	1	12/08/16 13:22	
Trichloroethene (TCE)	ND U	6.8	1.4	1	12/08/16 13:22	
Trichlorofluoromethane (CFC 11)	ND U	6.8	0.90	1	12/08/16 13:22	
Vinyl Chloride	ND U	6.8	2.5	1	12/08/16 13:22	
cis-1,3-Dichloropropene	ND U	6.8	1.3	1	12/08/16 13:22	
m,p-Xylenes	ND U	14	1.5	1	12/08/16 13:22	
o-Xylene	ND U	6.8	0.65	1	12/08/16 13:22	
trans-1,2-Dichloroethene	ND U	6.8	1.2	1	12/08/16 13:22	
trans-1,3-Dichloropropene	ND U	6.8	0.28	1	12/08/16 13:22	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	90	51 - 136	12/08/16 13:22	
Dibromofluoromethane	92	63 - 138	12/08/16 13:22	
Toluene-d8	97	66 - 138	12/08/16 13:22	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000104-76-7	1-Hexanol, 2-ethyl-	13.57	110	JN

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16 09:15

Sample Name: 1611301403 400-SB-12
Lab Code: R1612673-007

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	6.6	1.1	.99	12/08/16 13:46	
1,1,1-Trichloroethane (TCA)	ND U	6.6	0.97	.99	12/08/16 13:46	
1,1,2,2-Tetrachloroethane	ND U	6.6	1.1	.99	12/08/16 13:46	
1,1,2-Trichloroethane	ND U	6.6	0.97	.99	12/08/16 13:46	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	6.6	1.7	.99	12/08/16 13:46	
1,1-Dichloroethene (1,1-DCE)	ND U	6.6	1.7	.99	12/08/16 13:46	
1,2,3-Trichloropropane	ND U	6.6	1.8	.99	12/08/16 13:46	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	6.6	2.5	.99	12/08/16 13:46	
1,2-Dibromoethane	ND U	6.6	1.7	.99	12/08/16 13:46	
1,2-Dichlorobenzene	ND U	6.6	0.81	.99	12/08/16 13:46	
1,2-Dichloroethane	ND U	6.6	0.81	.99	12/08/16 13:46	
1,2-Dichloropropane	ND U	6.6	1.3	.99	12/08/16 13:46	
1,3-Dichlorobenzene	ND U	6.6	0.84	.99	12/08/16 13:46	
1,4-Dioxane	ND U	130	26	.99	12/08/16 13:46	
2-Butanone (MEK)	ND U	6.6	3.1	.99	12/08/16 13:46	
2-Chloro-1,3-butadiene	ND U	6.6	2.1	.99	12/08/16 13:46	
2-Chloroethyl Vinyl Ether	ND U	6.6	2.3	.99	12/08/16 13:46	
Isobutyl Alcohol	ND U	130	31	.99	12/08/16 13:46	
Allyl Chloride	ND U	6.6	2.3	.99	12/08/16 13:46	
4-Methyl-2-pentanone	ND U	6.6	1.3	.99	12/08/16 13:46	
Acetone	160	6.6	3.8	.99	12/08/16 13:46	
Acetonitrile	ND U	33	23	.99	12/08/16 13:46	
Acrolein	ND U	33	4.7	.99	12/08/16 13:46	
Acrylonitrile	ND U	33	8.6	.99	12/08/16 13:46	
Benzene	ND U	6.6	0.39	.99	12/08/16 13:46	
Bromodichloromethane	ND U	6.6	0.81	.99	12/08/16 13:46	
Bromoform	ND U	6.6	1.3	.99	12/08/16 13:46	
Bromomethane	ND U	6.6	1.9	.99	12/08/16 13:46	
Carbon Disulfide	ND U	6.6	1.7	.99	12/08/16 13:46	
Carbon Tetrachloride	ND U	6.6	1.3	.99	12/08/16 13:46	
Chlorobenzene	ND U	6.6	0.39	.99	12/08/16 13:46	
Chloroethane	ND U	6.6	3.9	.99	12/08/16 13:46	
Chloroform	ND U	6.6	1.7	.99	12/08/16 13:46	
Chloromethane	ND U	6.6	0.54	.99	12/08/16 13:46	
Dibromochloromethane	ND U	6.6	0.97	.99	12/08/16 13:46	
Dibromomethane	ND U	6.6	0.84	.99	12/08/16 13:46	
Dichlorodifluoromethane (CFC 12)	ND U	6.6	2.6	.99	12/08/16 13:46	
Dichloromethane	1.4 BJ	6.6	0.76	.99	12/08/16 13:46	
Ethyl Methacrylate	ND U	6.6	1.0	.99	12/08/16 13:46	
Ethylbenzene	ND U	6.6	0.31	.99	12/08/16 13:46	
Iodomethane	ND U	13	1.5	.99	12/08/16 13:46	
Methacrylonitrile	ND U	6.6	2.1	.99	12/08/16 13:46	
Methyl Methacrylate	ND U	6.6	0.97	.99	12/08/16 13:46	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611301403 400-SB-12
Lab Code: R1612673-007

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16 09:15

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	6.6	0.68	.99	12/08/16 13:46	
Propionitrile	ND U	33	8.7	.99	12/08/16 13:46	
Tetrachloroethene (PCE)	1.4 J	6.6	1.2	.99	12/08/16 13:46	
Toluene	ND U	6.6	1.4	.99	12/08/16 13:46	
Trichloroethene (TCE)	ND U	6.6	1.4	.99	12/08/16 13:46	
Trichlorofluoromethane (CFC 11)	ND U	6.6	0.88	.99	12/08/16 13:46	
Vinyl Chloride	ND U	6.6	2.5	.99	12/08/16 13:46	
cis-1,3-Dichloropropene	ND U	6.6	1.2	.99	12/08/16 13:46	
m,p-Xylenes	ND U	13	1.5	.99	12/08/16 13:46	
o-Xylene	ND U	6.6	0.64	.99	12/08/16 13:46	
trans-1,2-Dichloroethene	ND U	6.6	1.2	.99	12/08/16 13:46	
trans-1,3-Dichloropropene	ND U	6.6	0.27	.99	12/08/16 13:46	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	88	51 - 136	12/08/16 13:46	
Dibromofluoromethane	97	63 - 138	12/08/16 13:46	
Toluene-d8	96	66 - 138	12/08/16 13:46	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000104-76-7	1-Hexanol, 2-ethyl-	13.57	21	JN

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16 09:15

Sample Name: 1611301404 400-SB-12
Lab Code: R1612673-008

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	6.8	1.2	1	12/08/16 14:10	
1,1,1-Trichloroethane (TCA)	ND U	6.8	0.99	1	12/08/16 14:10	
1,1,2,2-Tetrachloroethane	ND U	6.8	1.1	1	12/08/16 14:10	
1,1,2-Trichloroethane	ND U	6.8	0.99	1	12/08/16 14:10	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	6.8	1.7	1	12/08/16 14:10	
1,1-Dichloroethene (1,1-DCE)	ND U	6.8	1.8	1	12/08/16 14:10	
1,2,3-Trichloropropane	ND U	6.8	1.8	1	12/08/16 14:10	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	6.8	2.6	1	12/08/16 14:10	
1,2-Dibromoethane	ND U	6.8	1.7	1	12/08/16 14:10	
1,2-Dichlorobenzene	ND U	6.8	0.83	1	12/08/16 14:10	
1,2-Dichloroethane	ND U	6.8	0.83	1	12/08/16 14:10	
1,2-Dichloropropane	ND U	6.8	1.4	1	12/08/16 14:10	
1,3-Dichlorobenzene	ND U	6.8	0.86	1	12/08/16 14:10	
1,4-Dioxane	ND U	140	26	1	12/08/16 14:10	
2-Butanone (MEK)	ND U	6.8	3.1	1	12/08/16 14:10	
2-Chloro-1,3-butadiene	ND U	6.8	2.1	1	12/08/16 14:10	
2-Chloroethyl Vinyl Ether	ND U	6.8	2.4	1	12/08/16 14:10	
Isobutyl Alcohol	ND U	140	31	1	12/08/16 14:10	
Allyl Chloride	ND U	6.8	2.3	1	12/08/16 14:10	
4-Methyl-2-pentanone	ND U	6.8	1.4	1	12/08/16 14:10	
Acetone	130	6.8	3.8	1	12/08/16 14:10	
Acetonitrile	ND U	34	23	1	12/08/16 14:10	
Acrolein	ND U	34	4.8	1	12/08/16 14:10	
Acrylonitrile	ND U	34	8.8	1	12/08/16 14:10	
Benzene	ND U	6.8	0.40	1	12/08/16 14:10	
Bromodichloromethane	ND U	6.8	0.83	1	12/08/16 14:10	
Bromoform	ND U	6.8	1.3	1	12/08/16 14:10	
Bromomethane	ND U	6.8	1.9	1	12/08/16 14:10	
Carbon Disulfide	ND U	6.8	1.7	1	12/08/16 14:10	
Carbon Tetrachloride	ND U	6.8	1.3	1	12/08/16 14:10	
Chlorobenzene	ND U	6.8	0.40	1	12/08/16 14:10	
Chloroethane	ND U	6.8	3.9	1	12/08/16 14:10	
Chloroform	ND U	6.8	1.8	1	12/08/16 14:10	
Chloromethane	ND U	6.8	0.55	1	12/08/16 14:10	
Dibromochloromethane	ND U	6.8	0.99	1	12/08/16 14:10	
Dibromomethane	ND U	6.8	0.86	1	12/08/16 14:10	
Dichlorodifluoromethane (CFC 12)	ND U	6.8	2.6	1	12/08/16 14:10	
Dichloromethane	1.4 BJ	6.8	0.78	1	12/08/16 14:10	
Ethyl Methacrylate	ND U	6.8	1.1	1	12/08/16 14:10	
Ethylbenzene	ND U	6.8	0.32	1	12/08/16 14:10	
Iodomethane	ND U	14	1.6	1	12/08/16 14:10	
Methacrylonitrile	ND U	6.8	2.1	1	12/08/16 14:10	
Methyl Methacrylate	ND U	6.8	0.99	1	12/08/16 14:10	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611301404 400-SB-12
Lab Code: R1612673-008

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16 09:15

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	6.8	0.69	1	12/08/16 14:10	
Propionitrile	ND U	34	8.8	1	12/08/16 14:10	
Tetrachloroethene (PCE)	ND U	6.8	1.2	1	12/08/16 14:10	
Toluene	ND U	6.8	1.4	1	12/08/16 14:10	
Trichloroethene (TCE)	ND U	6.8	1.4	1	12/08/16 14:10	
Trichlorofluoromethane (CFC 11)	ND U	6.8	0.90	1	12/08/16 14:10	
Vinyl Chloride	ND U	6.8	2.5	1	12/08/16 14:10	
cis-1,3-Dichloropropene	ND U	6.8	1.3	1	12/08/16 14:10	
m,p-Xylenes	ND U	14	1.5	1	12/08/16 14:10	
o-Xylene	ND U	6.8	0.65	1	12/08/16 14:10	
trans-1,2-Dichloroethene	ND U	6.8	1.2	1	12/08/16 14:10	
trans-1,3-Dichloropropene	ND U	6.8	0.28	1	12/08/16 14:10	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	88	51 - 136	12/08/16 14:10	
Dibromofluoromethane	96	63 - 138	12/08/16 14:10	
Toluene-d8	97	66 - 138	12/08/16 14:10	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000104-76-7	1-Hexanol, 2-ethyl-	13.57	14	JN

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water
Sample Name: 1611301340 400-SB-10
Lab Code: R1612673-001

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16 09:15

Units: ug/L
Basis: NA

Volatile Organic Compounds by GC/MS

Analysis Method: 8260C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	1.0	0.22	1	12/07/16 14:55	
1,1,1-Trichloroethane (TCA)	ND U	1.0	0.36	1	12/07/16 14:55	
1,1,2,2-Tetrachloroethane	ND U	1.0	0.25	1	12/07/16 14:55	
1,1,2-Trichloroethane	ND U	1.0	0.34	1	12/07/16 14:55	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	1.0	0.31	1	12/07/16 14:55	
1,1-Dichloroethene (1,1-DCE)	ND U	1.0	0.57	1	12/07/16 14:55	
1,2,3-Trichloropropane	ND U	1.0	0.70	1	12/07/16 14:55	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	2.0	0.74	1	12/07/16 14:55	
1,2-Dibromoethane	ND U	1.0	0.24	1	12/07/16 14:55	
1,2-Dichlorobenzene	ND U	1.0	0.21	1	12/07/16 14:55	
1,2-Dichloroethane	ND U	1.0	0.36	1	12/07/16 14:55	
1,2-Dichloropropane	ND U	1.0	0.20	1	12/07/16 14:55	
1,3-Dichlorobenzene	ND U	1.0	0.20	1	12/07/16 14:55	
1,4-Dioxane	ND U	40	20	1	12/07/16 14:55	
2-Butanone (MEK)	ND U	5.0	0.81	1	12/07/16 14:55	
2-Chloro-1,3-butadiene	ND U	1.0	0.27	1	12/07/16 14:55	
2-Chloroethyl Vinyl Ether	ND U	1.0	0.44	1	12/07/16 14:55	
Isobutyl Alcohol	ND U	40	11	1	12/07/16 14:55	
Allyl Chloride	ND U	1.0	0.26	1	12/07/16 14:55	
4-Methyl-2-pentanone	ND U	5.0	0.67	1	12/07/16 14:55	
Acetone	55	5.0	1.3	1	12/07/16 14:55	
Acetonitrile	ND U	10	4.7	1	12/07/16 14:55	
Acrolein	ND U	10	3.0	1	12/07/16 14:55	
Acrylonitrile	ND U	10	1.4	1	12/07/16 14:55	
Benzene	ND U	1.0	0.20	1	12/07/16 14:55	
Bromodichloromethane	ND U	1.0	0.32	1	12/07/16 14:55	
Bromoform	ND U	1.0	0.42	1	12/07/16 14:55	
Bromomethane	ND U	1.0	0.29	1	12/07/16 14:55	
Carbon Disulfide	ND U	1.0	0.22	1	12/07/16 14:55	
Carbon Tetrachloride	ND U	1.0	0.45	1	12/07/16 14:55	
Chlorobenzene	ND U	1.0	0.29	1	12/07/16 14:55	
Chloroethane	ND U	1.0	0.24	1	12/07/16 14:55	
Chloroform	ND U	1.0	0.25	1	12/07/16 14:55	
Chloromethane	ND U	1.0	0.21	1	12/07/16 14:55	
Dibromochloromethane	ND U	1.0	0.31	1	12/07/16 14:55	
Dibromomethane	ND U	1.0	0.32	1	12/07/16 14:55	
Dichlorodifluoromethane (CFC 12)	ND U	1.0	0.46	1	12/07/16 14:55	
Dichloromethane	ND U	1.0	0.60	1	12/07/16 14:55	
Ethyl Methacrylate	ND U	2.0	0.44	1	12/07/16 14:55	
Ethylbenzene	ND U	1.0	0.20	1	12/07/16 14:55	
Iodomethane	ND U	2.0	0.98	1	12/07/16 14:55	
Methacrylonitrile	ND U	2.0	0.50	1	12/07/16 14:55	
Methyl Methacrylate	ND U	2.0	0.62	1	12/07/16 14:55	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water
Sample Name: 1611301340 400-SB-10
Lab Code: R1612673-001

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16 09:15
Units: ug/L
Basis: NA

Volatile Organic Compounds by GC/MS

Analysis Method: 8260C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	1.0	0.20	1	12/07/16 14:55	
Propionitrile	ND U	5.0	3.1	1	12/07/16 14:55	
Tetrachloroethene (PCE)	ND U	1.0	0.30	1	12/07/16 14:55	
Toluene	ND U	1.0	0.20	1	12/07/16 14:55	
Trichloroethene (TCE)	ND U	1.0	0.22	1	12/07/16 14:55	
Trichlorofluoromethane (CFC 11)	ND U	1.0	0.20	1	12/07/16 14:55	
Vinyl Chloride	ND U	1.0	0.32	1	12/07/16 14:55	
cis-1,3-Dichloropropene	ND U	1.0	0.24	1	12/07/16 14:55	
m,p-Xylenes	ND U	2.0	0.33	1	12/07/16 14:55	
o-Xylene	ND U	1.0	0.20	1	12/07/16 14:55	
trans-1,2-Dichloroethene	ND U	1.0	0.33	1	12/07/16 14:55	
trans-1,3-Dichloropropene	ND U	1.0	0.20	1	12/07/16 14:55	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	96	85 - 122	12/07/16 14:55	
Dibromofluoromethane	93	89 - 119	12/07/16 14:55	
Toluene-d8	101	87 - 121	12/07/16 14:55	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/L	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water
Sample Name: 1611301341 400-SB-10
Lab Code: R1612673-002

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16 09:15

Units: ug/L
Basis: NA

Volatile Organic Compounds by GC/MS

Analysis Method: 8260C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	1.0	0.22	1	12/07/16 15:20	
1,1,1-Trichloroethane (TCA)	ND U	1.0	0.36	1	12/07/16 15:20	
1,1,2,2-Tetrachloroethane	ND U	1.0	0.25	1	12/07/16 15:20	
1,1,2-Trichloroethane	ND U	1.0	0.34	1	12/07/16 15:20	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	1.0	0.31	1	12/07/16 15:20	
1,1-Dichloroethene (1,1-DCE)	ND U	1.0	0.57	1	12/07/16 15:20	
1,2,3-Trichloropropane	ND U	1.0	0.70	1	12/07/16 15:20	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	2.0	0.74	1	12/07/16 15:20	
1,2-Dibromoethane	ND U	1.0	0.24	1	12/07/16 15:20	
1,2-Dichlorobenzene	ND U	1.0	0.21	1	12/07/16 15:20	
1,2-Dichloroethane	ND U	1.0	0.36	1	12/07/16 15:20	
1,2-Dichloropropane	ND U	1.0	0.20	1	12/07/16 15:20	
1,3-Dichlorobenzene	ND U	1.0	0.20	1	12/07/16 15:20	
1,4-Dioxane	ND U	40	20	1	12/07/16 15:20	
2-Butanone (MEK)	ND U	5.0	0.81	1	12/07/16 15:20	
2-Chloro-1,3-butadiene	ND U	1.0	0.27	1	12/07/16 15:20	
2-Chloroethyl Vinyl Ether	ND U	1.0	0.44	1	12/07/16 15:20	
Isobutyl Alcohol	ND U	40	11	1	12/07/16 15:20	
Allyl Chloride	ND U	1.0	0.26	1	12/07/16 15:20	
4-Methyl-2-pentanone	ND U	5.0	0.67	1	12/07/16 15:20	
Acetone	50	5.0	1.3	1	12/07/16 15:20	
Acetonitrile	ND U	10	4.7	1	12/07/16 15:20	
Acrolein	ND U	10	3.0	1	12/07/16 15:20	
Acrylonitrile	ND U	10	1.4	1	12/07/16 15:20	
Benzene	ND U	1.0	0.20	1	12/07/16 15:20	
Bromodichloromethane	ND U	1.0	0.32	1	12/07/16 15:20	
Bromoform	ND U	1.0	0.42	1	12/07/16 15:20	
Bromomethane	ND U	1.0	0.29	1	12/07/16 15:20	
Carbon Disulfide	ND U	1.0	0.22	1	12/07/16 15:20	
Carbon Tetrachloride	ND U	1.0	0.45	1	12/07/16 15:20	
Chlorobenzene	ND U	1.0	0.29	1	12/07/16 15:20	
Chloroethane	ND U	1.0	0.24	1	12/07/16 15:20	
Chloroform	ND U	1.0	0.25	1	12/07/16 15:20	
Chloromethane	ND U	1.0	0.21	1	12/07/16 15:20	
Dibromochloromethane	ND U	1.0	0.31	1	12/07/16 15:20	
Dibromomethane	ND U	1.0	0.32	1	12/07/16 15:20	
Dichlorodifluoromethane (CFC 12)	ND U	1.0	0.46	1	12/07/16 15:20	
Dichloromethane	ND U	1.0	0.60	1	12/07/16 15:20	
Ethyl Methacrylate	ND U	2.0	0.44	1	12/07/16 15:20	
Ethylbenzene	ND U	1.0	0.20	1	12/07/16 15:20	
Iodomethane	ND U	2.0	0.98	1	12/07/16 15:20	
Methacrylonitrile	ND U	2.0	0.50	1	12/07/16 15:20	
Methyl Methacrylate	ND U	2.0	0.62	1	12/07/16 15:20	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water
Sample Name: 1611301341 400-SB-10
Lab Code: R1612673-002

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16 09:15
Units: ug/L
Basis: NA

Volatile Organic Compounds by GC/MS

Analysis Method: 8260C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	1.0	0.20	1	12/07/16 15:20	
Propionitrile	ND U	5.0	3.1	1	12/07/16 15:20	
Tetrachloroethene (PCE)	ND U	1.0	0.30	1	12/07/16 15:20	
Toluene	ND U	1.0	0.20	1	12/07/16 15:20	
Trichloroethene (TCE)	ND U	1.0	0.22	1	12/07/16 15:20	
Trichlorofluoromethane (CFC 11)	ND U	1.0	0.20	1	12/07/16 15:20	
Vinyl Chloride	ND U	1.0	0.32	1	12/07/16 15:20	
cis-1,3-Dichloropropene	ND U	1.0	0.24	1	12/07/16 15:20	
m,p-Xylenes	ND U	2.0	0.33	1	12/07/16 15:20	
o-Xylene	ND U	1.0	0.20	1	12/07/16 15:20	
trans-1,2-Dichloroethene	ND U	1.0	0.33	1	12/07/16 15:20	
trans-1,3-Dichloropropene	ND U	1.0	0.20	1	12/07/16 15:20	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	96	85 - 122	12/07/16 15:20	
Dibromofluoromethane	95	89 - 119	12/07/16 15:20	
Toluene-d8	104	87 - 121	12/07/16 15:20	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/L	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16 09:15

Sample Name: 1611301400 400-SB-12
Lab Code: R1612673-005

Units: ug/L
Basis: NA

Volatile Organic Compounds by GC/MS

Analysis Method: 8260C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	1.0	0.22	1	12/07/16 15:44	
1,1,1-Trichloroethane (TCA)	ND U	1.0	0.36	1	12/07/16 15:44	
1,1,2,2-Tetrachloroethane	ND U	1.0	0.25	1	12/07/16 15:44	
1,1,2-Trichloroethane	ND U	1.0	0.34	1	12/07/16 15:44	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	1.0	0.31	1	12/07/16 15:44	
1,1-Dichloroethene (1,1-DCE)	ND U	1.0	0.57	1	12/07/16 15:44	
1,2,3-Trichloropropane	ND U	1.0	0.70	1	12/07/16 15:44	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	2.0	0.74	1	12/07/16 15:44	
1,2-Dibromoethane	ND U	1.0	0.24	1	12/07/16 15:44	
1,2-Dichlorobenzene	ND U	1.0	0.21	1	12/07/16 15:44	
1,2-Dichloroethane	ND U	1.0	0.36	1	12/07/16 15:44	
1,2-Dichloropropane	ND U	1.0	0.20	1	12/07/16 15:44	
1,3-Dichlorobenzene	ND U	1.0	0.20	1	12/07/16 15:44	
1,4-Dioxane	ND U	40	20	1	12/07/16 15:44	
2-Butanone (MEK)	ND U	5.0	0.81	1	12/07/16 15:44	
2-Chloro-1,3-butadiene	ND U	1.0	0.27	1	12/07/16 15:44	
2-Chloroethyl Vinyl Ether	ND U	1.0	0.44	1	12/07/16 15:44	
Isobutyl Alcohol	ND U	40	11	1	12/07/16 15:44	
Allyl Chloride	ND U	1.0	0.26	1	12/07/16 15:44	
4-Methyl-2-pentanone	ND U	5.0	0.67	1	12/07/16 15:44	
Acetone	26	5.0	1.3	1	12/07/16 15:44	
Acetonitrile	ND U	10	4.7	1	12/07/16 15:44	
Acrolein	ND U	10	3.0	1	12/07/16 15:44	
Acrylonitrile	ND U	10	1.4	1	12/07/16 15:44	
Benzene	ND U	1.0	0.20	1	12/07/16 15:44	
Bromodichloromethane	ND U	1.0	0.32	1	12/07/16 15:44	
Bromoform	ND U	1.0	0.42	1	12/07/16 15:44	
Bromomethane	ND U	1.0	0.29	1	12/07/16 15:44	
Carbon Disulfide	ND U	1.0	0.22	1	12/07/16 15:44	
Carbon Tetrachloride	ND U	1.0	0.45	1	12/07/16 15:44	
Chlorobenzene	ND U	1.0	0.29	1	12/07/16 15:44	
Chloroethane	ND U	1.0	0.24	1	12/07/16 15:44	
Chloroform	ND U	1.0	0.25	1	12/07/16 15:44	
Chloromethane	ND U	1.0	0.21	1	12/07/16 15:44	
Dibromochloromethane	ND U	1.0	0.31	1	12/07/16 15:44	
Dibromomethane	ND U	1.0	0.32	1	12/07/16 15:44	
Dichlorodifluoromethane (CFC 12)	ND U	1.0	0.46	1	12/07/16 15:44	
Dichloromethane	ND U	1.0	0.60	1	12/07/16 15:44	
Ethyl Methacrylate	ND U	2.0	0.44	1	12/07/16 15:44	
Ethylbenzene	ND U	1.0	0.20	1	12/07/16 15:44	
Iodomethane	ND U	2.0	0.98	1	12/07/16 15:44	
Methacrylonitrile	ND U	2.0	0.50	1	12/07/16 15:44	
Methyl Methacrylate	ND U	2.0	0.62	1	12/07/16 15:44	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water
Sample Name: 1611301400 400-SB-12
Lab Code: R1612673-005

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16 09:15
Units: ug/L
Basis: NA

Volatile Organic Compounds by GC/MS

Analysis Method: 8260C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	1.0	0.20	1	12/07/16 15:44	
Propionitrile	ND U	5.0	3.1	1	12/07/16 15:44	
Tetrachloroethene (PCE)	ND U	1.0	0.30	1	12/07/16 15:44	
Toluene	ND U	1.0	0.20	1	12/07/16 15:44	
Trichloroethene (TCE)	ND U	1.0	0.22	1	12/07/16 15:44	
Trichlorofluoromethane (CFC 11)	ND U	1.0	0.20	1	12/07/16 15:44	
Vinyl Chloride	ND U	1.0	0.32	1	12/07/16 15:44	
cis-1,3-Dichloropropene	ND U	1.0	0.24	1	12/07/16 15:44	
m,p-Xylenes	ND U	2.0	0.33	1	12/07/16 15:44	
o-Xylene	ND U	1.0	0.20	1	12/07/16 15:44	
trans-1,2-Dichloroethene	ND U	1.0	0.33	1	12/07/16 15:44	
trans-1,3-Dichloropropene	ND U	1.0	0.20	1	12/07/16 15:44	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	100	85 - 122	12/07/16 15:44	
Dibromofluoromethane	94	89 - 119	12/07/16 15:44	
Toluene-d8	105	87 - 121	12/07/16 15:44	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/L	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16 09:15

Sample Name: 1611301401 400-SB-12
Lab Code: R1612673-006

Units: ug/L
Basis: NA

Volatile Organic Compounds by GC/MS

Analysis Method: 8260C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	1.0	0.22	1	12/07/16 16:08	
1,1,1-Trichloroethane (TCA)	ND U	1.0	0.36	1	12/07/16 16:08	
1,1,2,2-Tetrachloroethane	ND U	1.0	0.25	1	12/07/16 16:08	
1,1,2-Trichloroethane	ND U	1.0	0.34	1	12/07/16 16:08	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	1.0	0.31	1	12/07/16 16:08	
1,1-Dichloroethene (1,1-DCE)	ND U	1.0	0.57	1	12/07/16 16:08	
1,2,3-Trichloropropane	ND U	1.0	0.70	1	12/07/16 16:08	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	2.0	0.74	1	12/07/16 16:08	
1,2-Dibromoethane	ND U	1.0	0.24	1	12/07/16 16:08	
1,2-Dichlorobenzene	ND U	1.0	0.21	1	12/07/16 16:08	
1,2-Dichloroethane	ND U	1.0	0.36	1	12/07/16 16:08	
1,2-Dichloropropane	ND U	1.0	0.20	1	12/07/16 16:08	
1,3-Dichlorobenzene	ND U	1.0	0.20	1	12/07/16 16:08	
1,4-Dioxane	ND U	40	20	1	12/07/16 16:08	
2-Butanone (MEK)	ND U	5.0	0.81	1	12/07/16 16:08	
2-Chloro-1,3-butadiene	ND U	1.0	0.27	1	12/07/16 16:08	
2-Chloroethyl Vinyl Ether	ND U	1.0	0.44	1	12/07/16 16:08	
Isobutyl Alcohol	ND U	40	11	1	12/07/16 16:08	
Allyl Chloride	ND U	1.0	0.26	1	12/07/16 16:08	
4-Methyl-2-pentanone	ND U	5.0	0.67	1	12/07/16 16:08	
Acetone	25	5.0	1.3	1	12/07/16 16:08	
Acetonitrile	ND U	10	4.7	1	12/07/16 16:08	
Acrolein	ND U	10	3.0	1	12/07/16 16:08	
Acrylonitrile	ND U	10	1.4	1	12/07/16 16:08	
Benzene	ND U	1.0	0.20	1	12/07/16 16:08	
Bromodichloromethane	ND U	1.0	0.32	1	12/07/16 16:08	
Bromoform	ND U	1.0	0.42	1	12/07/16 16:08	
Bromomethane	ND U	1.0	0.29	1	12/07/16 16:08	
Carbon Disulfide	ND U	1.0	0.22	1	12/07/16 16:08	
Carbon Tetrachloride	ND U	1.0	0.45	1	12/07/16 16:08	
Chlorobenzene	ND U	1.0	0.29	1	12/07/16 16:08	
Chloroethane	ND U	1.0	0.24	1	12/07/16 16:08	
Chloroform	ND U	1.0	0.25	1	12/07/16 16:08	
Chloromethane	ND U	1.0	0.21	1	12/07/16 16:08	
Dibromochloromethane	ND U	1.0	0.31	1	12/07/16 16:08	
Dibromomethane	ND U	1.0	0.32	1	12/07/16 16:08	
Dichlorodifluoromethane (CFC 12)	ND U	1.0	0.46	1	12/07/16 16:08	
Dichloromethane	ND U	1.0	0.60	1	12/07/16 16:08	
Ethyl Methacrylate	ND U	2.0	0.44	1	12/07/16 16:08	
Ethylbenzene	ND U	1.0	0.20	1	12/07/16 16:08	
Iodomethane	ND U	2.0	0.98	1	12/07/16 16:08	
Methacrylonitrile	ND U	2.0	0.50	1	12/07/16 16:08	
Methyl Methacrylate	ND U	2.0	0.62	1	12/07/16 16:08	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water
Sample Name: 1611301401 400-SB-12
Lab Code: R1612673-006

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16 09:15
Units: ug/L
Basis: NA

Volatile Organic Compounds by GC/MS

Analysis Method: 8260C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	1.0	0.20	1	12/07/16 16:08	
Propionitrile	ND U	5.0	3.1	1	12/07/16 16:08	
Tetrachloroethene (PCE)	ND U	1.0	0.30	1	12/07/16 16:08	
Toluene	ND U	1.0	0.20	1	12/07/16 16:08	
Trichloroethene (TCE)	ND U	1.0	0.22	1	12/07/16 16:08	
Trichlorofluoromethane (CFC 11)	ND U	1.0	0.20	1	12/07/16 16:08	
Vinyl Chloride	ND U	1.0	0.32	1	12/07/16 16:08	
cis-1,3-Dichloropropene	ND U	1.0	0.24	1	12/07/16 16:08	
m,p-Xylenes	ND U	2.0	0.33	1	12/07/16 16:08	
o-Xylene	ND U	1.0	0.20	1	12/07/16 16:08	
trans-1,2-Dichloroethene	ND U	1.0	0.33	1	12/07/16 16:08	
trans-1,3-Dichloropropene	ND U	1.0	0.20	1	12/07/16 16:08	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	98	85 - 122	12/07/16 16:08	
Dibromofluoromethane	96	89 - 119	12/07/16 16:08	
Toluene-d8	107	87 - 121	12/07/16 16:08	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/L	Q
	No Tentatively Identified Compounds Detected			



General Chemistry

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611301343 400-SB-10
Lab Code: R1612673-003

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16 09:15
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	73.6	Percent	-	1	12/05/16 12:05	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611301344 400-SB-10
Lab Code: R1612673-004

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16 09:15
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	73.9	Percent	-	1	12/05/16 12:05	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611301403 400-SB-12
Lab Code: R1612673-007

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16 09:15
Basis: As Received

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Q
Total Solids	ALS SOP	74.7	Percent	-	1	12/05/16 12:05	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1611301404 400-SB-12
Lab Code: R1612673-008

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16 09:15
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	74.0	Percent	-	1	12/05/16 12:05	



QC Summary Forms

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Volatile Organic Compounds by GC/MS

ALS Environmental—Rochester Laboratory
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Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1612673

SURROGATE RECOVERY SUMMARY
Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Extraction Method: EPA 5030C

Sample Name	Lab Code	4-Bromofluorobenzene	Dibromofluoromethane	Toluene-d8
		51 - 136	63 - 138	66 - 138
1611301343 400-SB-10	R1612673-003	84	98	96
1611301344 400-SB-10	R1612673-004	90	92	97
1611301403 400-SB-12	R1612673-007	88	97	96
1611301404 400-SB-12	R1612673-008	88	96	97
Method Blank	RQ1615064-01	95	97	98
Lab Control Sample	RQ1615064-02	96	99	96
1611301343 400-SB-10 MS	RQ1615064-05	90	97	97
1611301343 400-SB-10 DMS	RQ1615064-06	88	98	98
1611301403 400-SB-12 MS	RQ1615064-07	92	101	98
1611301403 400-SB-12 DMS	RQ1615064-08	92	99	98

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16
Date Analyzed: 12/8/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1611301343 400-SB-10 **Units:** ug/Kg
Lab Code: R1612673-003 **Basis:** Dry
Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Sample Result	Matrix Spike RQ1615064-05			Duplicate Matrix Spike RQ1615064-06			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
1,1,1,2-Tetrachloroethane	ND U	57.4	67.9	84	55.1	67.3	82	52-133	2	30
1,1,1-Trichloroethane (TCA)	ND U	53.9	67.9	79	51.8	67.3	77	51-132	3	30
1,1,2,2-Tetrachloroethane	ND U	64.3	67.9	95	62.7	67.3	93	53-134	2	30
1,1,2-Trichloroethane	ND U	60.1	67.9	89	57.7	67.3	86	62-126	3	30
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	44.2	67.9	65	42.8	67.3	64	45-136	2	30
1,1-Dichloroethene (1,1-DCE)	ND U	52.6	67.9	77	51.3	67.3	76	61-139	1	30
1,2,3-Trichloropropane	ND U	65.0	67.9	96	63.6	67.3	95	22-167	1	30
1,2-Dibromo-3-chloropropane (DBCP)	ND U	58.3	67.9	86	56.2	67.3	84	27-163	2	30
1,2-Dibromoethane	ND U	62.7	67.9	92	61.4	67.3	91	52-137	1	30
1,2-Dichlorobenzene	ND U	58.0	67.9	85	55.2	67.3	82	22-156	4	30
1,2-Dichloroethane	ND U	61.9	67.9	91	60.2	67.3	89	59-125	2	30
1,2-Dichloropropane	ND U	61.3	67.9	90	59.1	67.3	88	67-126	2	30
1,3-Dichlorobenzene	ND U	57.6	67.9	85	55.1	67.3	82	29-146	4	30
1,4-Dioxane	ND U	1390	1360	102	1320	1350	98	50-148	4	30
2-Butanone (MEK)	ND U	54.7	67.9	80	51.5	67.3	77	43-134	4	30
2-Chloro-1,3-butadiene	ND U	62.4	67.9	92	61.6	67.3	92	45-134	<1	30
2-Chloroethyl Vinyl Ether	ND U	65.9	67.9	97	64.9	67.3	97	37-150	<1	30
Isobutyl Alcohol	ND U	1110	1360	82	1060	1350	79	39-146	4	30
Allyl Chloride	ND U	58.4	67.9	86	54.1	67.3	80	34-135	7	30
4-Methyl-2-pentanone	ND U	58.9	67.9	87	57.4	67.3	85	47-145	2	30
Acetone	6.9	66.3	67.9	88	63.9	67.3	85	11-183	3	30
Acetonitrile	ND U	310	340	91	228	336	68	28-146	29	30
Acrolein	ND U	83.8	136	62	68.9	135	51	10-172	19	30
Acrylonitrile	ND U	275	340	81	268	336	80	46-139	1	30
Benzene	ND U	60.3	67.9	89	58.4	67.3	87	63-126	2	30
Bromodichloromethane	ND U	57.6	67.9	85	54.5	67.3	81	47-141	5	30
Bromoform	ND U	56.3	67.9	83	52.4	67.3	78	26-157	6	30
Bromomethane	ND U	70.2	67.9	103	60.8	67.3	90	10-137	13	30
Carbon Disulfide	5.8 J	69.6	67.9	94	67.8	67.3	92	35-135	2	30
Carbon Tetrachloride	ND U	49.8	67.9	73	46.4	67.3	69	46-137	6	30
Chlorobenzene	ND U	59.9	67.9	88	57.2	67.3	85	51-132	3	30
Chloroethane	ND U	58.9	67.9	87	56.0	67.3	83	45-132	5	30
Chloroform	ND U	60.7	67.9	89	58.2	67.3	87	61-124	2	30
Chloromethane	ND U	57.2	67.9	84	52.1	67.3	77	50-136	9	30
Dibromochloromethane	ND U	58.6	67.9	86	55.6	67.3	83	40-146	4	30

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Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16
Date Analyzed: 12/8/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1611301343 400-SB-10
Lab Code: R1612673-003
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1615064-05			Duplicate Matrix Spike RQ1615064-06			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Dibromomethane	ND U	62.4	67.9	92	61.0	67.3	91	61-122	1	30
Dichlorodifluoromethane (CFC 12)	ND U	47.9	67.9	70	47.0	67.3	70	44-138	<1	30
Dichloromethane	1.3 BJ	58.4	67.9	84	56.5	67.3	82	64-120	2	30
Ethyl Methacrylate	ND U	61.0	67.9	90	58.6	67.3	87	17-166	3	30
Ethylbenzene	ND U	54.4	67.9	80	51.3	67.3	76	44-131	5	30
Iodomethane	ND U	54.6	67.9	80	64.3	67.3	96	10-160	18	30
Methacrylonitrile	ND U	56.4	67.9	83	53.8	67.3	80	44-149	4	30
Methyl Methacrylate	ND U	60.8	67.9	90	57.7	67.3	86	41-162	5	30
Naphthalene	ND U	42.0	67.9	62	38.9	67.3	58	10-187	7	30
Propionitrile	ND U	268	340	79	263	336	78	46-144	1	30
Tetrachloroethene (PCE)	1.8 J	50.8	67.9	72	48.0	67.3	69	45-141	4	30
Toluene	ND U	58.4	67.9	86	55.4	67.3	82	50-140	5	30
Trichloroethene (TCE)	ND U	57.9	67.9	85	55.7	67.3	83	54-136	2	30
Trichlorofluoromethane (CFC 11)	ND U	52.6	67.9	77	51.2	67.3	76	47-129	1	30
Vinyl Chloride	ND U	54.3	67.9	80	50.2	67.3	75	53-128	6	30
cis-1,3-Dichloropropene	ND U	57.3	67.9	84	54.1	67.3	80	31-150	5	30
m,p-Xylenes	ND U	113	136	83	106	135	79	45-141	5	30
o-Xylene	ND U	57.4	67.9	84	54.4	67.3	81	46-139	4	30
trans-1,2-Dichloroethene	ND U	56.9	67.9	84	54.6	67.3	81	52-128	4	30
trans-1,3-Dichloropropene	ND U	56.8	67.9	84	53.9	67.3	80	23-160	5	30

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Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16
Date Analyzed: 12/8/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1611301403 400-SB-12
Lab Code: R1612673-007
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1615064-07			Duplicate Matrix Spike RQ1615064-08			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
1,1,1,2-Tetrachloroethane	ND U	64.4	66.9	96	62.8	66.9	94	52-133	2	30
1,1,1-Trichloroethane (TCA)	ND U	67.7	66.9	101	65.5	66.9	98	51-132	3	30
1,1,2,2-Tetrachloroethane	ND U	64.9	66.9	97	63.4	66.9	95	53-134	2	30
1,1,2-Trichloroethane	ND U	66.1	66.9	99	64.3	66.9	96	62-126	3	30
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	61.8	66.9	92	60.5	66.9	90	45-136	2	30
1,1-Dichloroethene (1,1-DCE)	ND U	67.2	66.9	100	66.3	66.9	99	61-139	1	30
1,2,3-Trichloropropane	ND U	68.6	66.9	102	67.7	66.9	101	22-167	<1	30
1,2-Dibromo-3-chloropropane (DBCP)	ND U	64.7	66.9	97	62.0	66.9	93	27-163	4	30
1,2-Dibromoethane	ND U	68.9	66.9	103	67.5	66.9	101	52-137	2	30
1,2-Dichlorobenzene	ND U	67.5	66.9	101	65.3	66.9	98	22-156	3	30
1,2-Dichloroethane	ND U	68.4	66.9	102	66.6	66.9	99	59-125	3	30
1,2-Dichloropropane	ND U	67.7	66.9	101	65.8	66.9	98	67-126	3	30
1,3-Dichlorobenzene	ND U	67.3	66.9	101	64.9	66.9	97	29-146	4	30
1,4-Dioxane	ND U	1650	1340	123	1520	1340	114	50-148	8	30
2-Butanone (MEK)	ND U	60.1	66.9	90	57.3	66.9	86	43-134	5	30
2-Chloro-1,3-butadiene	ND U	69.1	66.9	103	67.1	66.9	100	45-134	3	30
2-Chloroethyl Vinyl Ether	ND U	75.0	66.9	112	70.8	66.9	106	37-150	6	30
Isobutyl Alcohol	ND U	1430	1340	107	1240	1340	93	39-146	14	30
Allyl Chloride	ND U	72.0	66.9	108	69.9	66.9	104	34-135	4	30
4-Methyl-2-pentanone	ND U	65.3	66.9	98	62.8	66.9	94	47-145	4	30
Acetone	160	196	66.9	53	208	66.9	72	11-183	30	30
Acetonitrile	ND U	393	335	117	295	335	88	28-146	28	30
Acrolein	ND U	80.7	134	60	53.9	134	40	10-172	40*	30
Acrylonitrile	ND U	315	335	94	305	335	91	46-139	3	30
Benzene	ND U	69.2	66.9	103	67.2	66.9	100	63-126	3	30
Bromodichloromethane	ND U	64.5	66.9	96	63.0	66.9	94	47-141	2	30
Bromoform	ND U	64.6	66.9	97	64.2	66.9	96	26-157	1	30
Bromomethane	ND U	71.3	66.9	107	69.2	66.9	103	10-137	4	30
Carbon Disulfide	ND U	68.4	66.9	102	65.6	66.9	98	35-135	4	30
Carbon Tetrachloride	ND U	64.1	66.9	96	62.9	66.9	94	46-137	2	30
Chlorobenzene	ND U	67.3	66.9	101	66.5	66.9	99	51-132	2	30
Chloroethane	ND U	67.3	66.9	101	68.7	66.9	103	45-132	2	30
Chloroform	ND U	68.1	66.9	102	66.6	66.9	99	61-124	3	30
Chloromethane	ND U	66.5	66.9	99	64.0	66.9	96	50-136	3	30
Dibromochloromethane	ND U	65.7	66.9	98	65.1	66.9	97	40-146	1	30

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ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16
Date Analyzed: 12/8/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1611301403 400-SB-12 **Units:** ug/Kg
Lab Code: R1612673-007 **Basis:** Dry
Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Sample Result	Matrix Spike RQ1615064-07			Duplicate Matrix Spike RQ1615064-08			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Dibromomethane	ND U	69.7	66.9	104	66.0	66.9	99	61-122	5	30
Dichlorodifluoromethane (CFC 12)	ND U	65.4	66.9	98	63.1	66.9	94	44-138	4	30
Dichloromethane	1.4 BJ	65.7	66.9	96	63.4	66.9	93	64-120	3	30
Ethyl Methacrylate	ND U	68.1	66.9	102	66.7	66.9	100	17-166	2	30
Ethylbenzene	ND U	65.1	66.9	97	62.9	66.9	94	44-131	3	30
Iodomethane	ND U	78.2	66.9	117	76.0	66.9	114	10-160	3	30
Methacrylonitrile	ND U	62.4	66.9	93	61.6	66.9	92	44-149	1	30
Methyl Methacrylate	ND U	66.5	66.9	99	64.4	66.9	96	41-162	3	30
Naphthalene	ND U	54.4	66.9	81	51.6	66.9	77	10-187	5	30
Propionitrile	ND U	330	335	99	306	335	91	46-144	8	30
Tetrachloroethene (PCE)	1.4 J	63.0	66.9	92	63.7	66.9	93	45-141	1	30
Toluene	ND U	67.2	66.9	100	65.4	66.9	98	50-140	2	30
Trichloroethene (TCE)	ND U	71.1	66.9	106	70.1	66.9	105	54-136	<1	30
Trichlorofluoromethane (CFC 11)	ND U	70.6	66.9	105	69.3	66.9	104	47-129	<1	30
Vinyl Chloride	ND U	72.2	66.9	108	68.7	66.9	103	53-128	5	30
cis-1,3-Dichloropropene	ND U	65.0	66.9	97	62.9	66.9	94	31-150	3	30
m,p-Xylenes	ND U	134	134	100	132	134	98	45-141	2	30
o-Xylene	ND U	66.8	66.9	100	65.8	66.9	98	46-139	2	30
trans-1,2-Dichloroethene	ND U	67.5	66.9	101	66.0	66.9	99	52-128	2	30
trans-1,3-Dichloropropene	ND U	63.9	66.9	95	62.5	66.9	93	23-160	2	30

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Results flagged with a pound (#) indicate the control criteria is not applicable.

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ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1612673
Date Collected: NA
Date Received: NA

Sample Name: Method Blank
Lab Code: RQ1615064-01

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.0	0.83	1	12/08/16 12:21	
1,1,1-Trichloroethane (TCA)	ND U	5.0	0.73	1	12/08/16 12:21	
1,1,2,2-Tetrachloroethane	ND U	5.0	0.81	1	12/08/16 12:21	
1,1,2-Trichloroethane	ND U	5.0	0.73	1	12/08/16 12:21	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.0	1.3	1	12/08/16 12:21	
1,1-Dichloroethene (1,1-DCE)	ND U	5.0	1.3	1	12/08/16 12:21	
1,2,3-Trichloropropane	ND U	5.0	1.4	1	12/08/16 12:21	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.0	1.9	1	12/08/16 12:21	
1,2-Dibromoethane	ND U	5.0	1.3	1	12/08/16 12:21	
1,2-Dichlorobenzene	ND U	5.0	0.61	1	12/08/16 12:21	
1,2-Dichloroethane	ND U	5.0	0.61	1	12/08/16 12:21	
1,2-Dichloropropane	ND U	5.0	0.97	1	12/08/16 12:21	
1,3-Dichlorobenzene	ND U	5.0	0.63	1	12/08/16 12:21	
1,4-Dioxane	ND U	100	20	1	12/08/16 12:21	
2-Butanone (MEK)	ND U	5.0	2.3	1	12/08/16 12:21	
2-Chloro-1,3-butadiene	ND U	5.0	1.6	1	12/08/16 12:21	
2-Chloroethyl Vinyl Ether	ND U	5.0	1.8	1	12/08/16 12:21	
Isobutyl Alcohol	ND U	100	23	1	12/08/16 12:21	
Allyl Chloride	ND U	5.0	1.7	1	12/08/16 12:21	
4-Methyl-2-pentanone	ND U	5.0	0.98	1	12/08/16 12:21	
Acetone	ND U	5.0	2.9	1	12/08/16 12:21	
Acetonitrile	ND U	25	17	1	12/08/16 12:21	
Acrolein	ND U	25	3.5	1	12/08/16 12:21	
Acrylonitrile	ND U	25	6.5	1	12/08/16 12:21	
Benzene	ND U	5.0	0.29	1	12/08/16 12:21	
Bromodichloromethane	ND U	5.0	0.61	1	12/08/16 12:21	
Bromoform	ND U	5.0	0.93	1	12/08/16 12:21	
Bromomethane	ND U	5.0	1.4	1	12/08/16 12:21	
Carbon Disulfide	ND U	5.0	1.3	1	12/08/16 12:21	
Carbon Tetrachloride	ND U	5.0	0.92	1	12/08/16 12:21	
Chlorobenzene	ND U	5.0	0.29	1	12/08/16 12:21	
Chloroethane	ND U	5.0	2.9	1	12/08/16 12:21	
Chloroform	ND U	5.0	1.3	1	12/08/16 12:21	
Chloromethane	ND U	5.0	0.40	1	12/08/16 12:21	
Dibromochloromethane	ND U	5.0	0.73	1	12/08/16 12:21	
Dibromomethane	ND U	5.0	0.63	1	12/08/16 12:21	
Dichlorodifluoromethane (CFC 12)	ND U	5.0	1.9	1	12/08/16 12:21	
Dichloromethane	0.67 J	5.0	0.57	1	12/08/16 12:21	
Ethyl Methacrylate	ND U	5.0	0.75	1	12/08/16 12:21	
Ethylbenzene	ND U	5.0	0.23	1	12/08/16 12:21	
Iodomethane	ND U	10	1.2	1	12/08/16 12:21	
Methacrylonitrile	ND U	5.0	1.6	1	12/08/16 12:21	
Methyl Methacrylate	ND U	5.0	0.73	1	12/08/16 12:21	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: RQ1615064-01

Service Request: R1612673
Date Collected: NA
Date Received: NA
Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.0	0.51	1	12/08/16 12:21	
Propionitrile	ND U	25	6.5	1	12/08/16 12:21	
Tetrachloroethene (PCE)	ND U	5.0	0.88	1	12/08/16 12:21	
Toluene	ND U	5.0	1.0	1	12/08/16 12:21	
Trichloroethene (TCE)	ND U	5.0	1.1	1	12/08/16 12:21	
Trichlorofluoromethane (CFC 11)	ND U	5.0	0.66	1	12/08/16 12:21	
Vinyl Chloride	ND U	5.0	1.9	1	12/08/16 12:21	
cis-1,3-Dichloropropene	ND U	5.0	0.90	1	12/08/16 12:21	
m,p-Xylenes	ND U	10	1.1	1	12/08/16 12:21	
o-Xylene	ND U	5.0	0.48	1	12/08/16 12:21	
trans-1,2-Dichloroethene	ND U	5.0	0.86	1	12/08/16 12:21	
trans-1,3-Dichloropropene	ND U	5.0	0.20	1	12/08/16 12:21	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	95	51 - 136	12/08/16 12:21	
Dibromofluoromethane	97	63 - 138	12/08/16 12:21	
Toluene-d8	98	66 - 138	12/08/16 12:21	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1612673
Date Analyzed: 12/08/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Units:ug/Kg
Basis:Dry

Lab Control Sample
RQ1615064-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
1,1,1,2-Tetrachloroethane	8260C	19.6	20.0	98	40-140
1,1,1-Trichloroethane (TCA)	8260C	20.7	20.0	103	40-140
1,1,2,2-Tetrachloroethane	8260C	19.1	20.0	96	40-140
1,1,2-Trichloroethane	8260C	19.4	20.0	97	40-140
1,1,2-Trichloro-1,2,2-trifluoroethane	8260C	20.4	20.0	102	40-140
1,1-Dichloroethene (1,1-DCE)	8260C	21.2	20.0	106	40-140
1,2,3-Trichloropropane	8260C	18.9	20.0	94	40-140
1,2-Dibromo-3-chloropropane (DBCP)	8260C	18.0	20.0	90	40-140
1,2-Dibromoethane	8260C	20.6	20.0	103	40-140
1,2-Dichlorobenzene	8260C	21.2	20.0	106	40-140
1,2-Dichloroethane	8260C	20.2	20.0	101	40-140
1,2-Dichloropropane	8260C	20.3	20.0	102	40-140
1,3-Dichlorobenzene	8260C	21.2	20.0	106	40-140
1,4-Dioxane	8260C	420	400	105	40-140
2-Butanone (MEK)	8260C	16.5	20.0	83	40-140
2-Chloro-1,3-butadiene	8260C	18.2	20.0	91	40-140
2-Chloroethyl Vinyl Ether	8260C	18.5	20.0	93	40-140
Isobutyl Alcohol	8260C	346	400	86	40-140
Allyl Chloride	8260C	21.6	20.0	108	40-140
4-Methyl-2-pentanone	8260C	17.0	20.0	85	40-140
Acetone	8260C	16.7	20.0	83	40-140
Acetonitrile	8260C	98.9	100	99	40-140
Acrolein	8260C	40.1	40.0	100	40-140
Acrylonitrile	8260C	89.9	100	90	40-140
Benzene	8260C	21.2	20.0	106	40-140
Bromodichloromethane	8260C	19.8	20.0	99	40-140
Bromoform	8260C	20.0	20.0	100	40-140
Bromomethane	8260C	22.9	20.0	114	40-140
Carbon Disulfide	8260C	18.8	20.0	94	40-140
Carbon Tetrachloride	8260C	22.0	20.0	110	40-140
Chlorobenzene	8260C	21.0	20.0	105	40-140
Chloroethane	8260C	22.1	20.0	110	40-140
Chloroform	8260C	20.1	20.0	101	40-140

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1612673
Date Analyzed: 12/08/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Units:ug/Kg
Basis:Dry

Lab Control Sample
RQ1615064-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Chloromethane	8260C	20.7	20.0	104	40-140
Dibromochloromethane	8260C	20.0	20.0	100	40-140
Dibromomethane	8260C	20.5	20.0	103	40-140
Dichlorodifluoromethane (CFC 12)	8260C	21.4	20.0	107	40-140
Dichloromethane	8260C	19.6	20.0	98	40-140
Ethyl Methacrylate	8260C	19.6	20.0	98	40-140
Ethylbenzene	8260C	20.8	20.0	104	40-140
Iodomethane	8260C	21.0	20.0	105	40-140
Methacrylonitrile	8260C	18.5	20.0	92	40-140
Methyl Methacrylate	8260C	19.3	20.0	96	40-140
Naphthalene	8260C	18.8	20.0	94	40-140
Propionitrile	8260C	85.3	100	85	40-140
Tetrachloroethene (PCE)	8260C	21.1	20.0	105	40-140
Toluene	8260C	21.0	20.0	105	40-140
Trichloroethene (TCE)	8260C	21.3	20.0	106	40-140
Trichlorofluoromethane (CFC 11)	8260C	22.8	20.0	114	40-140
Vinyl Chloride	8260C	23.0	20.0	115	40-140
cis-1,3-Dichloropropene	8260C	19.5	20.0	98	40-140
m,p-Xylenes	8260C	43.1	40.0	108	40-140
o-Xylene	8260C	20.9	20.0	104	40-140
trans-1,2-Dichloroethene	8260C	20.4	20.0	102	40-140
trans-1,3-Dichloropropene	8260C	19.2	20.0	96	40-140

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water

Service Request: R1612673

SURROGATE RECOVERY SUMMARY
Volatile Organic Compounds by GC/MS

Analysis Method: 8260C

Sample Name	Lab Code	4-Bromofluorobenzene	Dibromofluoromethane	Toluene-d8
		85 - 122	89 - 119	87 - 121
1611301340 400-SB-10	R1612673-001	96	93	101
1611301341 400-SB-10	R1612673-002	96	95	104
1611301400 400-SB-12	R1612673-005	100	94	105
1611301401 400-SB-12	R1612673-006	98	96	107
Method Blank	RQ1614938-01	98	95	102
Lab Control Sample	RQ1614938-02	105	100	105
1611301400 400-SB-12 MS	RQ1614938-05	109	100	108
1611301400 400-SB-12 DMS	RQ1614938-06	103	99	106

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16
Date Analyzed: 12/7/16

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS

Sample Name: 1611301400 400-SB-12
Lab Code: R1612673-005
Analysis Method: 8260C

Units: ug/L
Basis: NA

Analyte Name	Sample Result	Matrix Spike RQ1614938-05			Duplicate Matrix Spike RQ1614938-06			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
1,1,1,2-Tetrachloroethane	ND U	48.4	50.0	97	47.6	50.0	95	77-126	2	30
1,1,1-Trichloroethane (TCA)	ND U	52.3	50.0	105	50.9	50.0	102	74-127	3	30
1,1,2,2-Tetrachloroethane	ND U	48.5	50.0	97	50.1	50.0	100	72-122	3	30
1,1,2-Trichloroethane	ND U	49.8	50.0	100	47.4	50.0	95	79-119	5	30
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	49.5	50.0	99	47.3	50.0	95	59-131	4	30
1,1-Dichloroethene (1,1-DCE)	ND U	54.7	50.0	109	51.2	50.0	102	74-139	7	30
1,2,3-Trichloropropane	ND U	42.5	50.0	85	45.7	50.0	91	75-122	7	30
1,2-Dibromo-3-chloropropane (DBCP)	ND U	44.5	50.0	89	45.7	50.0	91	65-137	3	30
1,2-Dibromoethane	ND U	47.2	50.0	94	47.0	50.0	94	80-117	<1	30
1,2-Dichlorobenzene	ND U	47.4	50.0	95	47.4	50.0	95	77-120	<1	30
1,2-Dichloroethane	ND U	54.5	50.0	109	52.5	50.0	105	68-130	4	30
1,2-Dichloropropane	ND U	54.2	50.0	108	52.4	50.0	105	79-124	3	30
1,3-Dichlorobenzene	ND U	47.8	50.0	96	48.3	50.0	97	74-125	1	30
1,4-Dioxane	ND U	986	1000	99	885	1000	88	48-143	11	30
2-Butanone (MEK)	ND U	56.0	50.0	112	53.8	50.0	108	46-141	4	30
2-Chloro-1,3-butadiene	ND U	66.0	50.0	132	63.5	50.0	127	44-165	4	30
2-Chloroethyl Vinyl Ether	ND U	59.7	50.0	119	56.3	50.0	113	10-179	6	30
Isobutyl Alcohol	ND U	1220	1000	122	1130	1000	113	50-141	8	30
Allyl Chloride	ND U	47.9	50.0	96	46.3	50.0	93	49-156	4	30
4-Methyl-2-pentanone	ND U	59.9	50.0	120	57.1	50.0	114	60-141	5	30
Acetone	26	90.3	50.0	129	89.7	50.0	128	29-151	<1	30
Acetonitrile	ND U	305	250	122	293	250	117	39-155	4	30
Acrolein	ND U	118	100	118	114	100	114	10-156	3	30
Acrylonitrile	ND U	281	250	112	283	250	113	69-131	<1	30
Benzene	ND U	55.7	50.0	111	52.1	50.0	104	76-129	7	30
Bromodichloromethane	ND U	46.5	50.0	93	45.1	50.0	90	76-127	3	30
Bromoform	ND U	44.7	50.0	89	44.2	50.0	88	58-133	<1	30
Bromomethane	ND U	35.1	50.0	70	34.1	50.0	68	10-162	3	30
Carbon Disulfide	ND U	47.8	50.0	96	46.9	50.0	94	34-162	2	30
Carbon Tetrachloride	ND U	50.3	50.0	101	47.6	50.0	95	65-135	6	30
Chlorobenzene	ND U	51.4	50.0	103	49.2	50.0	98	76-125	4	30
Chloroethane	ND U	51.1	50.0	102	46.6	50.0	93	70-140	9	30
Chloroform	ND U	50.4	50.0	101	48.6	50.0	97	75-130	4	30
Chloromethane	ND U	53.4	50.0	107	49.0	50.0	98	55-160	9	30
Dibromochloromethane	ND U	46.6	50.0	93	47.3	50.0	95	72-128	2	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16
Date Analyzed: 12/7/16

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS

Sample Name: 1611301400 400-SB-12
Lab Code: R1612673-005
Analysis Method: 8260C

Units: ug/L
Basis: NA

Analyte Name	Sample Result	Matrix Spike RQ1614938-05			Duplicate Matrix Spike RQ1614938-06			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Dibromomethane	ND U	49.7	50.0	99	47.1	50.0	94	77-119	6	30
Dichlorodifluoromethane (CFC 12)	ND U	45.6	50.0	91	42.8	50.0	86	49-154	7	30
Dichloromethane	ND U	48.8	50.0	98	47.0	50.0	94	75-121	4	30
Ethyl Methacrylate	ND U	52.1	50.0	104	50.9	50.0	102	63-138	2	30
Ethylbenzene	ND U	53.0	50.0	106	50.6	50.0	101	72-134	5	30
Iodomethane	ND U	55.7	50.0	111	54.3	50.0	109	14-159	3	30
Methacrylonitrile	ND U	49.4	50.0	99	48.6	50.0	97	67-131	2	30
Methyl Methacrylate	ND U	51.8	50.0	104	49.9	50.0	100	74-130	4	30
Naphthalene	ND U	47.1	50.0	94	46.6	50.0	93	57-153	1	30
Propionitrile	ND U	305	250	122	295	250	118	63-146	3	30
Tetrachloroethene (PCE)	ND U	48.8	50.0	98	47.3	50.0	95	67-137	3	30
Toluene	ND U	53.6	50.0	107	51.2	50.0	102	79-125	5	30
Trichloroethene (TCE)	ND U	53.7	50.0	107	51.0	50.0	102	62-142	5	30
Trichlorofluoromethane (CFC 11)	ND U	49.0	50.0	98	46.9	50.0	94	72-142	4	30
Vinyl Chloride	ND U	62.9	50.0	126	58.9	50.0	118	60-157	6	30
cis-1,3-Dichloropropene	ND U	49.1	50.0	98	47.7	50.0	95	52-134	3	30
m,p-Xylenes	ND U	108	100	108	101	100	101	68-138	6	30
o-Xylene	ND U	54.0	50.0	108	50.5	50.0	101	68-134	7	30
trans-1,2-Dichloroethene	ND U	53.1	50.0	106	52.4	50.0	105	77-125	1	30
trans-1,3-Dichloropropene	ND U	46.4	50.0	93	45.1	50.0	90	50-142	3	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water
Sample Name: Method Blank
Lab Code: RQ1614938-01

Service Request: R1612673
Date Collected: NA
Date Received: NA
Units: ug/L
Basis: NA

Volatile Organic Compounds by GC/MS

Analysis Method: 8260C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	1.0	0.22	1	12/07/16 13:11	
1,1,1-Trichloroethane (TCA)	ND U	1.0	0.36	1	12/07/16 13:11	
1,1,2,2-Tetrachloroethane	ND U	1.0	0.25	1	12/07/16 13:11	
1,1,2-Trichloroethane	ND U	1.0	0.34	1	12/07/16 13:11	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	1.0	0.31	1	12/07/16 13:11	
1,1-Dichloroethene (1,1-DCE)	ND U	1.0	0.57	1	12/07/16 13:11	
1,2,3-Trichloropropane	ND U	1.0	0.70	1	12/07/16 13:11	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	2.0	0.74	1	12/07/16 13:11	
1,2-Dibromoethane	ND U	1.0	0.24	1	12/07/16 13:11	
1,2-Dichlorobenzene	ND U	1.0	0.21	1	12/07/16 13:11	
1,2-Dichloroethane	ND U	1.0	0.36	1	12/07/16 13:11	
1,2-Dichloropropane	ND U	1.0	0.20	1	12/07/16 13:11	
1,3-Dichlorobenzene	ND U	1.0	0.20	1	12/07/16 13:11	
1,4-Dioxane	ND U	40	20	1	12/07/16 13:11	
2-Butanone (MEK)	ND U	5.0	0.81	1	12/07/16 13:11	
2-Chloro-1,3-butadiene	ND U	1.0	0.27	1	12/07/16 13:11	
2-Chloroethyl Vinyl Ether	ND U	1.0	0.44	1	12/07/16 13:11	
Isobutyl Alcohol	ND U	40	11	1	12/07/16 13:11	
Allyl Chloride	ND U	1.0	0.26	1	12/07/16 13:11	
4-Methyl-2-pentanone	ND U	5.0	0.67	1	12/07/16 13:11	
Acetone	ND U	5.0	1.3	1	12/07/16 13:11	
Acetonitrile	ND U	10	4.7	1	12/07/16 13:11	
Acrolein	ND U	10	3.0	1	12/07/16 13:11	
Acrylonitrile	ND U	10	1.4	1	12/07/16 13:11	
Benzene	ND U	1.0	0.20	1	12/07/16 13:11	
Bromodichloromethane	ND U	1.0	0.32	1	12/07/16 13:11	
Bromoform	ND U	1.0	0.42	1	12/07/16 13:11	
Bromomethane	ND U	1.0	0.29	1	12/07/16 13:11	
Carbon Disulfide	ND U	1.0	0.22	1	12/07/16 13:11	
Carbon Tetrachloride	ND U	1.0	0.45	1	12/07/16 13:11	
Chlorobenzene	ND U	1.0	0.29	1	12/07/16 13:11	
Chloroethane	ND U	1.0	0.24	1	12/07/16 13:11	
Chloroform	ND U	1.0	0.25	1	12/07/16 13:11	
Chloromethane	ND U	1.0	0.21	1	12/07/16 13:11	
Dibromochloromethane	ND U	1.0	0.31	1	12/07/16 13:11	
Dibromomethane	ND U	1.0	0.32	1	12/07/16 13:11	
Dichlorodifluoromethane (CFC 12)	ND U	1.0	0.46	1	12/07/16 13:11	
Dichloromethane	ND U	1.0	0.60	1	12/07/16 13:11	
Ethyl Methacrylate	ND U	2.0	0.44	1	12/07/16 13:11	
Ethylbenzene	ND U	1.0	0.20	1	12/07/16 13:11	
Iodomethane	ND U	2.0	0.98	1	12/07/16 13:11	
Methacrylonitrile	ND U	2.0	0.50	1	12/07/16 13:11	
Methyl Methacrylate	ND U	2.0	0.62	1	12/07/16 13:11	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water
Sample Name: Method Blank
Lab Code: RQ1614938-01

Service Request: R1612673
Date Collected: NA
Date Received: NA
Units: ug/L
Basis: NA

Volatile Organic Compounds by GC/MS

Analysis Method: 8260C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	1.0	0.20	1	12/07/16 13:11	
Propionitrile	ND U	5.0	3.1	1	12/07/16 13:11	
Tetrachloroethene (PCE)	ND U	1.0	0.30	1	12/07/16 13:11	
Toluene	ND U	1.0	0.20	1	12/07/16 13:11	
Trichloroethene (TCE)	ND U	1.0	0.22	1	12/07/16 13:11	
Trichlorofluoromethane (CFC 11)	ND U	1.0	0.20	1	12/07/16 13:11	
Vinyl Chloride	ND U	1.0	0.32	1	12/07/16 13:11	
cis-1,3-Dichloropropene	ND U	1.0	0.24	1	12/07/16 13:11	
m,p-Xylenes	ND U	2.0	0.33	1	12/07/16 13:11	
o-Xylene	ND U	1.0	0.20	1	12/07/16 13:11	
trans-1,2-Dichloroethene	ND U	1.0	0.33	1	12/07/16 13:11	
trans-1,3-Dichloropropene	ND U	1.0	0.20	1	12/07/16 13:11	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	98	85 - 122	12/07/16 13:11	
Dibromofluoromethane	95	89 - 119	12/07/16 13:11	
Toluene-d8	102	87 - 121	12/07/16 13:11	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/L	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water

Service Request: R1612673
Date Analyzed: 12/07/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS

Units:ug/L
Basis:NA

Lab Control Sample
RQ1614938-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
1,1,1,2-Tetrachloroethane	8260C	20.0	20.0	100	80-119
1,1,1-Trichloroethane (TCA)	8260C	20.4	20.0	102	74-120
1,1,2,2-Tetrachloroethane	8260C	20.8	20.0	104	78-122
1,1,2-Trichloroethane	8260C	20.7	20.0	104	82-118
1,1,2-Trichloro-1,2,2-trifluoroethane	8260C	20.6	20.0	103	75-124
1,1-Dichloroethene (1,1-DCE)	8260C	21.4	20.0	107	74-135
1,2,3-Trichloropropane	8260C	17.5	20.0	87	68-136
1,2-Dibromo-3-chloropropane (DBCP)	8260C	18.7	20.0	94	55-149
1,2-Dibromoethane	8260C	19.5	20.0	97	81-125
1,2-Dichlorobenzene	8260C	20.0	20.0	100	80-119
1,2-Dichloroethane	8260C	22.3	20.0	111	71-127
1,2-Dichloropropane	8260C	21.5	20.0	107	80-119
1,3-Dichlorobenzene	8260C	20.7	20.0	104	79-121
1,4-Dioxane	8260C	376	400	94	69-151
2-Butanone (MEK)	8260C	20.7	20.0	104	61-137
2-Chloro-1,3-butadiene	8260C	22.8	20.0	114	67-127
2-Chloroethyl Vinyl Ether	8260C	22.9	20.0	115	49-145
Isobutyl Alcohol	8260C	429	400	107	60-132
Allyl Chloride	8260C	19.3	20.0	96	69-140
4-Methyl-2-pentanone	8260C	20.7	20.0	103	66-124
Acetone	8260C	18.6	20.0	93	40-161
Acetonitrile	8260C	109	100	109	46-154
Acrolein	8260C	53.7	40.0	134	10-200
Acrylonitrile	8260C	116	100	116	71-130
Benzene	8260C	21.9	20.0	110	76-118
Bromodichloromethane	8260C	19.3	20.0	97	78-126
Bromoform	8260C	19.8	20.0	99	71-136
Bromomethane	8260C	14.9	20.0	75	42-166
Carbon Disulfide	8260C	18.0	20.0	90	65-127
Carbon Tetrachloride	8260C	19.4	20.0	97	68-125
Chlorobenzene	8260C	20.7	20.0	103	80-121
Chloroethane	8260C	18.2	20.0	91	70-127
Chloroform	8260C	19.8	20.0	99	76-120

ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water

Service Request: R1612673
Date Analyzed: 12/07/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS

Units:ug/L
Basis:NA

Lab Control Sample
RQ1614938-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Chloromethane	8260C	22.1	20.0	110	69-145
Dibromochloromethane	8260C	19.6	20.0	98	77-128
Dibromomethane	8260C	20.3	20.0	102	79-120
Dichlorodifluoromethane (CFC 12)	8260C	17.8	20.0	89	65-152
Dichloromethane	8260C	19.6	20.0	98	73-122
Ethyl Methacrylate	8260C	20.6	20.0	103	69-126
Ethylbenzene	8260C	20.7	20.0	104	76-120
Iodomethane	8260C	21.4	20.0	107	18-160
Methacrylonitrile	8260C	19.8	20.0	99	72-131
Methyl Methacrylate	8260C	20.0	20.0	100	71-127
Naphthalene	8260C	17.8	20.0	89	55-166
Propionitrile	8260C	118	100	118	69-133
Tetrachloroethene (PCE)	8260C	20.0	20.0	100	78-124
Toluene	8260C	21.2	20.0	106	77-120
Trichloroethene (TCE)	8260C	21.7	20.0	108	78-123
Trichlorofluoromethane (CFC 11)	8260C	20.0	20.0	100	68-126
Vinyl Chloride	8260C	24.9	20.0	125	69-133
cis-1,3-Dichloropropene	8260C	20.0	20.0	100	74-126
m,p-Xylenes	8260C	43.0	40.0	108	78-123
o-Xylene	8260C	20.4	20.0	102	80-120
trans-1,2-Dichloroethene	8260C	21.2	20.0	106	80-120
trans-1,3-Dichloropropene	8260C	19.2	20.0	96	67-135



General Chemistry

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dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16
Date Analyzed: 12/05/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1611301343 400-SB-10
Lab Code: R1612673-003

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>Sample Result</u>	<u>Duplicate Sample R1612673-003DUP Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	73.6	75.3	74.5	2	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1612673
Date Collected: 11/30/16
Date Received: 12/02/16
Date Analyzed: 12/05/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1611301403 400-SB-12
Lab Code: R1612673-007

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>Sample Result</u>	<u>Duplicate Sample R1612673-007DUP Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	74.7	75.3	75.0	<1	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Chemistry and Chemical Engineering Division
Department of Analytical & Environmental Chemistry

November 22, 2016

Navarro Research and Engineering Inc.
NASA - JSC - White Sands Test Facility
Transportation Officer, Building 120
12600 NASA Road
Las Cruces, NM 88012
Tel. 575-524-5452

Attention: Tom Hall

Subject: Reports for Batch-607-#723-IBC for NDMA/DMN Analysis of Soil Samples

SwRI Project #: 01.16988.103

SwRI Task Orders: **161111-7**

Navarro P.O. #: 15EC092B

Dear Tom,

Enclosed please find the analytical reports for Batch-607- #723-IBC-Navarro of soil samples.

Southwest Research Institute appreciates the opportunity to provide the service to Navarro Research and Engineering Inc.. If you have any questions, please do not hesitate to call me at 210-522-3954.

Sincerely,



Gang Sun, Ph.D.
Program Manager

APPROVAL:



Michael Dammann
Director



CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161111-7
NAVARRO PO #: 15EC092B

NARRATIVE

(M-607 - #723-Navarro-IBC)

Total Page Count: 010001-
Fraction: NDMA/ Pages: 010024
DMM/607

CLIENT: NAVARRO
SwRI PROJECT: 01.16988.01.103
BATCH #: Batch-607-#723-IBC
TASK ORDER: 161111-7
CLIENT PO#: 15EC092B
REPORT DATA: 11/22/2016

NARRATIVE FOR NDMA/ DMN/BROMACIL ANALYSIS

1. Samples were extracted with dichloromethane (DCM) and analyzed by GC/MS in selective ion monitoring mode for N-Nitrosodimethylamine (NDMA) and N-Nitrodimethylamine (DMN) according to the modified Method 607.
2. All samples were extracted within 14 days for soil sample of sample collection and were analyzed within 40 days after the extraction.
3. The response factor (RF) values for Calibration curve and/or for continuing calibration standard were less than 25 % for all target compounds. The sample reporting limit is 0.33 ppb for 30 g extracted soil samples.
4. Both blank spike and matrix spike samples were spiked at 17 ppb for soil sample, then extracted and analyzed. The recoveries for all target compounds were within method recovery criteria of 13-110% for NDMA, 30-150% for DMN, and 40-190% for Bromacil, respectively. The soil sample result is reported as received basis and not by dry weight.
5. Surrogate compound was spiked into every sample before sample extraction at 17 ppb for soil sample. The surrogate recoveries for all samples were within method recovery criteria of 40-160%.
6. Laboratory blanks were extracted and analyzed for every sample batch. No analytes were detected above report limits from the blanks.
7. A "J" value was reported if the associated value was below reporting limits but above the MDL value.
8. All analyte concentrations are expressed in ng/g (*ppb*). Sample calculation:

$$\text{for soil: Concentration } (\mu\text{g/kg}) = \frac{C \text{ (ng/}\mu\text{L)} \times V_{\text{extr}} \text{ (}\mu\text{L)} \times \text{DF}}{W_{\text{samp}} \text{ (g)}} \times \frac{1000 \text{ g}}{1 \text{ kg}} \times \frac{1 \mu\text{g}}{1000 \text{ ng}}$$

where:

C	=	result of GC/MS analysis, in ng/ μ L
V_{extr}	=	final volume of sample extract, in μ L
V_{samp}	=	aqueous sample volume taken for extraction, in mL
W_{samp}	=	soil sample weight taken for extraction, in gram
DF	=	dilution factor, if any

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161111-7
NAVARRO PO #: 15EC092B

TASK ORDER AND CHAIN OF CUSTODY

Southwest Research Institute

Laboratory Task Order

TO #: 161111-7 Revision: 0

SDG: 606740

SRR #'s: 58674
Client(s): NavarroProject(s): 16988.01.10X
Manager(s): SUN, GANG
To Client: 12/02/16**Instructions**

Documents Related to this task order: 210959[COC for SRR 58674], 210960[Paperwork for SRR 58674], 108294[PO #179 + #180], 113038[PO #179 + #180 Change Order #1], 113134[PO #NAV0000060], 115908[PO #NAV0000060 CO #1], 117303[PO #NAV0000060 CO #2], 118820[PO #179 + #180 Change Order #2], 120319 [PO #104], 122923[PO #179 Change Order #3], 124787[PO #132], 124995[PO #179 Change Order #5]

Deliverables --> Hard Copy: no EDD: -YES- PDF: -YES-

Test: E607S

Holding: 14 days from CED

Section: EXTLAB

EXTRACTION BY METHOD 607.

Cnt: 5

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
606740		1	Soil	1611090903 (IBC 7393 400-SB-14(0-153.5))	09 Nov 16	23 Nov 16
606741		1	Soil	1611090904 (IBC 7393 400-SB-14(0-153.5))	09 Nov 16	23 Nov 16
606742	MS	1	Soil	1611090905(MS) (IBC 7393 400-SB-14(0-153.5))	09 Nov 16	23 Nov 16
606743		1	Soil	1611090921 (IBC 7392 400-SB-14(0'-62'))	09 Nov 16	23 Nov 16
606744		1	Soil	1611090931 (IBC 7394 400-SB-14(62-153.5))	09 Nov 16	23 Nov 16

Test: T607W

Holding: 40 days from VTSR

Section: TDG

NDMA/DMN ANALYSIS BY GC/MS/SIM

Cnt: 5

System ID	Type	Cont	Matrix	Customer ID	VTSR	Method Date
606740		1	Soil	1611090903 (IBC 7393 400-SB-14(0-153.5))	11 Nov 16	21 Dec 16
606741		1	Soil	1611090904 (IBC 7393 400-SB-14(0-153.5))	11 Nov 16	21 Dec 16
606742	MS	1	Soil	1611090905(MS) (IBC 7393 400-SB-14(0-153.5))	11 Nov 16	21 Dec 16
606743		1	Soil	1611090921 (IBC 7392 400-SB-14(0'-62'))	11 Nov 16	21 Dec 16
606744		1	Soil	1611090931 (IBC 7394 400-SB-14(62-153.5))	11 Nov 16	21 Dec 16



WSTF CHAIN OF CUSTODY RECORD

Date 11-9-2016

Laboratory:SwRI		PO#15EC092B		Analytical Requirements					Special Instructions	
Address shipping questions to:		# of Containers	Sample Matrix*	EPA Method 607M	8 oz Glass Jar, Ice					Charge Number (WSTF Use Only)
Sample Number	Sample Location								Comments	
Address shipping questions to: <input type="checkbox"/> Lori Minnick, 575-524-5119 <input checked="" type="checkbox"/> Other <u>Tom Hall, 575-524-5453</u>									Return coolers and reusable packaging materials within 14 days as required in statement of work to: Return Address: NASA WSTF Environmental Department 12600 NASA Road; Bldg. 120 Las Cruces, NM 88012 Attn: Lori Minnick	
Send sample receipt confirmation and analytical reports to: <input type="checkbox"/> Carlyn Tufts, <u>carlyn.a.tufts@nasa.gov</u> <input type="checkbox"/> Shelly Hernandez, <u>shelly.j.hernandez@nasa.gov</u> <input checked="" type="checkbox"/> Tom Hall, <u>tom.a.hall@nasa.gov</u>										
<u>1611090903</u>	<u>IBC 7393</u> <u>400-56-14(0-1535)</u>	<u>1</u>	<u>S</u>	<u>X</u>					<u>4 IFW</u>	
<u>— 0904</u>	<u>..</u>	<u>1</u>	<u>S</u>	<u>X</u>					<u>4 IFW</u>	
<u>— 0905(MS)</u>	<u>..</u>	<u>1</u>	<u>S</u>	<u>X</u>					<u>"</u>	<u>MATRIX Spike For 1611090903</u>
<u>1611090921</u>	<u>IBC 7392</u> <u>400-56-14(0-62)</u>	<u>1</u>	<u>S</u>	<u>X</u>					<u>"</u>	
<u>1611090931</u>	<u>IBC 7394</u> <u>400-56-14(62-1535)</u>	<u>1</u>	<u>S</u>	<u>X</u>					<u>"</u>	
Relinquished By: <u>[Signature]</u>	Date/Time: <u>11-9-2016 (1030)</u>		Accepted By: <u>[Signature]</u>			Date/Time: <u>11-11-16 / 08:30</u>				

* Sample Matrix: A - Aqueous; G - Gaseous; S - Solid

Client: Navarro
 SRR # 58674
 Project # 16988.01.10X
 Case: 15EC092B
 VTSR: 11/11/16
 Sample(s) Received: Intact
 Temperature: 2.0 SN # 021055

NASA-WSTF SHIPPING DOCUMENT

DBLVE # XB47

SHIPPED FROM: NASA JSC WHITE SANDS TEST FACILITY 12600 NASA ROAD; BLDG. 120 LAS CRUCES, NEW MEXICO 88012		WSTF ORIGINATOR/MAIL CODE/TELEPHONE NO. Tom Hall 575-524-5453				
SHIP TO: (ADDRESS, PHONE#, POINT OF CONTACT) Southwest Research Institute 6220 Culebra Raod San Antonio, TX 782238 Gang Sun 210-522-3954		ORDER OR CONTRACT NUMBER Navarro PO #15EC092B		SHIPMENT CONTROL NO		
PROJECT or TASK NUMBER CP.6EE4IFW.0.71 - 16EE4IFW		SHIP VIA Fed Ex Air		DATE SHIPPED 11-10-16		
Contain Batteries NO		NO. PKG. 1		AirBill/ PRO #/Bol #		
Battery Type-Part # N/A		AUTHORIZED BY: Tom Hall		DEPT. Environmental		
ITEM NO.	EQUIPMENT CONTROL NO.	MODEL NO./ STOCK NO./ PART NO.	ITEM NAME - MANUFACTURER'S NAME AND SERIAL NO.		UNIT OF ISSUE	QTY.
1	Lot-Samples		Soil Samples Navarro PO #15EC092B Line Item #1 NDMA and Bromacil for Soil samples by method 607M		5 ea.	
JUSTIFICATION FOR SHIPMENT: (MDR #, Return Authorization #'s, Warranty Replacement, Repair, Overage/Shortage, Damage, Recycling) Sample for analysis as requested (Navarro PO #15EC092B)						
DOT HAZARDOUS MATERIALS INFO; EMERGENCY PHONE NUMBER AND GUIDE NUMBER: Not subject to regulation as a hazard material under 49 CFR.						
PROPERTY REVIEW:		<input type="checkbox"/> REMOVE EQUIPMENT TAG <input type="checkbox"/> DO NOT REMOVE EQUIPMENT TAG				
PACKED BY:		# CONTAINERS	TYPE CONTAINERS	DIMENSIONS		WEIGHT
Please check off the applicable labels! <input type="checkbox"/> FRAGILE <input checked="" type="checkbox"/> GLASS <input type="checkbox"/> DELICATE <input type="checkbox"/> DO NOT XRAY <input checked="" type="checkbox"/> REFRIGERATE <input type="checkbox"/> OTHER <input checked="" type="checkbox"/> BUBBLEWRAP <input checked="" type="checkbox"/> FOAM			Glass Containers	ea. 8 oz. Glass Jars		
		TOTAL CONTAINERS				TOTAL WEIGHT
RECEIVED BY: <i>David Harris</i>		SHIPPERS CERTIFICATION: This is to certify that the above named materials are properly classified, described, packaged, marked, labeled, and are in proper condition for transportation according to the regulations of the D.O.T. _____ Date _____				
REPRESENTING: <i>SWRI</i>						

Client: Navarro
SRR # 58674
Project # 16988.01.10X
Case: 15EC092B
VTSR: 11/11/16
Sample(s) Received: Intact
Temperature: 2.0 SN # 021055

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161111-7
NAVARRO PO #: 15EC092B

ANALYTICAL DATA REPORT SHEETS

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1611090903 (IBC 7393 400-SB-14(0-153.5))

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 606740

Batch: M607-#723

Date Received: 11/11/16

Lab File Name: A1121628.txt

Task Order: 161111-7

Date Extracted: 11/15/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 11/22/16

Dilution Factor: 1

Sample Wt/Vol: 30.01 g

Date Reported: 11/22/16

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit**J - Estimated value, greater than the MDL but less than the PQL**

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1611090904 (IBC 7393 400-SB-14(0-153.5))

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 606741

Batch: M607-#723

Date Received: 11/11/16

Lab File Name: A1121629.txt

Task Order: 161111-7

Date Extracted: 11/15/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 11/22/16

Dilution Factor: 1

Sample Wt/Vol: 30.05 g

Date Reported: 11/22/16

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1611090921 (IBC 7392 400-SB-14(0'-62'))

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 606743

Batch: M607-#723

Date Received: 11/11/16

Lab File Name: A1121631.txt

Task Order: 161111-7

Date Extracted: 11/15/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 11/22/16

Dilution Factor: 1

Sample Wt/Vol: 30.07 g

Date Reported: 11/22/16

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1611090931 (IBC 7394 400-SB-14(62-153.5))

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 606744

Batch: M607-#722

Date Received: 11/11/16

Lab File Name: A1121632.txt

Task Order: 161111-7

Date Extracted: 11/15/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 11/22/16

Dilution Factor: 1

Sample Wt/Vol: 30.02 g

Date Reported: 11/22/16

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161111-7
NAVARRO PO #: 15EC092B

QA DATA SHEETS

**(BLANK, MATRIX SPIKE, SURROGATE,
CALIBRATION)**

Southwest Research Institute

Method 607 Internal Standard Summary

Filename: A11216S2.txt
 Standard ID: IS=ING/UL
 Project: 16988.01.103

Date Analyzed: 11/22/2016
 Time Analyzed: 01:58:00
 Client: Navarro

		IS1		IS2	
		Area	RT	Area	RT
Mid Point Standard		304973	8.4	187784	15.01
Upper Limit		609946	8.73	375568	15.34
Lower Limit		152486.5	8.07	93892	14.68
Client Sample ID	Lab Sample ID				
BLANK_15NOV16	606816	266562	8.40	167405	15.02
LCS_15NOV16 LCS	606817 LCS	270975	8.40	167733	15.01
1611090903 (IBC 7393 400-SB-14(0-153.5))	606740	274552	8.40	170078	15.02
1611090904 (IBC 7393 400-SB-14(0-153.5))	606741	279375	8.40	174051	15.02
1611090905(MS) (IBC 7393 400-SB-14(0-153.5)) M	606742 MS	267674	8.40	163837	15.01
1611090921 (IBC 7392 400-SB-14(0'-62'))	606743	274276	8.40	168536	15.01
1611090931 (IBC 7394 400-SB-14(62-153.5))	606744	297256	8.40	173710	15.02

IS1 = 1,4-Dichlorobenzene-D4

IS2 = Atrazine-D5

* Flag indicating value is outside QC limits

Southwest Research Institute

Method 607 Blank Summary

Blank ID: BLANK_15NOV16

Project: 16988.01.103

Client: Navarro

SDG: 606740, 606419, 606689

Matrix: Soil

This method blank applies to the following samples, MS, and MSD's

Client Sample ID	Lab Sample ID	Date Acquired	Time Acquired
LCS_15NOV16	606817 LCS	11/22/16	03:05:00
1611090903 (IBC 7393 400-SB-14(0-153.5))	606740	11/22/16	03:39:00
1611090904 (IBC 7393 400-SB-14(0-153.5))	606741	11/22/16	04:13:00
1611090905(MS) (IBC 7393 400-SB-14(0-153.5))	606742 MS	11/22/16	04:47:00
1611090921 (IBC 7392 400-SB-14(0'-62'))	606743	11/22/16	05:21:00
1611090931 (IBC 7394 400-SB-14(62-153.5))	606744	11/22/16	05:55:00

Southwest Research Institute

Method 607 Surrogate Recovery Summary

Client: Navarro

Matrix: water & Soil SDG: 606419, 606429, 606539, 606540, 606682, 606689, 606712, 606800, 606740

Project: 16988.01.103

Client Sample ID	Lab Sample ID	N-Nitroso-di-n-propylamine	
		% Recovery	Recovery Limits
28 BLANK_15NOV16	606816	115	40-160
29 LCS_15NOV16	606817 LCS	116	40-160
30 1611090903 (IBC 7393 400-SB-14(0-153.5))	606740	107	40-160
31 1611090904 (IBC 7393 400-SB-14(0-153.5))	606741	104	40-160
32 1611090905(MS) (IBC 7393 400-SB-14(0-153.5))	606742 MS	105	40-160
33 1611090921 (IBC 7392 400-SB-14(0'-62'))	606743	100	40-160
34 1611090931 (IBC 7394 400-SB-14(62-153.5))	606744	100	40-160

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

BLANK_15NOV16

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 606816

Batch: M607-#723

Date Received: NA

Lab File Name: A1121626.txt

Task Order: NA

Date Extracted: 11/15/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 11/22/16

Dilution Factor: 1

Sample Wt/Vol: 30.02 g

Date Reported: 11/22/16

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit**J - Estimated value, greater than the MDL but less than the PQL**

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

LCS_15NOV16

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 606817 LCS

Batch: M607-#723

Date Received: NA

Lab File Name: A1121627.txt

Task Order: NA

Date Extracted: 11/15/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 11/22/16

Dilution Factor: 1

Sample Wt/Vol: 30.05 g

Date Reported: 11/22/16

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	14.51	
4164-28-7	N-Nitrodimethylamine	17.40	
314-40-9	Bromacil	23.13	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Blank Spike Recovery Report

Sample ID

LCS_15NOV16

Client: Navarro
 Batch: M607-#723
 Task Order: NA
 Matrix: Soil
 Sample Wt/Vol: 30.05 g

Project: 16988.01.103
 Date Received: NA
 Date Extracted: 11/15/16
 Date Analyzed: 11/22/16
 Date Reported: 11/22/16

Lab Sample ID: 606817 LCS
 Blank ID: BLANK_15NOV16

ANALYTE	Spike Added ng/g	Blank Conc ng/g	LCS Conc ng/g	% Recovery	QC % Recovery Limits
N-Nitrosodimethylamine	17	0	15	88	13 - 110
N-Nitrodimethylamine	17	0	17	100	30 - 150
Bromacil	17	0	23	135	40 - 190

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1611090905(MS) (IBC 7393 400-SB-14(0-153.5)) MS

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 606742 MS

Batch: M607-#723

Date Received: 11/11/16

Lab File Name: A1121630.txt

Task Order: 161111-7

Date Extracted: 11/15/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 11/22/16

Dilution Factor: 1

Sample Wt/Vol: 30.02 g

Date Reported: 11/22/16

Reporting Unit: ng/g

Compared Sample: 1611090903 (IBC 7393 400-SB-14(0-153.5))

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Spike	Recovery	Recovery Limit
62-75-9	N-Nitrosodimethylamine	14.89	17.00	88%	13-110%
4164-28-7	N-Nitrodimethylamine	17.39	17.00	102%	30-150%
314-40-9	Bromacil	24.18	17.00	142%	40-190%

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Continuing Calibration Check Sheet

SwRI Project #:	01.16988.01.103	Calibration Date:	11/22/16
Sponsor:	Navarro	Analytical Method:	TAP-01-0408-031
SwRI Standard ID:	202-04-120408017	Std Concentration:	1 µg/mL
File ID #:	A11216S2	Initial Calibration Date:	10/17/16

ANALYTE	Mean RRF	RRF	% Dif.
N-Nitrosodimethylamine	0.361	0.388	-7.6
N-Nitrodimethylamine	0.13	0.138	-6.4
N-Nitroso-di-n-propylamine-d14	0.127	0.133	-4.1
Bromacil	1.161	1.057	8.9

Southwest Research Institute

Initial Calibration Data Sheet

SwRI Project #:	01.16988.01.103	Calibration Data:	10/17/16
Sponsor:	Navarro	Analytical Method:	TAP-01-0408-031
SwRI Standard ID:	202-04-120408017	Std Concentration:	0.01-10 µg/mL

ANALYTE	RRF 0.01	RRF 0.05	RRF 0.2	RRF1	RRF5	RRF10	Ave. RRF	RSD%
N-Nitrosodimethylamine	0.291	0.308	0.352	0.369	0.417	0.430	0.361	15.49
N-Nitrodimethylamine	0.109	0.115	0.128	0.134	0.147	0.148	0.13	12.44
N-Nitroso-di-n-propylamine-d14	0.114	0.111	0.124	0.127	1.143	0.145	0.127	11.03
Bromacil	1.435	1.048	1.072	1.081	1.150	1.177	1.161	12.35

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161111-7
NAVARRO PO #: 15EC092B

EXTRACTION AND INJECTION LOG

SwRI Labs
 Client: Navarro
 Project: 16988.01.10X
 Case: 15EC092B

(E607S) SOIL Extraction By Soxhlet 3540C (Navarro)

Sample Receipt: 58674
 TO#: 161111-7

DATE EXTRACTED	11/15/16	ADDITIONAL NOTES	1.Soxhlet extraction began at 4:00pm and ended the following day at 10:00am. 2.BLANK(606816) and LCS(606817) are shared with page 503 of this book.
ANALYSTS INVOLVED	Hamed Edrisi (SU,SP) Christina Menn (SU,BD,QT,FV) Marina Lebron (SU,SW,Conc,QT)	EXTRACTION FLOWCHART	Xg >>> FV 1000uL DCM
SURROGATE SOL ID	203-01-120408017@5.0ng/uL	REFERENCE BOOK &PAGE	16-0402-032 P46
MTX SPK SOL ID	201-01-120408017@10.0ng/uL	TAP(S) USED	01-0402-152
EXTRACTS LOCATION	Tracked by LIMS (11/18/16 CM)		
CHEMICAL, BRAND & LOT#	Sodium Sulfate ID:04-0402-004p27A DCM Fisher Optima Lot #164214		
NOTES	Hamilton Co. Syringes: 100uL ID:462905(SURR) 50uL ID:462898(MS) Balance #14 was used.		

System ID	Type	Customer ID	SOLVENT VOL DCM (ML)	SAMPLE WT
1	606740	1611090903 (IBC 7393 400-SB-14(	250	30.01 g
2	606741	1611090904 (IBC 7393 400-SB-14(	250	30.05 g
3	606742 MS	1611090905(MS) (IBC 7393 400-SB	250	30.02 g
4	606743	1611090921 (IBC 7392 400-SB-14(	250	30.07 g
5	606744	1611090931 (IBC 7394 400-SB-14(	250	30.02 g
6	606816	BLANK_15NOV16	250	30.02 g
7	606817	LCS_15NOV16	250	30.05 g

System ID	Type	Customer ID	SURROGATE SOL VOL	MTX SPK SOL VOL
1	606740	1611090903 (IBC 7393 400-SB-14(	100 uL	0 uL
2	606741	1611090904 (IBC 7393 400-SB-14(	100 uL	0 uL
3	606742 MS	1611090905(MS) (IBC 7393 400-SB	100 uL	50 uL
4	606743	1611090921 (IBC 7392 400-SB-14(	100 uL	0 uL
5	606744	1611090931 (IBC 7394 400-SB-14(	100 uL	0 uL
6	606816	BLANK_15NOV16	100 uL	0 uL
7	606817	LCS_15NOV16	100 uL	50 uL

System ID	Type	Customer ID	FV DCM
1	606740	1611090903 (IBC 7393 400-SB-14(	1000 uL
2	606741	1611090904 (IBC 7393 400-SB-14(	1000 uL
3	606742 MS	1611090905(MS) (IBC 7393 400-SB	1000 uL
4	606743	1611090921 (IBC 7392 400-SB-14(	1000 uL
5	606744	1611090931 (IBC 7394 400-SB-14(	1000 uL
6	606816	BLANK_15NOV16	1000 uL
7	606817	LCS_15NOV16	1000 uL

SOUTHWEST RESEARCH INSTITUTE®

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Chemistry and Chemical Engineering Division
Department of Analytical & Environmental Chemistry

December 8, 2016

Navarro Research and Engineering Inc.
NASA - JSC - White Sands Test Facility
Transportation Officer, Building 120
12600 NASA Road
Las Cruces, NM 88012
Tel. 575-524-5452

Attention: Tom Hall

Subject: Reports for Batch-607-#725-T for NDMA/DMN Analysis of water & Soil Samples

SwRI Project #: 01.16988.103

SwRI Task Orders: **161122-9, 161122-10**

Navarro P.O. #: 15EC092B, 16EC034-C1

Dear Tom,

Enclosed please find the analytical reports for Batch-607- #725-T-Navarro of water & soil samples.


Southwest Research Institute appreciates the opportunity to provide the service to Navarro Research and Engineering Inc.. If you have any questions, please do not hesitate to call me at 210-522-3954.

Sincerely,



Gang Sun, Ph.D.
Program Manager

APPROVAL:



Michael Dammann
Director



CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161122-9, 161122-10
NAVARRO PO #: 15EC092B,16EC034-C1

NARRATIVE

(M-607 - #725-T-Navarro)

Total Page Count: 010001 -
Fraction: M607 Pages: 010044
for NDMA/DMN

CLIENT: NAVARRO
SwRI PROJECT: 01.16988.01.103
BATCH #: Batch-607-#725-T
TASK ORDER: 161122-9, 161122-10
CLIENT PO#: 15EC092B, 16EC034-C1
REPORT DATA: 12/08/2016

NARRATIVE FOR NDMA/ DMN/BROMACIL ANALYSIS

1. Samples were extracted with dichloromethane (DCM) and analyzed by GC/MS in selective ion monitoring mode for N-Nitrosodimethylamine (NDMA), N-Nitrodimethylamine (DMN) and Bromacil according to the modified Method 607.
2. All water samples were extracted within 7 days and soil samples within 14 days of sample collection and were analyzed within 40 days of the extraction.
3. The response factor (RF) values for Calibration curve and/or for continuing calibration standard were less than 25 % for all target compounds. The water sample reporting limit is 0.01 ppb for 1-L extraction of aqueous samples. The sample reporting limit is 0.33 ng/g for 30g extraction of soil samples.
4. Lab control spike for aqueous samples at 0.50 µg/L level were extracted and analyzed. Lab control spike for soil samples at 17 µg/g level were extracted and analyzed. The recoveries for all target compounds were within method recovery criteria of 13-110% for NDMA, 30-150% for DMN, and 40-190% for Bromacil.
4. Surrogate compound was spiked into all samples before sample extraction at 0.50 µg/L level for final extracts. The surrogate recoveries for all samples were within method recovery criteria of 40-160%.
5. Laboratory solvent blanks were extracted and analyzed for every sample batch. No analytes were detected above report limits from the blanks.
6. A "J" value was reported if the associated value was below reporting limits but above the MDL value.
7. All analyte concentrations are expressed in µg/L (*ppb*). Sample calculation:

$$\text{Concentration } (\mu\text{g/L}) = \frac{C \text{ (ng/}\mu\text{L)} \times V_{\text{extr}} \text{ (}\mu\text{L)} \times \text{DF}}{V_{\text{samp}} \text{ (mL)}} \times \frac{1000 \text{ mL}}{1 \text{ L}} \times \frac{1 \mu\text{g}}{1000 \text{ ng}}$$

where: C = result of GC/MS analysis, in ng/µL
 V_{extr} = final volume of sample extract, in µL
 V_{samp} = sample volume taken for extraction, in mL
 DF = dilution factor, if any

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161122-9, 161122-10
NAVARRO PO #: 15EC092B,16EC034-C1

TASK ORDER AND CHAIN OF CUSTODY

Southwest Research Institute

Laboratory Task Order

TO #: 161122-9 Revision: 1

SDG: 607071

SRR #s: 58711
Client(s): NavarroProject(s): 16988.01.10X
Manager(s): SUN, GANG
To Client: 12/13/16**Instructions**

Documents Related to this task order: 211505[COC for SRR 58711], 211506[Paperwork for SRR 58711], 108294[PO #179 + #180], 113038[PO #179 + #180 Change Order #1], 113134[PO #NAV0000060], 115908[PO #NAV0000060 CO #1], 117303[PO #NAV0000060 CO #2], 118820[PO #179 + #180 Change Order #2], 120319 [PO #104], 122923[PO #179 Change Order #3], 124787[PO #132], 124995[PO #179 Change Order #5]

Deliverables --> Hard Copy: no EDD: -YES- PDF: -YES-

Test: E607W

Holding: 7 days from CED

Section: EXTLAB

EXTRACTION BY METHOD 607

Cnt: 6

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
607071		1	Aqueous	1611181118 (400-SB-10)	18 Nov 16	25 Nov 16
607072		1	Aqueous	1611181119 (400-SB-10)	18 Nov 16	25 Nov 16
607073	MS	1	Aqueous	1611181120 (400-SB-10)	18 Nov 16	25 Nov 16
607074		1	Aqueous	1611181143 (400-SB-12)	18 Nov 16	25 Nov 16
607075		1	Aqueous	1611181144 (400-SB-12)	18 Nov 16	25 Nov 16
607076	MS	1	Aqueous	1611181145 (400-SB-12)	18 Nov 16	25 Nov 16

Test: T607W

Holding: 40 days from VTSR

Section: TDG

NDMA/DMN ANALYSIS BY GC/MS/SIM

Cnt: 6

System ID	Type	Cont	Matrix	Customer ID	VTSR	Method Date
607071		1	Aqueous	1611181118 (400-SB-10)	22 Nov 16	01 Jan 17
607072		1	Aqueous	1611181119 (400-SB-10)	22 Nov 16	01 Jan 17
607073	MS	1	Aqueous	1611181120 (400-SB-10)	22 Nov 16	01 Jan 17
607074		1	Aqueous	1611181143 (400-SB-12)	22 Nov 16	01 Jan 17
607075		1	Aqueous	1611181144 (400-SB-12)	22 Nov 16	01 Jan 17
607076	MS	1	Aqueous	1611181145 (400-SB-12)	22 Nov 16	01 Jan 17



Date: November 18, 2016

Page 1 of 1

Laboratory PO #15EC092B & 16ECO34		Analytical Requirements				Special Instructions
Return Address for Analytical Reports		# of Containers	Sample Type: Aqueous (A); Slurry (S)	EPA method 607M 1 liter glass amber bottle Ice	EPA method 607M 8 oz Amber Glass Jar, Ice	Comments
Sample No.	Sample Location					
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012 Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453						Please return coolers and reusable packaging materials as soon as possible. Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall
						* Bill to 15EC092B ** Bill to 16ECO34
1611181118*	400-SB-10	1	A	X		
1611181119*	400-SB-10	1	A	X		
1611181120*	400-SB-10	1	A	X		Matrix Spike for 1611181118
1611181127**	400-SB-10	1	S		X	
1611181128**	400-SB-10	1	S		X	
1611181129**	400-SB-10	1	S		X	Matrix Spike for 1611181127
1611181143*	400-SB-12	1	A	X		
1611181144*	400-SB-12	1	A	X		
1611181145*	400-SB-12	1	A	X		Matrix Spike for 1611181143
1611181152**	400-SB-12	1	S		X	
1611181153**	400-SB-12	1	S		X	
1611181154**	400-SB-12	1	S		X	Matrix Spike for 1611181152
Relinquished By:		Date/Time:		Accepted By:		Date/Time:
Sten Morales		11/21/16 11:00		David Navar		11-22-16/08:30

WSTF - 381C (02/15)

Client: Navarro
 SRR # 58711
 Project # 16988.01.10X
 Case: 15EC092B
 VTSR: 11/22/16
 Sample(s) Received: Intact
 Temperature: 2.0 SN # 021055

NASA-WSTF SHIPPING DOCUMENT

DBwe #XB13

SHIPPED FROM: NASA JSC WHITE SANDS TEST FACILITY 12600 NASA ROAD; BLDG. 120 LAS CRUCES, NEW MEXICO 88012		WSTF ORIGINATOR/MAIL CODE/TELEPHONE NO. Tom Hall 575-524-5453			
SHIP TO: (ADDRESS, PHONE#, POINT OF CONTACT) Southwest Research Institute 6220 Culebra Road San Antonio, TX 782238 Gang Sun 210-522-3954		ORDER OR CONTRACT NUMBER Navarro PO #15EC092B	SHIPMENT CONTROL NO.		
PROJECT or TASK NUMBER CP.6EE4IFW.0.71		SHIP VIA Fed Ex Air			
Contain Batteries NO	NO. PKG. 1	DATE SHIPPED 11/21/2016	AirBill/ PRO #/Bol #		
Battery Type-Part # N/A	AUTHORIZED BY: Tom Hall	DEPT. Environmental			
ITEM NO.	EQUIPMENT CONTROL NO.	MODEL NO./ STOCK NO./ PART NO.	ITEM NAME - MANUFACTURER'S NAME AND SERIAL NO.	UNIT OF ISSUE	QTY.
			Navarro PO #15EC092B: Line Item #1 NDMA and Bromacil for Aqueous samples by method 607M	ea.	6
			Navarro PO #16ECO34: Line Item #1 NDMA and Bromacil for Mixed Media samples by method 607M	ea.	6
JUSTIFICATION FOR SHIPMENT: (MDR #, Return Authorization #'s, Warranty Replacement, Repair, Overage/Shortage, Damage, Recycling) Sample for analysis as requested (Navarro PO #15EC092B)					
DOT HAZARDOUS MATERIALS INFO; EMERGENCY PHONE NUMBER AND GUIDE NUMBER: Not subject to regulation as a hazard material under 49 CFR.					
PROPERTY REVIEW:		<input type="checkbox"/> REMOVE EQUIPMENT TAG <input type="checkbox"/> DO NOT REMOVE EQUIPMENT TAG			
PACKED BY:	# CONTAINERS	TYPE CONTAINERS	DIMENSIONS	WEIGHT	
Please check off the applicable labels! <input type="checkbox"/> FRAGILE <input checked="" type="checkbox"/> GLASS <input type="checkbox"/> DELICATE <input type="checkbox"/> DO NOT XRAY <input checked="" type="checkbox"/> REFRIGERATE <input type="checkbox"/> OTHER <input checked="" type="checkbox"/> BUBBLEWRAP <input checked="" type="checkbox"/> FOAM	6	Glass	1 liter Glass Bottle		
	6	Glass	8 oz. Glass Jar		
	TOTAL CONTAINERS	12			TOTAL WEIGHT
RECEIVED BY: <i>David Gann</i>	SHIPPERS CERTIFICATION:		This is to certify that the above named materials are properly classified, described, packaged, marked, labeled, and are in proper condition for transportation according to the regulations of the D.O.T. Date _____		
REPRESENTING: <i>Suelli</i>					

Client: Navarro
SRR # 58711
Project # 16988.01.10X
Case: 15EC092B
VTSR: 11/22/16
Sample(s) Received: Intact
Temperature: 2.0 SN # 021055

Southwest Research Institute

Laboratory Task Order

TO #: 161122-10 Revision: 0

SDG: 607081

SRR #'s: 58713
Client(s): NavarroProject(s): 16988.01.10X
Manager(s): SUN, GANG
To Client: 12/13/16**Instructions**

Documents Related to this task order: 211512[COC for SRR 58713], 211513[Paperwork for SRR 58713], 108294[PO #179 + #180], 113038[PO #179 + #180 Change Order #1], 113134[PO #NAV0000060], 115908[PO #NAV0000060 CO #1], 117303[PO #NAV0000060 CO #2], 118820[PO #179 + #180 Change Order #2], 120319 [PO #104], 122923[PO #179 Change Order #3], 124787[PO #132], 124995[PO #179 Change Order #5]

Deliverables --> Hard Copy: no EDD: -YES- PDF: -YES-

Test: E607S

Holding: 14 days from CED

Section: EXTLAB

EXTRACTION BY METHOD 607.

Cnt: 6

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
607081		1	Soil	1611181127 (400-SB-10)	18 Nov 16	02 Dec 16
607082		1	Soil	1611181128 (400-SB-10)	18 Nov 16	02 Dec 16
607083	MS	1	Soil	1611181129 (400-SB-10)	18 Nov 16	02 Dec 16
607084		1	Soil	1611181152 (400-SB 12)	18 Nov 16	02 Dec 16
607085		1	Soil	1611181153 (400-SB-12)	18 Nov 16	02 Dec 16
607086	MS	1	Soil	1611181154 (400-SB-12)	18 Nov 16	02 Dec 16

Test: E607W

Holding: 7 days from CED

Section: EXTLAB

EXTRACTION BY METHOD 607

Cnt: 6

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
607081		1	Soil	1611181127 (400-SB-10)	18 Nov 16	25 Nov 16
607082		1	Soil	1611181128 (400-SB-10)	18 Nov 16	25 Nov 16
607083	MS	1	Soil	1611181129 (400-SB-10)	18 Nov 16	25 Nov 16
607084		1	Soil	1611181152 (400-SB 12)	18 Nov 16	25 Nov 16
607085		1	Soil	1611181153 (400-SB-12)	18 Nov 16	25 Nov 16
607086	MS	1	Soil	1611181154 (400-SB-12)	18 Nov 16	25 Nov 16

Test: T607W

Holding: 40 days from VTSR

Section: TDG

NDMA/DMN ANALYSIS BY GC/MS/SIM

Cnt: 6

System ID	Type	Cont	Matrix	Customer ID	VTSR	Method Date
607081		1	Soil	1611181127 (400-SB-10)	22 Nov 16	01 Jan 17
607082		1	Soil	1611181128 (400-SB-10)	22 Nov 16	01 Jan 17
607083	MS	1	Soil	1611181129 (400-SB-10)	22 Nov 16	01 Jan 17
607084		1	Soil	1611181152 (400-SB 12)	22 Nov 16	01 Jan 17
607085		1	Soil	1611181153 (400-SB-12)	22 Nov 16	01 Jan 17
607086	MS	1	Soil	1611181154 (400-SB-12)	22 Nov 16	01 Jan 17



Date: November 18, 2016

Page 1 of 1

Laboratory PO #15EC092B & 16ECO34 . 16ECO34-C1		Analytical Requirements				Special Instructions
Return Address for Analytical Reports		# of Containers	Sample Type: Aqueous (A); Slurry (S)	EPA method 607M 1 liter glass amber bottle Ice	EPA method 607M 8 oz Amber Glass Jar, Ice	Comments
Sample No.	Sample Location					
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012 Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453						Please return coolers and reusable packaging materials as soon as possible. Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall
						* Bill to 15EC092B ** Bill to 16ECO34
1611181118*	400-SB-10	1	A	X		
1611181119*	400-SB-10	1	A	X		
1611181120*	400-SB-10	1	A	X		Matrix Spike for 1611181118
1611181127**	400-SB-10	1	S		X	
1611181128**	400-SB-10	1	S		X	
1611181129**	400-SB-10	1	S		X	Matrix Spike for 1611181127
1611181143*	400-SB-12	1	A	X		
1611181144*	400-SB-12	1	A	X		
1611181145*	400-SB-12	1	A	X		Matrix Spike for 1611181143
1611181152**	400-SB-12	1	S		X	
1611181153**	400-SB-12	1	S		X	
1611181154**	400-SB-12	1	S		X	Matrix Spike for 1611181152
Relinquished By:		Date/Time:		Accepted By:		Date/Time:
Stan Masters		11/21/16 11:00		David Ramo		11-22-16 / 08:30

WSTF - 381C (02/15)

Client: Navarro
 SRR # 58713
 Project # 16988.01.10X
 Case: 16ECO34
 VTSR: 11/22/16
 Sample(s) Received: Intact
 Temperature: 2.0 SN # 021055

NASA-WSTF SHIPPING DOCUMENT

DBWE #XB13

SHIPPED FROM: NASA JSC WHITE SANDS TEST FACILITY 12600 NASA ROAD; BLDG. 120 LAS CRUCES, NEW MEXICO 88012			WSTF ORIGINATOR/MAIL CODE/TELEPHONE NO. Tom Hall 575-524-5453			
SHIP TO: (ADDRESS, PHONE#, POINT OF CONTACT) Southwest Research Institute 6220 Culebra Road San Antonio, TX 782238 Gang Sun 210-522-3954			ORDER OR CONTRACT NUMBER Navarro PO #15EC092B		SHIPMENT CONTROL NO	
PROJECT or TASK NUMBER CP.6EE4IFW.0.71			SHIP VIA Fed Ex Air			
Contain-Batteries NO		NO. PKG. 1	DATE SHIPPED 11/21/2016	AirBill/ PRO #/Bol #		
Battery Type-Part # N/A		AUTHORIZED BY: Tom Hall		DEPT. Environmental		
ITEM NO.	EQUIPMENT CONTROL NO.	MODEL NO./ STOCK NO./ PART NO.	ITEM NAME - MANUFACTURER'S NAME AND SERIAL NO.		UNIT OF ISSUE	QTY.
			Navarro PO #15EC092B: Line Item #1 NDMA and Bromacil for Aqueous samples by method 607M Navarro PO #16ECO34: Line Item #1 NDMA and Bromacil for Mixed Media samples by method 607M		ea.	6
					ea.	6
JUSTIFICATION FOR SHIPMENT: (MDR #, Return Authorization #'s, Warranty Replacement, Repair, Overage/Shortage, Damage, Recycling) Sample for analysis as requested (Navarro PO #15EC092B)						
DOT HAZARDOUS MATERIALS INFO; EMERGENCY PHONE NUMBER AND GUIDE NUMBER: Not subject to regulation as a hazard material under 49 CFR.						
PROPERTY REVIEW:		<input type="checkbox"/> REMOVE EQUIPMENT TAG <input type="checkbox"/> DO NOT REMOVE EQUIPMENT TAG				
PACKED BY:		# CONTAINERS	TYPE CONTAINERS	DIMENSIONS		WEIGHT
Please check off the applicable labels: <input type="checkbox"/> FRAGILE <input checked="" type="checkbox"/> GLASS <input type="checkbox"/> DELICATE <input type="checkbox"/> DO NOT XRAY <input checked="" type="checkbox"/> REFRIGERATE <input type="checkbox"/> OTHER <input checked="" type="checkbox"/> BUBBLEWRAP <input checked="" type="checkbox"/> FOAM		6	Glass	1 liter Glass Bottle		
		6	Glass	8 oz. Glass Jar		
		TOTAL CONTAINERS				TOTAL WEIGHT
		12				
RECEIVED BY: <i>David Gamm</i>		SHIPPERS CERTIFICATION: This is to certify that the above named materials are properly classified, described, packaged, marked, labeled, and are in proper condition for transportation according to the regulations of the D.O.T. Date				
REPRESENTING: <i>SWRI</i>						

Client: Navarro
SRR # 58713
Project # 16988.01.10X
Case: 16EC034
VTSR: 11/22/16
Sample(s) Received: Intact
Temperature: 2.0 SN # 021055

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161122-9, 161122-10
NAVARRO PO #: 15EC092B,16EC034-C1

ANALYTICAL DATA REPORT SHEETS

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

161181118 (400-SB-10)

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607071

Batch: M607-#725-T

Date Received: 11/22/16

Lab File Name: A1206625.txt

Task Order: 161122-9

Date Extracted: 11/23/16

Final Extraction Vol: 1000 uL

Matrix: Aqueous

Date Analyzed: 12/07/16

Dilution Factor: 1

Sample Wt/Vol: 1000 mL

Date Reported: 12/08/16

Reporting Unit: µg/L

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.01	U
4164-28-7	N-Nitrodimethylamine	0.10	
314-40-9	Bromacil	<0.01	U

U - Undetected, indicates not found above the detection limit**J - Estimated value, greater than the MDL but less than the PQL**

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1611181119 (400-SB-10)

Client: Navarro
Batch: M607-#725-T
Task Order: 161122-9
Matrix: Aqueous
Sample Wt/Vol: 1000 mL

Project: 16988.01.103
Date Received: 11/22/16
Date Extracted: 11/23/16
Date Analyzed: 12/07/16
Date Reported: 12/08/16

Lab Sample ID: 607072
Lab File Name: A1206626.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: µg/L
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.01	U
4164-28-7	N-Nitrodimethylamine	0.10	
314-40-9	Bromacil	<0.01	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

161181143 (400-SB-12)

Client: Navarro
 Batch: M607-#725-T
 Task Order: 161122-9
 Matrix: Aqueous
 Sample Wt/Vol: 990 mL

Project: 16988.01.103
 Date Received: 11/22/16
 Date Extracted: 11/23/16
 Date Analyzed: 12/07/16
 Date Reported: 12/08/16

Lab Sample ID: 607074
 Lab File Name: A1206628.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: µg/L
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.01	U
4164-28-7	N-Nitrodimethylamine	<0.01	U
314-40-9	Bromacil	<0.01	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1611181144 (400-SB-12)

Client: Navarro
Batch: M607-#725-T
Task Order: 161122-9
Matrix: Aqueous
Sample Wt/Vol: 990 mL

Project: 16988.01.103
Date Received: 11/22/16
Date Extracted: 11/23/16
Date Analyzed: 12/07/16
Date Reported: 12/08/16

Lab Sample ID: 607075
Lab File Name: A1206629.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: µg/L
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.01	U
4164-28-7	N-Nitrodimethylamine	<0.01	U
314-40-9	Bromacil	<0.01	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1611181127 (400-SB-10)

Client: Navarro
Batch: M607-#725-T
Task Order: 161122-10
Matrix: Soil
Sample Wt/Vol: 31.39 g

Project: 16988.01.103
Date Received: 11/22/16
Date Extracted: 11/23/16
Date Analyzed: 12/07/16
Date Reported: 12/08/16

Lab Sample ID: 607081
Lab File Name: A1206647.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: ng/g
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.32	U
4164-28-7	N-Nitrodimethylamine	<0.32	U
314-40-9	Bromacil	<0.32	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1611181128 (400-SB-10)

Client: Navarro
Batch: M607-#725-T
Task Order: 161122-10
Matrix: Soil
Sample Wt/Vol: 30.57 g

Project: 16988.01.103
Date Received: 11/22/16
Date Extracted: 11/23/16
Date Analyzed: 12/07/16
Date Reported: 12/08/16

Lab Sample ID: 607082
Lab File Name: A1206648.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: ng/g
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1611181152 (400-SB 12)

Client: Navarro
 Batch: M607-#725-T
 Task Order: 161122-10
 Matrix: Soil
 Sample Wt/Vol: 31.94 g

Project: 16988.01.103
 Date Received: 11/22/16
 Date Extracted: 11/23/16
 Date Analyzed: 12/07/16
 Date Reported: 12/08/16

Lab Sample ID: 607084
 Lab File Name: A1206650.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.31	U
4164-28-7	N-Nitrodimethylamine	<0.31	U
314-40-9	Bromacil	<0.31	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1611181153 (400-SB-12)

Client: Navarro
 Batch: M607-#725-T
 Task Order: 161122-10
 Matrix: Soil
 Sample Wt/Vol: 31.80 g

Project: 16988.01.103
 Date Received: 11/22/16
 Date Extracted: 11/23/16
 Date Analyzed: 12/07/16
 Date Reported: 12/08/16

Lab Sample ID: 607085
 Lab File Name: A1206651.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	0.16	J
4164-28-7	N-Nitrodimethylamine	<0.31	U
314-40-9	Bromacil	<0.31	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161122-9, 161122-10
NAVARRO PO #: 15EC092B,16EC034-C1

QA DATA SHEETS

**(BLANK, MATRIX SPIKE, SURROGATE,
CALIBRATION)**

Southwest Research Institute

Method 607 Internal Standard Summary

Filename: A12066S2.txt
 Standard ID: IS=1NG/UL
 Project: 16988.01.103

Date Analyzed: 12/07/2016
 Time Analyzed: 08:37:00
 Client: Navarro

		IS1		IS2	
		Area	RT	Area	RT
Mid Point Standard		281636	8.41	156295	15.02
Upper Limit		563272	8.74	312590	15.35
Lower Limit		140818	8.08	78147.5	14.69
Client Sample ID	Lab Sample ID				
BLANK_23NOV16	607195	233575	8.40	131352	15.02
LCS_23NOV16 LCS	607196 LCS	239160	8.40	132664	15.01
1611181127 (400-SB-10)	607081	242856	8.40	134971	15.02
1611181128 (400-SB-10)	607082	248413	8.40	138853	15.02
1611181129 (400-SB-10) MS	607083 MS	260217	8.40	137466	15.02
1611181152 (400-SB 12)	607084	260927	8.40	143055	15.02
1611181153 (400-SB-12)	607085	249156	8.40	142073	15.02
1611181154 (400-SB-12) MS	607086 MS	261328	8.40	139117	15.02

IS1 = 1,4-Dichlorobenzene-D4

IS2 = Atrazine-D5

* Flag indicating value is outside QC limits

Southwest Research Institute

Method 607 Internal Standard Summary

Filename: A12066S1.txt
 Standard ID: IS=1NG/UL
 Project: 16988.01.103

Date Analyzed: 12/06/2016
 Time Analyzed: 02:58:00
 Client: Navarro

		IS1		IS2	
		Area	RT	Area	RT
Mid Point Standard		292136	8.42	156851	15.03
Upper Limit		584272	8.75	313702	15.36
Lower Limit		146068	8.09	78425.5	14.7
Client Sample ID	Lab Sample ID				
BLANK_23NOV16	607159	222943	8.41	125186	15.02
LCS_23NOV16 LCS	607160 LCS	226859	8.41	124143	15.02
161181118 (400-SB-10)	607071	230203	8.41	123356	15.02
161181119 (400-SB-10)	607072	242024	8.41	126552	15.02
161181120 (400-SB-10) MS	607073 MS	247169	8.41	138246	15.02
161181143 (400-SB-12)	607074	253628	8.41	133983	15.03
161181144 (400-SB-12)	607075	240599	8.41	125396	15.03
161181145 (400-SB-12) MS	607076 MS	261321	8.41	143279	15.03

IS1 = 1,4-Dichlorobenzene-D4

IS2 = Atrazine-D5

* Flag indicating value is outside QC limits

Southwest Research Institute

Method 607 Blank Summary

Blank ID: BLANK_23NOV16

Project: 16988.01.103

Client: Navarro

SDG: 607081

Matrix: Soil

This method blank applies to the following samples, MS, and MSD's

Client Sample ID	Lab Sample ID	Date Acquired	Time Acquired
LCS_23NOV16	607196 LCS	12/07/16	17:42:00
1611181127 (400-SB-10)	607081	12/07/16	18:16:00
1611181128 (400-SB-10)	607082	12/07/16	18:50:00
1611181129 (400-SB-10)	607083 MS	12/07/16	19:24:00
1611181152 (400-SB 12)	607084	12/07/16	19:58:00
1611181153 (400-SB-12)	607085	12/07/16	20:32:00
1611181154 (400-SB-12)	607086 MS	12/07/16	21:06:00

Southwest Research Institute

Method 607 Blank Summary

Blank ID: BLANK_23NOV16

Project: 16988.01.103

Client: Navarro

SDG: 607071

Matrix: Aqueous

This method blank applies to the following samples, MS, and MSD's

Client Sample ID	Lab Sample ID	Date Acquired	Time Acquired
LCS_23NOV16	607160 LCS	12/06/16	19:29:00
1611181118 (400-SB-10)	607071	12/07/16	05:11:00
1611181119 (400-SB-10)	607072	12/07/16	05:46:00
1611181120 (400-SB-10)	607073 MS	12/07/16	06:20:00
1611181143 (400-SB-12)	607074	12/07/16	06:54:00
1611181144 (400-SB-12)	607075	12/07/16	07:29:00
1611181145 (400-SB-12)	607076 MS	12/07/16	08:03:00

Southwest Research Institute

Method 607 Surrogate Recovery Summary

Client: Navarro

Matrix: Soil, *Aqueous*

SDG: 607071, 607081

Project: 16988.01.103

Client Sample ID	Lab Sample ID	N-Nitroso-di-n-propylamine	
		% Recovery	Recovery Limits
3 BLANK_23NOV16	607159	106	40-160
4 LCS_23NOV16	607160 LCS	108	40-160
5 1611181118 (400-SB-10)	607071	111	40-160
6 1611181119 (400-SB-10)	607072	111	40-160
7 1611181120 (400-SB-10)	607073 MS	110	40-160
8 1611181143 (400-SB-12)	607074	105	40-160
9 1611181144 (400-SB-12)	607075	117	40-160
10 1611181145 (400-SB-12)	607076 MS	104	40-160
11 BLANK_23NOV16	607195	116	40-160
12 LCS_23NOV16	607196 LCS	108	40-160
13 1611181127 (400-SB-10)	607081	108	40-160
14 1611181128 (400-SB-10)	607082	107	40-160
15 1611181129 (400-SB-10)	607083 MS	109	40-160
16 1611181152 (400-SB 12)	607084	101	40-160
17 1611181153 (400-SB-12)	607085	101	40-160
18 1611181154 (400-SB-12)	607086 MS	98	40-160

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

BLANK_23NOV16

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607159

Batch: M607-#725-T

Date Received: NA

Lab File Name: A1206607.txt

Task Order: NA

Date Extracted: 11/23/16

Final Extraction Vol: 1000 uL

Matrix: Aqueous

Date Analyzed: 12/06/16

Dilution Factor: 1

Sample Wt/Vol: 1000 mL

Date Reported: 12/08/16

Reporting Unit: µg/L

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.01	U
4164-28-7	N-Nitrodimethylamine	<0.01	U
314-40-9	Bromacil	<0.01	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

LCS_23NOV16

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607160 LCS

Batch: M607-#725-T

Date Received: NA

Lab File Name: A1206608.txt

Task Order: NA

Date Extracted: 11/23/16

Final Extraction Vol: 1000 uL

Matrix: Aqueous

Date Analyzed: 12/06/16

Dilution Factor: 1

Sample Wt/Vol: 1000 mL

Date Reported: 12/08/16

Reporting Unit: µg/L

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	0.20	
4164-28-7	N-Nitrodimehylamine	0.38	
314-40-9	Bromacil	0.64	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Blank Spike Recovery Report

Sample ID

LCS_23NOV16

Client: Navarro
 Batch: M607-#725-T
 Task Order: NA
 Matrix: Aqueous
 Sample Wt/Vol: 1000 mL

Project: 16988.01.103
 Date Received: NA
 Date Extracted: 11/23/16
 Date Analyzed: 12/06/16
 Date Reported: 12/08/16

Lab Sample ID: 607160 LCS
 Blank ID: BLANK_23NOV16

ANALYTE	Spike Added μg/L	Blank Conc μg/L	LCS Conc μg/L	% Recovery	QC % Recovery Limits
N-Nitrosodimethylamine	0.50	0	0.20	40	13 - 110
N-Nitrodimethylamine	0.50	0	0.38	76	30 - 150
Bromacil	0.50	0	0.64	128	40 - 190

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1611181120 (400-SB-10) MS

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607073 MS

Batch: M607-#725-T

Date Received: 11/22/16

Lab File Name: A1206627.txt

Task Order: 161122-9

Date Extracted: 11/23/16

Final Extraction Vol: 1000 uL

Matrix: Aqueous

Date Analyzed: 12/07/16

Dilution Factor: 1

Sample Wt/Vol: 1000 mL

Date Reported: 12/08/16

Reporting Unit: µg/L

Compared Sample: 1611181118 (400-SB-10)

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Spike	Recovery	Recovery Limit
62-75-9	N-Nitrosodimethylamine	0.17	0.50	34%	13-110%
4164-28-7	N-Nitrodimethylamine	0.46	0.50	73%	30-150%
314-40-9	Bromacil	0.66	0.50	132%	40-190%

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1611181145 (400-SB-12) MS

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607076 MS

Batch: M607-#725-T

Date Received: 11/22/16

Lab File Name: A1206630.txt

Task Order: 161122-9

Date Extracted: 11/23/16

Final Extraction Vol: 1000 uL

Matrix: Aqueous

Date Analyzed: 12/07/16

Dilution Factor: 1

Sample Wt/Vol: 1000 mL

Date Reported: 12/08/16

Reporting Unit: µg/L

Compared Sample: 1611181143 (400-SB-12)

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Spike	Recovery	Recovery Limit
62-75-9	N-Nitrosodimethylamine	0.17	0.50	33%	13-110%
4164-28-7	N-Nitrodimethylamine	0.35	0.50	71%	30-150%
314-40-9	Bromacil	0.66	0.50	133%	40-190%

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

BLANK_23NOV16

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607195

Batch: M607-#725-T

Date Received: NA

Lab File Name: A1206645.txt

Task Order: NA

Date Extracted: 11/23/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/07/16

Dilution Factor: 1

Sample Wt/Vol: 30.55 g

Date Reported: 12/08/16

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

LCS_23NOV16

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607196 LCS

Batch: M607-#725-T

Date Received: NA

Lab File Name: A1206646.txt

Task Order: NA

Date Extracted: 11/23/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/07/16

Dilution Factor: 1

Sample Wt/Vol: 30.30 g

Date Reported: 12/08/16

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	16.80	
4164-28-7	N-Nitrodimethylamine	18.48	
314-40-9	Bromacil	22.64	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Blank Spike Recovery Report

Sample ID

LCS_23NOV16

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607196 LCS

Batch: M607-#725-T

Date Received: NA

Blank ID: BLANK_23NOV16

Task Order: NA

Date Extracted: 11/23/16

Matrix: Soil

Date Analyzed: 12/07/16

Sample Wt/Vol: 30.30 g

Date Reported: 12/08/16

ANALYTE	Spike Added ng/g	Blank Conc ng/g	LCS Conc ng/g	% Recovery	QC % Recovery Limits
N-Nitrosodimethylamine	17	0	17	100	13 - 110
N-Nitrodimethylamine	17	0	18	106	30 - 150
Bromacil	17	0	23	135	40 - 190

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

161181129 (400-SB-10) MS

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607083 MS

Batch: M607-#725-T

Date Received: 11/22/16

Lab File Name: A1206649.txt

Task Order: 161122-10

Date Extracted: 11/23/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/07/16

Dilution Factor: 1

Sample Wt/Vol: 30.68 g

Date Reported: 12/08/16

Reporting Unit: ng/g

Compared Sample: 161181127 (400-SB-10)

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Spike	Recovery	Recovery Limit
62-75-9	N-Nitrosodimethylamine	15.25	0.50	90%	13-110%
4164-28-7	N-Nitrodimethylamine	16.72	0.50	98%	30-150%
314-40-9	Bromacil	23.76	0.50	140%	40-190%

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

161181154 (400-SB-12) MS

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607086 MS

Batch: M607-#725-T

Date Received: 11/22/16

Lab File Name: A1206652.txt

Task Order: 161122-10

Date Extracted: 11/23/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/07/16

Dilution Factor: 1

Sample Wt/Vol: 30.90 g

Date Reported: 12/08/16

Reporting Unit: ng/g

Compared Sample: 161181152 (400-SB 12)

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Spike	Recovery	Recovery Limit
62-75-9	N-Nitrosodimethylamine	13.72	0.50	81%	13-110%
4164-28-7	N-Nitrodimethylamine	15.57	0.50	92%	30-150%
314-40-9	Bromacil	20.74	0.50	122%	40-190%

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute***Continuing Calibration Check Sheet***

SwRI Project #: 01.16988.01.103 Calibration Date: 12/06/16
Sponsor: Navarro Analytical Method: TAP-01-0408-031
SwRI Standard ID: 202-04-120408017 Std Concentration: 1 µg/mL
File ID #: A12066S1 Initial Calibration Date: 10/17/16

ANALYTE	Mean RRF	RRF	% Dif.
N-Nitrosodimethylamine	0.361	0.381	-5.4
N-Nitrodimethylamine	0.13	0.131	-1
N-Nitroso-di-n-propylamine-d14	0.127	0.129	-1.4
Bromacil	1.161	0.992	14.5

Southwest Research Institute***Continuing Calibration Check Sheet***

SwRI Project #: 01.16988.01.103 Calibration Date: 12/07/16
Sponsor: Navarro Analytical Method: TAP-01-0408-031
SwRI Standard ID: 202-04-120408017 Std Concentration: 1 µg/mL
File ID #: A12066S2 Initial Calibration Date: 10/17/16

ANALYTE	Mean RRF	RRF	% Dif.
N-Nitrosodimethylamine	0.361	0.39	-7.9
N-Nitrodimethylamine	0.13	0.134	-3.1
N-Nitroso-di-n-propylamine-d14	0.127	0.131	-2.6
Bromacil	1.161	1.013	12.7

Southwest Research Institute

Initial Calibration Data Sheet

SwRI Project #:	01.16988.01.103	Calibration Data:	10/17/16
Sponsor:	Navarro	Analytical Method:	TAP-01-0408-031
SwRI Standard ID:	202-04-120408017	Std Concentration:	0.01-10 µg/mL

ANALYTE	RRF 0.01	RRF 0.05	RRF 0.2	RRF1	RRF5	RRF10	Ave. RRF	RSD%
N-Nitrosodimethylamine	0.291	0.308	0.352	0.369	0.417	0.430	0.361	15.49
N-Nitrodimethylamine	0.109	0.115	0.128	0.134	0.147	0.148	0.13	12.44
N-Nitroso-di-n-propylamine-d14	0.114	0.111	0.124	0.127	1.143	0.145	0.127	11.03
Bromacil	1.435	1.048	1.072	1.081	1.150	1.177	1.161	12.35

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161122-9, 161122-10
NAVARRO PO #: 15EC092B,16EC034-C1

EXTRACTION AND INJECTION LOG

SwRI Labs
 Client: Navarro
 Project: 16988.01.10X
 Case: 15EC043B, 15EC092B

(E607W) Water Extraction By Sep-Funnel 3510C (Navarro)

Sample Receipt: 58707, 58709, 58711
 TO#s: 161122-8, 161122-9, 161122-7

DATE EXTRACTED	11/23/16	NOTES	Hamilton Co. Syringes: 100uL ID:462905(SURR) 50uL ID:462898(MS)
ANALYSTS INVOLVED	Hamed Edrisi(SU,SW,EXT,KD) Christina Menn (SU,SP,EXT,KD,QT,BD,FV)	ADDITIONAL NOTES	pH Paper ID:511507 Thermometer ID: G-076
SURROGATE SOL. ID	203-01-120408017 @5.0ng/uL	EMULSION	C= Centrifuged,W= Wired,T= Tilted
MTX SPK SOL. ID	201-01-120408017 @10ng/uL	EXTRACTION FLOWCHART	XmL H2O-->>FV 1000uL DCM
EXTRACTS LOCATION	Tracked by LIMS (12/01/16 CM)	REFERENCE BOOK &PAGE	16-0402-032 p51
CHEMICAL,BRAND &LOT#	Ozarka water ID:04-0402-003p22B7 Sodium Sulfate ID:04-0402-004p27B DCM Fisher Optima Lot#164214	TAP(S) USED	01-0402-074

	System ID	Type	Customer ID	PH	SAMPLE VOL	SURROGATE SOL VOL
1	607039		1611181649 (400-SB-13)	6.0	1060 mL	100 uL
2	607041		1611200809 (400-SB-08)	6.0	1060 mL	100 uL
3	607046		1611210832 (400-SB-13)	6.4	1050 mL	100 uL
4	607057		1611180700 (B655-EFF-2)	6.8	960 mL	100 uL
5	607058		1611180721 (B655-INF-2)	6.8	970 mL	100 uL
6	607059		1611180752 (MPE-1)	6.4	950 mL	100 uL
7	607060		1611180812 (MPE-8)	6.4	970 mL	100 uL
8	607061		1611180834 (MPE-9)	6.4	970 mL	100 uL
9	607062		1611180835 (MPE-9)	6.4	950 mL	100 uL
10	607063		1611180903 (MPE-10)	6.4	920 mL	100 uL
11	607064		1611180904 (MPE-10)	6.4	950 mL	100 uL
12	607065		1611180928 (MPE-11)	6.4	970 mL	100 uL
13	607066		1611190857B (BLM-3-182)	6.0	960 mL	100 uL
14	607067		1611210756Y (200-F-370)	6.4	960 mL	100 uL
15	607068		1611210901Y (200-F-420)	6.0	950 mL	100 uL
16	607069		1611211011Y (200-F-420)	6.4	950 mL	100 uL
17	607071		1611181118 (400-SB-10)	6.4	1000 mL	100 uL
18	607072		1611181119 (400-SB-10)	6.4	1000 mL	100 uL
19	607073	MS	1611181120 (400-SB-10)	6.4	1000 mL	100 uL
20	607074		1611181143 (400-SB-12)	6.8	990 mL	100 uL
21	607075		1611181144 (400-SB-12)	6.8	990 mL	100 uL
22	607076	MS	1611181145 (400-SB-12)	6.8	1000 mL	100 uL
23	607159		BLANK_23NOV16	6.4	1000 mL	100 uL
24	607160		LCS_23NOV16	6.4	1000 mL	100 uL

System ID	Type	Customer ID	MTX SPK SOL VOL	FV DCM	EMULSION
-----------	------	-------------	-----------------	--------	----------

SwRI Labs

(E607W) Water Extraction By Sep-Funnel 3510C (Navarro)

Client: Navarro

Project: 16988.01.10X

Case: 15EC043B, 15EC092B

Sample Receipt: 58707, 58709, 58711

TO#s: 161122-8, 161122-9, 161122-7

	System ID	Type	Customer ID	MTX SPK SOL VOL	FV DCM	EMULSION
1	607039		1611181649 (400-SB-13)	0 uL	1000 uL	no
2	607041		1611200809 (400-SB-08)	0 uL	1000 uL	no
3	607046		1611210832 (400-SB-13)	0 uL	1000 uL	no
4	607057		1611180700 (B655-EFF-2)	0 uL	1000 uL	yes-t
5	607058		1611180721 (B655-INF-2)	0 uL	1000 uL	no
6	607059		1611180752 (MPE-1)	0 uL	1000 uL	no
7	607060		1611180812 (MPE-8)	0 uL	1000 uL	no
8	607061		1611180834 (MPE-9)	0 uL	1000 uL	no
9	607062		1611180835 (MPE-9)	0 uL	1000 uL	no
10	607063		1611180903 (MPE-10)	0 uL	1000 uL	no
11	607064		1611180904 (MPE-10)	0 uL	1000 uL	no
12	607065		1611180928 (MPE-11)	0 uL	1000 uL	no
13	607066		1611190857B (BLM-3-182)	0 uL	1000 uL	no
14	607067		1611210756Y (200-F-370)	0 uL	1000 uL	no
15	607068		1611210901Y (200-F-420)	0 uL	1000 uL	no
16	607069		1611211011Y (200-F-420)	0 uL	1000 uL	no
17	607071		1611181118 (400-SB-10)	0 uL	1000 uL	yes-t
18	607072		1611181119 (400-SB-10)	0 uL	1000 uL	yes-t
19	607073	MS	1611181120 (400-SB-10)	50 uL	1000 uL	yes-t
20	607074		1611181143 (400-SB-12)	0 uL	1000 uL	yes
21	607075		1611181144 (400-SB-12)	0 uL	1000 uL	yes
22	607076	MS	1611181145 (400-SB-12)	50 uL	1000 uL	yes
23	607159		BLANK_23NOV16	0 uL	1000 uL	no
24	607160		LCS_23NOV16	50 uL	1000 uL	no

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Date Printed: 12/08/2016

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Approved by CHRISTINA MENN on Dec 8 2016 10:39AM

SwRI Labs

(E607S) SOIL/Water Ext By Sep-Funnel / Soxhlet 3540C (Navarro)

Client: Navarro

Project: 16988.01.10X

Case: 16EC034

Sample Receipt: 58713

TO#: 161122-10

DATE EXTRACTED	11/23/16	ADDITIONAL NOTES II	1.Soxhlet extraction began at 5:00pm and ended the following day at 11:00am. 2.The aqueous portion was spiked with 20% and the solid portion was spike with 80% of surrogate, MS'S and LCS also spiked with 20% in aqueous and 80% in solid of matrix spike prior to extraction.
ANALYSTS INVOLVED	Hamed Edrisi(SU,SW,EXT,KD) Christina Menn (SU,SP,EXT,KD,QT,BD,FV)		
SURROGATE SOL ID	203-01-120408017 @5.0ng/uL	EMULSION	C= Centrifuged,W= Wired,T= Tilted
MTX SPK SOL ID	201-01-120408017 @10ng/uL	REFERENCE BOOK &PAGE	16-0402-032 p52
EXTRACTS LOCATION	Tracked by LIMS (12/05/16 CM)	TAP(S) USED	Water 01-0402-074 Soil 01-0402-152
CHEMICAL, BRAND & LOT#	Ozarka water ID:04-0402-003p22B7 Sodium Sulfate ID:04-0402-004p27B DCM Fisher Optima Lot#164214		
NOTES	Hamilton Co. Syringes: 100uL ID:462905(SURR) 50uL ID:462898(MS) pH Paper ID:511507 Thermometer ID: G-076		
ADDITIONAL NOTES I	These samples contained approximately 6 to 14% water. As per PM's instructions, approximately 30 g of the water/soil sample mixture was weighed and separated into its aqueous and solid phase. The aqueous phase was extracted by sep-funnel method three times, and the solid phase was extracted by Soxhlet, extracts from both phases were combine and concentrated to FV for GC/MS analysis.		

System ID	Type	Customer ID	SOLVENT VOL DCM (ML)	SAMPLE WT	SURROGATE SOL VOL
1		1611181127 (400-SB-10)	300	31.39 g	100 uL
2		1611181128 (400-SB-10)	300	30.57 g	100 uL
3	MS	1611181129 (400-SB-10)	300	30.68 g	100 uL
4		1611181152 (400-SB 12)	300	31.94 g	100 uL
5		1611181153 (400-SB-12)	300	31.80 g	100 uL
6	MS	1611181154 (400-SB-12)	300	30.90 g	100 uL
7		BLANK_23NOV16	300	30.55 g	100 uL
8		LCS_23NOV16	300	30.30 g	100 uL

System ID	Type	Customer ID	MTX SPK SOL VOL	FV DCM
1		1611181127 (400-SB-10)	0 uL	1000 uL
2		1611181128 (400-SB-10)	0 uL	1000 uL
3	MS	1611181129 (400-SB-10)	50 uL	1000 uL
4		1611181152 (400-SB 12)	0 uL	1000 uL
5		1611181153 (400-SB-12)	0 uL	1000 uL
6	MS	1611181154 (400-SB-12)	50 uL	1000 uL
7		BLANK_23NOV16	0 uL	1000 uL
8		LCS_23NOV16	50 uL	1000 uL

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Date Printed: 12/08/2016

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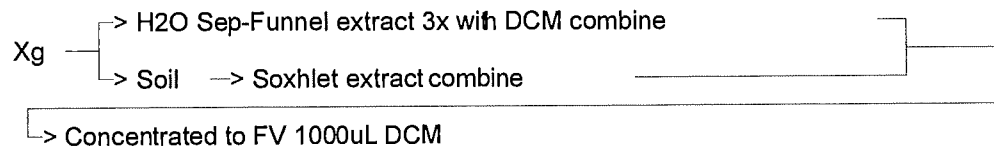
Approved by CHRISTINA MENN on Dec 8 2016 10:39AM

SwRI Labs
Client: Navarro
Project: 16988.01.10X
Case: 16EC034

(E607S) SOIL/Water Ext By Sep-Funnel / Soxhlet 3540 C (Navarro)

Sample Receipt: 58713
TO#: 161122-10

Extraction Flowchart:



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Approved by CHRISTINA MENN on Dec 8 2016 10:39AM

Date Printed: 12/08/2016

Southwest Research Institute GC/MS Injection Log

OPERATOR: GS SEQUENCE DATE: 12/06/16, 12/07/16, 12/08/16 INSTRUMENT: Amidalta
COLUMN: Agilent 122-0732 DB-1701, 0.25mm * 30m * 0.25um
CARRIER GAS: Helium SOLVENT: DCM
METHOD FILE: MET_607C, MET_607C.M
CLIENT NAME: NAVARRO PROJECT NUMBER: 16988.01.103
SR: 58695,58700,58709,58711,58713,58729,58751,58752,58762 METHOD: M-607
DATA PATH: C:\MSDCHEM\1\DATA\2016\A120616 MATRIX: water & soil

OVEN PROGRAM

Initial temp: 40 'C (On)
Initial time: 4.00 min
Ramps:
Rate Final temp Final time
1 15.00 150 0.00
2 25.00 270 10.00
3 0.0(off)
Post temp: 270 'C
Post time: 5.00 min
Run time: 29.80 min

Maximum temp: 350 'C
Equilibration time: 0.50 min

REVIEWED BY: *Alice Yan*
DATE: 12/08/16

FILENAME	VIAL	DATE/TIME	METHOD	SAMPLE DESCRIPTION
A12066C1	100	12/06/16 14:16	MET_607C	SLUG
A12066C2	1	12/06/16 14:50	MET_607C	DCM
A12066S1	2	12/06/16 14:58	MET_607C	NDMA/DMN/BROMACIL STD 1NG/UL IS=1NG/UL
A1206601	3	12/06/16 15:32	MET_607C	BLANK_22NOV16 IS=0.2NG/L 607133
A1206602	4	12/06/16 16:06	MET_607C	LCS_22NOV16 IS=0.2NG/L 607134
A1206603	5	12/06/16 16:39	MET_607C	1611170916B (BLM-26-404) IS=0.2NG/L 606930
A1206604	6	12/06/16 17:13	MET_607C	1611151248 (400-SB-9) IS=0.2NG/L 606990
A1206605	7	12/06/16 17:47	MET_607C	1611160828 (400-SB-09) IS=0.2NG/L 606992
A1206606	8	12/06/16 18:21	MET_607C	1611170949 (400-SB-13) IS=0.2NG/L 606996
A1206607	9	12/06/16 18:55	MET_607C	BLANK_23NOV16 IS=0.2NG/L 607159
A1206608	10	12/06/16 19:29	MET_607C	LCS_23NOV16 IS=0.2NG/L 607160
A1206609	11	12/06/16 20:03	MET_607C	1611181649 (400-SB-13) IS=0.2NG/L 607039
A1206610	12	12/06/16 20:37	MET_607C	1611200809 (400-SB-08) IS=0.2NG/L 607041
A1206611	13	12/06/16 21:11	MET_607C	1611210832 (400-SB-13) IS=0.2NG/L 607046
A1206612	14	12/06/16 21:46	MET_607C	1611180700 (B655-EFF-2) IS=0.2NG/L 607057
A1206613	15	12/06/16 22:20	MET_607C	1611180721 (B655-INF-2) IS=0.2NG/L 607058
A1206614	16	12/06/16 22:54	MET_607C	1611180752 (MPE-1) IS=0.2NG/L 607059
A1206615	17	12/06/16 23:28	MET_607C	1611180812 (MPE-8) IS=0.2NG/L 607060
A1206616	18	12/07/16 00:02	MET_607C	1611180834 (MPE-9) IS=0.2NG/L 607061
A1206617	19	12/07/16 00:36	MET_607C	1611180835 (MPE-9) IS=0.2NG/L 607062
A1206618	20	12/07/16 01:11	MET_607C	1611180903 (MPE-10) IS=0.2NG/L 607063
A1206619	21	12/07/16 01:45	MET_607C	1611180904 (MPE-10) IS=0.2NG/L 607064
A1206620	22	12/07/16 02:19	MET_607C	1611180928 (MPE-11) IS=0.2NG/L 607065
A1206621	23	12/07/16 02:54	MET_607C	1611190857B (BLM-3-182) IS=0.2NG/L 607066
A1206622	24	12/07/16 03:28	MET_607C	1611210756Y (200-F-370) IS=0.2NG/L 607067
A1206623	25	12/07/16 04:02	MET_607C	1611210901Y (200-F-420) IS=0.2NG/L 607068
A1206624	26	12/07/16 04:37	MET_607C	1611211011Y (200-F-420) IS=0.2NG/L 607069
A1206625	27	12/07/16 05:11	MET_607C	1611181118 (400-SB-10) IS=0.2NG/L 607071
A1206626	28	12/07/16 05:46	MET_607C	1611181119 (400-SB-10) IS=0.2NG/L 607072
A1206627	29	12/07/16 06:20	MET_607C	1611181120 (400-SB-10) IS=0.2NG/L 607073MS
A1206628	30	12/07/16 06:54	MET_607C	1611181143 (400-SB-12) IS=0.2NG/L 607074 ?
A1206629	31	12/07/16 07:29	MET_607C	1611181144 (400-SB-12) IS=0.2NG/L 607075
A1206630	32	12/07/16 08:03	MET_607C	1611181145 (400-SB-12) IS=0.2NG/L 607076MS
A12066S2	2	12/07/16 08:37	MET_607C	NDMA/DMN/BROMACIL STD 1NG/UL IS=1NG/UL
A1206631	33	12/07/16 09:12	MET_607C	BLANK_29NOV16 IS=0.2NG/L 607356
A1206632	34	12/07/16 09:46	MET_607C	LCS_29NOV16 IS=0.2NG/L 607357
A1206633	35	12/07/16 10:20	MET_607C	1611151614 (400-SB-9) 2.5'-3.5')) 606991
A1206634	36	12/07/16 10:54	MET_607C	1611161004 (400-SB-09) 52.5'-53.5')) 606993
A1206635	37	12/07/16 11:28	MET_607C	1611161010 (400-SB-09) 52.5'-53.5')) 606994MS
A1206636	38	12/07/16 12:02	MET_607C	1611161509 (400-SB-09) 86.5'-87.5')) 606995
A1206637	39	12/07/16 12:36	MET_607C	1611171144 (400-SB-13) 9'-10')) 607036
A1206638	40	12/07/16 13:10	MET_607C	1611181334 (400-SB-13) 47.7-48.5')) 607037
A1206639	41	12/07/16 13:45	MET_607C	1611181340 (400-SB-13) 47.5'-48.5')) 607038MS
A1206640	42	12/07/16 14:18	MET_607C	1611181704 (400-SB-13) 75'-77')) 607040
A1206641	43	12/07/16 14:53	MET_607C	1611201134 (400-SB-08) 1'-2')) 607042
A1206642	44	12/07/16 15:26	MET_607C	1611201419 (400-SB-08) 41'-42')) 607043
A1206643	45	12/07/16 16:00	MET_607C	1611201425 (400-SB-08) 41'-42')) 607044MS
A1206644	46	12/07/16 16:34	MET_607C	1611201624 (400-SB-08) 77'-77.5')) 607045
A1206645	47	12/07/16 17:08	MET_607C	BLANK_23NOV16 IS=0.2NG/L 607195
A1206646	48	12/07/16 17:42	MET_607C	LCS_23NOV16 IS=0.2NG/L 607196
A1206647	49	12/07/16 18:16	MET_607C	1611181127 (400-SB-10) IS=0.2NG/L 607081
A1206648	50	12/07/16 18:50	MET_607C	1611181128 (400-SB-10) IS=0.2NG/L 607082
A1206649	51	12/07/16 19:24	MET_607C	1611181129 (400-SB-10) IS=0.2NG/L 607083MS
A1206650	52	12/07/16 19:58	MET_607C	1611181152 (400-SB-12) IS=0.2NG/L 607084
A1206651	53	12/07/16 20:32	MET_607C	1611181153 (400-SB-12) IS=0.2NG/L 607085

SIGNATURE

DATE

12

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DATE

WITNESS

DATE

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M-607

PROJECT NO. 16988-01.103

BOOK NO. 10-0408-024

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12/8/16

A1206652	54	12/07/16	21:06	MET_607C	1611181154 (400-SB-12) IS=0.2NG/L 607086MS
A1206653	55	12/07/16	21:40	MET_607C	BLANK_02DEC16 IS=0.2NG/L 607579
A1206654	56	12/07/16	22:14	MET_607C	LCS_02DEC16 IS=0.2NG/L 607580
A1206655	57	12/07/16	22:48	MET_607C	1611250754 (B650-EFF-1) IS=0.2NG/L 607199
A1206656	58	12/07/16	23:22	MET_607C	1611250815 (B650-INF-1) IS=0.2NG/L 607200
A1206657	59	12/07/16	23:56	MET_607C	1611250816 (B650-INF-1) IS=0.2NG/L 607201
A1206658	60	12/08/16	00:30	MET_607C	1611281036Y (200-F-225) IS=0.2NG/L 607426
A1206659	61	12/08/16	01:04	MET_607C	1611281347B (100-C-365) IS=0.2NG/L 607427
A1206660	62	12/08/16	01:38	MET_607C	1611290931 (400-SB-08) IS=0.2NG/L 607428
A1206661	63	12/08/16	02:12	MET_607C	1611300954A (BLM-32-543) IS=0.2NG/L 607544
A1206662	64	12/08/16	02:46	MET_607C	1611301006A (BLM-32-571) IS=0.2NG/L 607545
A1206663	65	12/08/16	03:20	MET_607C	1611301421A (BLM-36-610) IS=0.2NG/L 607546
A1206664	66	12/08/16	12:00	MET_607C	1611201624 (400-SB-08)77'-77.5') DL2 607045
A1206665	67	12/08/16	12:34	MET_607C	1611290931 (400-SB-08) DL20 IS=0.2NG/L 607428

VIEWED BY: Alice Jan
12/8/16

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12/8/16

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DATE 12/8/16

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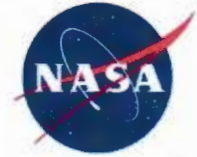
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DATE

National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
White Sands Test Facility
P.O. Box 20
Las Cruces, NM 88004-0020



January 1, 2017

Reply to Attn of:

RE-17-007

Mr. John E. Kieling, Chief
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505

Subject: Request for a Third "Contained-In" Determination for 400 Area Investigation-Derived Waste (IDW)

NASA is requesting a "No Longer Contained-In" Determination (NLCID) for the investigation-derived waste (IDW drill cuttings and IDW debris) generated during activities associated with the 400 Area Closure Investigation Work Plan (IWP), which was approved by NMED on November 8, 2011. This third "Contained-In" Determination request for the 400 Area Investigation is for applicable IDW drill cuttings from soil boring locations 400-SB-08, 400-SB-13 and 400-SB-14 and IDW contact debris associated with drilling activities. The IDW drill cuttings and IDW debris are currently being managed in accordance with 40 CFR § 262.34, as listed hazardous waste carrying EPA Waste Codes F001 and F002. The earliest 90-day accumulation time limit expiration date for the IDW associated with this NLCID will expire on February 4, 2017.

NASA is requesting a NLCID for the F001 and F002 hazardous waste listing. NASA received, reviewed, and compared analytical data generated from the IDW drill cuttings to the applicable 40 CFR § 268 Subpart D Treatment Standards, current NMED Residential Soil Screening Level (SSL), and the WSTF Background Soil Screening Levels. In all three boring locations, F001 and F002 contaminants of concern were not detected above regulatory limits. Thallium was detected above the Residential SSL in samples from waste generated at boreholes 400-SB-13 and 400-SB-14 (Container Numbers 7427 and 7414). There is no available WSTF Background SSL for thallium. NASA also compared N-Nitrosodimethylamine (NDMA) data to the SSLs identified in the NMED Risk Assessment Guidance for Site Investigations and Remediation (2015) for Residential Soil. NDMA was not detected in the IDW drill cuttings at concentrations above the Residential SSL.

If NMED finds the IDW drill cuttings do not contain hazardous waste, NASA requests concurrence from the NMED to dispose of drill cuttings generated from boreholes 400-SB-13 and 400-SB-14 at an appropriate waste facility and land apply drill cuttings generated from the 400-SB-08 borehole in the project area. Upon receipt of an approved NLCID and concurrence from the NMED, NASA will evenly land apply the environmental media to the

ground away from potential storm water run-off and document the final disposal location. The IDW contact debris associated with this request will be disposed of as solid waste.

Enclosure 1 provides a background and basis for the NLCID. Enclosure 2 provides a printed copy of detection summary tables of the analytical results and a comparison to applicable regulatory limits. Enclosure 3 provides a CD-ROM containing analytical summaries, laboratory analytical reports, and chain of custody documentation.

I certify under penalty of law that this document and attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have any questions or comments, please contact me at 575-524-5024, or Antonette Sanchez of my staff, at 575-524-5497.



Timothy J. Davis
Chief, Environmental Office

Enclosures (3)

cc: (w/enclosures)
Mr. Gabriel Acevedo
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505

Background

The Resource Conservation and Recovery Act (RCRA) Hazardous Waste Operating Permit (NMED, 2009; Permit) for the White Sands Test Facility (WSTF) required an investigation of soil directly beneath and adjacent to the WSTF 400 Area surface impoundments. Research conducted for the Historical Information Summary (HIS) associated with the 400 Area Investigation Work Plan (IWP) found chemicals meeting the listing descriptions of spent F001 and F002 per 40 CFR §261 Subpart D were used as solvents and referee propellants in the 400 Area. These F001 and F002 listed wastes were included in the waste streams managed within the 400 Area impoundments, but were not treated before discharge to the adjacent arroyo. The NMED Hazardous Waste Bureau approved the 400 Area IWP (November 8, 2011) and an associated abbreviated drilling work plan (August 30, 2016), which identified 15 soil boring locations. Five of the soil borings were designated to be completed as combination soil vapor/groundwater monitoring wells, while the remainder were designated as soil vapor monitoring wells only. The monitoring wells are intended to provide additional vertical delineation of the soil, soil vapor, and groundwater chemistry around the 400 Area Closure. This information will be used to determine if there is a continuing source of contamination near the 400 Area impoundments. NASA initiated the 400 Area Investigation in September 2016, and in consultation with NMED, modified the planned approach to include eight combination soil vapor/groundwater monitoring wells. The seven remaining borings were completed as soil vapor monitoring wells. Investigation-derived waste (IDW) has been generated during the 400 Area Investigation, and initial requests for a “contained-in” determinations for previously generated waste were approved by NMED on December 15, 2016 and January 6, 2017. The non-hazardous determinations were approved for IDW soil generated from borehole locations 400-SB-03, 400-SB-04, 400-SB-10, 400-SB-12, and 400-SB-15, IDW drill cuttings at 400-SB-10 and 400-SB-12, and associated IDW debris.

Waste material generated during 400 Area Investigation drilling activities includes IDW soil and IDW drill cuttings. IDW soil is defined as environmental media produced using the sonic drilling technique within alluvium from ground surface to the top of cemented alluvium, or conglomerate bedrock. Water is generally not added while using the sonic drilling method in alluvium. IDW drill cuttings are defined as environmental media produced using the air hammer drilling process while drilling boreholes within cemented alluvium and andesite bedrock. The air hammer drilling method allowed for more efficient advancement of the borings through bedrock where groundwater was encountered. Groundwater and water added during drilling produced slurry, or mixed media with aqueous and settleable solid phases, returns from the borehole. All IDW generated as part of the 400 Area Investigation is subject to regulation under the “contained-in” policy carrying EPA Waste Codes F001 and F002 per 40 CFR §261 Subpart D with constituents of concern (COCs): trichloroethene, tetrachloroethene, trichlorofluoromethane, and 1,1,2-trichloro-1,2,2-trifluoroethane.

Waste characterization and hazardous waste determination for 400 Area Investigation IDW is being conducted in accordance with Permit Attachment 12 (Waste Analysis Plan) and 40 CFR §260 and 261. NASA is providing analytical results from waste characterization samples collected from 400 Area Investigation IDW drill cuttings generated through November 22, 2016, and is requesting that the NMED perform a “contained-in” determination to determine whether the three 330 gallon containers of IDW drill cuttings and one 1-cubic yard of IDW debris included in this request pose an unacceptable risk.

Basis for “Contained-In” Determination

NASA is requesting that NMED perform a No Longer Contained-in Determination (NLCID) for environmental media (IDW drill cuttings) and associated contaminated IDW contact debris. Aqueous IDW, such as decontamination water and contaminated groundwater, is being managed as hazardous

waste and treated at the Mid-plume Interception and Treatment System. IDW decontamination water and groundwater is not part of this request. Analytical sampling data have been received and reviewed for the mixed media IDW drill cuttings from 400 Area Investigation boreholes 400-SB-08, 400-SB-13 and 400-SB-14. Analytical summary tables are provided in Enclosure 2 and the analytical reports are provided in Enclosure 3. Analytical data may be compared to the applicable 40 CFR §268 Subpart D Treatment Standards, the 2015 NMED Residential Soil Screening Levels (SSL), and WSTF Background SSLs. If the environmental media IDW is found not to pose an unacceptable risk, then the NMED may determine the drill cuttings and associated contact IDW debris can be managed as non-hazardous waste.

F001 and F002 Constituents of Concern

F001 and F002 COCs were not detected above the laboratory's method detection reporting limits in the waste characterization samples, which in all cases were below the regulatory limits included in the 40 CFR §268 Subpart D Treatment Standards and the 2015 NMED Residential SSL. Of the listed COCs, only Tetrachloroethene (PCE) was detected at a maximum concentration of 0.0020J mg/Kg in the settleable solid phase of IDW drill cuttings generated from borehole 400-SB-08 (container number 7436) and at a concentration of 0.0047J mg/Kg in the settleable solid phase of IDW drill cuttings generated from borehole 400-SB-13 (container number 7427). All detections of PCE included a "J" flag data qualifier, which indicated the reported result was an estimated concentration between the method detection limit and reporting limit. The reported PCE concentrations did not exceed the applicable regulatory limits.

Other Constituents

Metals

Native soils located at WSTF are known to have the potential to contain metals at concentrations that exceed regulatory limits. Metals sampling was performed based on the potential for land application of any environmental media that no longer contains listed hazardous waste. The sampling was performed to address the 40 CFR §261.24 Toxicity Characteristic incorporating the 40 CFR §268 Land Disposal Restrictions and the 2015 NMED Residential SSL. Based on the sampling results, metals were not detected in IDW drill cuttings at concentrations exceeding the 40 CFR §261.24 Toxicity Characteristic limits or 40 CFR §268 40 Treatment Standard Limits. Thallium was detected above the 2015 NMED Residential SSL in waste characterization samples associated with borehole 400-SB-13 (container number 7427) and 400-SB-14 (container number 7414). There is no established WSTF Background SSL concentration available for thallium. No other metals were detected at a concentration that exceeded the 2015 NMED Residential SSL.

N-Nitrosodimethylamine (NDMA)

NDMA is a constituent sometimes present as an impurity in hydrazine-based propellants. It is also a byproduct generated from treating hydrazine-based propellants by oxidation (neutralization), which occurred historically at the 400 Area impoundments. The 400 Area Investigation location is within the known boundaries of the WSTF groundwater contamination plume, which is also known to contain NDMA. Based on the waste characterization sampling results, NDMA was not detected above 40 CFR §268 40 Treatment Standard Limit, or the 2015 NMED Residential SSL. A comparison of results to the 2015 NMED Residential SSL was provided as a conservative measure, based on the potential for land application of the IDW drill cuttings. The maximum observed concentration of NDMA results from a sample collected from borehole 400-SB-08. The settleable solids phase of this sample contained 0.00211 mg/Kg NDMA and aqueous phase contained 0.00044 mg/L NDMA.

Other Volatile Organic Compounds

In addition to the F001 and F002 COCs, the laboratory's target analyte list for SW-846 Method 8260C includes the majority of volatile organic compounds typically analyzed for by SW-846 Method 8260C.

Acetone and dichloromethane were detected at trace concentrations (< 0.01 mg/Kg). Acetone and dichloromethane are known lab contaminants. Toluene was detected in a sample collected from borehole 400-SB-14 at an estimated concentration of 0.00037J mg/Kg, which carries the "J" data quality flag indicating the reported estimated result was above the laboratory detection limit but below the reporting limit. Detected volatile organic compounds did not exceed any applicable regulatory limit.

Other Semi-Volatile Organics

N-Nitrodimethylamine (DMN) is included in EPA Method 607M with the reported NDMA results. The maximum observed concentration of DMN was 0.00086 mg/L in the mixed media aqueous phase of waste from 400-SB-08. The 40 CFR §268.40 Treatment Standards do not include a treatment limit for N-DMN or bromacil. Also, the NMED SSLs do not include a limit for these constituents.

Analytical Reports and Chain of Custodies

Analytical reports and chains of custody are provided in Enclosure 3 for waste characterization samples collected from individual waste containers. Analytical data sheets specific to each analyses are included in the laboratory reports for each sampling event. The complete analytical report includes the laboratory case narrative and supporting documentation.

Other Considerations

If NMED concludes that the IDW drill cuttings do not contain hazardous waste, NASA is requesting concurrence from the NMED to dispose of drill cuttings generated from boreholes 400-SB-13 and 400-SB-14 at an appropriate waste facility and land apply drill cuttings generated from the 400-SB-08 borehole in the project area. Upon receipt of an approved NLCID and concurrence from the NMED, NASA will evenly land apply the environmental media from 400-SB-08 to the ground away from potential storm water run-off and document the final disposal location. The IDW contact debris associated with this request will be disposed of as solid waste.

Enclosure 2

Table 1 400-SB-08 IDW Mixed Media Aqueous Phase VOC Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Wastewaters Concentration (mg/L)
1612141315 No. 7436 2/20/2017	8260C	Acetone	0.0022J	N/A	0.28

Enclosure 2

Table 2 400-SB-08 IDW Mixed Media Settleable Solids Phase VOC Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters in mg/Kg unless noted as "mg/L TCLP"	NMED Residential Soil Screening Level (mg/Kg)
1612141316 No. 7436 2/20/2017	8260C	Dichloromethane	0.0038J	30	4.09E+02
1612141317 No. 7436 2/20/2017		Dichloromethane Tetrachloroethene	0.0030J 0.0020J	30 6.0	4.09E+02 1.11E+02

Enclosure 2

Table 3 400-SB-08 IDW Mixed Media Aqueous Phase Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Wastewaters Concentration (mg/L)
1612141324 No. 7436 2/20/2017	607M	N-Nitrosodimethylamine N-Nitrodimethylamine Bromacil	0.00044 0.00086 0.000006J	0.40 N/A N/A

Enclosure 2

Table 4 400-SB-08 IDW Mixed Media Settleable Solids Phase Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)
1612141325 No. 7436 2/20/2017	607M	N-Nitrosodimethylamine N-Nitrodimethylamine Bromacil	0.00138 0.00055 0.00093	2.3 N/A N/A	2.34E-02 N/A N/A
1612141326 No. 7436 2/20/2017		N-Nitrosodimethylamine N-Nitrodimethylamine Bromacil	0.00211 0.00067 ND	2.3 N/A N/A	2.34E-02 N/A N/A

Enclosure 2

Table 5 400-SB-08 IDW Mixed Media Aqueous Phase Metals Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Wastewaters (mg/L)
<u>1612141319</u> No. 7436 2/20/2017	1311/6010C	Barium	0.014J	100	1.2

Enclosure 2

Table 6 400-SB-08 IDW Mixed Media Settleable Solids Phase TCLP Metals Analytical Detection Summary

Sample ID Container No. 90-Day Date	Analytical Method	Detected Analyte	TCLP Results (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Non Wastewater (as “mg/L TCLP”)
1612141322 No. 7436 2/20/2017	1311/6010C	Cadmium	0.0056J	100	0.11
		Vanadium ¹	0.016J	N/A	1.6
		Zinc ¹	0.067J	N/A	4.3
1612141323 No. 7436 2/20/2017		Cadmium	0.0072J	100	0.11
		Vanadium ¹	0.014J	N/A	1.6
		Zinc ¹	0.10J	N/A	4.3

Enclosure 2

Table 7 400-SB-08 IDW Mixed Media Settleable Solids Phase Total Metals Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	WSTF Background Area 2 Screening Level (mg/Kg)
1612141320 No. 7436 2/20/2017	6010C	Arsenic	2.2	4.25E+00	12.2
		Barium	66.1	1.56E+04	137
		Beryllium	0.58	1.56E+02	0.609
		Chromium	0.8J	9.66E+01	9.38
		Lead	3.4J	4.00E+02	10.3
		Vanadium	30.7	3.94E+02	46.5
		Zinc	32.3	2.35E+04	43.5
1612141321 No. 7436 2/20/2017	6010C	Arsenic	2.2	4.25E+00	12.2
		Barium	50.6	1.56E+04	137
		Beryllium	0.62	1.56E+02	0.609
		Chromium	0.8J	9.66E+01	9.38
		Lead	3.7J	4.00E+02	10.3
		Vanadium	35.3	3.94E+02	46.5
		Zinc	35.2	2.35E+04	43.5

Table 8 400-SB-13 IDW Mixed Media Aqueous Phase VOC Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Wastewaters Concentration (mg/L)
<u>1612141330</u> No. 7427 2/17/2017	8260C	Acetone	0.0026J	N/A	0.28

Table 9 400-SB-13 IDW Mixed Media Settleable Solids Phase VOC Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)
<u>1612141331</u> No. 7427 2/17/2017	8260C	Acetone Dichloromethane	0.0057J 0.0033J	160 30	6.63E+04 4.09E+02
<u>1612141332</u> No. 7427 2/17/2017		Acetone Dichloromethane Tetrachloroethene	0.0048J 0.0027J 0.0047J	160 30 6.0	6.63E+04 4.09E+02 1.11E+02

Enclosure 2

Table 10 400-SB-13 IDW Mixed Media Aqueous Phase Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/L)	40 CFR Part 268 Subpart D Treatment Standard wastewaters Concentration (mg/L)
1612141339 No. 7427 2/17/2017	607M	N-Nitrosodimethylamine N-Nitrodimethylamine Bromacil	0.00005 0.00008 0.00008	0.40 N/A N/A

Enclosure 2

Table 11 400-SB-13 IDW Mixed Media Settleable Solids Phase Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)
1612141340 No. 7427 2/17/2017	607M	N-Nitrosodimethylamine N-Nitrodimethylamine Bromacil	ND ND ND	2.3 N/A N/A	2.34E-02 N/A N/A
1612141341 No. 7427 2/17/2017		N-Nitrosodimethylamine N-Nitrodimethylamine Bromacil	ND ND ND	2.3 N/A N/A	2.34E-02 N/A N/A

Enclosure 2

Table 12 400-SB-13 IDW Mixed Media Aqueous Phase Metals Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Wastewaters (mg/L)
<u>1612141334</u> No. 7427 2/17/2017	6010C	Barium	0.008J	100	1.2

Enclosure 2

Table 13 400-SB-13 IDW Mixed Media Settleable Solids Phase TCLP Metals Analytical Detection Summary

Sample ID Container No. 90-Day Date	Analytical Method	Detected Analyte	TCLP Results (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Non Wastewater (as "mg/L TCLP")
1612141337 No. 7427 2/17/2017	1311/6010C	Barium Cadmium Chromium Vanadium ¹ Zinc ¹	1.2J 0.0061J 0.019J 0.015J 0.088J	100 N/A 5.0 N/A N/A	21 0.11 0.60 1.6 4.3
1612141338 No. 7427 2/17/2017		Barium Cadmium Selenium ² Vanadium ¹ Zinc ¹	1.3J 0.0050J 0.043J 0.011J 0.11	100 N/A 1.0 N/A N/A	21 0.11 5.7 1.6 4.3

Enclosure 2

Table 14 400-SB-13 IDW Mixed Media Settleable Solids Phase Total Metals Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	WSTF Background Area 2 Screening Level (mg/Kg)
1612141335 No. 7427 2/17/2017	6010C	Arsenic	3.6	4.25E+00	12.2
		Barium	178	1.56E+04	137
		Beryllium	0.67	1.56E+02	0.609
		Chromium	6.3	9.66E+01	9.38
		Lead	8.8	4.00E+02	10.3
		Thallium	1.0J	7.82E-01	N/A
		Vanadium	29.9	3.94E+02	46.5
		Zinc	48.0	2.35E+04	43.5
1612141336 No. 7427 2/17/2017	6010C	Arsenic	2.9	4.25E+00	12.2
		Barium	204	1.56E+04	137
		Beryllium	0.52	1.56E+02	0.609
		Cadmium	0.10J	7.05E+01	1.42*
		Chromium	7.8	9.66E+01	9.38
		Lead	7.5	4.00E+02	10.3
		Thallium	2.6	7.82E-01	N/A
		Vanadium	22.7	3.94E+02	46.5
Zinc	47.5	2.35E+04	43.5		

Enclosure 2

Table 15 400-SB-14 IDW Mixed Media Aqueous Phase VOC Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Wastewaters (mg/L)
1612141345 No. 7414 2/04/2017	8260C	Toluene	0.00037J	N/A	0.080

Table 16 400-SB-14 IDW Mixed Media Settleable Solids Phase VOC Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)
1612141346 No. 7414 2/04/2017	8260C	Dichloromethane	0.0020J	30	4.09E+02
1612141347 No. 7414 2/04/2017		Acetone Dichloromethane	0.0042J 0.0023J	160 30	2.49E+02 4.09E+02

Enclosure 2

Table 17 400-SB-14 IDW Mixed Media Aqueous Phase Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/L)	40 CFR Part 268 Subpart D Treatment Standard wastewaters Concentration (mg/L)
1612141354 No. 7414 2/04/2017	607M	N-Nitrosodimethylamine N-Nitrodimethylamine Bromacil	ND 0.00009 0.00004	0.40 N/A N/A

Enclosure 2

Table 18 400-SB-14 IDW Mixed Media Settleable Solids Phase Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)	NMED Construction Worker Soil Screening Level (mg/Kg)
1612141355 No. 7414 2/04/2017	607M	N-Nitrosodimethylamine N-Nitrodimethylamine Bromacil	ND ND ND	2.3 N/A N/A	2.14E+00 N/A N/A
1612141356 No. 7414 2/04/2017		N-Nitrosodimethylamine N-Nitrodimethylamine Bromacil	ND ND ND	2.3 N/A N/A	2.14E+00 N/A N/A

Enclosure 2

Table 19 400-SB-14 IDW Mixed Media Aqueous Phase Metals Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Wastewaters (mg/L)
1612141349 No. 7414 2/04/2017	6010C	Barium	0.016J	100	1.2

Enclosure 2

Table 20 400-SB-14 IDW Mixed Media Settleable Solids Phase TCLP Metals Analytical Detection Summary

Sample ID Container No. 90-Day Date	Analytical Method	Detected Analyte	TCLP Results (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Non Wastewater (as "mg/L TCLP")
1612141352 No. 7414 2/04/2017	1311/6010C	Barium Cadmium Zinc ¹	2.4J 0.0044J 0.12	100 N/A N/A	21 0.69 4.3
1612141353 No. 7414 2/04/2017		Barium Cadmium Zinc ¹	2.7J 0.0050J 0.23	100 N/A N/A	21 0.69 4.3

Table 21 400-SB-14 IDW Mixed Media Settleable Solids Phase Total Metals Analytical Detection Summary

Sample ID Container No. 90-Day Expiration Date	Analytical Method	Detected Analyte	Total Results (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	WSTF Background Area 2 Screening Level (mg/Kg)
1612141350 No. 7414 2/04/2017	6010C	Arsenic	3.8	4.25E+00	12.2
		Barium	324	1.56E+04	137
		Beryllium	0.61	1.56E+02	0.609
		Chromium	5.1	9.66E+01	9.38
		Lead	6.3	4.00E+02	10.3
		Nickel	0.9J	1.56E+03	12.9
		Thallium	1.8	7.82E-01	N/A
		Vanadium	23.2	3.94E+02	46.5
1612141351 No. 7414 2/04/2017	6010C	Zinc	44.4	2.35E+04	43.5
		Arsenic	2.9	4.25E+00	12.2
		Barium	287	1.56E+04	137
		Beryllium	0.57	1.56E+02	0.609
		Chromium	5.7	9.66E+01	9.38
		Lead	5.9J	4.00E+02	10.3
		Nickel	0.7J	1.56E+03	12.9
		Vanadium	19.8	3.94E+02	46.5
Zinc	42.9	2.35E+04	43.5		

Table Notes:

B: Indicates analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result

J: Indicates result concentration is between the method reporting limit and the method detection limit.

ND: Indicates not detected.

N/A: Indicates not applicable.

* This analyte was not detected at all depths in the WSTF Soil Background Study. This screening level represents the lowest available 95% UTL.

¹: These Constituents are not “underlying hazardous constituents” in characteristic waste, according to the definition at §268.2(i)

²: This constituent is not an underlying hazardous constituent as defined at 40 CFR 268.2(i) because the Universal Treatment Standard (UTS) is greater than its Toxicity Characteristic (TC) level, thus a treated selenium waste would always be characteristically hazardous, unless it is treated to below its characteristic level.

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Chemistry and Chemical Engineering Division
Department of Analytical & Environmental Chemistry

December 21, 2016

Navarro Research and Engineering Inc.
NASA - JSC - White Sands Test Facility
Transportation Officer, Building 120
12600 NASA Road
Las Cruces, NM 88012
Tel. 575-524-5452

Attention: Carlyn Tufts

Subject: Reports for Batch-607-#726 for NDMA/DMN Analysis of Water/Soil Sample

SwRI Project #: 01.16988.103

SwRI Task Orders: 161206-6, 161206-8, 161209-2, 161209-4, 161213-3, 161213-4, 161214-4
161216-4, 161216-5

Navarro P.O. #: 15EC043B, 15EC092B

Dear Carlyn,

Enclosed please find the analytical reports for Batch-607-#726-Navarro of water/soil samples.


Southwest Research Institute appreciates the opportunity to provide the service to Navarro Research and Engineering Inc.. If you have any questions, please do not hesitate to call me at 210-522-3954.

Sincerely,



Gang Sun, Ph.D.
Program Manager

APPROVAL:



Michael Dammann
Director

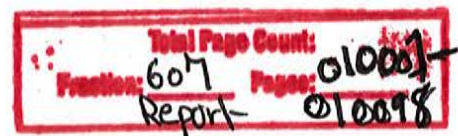


010001

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161206-6, 161206-8, 161209-2, 161209-4, 161213-3, 161213-4, 161214-4
161216-4, 161216-5
NAVARRO PO #: 15EC043B, 15EC092B

NARRATIVE

(M-607 - #726-Navarro)



CLIENT: Navarro Research and Engineering Inc. 010002
SwRI PROJECT: 01.16988.01.103
BATCH #: Batch-607-#726
TASK ORDER: 161206-6, 161206-8, 161209-2, 161209-4, 161213-3, 161213-4, 161214-4
 161216-4, 161216-5
REPORT DATA: 12/21/2016

NARRATIVE FOR NDMA/ DMN/BROMACIL ANALYSIS

1. Samples were extracted with dichloromethane (DCM) and analyzed by GC/MS in selective ion monitoring mode for N-Nitrosodimethylamine (NDMA), N-Nitrodimethylamine (DMN) and Bromacil according to the modified Method 607.
2. All water samples were extracted within 7 days and soil samples within 14 days of sample collection and were analyzed within 40 days of the extraction.
3. The response factor (RF) values for Calibration curve and/or for continuing calibration standard were less than 25 % for all target compounds. The water sample reporting limit is 0.01 ppb for 1-L extraction of aqueous samples. The sample reporting limit is 0.33 ng/g for 30g extraction of soil samples.
4. Lab control spike for aqueous samples at 0.50 µg/L level were extracted and analyzed. Lab control spike for soil samples at 17 µg/g level were extracted and analyzed. The recoveries for all target compounds were within method recovery criteria of 13-110% for NDMA, 30-150% for DMN, and 40-190% for Bromacil.
4. Surrogate compound was spiked into all samples before sample extraction at 0.50 µg/L level for final extracts. The surrogate recoveries for all samples were within method recovery criteria of 40-160%.
5. Laboratory solvent blanks were extracted and analyzed for every sample batch. No analytes were detected above report limits from the blanks.
6. A "J" value was reported if the associated value was below reporting limits but above the MDL value.
7. All analyte concentrations are expressed in µg/L (*ppb*). Sample calculation:

$$\text{Concentration } (\mu\text{g/L}) = \frac{C \text{ (ng/}\mu\text{L)} \times V_{\text{extr}} \text{ (}\mu\text{L)} \times \text{DF}}{V_{\text{samp}} \text{ (mL)}} \times \frac{1000 \text{ mL}}{1 \text{ L}} \times \frac{1 \mu\text{g}}{1000 \text{ ng}}$$

where: C = result of GC/MS analysis, in ng/µL
 V_{extr} = final volume of sample extract, in µL
 V_{samp} = sample volume taken for extraction, in mL
 DF = dilution factor, if any

010003

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161206-6, 161206-8, 161209-2, 161209-4, 161213-3, 161213-4, 161214-4
161216-4, 161216-5
NAVARRO PO #: 15EC043B, 15EC092B

TASK ORDER AND CHAIN OF CUSTODY

Laboratory Task Order

TO #: 161206-6 Revision: 1

SDG: 607625

SRR #'s: 58776
Client(s): Navarro

Project(s): 16988.01.10X
Manager(s): SUN, GANG
To Client: 12/27/16

010004

Instructions

Documents Related to this task order: 212085[COC for SRR 58776], 212086[Paperwork for SRR 58776], 108294[PO #179 + #180], 113038[PO #179 + #180 Change Order #1], 113134[PO #NAV0000060], 115908[PO #NAV0000060 CO #1], 117303[PO #NAV0000060 CO #2], 118820[PO #179 + #180 Change Order #2], 120319 [PO #104], 122923[PO #179 Change Order #3], 124787[PO #132], 124995[PO #179 Change Order #5]

Deliverables --> Hard Copy: no EDD: -YES- PDF: -YES-

Test: E607W
Section: EXTLAB

Holding: 7 days from CED

EXTRACTION BY METHOD 607

Cnt: 2

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
607625		1	Aqueous	1612011242 (PFE-3)	01 Dec 16	08 Dec 16
607626		1	Aqueous	1612011304A (BLM-32-632)	01 Dec 16	08 Dec 16

Test: T607W
Section: TDG

Holding: 40 days from VTSR

NDMA/DMN ANALYSIS BY GC/MS/SIM

Cnt: 2

System ID	Type	Cont	Matrix	Customer ID	VTSR	Method Date
607625		1	Aqueous	1612011242 (PFE-3)	06 Dec 16	15 Jan 17
607626		1	Aqueous	1612011304A (BLM-32-632)	06 Dec 16	15 Jan 17



WSTF CHAIN OF CUSTODY RECORD

010005

Date 12-6-16

Laboratory: <i>GWRP</i>		PO# <i>15EC043B</i>		Analytical Requirements				Special Instructions Return coolers and reusable packaging materials within 14 days as required in statement of work to: Return Address: NASA WSTF Environmental Department 12600 NASA Road; Bldg. 120 Las Cruces, NM 88012 Attn: Lori Minnick	
Address shipping questions to: <input type="checkbox"/> Lori Minnick, 575-524-5119 <input type="checkbox"/> Other _____, 575-524-_____				Analytical Method <i>607 MSMA/DMN/BROMACIL</i>					Charge Number (WSTF Use Only)
Send sample receipt confirmation and analytical reports to: <input checked="" type="checkbox"/> Carlyn Tufts, carlyn.a.tufts@nasa.gov <input checked="" type="checkbox"/> Shelly Hernandez, shelly.j.hernandez@nasa.gov <input type="checkbox"/> Other _____		# of Containers	Sample Matrix*						
Sample Number	Sample Location								
<i>1612011242</i>	<i>PFE-3</i>	<i>1</i>	<i>A</i>	<i>X</i>				<i>GMDR</i>	
<i>1612011304A</i>	<i>Bim-32-632</i>	<i>1</i>	<i>A</i>	<i>X</i>				<i>"</i>	
Relinquished By: <i>[Signature]</i>		Date/Time: <i>12-6-16 / 1100hrs.</i>		Accepted By: <i>[Signature]</i>				Date/Time: <i>12-06-16 / 12:00</i>	

* Sample Matrix: A – Aqueous; G – Gaseous; S – Solid

Client: Navarro
 SRR # 58776
 Project # 16988.01.10X
 Case: 15EC043B
 VTSR: 12/06/16
 Sample(s) Received: Intact
 Temperature: 2.0 SN # 021055

NASA-WSTF SHIPPING DOCUMENT

010006

1 Blue # XB17

SHIPPED FROM: NASA JSC WHITE SANDS TEST FACILITY 12600 NASA ROAD; BLDG. 120 LAS CRUCES, NEW MEXICO 88012			WSTF ORIGINATOR/MAIL CODE/TELEPHONE NO. Patricia Melendrez/Purchasing Dept/ 524-5334 Carlyn Tufts 575-524-5452			
			ORDER OR CONTRACT NUMBER PO 15EC043B	SHIPMENT CONTROL NO		
SHIP TO: (ADDRESS, PHONE#, POINT OF CONTACT) SOUTHWEST RESEARCH INSTITUTE 6220 CULEBRA ROAD SAN ANTONIO, TX 78238 Gang Sun 210-522-3954			PROJECT or TASK NUMBER GMDR			
			Contain Batteries NO	NO. PKG.		
			DATE SHIPPED 12-9-16	AirBill/ PRO #/Bol #		
			Battery Type-Part #	AUTHORIZED BY:		
			DEPT.			
ITEM NO.	EQUIPMENT CONTROL NO.	MODEL NO./ STOCK NO./ PART NO.	ITEM NAME - MANUFACTURER'S NAME AND SERIAL NO.	UNIT OF ISSUE	QTY.	
1			Groundwater Sample for Method 607 Analysis 21 day TAT	EA	2	
2			Groundwater Sample for Method 607 Analysis 7 day TAT	EA		
JUSTIFICATION FOR SHIPMENT: (MDR #, Return Authorization #'s, Warranty Replacement, Repair, Overage/Shortage, Damage, Recycling) Groundwater Samples for analysis per SOW						
DOT HAZARDOUS MATERIALS INFO; EMERGENCY PHONE NUMBER AND GUIDE NUMBER:						
PROPERTY REVIEW: <input type="checkbox"/> REMOVE EQUIPMENT TAG <input type="checkbox"/> DO NOT REMOVE EQUIPMENT TAG						
PACKED BY:		#	TYPE	DIMENSIONS		WEIGHT
		CONTAINERS	CONTAINERS			
Please check off the applicable labels! <input type="checkbox"/> FRAGILE <input type="checkbox"/> GLASS <input type="checkbox"/> DELICATE <input type="checkbox"/> DO NOT XRAY <input type="checkbox"/> REFRIGERATE <input type="checkbox"/> OTHER <input type="checkbox"/> BUBBLEWRAP <input type="checkbox"/> FOAM						
		TOTAL CONTAINERS				TOTAL WEIGHT
RECEIVED BY: <i>David Horn</i>		SHIPPERS CERTIFICATION: This is to certify that the above named materials are properly classified, described, packaged, marked, labeled, and are in proper condition for transportation according to the regulations of the D.O.T. _____ Date _____				
REPRESENTING: <i>SWRI</i>						

Client: Navarro
 SRR # 58776
 Project # 16988.01.10X
 Case: 15EC043B
 VTSR: 12/06/16
 Sample(s) Received: Intact
 Temperature: 2.0 SN # 021055

Laboratory Task Order

TO #: 161206-8 Revision: 0

SDG: 607665

SRR #'s: 58779
Client(s): Navarro

Project(s): 16988.01.10X
Manager(s): SUN, GANG
To Client: 12/27/16

010007

Instructions

Documents Related to this task order: 212090[COC for SRR 58779], 212091[Paperwork for SRR 58779], 108294[PO #179 + #180], 113038[PO #179 + #180 Change Order #1], 113134[PO #NAV0000060], 115908[PO #NAV0000060 CO #1], 117303[PO #NAV0000060 CO #2], 118820[PO #179 + #180 Change Order #2], 120319 [PO #104], 122923[PO #179 Change Order #3], 124787[PO #132], 124995[PO #179 Change Order #5]

Deliverables --> Hard Copy: no EDD: -YES- PDF: -YES-

Test: E607S

Holding: 14 days from CED

Section: EXTLAB

EXTRACTION BY METHOD 607.

Cnt: 5

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
607666		1	Soil	1612031204 (400-SB-07)1'-2')	03 Dec 16	17 Dec 16
607667		1	Soil	1612031434 (400-SB-07)48'-50')	03 Dec 16	17 Dec 16
607668		1	Soil	1612031644 (400-SB-07)75'-76')	03 Dec 16	17 Dec 16
607670		1	Soil	1612041424 (400-SB-06)13.5'-14.5')	04 Dec 16	18 Dec 16
607671		1	Soil	1612041619 (400-SB-06)42.5'-43.5')	04 Dec 16	18 Dec 16

Test: E607W

Holding: 7 days from CED

Section: EXTLAB

EXTRACTION BY METHOD 607

Cnt: 3

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
607665		1	Aqueous	1612030909 (400-SB-07)	03 Dec 16	10 Dec 16
607669		1	Aqueous	1612041238 (400-SB-06)	04 Dec 16	11 Dec 16
607672		1	Aqueous	1612050808 (400-SB-06)	05 Dec 16	12 Dec 16

Test: T607W

Holding: 40 days from VTSR

Section: TDG

NDMA/DMN ANALYSIS BY GC/MS/SIM

Cnt: 8

System ID	Type	Cont	Matrix	Customer ID	VTSR	Method Date
607665		1	Aqueous	1612030909 (400-SB-07)	06 Dec 16	15 Jan 17
607666		1	Soil	1612031204 (400-SB-07)1'-2')	06 Dec 16	15 Jan 17
607667		1	Soil	1612031434 (400-SB-07)48'-50')	06 Dec 16	15 Jan 17
607668		1	Soil	1612031644 (400-SB-07)75'-76')	06 Dec 16	15 Jan 17
607669		1	Aqueous	1612041238 (400-SB-06)	06 Dec 16	15 Jan 17
607670		1	Soil	1612041424 (400-SB-06)13.5'-14.5')	06 Dec 16	15 Jan 17
607671		1	Soil	1612041619 (400-SB-06)42.5'-43.5')	06 Dec 16	15 Jan 17
607672		1	Aqueous	1612050808 (400-SB-06)	06 Dec 16	15 Jan 17



WSTF CHAIN OF CUSTODY RECORD

Date 12-5-16

010008

Page 1 of 1

Laboratory: Southwest Research Institute PO# 15ECO92B		Analytical Requirements				Charge Number (WSTF Use Only)	Special Instructions Return coolers and reusable packaging materials within 14 days as required in statement of work to: Return Address: NASA WSTF Environmental Department 12600 NASA Road; Bldg. 120 Las Cruces, NM 88012 Attn: Lori Minnick
Address shipping questions to: <input type="checkbox"/> Lori Minnick, 575-524-5119 <input checked="" type="checkbox"/> Other: Pam Egan, 575-524-5351		# of Containers	Sample Matrix*	NDMA & Bromacil (607M)					Comments
Send sample receipt confirmation and analytical reports to: <input checked="" type="checkbox"/> Carlyn Tufts, carlyn.a.tufts@nasa.gov <input checked="" type="checkbox"/> Shelly Hernandez, shelly.j.hernandez@nasa.gov <input type="checkbox"/> Other	Sample Number					Sample Location	
	1612030909	400-SB-07	1	A	X		
	1612041238	400-SB-06	1	A	X		
	1612050808	"	1	A	X		
	1612031204	400-SB-07	1	S	X		1'-2'
	1612031434	"	1	S	X		48'-50'
	1612031644	"	1	S	X		75'-76'
	1612041424	400-SB-06	1	S	X		13.5' - 14.5'
	1612041619	"	1	S	X		42.5' - 43.5'
Relinquished By: <i>[Signature]</i>		Date/Time: 12-5-16 / 1100 Hrs.		Accepted By: <i>[Signature]</i>		Date/Time: 12-06-16 / 12:00	

* Sample Matrix: A – Aqueous; G – Gaseous; S – Solid

Client: Navarro
SRR # 58779
Project # 16988.01.10X
Case: 15ECO92B
VTSR: 12/06/16
Sample(s) Received: Intact
Temperature: 2.0 SN # 021055

NASA-WSTF SHIPPING DOCUMENT

010009

Blue # 1083

SHIPPED FROM:			WSTF ORIGINATOR/MAIL CODE/TELEPHONE NO.				
NASA JSC WHITE SANDS TEST FACILITY			Patricia Melendrez/Purchasing Dept/ 524-5334 Pam Egan 575-524-5351				
12600 NASA ROAD; BLDG. 120			ORDER OR CONTRACT NUMBER		SHIPMENT CONTROL NO		
LAS CRUCES, NEW MEXICO 88012			15EC092B		WS-16-340-B		
SHIP TO: (ADDRESS, PHONE#, POINT OF CONTACT)			PROJECT or TASK NUMBER		SHIP VIA		
Southwest Research Institute			CP.6EE4IFW.0.71 505-100				
6220 Culebra Road			Contain Batteries	NO. PKG.	DATE SHIPPED		
San Antonio, TX 78238			NO		12-9-16		
Gang Sun			Battery Type-Part #	AUTHORIZED BY:	DEPT.		
210-522-3954							
ITEM NO.	EQUIPMENT CONTROL NO.	MODEL NO./STOCK NO./PART NO.	ITEM NAME - MANUFACTURER'S NAME AND SERIAL NO.			UNIT OF ISSUE	QTY.
1			Soil Sample NDMA and Bromacil Method 607M			EA	5
2			Aqueous Sample for NDMA and Bromacil Method 607M			EA	3
JUSTIFICATION FOR SHIPMENT: (MDR #, Return Authorization #'s, Warranty Replacement, Repair, Overage/Shortage, Damage, Recycling)							
Samples for Analysis per SOW							
DOT HAZARDOUS MATERIALS INFO; EMERGENCY PHONE NUMBER AND GUIDE NUMBER:							
PROPERTY REVIEW: <input type="checkbox"/> REMOVE EQUIPMENT TAG <input type="checkbox"/> DO NOT REMOVE EQUIPMENT TAG							
PACKED BY: # TYPE DIMENSIONS WEIGHT							
Please check off the applicable labels!							
<input type="checkbox"/> FRAGILE							
<input type="checkbox"/> GLASS							
<input type="checkbox"/> DELICATE							
<input type="checkbox"/> DO NOT XRAY							
<input type="checkbox"/> REFRIGERATE							
<input type="checkbox"/> OTHER							
TOTAL WEIGHT							
<input type="checkbox"/> BUBBLEWRAP							
<input type="checkbox"/> FOAM							
RECEIVED BY: <i>David Low</i>			SHIPPERS CERTIFICATION: This is to certify that the above				
REPRESENTING: <i>SRI</i>			named materials are properly classified, described, packaged, marked,				
			labeled, and are in proper condition for transportation according to the				
			regulations of the D.O.T. _____ Date _____				

Client: Navarro
 SRR # 58779
 Project # 16988.01.10X
 Case: 15EC092B
 VTSR: 12/06/16
 Sample(s) Received: Intact
 Temperature: 2.0 SN # 021055

Laboratory Task Order

TO #: 161209-2 Revision: 1

Project(s): 16988.01.10X
 Manager(s): SUN, GANG
 To Client: 12/30/16

SDG: 607761

SRR #s: 58798
 Client(s): Navarro

010010

Instructions

Documents Related to this task order: 212423[COC for SRR 58798], 212424[Paperwork for SRR 58798], 108294[PO #179 + #180], 113038[PO #179 + #180 Change Order #1], 113134[PO #NAV0000060], 115908[PO #NAV0000060 CO #1], 117303[PO #NAV0000060 CO #2], 118820[PO #179 + #180 Change Order #2], 120319 [PO #104], 122923[PO #179 Change Order #3], 124787[PO #132], 124995[PO #179 Change Order #5]

Deliverables --> Hard Copy: no EDD: -YES- PDF: -YES-

Test: E607W
 Section: EXTLAB

Holding: 7 days from CED

EXTRACTION BY METHOD 607

Cnt: 1

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
607761		1	Aqueous	1612061357A (NASA 6)	06 Dec 16	13 Dec 16

Test: T607W
 Section: TDG

Holding: 40 days from VTSR

NDMA/DMN ANALYSIS BY GC/MS/SIM

Cnt: 1

System ID	Type	Cont	Matrix	Customer ID	VTSR	Method Date
607761		1	Aqueous	1612061357A (NASA 6)	09 Dec 16	18 Jan 17



WSTF CHAIN OF CUSTODY RECORD

010011

Date 12-8-16

Page 1 of 1

Laboratory: <u>SWR</u>		PO# <u>15EC043B</u>		Analytical Requirements				Special Instructions Return coolers and reusable packaging materials within 14 days as required in statement of work to: Return Address: NASA WSTF Environmental Department 12600 NASA Road; Bldg. 120 Las Cruces, NM 88012 Attn: Lori Minnick
Address shipping questions to: <input checked="" type="checkbox"/> Lori Minnick, 575-524-5119 <input type="checkbox"/> Other _____, 575-524-_____		# of Containers	Sample Matrix*	ANALYTES <u>MSMA/DMM/BROMAC</u>				
Send sample receipt confirmation and analytical reports to: <input checked="" type="checkbox"/> Carlyn Tufts, carlyn.a.tufts@nasa.gov <input checked="" type="checkbox"/> Shelly Hernandez, shelly.j.hernandez@nasa.gov <input type="checkbox"/> Other								Comments
Sample Number	Sample Location							
<u>1612061397A</u>	<u>NASA 6</u>	<u>1</u>	<u>A</u>	<u>X</u>				<u>GMDR</u>
Relinquished By: <u>John W. Munch</u>		Date/Time: <u>12-8-16 / 1100HRS.</u>		Accepted By: <u>David Garcia</u>				Date/Time: <u>12-09-16 / 09:45</u>

* Sample Matrix: A – Aqueous; G – Gaseous; S – Solid

Client: Navarro
 SRR # 58798
 Project # 16988.01.10X
 Case: 15EC043B
 VTSR: 12/09/16
 Sample(s) Received: Intact
 Temperature: 2.0 SN # 021055

NASA-WSTF SHIPPING DOCUMENT

Blue NB12

010012

SHIPPED FROM: NASA JSC WHITE SANDS TEST FACILITY 12600 NASA ROAD; BLDG. 120 LAS CRUCES, NEW MEXICO 88012			WSTF ORIGINATOR/MAIL CODE/TELEPHONE NO. Patricia Melendrez/Purchasing Dept/ 524-5334 Carlyn Tufts 575-524-5452		
SHIP TO: (ADDRESS, PHONE#, POINT OF CONTACT) SOUTHWEST RESEARCH INSTITUTE 6220 CULEBRA ROAD SAN ANTONIO, TX 78238 Gang Sun 210-522-3954			ORDER OR CONTRACT NUMBER PO 15EC043B		SHIPMENT CONTROL NO
PROJECT or TASK NUMBER GMDR			SHIP VIA		DATE SHIPPED <i>12-8-16</i>
Contain Batteries NO			NO. PKG.	AirBill/ PRO #/BoI #	AUTHORIZED BY:
Battery Type-Part #			DEPT.		DEPT.
ITEM NO.	EQUIPMENT CONTROL NO.	MODEL NO./ STOCK NO./ PART NO.	ITEM NAME - MANUFACTURER'S NAME AND SERIAL NO.	UNIT OF ISSUE	QTY.
1			Groundwater Sample for Method 607 Analysis 21 day TAT.	EA	1
2			Groundwater Sample for Method 607 Analysis 7 day TAT	EA	
JUSTIFICATION FOR SHIPMENT: (MDR #, Return Authorization #'s, Warranty Replacement, Repair, Overage/Shortage, Damage, Recycling) Groundwater Samples for analysis per SOW					
DOT HAZARDOUS MATERIALS INFO; EMERGENCY PHONE NUMBER AND GUIDE NUMBER:					
PROPERTY REVIEW:		<input type="checkbox"/> REMOVE EQUIPMENT TAG <input type="checkbox"/> DO NOT REMOVE EQUIPMENT TAG			
PACKED BY:		#	TYPE	DIMENSIONS	WEIGHT
Please check off the applicable labels! <input type="checkbox"/> FRAGILE <input type="checkbox"/> GLASS <input type="checkbox"/> DELICATE <input type="checkbox"/> DO NOT XRAY <input type="checkbox"/> REFRIGERATE <input type="checkbox"/> OTHER <input type="checkbox"/> BUBBLEWRAP <input type="checkbox"/> FOAM		CONTAINERS	CONTAINERS		
		TOTAL CONTAINERS			TOTAL WEIGHT
RECEIVED BY: <i>David Garcia</i>		SHIPPERS CERTIFICATION: This is to certify that the above named materials are properly classified, described, packaged, marked, labeled, and are in proper condition for transportation according to the regulations of the D.O.T. Date _____			
REPRESENTING: <i>SWRI</i>					

Client: Navarro
 SRR # 58798
 Project # 16988.01.10X
 Case: 15EC043B
 VTSR: 12/09/16
 Sample(s) Received: Intact
 Temperature: 2.0 SN # 021055

Laboratory Task Order

TO #: 161209-4 Revision: 0

SDG: 607766

SRR #s: 58800
Client(s): Navarro

Project(s): 16988.01.10X
Manager(s): SUN, GANG
To Client: 12/30/16

010013

Instructions

Documents Related to this task order: 212427[COC for SRR 58800], 212428[Paperwork for SRR 58800], 108294[PO #179 + #180], 113038[PO #179 + #180 Change Order #1], 113134[PO #NAV0000060], 115908[PO #NAV0000060 CO #1], 117303[PO #NAV0000060 CO #2], 118820[PO #179 + #180 Change Order #2], 120319 [PO #104], 122923[PO #179 Change Order #3], 124787[PO #132], 124995[PO #179 Change Order #5]

Deliverables --> Hard Copy: no EDD: -YES- PDF: -YES-

Test: E607S

Holding: 14 days from CED

Section: EXTLAB

EXTRACTION BY METHOD 607.

Cnt: 2

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
607766		1	Soil	1612051334 (400-SB-06)86.5'-87.5')	05 Dec 16	19 Dec 16
607768		1	Soil	1612080834 (400-SB-11) (12.5'-13')	08 Dec 16	22 Dec 16

Test: E607W

Holding: 7 days from CED

Section: EXTLAB

EXTRACTION BY METHOD 607

Cnt: 1

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
607767		1	Aqueous	1612080759 (400-SB-11)	08 Dec 16	15 Dec 16

Test: T607W

Holding: 40 days from VTSR

Section: TDG

NDMA/DMN ANALYSIS BY GC/MS/SIM

Cnt: 3

System ID	Type	Cont	Matrix	Customer ID	VTSR	Method Date
607766		1	Soil	1612051334 (400-SB-06)86.5'-87.5')	09 Dec 16	18 Jan 17
607767		1	Aqueous	1612080759 (400-SB-11)	09 Dec 16	18 Jan 17
607768		1	Soil	1612080834 (400-SB-11) (12.5'-13')	09 Dec 16	18 Jan 17



Date

12-8-16

WSTF CHAIN OF CUSTODY RECORD

010014

Page 1 of 1

Laboratory: Southwest Research Institute PO# 15ECO92B		Analytical Requirements					Charge Number (WSTF Use Only)	Special Instructions	
Address shipping questions to: <input type="checkbox"/> Lori Minnick, 575-524-5119 <input checked="" type="checkbox"/> Other: Pam Egan, 575-524-5351		# of Containers	Sample Matrix*	NDMA & Bromacil (607M)					Return coolers and reusable packaging materials within 14 days as required in statement of work to: Return Address: NASA WSTF Environmental Department 12600 NASA Road; Bldg. 120 Las Cruces, NM 88012 Attn: Lori Minnick
Sample Number	Sample Location						Comments		
1612051334	400-SB-06	1	S	X			6EE4IFW	86.5'-87.5'	
1612080759	400-SB-11	1	A	X			1		
1612080834	"	1	S	X				(12.5'-13')	
Relinquished By: <i>Pam Egan</i>		Date/Time: 12-8-16 / 1100 hrs.			Accepted By: <i>David Garcia</i>			Date/Time: 12-09-16 / 09:45	

* Sample Matrix: A - Aqueous; G - Gaseous; S - Solid

Client: Navarro
 SRR # 58800
 Project # 16988.01.10X
 Case: 15EC092B
 VTSR: 12/09/16
 Sample(s) Received: Intact
 Temperature: 2.0 SN # 021055

NASA-WSTF SHIPPING DOCUMENT

010015

① Blue # MB12

SHIPPED FROM: NASA JSC WHITE SANDS TEST FACILITY 12600 NASA ROAD; BLDG. 120 LAS CRUCES, NEW MEXICO 88012			WSTF ORIGINATOR/MAIL CODE/TELEPHONE NO. Patricia Melendrez/Purchasing Dept/ 524-5334 Pam Egan 575-524-5351			
SHIP TO: (ADDRESS, PHONE#, POINT OF CONTACT) Southwest Research Institute 6220 Culebra Road San Antonio, TX 78238 Gang Sun 210-522-3954			ORDER OR CONTRACT NUMBER 15EC092B	SHIPMENT CONTROL NO		
PROJECT or TASK NUMBER CP.6EE4IFW.0.71			SHIP VIA			
Contain Batteries NO			NO. PKG.	DATE SHIPPED 12-5-16	AirBill/ PRO #/Bol #	
Battery Type-Part #			AUTHORIZED BY:		DEPT.	
ITEM NO.	EQUIPMENT CONTROL NO.	MODEL NO./ STOCK NO./ PART NO.	ITEM NAME - MANUFACTURER'S NAME AND SERIAL NO.		UNIT OF ISSUE	QTY.
1			Soil Sample NDMA and Bromacil Method 607M		EA	2
2			Aqueous Sample for NDMA and Bromacil Method 607M		EA	1
JUSTIFICATION FOR SHIPMENT: (MDR #, Return Authorization #'s, Warranty Replacement, Repair, Overage/Shortage, Damage, Recycling) Samples for Analysis per SOW						
DOT HAZARDOUS MATERIALS INFO; EMERGENCY PHONE NUMBER AND GUIDE NUMBER:						
PROPERTY REVIEW:		<input type="checkbox"/> REMOVE EQUIPMENT TAG		<input type="checkbox"/> DO NOT REMOVE EQUIPMENT TAG		
PACKED BY:	#	TYPE	DIMENSIONS		WEIGHT	
	CONTAINERS	CONTAINERS				
Please check off the applicable labels!						
<input type="checkbox"/> FRAGILE						
<input type="checkbox"/> GLASS						
<input type="checkbox"/> DELICATE						
<input type="checkbox"/> DO NOT XRAY						
<input type="checkbox"/> REFRIGERATE						
<input type="checkbox"/> OTHER						
					TOTAL	TOTAL
					CONTAINERS	WEIGHT
RECEIVED BY: <i>David Garcia</i>			SHIPPERS CERTIFICATION: This is to certify that the above			
REPRESENTING: <i>SWRI</i>			named materials are properly classified, described, packaged, marked,			
			labeled, and are in proper condition for transportation according to the			
			regulations of the D.O.T. _____ Date _____			

Client: Navarro
 SRR # 58800
 Project # 16988.01.10X
 Case: 15EC092B
 VTSR: 12/09/16
 Sample(s) Received: Intact
 Temperature: 2.0 SN # 021055

Laboratory Task Order

TO #: 161213-3 Revision: 1

Project(s): 16988.01.10X
 Manager(s): SUN, GANG
 To Client: 01/03/17

SDG: 607856

SRR #s: 58813
 Client(s): Navarro

010016

Instructions

Documents Related to this task order: 212525[COC for SRR 58813], 212526[Paperwork for SRR 58813], 108294[PO #179 + #180], 113038[PO #179 + #180 Change Order #1], 113134[PO #NAV0000060], 115908[PO #NAV0000060 CO #1], 117303[PO #NAV0000060 CO #2], 118820[PO #179 + #180 Change Order #2], 120319 [PO #104], 122923[PO #179 Change Order #3], 124787[PO #132], 124995[PO #179 Change Order #5]

Deliverables --> Hard Copy: no EDD: -YES- PDF: -YES-

Test: E607S
 Section: EXTLAB

Holding: 14 days from CED

EXTRACTION BY METHOD 607.

Cnt: 3

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
607856		1	Soil	1612081024 (400-SB-11)46.5'-47.5'))	08 Dec 16	22 Dec 16
607857	MS	1	Soil	1612081034 (400-SB-11)46.5'-47.5'))	08 Dec 16	22 Dec 16
607858		1	Soil	1612081419 (400-SB-11)87'-87.5'))	08 Dec 16	22 Dec 16

Test: T607W
 Section: TDG

Holding: 40 days from VTSR

NDMA/DMN ANALYSIS BY GC/MS/SIM

Cnt: 3

System ID	Type	Cont	Matrix	Customer ID	VTSR	Method Date
607856		1	Soil	1612081024 (400-SB-11)46.5'-47.5'))	13 Dec 16	22 Jan 17
607857	MS	1	Soil	1612081034 (400-SB-11)46.5'-47.5'))	13 Dec 16	22 Jan 17
607858		1	Soil	1612081419 (400-SB-11)87'-87.5'))	13 Dec 16	22 Jan 17



WSTF CHAIN OF CUSTODY RECORD

Date 12-12-16

010017

Page 1 of 1

Laboratory: Southwest Research Institute PO# 15ECO92B		Analytical Requirements				Special Instructions Return coolers and reusable packaging materials within 14 days as required in statement of work to: Return Address: NASA WSTF Environmental Department 12600 NASA Road; Bldg. 120 Las Cruces, NM 88012 Attn: Lori Minnick					
Address shipping questions to: <input type="checkbox"/> Lori Minnick, 575-524-5119 <input checked="" type="checkbox"/> Other: Pam Egan, 575-524-5351		# of Containers	Sample Matrix*	NDMA & Bromacil (607M)						Charge Number (WSTF Use Only)	
Send sample receipt confirmation and analytical reports to: <input checked="" type="checkbox"/> Carlyn Tufts, carlyn.a.tufts@nasa.gov <input checked="" type="checkbox"/> Shelly Hernandez, shelly.j.hernandez@nasa.gov <input type="checkbox"/> Other											
Sample Number	Sample Location									Comments	
1612081024	400-SB-11	1	S	X					6EE4IFW	46.5'-47.5'	
1612081034	"	1	S	X					|	" *Water Spike for #1612081024	
1612081419	"	1	S	X					|	97'-97.5'	
16120812											
Relinquished By: <i>[Signature]</i>		Date/Time: 12-12-16 / 1100hrs				Accepted By: <i>[Signature]</i>		Date/Time: 12-13-16 / 08:45			

* Sample Matrix: A – Aqueous; G – Gaseous; S – Solid

Client: Navarro
 SRR # 58813
 Project # 16988.01.10X
 Case: 15EC092B
 VTSR: 12/13/16
 Sample(s) Received: Intact
 Temperature: 1.9 SN # 021055

NASA-WSTF SHIPPING DOCUMENT

010018

DBWE #XB12

SHIPPED FROM:			WSTF ORIGINATOR/MAIL CODE/TELEPHONE NO.				
NASA JSC WHITE SANDS TEST FACILITY			Patricia Melendrez/Purchasing Dept/ 524-5334		Pam Egan 575-524-5351		
12600 NASA ROAD; BLDG. 120			ORDER OR CONTRACT NUMBER	SHIPMENT CONTROL NO			
LAS CRUCES, NEW MEXICO 88012			15EC092B				
SHIP TO: (ADDRESS, PHONE#, POINT OF CONTACT)			PROJECT or TASK NUMBER		SHIP VIA		
Southwest Research Institute			CP.6EE4IFW.0.71				
6220 Culebra Road			Contain Batteries	NO. PKG.	DATE SHIPPED		
San Antonio, TX 78238			NO		12-12-16		
Gang Sun			Battery Type-Part #	AUTHORIZED BY:	DEPT.		
210-522-3954							
ITEM NO.	EQUIPMENT CONTROL NO.	MODEL NO./ STOCK NO./ PART NO.	ITEM NAME - MANUFACTURER'S NAME AND SERIAL NO.			UNIT OF ISSUE	QTY.
1			Soil Sample NDMA and Bromacil Method 607M			EA	3
2			Aqueous Sample for NDMA and Bromacil Method 607M			EA	
JUSTIFICATION FOR SHIPMENT: (MDR #, Return Authorization #'s, Warranty Replacement, Repair, Overage/Shortage, Damage, Recycling)							
Samples for Analysis per SOW							
DOT HAZARDOUS MATERIALS INFO; EMERGENCY PHONE NUMBER AND GUIDE NUMBER:							
PROPERTY REVIEW: <input type="checkbox"/> REMOVE EQUIPMENT TAG <input type="checkbox"/> DO NOT REMOVE EQUIPMENT TAG							
PACKED BY:		#	TYPE	DIMENSIONS		WEIGHT	
		CONTAINERS	CONTAINERS				
Please check off the applicable labels!							
<input type="checkbox"/> FRAGILE							
<input type="checkbox"/> GLASS							
<input type="checkbox"/> DELICATE							
<input type="checkbox"/> DO NOT XRAY							
<input type="checkbox"/> REFRIGERATE							
<input type="checkbox"/> OTHER							
		TOTAL				TOTAL	
<input type="checkbox"/> BUBBLEWRAP		CONTAINERS				WEIGHT	
<input type="checkbox"/> FOAM							
RECEIVED BY: <i>David Khan</i>		SHIPPER'S CERTIFICATION: This is to certify that the above					
REPRESENTING: <i>SWRI</i>		named materials are properly classified, described, packaged, marked,					
		labeled, and are in proper condition for transportation according to the					
		regulations of the D.O.T. _____ Date _____					

Client: Navarro
 SRR # 58813
 Project # 16988.01.10X
 Case: 15EC092B
 VTSR: 12/13/16
 Sample(s) Received: Intact
 Temperature: 1.9 SN # 021055

Laboratory Task Order

TO #: 161213-4 Revision: 1

SDG: 607859

SRR #s: 58814
Client(s): Navarro

Project(s): 16988.01.10X
Manager(s): SUN, GANG
To Client: 01/03/17

010019

Instructions

Documents Related to this task order: 212528[COC for SRR 58814], 212529[Paperwork for SRR 58814], 108294[PO #179 + #180], 113038[PO #179 + #180 Change Order #1], 113134[PO #NAV0000060], 115908[PO #NAV0000060 CO #1], 117303[PO #NAV0000060 CO #2], 118820[PO #179 + #180 Change Order #2], 120319 [PO #104], 122923[PO #179 Change Order #3], 124787[PO #132], 124995[PO #179 Change Order #5]

Deliverables --> Hard Copy: no EDD: -YES- PDF: -YES-

Test: E607W
Section: EXTLAB

Holding: 7 days from CED

EXTRACTION BY METHOD 607

Cnt: 5

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
607859		1	Aqueous	1612080831Y (300-E-138)	08 Dec 16	15 Dec 16
607860		1	Aqueous	1612090932Y (300-E-183)	09 Dec 16	16 Dec 16
607861		1	Aqueous	1612091015A (BLM-27-270)	09 Dec 16	16 Dec 16
607862		1	Aqueous	1612091023B (700-B-510)	09 Dec 16	16 Dec 16
607863	MS	1	Aqueous	1612091024B (700-B-510)	09 Dec 16	16 Dec 16

Test: T607W
Section: TDG

Holding: 40 days from VTSR

NDMA/DMN ANALYSIS BY GC/MS/SIM

Cnt: 5

System ID	Type	Cont	Matrix	Customer ID	VTSR	Method Date
607859		1	Aqueous	1612080831Y (300-E-138)	13 Dec 16	22 Jan 17
607860		1	Aqueous	1612090932Y (300-E-183)	13 Dec 16	22 Jan 17
607861		1	Aqueous	1612091015A (BLM-27-270)	13 Dec 16	22 Jan 17
607862		1	Aqueous	1612091023B (700-B-510)	13 Dec 16	22 Jan 17
607863	MS	1	Aqueous	1612091024B (700-B-510)	13 Dec 16	22 Jan 17



Date 12-12-16

WSTF CHAIN OF CUSTODY RECORD

010020

Page 1 of 1

Laboratory: <u>GWRP</u>		PO# <u>15EC043B</u>		Analytical Requirements					Special Instructions Return coolers and reusable packaging materials within 14 days as required in statement of work to: Return Address: NASA WSTF Environmental Department 12600 NASA Road; Bldg. 120 Las Cruces, NM 88012 Attn: Lori Minnick	
Address shipping questions to: <input type="checkbox"/> Lori Minnick, 575-524-5119 <input type="checkbox"/> Other _____, 575-524-_____		# of Containers	Sample Matrix*	Method <u>1007</u> <u>ADNA/DMU/BROMACIL</u>						Charge Number (WSTF Use Only) <u>GMDR</u>
Send sample receipt confirmation and analytical reports to: <input checked="" type="checkbox"/> Carlyn Tufts, carlyn.a.tufts@nasa.gov <input checked="" type="checkbox"/> Shelly Hernandez, shelly.j.hernandez@nasa.gov <input type="checkbox"/> Other _____									Sample Number	
	<u>16120808314</u>	<u>300-E-138</u>	<u>1</u>	<u>A</u>	<u>X</u>					
	<u>16120909324</u>	<u>300-E-183</u>	<u>1</u>	<u>A</u>	<u>X</u>					
	<u>1612091015A</u>	<u>61m-27-270</u>	<u>1</u>	<u>A</u>	<u>X</u>					
	<u>1612091023B</u>	<u>700-B-510</u>	<u>1</u>	<u>A</u>	<u>X</u>					
	<u>1612091024B</u>	<u>"</u>	<u>1</u>	<u>A</u>	<u>X</u>					<u>*MATRIX SPIKE FOR #1612091023B</u>
Relinquished By: <u>[Signature]</u>		Date/Time: <u>12-12-16 / 11:00 hrs.</u>		Accepted By: <u>[Signature]</u>		Date/Time: <u>12-13-16 / 08:45</u>				

* Sample Matrix: A – Aqueous; G – Gaseous; S – Solid

Client: Navarro
 SRR # 58814
 Project # 16988.01.10X
 Case: 15EC043B
 VTSR: 12/13/16
 Sample(s) Received: Intact
 Temperature: 1.9 SN # 021055

NASA-WSTF SHIPPING DOCUMENT

010021

Blue # XB12

SHIPPED FROM: NASA JSC WHITE SANDS TEST FACILITY 12600 NASA ROAD; BLDG. 120 LAS CRUCES, NEW MEXICO 88012			WSTF ORIGINATOR/MAIL CODE/TELEPHONE NO. Patricia Melendrez/Purchasing Dept/ 524-5334 Carlyn Tufts 575-524-5452		
SHIP TO: (ADDRESS, PHONE#, POINT OF CONTACT) SOUTHWEST RESEARCH INSTITUTE 6220 CULEBRA ROAD SAN ANTONIO, TX 78238 Gang Sun 210-522-3954			ORDER OR CONTRACT NUMBER PO 15EC043B		SHIPMENT CONTROL NO
PROJECT or TASK NUMBER GMDR			SHIP VIA		DATE SHIPPED 12-12-16
Contain Batteries NO			NO. PKG.	AirBill/ PRO #/Bol #	AUTHORIZED BY:
Battery Type-Part #			DEPT.		AUTHORIZED BY:

ITEM NO.	EQUIPMENT CONTROL NO.	MODEL NO./ STOCK NO./ PART NO.	ITEM NAME - MANUFACTURER'S NAME AND SERIAL NO.	UNIT OF ISSUE	QTY.
1			Groundwater Sample for Method 607 Analysis 21 day TAT	EA	5
2			Groundwater Sample for Method 607 Analysis 7 day TAT	EA	

JUSTIFICATION FOR SHIPMENT: (MDR #, Return Authorization #'s, Warranty Replacement, Repair, Overage/Shortage, Damage, Recycling)
 Groundwater Samples for analysis per SOW

DOT HAZARDOUS MATERIALS INFO; EMERGENCY PHONE NUMBER AND GUIDE NUMBER:

PROPERTY REVIEW: REMOVE EQUIPMENT TAG DO NOT REMOVE EQUIPMENT TAG

PACKED BY:	#		DIMENSIONS	WEIGHT
	CONTAINERS	CONTAINERS		
Please check off the applicable labels! <input type="checkbox"/> FRAGILE <input type="checkbox"/> GLASS <input type="checkbox"/> DELICATE <input type="checkbox"/> DO NOT XRAY <input type="checkbox"/> REFRIGERATE <input type="checkbox"/> OTHER <input type="checkbox"/> BUBBLEWRAP <input type="checkbox"/> FOAM				
	TOTAL CONTAINERS			TOTAL WEIGHT

RECEIVED BY: <i>David Mann</i>	SHIPPERS CERTIFICATION: This is to certify that the above named materials are properly classified, described, packaged, marked, labeled, and are in proper condition for transportation according to the regulations of the D.O.T. _____ Date _____
REPRESENTING: <i>SWRI</i>	

Client: Navarro
 SRR # 58814
 Project # 16988.01.10X
 Case: 15EC043B
 VTSR: 12/13/16
 Sample(s) Received: Intact
 Temperature: 1.9 SN # 021055

Laboratory Task Order

TO #: 161214-4 Revision: 0

Project(s): 16988.01.10X
Manager(s): SUN, GANG
To Client: 01/04/17

SDG: 607897

SRR #'s: 58821
Client(s): Navarro

010022

Instructions

Documents Related to this task order: 212574[COC for SRR 58821], 212576[Paperwork for SRR 58821], 108294[PO #179 + #180], 113038[PO #179 + #180 Change Order #1], 113134[PO #NAV0000060], 115908[PO #NAV0000060 CO #1], 117303[PO #NAV0000060 CO #2], 118820[PO #179 + #180 Change Order #2], 120319 [PO #104], 122923[PO #179 Change Order #3], 124787[PO #132], 124995[PO #179 Change Order #5]

Deliverables --> Hard Copy: no EDD: -YES- PDF: -YES-

Test: E607W

Holding: 7 days from CED

Section: EXTLAB

EXTRACTION BY METHOD 607

Cnt: 1

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
607897		1	Aqueous	1612121316Z (200-G-495)	12 Dec 16	19 Dec 16

Test: T607W

Holding: 40 days from VTSR

Section: TDG

NDMA/DMN ANALYSIS BY GC/MS/SIM

Cnt: 1

System ID	Type	Cont	Matrix	Customer ID	VTSR	Method Date
607897		1	Aqueous	1612121316Z (200-G-495)	14 Dec 16	23 Jan 17



WSTF CHAIN OF CUSTODY RECORD

010023

Date 12-13-16

Page 1 of 1

Laboratory: <u>GWR</u>		PO# <u>15EC043B</u>		Analytical Requirements				Special Instructions Return coolers and reusable packaging materials within 14 days as required in statement of work to: Return Address: NASA WSTF Environmental Department 12600 NASA Road; Bldg. 120 Las Cruces, NM 88012 Attn: Lori Minnick	
Address shipping questions to: <input type="checkbox"/> Lori Minnick, 575-524-5119 <input type="checkbox"/> Other _____, 575-524-_____		# of Containers	Sample Matrix*	607 Method NDWA/DWA/BROMACIL					Charge Number (WSTF Use Only)
Send sample receipt confirmation and analytical reports to: <input checked="" type="checkbox"/> Carlyn Tufts, carlyn.a.tufts@nasa.gov <input checked="" type="checkbox"/> Shelly Hernandez, shelly.j.hernandez@nasa.gov <input type="checkbox"/> Other									
Sample Number	Sample Location							Comments	
<u>1612121316Z</u>	<u>200-G-495</u>	<u>1</u>	<u>1</u>	<u>X</u>					
Relinquished By: <u>Lori Minnick</u>		Date/Time: <u>12-13-16 / 1100 hrs.</u>		Accepted By: <u>David Garcia</u>		Date/Time: <u>12-14-16 / 08:45</u>			

* Sample Matrix: A – Aqueous; G – Gaseous; S – Solid

Client: Navarro
SRR # 58821
Project # 16988.01.10X
Case: 15EC043B
VTSR: 12/14/16
Sample(s) Received: Intact
Temperature: 1.9 SN # 021055

NASA-WSTF SHIPPING DOCUMENT

010024

(1) BLUE # XB32

SHIPPED FROM: NASA JSC WHITE SANDS TEST FACILITY 12600 NASA ROAD; BLDG. 120 LAS CRUCES, NEW MEXICO 88012			WSTF ORIGINATOR/MAIL CODE/TELEPHONE NO. Patricia Melendrez/Purchasing Dept/ 524-5334 Carlyn Tufts 575-524-5452		
SHIP TO: (ADDRESS, PHONE#, POINT OF CONTACT) SOUTHWEST RESEARCH INSTITUTE 6220 CULEBRA ROAD SAN ANTONIO, TX 78238 Gang Sun 210-522-3954			ORDER OR CONTRACT NUMBER PO 15EC043B		SHIPMENT CONTROL NO
PROJECT or TASK NUMBER GMDR			SHIP VIA		
Contain Batteries NO		NO. PKG.	DATE SHIPPED 12-13-16	AirBill/ PRO #/Bol #	
Battery Type-Part #		AUTHORIZED BY:		DEPT.	

ITEM NO.	EQUIPMENT CONTROL NO.	MODEL NO./ STOCK NO./ PART NO.	ITEM NAME - MANUFACTURER'S NAME AND SERIAL NO.	UNIT OF ISSUE	QTY.
1			Groundwater Sample for Method 607 Analysis 21 day TAT	EA	1
2			Groundwater Sample for Method 607 Analysis 7 day TAT	EA	

JUSTIFICATION FOR SHIPMENT: (MDR #, Return Authorization #'s, Warranty Replacement, Repair, Overage/Shortage, Damage, Recycling)
 Groundwater Samples for analysis per SOW

DOT HAZARDOUS MATERIALS INFO; EMERGENCY PHONE NUMBER AND GUIDE NUMBER:

PROPERTY REVIEW: REMOVE EQUIPMENT TAG DO NOT REMOVE EQUIPMENT TAG

PACKED BY:	# CONTAINERS	TYPE CONTAINERS	DIMENSIONS	WEIGHT	
Please check off the applicable labels! <input type="checkbox"/> FRAGILE <input type="checkbox"/> GLASS <input type="checkbox"/> DELICATE <input type="checkbox"/> DO NOT XRAY <input type="checkbox"/> REFRIGERATE <input type="checkbox"/> OTHER <input type="checkbox"/> BUBBLEWRAP <input type="checkbox"/> FOAM					
		TOTAL CONTAINERS			TOTAL WEIGHT

RECEIVED BY: <i>Daniel Garin</i>	SHIPPERS CERTIFICATION: This is to certify that the above named materials are properly classified, described, packaged, marked, labeled, and are in proper condition for transportation according to the regulations of the D.O.T. _____ Date _____
REPRESENTING: <i>SWRI</i>	

Client: Navarro
 SRR # 58821
 Project # 16988.01.10X
 Case: 15EC043B
 VTSR: 12/14/16
 Sample(s) Received: Intact
 Temperature: 1.9 SN # 021055

Laboratory Task Order

TO #: 161216-4 Revision: 1

SDG: 608000

SRR #s: 58840
Client(s): Navarro

Project(s): 16988.01.10X
Manager(s): SUN, GANG
To Client: 01/06/17

010025

Instructions

Documents Related to this task order: 212744[COC for SRR 58840], 212745[Paperwork for SRR 58840], 108294[PO #179 + #180], 113038[PO #179 + #180 Change Order #1], 113134[PO #NAV0000060], 115908[PO #NAV0000060 CO #1], 117303[PO #NAV0000060 CO #2], 118820[PO #179 + #180 Change Order #2], 120319 [PO #104], 122923[PO #179 Change Order #3], 124787[PO #132], 124995[PO #179 Change Order #5]

Deliverables --> Hard Copy: no EDD: -YES- PDF: -YES-

Test: E607W
Section: EXTLAB

Holding: 7 days from CED

EXTRACTION BY METHOD 607

Cnt: 8

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
608000		1	Aqueous	1612130927B (BW-7-211)	13 Dec 16	20 Dec 16
608001		1	Aqueous	1612131101B (BW-7-211)	13 Dec 16	20 Dec 16
608002		1	Aqueous	1612140928A (BW-5-295)	14 Dec 16	21 Dec 16
608003		1	Aqueous	1612140930A (BW-5-295)	14 Dec 16	21 Dec 16
608004		1	Aqueous	1612140951B (ST-3-586)	14 Dec 16	21 Dec 16
608005		1	Aqueous	1612140952B (ST-3-586)	14 Dec 16	21 Dec 16
608006		1	Aqueous	1612141356Z (200-G-420)	14 Dec 16	21 Dec 16
608007		1	Aqueous	1612141428B (ST-3-666)	14 Dec 16	21 Dec 16

Test: T607W
Section: TDG

Holding: 40 days from VTSR

NDMA/DMN ANALYSIS BY GC/MS/SIM

Cnt: 8

System ID	Type	Cont	Matrix	Customer ID	VTSR	Method Date
608000		1	Aqueous	1612130927B (BW-7-211)	16 Dec 16	25 Jan 17
608001		1	Aqueous	1612131101B (BW-7-211)	16 Dec 16	25 Jan 17
608002		1	Aqueous	1612140928A (BW-5-295)	16 Dec 16	25 Jan 17
608003		1	Aqueous	1612140930A (BW-5-295)	16 Dec 16	25 Jan 17
608004		1	Aqueous	1612140951B (ST-3-586)	16 Dec 16	25 Jan 17
608005		1	Aqueous	1612140952B (ST-3-586)	16 Dec 16	25 Jan 17
608006		1	Aqueous	1612141356Z (200-G-420)	16 Dec 16	25 Jan 17
608007		1	Aqueous	1612141428B (ST-3-666)	16 Dec 16	25 Jan 17



WSTF CHAIN OF CUSTODY RECORD

Date 12-16-16

010026

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Laboratory: <u>SWLT</u>		PO# <u>15EC043B</u>		Analytical Requirements					Special Instructions Return coolers and reusable packaging materials within 14 days as required in statement of work to: Return Address: NASA WSTF Environmental Department 12600 NASA Road; Bldg. 120 Las Cruces, NM 88012 Attn: Lori Minnick	
Address shipping questions to: <input type="checkbox"/> Lori Minnick, 575-524-5119 <input type="checkbox"/> Other _____, 575-524-_____				Analytes <u>NDMA/DMA/BBM/PCP</u>						Charge Number (WSTF Use Only) <u>EMDR</u>
Send sample receipt confirmation and analytical reports to: <input checked="" type="checkbox"/> Carlyn Tufts, carlyn.a.tufts@nasa.gov <input checked="" type="checkbox"/> Shelly Hernandez, shelly.j.hernandez@nasa.gov <input type="checkbox"/> Other _____		# of Containers	Sample Matrix*							
Sample Number	Sample Location	# of Containers	Sample Matrix*						Comments	
<u>1612130927B</u>	<u>BW-7-211</u>	<u>1</u>	<u>A</u>	<u>X</u>						
<u>1612131101B</u>	<u>"</u>	<u>1</u>	<u>A</u>	<u>X</u>						
<u>1612140928A</u>	<u>BW-5-295</u>	<u>1</u>	<u>A</u>	<u>X</u>						
<u>1612140930A</u>	<u>"</u>	<u>1</u>	<u>A</u>	<u>X</u>						
<u>1612140951B</u>	<u>ST-3-586</u>	<u>1</u>	<u>A</u>	<u>X</u>						
<u>1612140952B</u>	<u>"</u>	<u>1</u>	<u>A</u>	<u>X</u>						
<u>1612141356Z</u>	<u>200-G-420</u>	<u>1</u>	<u>A</u>	<u>X</u>						
<u>1612141428B</u>	<u>ST-3-666</u>	<u>1</u>	<u>A</u>	<u>X</u>						
Relinquished By: <u>John W. Munch</u>		Date/Time: <u>12-16-16 / 1100 hrs.</u>		Accepted By: <u>Daniel Martin</u>				Date/Time: <u>12-16-16 / 08:30</u>		

* Sample Matrix: A – Aqueous; G – Gaseous; S – Solid

Client: Navarro
SRR # 58840
Project # 16988.01.10X
Case: 15EC043B
VTSR: 12/16/16
Sample(s) Received: Intact
Temperature: 1.9 SN # 021055

NASA-WSTF SHIPPING DOCUMENT

010027

① Red # RD30

SHIPPED FROM: NASA JSC WHITE SANDS TEST FACILITY 12600 NASA ROAD; BLDG. 120 LAS CRUCES, NEW MEXICO 88012			WSTF ORIGINATOR/MAIL CODE/TELEPHONE NO. Patricia Melendrez/Purchasing Dept/ 524-5334 Carlyn Tufts 575-524-5452			
SHIP TO: (ADDRESS, PHONE#, POINT OF CONTACT) SOUTHWEST RESEARCH INSTITUTE 6220 CULEBRA ROAD SAN ANTONIO, TX 78238 Gang Sun 210-522-3954			ORDER OR CONTRACT NUMBER PO 15EC043B		SHIPMENT CONTROL NO	
PROJECT or TASK NUMBER GMDR			SHIP VIA			
Contain Batteries NO		NO. PKG.	DATE SHIPPED 12-15-16	AirBill/ PRO #/Bot #		
Battery Type-Part #		AUTHORIZED BY:		DEPT.		
ITEM NO.	EQUIPMENT CONTROL NO.	MODEL NO./ STOCK NO./ PART NO.	ITEM NAME - MANUFACTURER'S NAME AND SERIAL NO.	UNIT OF ISSUE	QTY.	
1			Groundwater Sample for Method 607 Analysis 21 day TAT	EA	8	
2			Groundwater Sample for Method 607 Analysis 7 day TAT	EA		
JUSTIFICATION FOR SHIPMENT: (MDR #, Return Authorization #'s, Warranty Replacement, Repair, Overage/Shortage, Damage, Recycling) Groundwater Samples for analysis per SOW						
DOT HAZARDOUS MATERIALS INFO; EMERGENCY PHONE NUMBER AND GUIDE NUMBER:						
PROPERTY REVIEW:		<input type="checkbox"/> REMOVE EQUIPMENT TAG <input type="checkbox"/> DO NOT REMOVE EQUIPMENT TAG				
PACKED BY:		#	TYPE	DIMENSIONS		WEIGHT
		CONTAINERS	CONTAINERS			
Please check off the applicable labels! <input type="checkbox"/> FRAGILE <input type="checkbox"/> GLASS <input type="checkbox"/> DELICATE <input type="checkbox"/> DO NOT XRAY <input type="checkbox"/> REFRIGERATE <input type="checkbox"/> OTHER <input type="checkbox"/> BUBBLEWRAP <input type="checkbox"/> FOAM						
		TOTAL				TOTAL WEIGHT
RECEIVED BY: <i>David Gorin</i>		SHIPPERS CERTIFICATION: This is to certify that the above named materials are properly classified, described, packaged, marked, labeled, and are in proper condition for transportation according to the regulations of the D.O.T. Date _____				
REPRESENTING: <i>SWRI</i>						

Client: Navarro
 SRR # 58840
 Project # 16988.01.10X
 Case: 15EC043B
 VTSR: 12/16/16
 Sample(s) Received: Intact
 Temperature: 1.9 SN # 021055

Laboratory Task Order

TO #: 161216-5 Revision: 1

SDG: 608008

SRR #s: 58845
Client(s): Navarro

Project(s): 16988.01.10X
Manager(s): SUN, GANG
To Client: 01/06/17

010028

Instructions

Documents Related to this task order: 212746[COC for SRR 58845], 212747[Paperwork for SRR 58845], 108294[PO #179 + #180], 113038[PO #179 + #180 Change Order #1], 113134[PO #NAV0000060], 115908[PO #NAV0000060 CO #1], 117303[PO #NAV0000060 CO #2], 118820[PO #179 + #180 Change Order #2], 120319 [PO #104], 122923[PO #179 Change Order #3], 124787[PO #132], 124995[PO #179 Change Order #5]

Deliverables --> Hard Copy: no EDD: -YES- PDF: -YES-

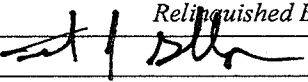

Test: E607W Holding: 7 days from CED
Section: EXTLAB **EXTRACTION BY METHOD 607** Cnt: 3

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
608008		1	Aqueous	1612141324 (400-SB-08)	14 Dec 16	21 Dec 16
608009		1	Aqueous	1612141339 (400-SB-13)	14 Dec 16	21 Dec 16
608010		1	Aqueous	1612141354 (400-SB-14)	14 Dec 16	21 Dec 16

Test: T607W Holding: 40 days from VTSR
Section: TDG **NDMA/DMN ANALYSIS BY GC/MS/SIM** Cnt: 3

System ID	Type	Cont	Matrix	Customer ID	VTSR	Method Date
608008		1	Aqueous	1612141324 (400-SB-08)	16 Dec 16	25 Jan 17
608009		1	Aqueous	1612141339 (400-SB-13)	16 Dec 16	25 Jan 17
608010		1	Aqueous	1612141354 (400-SB-14)	16 Dec 16	25 Jan 17



Laboratory PO #15EC092B & 16ECO38B		Analytical Requirements				Special Instructions
Return Address for Analytical Reports		# of Containers	Sample Type: Aqueous (A); Slurry (S)	EPA method 607M 1 liter glass amber bottle Ice	EPA method 607M 8 oz Amber Glass Jar, Ice	Comments
Sample No.	Sample Location					
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012 Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453						Please return coolers and reusable packaging materials as soon as possible. Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall
						* Bill to 15EC092B ** Bill to 16ECO38B
161214* 1324	400-SB-08	1	A	X		
161214** 1325	400-SB-08	1	S		X	
161214** 1326	400-SB-08	1	S		X	
161214* 1339	400-SB-13	1	A	X		
161214** 1340	400-SB-13	1	S		X	
161214** 1341	400-SB-13	1	S		X	
161214* 1354	400-SB-14	1	A	X		
161214** 1355	400-SB-14	1	S		X	
161214** 1356	400-SB-14	1	S		X	
Relinquished By: 		Date/Time: 12-14-16 (1445)		Accepted By: 		Date/Time: 12-16-16 / 08:30

Client: Navarro
 SRR # 58845
 Project # 16988.01.10X
 Case: 15EC092B
 VTSR: 12/16/16
 Sample(s) Received: Intact
 Temperature: 1.9 SN # 021055

NASA-WSTF SHIPPING DOCUMENT

010030

① Red RD-72

SHIPPED FROM: NASA JSC WHITE SANDS TEST FACILITY 12600 NASA ROAD; BLDG. 120 LAS CRUCES, NEW MEXICO 88012		WSTF ORIGINATOR/MAIL CODE/TELEPHONE NO. Tom Hall 575-524-5453	
SHIP TO: (ADDRESS, PHONE#, POINT OF CONTACT) Southwest Research Institute 6220 Culebra Road San Antonio, TX 782238 Gang Sun 210-522-3954		ORDER OR CONTRACT NUMBER Navarro PO #15EC092B & 16ECO38	SHIPMENT CONTROL NO
PROJECT or TASK NUMBER CP.6EE4IFW.0.71		SHIP VIA Fed Ex Air 12/15/16	
Contain Batteries NO		NO. PKG. 1	DATE SHIPPED 12/14/2016
Battery Type-Part # N/A		AUTHORIZED BY: Tom Hall	DEPT. Environmental

ITEM NO.	EQUIPMENT CONTROL NO.	MODEL NO./ STOCK NO./ PART NO.	ITEM NAME - MANUFACTURER'S NAME AND SERIAL NO.	UNIT OF ISSUE	QTY.
			Navarro PO #15EC092B: Line Item #1 NDMA and Bromacil for Soil samples by method 607M Line Item #2 NDMA and Bromacil for aqueous samples by method 607M Navarro PO #16ECO38: Line Item #1 NDMA and Bromacil for Mixed Media samples by method 607M	ea. ea. ea.	3 6

JUSTIFICATION FOR SHIPMENT: (MDR #, Return Authorization #'s, Warranty Replacement, Repair, Overage/Shortage, Damage, Recycling)
 Sample for analysis as requested (Navarro PO #15EC0092B)

DOT HAZARDOUS MATERIALS INFO; EMERGENCY PHONE NUMBER AND GUIDE NUMBER:
 Not subject to regulation as a hazard material under 49 CFR.

PROPERTY REVIEW: REMOVE EQUIPMENT TAG DO NOT REMOVE EQUIPMENT TAG

PACKED BY:	# CONTAINERS	TYPE CONTAINERS	DIMENSIONS	WEIGHT	
Please check off the applicable labels! <input type="checkbox"/> FRAGILE <input checked="" type="checkbox"/> GLASS <input type="checkbox"/> DELICATE <input type="checkbox"/> DO NOT XRAY <input checked="" type="checkbox"/> REFRIGERATE <input type="checkbox"/> OTHER <input checked="" type="checkbox"/> BUBBLEWRAP <input checked="" type="checkbox"/> FOAM	6	Glass	8 oz. Glass Jar		
	3	Glass	1 Liter Glass Bottle		
	TOTAL CONTAINERS	9			TOTAL WEIGHT

RECEIVED BY: <i>David Garcia</i>	SHIPPERS CERTIFICATION: This is to certify that the above named materials are properly classified, described, packaged, marked, labeled, and are in proper condition for transportation according to the regulations of the D.O.T. Date
REPRESENTING: <i>SWRI</i>	

Client: Navarro
 SRR # 58845
 Project # 16988.01.10X
 Case: 15EC092B
 VTSR: 12/16/16
 Sample(s) Received: Intact
 Temperature: 1.9 SN # 021055

010031

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161206-6, 161206-8, 161209-2, 161209-4, 161213-3, 161213-4, 161214-4
161216-4, 161216-5
NAVARRO PO #: 15EC043B, 15EC092B

ANALYTICAL DATA REPORT SHEETS

Southwest Research Institute

010032

Method 607 Analysis Data Sheet

Sample ID

1612011242 (PFE-3)

Client: Navarro
Batch: M607-#726
Task Order: 161206-6
Matrix: Aqueous
Sample Wt/Vol: 950 mL

Project: 16988.01.103
Date Received: 12/06/16
Date Extracted: 12/08/16
Date Analyzed: 12/20/16
Date Reported: 12/21/16

Lab Sample ID: 607625
Lab File Name: A1220603.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: µg/L
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	0.27	
4164-28-7	N-Nitrodimethylamine	0.28	
314-40-9	Bromacil	0.12	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

010033

Method 607 Analysis Data Sheet

Sample ID

1612011304A (BLM-32-632)

Client: Navarro
Batch: M607-#726
Task Order: 161206-6
Matrix: Aqueous
Sample Wt/Vol: 900 mL

Project: 16988.01.103
Date Received: 12/06/16
Date Extracted: 12/08/16
Date Analyzed: 12/20/16
Date Reported: 12/21/16

Lab Sample ID: 607626
Lab File Name: A1220604.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: µg/L
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.01	U
4164-28-7	N-Nitrodimethylamine	<0.01	U
314-40-9	Bromacil	<0.01	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

010034

Method 607 Analysis Data Sheet

Sample ID

1612030909 (400-SB-07)

Client: Navarro
Batch: M607-#726
Task Order: 161206-8
Matrix: Aqueous
Sample Wt/Vol: 1030 mL

Project: 16988.01.103
Date Received: 12/06/16
Date Extracted: 12/08/16
Date Analyzed: 12/20/16
Date Reported: 12/21/16

Lab Sample ID: 607665
Lab File Name: A1220605.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: µg/L
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.01	U
4164-28-7	N-Nitrodimethylamine	<0.01	U
314-40-9	Bromacil	<0.01	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

010035

Method 607 Analysis Data Sheet

Sample ID

1612041238 (400-SB-06)

Client: Navarro
Batch: M607-#726
Task Order: 161206-8
Matrix: Aqueous
Sample Wt/Vol: 1040 mL

Project: 16988.01.103
Date Received: 12/06/16
Date Extracted: 12/08/16
Date Analyzed: 12/20/16
Date Reported: 12/21/16

Lab Sample ID: 607669
Lab File Name: A1220606.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: µg/L
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.01	U
4164-28-7	N-Nitrodimethylamine	<0.01	U
314-40-9	Bromacil	<0.01	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

010036

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612050808 (400-SB-06)

Client: Navarro
Batch: M607-#726
Task Order: 161206-8
Matrix: Aqueous
Sample Wt/Vol: 1060 mL

Project: 16988.01.103
Date Received: 12/06/16
Date Extracted: 12/08/16
Date Analyzed: 12/20/16
Date Reported: 12/21/16

Lab Sample ID: 607672
Lab File Name: A1220607.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: µg/L
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.01	U
4164-28-7	N-Nitrodimethylamine	<0.01	U
314-40-9	Bromacil	<0.01	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

010037

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612061357A (NASA 6)

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607761

Batch: M607-#726

Date Received: 12/09/16

Lab File Name: A1220643.txt

Task Order: 161209-2

Date Extracted: 12/13/16

Final Extraction Vol: 1000 uL

Matrix: Aqueous

Date Analyzed: 12/21/16

Dilution Factor: 4

Sample Wt/Vol: 1020 mL

Date Reported: 12/21/16

Reporting Unit: µg/L

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	18.19	D
4164-28-7	N-Nitrodimethylamine	27.59	D
314-40-9	Bromacil	3.33	D

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

010038

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612080759 (400-SB-11)

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607767

Batch: M607-#726

Date Received: 12/09/16

Lab File Name: A1220611.txt

Task Order: 161209-4

Date Extracted: 12/13/16

Final Extraction Vol: 1000 uL

Matrix: Aqueous

Date Analyzed: 12/20/16

Dilution Factor: 1

Sample Wt/Vol: 1060 mL

Date Reported: 12/21/16

Reporting Unit: µg/L

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.01	U
4164-28-7	N-Nitrodimethylamine	<0.01	U
314-40-9	Bromacil	0.05	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

010039

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612080831Y (300-E-138)

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607859

Batch: M607-#726

Date Received: 12/13/16

Lab File Name: A1220612.txt

Task Order: 161213-4

Date Extracted: 12/13/16

Final Extraction Vol: 1000 uL

Matrix: Aqueous

Date Analyzed: 12/20/16

Dilution Factor: 1

Sample Wt/Vol: 950 mL

Date Reported: 12/21/16

Reporting Unit: µg/L

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	0.41	
4164-28-7	N-Nitrodimethylamine	1.92	
314-40-9	Bromacil	0.07	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

010040

Method 607 Analysis Data Sheet

Sample ID

1612090932Y (300-E-183)

Client: Navarro
Batch: M607-#726
Task Order: 161213-4
Matrix: Aqueous
Sample Wt/Vol: 920 mL

Project: 16988.01.103
Date Received: 12/13/16
Date Extracted: 12/13/16
Date Analyzed: 12/20/16
Date Reported: 12/21/16

Lab Sample ID: 607860
Lab File Name: A1220613.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: µg/L
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.01	U
4164-28-7	N-Nitrodimethylamine	0.16	
314-40-9	Bromacil	1.55	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

010041

Method 607 Analysis Data Sheet

Sample ID

1612091015A (BLM-27-270)

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607861

Batch: M607-#726

Date Received: 12/13/16

Lab File Name: A1220614.txt

Task Order: 161213-4

Date Extracted: 12/13/16

Final Extraction Vol: 1000 uL

Matrix: Aqueous

Date Analyzed: 12/20/16

Dilution Factor: 1

Sample Wt/Vol: 920 mL

Date Reported: 12/21/16

Reporting Unit: µg/L

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	3.41	
4164-28-7	N-Nitrodimethylamine	2.08	
314-40-9	Bromacil	0.24	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

010042

Method 607 Analysis Data Sheet

Sample ID

1612091023B (700-B-510)

Client: Navarro
Batch: M607-#726
Task Order: 161213-4
Matrix: Aqueous
Sample Wt/Vol: 970 mL

Project: 16988.01.103
Date Received: 12/13/16
Date Extracted: 12/13/16
Date Analyzed: 12/20/16
Date Reported: 12/21/16

Lab Sample ID: 607862
Lab File Name: A1220615.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: µg/L
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.01	U
4164-28-7	N-Nitrodimethylamine	<0.01	U
314-40-9	Bromacil	<0.01	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

010043

Method 607 Analysis Data Sheet

Sample ID

1612031204 (400-SB-07)1'-2')

Client: Navarro
Batch: M607-#726
Task Order: 161206-8
Matrix: Soil
Sample Wt/Vol: 30.61 g

Project: 16988.01.103
Date Received: 12/06/16
Date Extracted: 12/15/16
Date Analyzed: 12/20/16
Date Reported: 12/21/16

Lab Sample ID: 607666
Lab File Name: A1220619.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: ng/g
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	0.78	
4164-28-7	N-Nitrodimethylamine	0.23	J
314-40-9	Bromacil	1.01	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

010044

Method 607 Analysis Data Sheet

Sample ID

1612031434 (400-SB-07)48'-50')

Client: Navarro
Batch: M607-#726
Task Order: 161206-8
Matrix: Soil
Sample Wt/Vol: 30.20 g

Project: 16988.01.103
Date Received: 12/06/16
Date Extracted: 12/15/16
Date Analyzed: 12/20/16
Date Reported: 12/21/16

Lab Sample ID: 607667
Lab File Name: A1220620.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: ng/g
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	0.33	
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

010045

Method 607 Analysis Data Sheet

Sample ID

1612031644 (400-SB-07)75'-76')

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607668

Batch: M607-#726

Date Received: 12/06/16

Lab File Name: A1220621.txt

Task Order: 161206-8

Date Extracted: 12/15/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/21/16

Dilution Factor: 1

Sample Wt/Vol: 30.46 g

Date Reported: 12/21/16

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	0.39	
4164-28-7	N-Nitrodimethylamine	0.92	
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

010046

Method 607 Analysis Data Sheet

Sample ID

1612041424 (400-SB-06)13.5'-14.5'))

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607670

Batch: M607-#726

Date Received: 12/06/16

Lab File Name: A1220622.txt

Task Order: 161206-8

Date Extracted: 12/15/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/21/16

Dilution Factor: 1

Sample Wt/Vol: 30.40 g

Date Reported: 12/21/16

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

010047

Method 607 Analysis Data Sheet

Sample ID

1612041619 (400-SB-06)42.5'-43.5')

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607671

Batch: M607-#726

Date Received: 12/06/16

Lab File Name: A1220623.txt

Task Order: 161206-8

Date Extracted: 12/15/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/21/16

Dilution Factor: 1

Sample Wt/Vol: 30.26 g

Date Reported: 12/21/16

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

010048

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612051334 (400-SB-06)86.5'-87.5')

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607766

Batch: M607-#726

Date Received: 12/09/16

Lab File Name: A1220624.txt

Task Order: 161209-4

Date Extracted: 12/15/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/21/16

Dilution Factor: 1

Sample Wt/Vol: 30.63 g

Date Reported: 12/21/16

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

010049

Method 607 Analysis Data Sheet

Sample ID

1612080834 (400-SB-11)(12.5'-13')

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607768

Batch: M607-#726

Date Received: 12/09/16

Lab File Name: A1220625.txt

Task Order: 161209-4

Date Extracted: 12/15/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/21/16

Dilution Factor: 1

Sample Wt/Vol: 30.44 g

Date Reported: 12/21/16

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

010050

Method 607 Analysis Data Sheet

Sample ID

1612081024 (400-SB-11)46.5'-47.5')

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607856

Batch: M607-#726

Date Received: 12/13/16

Lab File Name: A1220626.txt

Task Order: 161213-3

Date Extracted: 12/15/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/21/16

Dilution Factor: 1

Sample Wt/Vol: 30.28 g

Date Reported: 12/21/16

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

010051

Method 607 Analysis Data Sheet

Sample ID

1612081419 (400-SB-11)87'-87.5')

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607858

Batch: M607-#726

Date Received: 12/13/16

Lab File Name: A1220628.txt

Task Order: 161213-3

Date Extracted: 12/15/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/21/16

Dilution Factor: 1

Sample Wt/Vol: 30.25 g

Date Reported: 12/21/16

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

010052
Rev 1

Sample ID

1612121316Z (200-G-495)

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607897

Batch: M607-#726

Date Received: 12/14/16

Lab File Name: A1220631.txt

Task Order: 161214-4

Date Extracted: 12/19/16

Final Extraction Vol: 1000 uL

Matrix: Aqueous

Date Analyzed: 12/21/16

Dilution Factor: 1

Sample Wt/Vol: 950 mL

Date Reported: 12/21/16

Reporting Unit: µg/L

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.01	U
4164-28-7	N-Nitrodimethylamine	<0.01	U
314-40-9	Bromacil	0.02	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

010053
Rev 1

Sample ID

1612130927B (BW-7-211)

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 608000

Batch: M607-#726

Date Received: 12/16/16

Lab File Name: A1220632.txt

Task Order: 161214-6

Date Extracted: 12/19/16

Final Extraction Vol: 1000 uL

Matrix: Aqueous

Date Analyzed: 12/21/16

Dilution Factor: 1

Sample Wt/Vol: 1000 mL

Date Reported: 12/21/16

Reporting Unit: µg/L

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	0.64	
4164-28-7	N-Nitrodimethylamine	3.09	
314-40-9	Bromacil	2.67	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

010054
Rev 1

Sample ID

1612131101B (BW-7-211)

Client: Navarro
Batch: M607-#726
Task Order: 161214-6
Matrix: Aqueous
Sample Wt/Vol: 1000 mL

Project: 16988.01.103
Date Received: 12/16/16
Date Extracted: 12/19/16
Date Analyzed: 12/21/16
Date Reported: 12/21/16

Lab Sample ID: 608001
Lab File Name: A1220633.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: µg/L
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	0.36	
4164-28-7	N-Nitrodimethylamine	<0.01	U
314-40-9	Bromacil	2.04	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

010055
Rev 1

Sample ID

1612140928A (BW-5-295)

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 608002

Batch: M607-#726

Date Received: 12/16/16

Lab File Name: A1220634.txt

Task Order: 161214-6

Date Extracted: 12/19/16

Final Extraction Vol: 1000 uL

Matrix: Aqueous

Date Analyzed: 12/21/16

Dilution Factor: 1

Sample Wt/Vol: 1040 mL

Date Reported: 12/21/16

Reporting Unit: µg/L

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	0.37	
4164-28-7	N-Nitrodimethylamine	1.87	
314-40-9	Bromacil	0.08	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

010056
Rev 1

Sample ID

1612140930A (BW-5-295)

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 608003

Batch: M607-#726

Date Received: 12/16/16

Lab File Name: A1220635.txt

Task Order: 161214-6

Date Extracted: 12/19/16

Final Extraction Vol: 1000 uL

Matrix: Aqueous

Date Analyzed: 12/21/16

Dilution Factor: 1

Sample Wt/Vol: 970 mL

Date Reported: 12/21/16

Reporting Unit: µg/L

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	0.39	
4164-28-7	N-Nitrodimethylamine	1.94	
314-40-9	Bromacil	0.04	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute
Method 607 Analysis Data Sheet

010057
Rev 1

Sample ID

1612140951B (ST-3-586)

Client: Navarro
Batch: M607-#726
Task Order: 161214-6
Matrix: Aqueous
Sample Wt/Vol: 960 mL

Project: 16988.01.103
Date Received: 12/16/16
Date Extracted: 12/19/16
Date Analyzed: 12/21/16
Date Reported: 12/21/16

Lab Sample ID: 608004
Lab File Name: A1220636.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: µg/L
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	0.24	
4164-28-7	N-Nitrodimethylamine	0.19	
314-40-9	Bromacil	0.01	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute
Method 607 Analysis Data Sheet

016058
Rev 1

Sample ID

1612140952B (ST-3-586)

Client: Navarro
Batch: M607-#726
Task Order: 161214-6
Matrix: Aqueous
Sample Wt/Vol: 970 mL

Project: 16988.01.103
Date Received: 12/16/16
Date Extracted: 12/19/16
Date Analyzed: 12/21/16
Date Reported: 12/21/16

Lab Sample ID: 608005
Lab File Name: A1220637.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: µg/L
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	0.23	
4164-28-7	N-Nitrodimethylamine	0.18	
314-40-9	Bromacil	0.008	J

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute
Method 607 Analysis Data Sheet

010059
Rev 1

Sample ID

1612141356Z (200-G-420)

Client: Navarro
Batch: M607-#726
Task Order: 161214-6
Matrix: Aqueous
Sample Wt/Vol: 970 mL

Project: 16988.01.103
Date Received: 12/16/16
Date Extracted: 12/19/16
Date Analyzed: 12/21/16
Date Reported: 12/21/16

Lab Sample ID: 608006
Lab File Name: A1220638.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: µg/L
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.01	U
4164-28-7	N-Nitrodimethylamine	<0.01	U
314-40-9	Bromacil	<0.01	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute
Method 607 Analysis Data Sheet

010060
Rev 1

Sample ID

1612141428B (ST-3-666)

Client: Navarro
Batch: M607-#726
Task Order: 161214-6
Matrix: Aqueous
Sample Wt/Vol: 940 mL

Project: 16988.01.103
Date Received: 12/16/16
Date Extracted: 12/19/16
Date Analyzed: 12/21/16
Date Reported: 12/21/16

Lab Sample ID: 608007
Lab File Name: A1220639.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: µg/L
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	0.53	
4164-28-7	N-Nitrodimethylamine	0.34	
314-40-9	Bromacil	0.02	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

010061
Rev 1

Sample ID

1612141324 (400-SB-08)

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 608008

Batch: M607-#726

Date Received: 12/16/16

Lab File Name: A1220640.txt

Task Order: 161216-5

Date Extracted: 12/19/16

Final Extraction Vol: 1000 uL

Matrix: Aqueous

Date Analyzed: 12/21/16

Dilution Factor: 1

Sample Wt/Vol: 1000 mL

Date Reported: 12/21/16

Reporting Unit: µg/L

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	0.44	
4164-28-7	N-Nitrodimethylamine	0.86	
314-40-9	Bromacil	0.006	J

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

010062
Rev 1

Sample ID

1612141339 (400-SB-13)

Client: Navarro
Batch: M607-#726
Task Order: 161216-5
Matrix: Aqueous
Sample Wt/Vol: 1000 mL

Project: 16988.01.103
Date Received: 12/16/16
Date Extracted: 12/19/16
Date Analyzed: 12/21/16
Date Reported: 12/21/16

Lab Sample ID: 608009
Lab File Name: A1220641.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: µg/L
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	0.05	
4164-28-7	N-Nitrodimethylamine	0.08	
314-40-9	Bromacil	0.08	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute
Method 607 Analysis Data Sheet

010063
Rev 1

Sample ID

1612141354 (400-SB-14)

Client: Navarro
Batch: M607-#726
Task Order: 161216-5
Matrix: Aqueous
Sample Wt/Vol: 1000 mL

Project: 16988.01.103
Date Received: 12/16/16
Date Extracted: 12/19/16
Date Analyzed: 12/21/16
Date Reported: 12/21/16

Lab Sample ID: 608010
Lab File Name: A1220642.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: µg/L
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.01	U
4164-28-7	N-Nitrodimethylamine	0.09	
314-40-9	Bromacil	0.04	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

010064

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161206-6, 161206-8, 161209-2, 161209-4, 161213-3, 161213-4, 161214-4
161216-4, 161216-5
NAVARRO PO #: 15EC043B, 15EC092B

QA DATA SHEETS

**(BLANK, MATRIX SPIKE, SURROGATE,
CALIBRATION)**

Southwest Research Institute

Method 607 Internal Standard Summary

010065

Filename: A12206S2.txt
 Standard ID: IS=1NG/UL
 Project: 16988.01.103

Date Analyzed: 12/20/2016
 Time Analyzed: 09:30:00
 Client: Navarro

		IS1		IS2	
		Area	RT	Area	RT
Mid Point Standard		277382	8.4	159621	15.02
Upper Limit		554764	8.73	319242	15.35
Lower Limit		138691	8.07	79810.5	14.69
Client Sample ID	Lab Sample ID				
1612061357A (NASA 6)	607761	225317	8.40	118306	15.01
BLANK_15DEC16	607986	228113	8.40	132475	15.02
LCS_15DEC16 LCS	607987 LCS	226209	8.40	129822	15.01
1612031204 (400-SB-07)1'-2''))	607666	237232	8.40	133293	15.01
1612031434 (400-SB-07)48'-50''))	607667	234102	8.40	132101	15.02
1612031644 (400-SB-07)75'-76''))	607668	229089	8.40	130439	15.01
1612041424 (400-SB-06)13.5'-14.5''))	607670	229908	8.40	133884	15.02
1612041619 (400-SB-06)42.5'-43.5''))	607671	232189	8.40	133641	15.01
1612051334 (400-SB-06)86.5'-87.5''))	607766	227011	8.40	132519	15.01
1612080834 (400-SB-11)(12.5'-13')	607768	233655	8.40	134911	15.01
1612081024 (400-SB-11)46.5'-47.5''))	607856	230450	8.40	132241	15.01
1612081034 (400-SB-11)46.5'-47.5''))	607857 MS	232630	8.40	133504	15.01
1612081419 (400-SB-11)87'-87.5''))	607858	230570	8.40	131660	15.01
BLANK_19DEC16	608163	220942	8.40	130496	15.01
LCS_19DEC16 LCS	608164 LCS	227025	8.40	131349	15.02
1612121316Z (200-G-495)	607897	222845	8.40	131565	15.01
1612130927B (BW-7-211)	608000	237976	8.40	126997	15.01
1612131101B (BW-7-211)	608001	222205	8.40	131863	15.01
1612140928A (BW-5-295)	608002	230268	8.40	125623	15.01
1612140930A (BW-5-295)	608003	235362	8.40	129031	15.01
1612140951B (ST-3-586)	608004	224885	8.40	130033	15.01
1612140952B (ST-3-586)	608005	234151	8.40	139297	15.01
1612141356Z (200-G-420)	608006	221543	8.40	129613	15.01
1612141428B (ST-3-666)	608007	234560	8.40	128407	15.01
1612141324 (400-SB-08)	608008	254022	8.40	136908	15.01
1612141339 (400-SB-13)	608009	246442	8.40	133507	15.01
1612141354 (400-SB-14)	608010	252413	8.40	135052	15.01

IS1 = 1,4-Dichlorobenzene-D4

IS2 = Atrazine-D5

010066

* Flag indicating value is outside QC limits

010067

Southwest Research Institute

Method 607 Internal Standard Summary

Filename: A12206S1.txt
 Standard ID: IS=1NG/UL
 Project: 16988.01.103

Date Analyzed: 12/20/2016
 Time Analyzed: 11:51:00
 Client: Navarro

		IS1		IS2	
		Area	RT	Area	RT
Mid Point Standard		291975	8.41	167215	15.02
Upper Limit		583950	8.74	334430	15.35
Lower Limit		145987.5	8.08	83607.5	14.69
Client Sample ID	Lab Sample ID				
BLANK_08DEC16	607713	220543	8.41	131043	15.02
LCS_08DEC16 LCS	607714 LCS	219039	8.41	123915	15.02
1612011242 (PFE-3)	607625	225564	8.41	131599	15.02
1612011304A (BLM-32-632)	607626	222597	8.41	130061	15.02
1612030909 (400-SB-07)	607665	216991	8.40	127512	15.02
1612041238 (400-SB-06)	607669	229933	8.41	133279	15.02
1612050808 (400-SB-06)	607672	221422	8.40	124854	15.02
BLANK_13DEC16	607915	214602	8.40	127389	15.02
LCS_13DEC16 LCS	607916 LCS	222694	8.40	128878	15.02
1612080759 (400-SB-11)	607767	242826	8.40	139123	15.02
1612080831Y (300-E-138)	607859	232187	8.40	130736	15.02
1612090932Y (300-E-183)	607860	222165	8.40	126174	15.02
1612091015A (BLM-27-270)	607861	220953	8.40	121954	15.01
1612091023B (700-B-510)	607862	219237	8.40	126583	15.01
1612091024B (700-B-510) MS	607863 MS	214285	8.40	122753	15.01

IS1 = 1,4-Dichlorobenzene-D4

IS2 = Atrazine-D5

* Flag indicating value is outside QC limits

Southwest Research Institute

010068

Method 607 Blank Summary

Blank ID: BLANK_19DEC16

Project: 16988.01.103

Client: Navarro

SDG: 607897, 608000, 608008

Matrix: Aqueous

This method blank applies to the following samples, MS, and MSD's

Client Sample ID	Lab Sample ID	Date Acquired	Time Acquired
LCS_19DEC16	608164 LCS	12/21/16	05:29:00
1612121316Z (200-G-495)	607897	12/21/16	06:03:00
1612130927B (BW-7-211)	608000	12/21/16	06:37:00
1612131101B (BW-7-211)	608001	12/21/16	07:11:00
1612140928A (BW-5-295)	608002	12/21/16	07:46:00
1612140930A (BW-5-295)	608003	12/21/16	08:20:00
1612140951B (ST-3-586)	608004	12/21/16	08:54:00
1612140952B (ST-3-586)	608005	12/21/16	09:29:00
1612141356Z (200-G-420)	608006	12/21/16	10:03:00
1612141428B (ST-3-666)	608007	12/21/16	10:37:00
1612141324 (400-SB-08)	608008	12/21/16	11:12:00
1612141339 (400-SB-13)	608009	12/21/16	11:46:00
1612141354 (400-SB-14)	608010	12/21/16	12:20:00

010069

Southwest Research Institute

Method 607 Blank Summary

Blank ID: BLANK_15DEC16

Project: 16988.01.103

Client: Navarro

SDG: 607665, 607766, 607856

Matrix: Soil

This method blank applies to the following samples, MS, and MSD's

Client Sample ID	Lab Sample ID	Date Acquired	Time Acquired
LCS_15DEC16	607987 LCS	12/20/16	22:39:00
1612031204 (400-SB-07)1'-2''))	607666	12/20/16	23:13:00
1612031434 (400-SB-07)48'-50''))	607667	12/20/16	23:47:00
1612031644 (400-SB-07)75'-76''))	607668	12/21/16	00:22:00
1612041424 (400-SB-06)13.5'-14.5''))	607670	12/21/16	00:56:00
1612041619 (400-SB-06)42.5'-43.5''))	607671	12/21/16	01:30:00
1612051334 (400-SB-06)86.5'-87.5''))	607766	12/21/16	02:04:00
1612080834 (400-SB-11)(12.5'-13''))	607768	12/21/16	02:38:00
1612081024 (400-SB-11)46.5'-47.5''))	607856	12/21/16	03:13:00
1612081034 (400-SB-11)46.5'-47.5''))	607857 MS	12/21/16	03:47:00
1612081419 (400-SB-11)87'-87.5''))	607858	12/21/16	04:21:00

Southwest Research Institute

Method 607 Blank Summary

Blank ID: BLANK_13DEC16

Project: 16988.01.103

Client: Navarro

SDG: 607761, 607766, 607859

Matrix: Aqueous

This method blank applies to the following samples, MS, and MSD's

Client Sample ID	Lab Sample ID	Date Acquired	Time Acquired
LCS_13DEC16	607916 LCS	12/20/16	16:57:00
1612061357A (NASA 6)	607761	12/21/16	12:54:00
1612080759 (400-SB-11)	607767	12/20/16	18:05:00
1612080831Y (300-E-138)	607859	12/20/16	18:39:00
1612090932Y (300-E-183)	607860	12/20/16	19:13:00
1612091015A (BLM-27-270)	607861	12/20/16	19:48:00
1612091023B (700-B-510)	607862	12/20/16	20:21:00
1612091024B (700-B-510)	607863 MS	12/20/16	20:56:00

Southwest Research Institute

010071

Method 607 Blank Summary

Blank ID: BLANK_08DEC16

Project: 16988.01.103

Client: Navarro

SDG: 607625, 607665

Matrix: Aqueous

This method blank applies to the following samples, MS, and MSD's

Client Sample ID	Lab Sample ID	Date Acquired	Time Acquired
LCS_08DEC16	607714 LCS	12/20/16	13:00:00
1612011242 (PFE-3)	607625	12/20/16	13:34:00
1612011304A (BLM-32-632)	607626	12/20/16	14:08:00
1612030909 (400-SB-07)	607665	12/20/16	14:42:00
1612041238 (400-SB-06)	607669	12/20/16	15:15:00
1612050808 (400-SB-06)	607672	12/20/16	15:49:00

Southwest Research Institute

Method 607 Surrogate Recovery Summary

Client: Navarro

Matrix: Aqueous

SDG: 607625, 607665, 607761, 607766, 607859, 607856, 607897, 608000, 608008

Project: 16988.01.103

Client Sample ID	Lab Sample ID	N-Nitroso-di-n-propylamine		
		% Recovery	Recovery Limits	
3	BLANK_08DEC16	607713	112	40-160
4	LCS_08DEC16	607714 LCS	112	40-160
5	1612011242 (PFE-3)	607625	110	40-160
6	1612011304A (BLM-32-632)	607626	112	40-160
7	1612030909 (400-SB-07)	607665	111	40-160
8	1612041238 (400-SB-06)	607669	108	40-160
9	1612050808 (400-SB-06)	607672	109	40-160
10	BLANK_13DEC16	607915	115	40-160
11	LCS_13DEC16	607916 LCS	118	40-160
12	1612061357A (NASA 6)	607761	104	40-160
13	1612080759 (400-SB-11)	607767	96	40-160
14	1612080831Y (300-E-138)	607859	103	40-160
15	1612090932Y (300-E-183)	607860	103	40-160
16	1612091015A (BLM-27-270)	607861	115	40-160
17	1612091023B (700-B-510)	607862	114	40-160
18	1612091024B (700-B-510)	607863 MS	114	40-160
19	BLANK_15DEC16	607986	91	40-160
20	LCS_15DEC16	607987 LCS	93	40-160
21	1612031204 (400-SB-07)1'-2'))	607666	82	40-160
22	1612031434 (400-SB-07)48'-50'))	607667	102	40-160
23	1612031644 (400-SB-07)75'-76'))	607668	96	40-160
24	1612041424 (400-SB-06)13.5'-14.5'))	607670	97	40-160
25	1612041619 (400-SB-06)42.5'-43.5'))	607671	97	40-160
26	1612051334 (400-SB-06)86.5'-87.5'))	607766	101	40-160
27	1612080834 (400-SB-11)(12.5'-13')	607768	97	40-160
28	1612081024 (400-SB-11)46.5'-47.5'))	607856	105	40-160
29	1612081034 (400-SB-11)46.5'-47.5'))	607857 MS	88	40-160
30	1612081419 (400-SB-11)87'-87.5'))	607858	97	40-160
31	BLANK_19DEC16	608163	98	40-160
32	LCS_19DEC16	608164 LCS	101	40-160
33	1612121316Z (200-G-495)	607897	94	40-160
34	1612130927B (BW-7-211)	608000	91	40-160
35	1612131101B (BW-7-211)	608001	98	40-160

010073

36	1612140928A (BW-5-295)	608002	94	40-160
37	1612140930A (BW-5-295)	608003	88	40-160
38	1612140951B (ST-3-586)	608004	100	40-160
39	1612140952B (ST-3-586)	608005	96	40-160
40	1612141356Z (200-G-420)	608006	104	40-160
41	1612141428B (ST-3-666)	608007	102	40-160
42	1612141324 (400-SB-08)	608008	99	40-160
43	1612141339 (400-SB-13)	608009	98	40-160
44	1612141354 (400-SB-14)	608010	96	40-160

Southwest Research Institute

010074

Method 607 Analysis Data Sheet

Sample ID

BLANK_08DEC16

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607713

Batch: M607-#726

Date Received: NA

Lab File Name: A1220601.txt

Task Order: NA

Date Extracted: 12/08/16

Final Extraction Vol: 1000 uL

Matrix: Aqueous

Date Analyzed: 12/20/16

Dilution Factor: 1

Sample Wt/Vol: 1000 mL

Date Reported: 12/21/16

Reporting Unit: µg/L

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.01	U
4164-28-7	N-Nitrodimethylamine	<0.01	U
314-40-9	Bromacil	<0.01	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

010075

Method 607 Analysis Data Sheet

Sample ID

LCS_08DEC16

Client: Navarro
Batch: M607-#726
Task Order: NA
Matrix: Aqueous
Sample Wt/Vol: 1000 mL

Project: 16988.01.103
Date Received: NA
Date Extracted: 12/08/16
Date Analyzed: 12/20/16
Date Reported: 12/21/16

Lab Sample ID: 607714 LCS
Lab File Name: A1220602.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: µg/L
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	0.41	
4164-28-7	N-Nitrodimethylamine	0.58	
314-40-9	Bromacil	0.78	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

010076

Method 607 Blank Spike Recovery Report

Sample ID

LCS_08DEC16

Client: Navarro
Batch: M607-#726
Task Order: NA
Matrix: Aqueous
Sample Wt/Vol: 1000 mL

Project: 16988.01.103
Date Received: NA
Date Extracted: 12/08/16
Date Analyzed: 12/20/16
Date Reported: 12/21/16

Lab Sample ID: 607714 LCS
Blank ID: BLANK_08DEC16

ANALYTE	Spike Added µg/L	Blank Conc µg/L	LCS Conc µg/L	% Recovery	QC % Recovery Limits
N-Nitrosodimethylamine	0.50	0	0.41	82	13 - 110
N-Nitrodimethylamine	0.50	0	0.58	116	30 - 150
Bromacil	0.50	0	0.78	156	40 - 190

Southwest Research Institute

010077

Method 607 Analysis Data Sheet

Sample ID

BLANK_13DEC16

Client: Navarro
Batch: M607-#726
Task Order: NA
Matrix: Aqueous
Sample Wt/Vol: 1000 mL

Project: 16988.01.103
Date Received: NA
Date Extracted: 12/13/16
Date Analyzed: 12/20/16
Date Reported: 12/21/16

Lab Sample ID: 607915
Lab File Name: A1220608.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: µg/L
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.01	U
4164-28-7	N-Nitrodimethylamine	<0.01	U
314-40-9	Bromacil	<0.01	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

010078

Method 607 Analysis Data Sheet

Sample ID

LCS_13DEC16

Client: Navarro
Batch: M607-#726
Task Order: NA
Matrix: Aqueous
Sample Wt/Vol: 1000 mL

Project: 16988.01.103
Date Received: NA
Date Extracted: 12/13/16
Date Analyzed: 12/20/16
Date Reported: 12/21/16

Lab Sample ID: 607916 LCS
Lab File Name: A1220609.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: µg/L
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	0.48	
4164-28-7	N-Nitrodimethylamine	0.55	
314-40-9	Bromacil	0.68	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Blank Spike Recovery Report

010079

Sample ID

LCS_13DEC16

Client: Navarro
Batch: M607-#726
Task Order: NA
Matrix: Aqueous
Sample Wt/Vol: 1000 mL

Project: 16988.01.103
Date Received: NA
Date Extracted: 12/13/16
Date Analyzed: 12/20/16
Date Reported: 12/21/16

Lab Sample ID: 607916 LCS
Blank ID: BLANK_13DEC16

ANALYTE	Spike Added µg/L	Blank Conc µg/L	LCS Conc µg/L	% Recovery	QC % Recovery Limits
N-Nitrosodimethylamine	0.50	0	0.48	96	13 - 110
N-Nitrodimethylamine	0.50	0	0.55	110	30 - 150
Bromacil	0.50	0	0.68	136	40 - 190

Southwest Research Institute

010080

Method 607 Analysis Data Sheet

Sample ID

1612091024B (700-B-510) MS

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607863 MS

Batch: M607-#726

Date Received: 12/13/16

Lab File Name: A1220616.txt

Task Order: 161213-4

Date Extracted: 12/13/16

Final Extraction Vol: 1000 uL

Matrix: Aqueous

Date Analyzed: 12/20/16

Dilution Factor: 1

Sample Wt/Vol: 980 mL

Date Reported: 12/21/16

Reporting Unit: µg/L

Compared Sample: 1612091023B (700-B-510)

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Spike	Recovery	Recovery Limit
62-75-9	N-Nitrosodimethylamine	0.20	0.50	39%	13-110%
4164-28-7	N-Nitrodimethylamine	0.43	0.50	85%	30-150%
314-40-9	Bromacil	0.67	0.50	134%	40-190%

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

010081

Method 607 Analysis Data Sheet

Sample ID

BLANK_15DEC16

Client: Navarro
Batch: M607-#726
Task Order: NA
Matrix: Soil
Sample Wt/Vol: 30.20 g

Project: 16988.01.103
Date Received: NA
Date Extracted: 12/15/16
Date Analyzed: 12/20/16
Date Reported: 12/21/16

Lab Sample ID: 607986
Lab File Name: A1220617.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: ng/g
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

010082

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

LCS_15DEC16

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607987 LCS

Batch: M607-#726

Date Received: NA

Lab File Name: A1220618.txt

Task Order: NA

Date Extracted: 12/15/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/20/16

Dilution Factor: 1

Sample Wt/Vol: 30.31 g

Date Reported: 12/21/16

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	11.48	
4164-28-7	N-Nitrodimethylamine	15.70	
314-40-9	Bromacil	23.29	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Blank Spike Recovery Report

010083

Sample ID

LCS_15DEC16

Client: Navarro
 Batch: M607-#726
 Task Order: NA
 Matrix: Soil
 Sample Wt/Vol: 30.31 g

Project: 16988.01.103
 Date Received: NA
 Date Extracted: 12/15/16
 Date Analyzed: 12/20/16
 Date Reported: 12/21/16

Lab Sample ID: 607987 LCS
 Blank ID: BLANK_15DEC16

ANALYTE	Spike Added ng/g	Blank Conc ng/g	LCS Conc ng/g	% Recovery	QC % Recovery Limits
N-Nitrosodimethylamine	16	0	11	69	13 - 110
N-Nitrodimethylamine	16	0	16	100	30 - 150
Bromacil	16	0	23	144	40 - 190

Southwest Research Institute

010084

Method 607 Analysis Data Sheet

Sample ID

1612081034 (400-SB-11)46.5'-47.5')) MS

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 607857 MS

Batch: M607-#726

Date Received: 12/13/16

Lab File Name: A1220627.txt

Task Order: 161213-3

Date Extracted: 12/15/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/21/16

Dilution Factor: 1

Sample Wt/Vol: 30.44 g

Date Reported: 12/21/16

Reporting Unit: ng/g

Compared Sample: 1612081024 (400-SB-11)46.5'-47.5'))

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Spike	Recovery	Recovery Limit
62-75-9	N-Nitrosodimethylamine	12.29	16.00	77%	13-110%
4164-28-7	N-Nitrodimethylamine	14.22	16.00	89%	30-150%
314-40-9	Bromacil	23.95	16.00	149%	40-190%

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

010085
Rev 1

Sample ID

BLANK_19DEC16

Client: Navarro
Batch: M607-#726
Task Order: NA
Matrix: Aqueous
Sample Wt/Vol: 1000 mL

Project: 16988.01.103
Date Received: NA
Date Extracted: 12/19/16
Date Analyzed: 12/21/16
Date Reported: 12/21/16

Lab Sample ID: 608163
Lab File Name: A1220629.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: µg/L
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.01	U
4164-28-7	N-Nitrodimethylamine	<0.01	U
314-40-9	Bromacil	<0.01	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

010086
Rev 4

Sample ID

LCS_19DEC16

Client: Navarro
Batch: M607-#726
Task Order: NA
Matrix: Aqueous
Sample Wt/Vol: 1000 mL

Project: 16988.01.103
Date Received: NA
Date Extracted: 12/19/16
Date Analyzed: 12/21/16
Date Reported: 12/21/16

Lab Sample ID: 608164 LCS
Lab File Name: A1220630.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: µg/L
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	0.40	
4164-28-7	N-Nitrodimethylamine	0.43	
314-40-9	Bromacil	0.66	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Blank Spike Recovery Report

010087
Rev 1

Sample ID

LCS_19DEC16

Client: Navarro
Batch: M607-#726
Task Order: NA
Matrix: Aqueous
Sample Wt/Vol: 1000 mL

Project: 16988.01.103
Date Received: NA
Date Extracted: 12/19/16
Date Analyzed: 12/21/16
Date Reported: 12/21/16

Lab Sample ID: 608164 LCS
Blank ID: BLANK_19DEC16

ANALYTE	Spike Added ng/g	Blank Conc ng/g	LCS Conc ng/g	% Recovery	QC % Recovery Limits
N-Nitrosodimethylamine	0.50	0	0.40	80	13 - 110
N-Nitrodimethylamine	0.50	0	0.43	86	30 - 150
Bromacil	0.50	0	0.66	132	40 - 190

Southwest Research Institute***Continuing Calibration Check Sheet***

SwRI Project #: 01.16988.01.103 Calibration Date: 12/20/16
Sponsor: Navarro Analytical Method: TAP-01-0408-031
SwRI Standard ID: 202-04-120408017 Std Concentration: 1 µg/mL
File ID #: A12206S1 Initial Calibration Date: 10/17/16

ANALYTE	Mean RRF	RRF	% Dif.
N-Nitrosodimethylamine	0.361	0.358	-6.7
N-Nitrodimethylamine	0.13	0.133	-2.3
N-Nitroso-di-n-propylamine-d14	0.127	0.128	-0.3
Bromacil	1.161	0.951	18

Southwest Research Institute***Continuing Calibration Check Sheet***

SwRI Project #:	01.16988.01.103	Calibration Date:	12/20/16
Sponsor:	Navarro	Analytical Method:	TAP-01-0408-031
SwRI Standard ID:	202-04-120408017	Std Concentration:	1 µg/mL
File ID #:	A12206S2	Initial Calibration Date:	10/17/16

ANALYTE	Mean RRF	RRF	% Dif.
N-Nitrosodimethylamine	0.361	0.4	-10.7
N-Nitrodimethylamine	0.13	0.141	-8.6
N-Nitroso-di-n-propylamine-d14	0.127	0.128	-0.7
Bromacil	1.161	0.909	21.7

Southwest Research Institute

Initial Calibration Data Sheet

SwRI Project #:	01.16988.01.103	Calibration Data:	10/17/16
Sponsor:	Navarro	Analytical Method:	TAP-01-0408-031
SwRI Standard ID:	202-04-120408017	Std Concentration:	0.01-10 µg/mL

ANALYTE	RRF 0.01	RRF 0.05	RRF 0.2	RRF1	RRF5	RRF10	Ave. RRF	RSD%
N-Nitrosodimethylamine	0.291	0.308	0.352	0.369	0.417	0.430	0.361	15.49
N-Nitrodimethylamine	0.109	0.115	0.128	0.134	0.147	0.148	0.13	12.44
N-Nitroso-di-n-propylamine-d14	0.114	0.111	0.124	0.127	1.143	0.145	0.127	11.03
Bromacil	1.435	1.048	1.072	1.081	1.150	1.177	1.161	12.35

010091

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161206-6, 161206-8, 161209-2, 161209-4, 161213-3, 161213-4, 161214-4
161216-4, 161216-5
NAVARRO PO #: 15EC043B, 15EC092B

EXTRACTION AND INJECTION LOG

SwRI Labs
 Client: Navarro
 Project: 16988.01.10X
 Case: 15EC043B, 15EC092B

(E607W) Water Extraction By Sep-Funnel 3510C (Navarro)

X36532

Sample Receipt: 58776, 58779
 TO#'s: 161206-6, 161206-8

010092

DATE EXTRACTED	12/08/16	NOTES	Hamilton Co. Syringes: 100uL ID:462905(SURR) 50uL ID:462898(MS)
ANALYSTS INVOLVED	Hamed Edrisi(SU,SP,EXT) Christina Menn (BD,QT,FV) Marina Lebron (SU,SW,EXT,KD)	ADDITIONAL NOTES	pH Paper ID:511507 Thermometer ID: G-076
SURROGATE SOL. ID	203-01-120408017 @5.0ng/uL	EMULSION	C= Centrifuged,W= Wired,T= Tilted
MTX SPK SOL. ID	201-01-120408017 @10ng/uL	EXTRACTION FLOWCHART	XmL H2O-->>FV 1000uL DCM
EXTRACTS LOCATION	Tracked by LIMS (12/09/16 CM)	REFERENCE BOOK &PAGE	16-0402-032 p65
CHEMICAL, BRAND & LOT#	Ozarka water ID:04-0402-003p22C1 Sodium Sulfate ID:04-0402-004p27D DCM Fisher Optima Lot#164214	TAP(S) USED	01-0402-074

System ID	Type	Customer ID	PH	SAMPLE VOL	SURROGATE SOL VOL
1	607625	1612011242 (PFE-3)	6.4	950 mL	100 uL
2	607626	1612011304A (BLM-32-632)	6.4	900 mL	100 uL
3	607665	1612030909 (400-SB-07)	6.0	1030 mL	100 uL
4	607669	1612041238 (400-SB-06)	6.0	1040 mL	100 uL
5	607672	1612050808 (400-SB-06)	6.0	1060 mL	100 uL
6	607713	BLANK_08DEC16	6.4	1000 mL	100 uL
7	607714	LCS_08DEC16	6.4	1000 mL	100 uL

System ID	Type	Customer ID	MTX SPK SOL VOL	FV DCM	EMULSION
1	607625	1612011242 (PFE-3)	0 uL	1000 uL	no
2	607626	1612011304A (BLM-32-632)	0 uL	1000 uL	no
3	607665	1612030909 (400-SB-07)	0 uL	1000 uL	no
4	607669	1612041238 (400-SB-06)	0 uL	1000 uL	no
5	607672	1612050808 (400-SB-06)	0 uL	1000 uL	no
6	607713	BLANK_08DEC16	0 uL	1000 uL	no
7	607714	LCS_08DEC16	50 uL	1000 uL	no

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 Approved by HAMED EDRISI on Dec 21 2016 11:51AM

Date Printed: 12/21/2016

Client: Navarro

Project: 16988.01.10X

Case: 15EC043B, 15EC092B

Sample Receipt: 58798, 58800, 58814

TO#s: 161209-4, 161213-4, 161209-2

010093

DATE EXTRACTED	12/13/16	ADDITIONAL NOTES	pH Paper ID:511507
ANALYSTS INVOLVED	Christina Menn (SU,SP,EXT,BD,QT,FV) Marina Lebron (SU,SW,EXT,KD)	EMULSION	Thermometer ID: G-076
SURROGATE SOL. ID	203-01-120408017 @5.0ng/uL	EXTRACTION FLOWCHART	C= Centrifuged,W= Wired,T= Tilted
MTX SPK SOL. ID	201-01-120408017 @10ng/uL	REFERENCE BOOK &PAGE	XmL H2O-->FV 1000uL DCM
EXTRACTS LOCATION	Tracked by LIMS (12/16/16 CM)	TAP(S) USED	16-0402-032 p68
CHEMICAL,BRAND &LOT#	Ozarka water ID:04-0402-003p22C2,3 Sodium Sulfate ID:04-0402-004p27D DCM Fisher Optima Lot#164214		01-0402-074
NOTES	Hamilton Co. Syringes: 100uL ID:462905(SURR) 50uL ID:462898(MS)		

System ID	Type	Customer ID	PH	SAMPLE VOL	SURROGATE SOL VOL
1	607761	1612061357A (NASA 6)	6.4	1020 mL	100 uL
2	607767	1612080759 (400-SB-11)	6.0	1060 mL	100 uL
3	607859	1612080831Y (300-E-138)	6.4	950 mL	100 uL
4	607860	1612090932Y (300-E-183)	6.4	920 mL	100 uL
5	607861	1612091015A (BLM-27-270)	6.4	920 mL	100 uL
6	607862	1612091023B (700-B-510)	6.4	970 mL	100 uL
7	607863 MS	1612091024B (700-B-510)	6.4	980 mL	100 uL
8	607915	BLANK_13DEC16	6.4	1000 mL	100 uL
9	607916	LCS_13DEC16	6.4	1000 mL	100 uL

System ID	Type	Customer ID	MTX SPK SOL VOL	FV DCM	EMULSION
1	607761	1612061357A (NASA 6)	0 uL	1000 uL	no
2	607767	1612080759 (400-SB-11)	0 uL	1000 uL	no
3	607859	1612080831Y (300-E-138)	0 uL	1000 uL	no
4	607860	1612090932Y (300-E-183)	0 uL	1000 uL	no
5	607861	1612091015A (BLM-27-270)	0 uL	1000 uL	no
6	607862	1612091023B (700-B-510)	0 uL	1000 uL	no
7	607863 MS	1612091024B (700-B-510)	50 uL	1000 uL	no
8	607915	BLANK_13DEC16	0 uL	1000 uL	no
9	607916	LCS_13DEC16	50 uL	1000 uL	no

Page created Dec 13 2016 9:27AM by mlebron

Date Printed: 12/21/2016

Book: EXTRACTION LAB, Volume: EXT-2016, Page: 540 (Section 1 of 1)

Approved by HAMED EDRISI on Dec 21 2016 11:45AM

SwRI Labs
 Client: Navarro
 Project: 16988.01.10X
 Case: 15EC092B

(E607S) SOIL Extraction By Soxhlet 3540C (Navarro)

X36555

Sample Receipt: 58779, 58800, 58813
 TO#s: 161209-4, 161213-3, 161206-8

010094

DATE EXTRACTED	12/15/16	ADDITIONAL NOTES	Soxhlet extraction began at 1:30pm and ended the following day at 8:30am.
ANALYSTS INVOLVED	Hamed Edrisi(SU,SP,BD,QT,FV) Christina Menn (SW,Conc,QT,BD)	EXTRACTION FLOWCHART	Xg >>> FV 1000uL DCM
SURROGATE SOL ID	203-01-120408017 @5.0ng/uL	REFERENCE BOOK &PAGE	16-0402-032 P71
MTX SPK SOL ID	201-01-120408017 @10ng/uL	TAP(S) USED	01-0402-152
EXTRACTS LOCATION	Tracked by LIMS (12/20/16 CM)		
CHEMICAL, BRAND & LOT#	Sodium Sulfate ID:04-0402-004p27D DCM Fisher Optima Lot#164214		
NOTES	Hamilton Co. Syringes: 100uL ID:462905(SURR) 50uL ID:462898(MS) Balance #14 was used.		

System ID	Type	Customer ID	SOLVENT VOL DCM (ML)	SAMPLE WT
1		1612031204 (400-SB-07)1'-2'))	250	30.61 g
2		1612031434 (400-SB-07)48'-50'))	250	30.20 g
3		1612031644 (400-SB-07)75'-76'))	250	30.46 g
4		1612041424 (400-SB-06)13.5'-14.	250	30.40 g
5		1612041619 (400-SB-06)42.5'-43.	250	30.26 g
6		1612051334 (400-SB-06)86.5'-87.	250	30.63 g
7		1612080834 (400-SB-11)(12.5'-13	250	30.44 g
8		1612081024 (400-SB-11)46.5'-47.	250	30.28 g
9	MS	1612081034 (400-SB-11)46.5'-47.	250	30.44 g
10		1612081419 (400-SB-11)87'-87.5'	250	30.25 g
11		BLANK_15DEC16	250	30.20 g
12		LCS_15DEC16	250	30.31 g

System ID	Type	Customer ID	SURROGATE SOL VOL	MTX SPK SOL VOL
1		1612031204 (400-SB-07)1'-2'))	100 uL	0 uL
2		1612031434 (400-SB-07)48'-50'))	100 uL	0 uL
3		1612031644 (400-SB-07)75'-76'))	100 uL	0 uL
4		1612041424 (400-SB-06)13.5'-14.	100 uL	0 uL
5		1612041619 (400-SB-06)42.5'-43.	100 uL	0 uL
6		1612051334 (400-SB-06)86.5'-87.	100 uL	0 uL
7		1612080834 (400-SB-11)(12.5'-13	100 uL	0 uL
8		1612081024 (400-SB-11)46.5'-47.	100 uL	0 uL
9	MS	1612081034 (400-SB-11)46.5'-47.	100 uL	50 uL
10		1612081419 (400-SB-11)87'-87.5'	100 uL	0 uL

(E607S) SOIL Extraction By Soxhlet 3540C (Navarro)

SwRI Labs
 Client: Navarro
 Project: 16988.01.10X
 Case: 15EC092B

Sample Receipt: 58779, 58800, 58813
 TO#s: 161209-4, 161213-3, 161206-8

010095

	System ID	Type	Customer ID	SURROGATE SOL VOL	MTX SPK SOL VOL
11	607986		BLANK_15DEC16	100 uL	0 uL
12	607987		LCS_15DEC16	100 uL	50 uL

	System ID	Type	Customer ID	FV DCM
1	607666		1612031204 (400-SB-07)1'-2''))	1000 uL
2	607667		1612031434 (400-SB-07)48'-50''))	1000 uL
3	607668		1612031644 (400-SB-07)75'-76''))	1000 uL
4	607670		1612041424 (400-SB-06)13.5'-14.	1000 uL
5	607671		1612041619 (400-SB-06)42.5'-43.	1000 uL
6	607766		1612051334 (400-SB-06)86.5'-87.	1000 uL
7	607768		1612080834 (400-SB-11)(12.5'-13	1000 uL
8	607856		1612081024 (400-SB-11)46.5'-47.	1000 uL
9	607857	MS	1612081034 (400-SB-11)46.5'-47.	1000 uL
10	607858		1612081419 (400-SB-11)87'-87.5'	1000 uL
11	607986		BLANK_15DEC16	1000 uL
12	607987		LCS_15DEC16	1000 uL

Page created Dec 15 2016 12:06PM by mlebron
 Book: EXTRACTION LAB, Volume: EXT-2016, Page: 543 (Section 2 of 2)
 Approved by HAMED EDRISI on Dec 21 2016 11:40AM

Date Printed: 12/21/2016

(E607W) Water Extraction By Sep-Funnel 3510C (Navarro)

X36566

SwRI Labs

Client: Navarro

Project: 16988.01.10X

Case: 15EC043B, 15EC092B

Sample Receipt: 58821, 58840, 58845

TO#s: 161216-4, 161216-5, 161214-4

010096

DATE EXTRACTED	12/19/16	NOTES	Hamilton Co. Syringes: 100uL ID:462905(SURR) 50uL ID:462898(MS)
ANALYSTS INVOLVED	Christina Menn (EXT,BD) Marina Lebron (SU,SW,EXT,KD) Hamed Edrisi (SU,SP,EXT,QT,BD,FV)	ADDITIONAL NOTES	pH Paper ID:511507 Thermometer ID: G-076
SURROGATE SOL. ID	203-01-120408017 @5.0ng/uL	EMULSION	C= Centrifuged,W= Wired,T= Tilted
MTX SPK SOL. ID	201-01-120408017 @10ng/uL	EXTRACTION FLOWCHART	Xml H2O-->FV 1000uL DCM
EXTRACTS LOCATION	Tracked by LIMS (12/20/16 CM)	REFERENCE BOOK &PAGE	16-0402-032 p74
CHEMICAL,BRAND &LOT#	Ozarka water ID:04-0402-003p22C3 Sodium Sulfate ID:04-0402-004p27E DCM Fisher Optima Lot#164214	TAP(S) USED	01-0402-074

System ID	Type	Customer ID	PH	SAMPLE VOL	SURROGATE SOL VOL
1	607897	1612121316Z (200-G-495)	6.4	950 mL	100 uL
2	608000	1612130927B (BW-7-211)	6.4	1000 mL	100 uL
3	608001	1612131101B (BW-7-211)	6.0	1000 mL	100 uL
4	608002	1612140928A (BW-5-295)	6.4	1040 mL	100 uL
5	608003	1612140930A (BW-5-295)	6.4	970 mL	100 uL
6	608004	1612140951B (ST-3-586)	6.4	960 mL	100 uL
7	608005	1612140952B (ST-3-586)	6.4	970 mL	100 uL
8	608006	1612141356Z (200-G-420)	6.0	970 mL	100 uL
9	608007	1612141428B (ST-3-666)	6.4	940 mL	100 uL
10	608008	1612141324 (400-SB-08)	6.4	1000 mL	100 uL
11	608009	1612141339 (400-SB-13)	6.4	1000 mL	100 uL
12	608010	1612141354 (400-SB-14)	6.4	1000 mL	100 uL
13	608163	BLANK_19DEC16	6.4	1000 mL	100 uL
14	608164	LCS_19DEC16	6.4	1000 mL	100 uL

System ID	Type	Customer ID	MTX SPK SOL VOL	FV DCM	EMULSION
1	607897	1612121316Z (200-G-495)	0 uL	1000 uL	no
2	608000	1612130927B (BW-7-211)	0 uL	1000 uL	no
3	608001	1612131101B (BW-7-211)	0 uL	1000 uL	no
4	608002	1612140928A (BW-5-295)	0 uL	1000 uL	no
5	608003	1612140930A (BW-5-295)	0 uL	1000 uL	no
6	608004	1612140951B (ST-3-586)	0 uL	1000 uL	no
7	608005	1612140952B (ST-3-586)	0 uL	1000 uL	no
8	608006	1612141356Z (200-G-420)	0 uL	1000 uL	no
9	608007	1612141428B (ST-3-666)	0 uL	1000 uL	no

SwRI Labs
Client: Navarro
Project: 16988.01.10X
Case: 15EC043B, 15EC092B

(E607W) Water Extraction By Sep-Funnel 3510C (Navarro)

X36566

Sample Receipt: 58821, 58840, 58845
TO#s: 161216-4, 161216-5, 161214-4

010097

	System ID	Type	Customer ID	MTX SPK SOL VOL	FV DCM	EMULSION
10	608008		1612141324 (400-SB-08)	0 uL	1000 uL	no
11	608009		1612141339 (400-SB-13)	0 uL	1000 uL	no
12	608010		1612141354 (400-SB-14)	0 uL	1000 uL	no
13	608163		BLANK_19DEC16	0 uL	1000 uL	no
14	608164		LCS_19DEC16	50 uL	1000 uL	no

Page created Dec 19 2016 12:01PM by MLebron
Book: EXTRACTION LAB, Volume: EXT-2016, Page: 546 (Section 2 of 2)
Approved by HAMED EDRISI on Dec 21 2016 11:37AM

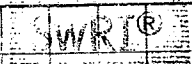
Date Printed: 12/21/2016

M-607

16988.01.103

10-0408-024

Work continued from Page



injlog

010098

Southwest Research Institute GC/MS Injection Log

OPERATOR: GS SEQUENCE DATE: 12/20/16, 12/21/16 INSTRUMENT: Amidala
COLUMN: Agilent 122-0732 DB-1701, 0.25mm * 30m * 0.25um
CARRIER GAS: Helium SOLVENT: DCM
METHOD FILE: MET_607C, MET_607C.M
CLIENT NAME: NAVARRO PROJECT NUMBER: 16988.01.103
SRR: 58776, 58779, 58798, 58800, 58814, 58813, 58821, 58840, 58845 METHOD: M-607
DATA PATH: C:\MSDCHEM\1\DATA\2016\A1220 MATRIX: water & soil

OVEN PROGRAM

Initial temp: 40 'c (On)

Maximum temp: 350 'c

Initial time: 4.00 min

Equilibration time: 0.50 min

Ramps:

Rate Final temp Final time

1 15.00 150 0.00

2 25.00 270 10.00

3 0.0(off)

Post temp: 270 'c

Post time: 5.00 min

Run time: 29.80 min

REVIEWED BY: [Signature]

DATE: 12/21/16

[Handwritten initials and date]

Table with columns: FILENAME, VIAL, DATE/TIME, METHOD, SAMPLE DESCRIPTION. Contains 45 rows of data including sample IDs, vial numbers, dates, and descriptions of various chemical samples.

SIGNATURE

[Signature]

DATE

12/21

DISCLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE

SOUTHWEST RESEARCH INSTITUTE®

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Chemistry and Chemical Engineering Division
Department of Analytical & Environmental Chemistry

January 3, 2017

Navarro Research and Engineering Inc.
NASA - JSC - White Sands Test Facility
Transportation Officer, Building 120
12600 NASA Road
Las Cruces, NM 88012
Tel. 575-524-5452

Attention: Tom Hall

Subject: Reports for Batch-607-#728-T for NDMA/DMN Analysis of water & Soil Samples

SwRI Project #: 01.16988.103

SwRI Task Orders: **161216-6, 161222-3**

Navarro P.O. #: 15EC092B, 16EC038B

Dear Tom,

Enclosed please find the analytical reports for Batch-607- #728-T-Navarro of water & soil samples.

Southwest Research Institute appreciates the opportunity to provide the service to Navarro Research and Engineering Inc.. If you have any questions, please do not hesitate to call me at 210-522-3954.

Sincerely,



Gang Sun, Ph.D.
Program Manager

APPROVAL:



Michael Dammann
Director



CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161216-6, 161222-3
NAVARRO PO #: 15EC092B,16EC038B

NARRATIVE

(M-607 - #728-T-Navarro)

CLIENT: NAVARRO
SwRI PROJECT: 01.16988.01.103
BATCH #: Batch-607-#728-T
TASK ORDER: 161216-6, 161222-3
CLIENT PO#: 15EC092B, 16EC038B
REPORT DATA: 01/03/2016

NARRATIVE FOR NDMA/ DMN/BROMACIL ANALYSIS

1. Samples were extracted with dichloromethane (DCM) and analyzed by GC/MS in selective ion monitoring mode for N-Nitrosodimethylamine (NDMA), N-Nitrodimethylamine (DMN) and Bromacil according to the modified Method 607.
2. All water samples were extracted within 7 days and soil samples within 14 days of sample collection and were analyzed within 40 days of the extraction.
3. The response factor (RF) values for Calibration curve and/or for continuing calibration standard were less than 25 % for all target compounds. The water sample reporting limit is 0.01 ppb for 1-L extraction of aqueous samples. The sample reporting limit is 0.33 ng/g for 30g extraction of soil samples.
4. Lab control spike for aqueous samples at 0.50 µg/L level were extracted and analyzed. Lab control spike for soil samples at 17 µg/g level were extracted and analyzed. The recoveries for all target compounds were within method recovery criteria of 13-110% for NDMA, 30-150% for DMN, and 40-190% for Bromacil.
4. Surrogate compound was spiked into all samples before sample extraction at 0.50 µg/L level for final extracts. The surrogate recoveries for all samples were within method recovery criteria of 40-160%.
5. Laboratory solvent blanks were extracted and analyzed for every sample batch. No analytes were detected above report limits from the blanks.
6. A "J" value was reported if the associated value was below reporting limits but above the MDL value.
7. All analyte concentrations are expressed in µg/L (*ppb*). Sample calculation:

$$\text{Concentration } (\mu\text{g/L}) = \frac{C \text{ (ng/}\mu\text{L)} \times V_{\text{extr}} \text{ (}\mu\text{L)} \times \text{DF}}{V_{\text{samp}} \text{ (mL)}} \times \frac{1000 \text{ mL}}{1 \text{ L}} \times \frac{1 \mu\text{g}}{1000 \text{ ng}}$$

where: C = result of GC/MS analysis, in ng/µL
 V_{extr} = final volume of sample extract, in µL
 V_{samp} = sample volume taken for extraction, in mL
 DF = dilution factor, if any

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161216-6, 161222-3
NAVARRO PO #: 15EC092B,16EC038B

TASK ORDER AND CHAIN OF CUSTODY

Laboratory Task Order

TO #: 161216-6 Revision: 0

Project(s): 16988.01.10X
 Manager(s): SUN, GANG
 To Client: 01/06/17

SDG: 608011

SRR #s: 58846
 Client(s): Navarro

Instructions

Documents Related to this task order: 212748[COC for SRR 58846], 212749[Paperwork for SRR 58846], 108294[PO #179 + #180], 113038[PO #179 + #180 Change Order #1], 113134[PO #NAV0000060], 115908[PO #NAV0000060 CO #1], 117303[PO #NAV0000060 CO #2], 118820[PO #179 + #180 Change Order #2], 120319 [PO #104], 122923[PO #179 Change Order #3], 124787[PO #132], 124995[PO #179 Change Order #5]

Deliverables --> Hard Copy: no EDD: -YES- PDF: -YES-

Test: E607S

Holding: 14 days from CED

Section: EXTLAB

EXTRACTION BY METHOD 607.

Cnt: 6

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
608011		1	Soil	1612141325 (400-SB-08)	14 Dec 16	28 Dec 16
608012		1	Soil	1612141326 (400-SB-08)	14 Dec 16	28 Dec 16
608013		1	Soil	1612141340 (400-SB-13)	14 Dec 16	28 Dec 16
608014		1	Soil	1612141341 (400-SB-13)	14 Dec 16	28 Dec 16
608015		1	Soil	1612141355 (400-SB-14)	14 Dec 16	28 Dec 16
608016		1	Soil	1612141356 (400-SB-14)	14 Dec 16	28 Dec 16

Test: E607W

Holding: 7 days from CED

Section: EXTLAB

EXTRACTION BY METHOD 607

Cnt: 6

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
608011		1	Soil	1612141325 (400-SB-08)	14 Dec 16	21 Dec 16
608012		1	Soil	1612141326 (400-SB-08)	14 Dec 16	21 Dec 16
608013		1	Soil	1612141340 (400-SB-13)	14 Dec 16	21 Dec 16
608014		1	Soil	1612141341 (400-SB-13)	14 Dec 16	21 Dec 16
608015		1	Soil	1612141355 (400-SB-14)	14 Dec 16	21 Dec 16
608016		1	Soil	1612141356 (400-SB-14)	14 Dec 16	21 Dec 16

Test: T607W

Holding: 40 days from VTSR

Section: TDG

NDMA/DMN ANALYSIS BY GC/MS/SIM

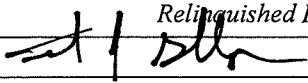
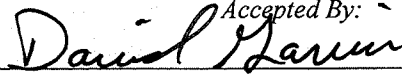
Cnt: 6

System ID	Type	Cont	Matrix	Customer ID	VTSR	Method Date
608011		1	Soil	1612141325 (400-SB-08)	16 Dec 16	25 Jan 17
608012		1	Soil	1612141326 (400-SB-08)	16 Dec 16	25 Jan 17
608013		1	Soil	1612141340 (400-SB-13)	16 Dec 16	25 Jan 17
608014		1	Soil	1612141341 (400-SB-13)	16 Dec 16	25 Jan 17
608015		1	Soil	1612141355 (400-SB-14)	16 Dec 16	25 Jan 17
608016		1	Soil	1612141356 (400-SB-14)	16 Dec 16	25 Jan 17



Date: December 14, 2016

Page 1 of 1

Laboratory PO #15EC092B & 16ECO38B		Analytical Requirements				Special Instructions	
Return Address for Analytical Reports		# of Containers	Sample Type: Aqueous (A); Slurry (S)	EPA method 607M 1 liter glass amber bottle Ice	EPA method 607M 8 oz Amber Glass Jar, Ice	Please return coolers and reusable packaging materials as soon as possible.	
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012 Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453						Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall	
Sample No.	Sample Location					Comments	
161214* 1324	400-SB-08	1	A	X			
161214** 1325	400-SB-08	1	S		X		
161214** 1326	400-SB-08	1	S		X		
161214* 1339	400-SB-13	1	A	X			
161214** 1340	400-SB-13	1	S		X		
161214** 1341	400-SB-13	1	S		X		
161214* 1354	400-SB-14	1	A	X			
161214** 1355	400-SB-14	1	S		X		
161214** 1356	400-SB-14	1	S		X		
Relinquished By: 		Date/Time: 12-14-16 (1445)		Accepted By: 		Date/Time: 12-16-16 / 08:30	

WSTF - 381C (02/15)

Client: Navarro
 SRR # 58846
 Project # 16988.01.10X
 Case: 16EC038B
 VTSR: 12/16/16
 Sample(s) Received: Intact
 Temperature: 1.9 SN # 021055

NASA-WSTF SHIPPING DOCUMENT

① Red RD-72

SHIPPED FROM: NASA JSC WHITE SANDS TEST FACILITY 12600 NASA ROAD; BLDG. 120 LAS CRUCES, NEW MEXICO 88012		WSTF ORIGINATOR/MAIL CODE/TELEPHONE NO. Tom Hall 575-524-5453			
SHIP TO: (ADDRESS, PHONE#, POINT OF CONTACT) Southwest Research Institute 6220 Culebra Road San Antonio, TX 782238 Gang Sun 210-522-3954		ORDER OR CONTRACT NUMBER Navarro PO #15EC092B & 16ECO38	SHIPMENT CONTROL NO		
PROJECT or TASK NUMBER CP.6EE4IFW.0.71		SHIP VIA Fed Ex Air <i>12/15/16</i>			
Contain Batteries NO		NO. PKG. 1	DATE SHIPPED 12/14/2016		
Battery Type-Part # N/A		AUTHORIZED BY: Tom Hall	DEPT. Environmental		
ITEM NO.	EQUIPMENT CONTROL NO.	MODEL NO./ STOCK NO./ PART NO.	ITEM NAME - MANUFACTURER'S NAME AND SERIAL NO.	UNIT OF ISSUE	QTY.
			Navarro PO #15EC092B: Line Item #1 NDMA and Bromacil for Soil samples by method 607M Line Item #2 NDMA and Bromacil for aqueous samples by method 607M Navarro PO #16ECO38: Line Item #1 NDMA and Bromacil for Mixed Media samples by method 607M	ea. ea. ea.	3 6
JUSTIFICATION FOR SHIPMENT: (MDR #, Return Authorization #'s, Warranty Replacement, Repair, Overage/Shortage, Damage, Recycling) Sample for analysis as requested (Navarro PO #15EC0092B)					
DOT HAZARDOUS MATERIALS INFO; EMERGENCY PHONE NUMBER AND GUIDE NUMBER: Not subject to regulation as a hazard material under 49 CFR.					
PROPERTY REVIEW: <input type="checkbox"/> REMOVE EQUIPMENT TAG <input type="checkbox"/> DO NOT REMOVE EQUIPMENT TAG					
PACKED BY:		# CONTAINERS	TYPE CONTAINERS	DIMENSIONS	WEIGHT
Please check off the applicable labels! <input type="checkbox"/> FRAGILE <input checked="" type="checkbox"/> GLASS <input type="checkbox"/> DELICATE <input type="checkbox"/> DO NOT XRAY <input checked="" type="checkbox"/> REFRIGERATE <input type="checkbox"/> OTHER <input checked="" type="checkbox"/> BUBBLEWRAP <input checked="" type="checkbox"/> FOAM		6 3 TOTAL CONTAINERS 9	Glass Glass	8 oz. Glass Jar 1 Liter Glass Bottle	TOTAL WEIGHT
RECEIVED BY: <i>David Garcia</i>		SHIPPERS CERTIFICATION: This is to certify that the above named materials are properly classified, described, packaged, marked, labeled, and are in proper condition for transportation according to the regulations of the D.O.T. Date			
REPRESENTING: <i>SWRI</i>					

Client: Navarro
 SRR # 58846
 Project # 16988.01.10X
 Case: 16ECO38B
 VTSR: 12/16/16
 Sample(s) Received: Intact
 Temperature: 1.9 SN # 021055

Laboratory Task Order

TO #: 161222-3 Revision: 1

Project(s): 16988.01.10X
 Manager(s): SUN, GANG
 To Client: 01/12/17

SDG: 608238

SRR #'s: 58883
 Client(s): Navarro

Instructions

Documents Related to this task order: 213166[COC for SRR 58883], 213167[Paperwork for SRR 58883], 108294[PO #179 + #180], 113038[PO #179 + #180 Change Order #1], 113134[PO #NAV0000060], 115908[PO #NAV0000060 CO #1], 117303[PO #NAV0000060 CO #2], 118820[PO #179 + #180 Change Order #2], 120319 [PO #104], 122923[PO #179 Change Order #3], 124787[PO #132], 124995[PO #179 Change Order #5]

Deliverables --> Hard Copy: no EDD: -YES- PDF: -YES-

Test: E607S

Holding: 14 days from CED

Section: EXTLAB

EXTRACTION BY METHOD 607.

Cnt: 16

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
608238		1	Soil	1612200843 (400-SB-06)	22 Dec 16	05 Jan 17
608239		1	Soil	1612200854 (400-SB-06)	22 Dec 16	05 Jan 17
608240		1	Soil	1612200903 (400-SB-07)	22 Dec 16	05 Jan 17
608241		1	Soil	1612200924 (400-SB-07)	22 Dec 16	05 Jan 17
608242		1	Soil	1612200933 (400-SB-08)	22 Dec 16	05 Jan 17
608243		1	Soil	1612200949 (400-SB-08)	22 Dec 16	05 Jan 17
608244		1	Soil	1612201003 (400-SB-09)	22 Dec 16	05 Jan 17
608245		1	Soil	1612201008 (400-SB-09)	22 Dec 16	05 Jan 17
608246		1	Soil	1612201024 (400-SB-09)	22 Dec 16	05 Jan 17
608247		1	Soil	1612201033 (400-SB-11)	22 Dec 16	05 Jan 17
608248		1	Soil	1612201049 (400-SB-11)	22 Dec 16	05 Jan 17
608249		1	Soil	1612201103 (400-SB-13)	22 Dec 16	05 Jan 17
608250		1	Soil	1612201318 (400-SB-13)	22 Dec 16	05 Jan 17
608251		1	Soil	1612201339 (400-SB-13)	22 Dec 16	05 Jan 17
608252		1	Soil	1612201340 (400-SB-13)	22 Dec 16	05 Jan 17
608253	MS	1	Soil	1612201341 (400-SB-13)	22 Dec 16	05 Jan 17

Test: T607W

Holding: 40 days from VTSR

Section: TDG

NDMA/DMN ANALYSIS BY GC/MS/SIM

Cnt: 16

System ID	Type	Cont	Matrix	Customer ID	VTSR	Method Date
608238		1	Soil	1612200843 (400-SB-06)	22 Dec 16	31 Jan 17
608239		1	Soil	1612200854 (400-SB-06)	22 Dec 16	31 Jan 17
608240		1	Soil	1612200903 (400-SB-07)	22 Dec 16	31 Jan 17
608241		1	Soil	1612200924 (400-SB-07)	22 Dec 16	31 Jan 17
608242		1	Soil	1612200933 (400-SB-08)	22 Dec 16	31 Jan 17
608243		1	Soil	1612200949 (400-SB-08)	22 Dec 16	31 Jan 17
608244		1	Soil	1612201003 (400-SB-09)	22 Dec 16	31 Jan 17
608245		1	Soil	1612201008 (400-SB-09)	22 Dec 16	31 Jan 17
608246		1	Soil	1612201024 (400-SB-09)	22 Dec 16	31 Jan 17
608247		1	Soil	1612201033 (400-SB-11)	22 Dec 16	31 Jan 17
608248		1	Soil	1612201049 (400-SB-11)	22 Dec 16	31 Jan 17
608249		1	Soil	1612201103 (400-SB-13)	22 Dec 16	31 Jan 17
608250		1	Soil	1612201318 (400-SB-13)	22 Dec 16	31 Jan 17
608251		1	Soil	1612201339 (400-SB-13)	22 Dec 16	31 Jan 17
608252		1	Soil	1612201340 (400-SB-13)	22 Dec 16	31 Jan 17
608253	MS	1	Soil	1612201341 (400-SB-13)	22 Dec 16	31 Jan 17



Date: December 20, 2016

Laboratory PO #15EC092B		Analytical Requirements				Special Instructions	
Return Address for Analytical Reports		# of Containers	Sample Type: Soil (S)	EPA method 607M 8 oz Amber Glass Jar, Ice			
Sample No.	Sample Location						Comments
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012 Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453							Please return coolers and reusable packaging materials as soon as possible. Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall
161220	0843 400-SB-06	1	S	X			Container 7449
161220	0854 400-SB-06	1	S	X			Container 7458
161220	0903 400-SB-07	1	S	X			Container 7441
161220	0924 400-SB-07	1	S	X			Container 7448
161220	0933 400-SB-08	1	S	X			Container 7439
161220	0949 400-SB-08	1	S	X			Container 7440
161220	1003 400-SB-09	1	S	X			Container 7395
161220	1008 400-SB-09	1	S	X			Container 7396
161220	1024 400-SB-09	1	S	X			Container 7397
161220	1037 400-SB-11	1	S	X			Container 7472
161220	1049 400-SB-11	1	S	X			Container 7473
Relinquished By:		Date/Time:		Accepted By:		Date/Time:	
<i>[Signature]</i>		12-20-16 (1500)		<i>[Signature]</i>		12-22-16 / 10:00	

WSTF - 381C (02/15)

Client: Navarro
 SRR # 58883
 Project # 16988.01.10X
 Case: 15EC092B
 VTSR: 12/22/16
 Sample(s) Received: Intact
 Temperature: 2.0 SN # 021055

Laboratory PO #15EC092B		Analytical Requirements				Special Instructions	
Return Address for Analytical Reports		# of Containers	Sample Type: Soil (S)	EPA method 607M 8 oz Amber Glass Jar, Ice			
Sample No.	Sample Location						Comments
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012 Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453							Please return coolers and reusable packaging materials as soon as possible. Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall
161220	1103 400-SB-13	1	S	X			Container 7398
161220	1718 400-SB-13	1	S	X			Container 7399
161220	1339 400-SB-13	1	S	X			Container 7400
161220	1340 400-SB-13	1	S	X			Container 7400
161220	1341 400-SB-13	1	S	X			Matrix Spike for 161220 ; Container 7400
							Received 2 extra samples that were not on this COC, 1612201050 (400-SB-11), 1612201051 (-400-SB-11) was held by PM to dispose them. 12-22-16 David Garcia
Relinquished By: <i>[Signature]</i>		Date/Time: 12-20-16 (1440)		Accepted By: <i>[Signature]</i>		Date/Time: 12-22-16 / 10:00	

WSTF - 381C (02/15)

Client: Navarro
 SRR # 58883
 Project # 16988.01.10X
 Case: 15EC092B
 VTSR: 12/22/16
 Sample(s) Received: Intact
 Temperature: 2.0 SN # 021055

NASA-WSTF SHIPPING DOCUMENT

① BLUE # XB47

SHIPPED FROM:			WSTF ORIGINATOR/MAIL CODE/TELEPHONE NO.					
NASA JSC WHITE SANDS TEST FACILITY			Patricia Melendrez/Purchasing Dept/ 524-5334		Tom Hall 575-524-5453			
12600 NASA ROAD; BLDG. 120			ORDER OR CONTRACT NUMBER	SHIPMENT CONTROL NO				
LAS CRUCES, NEW MEXICO 88012			PO 16EC038B					
SHIP TO: (ADDRESS, PHONE#, POINT OF CONTACT)			PROJECT or TASK NUMBER		SHIP VIA			
Southwest Research Institute			41FW 505-100					
6220 Culebra Road			Contain Batteries	NO. PKG.	DATE SHIPPED			
San Antonio, TX 78238			NO		12-21-16			
Gang Sun			Battery Type-Part #	AUTHORIZED BY:	DEPT.			
210-522-3954								
ITEM NO.	EQUIPMENT CONTROL NO.	MODEL NO./ STOCK NO./ PART NO.	ITEM NAME - MANUFACTURER'S NAME AND SERIAL NO.			UNIT OF ISSUE	QTY.	
1			Mixed Media Samples (Water/Soil) for NDMA, DMN & Bromacil by EPA Method 607M			EA	16	
JUSTIFICATION FOR SHIPMENT: (MDR #, Return Authorization #'s, Warranty Replacement, Repair, Overage/Shortage, Damage, Recycling)								
Mixed Media Samples for Analysis								
DOT HAZARDOUS MATERIALS INFO; EMERGENCY PHONE NUMBER AND GUIDE NUMBER:								
PROPERTY REVIEW:		<input type="checkbox"/> REMOVE EQUIPMENT TAG		<input type="checkbox"/> DO NOT REMOVE EQUIPMENT TAG				
PACKED BY:		#	TYPE	DIMENSIONS		WEIGHT		
		CONTAINERS	CONTAINERS					
Please check off the applicable labels!								
<input type="checkbox"/> FRAGILE								
<input type="checkbox"/> GLASS								
<input type="checkbox"/> DELICATE								
<input type="checkbox"/> DO NOT XRAY								
<input type="checkbox"/> REFRIGERATE								
<input type="checkbox"/> OTHER								
		TOTAL					TOTAL	
<input type="checkbox"/> BUBBLEWRAP		CONTAINERS					WEIGHT	
<input type="checkbox"/> FOAM								
RECEIVED BY:		SHIPPERS CERTIFICATION: This is to certify that the above						
David Garcia		named materials are properly classified, described, packaged, marked,						
REPRESENTING:		labeled, and are in proper condition for transportation according to the						
SWRI		regulations of the D.O.T. _____ Date _____						

Client: Navarro
 SRR # 58883
 Project # 16988.01.10X
 Case: 15EC092B
 VTSR: 12/22/16
 Sample(s) Received: Intact
 Temperature: 2.0 SN # 021055

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161216-6, 161222-3
NAVARRO PO #: 15EC092B,16EC038B

ANALYTICAL DATA REPORT SHEETS

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612141325 (400-SB-08)

Client: Navarro
Batch: M607-#728T
Task Order: 161216-6
Matrix: Soil
Sample Wt/Vol: 31.09 g

Project: 16988.01.103
Date Received: 12/16/16
Date Extracted: 12/21/16
Date Analyzed: 12/29/16
Date Reported: 01/03/17

Lab Sample ID: 608011
Lab File Name: A1229603.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: ng/g
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	1.38	
4164-28-7	N-Nitrodimethylamine	0.55	
314-40-9	Bromacil	0.93	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612141326 (400-SB-08)

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 608012

Batch: M607-#728T

Date Received: 12/16/16

Lab File Name: A1229604.txt

Task Order: 161216-6

Date Extracted: 12/21/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/29/16

Dilution Factor: 1

Sample Wt/Vol: 32.70 g

Date Reported: 01/03/17

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	2.11	
4164-28-7	N-Nitrodimethylamine	0.67	
314-40-9	Bromacil	<0.31	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612141340 (400-SB-13)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161216-6
 Matrix: Soil
 Sample Wt/Vol: 30.86 g

Project: 16988.01.103
 Date Received: 12/16/16
 Date Extracted: 12/21/16
 Date Analyzed: 12/29/16
 Date Reported: 01/03/17

Lab Sample ID: 608013
 Lab File Name: A1229605.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.32	U
4164-28-7	N-Nitrodimethylamine	<0.32	U
314-40-9	Bromacil	<0.32	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612141341 (400-SB-13)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161216-6
 Matrix: Soil
 Sample Wt/Vol: 31.60 g

Project: 16988.01.103
 Date Received: 12/16/16
 Date Extracted: 12/21/16
 Date Analyzed: 12/29/16
 Date Reported: 01/03/17

Lab Sample ID: 608014
 Lab File Name: A1229606.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.32	U
4164-28-7	N-Nitrodimethylamine	<0.32	U
314-40-9	Bromacil	<0.32	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612141355 (400-SB-14)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161216-6
 Matrix: Soil
 Sample Wt/Vol: 31.99 g

Project: 16988.01.103
 Date Received: 12/16/16
 Date Extracted: 12/21/16
 Date Analyzed: 12/29/16
 Date Reported: 01/03/17

Lab Sample ID: 608015
 Lab File Name: A1229607.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.31	U
4164-28-7	N-Nitrodimethylamine	<0.31	U
314-40-9	Bromacil	<0.31	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612141356 (400-SB-14)

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 608016

Batch: M607-#728T

Date Received: 12/16/16

Lab File Name: A1229608.txt

Task Order: 161216-6

Date Extracted: 12/21/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/29/16

Dilution Factor: 1

Sample Wt/Vol: 32.35 g

Date Reported: 01/03/17

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.31	U
4164-28-7	N-Nitrodimethylamine	<0.31	U
314-40-9	Bromacil	<0.31	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612200843 (400-SB-06)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.26 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608238
 Lab File Name: A1230607.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612200854 (400-SB-06)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.21 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608239
 Lab File Name: A1230608.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612200903 (400-SB-07)

Client: Navarro
Batch: M607-#728T
Task Order: 161222-3
Matrix: Soil
Sample Wt/Vol: 30.35 g

Project: 16988.01.103
Date Received: 12/22/16
Date Extracted: 12/28/16
Date Analyzed: 12/30/16
Date Reported: 01/03/17

Lab Sample ID: 608240
Lab File Name: A1230609.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: ng/g
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612200924 (400-SB-07)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.45 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608241
 Lab File Name: A1230610.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	0.16	J
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612200933 (400-SB-08)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.21 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608242
 Lab File Name: A1230611.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	10.26	
4164-28-7	N-Nitrodimethylamine	44.79	
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612200949 (400-SB-08)

Client: Navarro
Batch: M607-#728T
Task Order: 161222-3
Matrix: Soil
Sample Wt/Vol: 30.52 g

Project: 16988.01.103
Date Received: 12/22/16
Date Extracted: 12/28/16
Date Analyzed: 12/30/16
Date Reported: 01/03/17

Lab Sample ID: 608243
Lab File Name: A1230612.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: ng/g
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	22.51	
4164-28-7	N-Nitrodimethylamine	24.71	
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612201003 (400-SB-09)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.37 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608244
 Lab File Name: A1230613.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612201008 (400-SB-09)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.20 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608245
 Lab File Name: A1230614.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612201024 (400-SB-09)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.26 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608246
 Lab File Name: A1230615.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612201033 (400-SB-11)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.69 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608247
 Lab File Name: A1230616.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612201049 (400-SB-11)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.76 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608248
 Lab File Name: A1230617.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612201103 (400-SB-13)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.12 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608249
 Lab File Name: A1230618.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612201318 (400-SB-13)

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 608250

Batch: M607-#728T

Date Received: 12/22/16

Lab File Name: A1230619.txt

Task Order: 161222-3

Date Extracted: 12/28/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/30/16

Dilution Factor: 1

Sample Wt/Vol: 30.10 g

Date Reported: 01/03/17

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612201339 (400-SB-13)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.80 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608251
 Lab File Name: A1230620.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.32	U
4164-28-7	N-Nitrodimethylamine	<0.32	U
314-40-9	Bromacil	<0.32	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612201340 (400-SB-13)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.39 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/31/16
 Date Reported: 01/03/17

Lab Sample ID: 608252
 Lab File Name: A1230621.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161216-6, 161222-3
NAVARRO PO #: 15EC092B,16EC038B

QA DATA SHEETS

**(BLANK, MATRIX SPIKE, SURROGATE,
CALIBRATION)**

Southwest Research Institute

Method 607 Internal Standard Summary

Filename: A12306S1.txt
 Standard ID: IS=ING/UL
 Project: 16988.01.103

Date Analyzed: 12/30/2016
 Time Analyzed: 12:16:00
 Client: Navarro

		IS1		IS2	
		Area	RT	Area	RT
Mid Point Standard		276005	8.4	166031	15.01
Upper Limit		552010	8.73	332062	15.34
Lower Limit		138002.5	8.07	83015.5	14.68
Client Sample ID	Lab Sample ID				
BLANK_28DEC16	608376	213169	8.40	127557	15.01
LCS_28DEC16 LCS	608377 LCS	216814	8.40	132948	15.01
1612200843 (400-SB-06)	608238	216582	8.40	126722	15.01
1612200854 (400-SB-06)	608239	231538	8.40	132520	15.01
1612200903 (400-SB-07)	608240	230734	8.40	130254	15.01
1612200924 (400-SB-07)	608241	225654	8.40	128837	15.01
1612200933 (400-SB-08)	608242	219383	8.40	131088	15.01
1612200949 (400-SB-08)	608243	233470	8.40	131198	15.01
1612201003 (400-SB-09)	608244	214368	8.40	127091	15.01
1612201008 (400-SB-09)	608245	225260	8.40	130184	15.01
1612201024 (400-SB-09)	608246	225569	8.40	128573	15.02
1612201033 (400-SB-11)	608247	217401	8.40	128443	15.01
1612201049 (400-SB-11)	608248	226089	8.40	130444	15.01
1612201103 (400-SB-13)	608249	228404	8.40	132612	15.01
1612201318 (400-SB-13)	608250	223528	8.40	128702	15.02
1612201339 (400-SB-13)	608251	218995	8.40	125827	15.01
1612201340 (400-SB-13)	608252	220380	8.40	130621	15.01
1612201341 (400-SB-13) MS	608253 MS	207440	8.40	122369	15.01

IS1 = 1,4-Dichlorobenzene-D4

IS2 = Atrazine-D5

* Flag indicating value is outside QC limits

Southwest Research Institute

Method 607 Internal Standard Summary

Filename: A12296S1.txt
 Standard ID: IS=1NG/UL
 Project: 16988.01.103

Date Analyzed: 12/29/2016
 Time Analyzed: 11:39:00
 Client: Navarro

		IS1		IS2	
		Area	RT	Area	RT
Mid Point Standard		279030	8.4	158470	15.02
Upper Limit		558060	8.73	316940	15.35
Lower Limit		139515	8.07	79235	14.69
Client Sample ID	Lab Sample ID				
BLANK_21DEC16	608273	223521	8.40	132087	15.01
LCS_21DEC16 LCS	608274 LCS	226050	8.40	132067	15.01
1612141325 (400-SB-08)	608011	232376	8.40	130809	15.01
1612141326 (400-SB-08)	608012	235549	8.40	132074	15.01
1612141340 (400-SB-13)	608013	228864	8.40	134895	15.01
1612141341 (400-SB-13)	608014	239651	8.40	138602	15.01
1612141355 (400-SB-14)	608015	229826	8.40	129228	15.01
1612141356 (400-SB-14)	608016	235836	8.40	134657	15.01

IS1 = 1,4-Dichlorobenzene-D4

IS2 = Atrazine-D5

* Flag indicating value is outside QC limits

Southwest Research Institute

Method 607 Blank Summary

Blank ID: BLANK_28DEC16

Project: 16988.01.103

Client: Navarro

SDG: 608238

Matrix: Soil

This method blank applies to the following samples, MS, and MSD's

Client Sample ID	Lab Sample ID	Date Acquired	Time Acquired
LCS_28DEC16	608377 LCS	12/30/16	13:25:00
1612200843 (400-SB-06)	608238	12/30/16	16:17:00
1612200854 (400-SB-06)	608239	12/30/16	16:51:00
1612200903 (400-SB-07)	608240	12/30/16	17:26:00
1612200924 (400-SB-07)	608241	12/30/16	18:00:00
1612200933 (400-SB-08)	608242	12/30/16	18:34:00
1612200949 (400-SB-08)	608243	12/30/16	19:09:00
1612201003 (400-SB-09)	608244	12/30/16	19:43:00
1612201008 (400-SB-09)	608245	12/30/16	20:18:00
1612201024 (400-SB-09)	608246	12/30/16	20:52:00
1612201033 (400-SB-11)	608247	12/30/16	21:27:00
1612201049 (400-SB-11)	608248	12/30/16	22:01:00
1612201103 (400-SB-13)	608249	12/30/16	22:36:00
1612201318 (400-SB-13)	608250	12/30/16	23:11:00
1612201339 (400-SB-13)	608251	12/30/16	23:45:00
1612201340 (400-SB-13)	608252	12/31/16	00:19:00
1612201341 (400-SB-13)	608253 MS	12/31/16	00:54:00

Southwest Research Institute

Method 607 Blank Summary

Blank ID: BLANK_21DEC16

Project: 16988.01.103

Client: Navarro

SDG: 608011

Matrix: Soil

This method blank applies to the following samples, MS, and MSD's

Client Sample ID	Lab Sample ID	Date Acquired	Time Acquired
LCS_21DEC16	608274 LCS	12/29/16	12:46:00
1612141325 (400-SB-08)	608011	12/29/16	13:20:00
1612141326 (400-SB-08)	608012	12/29/16	13:54:00
1612141340 (400-SB-13)	608013	12/29/16	14:28:00
1612141341 (400-SB-13)	608014	12/29/16	15:02:00
1612141355 (400-SB-14)	608015	12/29/16	15:36:00
1612141356 (400-SB-14)	608016	12/29/16	16:09:00

Southwest Research Institute

Method 607 Surrogate Recovery Summary

Client: Navarro

Matrix: Soil

SDG: 608011, 608238

Project: 16988.01.103

	Client Sample ID	Lab Sample ID	N-Nitroso-di-n-propylamine	
			% Recovery	Recovery Limits
3	BLANK_21DEC16	608273	96	40-160
4	LCS_21DEC16	608274 LCS	102	40-160
5	1612141325 (400-SB-08)	608011	111	40-160
6	1612141326 (400-SB-08)	608012	107	40-160
7	1612141340 (400-SB-13)	608013	118	40-160
8	1612141341 (400-SB-13)	608014	112	40-160
9	1612141355 (400-SB-14)	608015	114	40-160
10	1612141356 (400-SB-14)	608016	110	40-160
11	BLANK_28DEC16	608376	83	40-160
12	LCS_28DEC16	608377 LCS	89	40-160
13	1612200843 (400-SB-06)	608238	87	40-160
14	1612200854 (400-SB-06)	608239	89	40-160
15	1612200903 (400-SB-07)	608240	91	40-160
16	1612200924 (400-SB-07)	608241	83	40-160
17	1612200933 (400-SB-08)	608242	82	40-160
18	1612200949 (400-SB-08)	608243	87	40-160
19	1612201003 (400-SB-09)	608244	83	40-160
20	1612201008 (400-SB-09)	608245	89	40-160
21	1612201024 (400-SB-09)	608246	92	40-160
22	1612201033 (400-SB-11)	608247	77	40-160
23	1612201049 (400-SB-11)	608248	95	40-160
24	1612201103 (400-SB-13)	608249	79	40-160
25	1612201318 (400-SB-13)	608250	83	40-160
26	1612201339 (400-SB-13)	608251	86	40-160
27	1612201340 (400-SB-13)	608252	87	40-160
28	1612201341 (400-SB-13)	608253 MS	96	40-160

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

BLANK_21DEC16

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 608273

Batch: M607-#728T

Date Received: NA

Lab File Name: A1229601.txt

Task Order: NA

Date Extracted: 12/21/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/29/16

Dilution Factor: 1

Sample Wt/Vol: 31.21 g

Date Reported: 01/03/17

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.32	U
4164-28-7	N-Nitrodimethylamine	<0.32	U
314-40-9	Bromacil	<0.32	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

LCS_21DEC16

Client: Navarro
 Batch: M607-#728T
 Task Order: NA
 Matrix: Soil
 Sample Wt/Vol: 30.86 g

Project: 16988.01.103
 Date Received: NA
 Date Extracted: 12/21/16
 Date Analyzed: 12/29/16
 Date Reported: 01/03/17

Lab Sample ID: 608274 LCS
 Lab File Name: A1229602.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	11.86	
4164-28-7	N-Nitrodimethylamine	14.48	
314-40-9	Bromacil	21.39	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Blank Spike Recovery Report

Sample ID

LCS_21DEC16

Client: Navarro
 Batch: M607-#728T
 Task Order: NA
 Matrix: Soil
 Sample Wt/Vol: 30.86 g

Project: 16988.01.103
 Date Received: NA
 Date Extracted: 12/21/16
 Date Analyzed: 12/29/16
 Date Reported: 01/03/17

Lab Sample ID: 608274 LCS
 Blank ID: BLANK_21DEC16

ANALYTE	Spike Added ng/g	Blank Conc ng/g	LCS Conc ng/g	% Recovery	QC % Recovery Limits
N-Nitrosodimethylamine	16	0	12	75	13 - 110
N-Nitrodimethylamine	16	0	14	88	30 - 150
Bromacil	16	0	21	131	40 - 190

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

BLANK_28DEC16

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 608376

Batch: M607-#728T

Date Received: NA

Lab File Name: A1230601.txt

Task Order: NA

Date Extracted: 12/28/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/30/16

Dilution Factor: 1

Sample Wt/Vol: 30.21 g

Date Reported: 01/03/17

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

LCS_28DEC16

Client: Navarro

Batch: M607-#728T

Task Order: NA

Matrix: Soil

Sample Wt/Vol: 30.05 g

Project: 16988.01.103

Date Received: NA

Date Extracted: 12/28/16

Date Analyzed: 12/30/16

Date Reported: 01/03/17

Lab Sample ID: 608377 LCS

Lab File Name: A1230602.txt

Final Extraction Vol: 1000 uL

Dilution Factor: 1

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	12.65	
4164-28-7	N-Nitrodimethylamine	14.58	
314-40-9	Bromacil	23.46	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Blank Spike Recovery Report

Sample ID

LCS_28DEC16

Client: Navarro
 Batch: M607-#728T
 Task Order: NA
 Matrix: Soil
 Sample Wt/Vol: 30.05 g

Project: 16988.01.103
 Date Received: NA
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608377 LCS
 Blank ID: BLANK_28DEC16

ANALYTE	Spike Added ng/g	Blank Conc ng/g	LCS Conc ng/g	% Recovery	QC % Recovery Limits
N-Nitrosodimethylamine	17	0	13	76	13 - 110
N-Nitrodimethylamine	17	0	15	88	30 - 150
Bromacil	17	0	23	135	40 - 190

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612201341 (400-SB-13) MS

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.63 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/31/16
 Date Reported: 01/03/17

Lab Sample ID: 608253 MS
 Lab File Name: A1230622.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Spike	Recovery	Recovery Limit
62-75-9	N-Nitrosodimethylamine	12.57	17.00	74%	13-110%
4164-28-7	N-Nitrodimethylamine	14.76	17.00	87%	30-150%
314-40-9	Bromacil	24.22	17.00	142%	40-190%

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute***Continuing Calibration Check Sheet***

SwRI Project #: 01.16988.01.103 Calibration Date: 12/29/16
Sponsor: Navarro Analytical Method: TAP-01-0408-031
SwRI Standard ID: 202-04-120408017 Std Concentration: 1 µg/mL
File ID #: A12296S1 Initial Calibration Date: 10/17/16

ANALYTE	Mean RRF	RRF	% Dif.
N-Nitrosodimethylamine	0.361	0.401	-11.1
N-Nitrodimethylamine	0.13	0.140	-7.6
N-Nitroso-di-n-propylamine-d14	0.127	0.128	-0.2
Bromacil	1.161	0.935	19.4

Southwest Research Institute

Continuing Calibration Check Sheet

SwRI Project #:	01.16988.01.103	Calibration Date:	12/30/16
Sponsor:	Navarro	Analytical Method:	TAP-01-0408-031
SwRI Standard ID:	202-04-120408017	Std Concentration:	1 µg/mL
File ID #:	A12306S1	Initial Calibration Date:	10/17/16

ANALYTE	Mean RRF	RRF	% Dif.
N-Nitrosodimethylamine	0.361	0.402	-11.4
N-Nitrodimethylamine	0.13	0.139	-7
N-Nitroso-di-n-propylamine-d14	0.127	0.133	-4
Bromacil	1.161	0.934	19.5

Southwest Research Institute

Initial Calibration Data Sheet

SwRI Project #:	01.16988.01.103	Calibration Data:	10/17/16
Sponsor:	Navarro	Analytical Method:	TAP-01-0408-031
SwRI Standard ID:	202-04-120408017	Std Concentration:	0.01-10 µg/mL

ANALYTE	RRF 0.01	RRF 0.05	RRF 0.2	RRF1	RRF5	RRF10	Ave. RRF	RSD%
N-Nitrosodimethylamine	0.291	0.308	0.352	0.369	0.417	0.430	0.361	15.49
N-Nitrodimethylamine	0.109	0.115	0.128	0.134	0.147	0.148	0.13	12.44
N-Nitroso-di-n-propylamine-d14	0.114	0.111	0.124	0.127	1.143	0.145	0.127	11.03
Bromacil	1.435	1.048	1.072	1.081	1.150	1.177	1.161	12.35

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161216-6, 161222-3
NAVARRO PO #: 15EC092B,16EC038B

EXTRACTION AND INJECTION LOG

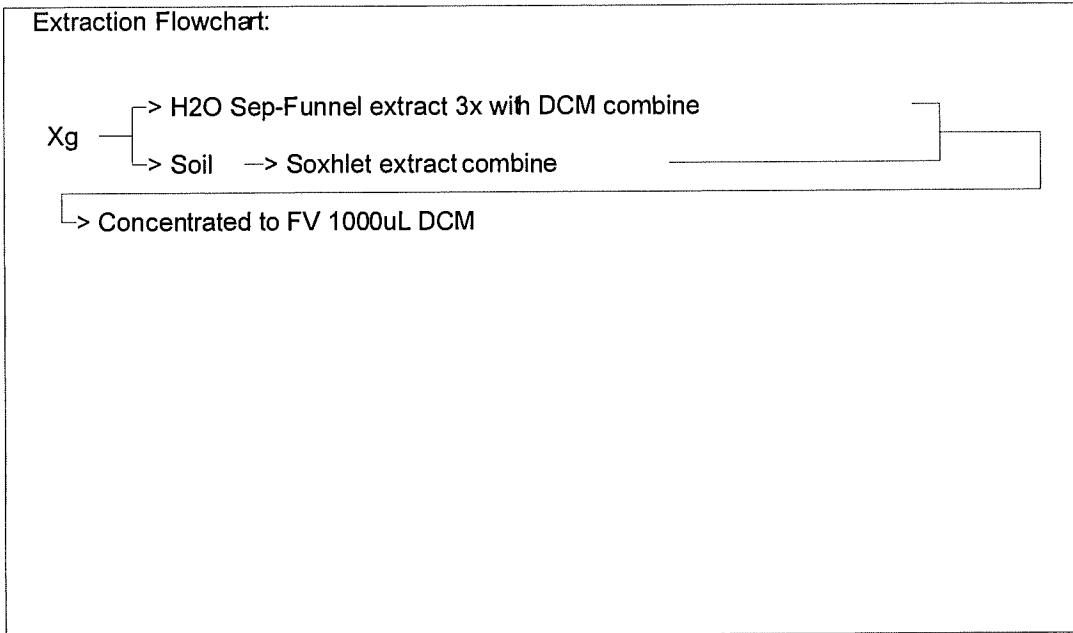
SwRI Labs
 Client: Navarro
 Project: 16988.01.10X
 Case: 16EC038B

Sample Receipt: 58846
 TO#: 161216-6

DATE EXTRACTED	12/21/16	ADDITIONAL NOTES II	1. Soxhlet extraction began at 4:00pm and ended the following day at 10:00am. 2. The aqueous portion was spiked with 20% and the solid portion was spike with 80% of surrogate, MS'S and LCS also spiked with 20% in aqueous and 80% in solid of matrix spike prior to extraction.
ANALYSTS INVOLVED	Hamed Edrisi (SU,SP,EXT) Christina Menn (SW,Conc,QT,FV)		
SURROGATE SOL ID	203-01-120408017 @5.0ng/uL	EMULSION	C= Centrifuged,W= Wired,T= Tilted
MTX SPK SOL ID	201-01-120408017 @10ng/uL	REFERENCE BOOK &PAGE	16-0402-032 p76
EXTRACTS LOCATION	Tracked by LIMS (12/29/16 CM)	TAP(S) USED	Water 01-0402-074 (Modified) Soil 01-0402-152
CHEMICAL, BRAND & LOT#	Ozarka water ID:04-0402-003p22C3 Sodium Sulfate ID:04-0402-004p27E DCM Fisher Optima Lot#164214		
NOTES	Hamilton Co. Syringes: 100uL ID:462905(SURR) 50uL ID:462898(MS) Thermometer ID: G-076		
ADDITIONAL NOTES I	These samples contained approximately 6 to 27% water. As per PM's instructions, approximately 30 g of the water/soil sample mixture was weighed and separated into its aqueous and solid phase. The aqueous phase was extracted by sep-funnel method three times, and the solid phase was extracted by Soxhlet, extracts from both phases were combine and concentrated to FV for GC/MS analysis.		

System ID	Type	Customer ID	SOLVENT VOL DCM (ML)	SAMPLE WT	SURROGATE SOL VOL
1	608011	1612141325 (400-SB-08)	250	31.09 g	100 uL
2	608012	1612141326 (400-SB-08)	250	32.70 g	100 uL
3	608013	1612141340 (400-SB-13)	250	30.86 g	100 uL
4	608014	1612141341 (400-SB-13)	250	31.60 g	100 uL
5	608015	1612141355 (400-SB-14)	250	31.99 g	100 uL
6	608016	1612141356 (400-SB-14)	250	32.35 g	100 uL
7	608273	BLANK_21DEC16	250	31.21 g	100 uL
8	608274	LCS_21DEC16	250	30.86 g	100 uL

System ID	Type	Customer ID	MTX SPK SOL VOL	FV DCM
1	608011	1612141325 (400-SB-08)	0 uL	1000 uL
2	608012	1612141326 (400-SB-08)	0 uL	1000 uL
3	608013	1612141340 (400-SB-13)	0 uL	1000 uL
4	608014	1612141341 (400-SB-13)	0 uL	1000 uL
5	608015	1612141355 (400-SB-14)	0 uL	1000 uL
6	608016	1612141356 (400-SB-14)	0 uL	1000 uL
7	608273	BLANK_21DEC16	0 uL	1000 uL
8	608274	LCS_21DEC16	50 uL	1000 uL



(E607S) SOIL Extraction By Soxhlet 3540C (Navarro)

010052 X36598

SwRI Labs

Client: Navarro

Project: 16988.01.10X

Case: 15EC092B

Sample Receipt: 58867, 58876, 58883

TO#s: 161221-4, 161220-4, 161222-3

DATE EXTRACTED	12/28/16	ADDITIONAL NOTES	Soxhlet extraction began at 5:00pm and ended the following day at 11:00am.
ANALYSTS INVOLVED	Hamed Edrisi (SU,SP,BD,QT,FV) Christina Menn (SW,Conc)	EXTRACTION FLOWCHART	Xg >>> FV 1000uL DCM
SURROGATE SOL ID	203-01-120408017 @5.0ng/uL	REFERENCE BOOK &PAGE	16-0402-032 P82
MTX SPK SOL ID	201-01-120408017 @10ng/uL	TAP(S) USED	01-0402-152
EXTRACTS LOCATION	Tracked by LIMS (12/30/16 HE)		
CHEMICAL,BRAND &LOT#	Sodium Sulfate ID:04-0402-004p27F DCM Fisher Optima Lot#164214		
NOTES	Hamilton Co. Syringes: 100uL ID:462905(SURR) 50uL ID:462898(MS)		

System ID	Type	Customer ID	SOLVENT VOL DCM (ML)	SAMPLE WT
1	608158	1612190954 (400-SB--01)9'-10')	250	30.46 g
2	608220	1612191134 (400-SB-01)44'-45'))	250	30.88 g
3	608221	1612191144 (400-SB-01)44'-45'))	250	30.52 g
4	608222	1612191444 (400-SB-01)79'-80'))	250	30.39 g
5	608238	1612200843 (400-SB-06)	250	30.26 g
6	608239	1612200854 (400-SB-06)	250	30.21 g
7	608240	1612200903 (400-SB-07)	250	30.35 g
8	608241	1612200924 (400-SB-07)	250	30.45 g
9	608242	1612200933 (400-SB-08)	250	30.21 g
10	608243	1612200949 (400-SB-08)	250	30.52 g
11	608244	1612201003 (400-SB-09)	250	30.37 g
12	608245	1612201008 (400-SB-09)	250	30.20 g
13	608246	1612201024 (400-SB-09)	250	30.26 g
14	608247	1612201033 (400-SB-11)	250	30.69 g
15	608248	1612201049 (400-SB-11)	250	30.76 g
16	608249	1612201103 (400-SB-13)	250	30.12 g
17	608250	1612201318 (400-SB-13)	250	30.10 g
18	608251	1612201339 (400-SB-13)	250	30.80 g
19	608252	1612201340 (400-SB-13)	250	30.39 g
20	608253 MS	1612201341 (400-SB-13)	250	30.63 g
21	608376	BLANK_28DEC16	250	30.21 g
22	608377	LCS_28DEC16	250	30.05 g

System ID	Type	Customer ID	SURROGATE SOL VOL	MTX SPK SOL VOL
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SwRI Labs
 Client: Navarro
 Project: 16988.01.10X
 Case: 15EC092B

(E607S) SOIL Extraction By Soxhlet 3540C (Navarro)

Sample Receipt: 58867, 58876, 58883
 TO#s: 161221-4, 161220-4, 161222-3

	System ID	Type	Customer ID	SURROGATE SOL VOL	MTX SPK SOL VOL
1	608158		1612190954 (400-SB--01)9'-10')	100 uL	0 uL
2	608220		1612191134 (400-SB-01)44'-45'))	100 uL	0 uL
3	608221		1612191144 (400-SB-01)44'-45'))	100 uL	0 uL
4	608222		1612191444 (400-SB-01)79'-80'))	100 uL	0 uL
5	608238		1612200843 (400-SB-06)	100 uL	0 uL
6	608239		1612200854 (400-SB-06)	100 uL	0 uL
7	608240		1612200903 (400-SB-07)	100 uL	0 uL
8	608241		1612200924 (400-SB-07)	100 uL	0 uL
9	608242		1612200933 (400-SB-08)	100 uL	0 uL
10	608243		1612200949 (400-SB-08)	100 uL	0 uL
11	608244		1612201003 (400-SB-09)	100 uL	0 uL
12	608245		1612201008 (400-SB-09)	100 uL	0 uL
13	608246		1612201024 (400-SB-09)	100 uL	0 uL
14	608247		1612201033 (400-SB-11)	100 uL	0 uL
15	608248		1612201049 (400-SB-11)	100 uL	0 uL
16	608249		1612201103 (400-SB-13)	100 uL	0 uL
17	608250		1612201318 (400-SB-13)	100 uL	0 uL
18	608251		1612201339 (400-SB-13)	100 uL	0 uL
19	608252		1612201340 (400-SB-13)	100 uL	0 uL
20	608253	MS	1612201341 (400-SB-13)	100 uL	50 uL
21	608376		BLANK_28DEC16	100 uL	0 uL
22	608377		LCS_28DEC16	100 uL	50 uL

	System ID	Type	Customer ID	FV DCM
1	608158		1612190954 (400-SB--01)9'-10')	1000 uL
2	608220		1612191134 (400-SB-01)44'-45'))	1000 uL
3	608221		1612191144 (400-SB-01)44'-45'))	1000 uL
4	608222		1612191444 (400-SB-01)79'-80'))	1000 uL
5	608238		1612200843 (400-SB-06)	1000 uL
6	608239		1612200854 (400-SB-06)	1000 uL
7	608240		1612200903 (400-SB-07)	1000 uL
8	608241		1612200924 (400-SB-07)	1000 uL

(E607S) SOIL Extraction By Soxhlet 3540C (Navarro)

SwRI Labs

Client: Navarro

Project: 16988.01.10X

Case: 15EC092B

Sample Receipt: 58867, 58876, 58883

TO#s: 161221-4, 161220-4, 161222-3

	System ID	Type	Customer ID	FV DCM
9	608242		1612200933 (400-SB-08)	1000 uL
10	608243		1612200949 (400-SB-08)	1000 uL
11	608244		1612201003 (400-SB-09)	1000 uL
12	608245		1612201008 (400-SB-09)	1000 uL
13	608246		1612201024 (400-SB-09)	1000 uL
14	608247		1612201033 (400-SB-11)	1000 uL
15	608248		1612201049 (400-SB-11)	1000 uL
16	608249		1612201103 (400-SB-13)	1000 uL
17	608250		1612201318 (400-SB-13)	1000 uL
18	608251		1612201339 (400-SB-13)	1000 uL
19	608252		1612201340 (400-SB-13)	1000 uL
20	608253	MS	1612201341 (400-SB-13)	1000 uL
21	608376		BLANK_28DEC16	1000 uL
22	608377		LCS_28DEC16	1000 uL

Page created Dec 28 2016 1:57PM by mlebron
 Book: EXTRACTION LAB, Volume: EXT-2016, Page: 559 (Section 3 of 3)
 Approved by CHRISTINA MENN on Jan 3 2017 1:34PM

Date Printed: 1/03/2017

M-607

Work continued from Data

injlog

Southwest Research Institute GC/MS Injection Log

OPERATOR: GS SEQUENCE DATE: 12/29/16, 12/30/16 INSTRUMENT: Amida1a
COLUMN: Agilent 122-0732 DB-1701, 0.25mm * 30m * 0.25um
CARRIER GAS: Helium SOLVENT: DCM
METHOD FILE: MET_607C, MET_607C.M
CLIENT NAME: NAVARRO PROJECT NUMBER: 16988.01.103
SRR: 58866, 58875, 58876, 58846, 58883 METHOD: M-607 MATRIX: water&soil
DATA PATH: C:\MSDCHEM\1\DATA\2016\A122916

OVEN PROGRAM

Initial temp: 40 'C (on)
Initial time: 4.00 min

Maximum temp: 350 'C
Equilibration time: 0.50 min

Ramps:
Rate Final temp Final time
1 15.00 150 0.00
2 25.00 270 10.00
3 0.0(off)
Post temp: 270 'C
Post time: 5.00 min
Run time: 29.80 min

REVIEWED BY: [Signature]

DATE: 1/3/17

Table with columns: FILENAME, VIAL, DATE/TIME, METHOD, SAMPLE DESCRIPTION. Contains detailed log entries for various samples and methods.

SIGNATURE

REVIEWED BY: [Signature]

DATE

1/3/17

DISCLOSED TO AND UNDERSTOOD BY

DATE

01/03/17

DATE

WITNESS

DATE



January 03, 2017

Service Request No:R1613221

Mr. Tom Hall
NASA/WSTF/Navarro
P.O. Box 20
Las Cruces, NM 88004

Laboratory Results for: White Sands Test Facility

Dear Mr.Hall,

Enclosed are the results of the sample(s) submitted to our laboratory December 16, 2016
For your reference, these analyses have been assigned our service request number **R1613221**.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAP standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report. The measurement uncertainty of the results included in this report is within that expected when using the prescribed method(s) for analysis of these samples, and represented by Laboratory Control Sample control limits. Any events, such as QC failures, which may add to the uncertainty are explained in the report narrative.

Please contact me if you have any questions. My extension is 7472. You may also contact me via email at Janice.Jaeger@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Janice Jaeger
Project Manager

ADDRESS

1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623

PHONE +1 585 288 5380 | **FAX** +1 585 288 8475

ALS Group USA, Corp.

dba ALS Environmental



Narrative Documents

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com



Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request:R1613221
Date Received:12/16/16

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables, including results of QC samples analyzed from this delivery group. Analytical procedures performed by the lab are validated in accordance with NELAC standards. Any parameters that are not included in the lab's NELAC accreditation are identified on a "Non-Certified Analytes" report in the Miscellaneous Forms Section of this report. Individual analytical results requiring further explanation are flagged with qualifiers and/or discussed below. The flags are explained in the Report Qualifiers and Definitions page in the Miscellaneous Forms section of this report.

Sample Receipt

Twenty four Water, Soil samples were received for analysis at ALS Environmental on 12/16/2016. Any discrepancies noted upon initial sample inspection are noted on the cooler receipt and preservation form included in this data package. The samples were received in good condition and consistent with the accompanying chain of custody form. Samples are refrigerated at ≤6°C upon receipt at the lab except for aqueous samples designated for metals analyses, which are stored at room temperature.

Volatle Organic Analyses:

Method 8260c, 12/19/16 12/22/16: The upper control limit was exceeded for one or more analytes in the Continuing Calibration Verification (CCV). The field samples analyzed in this sequence did not contain the analyte(s) in question above the Method Reporting Limit (MRL). Since the exceedance equates to a potential high bias, the data quality was not significantly affected and no further corrective action was taken.

Method 8260c, 12/22/16: The lower control limit was exceeded for one or more analytes in the Continuing Calibration Verification (CCV). Since there were no detections of the analyte(s) in the associated field samples, the quantitation is not affected. The data quality was not significantly affected and no further corrective action was taken.

Method 8260c, 12/22/16: The upper control criterion was exceeded for one or more analytes in the Laboratory Control Sample (LCS). There were no detections of the analyte(s) in the associated field samples. The error associated with elevated recovery equates to a high bias. The sample data is not significantly affected. No further corrective action was appropriate.

Water samples 13221-001, 009, 017 had a pH of 7 and ran 8 days after sampling.

Metals Analyses:

Method Se 6010C, 12/29/16: The upper control limit was exceeded for one or more analytes in the Continuing Calibration Verification (CCV). The field samples analyzed in this sequence did not contain the analyte(s) in question above the Method Reporting Limit (MRL). Since the exceedance equates to a potential high bias, the data quality was not significantly affected and no further corrective action was taken.

General Chemistry Analyses:

No significant anomalies were noted with this analysis.

Subcontracted Analytical Parameters:

Approved by  Date 1/3/2017

One or more samples were subcontracted to another laboratory for testing. The certified analytical report from the subcontractor has been included in its entirety at the end of this report and includes the name and address of the subcontracted laboratory.

Sample Receiving Notes:

Method 8260C: soil samples included in this report were received in jars and not collected using one of the EPA method 5035A low level options. In accordance with the NYSDOH technical notice of October 2012 all results or reporting limits <200 ug/kg should be considered as estimated due to potential low bias.

Approved by  Date 1/3/2017



SAMPLE DETECTION SUMMARY

CLIENT ID: 1612141315 400-SB-08		Lab ID: R1613221-001				
Analyte	Results	Flag	MDL	PQL	Units	Method
Acetone	2.2	J	1.3	5.0	ug/L	8260C

CLIENT ID: 1612141316 400-SB-08		Lab ID: R1613221-002				
Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	54.3				Percent	ALS SOP
Dichloromethane	3.8	J	1.1	9.2	ug/Kg	8260C

CLIENT ID: 1612141317 400-SB-08		Lab ID: R1613221-003				
Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	54.9				Percent	ALS SOP
Dichloromethane	3.0	J	1.1	9.1	ug/Kg	8260C
Tetrachloroethene (PCE)	2.0	J	1.7	9.1	ug/Kg	8260C

CLIENT ID: 1612141319 400-SB-08		Lab ID: R1613221-004				
Analyte	Results	Flag	MDL	PQL	Units	Method
Barium, Total	0.014	J	0.002	0.020	mg/L	6010C

CLIENT ID: 1612141320 400-SB-08		Lab ID: R1613221-005				
Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	57.0				Percent	ALS SOP
Arsenic, Total	2.2		0.5	1.7	mg/Kg	6010C
Barium, Total	66.1		0.2	3.4	mg/Kg	6010C
Beryllium, Total	0.58		0.03	0.51	mg/Kg	6010C
Chromium, Total	0.8	J	0.3	1.7	mg/Kg	6010C
Lead, Total	3.4	J	0.5	8.5	mg/Kg	6010C
Vanadium, Total	30.7		0.3	8.5	mg/Kg	6010C
Zinc, Total	32.3		0.3	3.4	mg/Kg	6010C

CLIENT ID: 1612141321 400-SB-08		Lab ID: R1613221-006				
Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	56.7				Percent	ALS SOP
Arsenic, Total	2.2		0.5	1.7	mg/Kg	6010C
Barium, Total	50.6		0.2	3.4	mg/Kg	6010C
Beryllium, Total	0.62		0.03	0.51	mg/Kg	6010C
Chromium, Total	0.8	J	0.3	1.7	mg/Kg	6010C
Lead, Total	3.7	J	0.5	8.6	mg/Kg	6010C
Vanadium, Total	35.3		0.3	8.6	mg/Kg	6010C
Zinc, Total	35.2		0.3	3.4	mg/Kg	6010C

CLIENT ID: 1612141330 400-SB-13		Lab ID: R1613221-009				
Analyte	Results	Flag	MDL	PQL	Units	Method
Acetone	2.6	J	1.3	5.0	ug/L	8260C



SAMPLE DETECTION SUMMARY

CLIENT ID: 1612141331 400-SB-13	Lab ID: R1613221-010
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	51.8				Percent	ALS SOP
Acetone	5.7	J	5.5	9.7	ug/Kg	8260C
Dichloromethane	3.3	J	1.2	9.7	ug/Kg	8260C

CLIENT ID: 1612141332 400-SB-13	Lab ID: R1613221-011
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	66.8				Percent	ALS SOP
Acetone	4.8	J	4.3	7.5	ug/Kg	8260C
Dichloromethane	2.7	J	0.86	7.5	ug/Kg	8260C
Tetrachloroethene (PCE)	4.7	J	1.4	7.5	ug/Kg	8260C

CLIENT ID: 1612141334 400-SB-13	Lab ID: R1613221-012
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Analyte	Results	Flag	MDL	PQL	Units	Method
Barium, Total	0.008	J	0.002	0.020	mg/L	6010C

CLIENT ID: 1612141335 400-SB-13	Lab ID: R1613221-013
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	59.8				Percent	ALS SOP
Arsenic, Total	3.6		0.4	1.6	mg/Kg	6010C
Barium, Total	178		0.2	3.2	mg/Kg	6010C
Beryllium, Total	0.67		0.03	0.49	mg/Kg	6010C
Chromium, Total	6.3		0.2	1.6	mg/Kg	6010C
Lead, Total	8.8		0.5	8.1	mg/Kg	6010C
Thallium, Total	1.0	J	0.9	1.6	mg/Kg	6010C
Vanadium, Total	29.9		0.3	8.1	mg/Kg	6010C
Zinc, Total	48.0		0.3	3.2	mg/Kg	6010C

CLIENT ID: 1612141336 400-SB-13	Lab ID: R1613221-014
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	65.9				Percent	ALS SOP
Arsenic, Total	2.9		0.4	1.5	mg/Kg	6010C
Barium, Total	204		0.2	2.9	mg/Kg	6010C
Beryllium, Total	0.52		0.03	0.44	mg/Kg	6010C
Cadmium, Total	0.10	J	0.05	0.74	mg/Kg	6010C
Chromium, Total	7.8		0.2	1.5	mg/Kg	6010C
Lead, Total	7.5		0.5	7.4	mg/Kg	6010C
Thallium, Total	2.6		0.8	1.5	mg/Kg	6010C
Vanadium, Total	22.7		0.2	7.4	mg/Kg	6010C
Zinc, Total	47.5		0.2	2.9	mg/Kg	6010C

CLIENT ID: 1612141345 400-SB-14	Lab ID: R1613221-017
--	-----------------------------

Analyte	Results	Flag	MDL	PQL	Units	Method
Toluene	0.37	J	0.20	1.0	ug/L	8260C



SAMPLE DETECTION SUMMARY

CLIENT ID: 1612141346 400-SB-14	Lab ID: R1613221-018
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	74.5				Percent	ALS SOP
Dichloromethane	2.0	J	0.77	6.7	ug/Kg	8260C

CLIENT ID: 1612141347 400-SB-14	Lab ID: R1613221-019
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	72.7				Percent	ALS SOP
Acetone	4.2	J	3.9	6.9	ug/Kg	8260C
Dichloromethane	2.3	J	0.79	6.9	ug/Kg	8260C

CLIENT ID: 1612141349 400-SB-14	Lab ID: R1613221-020
--	-----------------------------

Analyte	Results	Flag	MDL	PQL	Units	Method
Barium, Total	0.016	J	0.002	0.020	mg/L	6010C

CLIENT ID: 1612141350 400-SB-14	Lab ID: R1613221-021
--	-----------------------------

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	78.8				Percent	ALS SOP
Arsenic, Total	3.8		0.3	1.2	mg/Kg	6010C
Barium, Total	324		0.2	2.4	mg/Kg	6010C
Beryllium, Total	0.61		0.03	0.37	mg/Kg	6010C
Chromium, Total	5.1		0.2	1.2	mg/Kg	6010C
Lead, Total	6.3		0.4	6.1	mg/Kg	6010C
Nickel, Total	0.9	J	0.2	4.9	mg/Kg	6010C
Thallium, Total	1.8		0.7	1.2	mg/Kg	6010C
Vanadium, Total	23.2		0.2	6.1	mg/Kg	6010C
Zinc, Total	44.4		0.2	2.4	mg/Kg	6010C

CLIENT ID: 1612141351 400-SB-14	Lab ID: R1613221-022
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	77.4				Percent	ALS SOP
Arsenic, Total	2.9		0.3	1.2	mg/Kg	6010C
Barium, Total	287		0.2	2.5	mg/Kg	6010C
Beryllium, Total	0.57		0.03	0.37	mg/Kg	6010C
Chromium, Total	5.7		0.2	1.2	mg/Kg	6010C
Lead, Total	5.9	J	0.4	6.2	mg/Kg	6010C
Nickel, Total	0.7	J	0.2	4.9	mg/Kg	6010C
Vanadium, Total	19.8		0.2	6.2	mg/Kg	6010C
Zinc, Total	42.9		0.2	2.5	mg/Kg	6010C



Sample Receipt Information

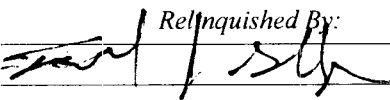
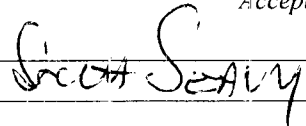
ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com


Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B


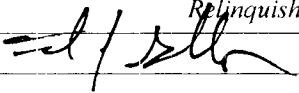
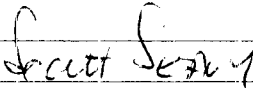
Service Request:R1613221

SAMPLE CROSS-REFERENCE

<u>SAMPLE #</u>	<u>CLIENT SAMPLE ID</u>	<u>DATE</u>	<u>TIME</u>
R1613221-001	1612141315 400-SB-08	12/14/2016	
R1613221-002	1612141316 400-SB-08	12/14/2016	
R1613221-003	1612141317 400-SB-08	12/14/2016	
R1613221-004	1612141319 400-SB-08	12/14/2016	
R1613221-005	1612141320 400-SB-08	12/14/2016	
R1613221-006	1612141321 400-SB-08	12/14/2016	
R1613221-007	1612141322 400-SB-08	12/14/2016	
R1613221-008	1612141323 400-SB-08	12/14/2016	
R1613221-009	1612141330 400-SB-13	12/14/2016	
R1613221-010	1612141331 400-SB-13	12/14/2016	
R1613221-011	1612141332 400-SB-13	12/14/2016	
R1613221-012	1612141334 400-SB-13	12/14/2016	
R1613221-013	1612141335 400-SB-13	12/14/2016	
R1613221-014	1612141336 400-SB-13	12/14/2016	
R1613221-015	1612141337 400-SB-13	12/14/2016	
R1613221-016	1612141338 400-SB-13	12/14/2016	
R1613221-017	1612141345 400-SB-14	12/14/2016	
R1613221-018	1612141346 400-SB-14	12/14/2016	
R1613221-019	1612141347 400-SB-14	12/14/2016	
R1613221-020	1612141349 400-SB-14	12/14/2016	
R1613221-021	1612141350 400-SB-14	12/14/2016	
R1613221-022	1612141351 400-SB-14	12/14/2016	
R1613221-023	1612141352 400-SB-14	12/14/2016	
R1613221-024	1612141353 400-SB-14	12/14/2016	

Laboratory PO #15EC007B		Analytical Requirements							Special Instructions	
Return Address for Analytical Reports		# of Containers	Sample Type: Aqueous (A); Slurry (S)	SW-846 Method 8260B 40 ml Amber Glass Vial, Ice	SW-846 Method 8260B 4 oz Glass Jar, Ice	Total Metals SW-846-6010C and 7470A 500 ml poly, Ice	Total Metals SW-846-6010C and 7470A 4 oz. Glass Jar, Ice	TCLP Metals EPA Method 1311 incorporating SW-846-6010C and 7470A 8 oz. Glass Jar, Ice	Please return coolers and reusable packaging materials as possible. Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall	
Sample No.	Sample Location									Comments
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012										
Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453										
161214 1315	400-SB-08	2	A	X						
161214 1316	400-SB-08	1	S		X					
161214 1317	400-SB-08	1	S		X					
161214 1318	400-SB-08	1	S		X				Matrix Spike for 161214 1316	
161214 1319	400-SB-08	21	A			X				
161214 1320	400-SB-08	1	S				X			
161214 1321	400-SB-08	1	S				X			
161214 1322	400-SB-08	1	S					X		
161214 1323	400-SB-08	1	S					X		
Relinquished By: 		Date/Time:	Accepted By: 					Date/Time:		
		12-14-16 (1445)						12/16/16 1020		

R1613221 **5**
 NASA/WSTF/Navarro
 White Sands Test Facility


Laboratory PO #15EC007B		Analytical Requirements						Special Instructions	
Return Address for Analytical Reports		# of Containers	Sample Type: Aqueous (A); Slurry (S)	SW-846 Method 8260B 40 ml Amber Glass Vial, Ice	SW-846 Method 8260B 4 oz. Glass Jar, Ice	Total Metals SW-846-6010C and 7470A 500 ml poly, Ice	Total Metals SW-846-6010C and 7470A 4 oz. Glass Jar, Ice	TCLP Metals EPA Method 1311 incorporating SW-846-6010C and 7470A 8 oz. Glass Jar, Ice	
Sample No.	Sample Location								Comments
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012								Please return coolers and reusable packaging materials as possible.	
Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453								Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall	
✓ 161214 1330	400-SB-13	2	A	X					
✓ 161214 1331	400-SB-13	1	S		X				
✓ 161214 1332	400-SB-13	1	S		X				
✓ 161214 1333	400-SB-13	1	S		X			Matrix Spike for 161214 1331	
✓ 161214 1334	400-SB-13	21	A			X			
✓ 161214 1335	400-SB-13	1	S				X		
✓ 161214 1336	400-SB-13	1	S				X		
✓ 161214 1337	400-SB-13	1	S					X	
✓ 161214 1338	400-SB-13	1	S					X	
								R1613221	5
								NASA/WSTF/Navarro White Sands Test Facility	
									
Relinquished By: 		Date/Time: 12/14/16 (1445)		Accepted By: 			Date/Time: 12/16/16 1020		



Cooler Receipt and Preservation Check Form

R1613221

5

NASA/WSTF/Navarro
White Sands Test Facility



Project/Client NAST Folder Number R1613221

Cooler received on 12/16/16 by: SAS COURIER: ALS UPS FEDEX VELOCITY CLIENT

1	Were Custody seals on outside of cooler?	<u>(Y)</u> N
2	Custody papers properly completed (ink, signed)?	<u>(Y)</u> N
3	Did all bottles arrive in good condition (unbroken)?	<u>(Y)</u> N
4	Circle: <u>Wet Ice</u> Dry Ice Gel packs present?	<u>(Y)</u> N

5a	Perchlorate samples have required headspace?	<u>(Y)</u> N <u>NA</u>
5b	Did VOA vials, Alk, or Sulfide have sig* bubbles?	<u>(Y)</u> N NA
6	Where did the bottles originate?	<u>ALS/ROE</u> CLIENT
7	Soil VOA received as: Bulk Encore 5035set	<u>NA</u>

8. Temperature Readings Date: 12/16/16 Time: 1030 ID: IR#7 IR#8 From: Temp Blank Sample Bottle

Observed Temp (°C)	<u>5</u>	<u>1.2</u>					
Correction Factor (°C)							
Corrected Temp (°C)							
Within 0-6°C?	Y N	Y N	Y N	Y N	Y N	Y N	Y N
If <0°C, were samples frozen?	Y N	Y N	Y N	Y N	Y N	Y N	Y N

If out of Temperature, note packing/ice condition: Ice melted Poorly Packed Same Day Rule

& Client Approval to Run Samples: Standing Approval Client aware at drop-off Client notified by:

All samples held in storage location: R-012 by SAS on 12/16/16 at 1030
5035 samples placed in storage location: by on at

Cooler Breakdown: Date: 12/16/16 Time: 1545 by: SPW

- Were all bottle labels complete (i.e. analysis, preservation, etc.)? YES NO
- Did all bottle labels and tags agree with custody papers? YES NO
- Were correct containers used for the tests indicated? YES NO
- Were 5035 vials acceptable (no extra labels, not leaking)? YES NO
- Air Samples: Cassettes / Tubes Intact Canisters Pressurized Tedlar® Bags Inflated NA

Explain any discrepancies:

pH	Reagent	Yes	No	Lot Received	Exp	Sample ID	Vol. Added	Lot Added	Final pH
≥12	NaOH								
≤2	HNO ₃		✓	<u>Client label</u>		<u>-004,013,90</u>	<u>2.0</u>	<u>5035 set bulk</u>	<u>5.2</u>
≤2	H ₂ SO ₄								
<4	NaHSO ₄								
Residual Chlorine (-)	For CN Phenol and 522			If +, contact PM to add Na ₂ S ₂ O ₃ (CN), ascorbic (phenol).					
	Na ₂ S ₂ O ₃	-	-						
	ZnAcetate	-	-						
	HCl	**	**						

Yes=All samples OK

No=Samples were preserved at The lab as listed

PM OK to Adjust:

**Not to be tested before analysis – pH tested and recorded by VOAs on a separate worksheet

Bottle lot numbers: Client label

Other Comments:

(4) VIALS - SEE CHAIN

CLRES	<u>BULK</u>
DO	FLDT
HPROD	HGFB
HTR	LL3541
PH	<u>SUB</u>
SO3	MARRS
ALS	REV

PC Secondary Review: 12/19/16

*significant air bubbles: VOA > 5-6 mm : WC > 1 in. diameter



Miscellaneous Forms

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
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www.alsglobal.com

REPORT QUALIFIERS AND DEFINITIONS

- | | |
|---|--|
| <p>U Analyte was analyzed for but not detected. The sample quantitation limit has been corrected for dilution and for percent moisture, unless otherwise noted in the case narrative.</p> <p>J Estimated value due to either being a Tentatively Identified Compound (TIC) or that the concentration is between the MRL and the MDL. Concentrations are not verified within the linear range of the calibration. For DoD: concentration >40% difference between two GC columns (pesticides/Aroclors).</p> <p>B Analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.</p> <p>E Inorganics- Concentration is estimated due to the serial dilution was outside control limits.</p> <p>E Organics- Concentration has exceeded the calibration range for that specific analysis.</p> <p>D Concentration is a result of a dilution, typically a secondary analysis of the sample due to exceeding the calibration range or that a surrogate has been diluted out of the sample and cannot be assessed.</p> <p>* Indicates that a quality control parameter has exceeded laboratory limits. Under the “Notes” column of the Form I, this qualifier denotes analysis was performed out of Holding Time.</p> <p>H Analysis was performed out of hold time for tests that have an “immediate” hold time criteria.</p> <p># Spike was diluted out.</p> | <p>+ Correlation coefficient for MSA is <0.995.</p> <p>N Inorganics- Matrix spike recovery was outside laboratory limits.</p> <p>N Organics- Presumptive evidence of a compound (reported as a TIC) based on the MS library search.</p> <p>S Concentration has been determined using Method of Standard Additions (MSA).</p> <p>W Post-Digestion Spike recovery is outside control limits and the sample absorbance is <50% of the spike absorbance.</p> <p>P Concentration >40% (25% for CLP) difference between the two GC columns.</p> <p>C Confirmed by GC/MS</p> <p>Q DoD reports: indicates a pesticide/Aroclor is not confirmed ($\geq 100\%$ Difference between two GC columns).</p> <p>X See Case Narrative for discussion.</p> <p>MRL Method Reporting Limit. Also known as:</p> <p>LOQ Limit of Quantitation (LOQ)
The lowest concentration at which the method analyte may be reliably quantified under the method conditions.</p> <p>MDL Method Detection Limit. A statistical value derived from a study designed to provide the lowest concentration that will be detected 99% of the time. Values between the MDL and MRL are estimated (see J qualifier).</p> <p>LOD Limit of Detection. A value at or above the MDL which has been verified to be detectable.</p> <p>ND Non-Detect. Analyte was not detected at the concentration listed. Same as U qualifier.</p> |
|---|--|



Rochester Lab ID # for State Certifications¹

Connecticut ID # PH0556	Maine ID #NY0032	New Hampshire ID #
Delaware Accredited	Nebraska Accredited	294100 A/B
DoD ELAP #65817	New Jersey ID # NY004	Pennsylvania ID# 68-786
Florida ID # E87674	New York ID # 10145	Rhode Island ID # 158
Illinois ID #200047	North Carolina #676	Virginia #460167

¹ Analyses were performed according to our laboratory’s NELAP-approved quality assurance program and any applicable state or agency requirements. The test results meet requirements of the current NELAP/TNI standards or state or agency requirements, where applicable, except as noted in the case narrative. Since not all analyte/method/matrix combinations are offered for state/NELAC accreditation, this report may contain results which are not accredited. For a specific list of accredited analytes, contact the laboratory or go to <http://www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads/North-America-Downloads>

ALS Laboratory Group

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1613221

Sample Name: 1612141315 400-SB-08
Lab Code: R1613221-001
Sample Matrix: Water

Date Collected: 12/14/16
Date Received: 12/16/16

Analysis Method
8260C

Extracted/Digested By

Analyzed By
KRUEST

Sample Name: 1612141316 400-SB-08
Lab Code: R1613221-002
Sample Matrix: Soil

Date Collected: 12/14/16
Date Received: 12/16/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1612141317 400-SB-08
Lab Code: R1613221-003
Sample Matrix: Soil

Date Collected: 12/14/16
Date Received: 12/16/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1612141319 400-SB-08
Lab Code: R1613221-004
Sample Matrix: Water

Date Collected: 12/14/16
Date Received: 12/16/16

Analysis Method
6010C
7470A

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CBURLESON

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1613221

Sample Name: 1612141320 400-SB-08
Lab Code: R1613221-005
Sample Matrix: Soil

Date Collected: 12/14/16
Date Received: 12/16/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
NMANSEN

Analyzed By
NMANSEN
NMANSEN
KWONG

Sample Name: 1612141321 400-SB-08
Lab Code: R1613221-006
Sample Matrix: Soil

Date Collected: 12/14/16
Date Received: 12/16/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
NMANSEN

Analyzed By
NMANSEN
NMANSEN
KWONG

Sample Name: 1612141330 400-SB-13
Lab Code: R1613221-009
Sample Matrix: Water

Date Collected: 12/14/16
Date Received: 12/16/16

Analysis Method
8260C

Extracted/Digested By

Analyzed By
KRUEST

Sample Name: 1612141331 400-SB-13
Lab Code: R1613221-010
Sample Matrix: Soil

Date Collected: 12/14/16
Date Received: 12/16/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1613221

Sample Name: 1612141332 400-SB-13
Lab Code: R1613221-011
Sample Matrix: Soil

Date Collected: 12/14/16
Date Received: 12/16/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1612141334 400-SB-13
Lab Code: R1613221-012
Sample Matrix: Water

Date Collected: 12/14/16
Date Received: 12/16/16

Analysis Method
6010C
7470A

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CBURLESON

Sample Name: 1612141335 400-SB-13
Lab Code: R1613221-013
Sample Matrix: Soil

Date Collected: 12/14/16
Date Received: 12/16/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
NMANSEN

Analyzed By
NMANSEN
NMANSEN
KWONG

Sample Name: 1612141336 400-SB-13
Lab Code: R1613221-014
Sample Matrix: Soil

Date Collected: 12/14/16
Date Received: 12/16/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
NMANSEN

Analyzed By
NMANSEN
NMANSEN
KWONG

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1613221

Sample Name: 1612141345 400-SB-14
Lab Code: R1613221-017
Sample Matrix: Water

Date Collected: 12/14/16
Date Received: 12/16/16

Analysis Method
8260C

Extracted/Digested By

Analyzed By
KRUEST

Sample Name: 1612141346 400-SB-14
Lab Code: R1613221-018
Sample Matrix: Soil

Date Collected: 12/14/16
Date Received: 12/16/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1612141347 400-SB-14
Lab Code: R1613221-019
Sample Matrix: Soil

Date Collected: 12/14/16
Date Received: 12/16/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1612141349 400-SB-14
Lab Code: R1613221-020
Sample Matrix: Water

Date Collected: 12/14/16
Date Received: 12/16/16

Analysis Method
6010C
7470A

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CBURLESON

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dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1613221

Sample Name: 1612141350 400-SB-14
Lab Code: R1613221-021
Sample Matrix: Soil

Date Collected: 12/14/16
Date Received: 12/16/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
NMANSEN

Analyzed By
NMANSEN
NMANSEN
KWONG

Sample Name: 1612141351 400-SB-14
Lab Code: R1613221-022
Sample Matrix: Soil

Date Collected: 12/14/16
Date Received: 12/16/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
NMANSEN

Analyzed By
NMANSEN
NMANSEN
KWONG



INORGANIC PREPARATION METHODS

The preparation methods associated with this report are found in these tables unless discussed in the case narrative.

Water/Liquid Matrix

Analytical Method	Preparation Method
200.7	200.2
200.8	200.2
6010C	3005A/3010A
6020A	ILM05.3
9014 Cyanide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Acid Soluble	9030B
9056A Bomb (Halogens)	5050A
9066 Manual Distillation	9065
SM 4500-CN-E Residual Cyanide	SM 4500-CN-G
SM 4500-CN-E WAD Cyanide	SM 4500-CN-I

Solid/Soil/Non-Aqueous Matrix

Analytical Method	Preparation Method
6010C	3050B
6020A	3050B
6010C TCLP (1311) extract	3005A/3010A
6010 SPLP (1312) extract	3005A/3010A
7196A	3060A
7199	3060A
9056A Halogens/Halides	5050
300.0 Anions/ 350.1/ 353.2/ SM 2320B/ SM 5210B/ 9056A Anions	DI extraction

For analytical methods not listed, the preparation method is the same as the analytical method reference.



Sample Results

ALS Environmental—Rochester Laboratory
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Volatile Organic Compounds by GC/MS

ALS Environmental—Rochester Laboratory

1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623

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www.alsglobal.com

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20

Sample Name: 1612141316 400-SB-08
Lab Code: R1613221-002

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	9.2	1.6	1	12/19/16 19:14	
1,1,1-Trichloroethane (TCA)	ND U	9.2	1.4	1	12/19/16 19:14	
1,1,2,2-Tetrachloroethane	ND U	9.2	1.5	1	12/19/16 19:14	
1,1,2-Trichloroethane	ND U	9.2	1.4	1	12/19/16 19:14	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	9.2	2.3	1	12/19/16 19:14	
1,1-Dichloroethene (1,1-DCE)	ND U	9.2	2.4	1	12/19/16 19:14	
1,2,3-Trichloropropane	ND U	9.2	2.5	1	12/19/16 19:14	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	9.2	3.5	1	12/19/16 19:14	
1,2-Dibromoethane	ND U	9.2	2.3	1	12/19/16 19:14	
1,2-Dichlorobenzene	ND U	9.2	1.2	1	12/19/16 19:14	
1,2-Dichloroethane	ND U	9.2	1.2	1	12/19/16 19:14	
1,2-Dichloropropane	ND U	9.2	1.8	1	12/19/16 19:14	
1,3-Dichlorobenzene	ND U	9.2	1.2	1	12/19/16 19:14	
1,4-Dioxane	ND U	180	36	1	12/19/16 19:14	
2-Butanone (MEK)	ND U	9.2	4.3	1	12/19/16 19:14	
2-Chloro-1,3-butadiene	ND U	9.2	2.8	1	12/19/16 19:14	
2-Chloroethyl Vinyl Ether	ND U	9.2	3.2	1	12/19/16 19:14	
Isobutyl Alcohol	ND U	180	42	1	12/19/16 19:14	
Allyl Chloride	ND U	9.2	3.2	1	12/19/16 19:14	
4-Methyl-2-pentanone	ND U	9.2	1.9	1	12/19/16 19:14	
Acetone	ND U	9.2	5.2	1	12/19/16 19:14	
Acetonitrile	ND U	46	31	1	12/19/16 19:14	
Acrolein	ND U	46	6.5	1	12/19/16 19:14	
Acrylonitrile	ND U	46	12	1	12/19/16 19:14	
Benzene	ND U	9.2	0.54	1	12/19/16 19:14	
Bromodichloromethane	ND U	9.2	1.2	1	12/19/16 19:14	
Bromoform	ND U	9.2	1.8	1	12/19/16 19:14	
Bromomethane	ND U	9.2	2.6	1	12/19/16 19:14	
Carbon Disulfide	ND U	9.2	2.3	1	12/19/16 19:14	
Carbon Tetrachloride	ND U	9.2	1.7	1	12/19/16 19:14	
Chlorobenzene	ND U	9.2	0.54	1	12/19/16 19:14	
Chloroethane	ND U	9.2	5.3	1	12/19/16 19:14	
Chloroform	ND U	9.2	2.4	1	12/19/16 19:14	
Chloromethane	ND U	9.2	0.74	1	12/19/16 19:14	
Dibromochloromethane	ND U	9.2	1.4	1	12/19/16 19:14	
Dibromomethane	ND U	9.2	1.2	1	12/19/16 19:14	
Dichlorodifluoromethane (CFC 12)	ND U	9.2	3.5	1	12/19/16 19:14	
Dichloromethane	3.8 J	9.2	1.1	1	12/19/16 19:14	
Ethyl Methacrylate	ND U	9.2	1.4	1	12/19/16 19:14	
Ethylbenzene	ND U	9.2	0.43	1	12/19/16 19:14	
Iodomethane	ND U	18	2.1	1	12/19/16 19:14	
Methacrylonitrile	ND U	9.2	2.8	1	12/19/16 19:14	
Methyl Methacrylate	ND U	9.2	1.4	1	12/19/16 19:14	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141316 400-SB-08
Lab Code: R1613221-002

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20
Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	9.2	0.94	1	12/19/16 19:14	
Propionitrile	ND U	46	12	1	12/19/16 19:14	
Tetrachloroethene (PCE)	ND U	9.2	1.7	1	12/19/16 19:14	
Toluene	ND U	9.2	1.9	1	12/19/16 19:14	
Trichloroethene (TCE)	ND U	9.2	1.9	1	12/19/16 19:14	
Trichlorofluoromethane (CFC 11)	ND U	9.2	1.3	1	12/19/16 19:14	
Vinyl Chloride	ND U	9.2	3.4	1	12/19/16 19:14	
cis-1,3-Dichloropropene	ND U	9.2	1.7	1	12/19/16 19:14	
m,p-Xylenes	ND U	18	2.1	1	12/19/16 19:14	
o-Xylene	ND U	9.2	0.89	1	12/19/16 19:14	
trans-1,2-Dichloroethene	ND U	9.2	1.6	1	12/19/16 19:14	
trans-1,3-Dichloropropene	ND U	9.2	0.37	1	12/19/16 19:14	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	104	51 - 136	12/19/16 19:14	
Dibromofluoromethane	99	63 - 138	12/19/16 19:14	
Toluene-d8	105	66 - 138	12/19/16 19:14	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20

Sample Name: 1612141317 400-SB-08
Lab Code: R1613221-003

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	9.1	1.6	1	12/19/16 19:38	
1,1,1-Trichloroethane (TCA)	ND U	9.1	1.4	1	12/19/16 19:38	
1,1,2,2-Tetrachloroethane	ND U	9.1	1.5	1	12/19/16 19:38	
1,1,2-Trichloroethane	ND U	9.1	1.4	1	12/19/16 19:38	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	9.1	2.3	1	12/19/16 19:38	
1,1-Dichloroethene (1,1-DCE)	ND U	9.1	2.4	1	12/19/16 19:38	
1,2,3-Trichloropropane	ND U	9.1	2.5	1	12/19/16 19:38	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	9.1	3.5	1	12/19/16 19:38	
1,2-Dibromoethane	ND U	9.1	2.3	1	12/19/16 19:38	
1,2-Dichlorobenzene	ND U	9.1	1.2	1	12/19/16 19:38	
1,2-Dichloroethane	ND U	9.1	1.2	1	12/19/16 19:38	
1,2-Dichloropropane	ND U	9.1	1.8	1	12/19/16 19:38	
1,3-Dichlorobenzene	ND U	9.1	1.2	1	12/19/16 19:38	
1,4-Dioxane	ND U	180	35	1	12/19/16 19:38	
2-Butanone (MEK)	ND U	9.1	4.2	1	12/19/16 19:38	
2-Chloro-1,3-butadiene	ND U	9.1	2.8	1	12/19/16 19:38	
2-Chloroethyl Vinyl Ether	ND U	9.1	3.2	1	12/19/16 19:38	
Isobutyl Alcohol	ND U	180	42	1	12/19/16 19:38	
Allyl Chloride	ND U	9.1	3.1	1	12/19/16 19:38	
4-Methyl-2-pentanone	ND U	9.1	1.8	1	12/19/16 19:38	
Acetone	ND U	9.1	5.2	1	12/19/16 19:38	
Acetonitrile	ND U	46	31	1	12/19/16 19:38	
Acrolein	ND U	46	6.4	1	12/19/16 19:38	
Acrylonitrile	ND U	46	12	1	12/19/16 19:38	
Benzene	ND U	9.1	0.53	1	12/19/16 19:38	
Bromodichloromethane	ND U	9.1	1.2	1	12/19/16 19:38	
Bromoform	ND U	9.1	1.7	1	12/19/16 19:38	
Bromomethane	ND U	9.1	2.6	1	12/19/16 19:38	
Carbon Disulfide	ND U	9.1	2.3	1	12/19/16 19:38	
Carbon Tetrachloride	ND U	9.1	1.7	1	12/19/16 19:38	
Chlorobenzene	ND U	9.1	0.53	1	12/19/16 19:38	
Chloroethane	ND U	9.1	5.3	1	12/19/16 19:38	
Chloroform	ND U	9.1	2.3	1	12/19/16 19:38	
Chloromethane	ND U	9.1	0.73	1	12/19/16 19:38	
Dibromochloromethane	ND U	9.1	1.4	1	12/19/16 19:38	
Dibromomethane	ND U	9.1	1.2	1	12/19/16 19:38	
Dichlorodifluoromethane (CFC 12)	ND U	9.1	3.5	1	12/19/16 19:38	
Dichloromethane	3.0 J	9.1	1.1	1	12/19/16 19:38	
Ethyl Methacrylate	ND U	9.1	1.4	1	12/19/16 19:38	
Ethylbenzene	ND U	9.1	0.42	1	12/19/16 19:38	
Iodomethane	ND U	18	2.1	1	12/19/16 19:38	
Methacrylonitrile	ND U	9.1	2.8	1	12/19/16 19:38	
Methyl Methacrylate	ND U	9.1	1.4	1	12/19/16 19:38	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141317 400-SB-08
Lab Code: R1613221-003

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20
Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	9.1	0.93	1	12/19/16 19:38	
Propionitrile	ND U	46	12	1	12/19/16 19:38	
Tetrachloroethene (PCE)	2.0 J	9.1	1.7	1	12/19/16 19:38	
Toluene	ND U	9.1	1.9	1	12/19/16 19:38	
Trichloroethene (TCE)	ND U	9.1	1.9	1	12/19/16 19:38	
Trichlorofluoromethane (CFC 11)	ND U	9.1	1.3	1	12/19/16 19:38	
Vinyl Chloride	ND U	9.1	3.4	1	12/19/16 19:38	
cis-1,3-Dichloropropene	ND U	9.1	1.7	1	12/19/16 19:38	
m,p-Xylenes	ND U	18	2.0	1	12/19/16 19:38	
o-Xylene	ND U	9.1	0.88	1	12/19/16 19:38	
trans-1,2-Dichloroethene	ND U	9.1	1.6	1	12/19/16 19:38	
trans-1,3-Dichloropropene	ND U	9.1	0.37	1	12/19/16 19:38	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	100	51 - 136	12/19/16 19:38	
Dibromofluoromethane	97	63 - 138	12/19/16 19:38	
Toluene-d8	102	66 - 138	12/19/16 19:38	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20

Sample Name: 1612141331 400-SB-13
Lab Code: R1613221-010

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	9.7	1.7	1	12/19/16 20:02	
1,1,1-Trichloroethane (TCA)	ND U	9.7	1.5	1	12/19/16 20:02	
1,1,2,2-Tetrachloroethane	ND U	9.7	1.6	1	12/19/16 20:02	
1,1,2-Trichloroethane	ND U	9.7	1.5	1	12/19/16 20:02	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	9.7	2.4	1	12/19/16 20:02	
1,1-Dichloroethene (1,1-DCE)	ND U	9.7	2.5	1	12/19/16 20:02	
1,2,3-Trichloropropane	ND U	9.7	2.6	1	12/19/16 20:02	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	9.7	3.7	1	12/19/16 20:02	
1,2-Dibromoethane	ND U	9.7	2.4	1	12/19/16 20:02	
1,2-Dichlorobenzene	ND U	9.7	1.2	1	12/19/16 20:02	
1,2-Dichloroethane	ND U	9.7	1.2	1	12/19/16 20:02	
1,2-Dichloropropane	ND U	9.7	1.9	1	12/19/16 20:02	
1,3-Dichlorobenzene	ND U	9.7	1.3	1	12/19/16 20:02	
1,4-Dioxane	ND U	190	37	1	12/19/16 20:02	
2-Butanone (MEK)	ND U	9.7	4.5	1	12/19/16 20:02	
2-Chloro-1,3-butadiene	ND U	9.7	3.0	1	12/19/16 20:02	
2-Chloroethyl Vinyl Ether	ND U	9.7	3.4	1	12/19/16 20:02	
Isobutyl Alcohol	ND U	190	44	1	12/19/16 20:02	
Allyl Chloride	ND U	9.7	3.3	1	12/19/16 20:02	
4-Methyl-2-pentanone	ND U	9.7	1.9	1	12/19/16 20:02	
Acetone	5.7 J	9.7	5.5	1	12/19/16 20:02	
Acetonitrile	ND U	48	33	1	12/19/16 20:02	
Acrolein	ND U	48	6.8	1	12/19/16 20:02	
Acrylonitrile	ND U	48	13	1	12/19/16 20:02	
Benzene	ND U	9.7	0.56	1	12/19/16 20:02	
Bromodichloromethane	ND U	9.7	1.2	1	12/19/16 20:02	
Bromoform	ND U	9.7	1.8	1	12/19/16 20:02	
Bromomethane	ND U	9.7	2.7	1	12/19/16 20:02	
Carbon Disulfide	ND U	9.7	2.4	1	12/19/16 20:02	
Carbon Tetrachloride	ND U	9.7	1.8	1	12/19/16 20:02	
Chlorobenzene	ND U	9.7	0.56	1	12/19/16 20:02	
Chloroethane	ND U	9.7	5.6	1	12/19/16 20:02	
Chloroform	ND U	9.7	2.5	1	12/19/16 20:02	
Chloromethane	ND U	9.7	0.78	1	12/19/16 20:02	
Dibromochloromethane	ND U	9.7	1.5	1	12/19/16 20:02	
Dibromomethane	ND U	9.7	1.3	1	12/19/16 20:02	
Dichlorodifluoromethane (CFC 12)	ND U	9.7	3.7	1	12/19/16 20:02	
Dichloromethane	3.3 J	9.7	1.2	1	12/19/16 20:02	
Ethyl Methacrylate	ND U	9.7	1.5	1	12/19/16 20:02	
Ethylbenzene	ND U	9.7	0.45	1	12/19/16 20:02	
Iodomethane	ND U	19	2.2	1	12/19/16 20:02	
Methacrylonitrile	ND U	9.7	3.0	1	12/19/16 20:02	
Methyl Methacrylate	ND U	9.7	1.5	1	12/19/16 20:02	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141331 400-SB-13
Lab Code: R1613221-010

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	9.7	0.99	1	12/19/16 20:02	
Propionitrile	ND U	48	13	1	12/19/16 20:02	
Tetrachloroethene (PCE)	ND U	9.7	1.7	1	12/19/16 20:02	
Toluene	ND U	9.7	2.0	1	12/19/16 20:02	
Trichloroethene (TCE)	ND U	9.7	2.0	1	12/19/16 20:02	
Trichlorofluoromethane (CFC 11)	ND U	9.7	1.3	1	12/19/16 20:02	
Vinyl Chloride	ND U	9.7	3.6	1	12/19/16 20:02	
cis-1,3-Dichloropropene	ND U	9.7	1.8	1	12/19/16 20:02	
m,p-Xylenes	ND U	19	2.2	1	12/19/16 20:02	
o-Xylene	ND U	9.7	0.93	1	12/19/16 20:02	
trans-1,2-Dichloroethene	ND U	9.7	1.7	1	12/19/16 20:02	
trans-1,3-Dichloropropene	ND U	9.7	0.39	1	12/19/16 20:02	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	100	51 - 136	12/19/16 20:02	
Dibromofluoromethane	93	63 - 138	12/19/16 20:02	
Toluene-d8	103	66 - 138	12/19/16 20:02	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	unknown	13.57	13	J

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20

Sample Name: 1612141332 400-SB-13
Lab Code: R1613221-011

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	7.5	1.3	1	12/19/16 20:26	
1,1,1-Trichloroethane (TCA)	ND U	7.5	1.1	1	12/19/16 20:26	
1,1,2,2-Tetrachloroethane	ND U	7.5	1.3	1	12/19/16 20:26	
1,1,2-Trichloroethane	ND U	7.5	1.1	1	12/19/16 20:26	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	7.5	1.9	1	12/19/16 20:26	
1,1-Dichloroethene (1,1-DCE)	ND U	7.5	2.0	1	12/19/16 20:26	
1,2,3-Trichloropropane	ND U	7.5	2.0	1	12/19/16 20:26	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	7.5	2.8	1	12/19/16 20:26	
1,2-Dibromoethane	ND U	7.5	1.9	1	12/19/16 20:26	
1,2-Dichlorobenzene	ND U	7.5	0.92	1	12/19/16 20:26	
1,2-Dichloroethane	ND U	7.5	0.92	1	12/19/16 20:26	
1,2-Dichloropropane	ND U	7.5	1.5	1	12/19/16 20:26	
1,3-Dichlorobenzene	ND U	7.5	0.95	1	12/19/16 20:26	
1,4-Dioxane	ND U	150	29	1	12/19/16 20:26	
2-Butanone (MEK)	ND U	7.5	3.5	1	12/19/16 20:26	
2-Chloro-1,3-butadiene	ND U	7.5	2.3	1	12/19/16 20:26	
2-Chloroethyl Vinyl Ether	ND U	7.5	2.6	1	12/19/16 20:26	
Isobutyl Alcohol	ND U	150	35	1	12/19/16 20:26	
Allyl Chloride	ND U	7.5	2.6	1	12/19/16 20:26	
4-Methyl-2-pentanone	ND U	7.5	1.5	1	12/19/16 20:26	
Acetone	4.8 J	7.5	4.3	1	12/19/16 20:26	
Acetonitrile	ND U	37	25	1	12/19/16 20:26	
Acrolein	ND U	37	5.3	1	12/19/16 20:26	
Acrylonitrile	ND U	37	9.7	1	12/19/16 20:26	
Benzene	ND U	7.5	0.44	1	12/19/16 20:26	
Bromodichloromethane	ND U	7.5	0.92	1	12/19/16 20:26	
Bromoform	ND U	7.5	1.4	1	12/19/16 20:26	
Bromomethane	ND U	7.5	2.1	1	12/19/16 20:26	
Carbon Disulfide	ND U	7.5	1.9	1	12/19/16 20:26	
Carbon Tetrachloride	ND U	7.5	1.4	1	12/19/16 20:26	
Chlorobenzene	ND U	7.5	0.44	1	12/19/16 20:26	
Chloroethane	ND U	7.5	4.3	1	12/19/16 20:26	
Chloroform	ND U	7.5	1.9	1	12/19/16 20:26	
Chloromethane	ND U	7.5	0.60	1	12/19/16 20:26	
Dibromochloromethane	ND U	7.5	1.1	1	12/19/16 20:26	
Dibromomethane	ND U	7.5	0.95	1	12/19/16 20:26	
Dichlorodifluoromethane (CFC 12)	ND U	7.5	2.9	1	12/19/16 20:26	
Dichloromethane	2.7 J	7.5	0.86	1	12/19/16 20:26	
Ethyl Methacrylate	ND U	7.5	1.2	1	12/19/16 20:26	
Ethylbenzene	ND U	7.5	0.35	1	12/19/16 20:26	
Iodomethane	ND U	15	1.7	1	12/19/16 20:26	
Methacrylonitrile	ND U	7.5	2.3	1	12/19/16 20:26	
Methyl Methacrylate	ND U	7.5	1.1	1	12/19/16 20:26	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141332 400-SB-13
Lab Code: R1613221-011

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20
Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	7.5	0.77	1	12/19/16 20:26	
Propionitrile	ND U	37	9.8	1	12/19/16 20:26	
Tetrachloroethene (PCE)	4.7 J	7.5	1.4	1	12/19/16 20:26	
Toluene	ND U	7.5	1.5	1	12/19/16 20:26	
Trichloroethene (TCE)	ND U	7.5	1.6	1	12/19/16 20:26	
Trichlorofluoromethane (CFC 11)	ND U	7.5	0.99	1	12/19/16 20:26	
Vinyl Chloride	ND U	7.5	2.8	1	12/19/16 20:26	
cis-1,3-Dichloropropene	ND U	7.5	1.4	1	12/19/16 20:26	
m,p-Xylenes	ND U	15	1.7	1	12/19/16 20:26	
o-Xylene	ND U	7.5	0.72	1	12/19/16 20:26	
trans-1,2-Dichloroethene	ND U	7.5	1.3	1	12/19/16 20:26	
trans-1,3-Dichloropropene	ND U	7.5	0.30	1	12/19/16 20:26	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	100	51 - 136	12/19/16 20:26	
Dibromofluoromethane	97	63 - 138	12/19/16 20:26	
Toluene-d8	105	66 - 138	12/19/16 20:26	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000104-76-7	1-Hexanol, 2-ethyl-	13.57	10	JN

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20

Sample Name: 1612141346 400-SB-14
Lab Code: R1613221-018

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	6.7	1.2	1	12/19/16 20:50	
1,1,1-Trichloroethane (TCA)	ND U	6.7	0.98	1	12/19/16 20:50	
1,1,2,2-Tetrachloroethane	ND U	6.7	1.1	1	12/19/16 20:50	
1,1,2-Trichloroethane	ND U	6.7	0.98	1	12/19/16 20:50	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	6.7	1.7	1	12/19/16 20:50	
1,1-Dichloroethene (1,1-DCE)	ND U	6.7	1.8	1	12/19/16 20:50	
1,2,3-Trichloropropane	ND U	6.7	1.8	1	12/19/16 20:50	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	6.7	2.6	1	12/19/16 20:50	
1,2-Dibromoethane	ND U	6.7	1.7	1	12/19/16 20:50	
1,2-Dichlorobenzene	ND U	6.7	0.82	1	12/19/16 20:50	
1,2-Dichloroethane	ND U	6.7	0.82	1	12/19/16 20:50	
1,2-Dichloropropane	ND U	6.7	1.4	1	12/19/16 20:50	
1,3-Dichlorobenzene	ND U	6.7	0.85	1	12/19/16 20:50	
1,4-Dioxane	ND U	130	26	1	12/19/16 20:50	
2-Butanone (MEK)	ND U	6.7	3.1	1	12/19/16 20:50	
2-Chloro-1,3-butadiene	ND U	6.7	2.1	1	12/19/16 20:50	
2-Chloroethyl Vinyl Ether	ND U	6.7	2.3	1	12/19/16 20:50	
Isobutyl Alcohol	ND U	130	31	1	12/19/16 20:50	
Allyl Chloride	ND U	6.7	2.3	1	12/19/16 20:50	
4-Methyl-2-pentanone	ND U	6.7	1.4	1	12/19/16 20:50	
Acetone	ND U	6.7	3.8	1	12/19/16 20:50	
Acetonitrile	ND U	34	23	1	12/19/16 20:50	
Acrolein	ND U	34	4.7	1	12/19/16 20:50	
Acrylonitrile	ND U	34	8.7	1	12/19/16 20:50	
Benzene	ND U	6.7	0.39	1	12/19/16 20:50	
Bromodichloromethane	ND U	6.7	0.82	1	12/19/16 20:50	
Bromoform	ND U	6.7	1.3	1	12/19/16 20:50	
Bromomethane	ND U	6.7	1.9	1	12/19/16 20:50	
Carbon Disulfide	ND U	6.7	1.7	1	12/19/16 20:50	
Carbon Tetrachloride	ND U	6.7	1.3	1	12/19/16 20:50	
Chlorobenzene	ND U	6.7	0.39	1	12/19/16 20:50	
Chloroethane	ND U	6.7	3.9	1	12/19/16 20:50	
Chloroform	ND U	6.7	1.7	1	12/19/16 20:50	
Chloromethane	ND U	6.7	0.54	1	12/19/16 20:50	
Dibromochloromethane	ND U	6.7	0.98	1	12/19/16 20:50	
Dibromomethane	ND U	6.7	0.85	1	12/19/16 20:50	
Dichlorodifluoromethane (CFC 12)	ND U	6.7	2.6	1	12/19/16 20:50	
Dichloromethane	2.0 J	6.7	0.77	1	12/19/16 20:50	
Ethyl Methacrylate	ND U	6.7	1.1	1	12/19/16 20:50	
Ethylbenzene	ND U	6.7	0.31	1	12/19/16 20:50	
Iodomethane	ND U	13	1.6	1	12/19/16 20:50	
Methacrylonitrile	ND U	6.7	2.1	1	12/19/16 20:50	
Methyl Methacrylate	ND U	6.7	0.98	1	12/19/16 20:50	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141346 400-SB-14
Lab Code: R1613221-018

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20
Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	6.7	0.69	1	12/19/16 20:50	
Propionitrile	ND U	34	8.8	1	12/19/16 20:50	
Tetrachloroethene (PCE)	ND U	6.7	1.2	1	12/19/16 20:50	
Toluene	ND U	6.7	1.4	1	12/19/16 20:50	
Trichloroethene (TCE)	ND U	6.7	1.4	1	12/19/16 20:50	
Trichlorofluoromethane (CFC 11)	ND U	6.7	0.89	1	12/19/16 20:50	
Vinyl Chloride	ND U	6.7	2.5	1	12/19/16 20:50	
cis-1,3-Dichloropropene	ND U	6.7	1.3	1	12/19/16 20:50	
m,p-Xylenes	ND U	13	1.5	1	12/19/16 20:50	
o-Xylene	ND U	6.7	0.65	1	12/19/16 20:50	
trans-1,2-Dichloroethene	ND U	6.7	1.2	1	12/19/16 20:50	
trans-1,3-Dichloropropene	ND U	6.7	0.27	1	12/19/16 20:50	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	103	51 - 136	12/19/16 20:50	
Dibromofluoromethane	96	63 - 138	12/19/16 20:50	
Toluene-d8	106	66 - 138	12/19/16 20:50	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20

Sample Name: 1612141347 400-SB-14
Lab Code: R1613221-019

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	6.9	1.2	1	12/19/16 21:15	
1,1,1-Trichloroethane (TCA)	ND U	6.9	1.1	1	12/19/16 21:15	
1,1,2,2-Tetrachloroethane	ND U	6.9	1.2	1	12/19/16 21:15	
1,1,2-Trichloroethane	ND U	6.9	1.1	1	12/19/16 21:15	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	6.9	1.8	1	12/19/16 21:15	
1,1-Dichloroethene (1,1-DCE)	ND U	6.9	1.8	1	12/19/16 21:15	
1,2,3-Trichloropropane	ND U	6.9	1.9	1	12/19/16 21:15	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	6.9	2.6	1	12/19/16 21:15	
1,2-Dibromoethane	ND U	6.9	1.7	1	12/19/16 21:15	
1,2-Dichlorobenzene	ND U	6.9	0.84	1	12/19/16 21:15	
1,2-Dichloroethane	ND U	6.9	0.84	1	12/19/16 21:15	
1,2-Dichloropropane	ND U	6.9	1.4	1	12/19/16 21:15	
1,3-Dichlorobenzene	ND U	6.9	0.87	1	12/19/16 21:15	
1,4-Dioxane	ND U	140	27	1	12/19/16 21:15	
2-Butanone (MEK)	ND U	6.9	3.2	1	12/19/16 21:15	
2-Chloro-1,3-butadiene	ND U	6.9	2.1	1	12/19/16 21:15	
2-Chloroethyl Vinyl Ether	ND U	6.9	2.4	1	12/19/16 21:15	
Isobutyl Alcohol	ND U	140	32	1	12/19/16 21:15	
Allyl Chloride	ND U	6.9	2.4	1	12/19/16 21:15	
4-Methyl-2-pentanone	ND U	6.9	1.4	1	12/19/16 21:15	
Acetone	4.2 J	6.9	3.9	1	12/19/16 21:15	
Acetonitrile	ND U	34	23	1	12/19/16 21:15	
Acrolein	ND U	34	4.9	1	12/19/16 21:15	
Acrylonitrile	ND U	34	8.9	1	12/19/16 21:15	
Benzene	ND U	6.9	0.40	1	12/19/16 21:15	
Bromodichloromethane	ND U	6.9	0.84	1	12/19/16 21:15	
Bromoform	ND U	6.9	1.3	1	12/19/16 21:15	
Bromomethane	ND U	6.9	1.9	1	12/19/16 21:15	
Carbon Disulfide	ND U	6.9	1.8	1	12/19/16 21:15	
Carbon Tetrachloride	ND U	6.9	1.3	1	12/19/16 21:15	
Chlorobenzene	ND U	6.9	0.40	1	12/19/16 21:15	
Chloroethane	ND U	6.9	4.0	1	12/19/16 21:15	
Chloroform	ND U	6.9	1.8	1	12/19/16 21:15	
Chloromethane	ND U	6.9	0.56	1	12/19/16 21:15	
Dibromochloromethane	ND U	6.9	1.1	1	12/19/16 21:15	
Dibromomethane	ND U	6.9	0.87	1	12/19/16 21:15	
Dichlorodifluoromethane (CFC 12)	ND U	6.9	2.6	1	12/19/16 21:15	
Dichloromethane	2.3 J	6.9	0.79	1	12/19/16 21:15	
Ethyl Methacrylate	ND U	6.9	1.1	1	12/19/16 21:15	
Ethylbenzene	ND U	6.9	0.32	1	12/19/16 21:15	
Iodomethane	ND U	14	1.6	1	12/19/16 21:15	
Methacrylonitrile	ND U	6.9	2.1	1	12/19/16 21:15	
Methyl Methacrylate	ND U	6.9	1.1	1	12/19/16 21:15	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141347 400-SB-14
Lab Code: R1613221-019

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	6.9	0.71	1	12/19/16 21:15	
Propionitrile	ND U	34	9.0	1	12/19/16 21:15	
Tetrachloroethene (PCE)	ND U	6.9	1.3	1	12/19/16 21:15	
Toluene	ND U	6.9	1.4	1	12/19/16 21:15	
Trichloroethene (TCE)	ND U	6.9	1.4	1	12/19/16 21:15	
Trichlorofluoromethane (CFC 11)	ND U	6.9	0.91	1	12/19/16 21:15	
Vinyl Chloride	ND U	6.9	2.6	1	12/19/16 21:15	
cis-1,3-Dichloropropene	ND U	6.9	1.3	1	12/19/16 21:15	
m,p-Xylenes	ND U	14	1.5	1	12/19/16 21:15	
o-Xylene	ND U	6.9	0.67	1	12/19/16 21:15	
trans-1,2-Dichloroethene	ND U	6.9	1.2	1	12/19/16 21:15	
trans-1,3-Dichloropropene	ND U	6.9	0.28	1	12/19/16 21:15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	104	51 - 136	12/19/16 21:15	
Dibromofluoromethane	97	63 - 138	12/19/16 21:15	
Toluene-d8	107	66 - 138	12/19/16 21:15	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water
Sample Name: 1612141315 400-SB-08
Lab Code: R1613221-001

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20

Units: ug/L
Basis: NA

Volatile Organic Compounds by GC/MS

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	1.0	0.22	1	12/22/16 12:58	
1,1,1-Trichloroethane (TCA)	ND U	1.0	0.36	1	12/22/16 12:58	
1,1,2,2-Tetrachloroethane	ND U	1.0	0.25	1	12/22/16 12:58	
1,1,2-Trichloroethane	ND U	1.0	0.34	1	12/22/16 12:58	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	1.0	0.31	1	12/22/16 12:58	
1,1-Dichloroethene (1,1-DCE)	ND U	1.0	0.57	1	12/22/16 12:58	
1,2,3-Trichloropropane	ND U	1.0	0.70	1	12/22/16 12:58	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	2.0	0.74	1	12/22/16 12:58	
1,2-Dibromoethane	ND U	1.0	0.24	1	12/22/16 12:58	
1,2-Dichlorobenzene	ND U	1.0	0.21	1	12/22/16 12:58	
1,2-Dichloroethane	ND U	1.0	0.36	1	12/22/16 12:58	
1,2-Dichloropropane	ND U	1.0	0.20	1	12/22/16 12:58	
1,3-Dichlorobenzene	ND U	1.0	0.20	1	12/22/16 12:58	
1,4-Dioxane	ND U	40	20	1	12/22/16 12:58	
2-Butanone (MEK)	ND U	5.0	0.81	1	12/22/16 12:58	
2-Chloro-1,3-butadiene	ND U	1.0	0.27	1	12/22/16 12:58	
2-Chloroethyl Vinyl Ether	ND U	1.0	0.44	1	12/22/16 12:58	
Isobutyl Alcohol	ND U	40	11	1	12/22/16 12:58	
Allyl Chloride	ND U	1.0	0.26	1	12/22/16 12:58	
4-Methyl-2-pentanone	ND U	5.0	0.67	1	12/22/16 12:58	
Acetone	2.2 J	5.0	1.3	1	12/22/16 12:58	
Acetonitrile	ND U	10	4.7	1	12/22/16 12:58	
Acrolein	ND U	10	3.0	1	12/22/16 12:58	
Acrylonitrile	ND U	10	1.4	1	12/22/16 12:58	
Benzene	ND U	1.0	0.20	1	12/22/16 12:58	
Bromodichloromethane	ND U	1.0	0.32	1	12/22/16 12:58	
Bromoform	ND U	1.0	0.42	1	12/22/16 12:58	
Bromomethane	ND U	1.0	0.29	1	12/22/16 12:58	
Carbon Disulfide	ND U	1.0	0.22	1	12/22/16 12:58	
Carbon Tetrachloride	ND U	1.0	0.45	1	12/22/16 12:58	
Chlorobenzene	ND U	1.0	0.29	1	12/22/16 12:58	
Chloroethane	ND U	1.0	0.24	1	12/22/16 12:58	
Chloroform	ND U	1.0	0.25	1	12/22/16 12:58	
Chloromethane	ND U	1.0	0.21	1	12/22/16 12:58	
Dibromochloromethane	ND U	1.0	0.31	1	12/22/16 12:58	
Dibromomethane	ND U	1.0	0.32	1	12/22/16 12:58	
Dichlorodifluoromethane (CFC 12)	ND U	1.0	0.46	1	12/22/16 12:58	
Dichloromethane	ND U	1.0	0.60	1	12/22/16 12:58	
Ethyl Methacrylate	ND U	2.0	0.44	1	12/22/16 12:58	
Ethylbenzene	ND U	1.0	0.20	1	12/22/16 12:58	
Iodomethane	ND U	2.0	0.98	1	12/22/16 12:58	
Methacrylonitrile	ND U	2.0	0.50	1	12/22/16 12:58	
Methyl Methacrylate	ND U	2.0	0.62	1	12/22/16 12:58	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water
Sample Name: 1612141315 400-SB-08
Lab Code: R1613221-001

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20
Units: ug/L
Basis: NA

Volatile Organic Compounds by GC/MS

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	1.0	0.20	1	12/22/16 12:58	
Propionitrile	ND U	5.0	3.1	1	12/22/16 12:58	
Tetrachloroethene (PCE)	ND U	1.0	0.30	1	12/22/16 12:58	
Toluene	ND U	1.0	0.20	1	12/22/16 12:58	
Trichloroethene (TCE)	ND U	1.0	0.22	1	12/22/16 12:58	
Trichlorofluoromethane (CFC 11)	ND U	1.0	0.20	1	12/22/16 12:58	
Vinyl Chloride	ND U	1.0	0.32	1	12/22/16 12:58	
cis-1,3-Dichloropropene	ND U	1.0	0.24	1	12/22/16 12:58	
m,p-Xylenes	ND U	2.0	0.33	1	12/22/16 12:58	
o-Xylene	ND U	1.0	0.20	1	12/22/16 12:58	
trans-1,2-Dichloroethene	ND U	1.0	0.33	1	12/22/16 12:58	
trans-1,3-Dichloropropene	ND U	1.0	0.20	1	12/22/16 12:58	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	102	85 - 122	12/22/16 12:58	
Dibromofluoromethane	112	89 - 119	12/22/16 12:58	
Toluene-d8	111	87 - 121	12/22/16 12:58	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/L	Q
	No Tentatively Identified Compounds Detected			

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20

Sample Name: 1612141330 400-SB-13
Lab Code: R1613221-009

Units: ug/L
Basis: NA

Volatile Organic Compounds by GC/MS

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	1.0	0.22	1	12/22/16 13:28	
1,1,1-Trichloroethane (TCA)	ND U	1.0	0.36	1	12/22/16 13:28	
1,1,2,2-Tetrachloroethane	ND U	1.0	0.25	1	12/22/16 13:28	
1,1,2-Trichloroethane	ND U	1.0	0.34	1	12/22/16 13:28	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	1.0	0.31	1	12/22/16 13:28	
1,1-Dichloroethene (1,1-DCE)	ND U	1.0	0.57	1	12/22/16 13:28	
1,2,3-Trichloropropane	ND U	1.0	0.70	1	12/22/16 13:28	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	2.0	0.74	1	12/22/16 13:28	
1,2-Dibromoethane	ND U	1.0	0.24	1	12/22/16 13:28	
1,2-Dichlorobenzene	ND U	1.0	0.21	1	12/22/16 13:28	
1,2-Dichloroethane	ND U	1.0	0.36	1	12/22/16 13:28	
1,2-Dichloropropane	ND U	1.0	0.20	1	12/22/16 13:28	
1,3-Dichlorobenzene	ND U	1.0	0.20	1	12/22/16 13:28	
1,4-Dioxane	ND U	40	20	1	12/22/16 13:28	
2-Butanone (MEK)	ND U	5.0	0.81	1	12/22/16 13:28	
2-Chloro-1,3-butadiene	ND U	1.0	0.27	1	12/22/16 13:28	
2-Chloroethyl Vinyl Ether	ND U	1.0	0.44	1	12/22/16 13:28	
Isobutyl Alcohol	ND U	40	11	1	12/22/16 13:28	
Allyl Chloride	ND U	1.0	0.26	1	12/22/16 13:28	
4-Methyl-2-pentanone	ND U	5.0	0.67	1	12/22/16 13:28	
Acetone	2.6 J	5.0	1.3	1	12/22/16 13:28	
Acetonitrile	ND U	10	4.7	1	12/22/16 13:28	
Acrolein	ND U	10	3.0	1	12/22/16 13:28	
Acrylonitrile	ND U	10	1.4	1	12/22/16 13:28	
Benzene	ND U	1.0	0.20	1	12/22/16 13:28	
Bromodichloromethane	ND U	1.0	0.32	1	12/22/16 13:28	
Bromoform	ND U	1.0	0.42	1	12/22/16 13:28	
Bromomethane	ND U	1.0	0.29	1	12/22/16 13:28	
Carbon Disulfide	ND U	1.0	0.22	1	12/22/16 13:28	
Carbon Tetrachloride	ND U	1.0	0.45	1	12/22/16 13:28	
Chlorobenzene	ND U	1.0	0.29	1	12/22/16 13:28	
Chloroethane	ND U	1.0	0.24	1	12/22/16 13:28	
Chloroform	ND U	1.0	0.25	1	12/22/16 13:28	
Chloromethane	ND U	1.0	0.21	1	12/22/16 13:28	
Dibromochloromethane	ND U	1.0	0.31	1	12/22/16 13:28	
Dibromomethane	ND U	1.0	0.32	1	12/22/16 13:28	
Dichlorodifluoromethane (CFC 12)	ND U	1.0	0.46	1	12/22/16 13:28	
Dichloromethane	ND U	1.0	0.60	1	12/22/16 13:28	
Ethyl Methacrylate	ND U	2.0	0.44	1	12/22/16 13:28	
Ethylbenzene	ND U	1.0	0.20	1	12/22/16 13:28	
Iodomethane	ND U	2.0	0.98	1	12/22/16 13:28	
Methacrylonitrile	ND U	2.0	0.50	1	12/22/16 13:28	
Methyl Methacrylate	ND U	2.0	0.62	1	12/22/16 13:28	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water
Sample Name: 1612141330 400-SB-13
Lab Code: R1613221-009

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20

Units: ug/L
Basis: NA

Volatile Organic Compounds by GC/MS

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	1.0	0.20	1	12/22/16 13:28	
Propionitrile	ND U	5.0	3.1	1	12/22/16 13:28	
Tetrachloroethene (PCE)	ND U	1.0	0.30	1	12/22/16 13:28	
Toluene	ND U	1.0	0.20	1	12/22/16 13:28	
Trichloroethene (TCE)	ND U	1.0	0.22	1	12/22/16 13:28	
Trichlorofluoromethane (CFC 11)	ND U	1.0	0.20	1	12/22/16 13:28	
Vinyl Chloride	ND U	1.0	0.32	1	12/22/16 13:28	
cis-1,3-Dichloropropene	ND U	1.0	0.24	1	12/22/16 13:28	
m,p-Xylenes	ND U	2.0	0.33	1	12/22/16 13:28	
o-Xylene	ND U	1.0	0.20	1	12/22/16 13:28	
trans-1,2-Dichloroethene	ND U	1.0	0.33	1	12/22/16 13:28	
trans-1,3-Dichloropropene	ND U	1.0	0.20	1	12/22/16 13:28	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	106	85 - 122	12/22/16 13:28	
Dibromofluoromethane	109	89 - 119	12/22/16 13:28	
Toluene-d8	114	87 - 121	12/22/16 13:28	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/L	Q
	No Tentatively Identified Compounds Detected			

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20

Sample Name: 1612141345 400-SB-14
Lab Code: R1613221-017

Units: ug/L
Basis: NA

Volatile Organic Compounds by GC/MS

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	1.0	0.22	1	12/22/16 13:58	
1,1,1-Trichloroethane (TCA)	ND U	1.0	0.36	1	12/22/16 13:58	
1,1,2,2-Tetrachloroethane	ND U	1.0	0.25	1	12/22/16 13:58	
1,1,2-Trichloroethane	ND U	1.0	0.34	1	12/22/16 13:58	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	1.0	0.31	1	12/22/16 13:58	
1,1-Dichloroethene (1,1-DCE)	ND U	1.0	0.57	1	12/22/16 13:58	
1,2,3-Trichloropropane	ND U	1.0	0.70	1	12/22/16 13:58	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	2.0	0.74	1	12/22/16 13:58	
1,2-Dibromoethane	ND U	1.0	0.24	1	12/22/16 13:58	
1,2-Dichlorobenzene	ND U	1.0	0.21	1	12/22/16 13:58	
1,2-Dichloroethane	ND U	1.0	0.36	1	12/22/16 13:58	
1,2-Dichloropropane	ND U	1.0	0.20	1	12/22/16 13:58	
1,3-Dichlorobenzene	ND U	1.0	0.20	1	12/22/16 13:58	
1,4-Dioxane	ND U	40	20	1	12/22/16 13:58	
2-Butanone (MEK)	ND U	5.0	0.81	1	12/22/16 13:58	
2-Chloro-1,3-butadiene	ND U	1.0	0.27	1	12/22/16 13:58	
2-Chloroethyl Vinyl Ether	ND U	1.0	0.44	1	12/22/16 13:58	
Isobutyl Alcohol	ND U	40	11	1	12/22/16 13:58	
Allyl Chloride	ND U	1.0	0.26	1	12/22/16 13:58	
4-Methyl-2-pentanone	ND U	5.0	0.67	1	12/22/16 13:58	
Acetone	ND U	5.0	1.3	1	12/22/16 13:58	
Acetonitrile	ND U	10	4.7	1	12/22/16 13:58	
Acrolein	ND U	10	3.0	1	12/22/16 13:58	
Acrylonitrile	ND U	10	1.4	1	12/22/16 13:58	
Benzene	ND U	1.0	0.20	1	12/22/16 13:58	
Bromodichloromethane	ND U	1.0	0.32	1	12/22/16 13:58	
Bromoform	ND U	1.0	0.42	1	12/22/16 13:58	
Bromomethane	ND U	1.0	0.29	1	12/22/16 13:58	
Carbon Disulfide	ND U	1.0	0.22	1	12/22/16 13:58	
Carbon Tetrachloride	ND U	1.0	0.45	1	12/22/16 13:58	
Chlorobenzene	ND U	1.0	0.29	1	12/22/16 13:58	
Chloroethane	ND U	1.0	0.24	1	12/22/16 13:58	
Chloroform	ND U	1.0	0.25	1	12/22/16 13:58	
Chloromethane	ND U	1.0	0.21	1	12/22/16 13:58	
Dibromochloromethane	ND U	1.0	0.31	1	12/22/16 13:58	
Dibromomethane	ND U	1.0	0.32	1	12/22/16 13:58	
Dichlorodifluoromethane (CFC 12)	ND U	1.0	0.46	1	12/22/16 13:58	
Dichloromethane	ND U	1.0	0.60	1	12/22/16 13:58	
Ethyl Methacrylate	ND U	2.0	0.44	1	12/22/16 13:58	
Ethylbenzene	ND U	1.0	0.20	1	12/22/16 13:58	
Iodomethane	ND U	2.0	0.98	1	12/22/16 13:58	
Methacrylonitrile	ND U	2.0	0.50	1	12/22/16 13:58	
Methyl Methacrylate	ND U	2.0	0.62	1	12/22/16 13:58	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water
Sample Name: 1612141345 400-SB-14
Lab Code: R1613221-017

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20
Units: ug/L
Basis: NA

Volatile Organic Compounds by GC/MS

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	1.0	0.20	1	12/22/16 13:58	
Propionitrile	ND U	5.0	3.1	1	12/22/16 13:58	
Tetrachloroethene (PCE)	ND U	1.0	0.30	1	12/22/16 13:58	
Toluene	0.37 J	1.0	0.20	1	12/22/16 13:58	
Trichloroethene (TCE)	ND U	1.0	0.22	1	12/22/16 13:58	
Trichlorofluoromethane (CFC 11)	ND U	1.0	0.20	1	12/22/16 13:58	
Vinyl Chloride	ND U	1.0	0.32	1	12/22/16 13:58	
cis-1,3-Dichloropropene	ND U	1.0	0.24	1	12/22/16 13:58	
m,p-Xylenes	ND U	2.0	0.33	1	12/22/16 13:58	
o-Xylene	ND U	1.0	0.20	1	12/22/16 13:58	
trans-1,2-Dichloroethene	ND U	1.0	0.33	1	12/22/16 13:58	
trans-1,3-Dichloropropene	ND U	1.0	0.20	1	12/22/16 13:58	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	104	85 - 122	12/22/16 13:58	
Dibromofluoromethane	109	89 - 119	12/22/16 13:58	
Toluene-d8	111	87 - 121	12/22/16 13:58	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/L	Q
	No Tentatively Identified Compounds Detected			



Metals

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water
Sample Name: 1612141319 400-SB-08
Lab Code: R1613221-004

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20
Basis: NA

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/L	0.060	0.005	1	12/20/16 22:54	12/19/16	
Arsenic, Total	6010C	ND U	mg/L	0.010	0.005	1	12/20/16 22:54	12/19/16	
Barium, Total	6010C	0.014 J	mg/L	0.020	0.002	1	12/20/16 22:54	12/19/16	
Beryllium, Total	6010C	ND U	mg/L	0.0030	0.0002	1	12/20/16 22:54	12/19/16	
Cadmium, Total	6010C	ND U	mg/L	0.0050	0.0002	1	12/20/16 22:54	12/19/16	
Chromium, Total	6010C	ND U	mg/L	0.010	0.0003	1	12/20/16 22:54	12/19/16	
Lead, Total	6010C	ND U	mg/L	0.050	0.005	1	12/20/16 22:54	12/19/16	
Mercury, Total	7470A	ND U	mg/L	0.00020	0.00004	1	12/22/16 12:03	12/21/16	
Nickel, Total	6010C	ND U	mg/L	0.040	0.002	1	12/20/16 22:54	12/19/16	
Selenium, Total	6010C	ND U	mg/L	0.010	0.005	1	12/20/16 22:54	12/19/16	
Silver, Total	6010C	ND U	mg/L	0.010	0.0006	1	12/20/16 22:54	12/19/16	
Thallium, Total	6010C	ND U	mg/L	0.010	0.005	1	12/20/16 22:54	12/19/16	
Vanadium, Total	6010C	ND U	mg/L	0.050	0.0010	1	12/20/16 22:54	12/19/16	
Zinc, Total	6010C	ND U	mg/L	0.020	0.007	1	12/20/16 22:54	12/19/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141320 400-SB-08
Lab Code: R1613221-005

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	10	0.7	1	12/29/16 19:31	12/19/16	
Arsenic, Total	6010C	2.2	mg/Kg	1.7	0.5	1	12/29/16 19:31	12/19/16	
Barium, Total	6010C	66.1	mg/Kg	3.4	0.2	1	12/29/16 19:31	12/19/16	
Beryllium, Total	6010C	0.58	mg/Kg	0.51	0.03	1	12/29/16 19:31	12/19/16	
Cadmium, Total	6010C	ND U	mg/Kg	0.85	0.06	1	12/29/16 19:31	12/19/16	
Chromium, Total	6010C	0.8 J	mg/Kg	1.7	0.3	1	12/29/16 19:31	12/19/16	
Lead, Total	6010C	3.4 J	mg/Kg	8.5	0.5	1	12/29/16 19:31	12/19/16	
Mercury, Total	7471B	ND U	mg/Kg	0.057	0.006	1	12/22/16 16:24	12/21/16	
Nickel, Total	6010C	ND U	mg/Kg	6.8	0.3	1	12/29/16 19:31	12/19/16	
Selenium, Total	6010C	ND U	mg/Kg	1.7	1.1	1	12/29/16 19:31	12/19/16	
Silver, Total	6010C	ND U	mg/Kg	1.7	0.8	1	12/29/16 19:31	12/19/16	
Thallium, Total	6010C	ND U	mg/Kg	1.7	0.9	1	12/29/16 19:31	12/19/16	
Vanadium, Total	6010C	30.7	mg/Kg	8.5	0.3	1	12/29/16 19:31	12/19/16	
Zinc, Total	6010C	32.3	mg/Kg	3.4	0.3	1	12/29/16 19:31	12/19/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141321 400-SB-08
Lab Code: R1613221-006

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	10	0.7	1	12/29/16 19:47	12/19/16	
Arsenic, Total	6010C	2.2	mg/Kg	1.7	0.5	1	12/29/16 19:47	12/19/16	
Barium, Total	6010C	50.6	mg/Kg	3.4	0.2	1	12/29/16 19:47	12/19/16	
Beryllium, Total	6010C	0.62	mg/Kg	0.51	0.03	1	12/29/16 19:47	12/19/16	
Cadmium, Total	6010C	ND U	mg/Kg	0.86	0.06	1	12/29/16 19:47	12/19/16	
Chromium, Total	6010C	0.8 J	mg/Kg	1.7	0.3	1	12/29/16 19:47	12/19/16	
Lead, Total	6010C	3.7 J	mg/Kg	8.6	0.5	1	12/29/16 19:47	12/19/16	
Mercury, Total	7471B	ND U	mg/Kg	0.058	0.006	1	12/22/16 16:25	12/21/16	
Nickel, Total	6010C	ND U	mg/Kg	6.8	0.3	1	12/29/16 19:47	12/19/16	
Selenium, Total	6010C	ND U	mg/Kg	1.7	1.1	1	12/29/16 19:47	12/19/16	
Silver, Total	6010C	ND U	mg/Kg	1.7	0.8	1	12/29/16 19:47	12/19/16	
Thallium, Total	6010C	ND U	mg/Kg	1.7	0.9	1	12/29/16 19:47	12/19/16	
Vanadium, Total	6010C	35.3	mg/Kg	8.6	0.3	1	12/29/16 19:47	12/19/16	
Zinc, Total	6010C	35.2	mg/Kg	3.4	0.3	1	12/29/16 19:47	12/19/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water
Sample Name: 1612141334 400-SB-13
Lab Code: R1613221-012

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20

Basis: NA

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/L	0.060	0.005	1	12/20/16 22:57	12/19/16	
Arsenic, Total	6010C	ND U	mg/L	0.010	0.005	1	12/20/16 22:57	12/19/16	
Barium, Total	6010C	0.008 J	mg/L	0.020	0.002	1	12/20/16 22:57	12/19/16	
Beryllium, Total	6010C	ND U	mg/L	0.0030	0.0002	1	12/20/16 22:57	12/19/16	
Cadmium, Total	6010C	ND U	mg/L	0.0050	0.0002	1	12/20/16 22:57	12/19/16	
Chromium, Total	6010C	ND U	mg/L	0.010	0.0003	1	12/20/16 22:57	12/19/16	
Lead, Total	6010C	ND U	mg/L	0.050	0.005	1	12/20/16 22:57	12/19/16	
Mercury, Total	7470A	ND U	mg/L	0.00020	0.00004	1	12/22/16 12:05	12/21/16	
Nickel, Total	6010C	ND U	mg/L	0.040	0.002	1	12/20/16 22:57	12/19/16	
Selenium, Total	6010C	ND U	mg/L	0.010	0.005	1	12/20/16 22:57	12/19/16	
Silver, Total	6010C	ND U	mg/L	0.010	0.0006	1	12/20/16 22:57	12/19/16	
Thallium, Total	6010C	ND U	mg/L	0.010	0.005	1	12/20/16 22:57	12/19/16	
Vanadium, Total	6010C	ND U	mg/L	0.050	0.0010	1	12/20/16 22:57	12/19/16	
Zinc, Total	6010C	ND U	mg/L	0.020	0.007	1	12/20/16 22:57	12/19/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141335 400-SB-13
Lab Code: R1613221-013

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	9.7	0.7	1	12/29/16 19:50	12/19/16	
Arsenic, Total	6010C	3.6	mg/Kg	1.6	0.4	1	12/29/16 19:50	12/19/16	
Barium, Total	6010C	178	mg/Kg	3.2	0.2	1	12/29/16 19:50	12/19/16	
Beryllium, Total	6010C	0.67	mg/Kg	0.49	0.03	1	12/29/16 19:50	12/19/16	
Cadmium, Total	6010C	ND U	mg/Kg	0.81	0.06	1	12/29/16 19:50	12/19/16	
Chromium, Total	6010C	6.3	mg/Kg	1.6	0.2	1	12/29/16 19:50	12/19/16	
Lead, Total	6010C	8.8	mg/Kg	8.1	0.5	1	12/29/16 19:50	12/19/16	
Mercury, Total	7471B	ND U	mg/Kg	0.052	0.005	1	12/22/16 16:27	12/21/16	
Nickel, Total	6010C	ND U	mg/Kg	6.5	0.3	1	12/29/16 19:50	12/19/16	
Selenium, Total	6010C	ND U	mg/Kg	1.6	1.0	1	12/29/16 19:50	12/19/16	
Silver, Total	6010C	ND U	mg/Kg	1.6	0.8	1	12/29/16 19:50	12/19/16	
Thallium, Total	6010C	1.0 J	mg/Kg	1.6	0.9	1	12/29/16 19:50	12/19/16	
Vanadium, Total	6010C	29.9	mg/Kg	8.1	0.3	1	12/29/16 19:50	12/19/16	
Zinc, Total	6010C	48.0	mg/Kg	3.2	0.3	1	12/29/16 19:50	12/19/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141336 400-SB-13
Lab Code: R1613221-014

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	8.8	0.6	1	12/29/16 19:53	12/19/16	
Arsenic, Total	6010C	2.9	mg/Kg	1.5	0.4	1	12/29/16 19:53	12/19/16	
Barium, Total	6010C	204	mg/Kg	2.9	0.2	1	12/29/16 19:53	12/19/16	
Beryllium, Total	6010C	0.52	mg/Kg	0.44	0.03	1	12/29/16 19:53	12/19/16	
Cadmium, Total	6010C	0.10 J	mg/Kg	0.74	0.05	1	12/29/16 19:53	12/19/16	
Chromium, Total	6010C	7.8	mg/Kg	1.5	0.2	1	12/29/16 19:53	12/19/16	
Lead, Total	6010C	7.5	mg/Kg	7.4	0.5	1	12/29/16 19:53	12/19/16	
Mercury, Total	7471B	ND U	mg/Kg	0.049	0.005	1	12/22/16 16:29	12/21/16	
Nickel, Total	6010C	ND U	mg/Kg	5.9	0.2	1	12/29/16 19:53	12/19/16	
Selenium, Total	6010C	ND U	mg/Kg	1.5	0.9	1	12/29/16 19:53	12/19/16	
Silver, Total	6010C	ND U	mg/Kg	1.5	0.7	1	12/29/16 19:53	12/19/16	
Thallium, Total	6010C	2.6	mg/Kg	1.5	0.8	1	12/29/16 19:53	12/19/16	
Vanadium, Total	6010C	22.7	mg/Kg	7.4	0.2	1	12/29/16 19:53	12/19/16	
Zinc, Total	6010C	47.5	mg/Kg	2.9	0.2	1	12/29/16 19:53	12/19/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water
Sample Name: 1612141349 400-SB-14
Lab Code: R1613221-020

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20

Basis: NA

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/L	0.060	0.005	1	12/20/16 23:00	12/19/16	
Arsenic, Total	6010C	ND U	mg/L	0.010	0.005	1	12/20/16 23:00	12/19/16	
Barium, Total	6010C	0.016 J	mg/L	0.020	0.002	1	12/20/16 23:00	12/19/16	
Beryllium, Total	6010C	ND U	mg/L	0.0030	0.0002	1	12/20/16 23:00	12/19/16	
Cadmium, Total	6010C	ND U	mg/L	0.0050	0.0002	1	12/20/16 23:00	12/19/16	
Chromium, Total	6010C	ND U	mg/L	0.010	0.0003	1	12/20/16 23:00	12/19/16	
Lead, Total	6010C	ND U	mg/L	0.050	0.005	1	12/20/16 23:00	12/19/16	
Mercury, Total	7470A	ND U	mg/L	0.00020	0.00004	1	12/22/16 12:06	12/21/16	
Nickel, Total	6010C	ND U	mg/L	0.040	0.002	1	12/20/16 23:00	12/19/16	
Selenium, Total	6010C	ND U	mg/L	0.010	0.005	1	12/20/16 23:00	12/19/16	
Silver, Total	6010C	ND U	mg/L	0.010	0.0006	1	12/20/16 23:00	12/19/16	
Thallium, Total	6010C	ND U	mg/L	0.010	0.005	1	12/20/16 23:00	12/19/16	
Vanadium, Total	6010C	ND U	mg/L	0.050	0.0010	1	12/20/16 23:00	12/19/16	
Zinc, Total	6010C	ND U	mg/L	0.020	0.007	1	12/20/16 23:00	12/19/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141350 400-SB-14
Lab Code: R1613221-021

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	7.3	0.5	1	12/29/16 20:03	12/19/16	
Arsenic, Total	6010C	3.8	mg/Kg	1.2	0.3	1	12/29/16 20:03	12/19/16	
Barium, Total	6010C	324	mg/Kg	2.4	0.2	1	12/29/16 20:03	12/19/16	
Beryllium, Total	6010C	0.61	mg/Kg	0.37	0.03	1	12/29/16 20:03	12/19/16	
Cadmium, Total	6010C	ND U	mg/Kg	0.61	0.04	1	12/29/16 20:03	12/19/16	
Chromium, Total	6010C	5.1	mg/Kg	1.2	0.2	1	12/29/16 20:03	12/19/16	
Lead, Total	6010C	6.3	mg/Kg	6.1	0.4	1	12/29/16 20:03	12/19/16	
Mercury, Total	7471B	ND U	mg/Kg	0.039	0.004	1	12/22/16 16:30	12/21/16	
Nickel, Total	6010C	0.9 J	mg/Kg	4.9	0.2	1	12/29/16 20:03	12/19/16	
Selenium, Total	6010C	ND U	mg/Kg	1.2	0.8	1	12/29/16 20:03	12/19/16	
Silver, Total	6010C	ND U	mg/Kg	1.2	0.6	1	12/29/16 20:03	12/19/16	
Thallium, Total	6010C	1.8	mg/Kg	1.2	0.7	1	12/29/16 20:03	12/19/16	
Vanadium, Total	6010C	23.2	mg/Kg	6.1	0.2	1	12/29/16 20:03	12/19/16	
Zinc, Total	6010C	44.4	mg/Kg	2.4	0.2	1	12/29/16 20:03	12/19/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141351 400-SB-14
Lab Code: R1613221-022

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20
Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	7.4	0.5	1	12/29/16 20:06	12/19/16	
Arsenic, Total	6010C	2.9	mg/Kg	1.2	0.3	1	12/29/16 20:06	12/19/16	
Barium, Total	6010C	287	mg/Kg	2.5	0.2	1	12/29/16 20:06	12/19/16	
Beryllium, Total	6010C	0.57	mg/Kg	0.37	0.03	1	12/29/16 20:06	12/19/16	
Cadmium, Total	6010C	ND U	mg/Kg	0.62	0.04	1	12/29/16 20:06	12/19/16	
Chromium, Total	6010C	5.7	mg/Kg	1.2	0.2	1	12/29/16 20:06	12/19/16	
Lead, Total	6010C	5.9 J	mg/Kg	6.2	0.4	1	12/29/16 20:06	12/19/16	
Mercury, Total	7471B	ND U	mg/Kg	0.041	0.004	1	12/22/16 16:32	12/21/16	
Nickel, Total	6010C	0.7 J	mg/Kg	4.9	0.2	1	12/29/16 20:06	12/19/16	
Selenium, Total	6010C	ND U	mg/Kg	1.2	0.8	1	12/29/16 20:06	12/19/16	
Silver, Total	6010C	ND U	mg/Kg	1.2	0.6	1	12/29/16 20:06	12/19/16	
Thallium, Total	6010C	ND U	mg/Kg	1.2	0.7	1	12/29/16 20:06	12/19/16	
Vanadium, Total	6010C	19.8	mg/Kg	6.2	0.2	1	12/29/16 20:06	12/19/16	
Zinc, Total	6010C	42.9	mg/Kg	2.5	0.2	1	12/29/16 20:06	12/19/16	



General Chemistry

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141316 400-SB-08
Lab Code: R1613221-002

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	54.3	Percent	-	1	12/27/16 11:05	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141317 400-SB-08
Lab Code: R1613221-003

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20
Basis: As Received

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Q
Total Solids	ALS SOP	54.9	Percent	-	1	12/27/16 11:05	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141320 400-SB-08
Lab Code: R1613221-005

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	57.0	Percent	-	-	1	12/27/16 11:05	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141321 400-SB-08
Lab Code: R1613221-006

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	56.7	Percent	-	-	1	12/27/16 11:05	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141331 400-SB-13
Lab Code: R1613221-010

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	51.8	Percent	-	1	12/27/16 11:05	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141332 400-SB-13
Lab Code: R1613221-011

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	66.8	Percent	-	1	12/27/16 11:05	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141335 400-SB-13
Lab Code: R1613221-013

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	59.8	Percent	-	-	1	12/27/16 11:05	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141336 400-SB-13
Lab Code: R1613221-014

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	65.9	Percent	-	-	1	12/27/16 11:05	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141346 400-SB-14
Lab Code: R1613221-018

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	74.5	Percent	-	1	12/27/16 11:05	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141347 400-SB-14
Lab Code: R1613221-019

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	72.7	Percent	-	1	12/27/16 11:05	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141350 400-SB-14
Lab Code: R1613221-021

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	78.8	Percent	-	-	1	12/27/16 11:05	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612141351 400-SB-14
Lab Code: R1613221-022

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16 10:20
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	77.4	Percent	-	-	1	12/27/16 11:05	



QC Summary Forms

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
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Volatile Organic Compounds by GC/MS

ALS Environmental—Rochester Laboratory

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Phone (585) 288-5380 Fax (585) 288-8475

www.alsglobal.com

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221

SURROGATE RECOVERY SUMMARY
Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Extraction Method: EPA 5030C

Sample Name	Lab Code	4-Bromofluorobenzene	Dibromofluoromethane	Toluene-d8
		51 - 136	63 - 138	66 - 138
1612141316 400-SB-08	R1613221-002	104	99	105
1612141317 400-SB-08	R1613221-003	100	97	102
1612141331 400-SB-13	R1613221-010	100	93	103
1612141332 400-SB-13	R1613221-011	100	97	105
1612141346 400-SB-14	R1613221-018	103	96	106
1612141347 400-SB-14	R1613221-019	104	97	107
Lab Control Sample	RQ1615384-03	107	105	105
Method Blank	RQ1615384-04	106	98	104
Lab Control Sample	RQ1615582-03	110	110	110
1612141316 400-SB-08 MS	RQ1615582-05	105	105	108
1612141316 400-SB-08 DMS	RQ1615582-06	106	107	108
1612141331 400-SB-13 MS	RQ1615582-07	102	108	109
1612141331 400-SB-13 DMS	RQ1615582-08	101	108	107
1612141346 400-SB-14 MS	RQ1615582-09	107	109	108
1612141346 400-SB-14 DMS	RQ1615582-10	109	110	109
Method Blank	RQ1615582-11	104	104	105

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16
Date Analyzed: 12/20/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1612141316 400-SB-08 **Units:** ug/Kg
Lab Code: R1613221-002 **Basis:** Dry
Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Sample Result	Matrix Spike RQ1615582-05			Duplicate Matrix Spike RQ1615582-06			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
1,1,1,2-Tetrachloroethane	ND U	83.4	92.1	91	83.6	92.1	91	52-133	<1	30
1,1,1-Trichloroethane (TCA)	ND U	81.2	92.1	88	79.7	92.1	87	51-132	1	30
1,1,2,2-Tetrachloroethane	ND U	80.7	92.1	88	80.6	92.1	88	53-134	<1	30
1,1,2-Trichloroethane	ND U	82.5	92.1	90	80.8	92.1	88	62-126	2	30
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	71.9	92.1	78	70.7	92.1	77	45-136	1	30
1,1-Dichloroethene (1,1-DCE)	ND U	80.2	92.1	87	80.1	92.1	87	61-139	<1	30
1,2,3-Trichloropropane	ND U	82.4	92.1	89	84.6	92.1	92	22-167	3	30
1,2-Dibromo-3-chloropropane (DBCP)	ND U	84.9	92.1	92	84.8	92.1	92	27-163	<1	30
1,2-Dibromoethane	ND U	86.0	92.1	93	85.8	92.1	93	52-137	<1	30
1,2-Dichlorobenzene	ND U	83.4	92.1	91	82.7	92.1	90	22-156	1	30
1,2-Dichloroethane	ND U	82.7	92.1	90	83.7	92.1	91	59-125	1	30
1,2-Dichloropropane	ND U	85.1	92.1	92	84.2	92.1	91	67-126	1	30
1,3-Dichlorobenzene	ND U	84.8	92.1	92	83.4	92.1	91	29-146	1	30
1,4-Dioxane	ND U	2210	1840	120	2050	1840	112	50-148	7	30
2-Butanone (MEK)	ND U	70.7	92.1	77	67.7	92.1	74	43-134	4	30
2-Chloro-1,3-butadiene	ND U	76.5	92.1	83	75.5	92.1	82	45-134	1	30
2-Chloroethyl Vinyl Ether	ND U	91.9	92.1	100	92.1	92.1	100	37-150	<1	30
Isobutyl Alcohol	ND U	1800	1840	98	1690	1840	92	39-146	6	30
Allyl Chloride	ND U	80.2	92.1	87	82.4	92.1	90	34-135	3	30
4-Methyl-2-pentanone	ND U	85.1	92.1	92	85.1	92.1	92	47-145	<1	30
Acetone	ND U	304	92.1	330 *	303	92.1	329 *	11-183	<1	30
Acetonitrile	ND U	453	460	98	454	460	99	28-146	1	30
Acrolein	ND U	10.6	184	6 *	12.8 J	184	7 *	10-172	15	30
Acrylonitrile	ND U	378	460	82	379	460	82	46-139	<1	30
Benzene	ND U	86.1	92.1	94	84.2	92.1	91	63-126	3	30
Bromodichloromethane	ND U	81.9	92.1	89	82.0	92.1	89	47-141	<1	30
Bromoform	ND U	82.4	92.1	90	83.4	92.1	91	26-157	1	30
Bromomethane	ND U	83.8	92.1	91	75.5	92.1	82	10-137	10	30
Carbon Disulfide	ND U	68.0	92.1	74	67.6	92.1	73	35-135	1	30
Carbon Tetrachloride	ND U	81.5	92.1	89	79.2	92.1	86	46-137	3	30
Chlorobenzene	ND U	85.2	92.1	93	83.8	92.1	91	51-132	2	30
Chloroethane	ND U	77.8	92.1	84	79.0	92.1	86	45-132	2	30
Chloroform	ND U	82.1	92.1	89	81.6	92.1	89	61-124	<1	30
Chloromethane	ND U	71.7	92.1	78	72.4	92.1	79	50-136	1	30
Dibromochloromethane	ND U	84.4	92.1	92	86.4	92.1	94	40-146	2	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16
Date Analyzed: 12/20/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1612141316 400-SB-08
Lab Code: R1613221-002
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1615582-05			Duplicate Matrix Spike RQ1615582-06			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Dibromomethane	ND U	84.4	92.1	92	84.3	92.1	92	61-122	<1	30
Dichlorodifluoromethane (CFC 12)	ND U	64.2	92.1	70	63.2	92.1	69	44-138	1	30
Dichloromethane	3.8 J	84.9	92.1	88	84.4	92.1	88	64-120	<1	30
Ethyl Methacrylate	ND U	87.0	92.1	94	86.0	92.1	93	17-166	1	30
Ethylbenzene	ND U	82.4	92.1	90	81.4	92.1	88	44-131	2	30
Iodomethane	ND U	48.2	92.1	52	64.8	92.1	70	10-160	30	30
Methacrylonitrile	ND U	78.5	92.1	85	80.2	92.1	87	44-149	2	30
Methyl Methacrylate	ND U	87.0	92.1	94	86.3	92.1	94	41-162	<1	30
Naphthalene	ND U	70.6	92.1	77	72.5	92.1	79	10-187	3	30
Propionitrile	ND U	392	460	85	376	460	82	46-144	4	30
Tetrachloroethene (PCE)	ND U	79.8	92.1	87	80.2	92.1	87	45-141	<1	30
Toluene	ND U	82.7	92.1	90	81.2	92.1	88	50-140	2	30
Trichloroethene (TCE)	ND U	86.7	92.1	94	85.5	92.1	93	54-136	1	30
Trichlorofluoromethane (CFC 11)	ND U	78.0	92.1	85	77.7	92.1	84	47-129	1	30
Vinyl Chloride	ND U	79.9	92.1	87	80.1	92.1	87	53-128	<1	30
cis-1,3-Dichloropropene	ND U	82.8	92.1	90	82.1	92.1	89	31-150	1	30
m,p-Xylenes	ND U	169	184	92	166	184	90	45-141	2	30
o-Xylene	ND U	84.4	92.1	92	82.4	92.1	89	46-139	3	30
trans-1,2-Dichloroethene	ND U	82.8	92.1	90	81.3	92.1	88	52-128	2	30
trans-1,3-Dichloropropene	ND U	82.9	92.1	90	83.8	92.1	91	23-160	1	30

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16
Date Analyzed: 12/20/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1612141331 400-SB-13
Lab Code: R1613221-010
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1615582-07			Duplicate Matrix Spike RQ1615582-08			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
1,1,1,2-Tetrachloroethane	ND U	87.7	96.5	91	88.3	96.5	92	52-133	1	30
1,1,1-Trichloroethane (TCA)	ND U	84.5	96.5	88	83.6	96.5	87	51-132	1	30
1,1,2,2-Tetrachloroethane	ND U	84.8	96.5	88	89.0	96.5	92	53-134	4	30
1,1,2-Trichloroethane	ND U	85.0	96.5	88	85.0	96.5	88	62-126	<1	30
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	73.7	96.5	76	74.6	96.5	77	45-136	1	30
1,1-Dichloroethene (1,1-DCE)	ND U	84.2	96.5	87	82.4	96.5	85	61-139	2	30
1,2,3-Trichloropropane	ND U	86.5	96.5	90	91.7	96.5	95	22-167	5	30
1,2-Dibromo-3-chloropropane (DBCP)	ND U	89.9	96.5	93	88.5	96.5	92	27-163	1	30
1,2-Dibromoethane	ND U	90.1	96.5	93	91.9	96.5	95	52-137	2	30
1,2-Dichlorobenzene	ND U	85.6	96.5	89	86.8	96.5	90	22-156	1	30
1,2-Dichloroethane	ND U	86.5	96.5	90	87.9	96.5	91	59-125	1	30
1,2-Dichloropropane	ND U	87.5	96.5	91	88.0	96.5	91	67-126	<1	30
1,3-Dichlorobenzene	ND U	86.5	96.5	90	89.4	96.5	93	29-146	3	30
1,4-Dioxane	ND U	2570	1930	133	2230	1930	115	50-148	15	30
2-Butanone (MEK)	ND U	68.2	96.5	71	71.7	96.5	74	43-134	4	30
2-Chloro-1,3-butadiene	ND U	78.6	96.5	81	78.7	96.5	82	45-134	1	30
2-Chloroethyl Vinyl Ether	ND U	92.0	96.5	95	91.8	96.5	95	37-150	<1	30
Isobutyl Alcohol	ND U	1700	1930	88	1580	1930	82	39-146	7	30
Allyl Chloride	ND U	87.5	96.5	91	86.5	96.5	90	34-135	1	30
4-Methyl-2-pentanone	ND U	81.1	96.5	84	83.8	96.5	87	47-145	4	30
Acetone	5.7 J	552	96.5	566 *	595 E	96.5	611 *	11-183	8	30
Acetonitrile	ND U	468	483	97	415	483	86	28-146	12	30
Acrolein	ND U	ND	193	3 *	ND U	193	3 *	10-172	NC	30
Acrylonitrile	ND U	389	483	81	401	483	83	46-139	2	30
Benzene	ND U	88.7	96.5	92	89.1	96.5	92	63-126	<1	30
Bromodichloromethane	ND U	86.0	96.5	89	86.4	96.5	90	47-141	1	30
Bromoform	ND U	85.5	96.5	89	89.0	96.5	92	26-157	3	30
Bromomethane	ND U	77.0	96.5	80	77.7	96.5	80	10-137	<1	30
Carbon Disulfide	ND U	71.3	96.5	74	70.9	96.5	73	35-135	1	30
Carbon Tetrachloride	ND U	82.7	96.5	86	82.3	96.5	85	46-137	1	30
Chlorobenzene	ND U	86.7	96.5	90	87.5	96.5	91	51-132	1	30
Chloroethane	ND U	83.9	96.5	87	82.4	96.5	85	45-132	2	30
Chloroform	ND U	86.1	96.5	89	85.7	96.5	89	61-124	<1	30
Chloromethane	ND U	77.7	96.5	80	77.4	96.5	80	50-136	<1	30
Dibromochloromethane	ND U	90.1	96.5	93	91.0	96.5	94	40-146	1	30

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16
Date Analyzed: 12/20/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1612141331 400-SB-13 **Units:** ug/Kg
Lab Code: R1613221-010 **Basis:** Dry
Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Sample Result	Matrix Spike RQ1615582-07			Duplicate Matrix Spike RQ1615582-08			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Dibromomethane	ND U	86.4	96.5	90	87.7	96.5	91	61-122	1	30
Dichlorodifluoromethane (CFC 12)	ND U	67.5	96.5	70	65.6	96.5	68	44-138	3	30
Dichloromethane	3.3 J	89.5	96.5	89	89.8	96.5	90	64-120	1	30
Ethyl Methacrylate	ND U	87.3	96.5	90	89.4	96.5	93	17-166	3	30
Ethylbenzene	ND U	83.7	96.5	87	84.3	96.5	87	44-131	<1	30
Iodomethane	ND U	74.4	96.5	77	78.5	96.5	81	10-160	5	30
Methacrylonitrile	ND U	79.8	96.5	83	85.0	96.5	88	44-149	6	30
Methyl Methacrylate	ND U	89.4	96.5	93	91.3	96.5	95	41-162	2	30
Naphthalene	ND U	70.4	96.5	73	70.0	96.5	73	10-187	<1	30
Propionitrile	ND U	404	483	84	391	483	81	46-144	4	30
Tetrachloroethene (PCE)	ND U	81.9	96.5	85	83.3	96.5	86	45-141	1	30
Toluene	ND U	83.8	96.5	87	84.4	96.5	87	50-140	<1	30
Trichloroethene (TCE)	ND U	87.6	96.5	91	88.7	96.5	92	54-136	1	30
Trichlorofluoromethane (CFC 11)	ND U	81.8	96.5	85	80.8	96.5	84	47-129	1	30
Vinyl Chloride	ND U	85.5	96.5	89	83.9	96.5	87	53-128	2	30
cis-1,3-Dichloropropene	ND U	86.3	96.5	89	86.1	96.5	89	31-150	<1	30
m,p-Xylenes	ND U	169	193	87	169	193	88	45-141	1	30
o-Xylene	ND U	86.4	96.5	90	86.4	96.5	90	46-139	<1	30
trans-1,2-Dichloroethene	ND U	85.6	96.5	89	84.7	96.5	88	52-128	1	30
trans-1,3-Dichloropropene	ND U	87.4	96.5	91	88.5	96.5	92	23-160	1	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16
Date Analyzed: 12/20/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1612141346 400-SB-14
Lab Code: R1613221-018
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1615582-09			Duplicate Matrix Spike RQ1615582-10			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
1,1,1,2-Tetrachloroethane	ND U	65.3	67.1	97	66.6	67.1	99	52-133	2	30
1,1,1-Trichloroethane (TCA)	ND U	61.3	67.1	91	63.1	67.1	94	51-132	3	30
1,1,2,2-Tetrachloroethane	ND U	59.5	67.1	89	56.4	67.1	84	53-134	6	30
1,1,2-Trichloroethane	ND U	63.2	67.1	94	64.3	67.1	96	62-126	2	30
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	52.4	67.1	78	53.3	67.1	79	45-136	1	30
1,1-Dichloroethene (1,1-DCE)	ND U	59.8	67.1	89	61.2	67.1	91	61-139	2	30
1,2,3-Trichloropropane	ND U	65.5	67.1	98	63.4	67.1	94	22-167	4	30
1,2-Dibromo-3-chloropropane (DBCP)	ND U	67.6	67.1	101	68.9	67.1	103	27-163	2	30
1,2-Dibromoethane	ND U	67.8	67.1	101	66.9	67.1	100	52-137	<1	30
1,2-Dichlorobenzene	ND U	64.6	67.1	96	63.0	67.1	94	22-156	2	30
1,2-Dichloroethane	ND U	64.1	67.1	96	65.0	67.1	97	59-125	1	30
1,2-Dichloropropane	ND U	65.4	67.1	97	65.3	67.1	97	67-126	<1	30
1,3-Dichlorobenzene	ND U	64.3	67.1	96	61.8	67.1	92	29-146	4	30
1,4-Dioxane	ND U	1290	1340	96	1300	1340	97	50-148	1	30
2-Butanone (MEK)	ND U	54.1	67.1	81	56.2	67.1	84	43-134	4	30
2-Chloro-1,3-butadiene	ND U	60.8	67.1	91	61.7	67.1	92	45-134	1	30
2-Chloroethyl Vinyl Ether	ND U	69.1	67.1	103	69.9	67.1	104	37-150	<1	30
Isobutyl Alcohol	ND U	1180	1340	88	1250	1340	93	39-146	6	30
Allyl Chloride	ND U	62.6	67.1	93	64.8	67.1	96	34-135	3	30
4-Methyl-2-pentanone	ND U	66.8	67.1	100	68.8	67.1	103	47-145	3	30
Acetone	ND U	154	67.1	229 *	160	67.1	239 *	11-183	4	30
Acetonitrile	ND U	270	336	81	324	336	97	28-146	18	30
Acrolein	ND U	28.8	134	21	33.9 J	134	25	10-172	17	30
Acrylonitrile	ND U	308	336	92	318	336	95	46-139	3	30
Benzene	ND U	64.9	67.1	97	65.3	67.1	97	63-126	<1	30
Bromodichloromethane	ND U	63.4	67.1	94	63.5	67.1	95	47-141	1	30
Bromoform	ND U	66.5	67.1	99	67.8	67.1	101	26-157	2	30
Bromomethane	ND U	57.1	67.1	85	58.2	67.1	87	10-137	2	30
Carbon Disulfide	ND U	55.1	67.1	82	56.6	67.1	84	35-135	2	30
Carbon Tetrachloride	ND U	58.4	67.1	87	60.2	67.1	90	46-137	3	30
Chlorobenzene	ND U	63.3	67.1	94	62.5	67.1	93	51-132	1	30
Chloroethane	ND U	61.3	67.1	91	61.8	67.1	92	45-132	1	30
Chloroform	ND U	63.2	67.1	94	64.6	67.1	96	61-124	2	30
Chloromethane	ND U	56.1	67.1	84	59.2	67.1	88	50-136	5	30
Dibromochloromethane	ND U	66.4	67.1	99	66.5	67.1	99	40-146	<1	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16
Date Analyzed: 12/20/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1612141346 400-SB-14
Lab Code: R1613221-018
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1615582-09			Duplicate Matrix Spike RQ1615582-10			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Dibromomethane	ND U	65.7	67.1	98	67.0	67.1	100	61-122	2	30
Dichlorodifluoromethane (CFC 12)	ND U	46.6	67.1	69	48.6	67.1	72	44-138	4	30
Dichloromethane	2.0 J	65.7	67.1	95	67.2	67.1	97	64-120	2	30
Ethyl Methacrylate	ND U	68.2	67.1	102	69.0	67.1	103	17-166	<1	30
Ethylbenzene	ND U	61.8	67.1	92	61.3	67.1	91	44-131	1	30
Iodomethane	ND U	60.6	67.1	90	63.2	67.1	94	10-160	4	30
Methacrylonitrile	ND U	63.9	67.1	95	65.3	67.1	97	44-149	2	30
Methyl Methacrylate	ND U	68.4	67.1	102	69.2	67.1	103	41-162	<1	30
Naphthalene	ND U	58.3	67.1	87	57.4	67.1	85	10-187	2	30
Propionitrile	ND U	296	336	88	306	336	91	46-144	3	30
Tetrachloroethene (PCE)	ND U	59.7	67.1	89	59.0	67.1	88	45-141	1	30
Toluene	ND U	61.8	67.1	92	62.6	67.1	93	50-140	1	30
Trichloroethene (TCE)	ND U	68.4	67.1	102	68.8	67.1	102	54-136	<1	30
Trichlorofluoromethane (CFC 11)	ND U	56.6	67.1	84	59.5	67.1	89	47-129	6	30
Vinyl Chloride	ND U	60.0	67.1	89	62.6	67.1	93	53-128	4	30
cis-1,3-Dichloropropene	ND U	63.2	67.1	94	63.5	67.1	95	31-150	1	30
m,p-Xylenes	ND U	125	134	93	124	134	92	45-141	1	30
o-Xylene	ND U	63.7	67.1	95	64.0	67.1	95	46-139	<1	30
trans-1,2-Dichloroethene	ND U	61.9	67.1	92	63.0	67.1	94	52-128	2	30
trans-1,3-Dichloropropene	ND U	65.1	67.1	97	66.3	67.1	99	23-160	2	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221
Date Collected: NA
Date Received: NA

Sample Name: Method Blank
Lab Code: RQ1615384-04

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.0	0.83	1	12/19/16 14:02	
1,1,1-Trichloroethane (TCA)	ND U	5.0	0.73	1	12/19/16 14:02	
1,1,2,2-Tetrachloroethane	ND U	5.0	0.81	1	12/19/16 14:02	
1,1,2-Trichloroethane	ND U	5.0	0.73	1	12/19/16 14:02	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.0	1.3	1	12/19/16 14:02	
1,1-Dichloroethene (1,1-DCE)	ND U	5.0	1.3	1	12/19/16 14:02	
1,2,3-Trichloropropane	ND U	5.0	1.4	1	12/19/16 14:02	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.0	1.9	1	12/19/16 14:02	
1,2-Dibromoethane	ND U	5.0	1.3	1	12/19/16 14:02	
1,2-Dichlorobenzene	ND U	5.0	0.61	1	12/19/16 14:02	
1,2-Dichloroethane	ND U	5.0	0.61	1	12/19/16 14:02	
1,2-Dichloropropane	ND U	5.0	0.97	1	12/19/16 14:02	
1,3-Dichlorobenzene	ND U	5.0	0.63	1	12/19/16 14:02	
1,4-Dioxane	ND U	100	20	1	12/19/16 14:02	
2-Butanone (MEK)	ND U	5.0	2.3	1	12/19/16 14:02	
2-Chloro-1,3-butadiene	ND U	5.0	1.6	1	12/19/16 14:02	
2-Chloroethyl Vinyl Ether	ND U	5.0	1.8	1	12/19/16 14:02	
Isobutyl Alcohol	ND U	100	23	1	12/19/16 14:02	
Allyl Chloride	ND U	5.0	1.7	1	12/19/16 14:02	
4-Methyl-2-pentanone	ND U	5.0	0.98	1	12/19/16 14:02	
Acetone	ND U	5.0	2.9	1	12/19/16 14:02	
Acetonitrile	ND U	25	17	1	12/19/16 14:02	
Acrolein	ND U	25	3.5	1	12/19/16 14:02	
Acrylonitrile	ND U	25	6.5	1	12/19/16 14:02	
Benzene	ND U	5.0	0.29	1	12/19/16 14:02	
Bromodichloromethane	ND U	5.0	0.61	1	12/19/16 14:02	
Bromoform	ND U	5.0	0.93	1	12/19/16 14:02	
Bromomethane	ND U	5.0	1.4	1	12/19/16 14:02	
Carbon Disulfide	ND U	5.0	1.3	1	12/19/16 14:02	
Carbon Tetrachloride	ND U	5.0	0.92	1	12/19/16 14:02	
Chlorobenzene	ND U	5.0	0.29	1	12/19/16 14:02	
Chloroethane	ND U	5.0	2.9	1	12/19/16 14:02	
Chloroform	ND U	5.0	1.3	1	12/19/16 14:02	
Chloromethane	ND U	5.0	0.40	1	12/19/16 14:02	
Dibromochloromethane	ND U	5.0	0.73	1	12/19/16 14:02	
Dibromomethane	ND U	5.0	0.63	1	12/19/16 14:02	
Dichlorodifluoromethane (CFC 12)	ND U	5.0	1.9	1	12/19/16 14:02	
Dichloromethane	ND U	5.0	0.57	1	12/19/16 14:02	
Ethyl Methacrylate	ND U	5.0	0.75	1	12/19/16 14:02	
Ethylbenzene	ND U	5.0	0.23	1	12/19/16 14:02	
Iodomethane	ND U	10	1.2	1	12/19/16 14:02	
Methacrylonitrile	ND U	5.0	1.6	1	12/19/16 14:02	
Methyl Methacrylate	ND U	5.0	0.73	1	12/19/16 14:02	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: RQ1615384-04

Service Request: R1613221
Date Collected: NA
Date Received: NA
Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.0	0.51	1	12/19/16 14:02	
Propionitrile	ND U	25	6.5	1	12/19/16 14:02	
Tetrachloroethene (PCE)	ND U	5.0	0.88	1	12/19/16 14:02	
Toluene	ND U	5.0	1.0	1	12/19/16 14:02	
Trichloroethene (TCE)	ND U	5.0	1.1	1	12/19/16 14:02	
Trichlorofluoromethane (CFC 11)	ND U	5.0	0.66	1	12/19/16 14:02	
Vinyl Chloride	ND U	5.0	1.9	1	12/19/16 14:02	
cis-1,3-Dichloropropene	ND U	5.0	0.90	1	12/19/16 14:02	
m,p-Xylenes	ND U	10	1.1	1	12/19/16 14:02	
o-Xylene	ND U	5.0	0.48	1	12/19/16 14:02	
trans-1,2-Dichloroethene	ND U	5.0	0.86	1	12/19/16 14:02	
trans-1,3-Dichloropropene	ND U	5.0	0.20	1	12/19/16 14:02	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	106	51 - 136	12/19/16 14:02	
Dibromofluoromethane	98	63 - 138	12/19/16 14:02	
Toluene-d8	104	66 - 138	12/19/16 14:02	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221
Date Collected: NA
Date Received: NA

Sample Name: Method Blank
Lab Code: RQ1615582-11

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.0	0.83	1	12/20/16 16:01	
1,1,1-Trichloroethane (TCA)	ND U	5.0	0.73	1	12/20/16 16:01	
1,1,2,2-Tetrachloroethane	ND U	5.0	0.81	1	12/20/16 16:01	
1,1,2-Trichloroethane	ND U	5.0	0.73	1	12/20/16 16:01	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.0	1.3	1	12/20/16 16:01	
1,1-Dichloroethene (1,1-DCE)	ND U	5.0	1.3	1	12/20/16 16:01	
1,2,3-Trichloropropane	ND U	5.0	1.4	1	12/20/16 16:01	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.0	1.9	1	12/20/16 16:01	
1,2-Dibromoethane	ND U	5.0	1.3	1	12/20/16 16:01	
1,2-Dichlorobenzene	ND U	5.0	0.61	1	12/20/16 16:01	
1,2-Dichloroethane	ND U	5.0	0.61	1	12/20/16 16:01	
1,2-Dichloropropane	ND U	5.0	0.97	1	12/20/16 16:01	
1,3-Dichlorobenzene	ND U	5.0	0.63	1	12/20/16 16:01	
1,4-Dioxane	ND U	100	20	1	12/20/16 16:01	
2-Butanone (MEK)	ND U	5.0	2.3	1	12/20/16 16:01	
2-Chloro-1,3-butadiene	ND U	5.0	1.6	1	12/20/16 16:01	
2-Chloroethyl Vinyl Ether	ND U	5.0	1.8	1	12/20/16 16:01	
Isobutyl Alcohol	ND U	100	23	1	12/20/16 16:01	
Allyl Chloride	ND U	5.0	1.7	1	12/20/16 16:01	
4-Methyl-2-pentanone	ND U	5.0	0.98	1	12/20/16 16:01	
Acetone	ND U	5.0	2.9	1	12/20/16 16:01	
Acetonitrile	ND U	25	17	1	12/20/16 16:01	
Acrolein	ND U	25	3.5	1	12/20/16 16:01	
Acrylonitrile	ND U	25	6.5	1	12/20/16 16:01	
Benzene	ND U	5.0	0.29	1	12/20/16 16:01	
Bromodichloromethane	ND U	5.0	0.61	1	12/20/16 16:01	
Bromoform	ND U	5.0	0.93	1	12/20/16 16:01	
Bromomethane	ND U	5.0	1.4	1	12/20/16 16:01	
Carbon Disulfide	ND U	5.0	1.3	1	12/20/16 16:01	
Carbon Tetrachloride	ND U	5.0	0.92	1	12/20/16 16:01	
Chlorobenzene	ND U	5.0	0.29	1	12/20/16 16:01	
Chloroethane	ND U	5.0	2.9	1	12/20/16 16:01	
Chloroform	ND U	5.0	1.3	1	12/20/16 16:01	
Chloromethane	ND U	5.0	0.40	1	12/20/16 16:01	
Dibromochloromethane	ND U	5.0	0.73	1	12/20/16 16:01	
Dibromomethane	ND U	5.0	0.63	1	12/20/16 16:01	
Dichlorodifluoromethane (CFC 12)	ND U	5.0	1.9	1	12/20/16 16:01	
Dichloromethane	ND U	5.0	0.57	1	12/20/16 16:01	
Ethyl Methacrylate	ND U	5.0	0.75	1	12/20/16 16:01	
Ethylbenzene	ND U	5.0	0.23	1	12/20/16 16:01	
Iodomethane	ND U	10	1.2	1	12/20/16 16:01	
Methacrylonitrile	ND U	5.0	1.6	1	12/20/16 16:01	
Methyl Methacrylate	ND U	5.0	0.73	1	12/20/16 16:01	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: RQ1615582-11

Service Request: R1613221
Date Collected: NA
Date Received: NA
Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.0	0.51	1	12/20/16 16:01	
Propionitrile	ND U	25	6.5	1	12/20/16 16:01	
Tetrachloroethene (PCE)	ND U	5.0	0.88	1	12/20/16 16:01	
Toluene	ND U	5.0	1.0	1	12/20/16 16:01	
Trichloroethene (TCE)	ND U	5.0	1.1	1	12/20/16 16:01	
Trichlorofluoromethane (CFC 11)	ND U	5.0	0.66	1	12/20/16 16:01	
Vinyl Chloride	ND U	5.0	1.9	1	12/20/16 16:01	
cis-1,3-Dichloropropene	ND U	5.0	0.90	1	12/20/16 16:01	
m,p-Xylenes	ND U	10	1.1	1	12/20/16 16:01	
o-Xylene	ND U	5.0	0.48	1	12/20/16 16:01	
trans-1,2-Dichloroethene	ND U	5.0	0.86	1	12/20/16 16:01	
trans-1,3-Dichloropropene	ND U	5.0	0.20	1	12/20/16 16:01	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	104	51 - 136	12/20/16 16:01	
Dibromofluoromethane	104	63 - 138	12/20/16 16:01	
Toluene-d8	105	66 - 138	12/20/16 16:01	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221
Date Analyzed: 12/19/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Units:ug/Kg
Basis:Dry

Lab Control Sample
RQ1615384-03

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
1,1,1,2-Tetrachloroethane	8260C	18.2	20.0	91	40-140
1,1,1-Trichloroethane (TCA)	8260C	15.8	20.0	79	40-140
1,1,2,2-Tetrachloroethane	8260C	18.0	20.0	90	40-140
1,1,2-Trichloroethane	8260C	18.5	20.0	92	40-140
1,1,2-Trichloro-1,2,2-trifluoroethane	8260C	12.4	20.0	62	40-140
1,1-Dichloroethene (1,1-DCE)	8260C	15.9	20.0	79	40-140
1,2,3-Trichloropropane	8260C	17.7	20.0	88	40-140
1,2-Dibromo-3-chloropropane (DBCP)	8260C	18.0	20.0	90	40-140
1,2-Dibromoethane	8260C	19.0	20.0	95	40-140
1,2-Dichlorobenzene	8260C	18.6	20.0	93	40-140
1,2-Dichloroethane	8260C	19.0	20.0	95	40-140
1,2-Dichloropropane	8260C	18.9	20.0	95	40-140
1,3-Dichlorobenzene	8260C	18.9	20.0	95	40-140
1,4-Dioxane	8260C	390	400	97	40-140
2-Butanone (MEK)	8260C	17.6	20.0	88	40-140
2-Chloro-1,3-butadiene	8260C	19.0	20.0	95	40-140
2-Chloroethyl Vinyl Ether	8260C	19.7	20.0	99	40-140
Isobutyl Alcohol	8260C	351	400	88	40-140
Allyl Chloride	8260C	18.2	20.0	91	40-140
4-Methyl-2-pentanone	8260C	19.3	20.0	96	40-140
Acetone	8260C	21.7	20.0	108	40-140
Acetonitrile	8260C	112	100	112	40-140
Acrolein	8260C	31.3	40.0	78	40-140
Acrylonitrile	8260C	91.2	100	91	40-140
Benzene	8260C	18.7	20.0	93	40-140
Bromodichloromethane	8260C	18.6	20.0	93	40-140
Bromoform	8260C	18.7	20.0	93	40-140
Bromomethane	8260C	18.0	20.0	90	40-140
Carbon Disulfide	8260C	17.5	20.0	88	40-140
Carbon Tetrachloride	8260C	15.3	20.0	77	40-140
Chlorobenzene	8260C	18.5	20.0	92	40-140
Chloroethane	8260C	16.7	20.0	84	40-140
Chloroform	8260C	18.1	20.0	91	40-140

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221
Date Analyzed: 12/19/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Units:ug/Kg
Basis:Dry

Lab Control Sample
RQ1615384-03

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Chloromethane	8260C	16.5	20.0	82	40-140
Dibromochloromethane	8260C	18.6	20.0	93	40-140
Dibromomethane	8260C	18.7	20.0	94	40-140
Dichlorodifluoromethane (CFC 12)	8260C	13.0	20.0	65	40-140
Dichloromethane	8260C	19.0	20.0	95	40-140
Ethyl Methacrylate	8260C	19.2	20.0	96	40-140
Ethylbenzene	8260C	16.7	20.0	84	40-140
Iodomethane	8260C	17.6	20.0	88	40-140
Methacrylonitrile	8260C	18.5	20.0	92	40-140
Methyl Methacrylate	8260C	20.0	20.0	100	40-140
Naphthalene	8260C	17.5	20.0	88	40-140
Propionitrile	8260C	92.9	100	93	40-140
Tetrachloroethene (PCE)	8260C	14.9	20.0	74	40-140
Toluene	8260C	17.5	20.0	87	40-140
Trichloroethene (TCE)	8260C	17.6	20.0	88	40-140
Trichlorofluoromethane (CFC 11)	8260C	14.7	20.0	73	40-140
Vinyl Chloride	8260C	17.0	20.0	85	40-140
cis-1,3-Dichloropropene	8260C	18.6	20.0	93	40-140
m,p-Xylenes	8260C	34.2	40.0	86	40-140
o-Xylene	8260C	17.9	20.0	89	40-140
trans-1,2-Dichloroethene	8260C	17.9	20.0	89	40-140
trans-1,3-Dichloropropene	8260C	18.8	20.0	94	40-140

ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221
Date Analyzed: 12/20/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Units:ug/Kg
Basis:Dry

Lab Control Sample
RQ1615582-03

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
1,1,1,2-Tetrachloroethane	8260C	17.7	20.0	88	40-140
1,1,1-Trichloroethane (TCA)	8260C	16.3	20.0	81	40-140
1,1,2,2-Tetrachloroethane	8260C	19.2	20.0	96	40-140
1,1,2-Trichloroethane	8260C	18.2	20.0	91	40-140
1,1,2-Trichloro-1,2,2-trifluoroethane	8260C	14.0	20.0	70	40-140
1,1-Dichloroethene (1,1-DCE)	8260C	17.4	20.0	87	40-140
1,2,3-Trichloropropane	8260C	18.3	20.0	91	40-140
1,2-Dibromo-3-chloropropane (DBCP)	8260C	19.4	20.0	97	40-140
1,2-Dibromoethane	8260C	19.4	20.0	97	40-140
1,2-Dichlorobenzene	8260C	17.9	20.0	89	40-140
1,2-Dichloroethane	8260C	18.7	20.0	93	40-140
1,2-Dichloropropane	8260C	18.4	20.0	92	40-140
1,3-Dichlorobenzene	8260C	18.1	20.0	90	40-140
1,4-Dioxane	8260C	394	400	99	40-140
2-Butanone (MEK)	8260C	16.9	20.0	85	40-140
2-Chloro-1,3-butadiene	8260C	15.5	20.0	77	40-140
2-Chloroethyl Vinyl Ether	8260C	19.7	20.0	98	40-140
Isobutyl Alcohol	8260C	360	400	90	40-140
Allyl Chloride	8260C	17.8	20.0	89	40-140
4-Methyl-2-pentanone	8260C	19.5	20.0	98	40-140
Acetone	8260C	17.1	20.0	86	40-140
Acetonitrile	8260C	81.8	100	82	40-140
Acrolein	8260C	31.9	40.0	80	40-140
Acrylonitrile	8260C	95.1	100	95	40-140
Benzene	8260C	18.5	20.0	92	40-140
Bromodichloromethane	8260C	17.7	20.0	88	40-140
Bromoform	8260C	18.5	20.0	92	40-140
Bromomethane	8260C	16.4	20.0	82	40-140
Carbon Disulfide	8260C	14.3	20.0	71	40-140
Carbon Tetrachloride	8260C	15.8	20.0	79	40-140
Chlorobenzene	8260C	17.9	20.0	90	40-140
Chloroethane	8260C	17.5	20.0	87	40-140
Chloroform	8260C	18.0	20.0	90	40-140

ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221
Date Analyzed: 12/20/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Units:ug/Kg
Basis:Dry

Lab Control Sample
RQ1615582-03

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Chloromethane	8260C	16.3	20.0	81	40-140
Dibromochloromethane	8260C	18.3	20.0	91	40-140
Dibromomethane	8260C	18.9	20.0	95	40-140
Dichlorodifluoromethane (CFC 12)	8260C	14.1	20.0	71	40-140
Dichloromethane	8260C	18.4	20.0	92	40-140
Ethyl Methacrylate	8260C	19.3	20.0	96	40-140
Ethylbenzene	8260C	16.6	20.0	83	40-140
Iodomethane	8260C	15.4	20.0	77	40-140
Methacrylonitrile	8260C	19.5	20.0	98	40-140
Methyl Methacrylate	8260C	19.8	20.0	99	40-140
Naphthalene	8260C	17.6	20.0	88	40-140
Propionitrile	8260C	92.5	100	93	40-140
Tetrachloroethene (PCE)	8260C	15.5	20.0	78	40-140
Toluene	8260C	17.0	20.0	85	40-140
Trichloroethene (TCE)	8260C	17.3	20.0	87	40-140
Trichlorofluoromethane (CFC 11)	8260C	16.7	20.0	84	40-140
Vinyl Chloride	8260C	18.0	20.0	90	40-140
cis-1,3-Dichloropropene	8260C	18.0	20.0	90	40-140
m,p-Xylenes	8260C	33.7	40.0	84	40-140
o-Xylene	8260C	17.0	20.0	85	40-140
trans-1,2-Dichloroethene	8260C	17.9	20.0	89	40-140
trans-1,3-Dichloropropene	8260C	18.0	20.0	90	40-140

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water

Service Request: R1613221

SURROGATE RECOVERY SUMMARY
Volatile Organic Compounds by GC/MS

Analysis Method: 8260C
Extraction Method: EPA 5030C

Sample Name	Lab Code	4-Bromofluorobenzene	Dibromofluoromethane	Toluene-d8
		85 - 122	89 - 119	87 - 121
1612141315 400-SB-08	R1613221-001	102	112	111
1612141330 400-SB-13	R1613221-009	106	109	114
1612141345 400-SB-14	R1613221-017	104	109	111
Lab Control Sample	RQ1615534-03	109	110	114
Method Blank	RQ1615534-04	104	109	111

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water
Sample Name: Method Blank
Lab Code: RQ1615534-04

Service Request: R1613221
Date Collected: NA
Date Received: NA
Units: ug/L
Basis: NA

Volatile Organic Compounds by GC/MS

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	1.0	0.22	1	12/22/16 11:29	
1,1,1-Trichloroethane (TCA)	ND U	1.0	0.36	1	12/22/16 11:29	
1,1,2,2-Tetrachloroethane	ND U	1.0	0.25	1	12/22/16 11:29	
1,1,2-Trichloroethane	ND U	1.0	0.34	1	12/22/16 11:29	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	1.0	0.31	1	12/22/16 11:29	
1,1-Dichloroethene (1,1-DCE)	ND U	1.0	0.57	1	12/22/16 11:29	
1,2,3-Trichloropropane	ND U	1.0	0.70	1	12/22/16 11:29	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	2.0	0.74	1	12/22/16 11:29	
1,2-Dibromoethane	ND U	1.0	0.24	1	12/22/16 11:29	
1,2-Dichlorobenzene	ND U	1.0	0.21	1	12/22/16 11:29	
1,2-Dichloroethane	ND U	1.0	0.36	1	12/22/16 11:29	
1,2-Dichloropropane	ND U	1.0	0.20	1	12/22/16 11:29	
1,3-Dichlorobenzene	ND U	1.0	0.20	1	12/22/16 11:29	
1,4-Dioxane	ND U	40	20	1	12/22/16 11:29	
2-Butanone (MEK)	ND U	5.0	0.81	1	12/22/16 11:29	
2-Chloro-1,3-butadiene	ND U	1.0	0.27	1	12/22/16 11:29	
2-Chloroethyl Vinyl Ether	ND U	1.0	0.44	1	12/22/16 11:29	
Isobutyl Alcohol	ND U	40	11	1	12/22/16 11:29	
Allyl Chloride	ND U	1.0	0.26	1	12/22/16 11:29	
4-Methyl-2-pentanone	ND U	5.0	0.67	1	12/22/16 11:29	
Acetone	ND U	5.0	1.3	1	12/22/16 11:29	
Acetonitrile	ND U	10	4.7	1	12/22/16 11:29	
Acrolein	ND U	10	3.0	1	12/22/16 11:29	
Acrylonitrile	ND U	10	1.4	1	12/22/16 11:29	
Benzene	ND U	1.0	0.20	1	12/22/16 11:29	
Bromodichloromethane	ND U	1.0	0.32	1	12/22/16 11:29	
Bromoform	ND U	1.0	0.42	1	12/22/16 11:29	
Bromomethane	ND U	1.0	0.29	1	12/22/16 11:29	
Carbon Disulfide	ND U	1.0	0.22	1	12/22/16 11:29	
Carbon Tetrachloride	ND U	1.0	0.45	1	12/22/16 11:29	
Chlorobenzene	ND U	1.0	0.29	1	12/22/16 11:29	
Chloroethane	ND U	1.0	0.24	1	12/22/16 11:29	
Chloroform	ND U	1.0	0.25	1	12/22/16 11:29	
Chloromethane	ND U	1.0	0.21	1	12/22/16 11:29	
Dibromochloromethane	ND U	1.0	0.31	1	12/22/16 11:29	
Dibromomethane	ND U	1.0	0.32	1	12/22/16 11:29	
Dichlorodifluoromethane (CFC 12)	ND U	1.0	0.46	1	12/22/16 11:29	
Dichloromethane	ND U	1.0	0.60	1	12/22/16 11:29	
Ethyl Methacrylate	ND U	2.0	0.44	1	12/22/16 11:29	
Ethylbenzene	ND U	1.0	0.20	1	12/22/16 11:29	
Iodomethane	ND U	2.0	0.98	1	12/22/16 11:29	
Methacrylonitrile	ND U	2.0	0.50	1	12/22/16 11:29	
Methyl Methacrylate	ND U	2.0	0.62	1	12/22/16 11:29	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water
Sample Name: Method Blank
Lab Code: RQ1615534-04

Service Request: R1613221
Date Collected: NA
Date Received: NA
Units: ug/L
Basis: NA

Volatile Organic Compounds by GC/MS

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	0.34 J	1.0	0.20	1	12/22/16 11:29	
Propionitrile	ND U	5.0	3.1	1	12/22/16 11:29	
Tetrachloroethene (PCE)	ND U	1.0	0.30	1	12/22/16 11:29	
Toluene	ND U	1.0	0.20	1	12/22/16 11:29	
Trichloroethene (TCE)	ND U	1.0	0.22	1	12/22/16 11:29	
Trichlorofluoromethane (CFC 11)	ND U	1.0	0.20	1	12/22/16 11:29	
Vinyl Chloride	ND U	1.0	0.32	1	12/22/16 11:29	
cis-1,3-Dichloropropene	ND U	1.0	0.24	1	12/22/16 11:29	
m,p-Xylenes	ND U	2.0	0.33	1	12/22/16 11:29	
o-Xylene	ND U	1.0	0.20	1	12/22/16 11:29	
trans-1,2-Dichloroethene	ND U	1.0	0.33	1	12/22/16 11:29	
trans-1,3-Dichloropropene	ND U	1.0	0.20	1	12/22/16 11:29	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	104	85 - 122	12/22/16 11:29	
Dibromofluoromethane	109	89 - 119	12/22/16 11:29	
Toluene-d8	111	87 - 121	12/22/16 11:29	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/L	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water

Service Request: R1613221
Date Analyzed: 12/22/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS

Units:ug/L
Basis:NA

Lab Control Sample
RQ1615534-03

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
1,1,1,2-Tetrachloroethane	8260C	19.5	20.0	98	80-119
1,1,1-Trichloroethane (TCA)	8260C	19.1	20.0	96	74-120
1,1,2,2-Tetrachloroethane	8260C	20.6	20.0	103	78-122
1,1,2-Trichloroethane	8260C	20.6	20.0	103	82-118
1,1,2-Trichloro-1,2,2-trifluoroethane	8260C	20.2	20.0	101	75-124
1,1-Dichloroethene (1,1-DCE)	8260C	20.4	20.0	102	74-135
1,2,3-Trichloropropane	8260C	19.4	20.0	97	68-136
1,2-Dibromo-3-chloropropane (DBCP)	8260C	18.0	20.0	90	55-149
1,2-Dibromoethane	8260C	19.9	20.0	100	81-125
1,2-Dichlorobenzene	8260C	21.6	20.0	108	80-119
1,2-Dichloroethane	8260C	20.8	20.0	104	71-127
1,2-Dichloropropane	8260C	21.3	20.0	106	80-119
1,3-Dichlorobenzene	8260C	21.4	20.0	107	79-121
1,4-Dioxane	8260C	369	400	92	69-151
2-Butanone (MEK)	8260C	17.9	20.0	90	61-137
2-Chloro-1,3-butadiene	8260C	17.4	20.0	87	67-127
2-Chloroethyl Vinyl Ether	8260C	21.0	20.0	105	49-145
Isobutyl Alcohol	8260C	287	400	72	60-132
Allyl Chloride	8260C	18.8	20.0	94	69-140
4-Methyl-2-pentanone	8260C	16.7	20.0	83	66-124
Acetone	8260C	16.1	20.0	81	40-161
Acetonitrile	8260C	89.2	100	89	46-154
Acrolein	8260C	37.4	40.0	93	10-200
Acrylonitrile	8260C	90.4	100	90	71-130
Benzene	8260C	20.2	20.0	101	76-118
Bromodichloromethane	8260C	19.6	20.0	98	78-126
Bromoform	8260C	19.6	20.0	98	71-136
Bromomethane	8260C	22.9	20.0	115	42-166
Carbon Disulfide	8260C	16.7	20.0	84	65-127
Carbon Tetrachloride	8260C	16.8	20.0	84	68-125
Chlorobenzene	8260C	20.8	20.0	104	80-121
Chloroethane	8260C	26.9	20.0	135 *	70-127
Chloroform	8260C	20.2	20.0	101	76-120

ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water

Service Request: R1613221
Date Analyzed: 12/22/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS

Units:ug/L
Basis:NA

Lab Control Sample
RQ1615534-03

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Chloromethane	8260C	21.7	20.0	108	69-145
Dibromochloromethane	8260C	18.7	20.0	93	77-128
Dibromomethane	8260C	18.8	20.0	94	79-120
Dichlorodifluoromethane (CFC 12)	8260C	20.6	20.0	103	65-152
Dichloromethane	8260C	20.2	20.0	101	73-122
Ethyl Methacrylate	8260C	18.1	20.0	90	69-126
Ethylbenzene	8260C	21.2	20.0	106	76-120
Iodomethane	8260C	16.4	20.0	82	18-160
Methacrylonitrile	8260C	16.9	20.0	85	72-131
Methyl Methacrylate	8260C	18.1	20.0	91	71-127
Naphthalene	8260C	21.7	20.0	108	55-166
Propionitrile	8260C	87.8	100	88	69-133
Tetrachloroethene (PCE)	8260C	21.0	20.0	105	78-124
Toluene	8260C	21.6	20.0	108	77-120
Trichloroethene (TCE)	8260C	20.2	20.0	101	78-123
Trichlorofluoromethane (CFC 11)	8260C	23.3	20.0	116	68-126
Vinyl Chloride	8260C	25.4	20.0	127	69-133
cis-1,3-Dichloropropene	8260C	19.1	20.0	96	74-126
m,p-Xylenes	8260C	42.6	40.0	106	78-123
o-Xylene	8260C	20.7	20.0	104	80-120
trans-1,2-Dichloroethene	8260C	20.0	20.0	100	80-120
trans-1,3-Dichloropropene	8260C	17.8	20.0	89	67-135



Metals

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water
Sample Name: Method Blank
Lab Code: R1613221-MB1

Service Request: R1613221
Date Collected: NA
Date Received: NA
Basis: NA

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/L	0.060	0.005	1	12/20/16 21:29	12/19/16	
Arsenic, Total	6010C	ND U	mg/L	0.010	0.005	1	12/20/16 21:29	12/19/16	
Barium, Total	6010C	ND U	mg/L	0.020	0.002	1	12/20/16 21:29	12/19/16	
Beryllium, Total	6010C	ND U	mg/L	0.0030	0.0002	1	12/20/16 21:29	12/19/16	
Cadmium, Total	6010C	ND U	mg/L	0.0050	0.0002	1	12/20/16 21:29	12/19/16	
Chromium, Total	6010C	0.0009 J	mg/L	0.010	0.0003	1	12/20/16 21:29	12/19/16	
Lead, Total	6010C	ND U	mg/L	0.050	0.005	1	12/20/16 21:29	12/19/16	
Mercury, Total	7470A	ND U	mg/L	0.00020	0.00004	1	12/22/16 11:35	12/21/16	
Nickel, Total	6010C	ND U	mg/L	0.040	0.002	1	12/20/16 21:29	12/19/16	
Selenium, Total	6010C	ND U	mg/L	0.010	0.005	1	12/20/16 21:29	12/19/16	
Silver, Total	6010C	ND U	mg/L	0.010	0.0006	1	12/20/16 21:29	12/19/16	
Thallium, Total	6010C	ND U	mg/L	0.010	0.005	1	12/20/16 21:29	12/19/16	
Vanadium, Total	6010C	ND U	mg/L	0.050	0.0010	1	12/20/16 21:29	12/19/16	
Zinc, Total	6010C	ND U	mg/L	0.020	0.007	1	12/20/16 21:29	12/19/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: R1613221-MB2

Service Request: R1613221
Date Collected: NA
Date Received: NA
Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.0	0.4	1	12/29/16 18:47	12/19/16	
Arsenic, Total	6010C	ND U	mg/Kg	1.0	0.3	1	12/29/16 18:47	12/19/16	
Barium, Total	6010C	ND U	mg/Kg	2.0	0.2	1	12/29/16 18:47	12/19/16	
Beryllium, Total	6010C	ND U	mg/Kg	0.30	0.02	1	12/29/16 18:47	12/19/16	
Cadmium, Total	6010C	ND U	mg/Kg	0.50	0.04	1	12/29/16 18:47	12/19/16	
Chromium, Total	6010C	ND U	mg/Kg	1.0	0.2	1	12/29/16 18:47	12/19/16	
Lead, Total	6010C	ND U	mg/Kg	5.0	0.3	1	12/29/16 18:47	12/19/16	
Mercury, Total	7471B	ND U	mg/Kg	0.033	0.003	1	12/22/16 15:46	12/21/16	
Nickel, Total	6010C	ND U	mg/Kg	4.0	0.2	1	12/29/16 18:47	12/19/16	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	12/29/16 18:47	12/19/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	12/29/16 18:47	12/19/16	
Thallium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	12/29/16 18:47	12/19/16	
Vanadium, Total	6010C	ND U	mg/Kg	5.0	0.2	1	12/29/16 18:47	12/19/16	
Zinc, Total	6010C	ND U	mg/Kg	2.0	0.2	1	12/29/16 18:47	12/19/16	

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16
Date Analyzed: 12/29/16

**Duplicate Matrix Spike Summary
Inorganic Parameters**

Sample Name: 1612141320 400-SB-08
Lab Code: R1613221-005

Units: mg/Kg
Basis: Dry

Analyte Name	Method	Sample Result	Result	Matrix Spike R1613221-005MS		Duplicate Matrix Spike R1613221-005DMS		% Rec Limits	RPD	RPD Limit	
				Spike Amount	% Rec	Result	Spike Amount				% Rec
Silver, Total	6010C	ND U	7.9	8.6	92	8.2	8.6	95	75-125	3	20
Arsenic, Total	6010C	2.2	8.8	6.9	95	9.2	6.9	102	75-125	5	20
Barium, Total	6010C	66.1	393	344	95	410	344	100	75-125	4	20
Beryllium, Total	6010C	0.58	8.81	8.60	96	9.06	8.60	99	75-125	3	20
Cadmium, Total	6010C	ND U	7.86	8.60	91	8.15	8.60	95	75-125	4	20
Chromium, Total	6010C	0.8 J	33.1	34.4	94	34.1	34.4	97	75-125	3	20
Nickel, Total	6010C	ND U	74.9	86.0	87	77.2	86.0	90	75-125	3	20
Lead, Total	6010C	3.4 J	85.0	86.0	95	87.7	86.0	98	75-125	3	20
Antimony, Total	6010C	ND U	32	86	38 *	28	86	32 *	75-125	16	20
Selenium, Total	6010C	ND U	161	174	93	165	174	95	75-125	2	20
Thallium, Total	6010C	ND U	323	344	94	333	344	97	75-125	3	20
Vanadium, Total	6010C	30.7	116	86.0	99	118	86.0	101	75-125	2	20
Zinc, Total	6010C	32.3	115	86.0	96	117	86.0	98	75-125	2	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221
Date Analyzed: 12/22/16 - 12/29/16

Lab Control Sample Summary
Inorganic Parameters

Units:mg/Kg
Basis:Dry

Lab Control Sample
R1613221-LCS1

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Antimony, Total	6010C	46.5	50.0	93	80-120
Arsenic, Total	6010C	3.94	4.0	99	80-120
Barium, Total	6010C	204	200	102	80-120
Beryllium, Total	6010C	4.80	5.00	96	80-120
Cadmium, Total	6010C	5.02	5.00	100	80-120
Chromium, Total	6010C	19.6	20.0	98	80-120
Lead, Total	6010C	49.5	50.0	99	80-120
Mercury, Total	7471B	0.162	0.167	97	80-120
Nickel, Total	6010C	49.6	50.0	99	80-120
Selenium, Total	6010C	91.9	101	91	80-120
Silver, Total	6010C	4.57	5.0	91	80-120
Thallium, Total	6010C	174	200	87	80-120
Vanadium, Total	6010C	48.8	50.0	98	80-120
Zinc, Total	6010C	47.4	50.0	95	80-120

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Water

Service Request: R1613221
Date Analyzed: 12/20/16 - 12/22/16

Lab Control Sample Summary
Inorganic Parameters

Units:mg/L
Basis:NA

Lab Control Sample
R1613221-LCS2

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Antimony, Total	6010C	0.470	0.500	94	80-120
Arsenic, Total	6010C	0.0392	0.040	98	80-120
Barium, Total	6010C	2.07	2.00	104	80-120
Beryllium, Total	6010C	0.0492	0.0500	98	80-120
Cadmium, Total	6010C	0.0512	0.0500	102	80-120
Chromium, Total	6010C	0.202	0.200	101	80-120
Lead, Total	6010C	0.514	0.500	103	80-120
Mercury, Total	7470A	0.00097	0.00100	97	80-120
Nickel, Total	6010C	0.509	0.500	102	80-120
Selenium, Total	6010C	0.884	1.01	87	80-120
Silver, Total	6010C	0.0460	0.050	92	80-120
Thallium, Total	6010C	1.80	2.00	90	80-120
Vanadium, Total	6010C	0.503	0.500	101	80-120
Zinc, Total	6010C	0.487	0.500	97	80-120



General Chemistry

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QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16
Date Analyzed: 12/27/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1612141316 400-SB-08
Lab Code: R1613221-002

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>Sample Result</u>	<u>Duplicate Sample R1613221-002DUP Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	54.3	56.2	55.2	3	20

Results flagged with an asterisk (*) indicate values outside control criteria.

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QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16
Date Analyzed: 12/27/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1612141331 400-SB-13
Lab Code: R1613221-010

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>Sample Result</u>	<u>Duplicate Sample R1613221-010DUP Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	51.8	52.7	52.2	2	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613221
Date Collected: 12/14/16
Date Received: 12/16/16
Date Analyzed: 12/27/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1612141346 400-SB-14
Lab Code: R1613221-018

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>Sample Result</u>	<u>Duplicate Sample R1613221-018DUP Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	74.5	74.6	74.6	<1	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

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Subcontracted Analytical Parameters

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December 31, 2016

Reports and Invoices
ALS Environmental
1565 Jefferson Road
Building 300, Suite 360
Rochester, NY 14623

Certificate of Analysis

Project Name:	Metals without J values	Workorder:	2196938
Purchase Order:	58R1613221	Workorder ID:	R1613221

Dear Reports Invoices:

Enclosed are the analytical results for samples received by the laboratory on Tuesday, December 20, 2016.

The ALS Environmental laboratory in Middletown, Pennsylvania is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Mr. Brad W Kintzer (Project Coordinator) at (717) 944-5541.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state requirements. The test results meet requirements of the current NELAP standards or state requirements, where applicable. For a specific list of accredited analytes, refer to the certifications section of the ALS website at www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads.

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ALS Spring City: 10 Riverside Drive, Spring City, PA 19475 610-948-4903

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.


Mr. Brad W Kintzer
Project Coordinator

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SAMPLE SUMMARY

Workorder: 2196938 R1613221

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
2196938001	1612141322 400-SB-08	Solid	12/14/2016 00:00	12/20/2016 10:18	Collected by Client
2196938002	1612141323 400-SB-08	Solid	12/14/2016 00:00	12/20/2016 10:18	Collected by Client
2196938003	1612141337 400-SB-13	Solid	12/14/2016 00:00	12/20/2016 10:18	Collected by Client
2196938004	1612141338 400-SB-13	Solid	12/14/2016 00:00	12/20/2016 10:18	Collected by Client
2196938005	1612141352 400-SB-14	Solid	12/14/2016 00:00	12/20/2016 10:18	Collected by Client
2196938006	1612141353 400-SB-14	Solid	12/14/2016 00:00	12/20/2016 10:18	Collected by Client

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SAMPLE SUMMARY

Workorder: 2196938 R1613221

Notes

- Samples collected by ALS personnel are done so in accordance with the procedures set forth in the ALS Field Sampling Plan (20 - Field Services Sampling Plan).
- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
- The Chain of Custody document is included as part of this report.
- All Library Search analytes should be regarded as tentative identifications based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.
- Parameters identified as "analyze immediately" require analysis within 15 minutes of collection. Any "analyze immediately" parameters not listed under the header "Field Parameters" are performed in the laboratory and are therefore analyzed out of hold time.
- Method references listed on this report beginning with the prefix "S" followed by a method number (such as S2310B-97) refer to methods from "Standard Methods for the Examination of Water and Wastewater".
- For microbiological analyses, the "Prepared" value is the date/time into the incubator and the "Analyzed" value is the date/time out the incubator.

Standard Acronyms/Flags

J	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
N	Indicates presumptive evidence of the presence of a compound
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference
LOD	DoD Limit of Detection
LOQ	DoD Limit of Quantitation
DL	DoD Detection Limit
I	Indicates reported value is greater than or equal to the Method Detection Limit (MDL) but less than the Report Detection Limit (RDL)
(S)	Surrogate Compound
NC	Not Calculated
*	Result outside of QC limits

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ANALYTICAL RESULTS

Workorder: 2196938 R1613221

Lab ID: **2196938001**
Sample ID: **1612141322 400-SB-08**

Date Collected: 12/14/2016 00:00 Matrix: Solid
Date Received: 12/20/2016 10:18

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
TCLP METALS										
Antimony, Total	0.15 U	U	mg/L	0.15	0.050	SW846 6010C	12/22/16 11:19 TRR	12/27/16 12:59	SRT	A2
Arsenic, Total	0.14 U	U	mg/L	0.14	0.046	SW846 6010C	12/22/16 11:19 TRR	12/27/16 12:59	SRT	A2
Barium, Total	2.8 U	U	mg/L	2.8	0.94	SW846 6010C	12/22/16 11:19 TRR	12/27/16 12:59	SRT	A2
Beryllium, Total	0.022 U	U	mg/L	0.022	0.0070	SW846 6010C	12/22/16 11:19 TRR	12/27/16 12:59	SRT	A2
Cadmium, Total	0.0056J	J	mg/L	0.011	0.0037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 12:59	SRT	A2
Chromium, Total	0.028 U	U	mg/L	0.028	0.010	SW846 6010C	12/22/16 11:19 TRR	12/27/16 12:59	SRT	A2
Lead, Total	0.033 U	U	mg/L	0.033	0.011	SW846 6010C	12/22/16 11:19 TRR	12/27/16 12:59	SRT	A2
Mercury, Total	0.0020 U	U	mg/L	0.0020	0.00066	SW846 7470A	12/22/16 08:45 AXC	12/22/16 12:39	MNP	A1
Nickel, Total	0.11 U	U	mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 12:59	SRT	A2
Selenium, Total	0.11 U	U	mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 12:59	SRT	A2
Silver, Total	0.022 U	U	mg/L	0.022	0.0070	SW846 6010C	12/22/16 11:19 TRR	12/27/16 12:59	SRT	A2
Thallium, Total	0.11 U	U	mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 12:59	SRT	A2
Vanadium, Total	0.016J	J	mg/L	0.028	0.010	SW846 6010C	12/22/16 11:19 TRR	12/27/16 12:59	SRT	A2
Zinc, Total	0.067J	J	mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 12:59	SRT	A2



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ANALYTICAL RESULTS

Workorder: 2196938 R1613221

Lab ID: **2196938002**
Sample ID: **1612141323 400-SB-08**

Date Collected: 12/14/2016 00:00 Matrix: Solid
Date Received: 12/20/2016 10:18

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
TCLP METALS										
Antimony, Total	0.15 U	U	mg/L	0.15	0.050	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:10	SRT	A2
Arsenic, Total	0.14 U	U	mg/L	0.14	0.046	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:10	SRT	A2
Barium, Total	2.8 U	U	mg/L	2.8	0.94	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:10	SRT	A2
Beryllium, Total	0.022 U	U	mg/L	0.022	0.0070	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:10	SRT	A2
Cadmium, Total	0.0072J	J	mg/L	0.011	0.0037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:10	SRT	A2
Chromium, Total	0.028 U	U	mg/L	0.028	0.010	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:10	SRT	A2
Lead, Total	0.033 U	U	mg/L	0.033	0.011	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:10	SRT	A2
Mercury, Total	0.0020 U	U	mg/L	0.0020	0.00066	SW846 7470A	12/22/16 08:45 AXC	12/22/16 12:40	MNP	A1
Nickel, Total	0.11 U	U	mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:10	SRT	A2
Selenium, Total	0.11 U	U	mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:10	SRT	A2
Silver, Total	0.022 U	U	mg/L	0.022	0.0070	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:10	SRT	A2
Thallium, Total	0.11 U	U	mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:10	SRT	A2
Vanadium, Total	0.014J	J	mg/L	0.028	0.010	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:10	SRT	A2
Zinc, Total	0.10J	J	mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:10	SRT	A2



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ANALYTICAL RESULTS

Workorder: 2196938 R1613221

Lab ID: **2196938003**
Sample ID: **1612141337 400-SB-13**

Date Collected: 12/14/2016 00:00 Matrix: Solid
Date Received: 12/20/2016 10:18

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
TCLP METALS										
Antimony, Total	0.15 U	U	mg/L	0.15	0.050	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:14	SRT	A2
Arsenic, Total	0.14 U	U	mg/L	0.14	0.046	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:14	SRT	A2
Barium, Total	1.2J	J	mg/L	2.8	0.94	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:14	SRT	A2
Beryllium, Total	0.022 U	U	mg/L	0.022	0.0070	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:14	SRT	A2
Cadmium, Total	0.0061J	J	mg/L	0.011	0.0037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:14	SRT	A2
Chromium, Total	0.019J	J	mg/L	0.028	0.010	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:14	SRT	A2
Lead, Total	0.033 U	U	mg/L	0.033	0.011	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:14	SRT	A2
Mercury, Total	0.0020 U	U	mg/L	0.0020	0.00066	SW846 7470A	12/29/16 21:00 AXC	12/30/16 15:53	MNP	A3
Nickel, Total	0.11 U	U	mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:14	SRT	A2
Selenium, Total	0.11 U	U	mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:14	SRT	A2
Silver, Total	0.022 U	U	mg/L	0.022	0.0070	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:14	SRT	A2
Thallium, Total	0.11 U	U	mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:14	SRT	A2
Vanadium, Total	0.015J	J	mg/L	0.028	0.010	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:14	SRT	A2
Zinc, Total	0.088J	J	mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:14	SRT	A2



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ANALYTICAL RESULTS

Workorder: 2196938 R1613221

Lab ID: **2196938004**
Sample ID: **1612141338 400-SB-13**

Date Collected: 12/14/2016 00:00 Matrix: Solid
Date Received: 12/20/2016 10:18

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
TCLP METALS										
Antimony, Total	0.15 U	U	mg/L	0.15	0.050	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:18	SRT	A2
Arsenic, Total	0.14 U	U	mg/L	0.14	0.046	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:18	SRT	A2
Barium, Total	1.3J	J	mg/L	2.8	0.94	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:18	SRT	A2
Beryllium, Total	0.022 U	U	mg/L	0.022	0.0070	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:18	SRT	A2
Cadmium, Total	0.0050J	J	mg/L	0.011	0.0037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:18	SRT	A2
Chromium, Total	0.028 U	U	mg/L	0.028	0.010	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:18	SRT	A2
Lead, Total	0.033 U	U	mg/L	0.033	0.011	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:18	SRT	A2
Mercury, Total	0.0020 U	U	mg/L	0.0020	0.00066	SW846 7470A	12/22/16 08:45 AXC	12/22/16 12:41	MNP	A1
Nickel, Total	0.11 U	U	mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:18	SRT	A2
Selenium, Total	0.043J	J	mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:18	SRT	A2
Silver, Total	0.022 U	U	mg/L	0.022	0.0070	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:18	SRT	A2
Thallium, Total	0.11 U	U	mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:18	SRT	A2
Vanadium, Total	0.011J	J	mg/L	0.028	0.010	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:18	SRT	A2
Zinc, Total	0.11		mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:18	SRT	A2



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ANALYTICAL RESULTS

Workorder: 2196938 R1613221

Lab ID: **2196938005**
Sample ID: **1612141352 400-SB-14**

Date Collected: 12/14/2016 00:00 Matrix: Solid
Date Received: 12/20/2016 10:18

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
TCLP METALS										
Antimony, Total	0.15 U	U	mg/L	0.15	0.050	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:22	SRT	A2
Arsenic, Total	0.14 U	U	mg/L	0.14	0.046	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:22	SRT	A2
Barium, Total	2.4J	J	mg/L	2.8	0.94	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:22	SRT	A2
Beryllium, Total	0.022 U	U	mg/L	0.022	0.0070	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:22	SRT	A2
Cadmium, Total	0.0044J	J	mg/L	0.011	0.0037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:22	SRT	A2
Chromium, Total	0.028 U	U	mg/L	0.028	0.010	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:22	SRT	A2
Lead, Total	0.033 U	U	mg/L	0.033	0.011	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:22	SRT	A2
Mercury, Total	0.0020 U	U	mg/L	0.0020	0.00066	SW846 7470A	12/22/16 08:45 AXC	12/22/16 12:42	MNP	A1
Nickel, Total	0.11 U	U	mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:22	SRT	A2
Selenium, Total	0.11 U	U	mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:22	SRT	A2
Silver, Total	0.022 U	U	mg/L	0.022	0.0070	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:22	SRT	A2
Thallium, Total	0.11 U	U	mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:22	SRT	A2
Vanadium, Total	0.028 U	U	mg/L	0.028	0.010	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:22	SRT	A2
Zinc, Total	0.12		mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:22	SRT	A2



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ANALYTICAL RESULTS

Workorder: 2196938 R1613221

Lab ID: **2196938006**
Sample ID: **1612141353 400-SB-14**

Date Collected: 12/14/2016 00:00 Matrix: Solid
Date Received: 12/20/2016 10:18

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
TCLP METALS										
Antimony, Total	0.15 U	U	mg/L	0.15	0.050	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:25	SRT	A2
Arsenic, Total	0.14 U	U	mg/L	0.14	0.046	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:25	SRT	A2
Barium, Total	2.7J	J	mg/L	2.8	0.94	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:25	SRT	A2
Beryllium, Total	0.022 U	U	mg/L	0.022	0.0070	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:25	SRT	A2
Cadmium, Total	0.0050J	J	mg/L	0.011	0.0037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:25	SRT	A2
Chromium, Total	0.028 U	U	mg/L	0.028	0.010	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:25	SRT	A2
Lead, Total	0.033 U	U	mg/L	0.033	0.011	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:25	SRT	A2
Mercury, Total	0.0020 U	U	mg/L	0.0020	0.00066	SW846 7470A	12/22/16 08:45 AXC	12/22/16 12:43	MNP	A1
Nickel, Total	0.11 U	U	mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:25	SRT	A2
Selenium, Total	0.11 U	U	mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:25	SRT	A2
Silver, Total	0.022 U	U	mg/L	0.022	0.0070	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:25	SRT	A2
Thallium, Total	0.11 U	U	mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:25	SRT	A2
Vanadium, Total	0.028 U	U	mg/L	0.028	0.010	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:25	SRT	A2
Zinc, Total	0.23		mg/L	0.11	0.037	SW846 6010C	12/22/16 11:19 TRR	12/27/16 13:25	SRT	A2



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QUALITY CONTROL DATA

Workorder: 2196938 R1613221

QC Batch: MDIG/61600 **Analysis Method:** SW846 7470A

QC Batch Method: SW846 7470A

Associated Lab Samples: 2196938001, 2196938002, 2196938003, 2196938004, 2196938005, 2196938006

METHOD BLANK: 2459642

Parameter	Blank Result	Units	Reporting Limit
Mercury, Total	0.0020 U	mg/L	0.0020

LABORATORY CONTROL SAMPLE: 2459643

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Mercury, Total	89.5	mg/L	.002	0.0018J	85 - 115

MATRIX SPIKE: 2459644 DUPLICATE: 2459645 ORIGINAL: 2196719001

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Mercury, Total	0	mg/L	.005	.00479	.00503	95.8	101	70 - 130	4.89	20

MATRIX SPIKE: 2459646 DUPLICATE: 2459647 ORIGINAL: 2197018005

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Mercury, Total	0	mg/L	.005	.00486	.00485	97.1	96.9	70 - 130	.21	20

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QUALITY CONTROL DATA

Workorder: 2196938 R1613221

QC Batch: MDIG/61606 **Analysis Method:** SW846 6010C

QC Batch Method: SW846 3015

Associated Lab Samples: 2196938001, 2196938002, 2196938003, 2196938004, 2196938005, 2196938006

METHOD BLANK: 2459767

Parameter	Blank Result	Units	Reporting Limit
Antimony, Total	0.030 U	mg/L	0.030
Arsenic, Total	0.028 U	mg/L	0.028
Barium, Total	0.56 U	mg/L	0.56
Beryllium, Total	0.0044 U	mg/L	0.0044
Cadmium, Total	0.0022 U	mg/L	0.0022
Chromium, Total	0.0056 U	mg/L	0.0056
Lead, Total	0.0067 U	mg/L	0.0067
Nickel, Total	0.022 U	mg/L	0.022
Selenium, Total	0.022 U	mg/L	0.022
Silver, Total	0.0044 U	mg/L	0.0044
Thallium, Total	0.022 U	mg/L	0.022
Vanadium, Total	0.0056 U	mg/L	0.0056
Zinc, Total	0.022 U	mg/L	0.022

LABORATORY CONTROL SAMPLE: 2459768

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Antimony, Total	102	mg/L	.22	0.23	80 - 120
Arsenic, Total	103	mg/L	.11	0.11	80 - 120
Barium, Total	105	mg/L	1.1	1.2	80 - 120
Beryllium, Total	103	mg/L	.22	0.23	80 - 120
Cadmium, Total	104	mg/L	.11	0.12	80 - 120
Chromium, Total	105	mg/L	.11	0.12	80 - 120
Lead, Total	103	mg/L	.11	0.11	80 - 120
Nickel, Total	105	mg/L	1.1	1.2	80 - 120
Selenium, Total	102	mg/L	1.1	1.1	80 - 120
Silver, Total	104	mg/L	.11	0.12	80 - 120
Thallium, Total	103	mg/L	.11	0.11	80 - 120
Vanadium, Total	106	mg/L	.056	0.059	80 - 120
Zinc, Total	104	mg/L	.56	0.58	80 - 120

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QUALITY CONTROL DATA

Workorder: 2196938 R1613221

MATRIX SPIKE: 2459769 DUPLICATE: 2459770 ORIGINAL: 2196785001

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Arsenic, Total	.015	mg/L	5	5.82216	5.89439	116	118	50 - 150	1.23	20
Barium, Total	.37666	mg/L	10	11.43322	11.48322	111	111	50 - 150	.44	20
Cadmium, Total	.00333	mg/L	1	1.18832	1.19499	118	119	50 - 150	.56	20
Chromium, Total	.00722	mg/L	5	5.25328	5.2555	105	105	50 - 150	.04	20
Lead, Total	.01222	mg/L	5	5.4755	5.49495	109	110	50 - 150	.35	20
Selenium, Total	.04778	mg/L	1	1.19165	1.21443	114	117	50 - 150	1.89	20
Silver, Total	0	mg/L	1	.03833	.03222	3.83*	3.22*	50 - 150	17.3	20

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QUALITY CONTROL DATA

Workorder: 2196938 R1613221

QC Batch: MDIG/61690 **Analysis Method:** SW846 7470A
QC Batch Method: SW846 7470A
Associated Lab Samples: 2196938003

METHOD BLANK: 2462147

Parameter	Blank Result	Units	Reporting Limit
Mercury, Total	0.0020 U	mg/L	0.0020

LABORATORY CONTROL SAMPLE: 2462148

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Mercury, Total	102	mg/L	.002	0.0020	85 - 115

MATRIX SPIKE: 2462149 DUPLICATE: 2462150 ORIGINAL: 2197873005

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Mercury, Total	0	mg/L	.005	.00467	.00459	93.4	91.8	70 - 130	1.73	20

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Workorder: 2196938 R1613221

Lab ID	Sample ID	Prep Method	Prep Batch	Analysis Method	Analysis Batch
2196938001	1612141322 400-SB-08	SW846 7470A	MDIG/61600	SW846 7470A	META/55453
2196938002	1612141323 400-SB-08	SW846 7470A	MDIG/61600	SW846 7470A	META/55453
2196938004	1612141338 400-SB-13	SW846 7470A	MDIG/61600	SW846 7470A	META/55453
2196938005	1612141352 400-SB-14	SW846 7470A	MDIG/61600	SW846 7470A	META/55453
2196938006	1612141353 400-SB-14	SW846 7470A	MDIG/61600	SW846 7470A	META/55453
2196938001	1612141322 400-SB-08	SW846 3015	MDIG/61606	SW846 6010C	META/55466
2196938002	1612141323 400-SB-08	SW846 3015	MDIG/61606	SW846 6010C	META/55466
2196938003	1612141337 400-SB-13	SW846 3015	MDIG/61606	SW846 6010C	META/55466
2196938004	1612141338 400-SB-13	SW846 3015	MDIG/61606	SW846 6010C	META/55466
2196938005	1612141352 400-SB-14	SW846 3015	MDIG/61606	SW846 6010C	META/55466
2196938006	1612141353 400-SB-14	SW846 3015	MDIG/61606	SW846 6010C	META/55466
2196938003	1612141337 400-SB-13	SW846 7470A	MDIG/61690	SW846 7470A	META/55520

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ALS Environmental Chain of Custody

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ALS Conta



Project Number: R1613221
 Project Manager: Janice Jaeger
 QAP: LAB QAP

Lab Code	Sample ID	# of Cont.	Matrix	Sample Time		Date	Matrix	# of Cont.	Matrix	Date	Time	Lab ID	6010C																									
				Ag TCLP	Vs TCLP								Ba TCLP	Ba TCLP	Ba TCLP	Cd TCLP	Cd TCLP	Cr TCLP	Hg TCLP 7470A	Ni TCLP	Pb TCLP																	
R1613221-007	1612141322 400-SB-08	1	Soil		12/14/16		Soil	1		12/14/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
R1613221-008	1612141323 400-SB-08	1	Soil		12/14/16		Soil	1		12/14/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
R1613221-015	1612141337 400-SB-13	1	Soil		12/14/16		Soil	1		12/14/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
R1613221-016	1612141338 400-SB-13	1	Soil		12/14/16		Soil	1		12/14/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
R1613221-023	1612141352 400-SB-14	1	Soil		12/14/16		Soil	1		12/14/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
R1613221-024	1612141353 400-SB-14	1	Soil		12/14/16		Soil	1		12/14/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Y X Initials Cooler Temp
 Custody Seals Present?
 (if present) Seals intact?
 Received on Ice?
 COC/Lbls Complete
 Cont in Good Cond?
 Correct Containers?
 Correct Samp Vol?
 Correct Preservation?
 Headspace/Volatiles?
 Tracking #: 65245014754

AG
12/20/16

Folder Comments:
ND U

Special Instructions/Comments	Turnaround Requirements	Report Requirements	Invoice Information
	RUSH (Surcharges Apply) PLEASE CIRCLE WORK DAYS 1 2 3 4 5 <input checked="" type="checkbox"/> STANDARD Requested FAX Date: _____ Requested Report Date: 12/30/16	I. Results Only <input checked="" type="checkbox"/> II. Results + QC Summaries III. Results + QC and Calibration Summaries IV. Data Validation Report with Raw Data PQL/MDL/ EDD <input checked="" type="checkbox"/> Y <input type="checkbox"/> N	PO# 58R1613221 Bill to
H - Test is On Hold P - Test is Authorized for Prep Only			

Reinquished By: AS 12/19 1445 Received By: AS 12/16 2018 Airbill Number: _____

2196938

R1613221-007	1612141322 400-SB-08	Soil	12/14/16	Middletown ALS	Sb TCLP 6010C	Sr TCLP 6010C	TCLP EPA 1311	Ti TCLP 6010C	V TCLP 6010C	Zn TCLP 6010C
R1613221-008	1612141323 400-SB-08	Soil	12/14/16	Middletown ALS						
R1613221-015	1612141337 400-SB-13	Soil	12/14/16	Middletown ALS						
R1613221-016	1612141338 400-SB-13	Soil	12/14/16	Middletown ALS						
R1613221-023	1612141352 400-SB-14	Soil	12/14/16	Middletown ALS						
R1613221-024	1612141353 400-SB-14	Soil	12/14/16	Middletown ALS						



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Governor

JOHN A. SANCHEZ
Lieutenant Governor

NEW MEXICO ENVIRONMENT DEPARTMENT

2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303
Phone (505) 476-6000 Fax (505) 476-6030
www.env.nm.gov



BUTCH TONGATE
Cabinet Secretary - Designate

J. C. BORREGO
Deputy Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

January 6, 2017

Timothy J. Davis
Chief, Environmental Office
National Aeronautics and Space Administration
White Sands Test Facility
P.O. Box 20
Las Cruces, NM 88004-0020

Attention of: RE-16-168

**RE: APPROVAL
REQUEST FOR SECOND "CONTAINED-IN" DETERMINATION
FOR 400 AREA INVESTIGATION-DERIVED WASTE (IDW)
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WHITE SANDS TEST FACILITY
DOÑA ANA COUNTY, NEW MEXICO
EPA ID #NM08800019434
HWB-NASA-11-006**

Dear Mr. Davis:

The New Mexico Environment Department (NMED) has received the National Aeronautics and Space Administration's (NASA WSTF) (Permittee) *Request for a Second "Contained-In" Determination for 400 Area Investigation-Derived Waste (IDW)* (Request), dated December 23, 2016.

The IDW was generated during investigation activities at the 400 Area at boring locations 400-SB-10, 400-SB-12 and 400-SB-14. The IDW material is comprised of fourteen 55-gallon containers of drilling cuttings, three one-cubic yard containers of IDW soil generated during investigation activities, and one 1-cubic yard container of contact debris.

Mr. Timothy J. Davis

January 6, 2017

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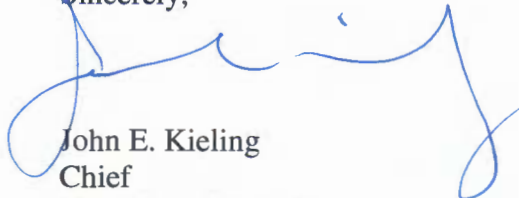
Waste characterization samples of soil were collected and analyzed to determine if applicable F001 and F002 hazardous waste constituents and other chemicals of concern were present in the waste generated during investigation activities at the 400 Area Closure.

Based on the information provided in the Request, the IDW stream does not exceed NMED soil screening levels (SSL) for construction or industrial worker exposure. However, reported concentrations of thallium in waste soil from 400-SB-14 and arsenic exceeded the NMED residential SSL. Reported arsenic concentrations did not exceed established Facility background concentrations. No site specific background concentration information is available for thallium. Based on the provided information, the IDW does not exhibit properties of a characteristic hazardous waste per 40 CFR Part 261 Subpart C. Additionally, all applicable 40 CFR Part 261 Subpart D listed hazardous waste (F001 and F002) concentrations were either below laboratory detection limits or below the applicable NMED soil screening levels.

NMED has reviewed the Permittee's Request and determined that the IDW can be managed as a nonhazardous waste. The mixed media drilling cutting solids may be land applied near the point of generation and away from potential storm water run-off. The aqueous phase mixed media waste must be treated at the Mid-plume Interception Treatment System. The contact debris and 400-SB-14 soil waste material (three 1-cubic yard containers) may be managed as a solid waste and disposed at an appropriate waste facility.

If you have any questions regarding this letter, please contact Gabriel Acevedo at (505) 476-6043.

Sincerely,



John E. Kieling
Chief
Hazardous Waste Bureau

cc: D. Cobrain, NMED HWB
B. Wear, NMED HWB
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File: NASA WSTF 2016 and Reading, NASA-11-006

HWB 3391

New Mexico Environment Department
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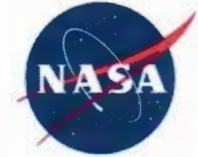
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National Aeronautics and
Space Administration

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January 13, 2017

Reply to Attn of: RE-17-022

Mr. John E. Kieling, Chief
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505

Subject: Request for a Fifth "Contained-In" Determination for 400 Area Investigation-Derived Waste (IDW)

NASA is requesting a "No Longer Contained-In" Determination (NLCID) for the investigation-derived waste (IDW soil and IDW debris) generated during activities associated with the 400 Area Closure Investigation Work Plan (IWP), which was approved by NMED on November 8, 2011. This fifth and final "Contained-In" Determination request for the 400 Area Investigation is for applicable IDW soil from soil boring locations 400-SB-01, 400-SB-02, 400-SB-05, and 400-SB-06 and IDW contact debris associated with drilling activities. The IDW soil and IDW debris are currently being managed in accordance with 40 CFR §262.34, as listed hazardous waste carrying EPA Waste Codes F001 and F002. The earliest 90-day accumulation time limit expiration date for the IDW associated with this NLCID will expire on March 15, 2017.

NASA is requesting a NLCID for the F001 and F002 hazardous waste listing. NASA received, reviewed, and compared analytical data generated from the IDW soil to the applicable 40 CFR §268 Subpart D Treatment Standards, current NMED Residential Soil Screening Level (RSSL), and the WSTF Background Soil Screening Levels. In all four boring locations, F001 and F002 contaminants of concern were not detected above regulatory limits. Thallium was detected above the RSSL in samples from waste generated at boreholes 400-SB-01 (Containers #7489 and #7490), 400-SB-02 (Container #7516), 400-SB-05 (Containers #7523 and #7524), and 400-SB-06 (Containers #7486 and #7487). Thallium was detected below the RSSL in a sample from Container #7517, which contains waste from borehole 400-SB-02. There is no available WSTF Background SSL for thallium. NASA also compared N-Nitrosodimethylamine (NDMA) data to the RSSL identified in the NMED Risk Assessment Guidance for Site Investigations and Remediation (2015) for Residential Soil. NDMA was not detected in any of the IDW soil samples associated with this NLCID request.

If NMED finds the IDW soil does not contain hazardous waste, NASA requests concurrence from the NMED to dispose of IDW soil generated from boreholes 400-SB-01 (Containers #7489 and #7490), 400-SB-02 (Container #7516), 400-SB-05 (Containers #7523 and #7524),

and 400-SB-06 (Containers #7486 and #7487) at an appropriate waste facility. NASA requests concurrence from the NMED to evenly land apply IDW soil generated at 400-SB-02 (Container #7517 only) in the project area. Upon receipt of an approved NLCID and concurrence from the NMED, NASA will evenly land apply the environmental media to the ground away from potential storm water run-off and document the final disposal location. The IDW contact debris associated with this request will be disposed of as solid waste.

Enclosure 1 provides a background and basis for the NLCID. Enclosure 2 provides a printed copy of detection summary tables of the analytical results and a comparison to applicable regulatory limits. Enclosure 3 provides a CD-ROM containing analytical summaries, laboratory analytical reports, and chain of custody documentation.

I certify under penalty of law that this document and attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have any questions or comments, please contact me at 575-524-5024, or Antonette Sanchez of my staff, at 575-524-5497.



Timothy J. Davis
Chief, Environmental Office

Enclosures (3)

cc: (w/enclosures)
Mr. Gabriel Acevedo
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505

Enclosure 1

Background

The Resource Conservation and Recovery Act (RCRA) Hazardous Waste Operating Permit (NMED, 2009; Permit) for the White Sands Test Facility (WSTF) required an investigation of soil directly beneath and adjacent to the WSTF 400 Area surface impoundments. Research conducted for the Historical Information Summary (HIS) associated with the 400 Area Investigation Work Plan (IWP) found chemicals meeting the listing descriptions of spent F001 and F002 per 40 CFR §261 Subpart D were used as solvents and referee propellants in the 400 Area. These F001 and F002 listed wastes were included in the waste streams managed within the 400 Area impoundments, but were not treated before discharge to an adjacent arroyo. The NMED Hazardous Waste Bureau approved the 400 Area IWP (November 8, 2011) and an associated abbreviated drilling work plan (August 30, 2016), which identified 15 soil boring locations. Five of the soil borings were designated to be completed as combination soil vapor/groundwater monitoring wells, while the remainder were designated as soil vapor monitoring wells only. The monitoring wells are intended to provide additional vertical delineation of the soil, soil vapor, and groundwater chemistry around the 400 Area Closure. This information will be used to determine if there is a continuing source of contamination near the 400 Area impoundments. NASA initiated the 400 Area Investigation in September 2016, and in consultation with NMED, modified the planned approach to include eight combination soil vapor/groundwater monitoring wells. The seven remaining borings were completed as soil vapor monitoring wells. Investigation-derived waste (IDW) has been generated during the 400 Area Investigation, and initial requests for a “contained-in” determinations for previously generated waste were approved by NMED on December 15, 2016, January 6, 2017, January 27, 2017, and February 6, 2017. The non-hazardous determinations were approved for IDW soil generated from borehole locations 400-SB-03, 400-SB-04, 400-SB-06, 400-SB-07, 400-SB-08, 400-SB-09, 400-SB-10, 400-SB-11, 400-SB-12, 400-SB-13, 400-SB-14 and 400-SB-15, IDW drill cuttings at 400-SB-08, 400-SB-10, 400-SB-12, 400-SB-13 and 400-SB-14 and associated IDW debris.

Waste material generated during 400 Area Investigation drilling activities included IDW soil and IDW drill cuttings. IDW soil is defined as environmental media produced using the sonic drilling technique within alluvium from ground surface to the top of cemented alluvium, or conglomerate bedrock. The sonic drilling technique was also used to advance boreholes in bedrock at 400-SB-04, 400-SB-05, 400-SB-06, and 400-SB-11. Returns from the borehole at these locations were not saturated and were also characterized as IDW soil. IDW drill cuttings are defined as environmental media produced using the air hammer drilling process while drilling boreholes within cemented alluvium and andesite bedrock. This type of waste was included in previous NLCID requests, but does not apply to the current request. All IDW generated as part of the 400 Area Investigation is subject to regulation under the “contained-in” policy carrying EPA Waste Codes F001 and F002 per 40 CFR §261 Subpart D with constituents of concern (COCs): trichloroethene, tetrachloroethene, trichlorofluoromethane, and 1,1,2-trichloro-1,2,2-trifluoroethane.

Waste characterization and hazardous waste determination for 400 Area Investigation IDW was conducted in accordance with Permit Attachment 12 (Waste Analysis Plan) and 40 CFR §260 and 261. NASA is providing analytical results from waste characterization samples collected from 400 Area Investigation IDW soil generated through January 10, 2017, and is requesting that the NMED perform a “contained-in” determination to determine whether the seven 1-cubic yard containers of IDW soil, one 55-gallon drum of IDW soil, and one 1-cubic yard container of IDW debris included in this request pose an unacceptable risk.

Basis for “Contained-In” Determination

NASA is requesting that NMED perform a No Longer Contained-in Determination (NLCID) for environmental media (IDW soil) and associated contaminated IDW contact debris. Aqueous IDW, such as decontamination water and contaminated groundwater, is being managed as hazardous waste and treated at the Mid-plume Interception and Treatment System. IDW decontamination water and groundwater is not part of this request. Analytical sampling data have been received and reviewed for the IDW soil from 400 Area Investigation boreholes 400-SB-01, 400-SB-02, 400-SB-05, and 400-SB-06. Analytical summary tables are provided in Enclosure 2 and the analytical reports are provided in Enclosure 3. Analytical data may be compared to the applicable 40 CFR §268 Subpart D Treatment Standards, the 2015 NMED Residential Soil Screening Levels (RSSL), and WSTF Background SSLs. If the environmental media IDW is found not to pose an unacceptable risk, then the NMED may determine the IDW soil and associated contact IDW debris can be managed as non-hazardous waste.

F001 and F002 Constituents of Concern

F001 and F002 COCs were not detected above the laboratory’s reporting limits in the waste characterization samples, which in all cases were below the regulatory limits included in the 40 CFR §268 Subpart D Treatment Standards and the 2015 NMED RSSL. Tetrachloroethene (PCE) was detected in samples from borehole location 400-SB-01, but included a “J” flag data qualifier that indicated the reported result was an estimated concentration between the method detection limit and reporting limit. The reported PCE concentrations did not exceed the applicable regulatory limits.

Other Constituents

Metals

Native soils located at WSTF are known to have the potential to contain metals at concentrations that exceed regulatory limits. Metals sampling was performed based on the potential for land application of any environmental media that no longer contains listed hazardous waste. The sampling was performed to address the 40 CFR §261.24 Toxicity Characteristic incorporating the 40 CFR §268 Land Disposal Restrictions and the 2015 NMED RSSL. Based on the sampling results, metals were not detected in IDW soil at concentrations exceeding the 40 CFR §261.24 Toxicity Characteristic limits or 40 CFR §268 40 Treatment Standard Limits. Thallium was detected above the 2015 NMED RSSL in waste characterization samples associated with boreholes 400-SB-01, 400-SB-02, 400-SB-05, and 400-SB-06. There is no established WSTF Background SSL concentration available for thallium. In addition, arsenic was detected in borehole locations 400-SB-01, 400-SB-02, 400-SB-05, and 400-SB-06 at concentrations that exceed the 2015 NMED RSSL; however, the concentrations are below the WSTF Background Area #2 Screening Level. No other metals were detected at a concentration that exceeded the 2015 NMED RSSL.

N-Nitrosodimethylamine (NDMA)

NDMA is a constituent sometimes present as an impurity in hydrazine-based propellants. It is also a byproduct generated from treating hydrazine-based propellants by oxidation (neutralization), which occurred historically at the 400 Area impoundments. The 400 Area Investigation location is within the known boundaries of the WSTF groundwater contamination plume, which is also known to contain NDMA. Based on the waste characterization sampling results, NDMA was not detected in any of the borehole locations.

Other Volatile Organic Compounds

In addition to the F001 and F002 COCs, the laboratory’s target analyte list for SW-846 Method 8260C includes the majority of volatile organic compounds typically analyzed for by SW-846 Method 8260C. Acetone was detected at trace concentrations (< 0.01 mg/Kg). Acetone is a known lab contaminate. The

acetone detections did not exceed any applicable regulatory limits. 1,4-Dioxane was detected at low concentration in samples from borehole locations 400-SB-02, 400-SB-05, and 400-SB-06. Detections of 1,4-Dioxane only occurred in the samples that were shipped on January 18, 2017. This constituent was not detected in samples shipped on January 4, 2017. The narrative provided with the laboratory analytical reports indicated the instrument used for the EPA 8260 analysis had 1,4-Dioxane contamination. Each detection of 1,4-Dioxane included a "B" flag data qualifier, which indicated the reported analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result. Even though the 1,4-Dioxane detections appear not to be representative of the waste samples, it is noted that the reported 1,4-Dioxane concentrations did not exceed the 40 CFR §268 Land Disposal Restrictions treatment standards for nonwastewater concentration or the 2015 NMED Residential Soil Screening Level.

Other Semi-Volatile Organics

N-Nitrodimethylamine (DMN) and bromacil concentration were included in EPA Method 607M with the reported NDMA results. DMN was not detected in any of the waste characterization samples. Bromacil was detected at low concentration in samples from boreholes 400-SB-02 and 400-SB-06. The 40 CFR §268.40 Treatment Standards do not include a treatment limit for DMN or bromacil. Also, the NMED RSSLs do not include a limit for these constituents.

Analytical Reports and Chain of Custodies

Analytical reports and chains of custody are provided in Enclosure 3 for waste characterization samples collected from individual waste containers. Analytical data sheets specific to each analyses are included in the laboratory reports for each sampling event. The complete analytical report includes the laboratory case narrative and supporting documentation.

Other Considerations

If NMED concludes that the IDW soil does not contain hazardous waste, NASA will dispose of IDW soil generated from boreholes 400-SB-01 (Containers #7489 and #7490), 400-SB-02 (Container #7516) 400-SB-05 (Containers #7523 and #7524), and 400-SB-06 (Containers #7486, and #7487) at an appropriate waste facility. NASA requests concurrence from NMED to land apply IDW soil generated from borehole 400-SB-02 (container #7517) in the project area. Upon receipt of an approved NLCID and concurrence from NMED, NASA will evenly land apply the identified environmental media away from potential storm water run-off and document the final disposal location. The IDW debris associated with this request will be disposed of as solid waste.

Enclosure 2

Table 1 400-SB-01 IDW Soil VOC Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg unless noted as "mg/L TCLP")	NMED Residential Soil Screening Level (mg/Kg)
<u>1701040835</u> No. 7489 3/19/17	8260C	Tetrachloroethene	0.0011J	0.7	6.0 mg/L TCLP	1.11E+02
<u>1701040840</u> No. 7490 3/19/17		Acetone Tetrachloroethene	0.0038J 0.0043J	N/A 0.7	160 6.0 mg/L TCLP	6.63E+04 1.11E+02
<u>1701040841</u> No. 7490 3/19/17		Acetone Tetrachloroethene	0.0048J 0.0018J	N/A 0.7	160 6.0 mg/L TCLP	6.63E+04 1.11E+02

Table 2 400-SB-01 IDW Soil Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)
1701040838 No. 7489 3/19/17	607M	N-Nitrosodimethylamine	ND	2.34E-02	2.3
		N-Nitrodimethylamine	ND	N/A	N/A
		Bromacil	0.00023	N/A	N/A
1701040849 No. 7490 3/19/17	607M	N-Nitrosodimethylamine	ND	2.34E-02	2.3
		N-Nitrodimethylamine	ND	N/A	N/A
		Bromacil	ND	N/A	N/A
1701040850 No. 7490 3/19/17	607M	N-Nitrosodimethylamine	ND	2.34E-02	2.3
		N-Nitrodimethylamine	ND	N/A	N/A
		Bromacil	ND	N/A	N/A

Table 3 400-SB-01 IDW Soil TCLP Metals Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	TCLP Result (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewater (mg/L TCLP)
1701040837 No. 7489 3/19/17	1311/6010C	Barium	3.4	100	21
1701040846 No. 7490 3/19/17		Barium	1.1J	100	21
1701040847 No. 7490 3/19/17		Zinc ¹	0.12	N/A	4.3

Table 4 400-SB-01 IDW Soil Total Metals Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	WSTF Background Area 2 Screening Level (mg/Kg)
1701040836 No. 7489 03/19/17	6010C	Antimony	0.7BJ	3.13E+01	0.902
		Arsenic	4.5	4.25E+00	12.2
		Barium	523	1.56E+04	137
		Beryllium	0.63B	1.56E+02	0.609
		Cadmium	0.56	7.05E+01	1.42*
		Chromium	10.5	9.66E+01	9.38
		Lead	7.4	4.00E+02	10.3
		Nickel	3.5J	1.56E+03	12.9
		Thallium	1.0	7.82E-01	N/A
		Vanadium	22.7	3.94E+02	46.5
Zinc	40.5	2.35E+04	43.5		
1701040843 No. 7490 3/19/17	6010C	Antimony	0.6BJ	3.13E+01	0.902
		Arsenic	5.9	4.25E+00	12.2
		Barium	118	1.56E+04	137
		Beryllium	0.43B	1.56E+02	0.609
		Cadmium	0.30J	7.05E+01	1.42*
		Chromium	16.1	9.66E+01	9.38
		Lead	6.4	4.00E+02	10.3
		Nickel	6.4	1.56E+03	12.9
		Selenium	1.0J	3.91E+02	N/A
		Vanadium	18.9	3.94E+02	46.5
Zinc	24.2	2.35E+04	43.5		

Table 4 Cont. 400-SB-01 IDW Soil Total Metals Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	WSTF Background Area 2 Screening Level (mg/Kg)
1701040844 No. 7490 3/19/17	6010C	Antimony	0.7BJ	3.13E+01	0.902
		Arsenic	4.3	4.25E+00	12.2
		Barium	117	1.56E+04	137
		Beryllium	0.44B	1.56E+02	0.609
		Cadmium	0.41J	7.05E+01	1.42*
		Chromium	24.3	9.66E+01	9.38
		Lead	6.6	4.00E+02	10.3
		Nickel	9.2	1.56E+03	12.9
		Selenium	0.9J	3.91E+02	N/A
		Thallium	1.5	7.82E-01	N/A
		Vanadium	15.4	3.94E+02	46.5
		Zinc	32.1	2.35E+04	43.5

Table 5 400-SB-02 IDW Soil VOC Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)
1701180925 No. 7516 4/7/17	8260C	1,4-Dioxane	0.760B	N/A	170	5.33E+01
1701180930 No. 7517 4/7/17		1,4-Dioxane	0.650B	N/A	170	5.33E+01

Table 6 400-SB-02 IDW Soil Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)
1701180928 No. 7516 4/7/17	607M	N-Nitrosodimethylamine N-Nitrodimethylamine Bromacil	ND ND 0.00023J	2.34E-02 N/A N/A	2.3 N/A N/A
1701180933 No. 7517 4/7/17		N-Nitrosodimethylamine N-Nitrodimethylamine Bromacil	ND ND ND	2.34E-02 N/A N/A	2.3 N/A N/A

Table 7 400-SB-02 IDW Soil TCLP Metals Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	TCLP Result (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewater (mg/L TCLP)
1701180927 No. 7516 4/7/17	1311/6010C	None	N/A	N/A	N/A
1701180932 No. 7517 4/7/17		None	N/A	N/A	N/A

Table 8 400-SB-02 IDW Soil Total Metals Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	WSTF Background Area 2 Screening Level (mg/Kg)
1701180926 No. 7516 4/7/17	6010C/7471B	Arsenic	5.8	4.25E+00	12.2
		Barium	110	1.56E+04	137
		Beryllium	0.49	1.56E+02	0.609
		Chromium	43.9	9.66E+01	9.38
		Lead	9.0	4.00E+02	10.3
		Mercury	0.006J	2.38E+01	N/A
		Nickel	8.8	1.56E+03	12.9
		Thallium	2.4	7.82E-01	N/A
		Vanadium	14.4	3.94E+02	46.5
		Zinc	49.5	2.35E+04	43.5
1701180931 No. 7517 4/7/17	6010C/7471B	Arsenic	3.93	4.25E+00	12.2
		Barium	67.0	1.56E+04	137
		Beryllium	0.46	1.56E+02	0.609
		Chromium	22.1	9.66E+01	9.38
		Lead	7.5	4.00E+02	10.3
		Mercury	0.004J	2.38E+01	N/A
		Nickel	9.4	1.56E+03	12.9
		Thallium	0.72J	7.82E-01	N/A
		Vanadium	15.0	3.94E+02	46.5
		Zinc	40.3	2.35E+04	43.5

Table 9 400-SB-05 IDW Soil VOC Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)
1701180935 No. 7523 4/10/17	8260C	1,4-Dioxane	0.720B	N/A	170	5.33E+01
1701180940 No. 7524 4/10/17		1,4-Dioxane	0.660B	N/A	170	5.33E+01
1701180941 No. 7524 4/10/17		1,4-Dioxane	0.680B	N/A	170	5.33E+01

Table 10 400-SB-05 IDW Soil Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)
1701180938 No. 7523 4/10/17	607M	N-Nitrosodimethylamine	ND	2.34E-02	2.3
		N-Nitrodimethylamine	ND	N/A	N/A
		Bromacil	ND	N/A	N/A
1701180949 No. 7524 4/10/17	607M	N-Nitrosodimethylamine	ND	2.34E-02	2.3
		N-Nitrodimethylamine	ND	N/A	N/A
		Bromacil	ND	N/A	N/A
1701180950 No. 7524 4/10/17	607M	N-Nitrosodimethylamine	ND	2.34E-02	2.3
		N-Nitrodimethylamine	ND	N/A	N/A
		Bromacil	ND	N/A	N/A

Table 11 400-SB-05 IDW Soil TCLP Metals Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	TCLP Result (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewater (mg/L TCLP)
1701180937 No. 7523 4/10/17	1311/6010C	None	N/A	N/A	N/A
1701180946 No. 7524 4/10/17		None	N/A	N/A	N/A
1701180947 No. 7524 4/10/17		None	N/A	N/A	N/A

Table 12 400-SB-05 IDW Soil Total Metals Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	WSTF Background Area 2 Screening Level (mg/Kg)
1701180936 No. 7523 4/10/17	6010C/7471B	Arsenic	7.2	4.25E+00	12.2
		Barium	82.2	1.56E+04	137
		Beryllium	0.58	1.56E+02	0.609
		Cadmium	0.15J	7.05E+01	1.42*
		Chromium	31.9	9.66E+01	9.38
		Lead	11.9	4.00E+02	10.3
		Mercury	0.004J	2.38E+01	N/A
		Nickel	9.7	1.56E+03	12.9
		Thallium	2.1	7.82E-01	N/A
		Vanadium	17.7	3.94E+02	46.5
		Zinc	63.6	2.35E+04	43.5
1701180943 No. 7524 4/10/17	6010C/7471B	Arsenic	4.5	4.25E+00	12.2
		Barium	90.9	1.56E+04	137
		Beryllium	0.38	1.56E+02	0.609
		Cadmium	0.18J	7.05E+01	1.42*
		Chromium	24.4	9.66E+01	9.38
		Lead	11.2	4.00E+02	10.3
		Nickel	6.0	1.56E+03	12.9
		Thallium	2.0	7.82E-01	N/A
		Vanadium	12.9	3.94E+02	46.5
		Zinc	36.6	2.35E+04	43.5
		1701180944 No. 7524 4/10/17	6010C/7471B	Arsenic	4.1	4.25E+00	12.2
Barium	126			1.56E+04	137
Beryllium	0.41			1.56E+02	0.609
Cadmium	0.09J			7.05E+01	1.42*
Chromium	32.4			9.66E+01	9.38
Lead	8.6			4.00E+02	10.3
Nickel	8.0			1.56E+03	12.9
Thallium	2.2			7.82E-01	N/A
Vanadium	13.6			3.94E+02	46.5
Zinc	37.1			2.35E+04	43.5

Table 13 400-SB-06 IDW Soil VOC Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)
1701040830 No. 7486 3/15/17	8260C	Acetone	0.0059	N/A	160	6.63E+04
1701180920 No. 7487 3/15/17		1,4-Dioxane	0.910B	N/A	170	5.33E+01

Table 14 400-SB-06 IDW Soil Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)
1701040833 No. 7486 3/15/17	607M	N-Nitrosodimethylamine N-Nitrodimethylamine Bromacil	ND ND 0.00166	2.34E-02 N/A N/A	2.3 N/A N/A
1701180923 No. 7487 3/15/17		N-Nitrosodimethylamine N-Nitrodimethylamine Bromacil	ND ND 0.00118	2.34E-02 N/A N/A	2.3 N/A N/A

Table 15 400-SB-06 IDW Soil TCLP Metals Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	TCLP Result (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewater (mg/L TCLP)
1701040832 No. 7486 3/15/17	1311/6010C	Barium Chromium Lead Zinc ¹	2.8 0.013J 0.039 0.092J	100 5.0 5.0 N/A	21 0.60 0.75 4.3
1701180922 No. 7487 3/15/17		Barium Chromium	3.5 0.038	100 5.0	21 0.60

Table 16 400-SB-06 IDW Soil Total Metals Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	WSTF Background Area 2 Screening Level (mg/Kg)
1701040831 No. 7486 3/15/17	6010C/7471B	Antimony	1.2BJ	3.13E+01	0.902
		Arsenic	5.5	4.25E+00	12.2
		Barium	335	1.56E+04	137
		Beryllium	0.42B	1.56E+02	0.609
		Cadmium	0.70	7.05E+01	1.42*
		Chromium	33.8	9.66E+01	9.38
		Lead	7.3	4.00E+02	10.3
		Nickel	8.8	1.56E+03	12.9
		Thallium	3.1	7.82E-01	N/A
		Vanadium	14.0	3.94E+02	46.5
1701180921 No. 7487 3/15/17	6010C/7471B	Zinc	40.2	2.35E+04	43.5
		Arsenic	6.4	4.25E+00	12.2
		Barium	667	1.56E+04	137
		Beryllium	0.53	1.56E+02	0.609
		Chromium	10.4	9.66E+01	9.38
		Lead	6.1	4.00E+02	10.3
		Nickel	6.7	1.56E+03	12.9
		Selenium	1.0J	3.91E+02	N/A
		Thallium	3.4	7.82E-01	N/A
Vanadium	19.9	3.94E+02	46.5		
		Zinc	55.1	2.35E+04	43.5

Table Notes:

B: Indicates analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.

J: Indicates result concentration is between the method reporting limit and the method detection limit.

ND: Indicates not detected.

N/A: Indicates not applicable.

* This analyte was not detected at all depths in the WSTF Soil Background Study. This screening level represents the lowest available 95% UTL.

¹: These Constituents are not “underlying hazardous constituents” in characteristic waste, according to the definition at §268.2(i).

SOUTHWEST RESEARCH INSTITUTE®

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Chemistry and Chemical Engineering Division
Department of Analytical & Environmental Chemistry

January 25, 2017

Navarro Research and Engineering Inc.
NASA - JSC - White Sands Test Facility
Transportation Officer, Building 120
12600 NASA Road
Las Cruces, NM 88012
Tel. 575-524-5452

Attention: Tom Hall

Subject: Reports for Batch-607-#730-T for NDMA/DMN Analysis of Soil Samples

SwRI Project #: 01.16988.103

SwRI Task Orders: **170106-4**

Navarro P.O. #: 15EC092B

Dear Tom,

Enclosed please find the analytical reports for Batch-607- #730-T-Navarro of soil samples.

Southwest Research Institute appreciates the opportunity to provide the service to Navarro Research and Engineering Inc.. If you have any questions, please do not hesitate to call me at 210-522-3954.

Sincerely,



Gang Sun, Ph.D.
Program Manager

APPROVAL:



Michael Dammann
Director



CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 170106-4
NAVARRO PO #: 15EC092B

NARRATIVE

(M-607 - #730-T-Navarro)

CLIENT: NAVARRO
 SwRI PROJECT: 01.16988.01.103
 BATCH #: Batch-607-#730-T
 TASK ORDER: 170106-4
 CLIENT PO#: 15EC092B
 REPORT DATA: 01/25/2017

NARRATIVE FOR NDMA/ DMN/BROMACIL ANALYSIS

1. Samples were extracted with dichloromethane (DCM) and analyzed by GC/MS in selective ion monitoring mode for N-Nitrosodimethylamine (NDMA) and N-Nitrodimethylamine (DMN) according to the modified Method 607.
2. All samples were extracted within 14 days for soil sample of sample collection and were analyzed within 40 days after the extraction.
3. The response factor (RF) values for Calibration curve and/or for continuing calibration standard were less than 25 % for all target compounds. The sample reporting limit is 0.33 ppb for 30 g extracted soil samples.
4. Both blank spike and matrix spike samples were spiked at 17 ppb for soil sample, then extracted and analyzed. The recoveries for all target compounds were within method recovery criteria of 13-110% for NDMA, 30-150% for DMN, and 40-190% for Bromacil, respectively. The soil sample result is reported as received basis and not by dry weight.
5. Surrogate compound was spiked into every sample before sample extraction at 17 ppb for soil sample. The surrogate recoveries for all samples were within method recovery criteria of 40-160%.
6. Laboratory blanks were extracted and analyzed for every sample batch. No analytes were detected above report limits from the blanks.
7. A "J" value was reported if the associated value was below reporting limits but above the MDL value.
8. All analyte concentrations are expressed in ng/g (*ppb*). Sample calculation:

$$\text{for soil: Concentration } (\mu\text{g/kg}) = \frac{C \text{ (ng/}\mu\text{L)} \times V_{\text{extr}} \text{ (}\mu\text{L)} \times \text{DF}}{W_{\text{samp}} \text{ (g)}} \times \frac{1000 \text{ g}}{1 \text{ kg}} \times \frac{1 \mu\text{g}}{1000 \text{ ng}}$$

where:

C	=	result of GC/MS analysis, in ng/μL
V _{extr}	=	final volume of sample extract, in μL
V _{samp}	=	aqueous sample volume taken for extraction, in mL
W _{samp}	=	soil sample weight taken for extraction, in gram
DF	=	dilution factor, if any

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 170106-4
NAVARRO PO #: 15EC092B

TASK ORDER AND CHAIN OF CUSTODY

Southwest Research Institute

Laboratory Task Order

TO #: 170106-4 Revision: 0

SDG: 608584

SRR #s: 58923
Client(s): NavarroProject(s): 16988.01.10X
Manager(s): SUN, GANG
To Client: 01/27/17**Instructions**

Documents Related to this task order: 213755[Paperwork for SRR 58923], 108294[PO #179 + #180], 113038[PO #179 + #180 Change Order #1], 113134[PO #NAV0000060], 115908[PO #NAV0000060 CO #1], 117303[PO #NAV0000060 CO #2], 118820[PO #179 + #180 Change Order #2], 120319[PO #104], 122923[PO #179 Change Order #3], 124787[PO #132], 124995[PO #179 Change Order #5]

Deliverables --> Hard Copy: no EDD: -YES- PDF: -YES-

Test: E607S

Holding: 14 days from CED

Section: EXTLAB

EXTRACTION BY METHOD 607.

Cnt: 5

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
608584		1	Soil	1701040833 (400-SB-06)	04 Jan 17	18 Jan 17
608585		1	Soil	1701040838 (400-SB-01)	04 Jan 17	18 Jan 17
608586		1	Soil	1701040849 (400-SB-01)	04 Jan 17	18 Jan 17
608587		1	Soil	1701040850 (400-SB-01)	04 Jan 17	18 Jan 17
608588	MS	1	Soil	1701040851 (400-SB-01)	04 Jan 17	18 Jan 17

Test: T607W

Holding: 40 days from VTSR

Section: TDG

NDMA/DMN ANALYSIS BY GC/MS/SIM

Cnt: 5

System ID	Type	Cont	Matrix	Customer ID	VTSR	Method Date
608584		1	Soil	1701040833 (400-SB-06)	06 Jan 17	15 Feb 17
608585		1	Soil	1701040838 (400-SB-01)	06 Jan 17	15 Feb 17
608586		1	Soil	1701040849 (400-SB-01)	06 Jan 17	15 Feb 17
608587		1	Soil	1701040850 (400-SB-01)	06 Jan 17	15 Feb 17
608588	MS	1	Soil	1701040851 (400-SB-01)	06 Jan 17	15 Feb 17



Date: January 4, 2017

Page 1 of 1

Laboratory PO #15EC092B		Analytical Requirements				Special Instructions	
Return Address for Analytical Reports		# of Containers	Sample Type: Soil (S)	EPA method 607M 8 oz Amber Glass Jar, Ice			Comments
Sample No.	Sample Location						
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012 Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453							Please return coolers and reusable packaging materials as soon as possible. Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall
170104 <i>0833</i>	400-SB-06	1	S	X			Container 7486
170104 <i>0838</i>	400-SB-01	1	S	X			Container 7489
170104 <i>0849</i>	400-SB-01	1	S	X			Container 7490
170104 <i>0850</i>	400-SB-01	1	S	X			Container 7490
170104 <i>0851</i>	400-SB-01	1	S	X			Matrix Spike for 170104 Container 7490
Relinquished By: <i>[Signature]</i>		Date/Time: <i>01-04-2017</i>		Accepted By: <i>[Signature]</i>		Date/Time: <i>01-06-17 / 12:15</i>	

WSTF - 381C (02/15)

Client: Navarro
 SRR # 58923
 Project # 16988.01.10X
 Case: 15EC092B
 VTSR: 01/06/17
 Sample(s) Received: Intact
 Temperature: 2.0 SN # 021055

NASA-WSTF SHIPPING DOCUMENT

15m Fed # MR12

SHIPPED FROM: NASA JSC WHITE SANDS TEST FACILITY 12600 NASA ROAD; BLDG. 120 LAS CRUCES, NEW MEXICO 88012		WSTF ORIGINATOR/MAIL CODE/TELEPHONE NO. Tom Hall 575-524-5453			
SHIP TO: (ADDRESS, PHONE#, POINT OF CONTACT) Southwest Research Institute 6220 Culebra Road San Antonio, TX 782238 Gang Sun 210-522-3954		ORDER OR CONTRACT NUMBER Navarro PO #15EC092B	SHIPMENT CONTROL NO.		
PROJECT or TASK NUMBER CP.6EE4IFW.0.71 - 16EE4IFW		SHIP VIA Fed Ex Air			
Contain Batteries NO	NO. PKG. 1	DATE SHIPPED 1/5/2017	AirBill/ PRO #/Bol #		
Battery Type-Part # N/A	AUTHORIZED BY: Tom Hall		DEPT. Environmental		
ITEM NO.	EQUIPMEN CONTROL NO.	MODEL NO./ STOCK NO./ PART NO.	ITEM NAME - MANUFACTURER'S NAME AND SERIAL NO.	UNIT OF ISSUE	QTY.
1	Lot-Samples		Soil Samples Navarro PO #15EC092B Line Item #1 NDMA and Bromacil for Soil samples by method 607M	ea.	5
JUSTIFICATION FOR SHIPMENT: (MDR #, Return Authorization #'s, Warranty Replacement, Repair, Overage/Shortage, Damage, Recycling) Sample for analysis as requested (Navarro PO #15EC092B)					
DOT HAZARDOUS MATERIALS INFO; EMERGENCY PHONE NUMBER AND GUIDE NUMBER: Not subject to regulation as a hazard material under 49 CFR.					
PROPERTY REVIEW:		<input type="checkbox"/> REMOVE EQUIPMENT TAG <input type="checkbox"/> DO NOT REMOVE EQUIPMENT TAG			
PACKED BY:		# CONTAINERS	TYPE CONTAINERS	DIMENSIONS	WEIGHT
Please check off the applicable labels! <input type="checkbox"/> FRAGILE <input checked="" type="checkbox"/> GLASS <input type="checkbox"/> DELICATE <input type="checkbox"/> DO NOT XRAY <input checked="" type="checkbox"/> REFRIGERATE <input type="checkbox"/> OTHER <input checked="" type="checkbox"/> BUBBLEWRAP <input checked="" type="checkbox"/> FOAM		5	Glass Containers	5ea. 8 oz. Glass Jars	
		TOTAL CONTAINERS			TOTAL WEIGHT
RECEIVED BY: <i>David L...</i>		SHIPPERS CERTIFICATION: This is to certify that the above named materials are properly classified, described, packaged, marked, labeled, and are in proper condition for transportation according to the regulations of the D.O.T. Date			
REPRESENTING: <i>SURI</i>					

Client: Navarro
SRR # 58923
Project # 16988.01.10X
Case: 15EC092B
VTSR: 01/06/17
Sample(s) Received: Intact
Temperature: 2.0 SN # 021055

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 170106-4
NAVARRO PO #: 15EC092B

ANALYTICAL DATA REPORT SHEETS

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1701040833 (400-SB-06)

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 608584

Batch: M607-#730-T

Date Received: 01/06/17

Lab File Name: A0123735.txt

Task Order: 170106-4

Date Extracted: 01/15/17

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 01/24/17

Dilution Factor: 1

Sample Wt/Vol: 30.07 g

Date Reported: 01/25/17

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	1.66	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1701040838 (400-SB-01)

Client: Navarro

Project: 16988.01.10X

Lab Sample ID: 608585

Batch: M607-#730-T

Date Received: 01/06/17

Lab File Name: A0123736.txt

Task Order: 170106-4

Date Extracted: 01/15/17

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 01/24/17

Dilution Factor: 1

Sample Wt/Vol: 30.43 g

Date Reported: 01/25/17

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	0.23	J

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1701040849 (400-SB-01)

Client: Navarro

Project: 16988.01.10X

Lab Sample ID: 608586

Batch: M607-#730-T

Date Received: 01/06/17

Lab File Name: A0123737.txt

Task Order: 170106-4

Date Extracted: 01/15/17

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 01/24/17

Dilution Factor: 1

Sample Wt/Vol: 30.29 g

Date Reported: 01/25/17

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1701040850 (400-SB-01)

Client: Navarro
 Batch: M607-#730-T
 Task Order: 170106-4
 Matrix: Soil
 Sample Wt/Vol: 30.89 g

Project: 16988.01.10X
 Date Received: 01/06/17
 Date Extracted: 01/15/17
 Date Analyzed: 01/24/17
 Date Reported: 01/25/17

Lab Sample ID: 608587
 Lab File Name: A0123738.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.32	U
4164-28-7	N-Nitrodimethylamine	<0.32	U
314-40-9	Bromacil	<0.32	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 170106-4
NAVARRO PO #: 15EC092B

QA DATA SHEETS

**(BLANK, MATRIX SPIKE, SURROGATE,
CALIBRATION)**

Southwest Research Institute

Method 607 Internal Standard Summary

Filename: A01237S2.txt
 Standard ID: IS=ING/UL
 Project:

Date Analyzed: 01/24/2017
 Time Analyzed: 02:30:00
 Client: Navarro

		IS1		IS2	
		Area	RT	Area	RT
Mid Point Standard		281644	8.41	159886	15.02
Upper Limit		563288	8.74	319772	15.35
Lower Limit		140822	8.08	79943	14.69
Client Sample ID	Lab Sample ID				
BLANK_15JAN17	609083	223175	8.41	127974	15.02
LCS_15JAN17 LCS	609084 LCS	228134	8.41	129389	15.02
1701040833 (400-SB-06)	608584	238596	8.41	131613	15.02
1701040838 (400-SB-01)	608585	239940	8.41	134093	15.02
1701040849 (400-SB-01)	608586	253408	8.41	140582	15.02
1701040850 (400-SB-01)	608587	241130	8.41	134240	15.02
1701040851 (400-SB-01) MS	608588 MS	253310	8.41	137482	15.02

IS1 = 1,4-Dichlorobenzene-D4

IS2 = Atrazine-D5

* Flag indicating value is outside QC limits

Southwest Research Institute

Method 607 Blank Summary

Blank ID: BLANK_15JAN17

Project: 16988.01.10X

Client: Navarro

SDG: 608584

Matrix: Soil

This method blank applies to the following samples, MS, and MSD's

Client Sample ID	Lab Sample ID	Date Acquired	Time Acquired
LCS_15JAN17	609084 LCS	01/24/17	08:14:00
1701040833 (400-SB-06)	608584	01/24/17	08:49:00
1701040838 (400-SB-01)	608585	01/24/17	09:23:00
1701040849 (400-SB-01)	608586	01/24/17	09:57:00
1701040850 (400-SB-01)	608587	01/24/17	10:31:00
1701040851 (400-SB-01)	608588 MS	01/24/17	11:05:00

Southwest Research Institute

Method 607 Surrogate Recovery Summary

Client: Navarro

Matrix: Soil

SDG: 608584

Project: 16988.01.10X

Client Sample ID	Lab Sample ID	N-Nitroso-di-n-propylamine	
		% Recovery	Recovery Limits
2 BLANK_15JAN17	609083	97	40-160
3 LCS_15JAN17	609084 LCS	93	40-160
4 1701040833 (400-SB-06)	608584	103	40-160
5 1701040838 (400-SB-01)	608585	98	40-160
6 1701040849 (400-SB-01)	608586	93	40-160
7 1701040850 (400-SB-01)	608587	103	40-160
8 1701040851 (400-SB-01)	608588 MS	90	40-160

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

BLANK_15JAN17

Client: Navarro

Batch: M607-#730-T

Task Order: NA

Matrix: Soil

Sample Wt/Vol: 30.29 g

Project:

Date Received: NA

Date Extracted: 01/15/17

Date Analyzed: 01/24/17

Date Reported: 01/25/17

Lab Sample ID: 609083

Lab File Name: A0123733.txt

Final Extraction Vol: 1000 uL

Dilution Factor: 1

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Client: Navarro
 Batch: M607-#730-T
 Task Order: NA
 Matrix: Soil
 Sample Wt/Vol: 30.21 g

Project:
 Date Received: NA
 Date Extracted: 01/15/17
 Date Analyzed: 01/24/17
 Date Reported: 01/25/17

Sample ID
LCS_15JAN17

Lab Sample ID: 609084 LCS
 Lab File Name: A0123734.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	12.94	
4164-28-7	N-Nitrodimethylamine	14.30	
314-40-9	Bromacil	22.44	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Blank Spike Recovery Report

Sample ID

LCS_15JAN17

Client: Navarro

Project:

Lab Sample ID: 609084 LCS

Batch: M607-#730-T

Date Received: NA

Blank ID: BLANK_15JAN17

Task Order: NA

Date Extracted: 01/15/17

Matrix: Soil

Date Analyzed: 01/24/17

Sample Wt/Vol: 30.21 g

Date Reported: 01/25/17

ANALYTE	Spike Added ng/g	Blank Conc ng/g	LCS Conc ng/g	% Recovery	QC % Recovery Limits
N-Nitrosodimethylamine	17	0	13	76	13 - 110
N-Nitrodimethylamine	17	0	14	82	30 - 150
Bromacil	17	0	22	129	40 - 190

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1701040851 (400-SB-01) MS

Client: Navarro

Project: 16988.01.10X

Lab Sample ID: 608588 MS

Batch: M607-#730-T

Date Received: 01/06/17

Lab File Name: A0123739.txt

Task Order: 170106-4

Date Extracted: 01/15/17

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 01/24/17

Dilution Factor: 1

Sample Wt/Vol: 30.81 g

Date Reported: 01/25/17

Reporting Unit: ng/g

Compared Sample: 1701040850 (400-SB-01)

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Spike	Recovery	Recovery Limit
62-75-9	N-Nitrosodimethylamine	11.13	17.00	65%	13-110%
4164-28-7	N-Nitrodimethylamine	13.50	17.00	79%	30-150%
314-40-9	Bromacil	23.99	17.00	141%	40-190%

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute***Continuing Calibration Check Sheet***

SwRI Project #: 01.16988.01.103 Calibration Date: 01/24/17
Sponsor: Navarro Analytical Method: TAP-01-0408-031
SwRI Standard ID: 202-04-120408017 Std Concentration: 1 µg/mL
File ID #: A01237S2 Initial Calibration Date: 10/17/16

ANALYTE	Mean RRF	RRF	% Dif.
N-Nitrosodimethylamine	0.361	0.409	-13.4
N-Nitrodimethylamine	0.13	0.140	-7.7
N-Nitroso-di-n-propylamine-d14	0.127	0.127	0.2
Bromacil	1.161	0.906	22

Southwest Research Institute

Initial Calibration Data Sheet

SwRI Project #:	01.16988.01.103	Calibration Data:	10/17/16
Sponsor:	Navarro	Analytical Method:	TAP-01-0408-031
SwRI Standard ID:	202-04-120408017	Std Concentration:	0.01-10 µg/mL

ANALYTE	RRF 0.01	RRF 0.05	RRF 0.2	RRF1	RRF5	RRF10	Ave. RRF	RSD%
N-Nitrosodimethylamine	0.291	0.308	0.352	0.369	0.417	0.430	0.361	15.49
N-Nitrodimethylamine	0.109	0.115	0.128	0.134	0.147	0.148	0.13	12.44
N-Nitroso-di-n-propylamine-d14	0.114	0.111	0.124	0.127	1.143	0.145	0.127	11.03
Bromacil	1.435	1.048	1.072	1.081	1.150	1.177	1.161	12.35

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 170106-4
NAVARRO PO #: 15EC092B

EXTRACTION AND INJECTION LOG

SwRI Labs

(E607S) SOIL Extraction By Soxhlet 3540C (Navarro)

Client: Navarro

Project: 16988.01.10X

Case: 15EC092B

Sample Receipt: 58923, 58943, 58962

TO#s: 170106-4, 170111-6, 170113-4

DATE EXTRACTED	01/15/17	NOTES	Hamilton Co. Syringes: 100uL ID:462905(SURR) 50uL ID:462898(MS) Balance #60 was used.
ANALYSTS INVOLVED	Hamed Edrisi (SU,SP,Conc) Marina Lebron (SW,QT) Christina Menn (BD,QT,FV)	ADDITIONAL NOTES	Soxhlet extraction began at 7:00pm and ended the following day at 1:00pm.
SURROGATE SOL ID	203-01-120408017 @5.0ng/uL	EXTRACTION FLOWCHART	Xg >>> FV 1000uL DCM
MTX SPK SOL ID	201-01-120408017 @10ng/uL	REFERENCE BOOK & PAGE	16-0402-032 P93
EXTRACTS LOCATION	Tracked by LIMS (01/19/17 CM)	TAP(S) USED	01-0402-152
CHEMICAL, BRAND & LOT#	Sodium Sulfate ID:04-0402-004p27G DCM Fisher Optima Lot#164214		

System ID	Type	Customer ID	SOLVENT VOL DCM (ML)	SAMPLE WT	SURROGATE SOL VOL
1		1701040833 (400-SB-06)	250	30.07 g	100 uL
2		1701040838 (400-SB-01)	250	30.43 g	100 uL
3		1701040849 (400-SB-01)	250	30.29 g	100 uL
4		1701040850 (400-SB-01)	250	30.89 g	100 uL
5	MS	1701040851 (400-SB-01)	250	30.81 g	100 uL
6		1701071519 (400-SB-02)0'-0.5')	250	30.88 g	100 uL
7		1701081004 (400-SB-02)40'-45'))	250	30.56 g	100 uL
8		1701081634 (400-SB-02)75'-80'))	250	30.26 g	100 uL
9		1701100804 (400-SB-05)5'-10'))	250	30.40 g	100 uL
10		1701101034 (400-SB-05)45'-50'))	250	30.21 g	100 uL
11		1701101044 (400-SB-05)45'-50'))	250	30.15 g	100 uL
12		1701101354 (400-SB-05)80'-85'))	250	30.56 g	100 uL
13		BLANK_15JAN17	250	30.29 g	100 uL
14		LCS_15JAN17	250	30.21 g	100 uL

System ID	Type	Customer ID	MTX SPK SOL VOL	FV DCM
1		1701040833 (400-SB-06)	0 uL	1000 uL
2		1701040838 (400-SB-01)	0 uL	1000 uL
3		1701040849 (400-SB-01)	0 uL	1000 uL
4		1701040850 (400-SB-01)	0 uL	1000 uL
5	MS	1701040851 (400-SB-01)	50 uL	1000 uL
6		1701071519 (400-SB-02)0'-0.5')	0 uL	1000 uL
7		1701081004 (400-SB-02)40'-45'))	0 uL	1000 uL
8		1701081634 (400-SB-02)75'-80'))	0 uL	1000 uL
9		1701100804 (400-SB-05)5'-10'))	0 uL	1000 uL
10		1701101034 (400-SB-05)45'-50'))	0 uL	1000 uL

Page created Jan 15 2017 3:57PM by hedrisi

Date Printed: 1/25/2017

Book: EXTRACTION LAB, Volume: EXT-2017, Page: 20 (Section 1 of 2)

Approved by CHRISTINA MENN on Jan 25 2017 1:11PM

ver (07/18/2014)

SwRI Labs
Client: Navarro
Project: 16988.01.10X
Case: 15EC092B

(E607S) SOIL Extraction By Soxhlet 3540C (Navarro)

Sample Receipt: 58923, 58943, 58962
TO#s: 170106-4, 170111-6, 170113-4

	System ID	Type	Customer ID	MTX SPK SOL VOL	FV DCM
11	608926		1701101044 (400-SB-05)45'-50'))	0 uL	1000 uL
12	608927		1701101354 (400-SB-05)80'-85'))	0 uL	1000 uL
13	609083		BLANK_15JAN17	0 uL	1000 uL
14	609084		LCS_15JAN17	50 uL	1000 uL

Page created Jan 15 2017 3:57PM by hedrisi
Book: EXTRACTION LAB, Volume: EXT-2017, Page: 20 (Section 2 of 2)
Approved by CHRISTINA MENN on Jan 25 2017 1:11PM

Date Printed: 1/25/2017

Work

injlog

Southwest Research Institute GC/MS Injection Log

OPERATOR: GS SEQUENCE DATE: 01/23/17, 01/24/17 INSTRUMENT: Amidala
 COLUMN: Agilent 122-0732 DB-1701, 0.25mm * 30m * 0.25um
 CARRIER GAS: Helium SOLVENT: DCM
 METHOD FILE: MET_607C, MET_607C.M PROJECT NUMBER: 16988.01.103
 CLIENT NAME: NAVARRO METHOD: M-607 MATRIX: water & soil
 SRR: 58941, 58943, 58948, 58960, 58962, 58923
 DATA PATH: C:\MSDCHEM\1\DATA\2016\A012317

OVEN PROGRAM

Initial temp: 40 'c (On)
 Initial time: 4.00 min
 Ramps:
 # Rate Final temp Final time
 1 15.00 150 0.00
 2 25.00 270 10.00
 3 0.0(off)
 Post temp: 270 'c
 Post time: 5.00 min
 Run time: 29.80 min

Maximum temp: 350 'c
 Equilibration time: 0.50 min

REVIEWED BY: Alice [Signature]

DATE: 01/25/17 1-25-17

FILENAME	VIAL	DATE/TIME	METHOD	SAMPLE DESCRIPTION
A01237C1	100	01/23/17 11:36	MET_607C	SLUG
A01237C2	1	01/23/17 12:10	MET_607C	DCM
A01237S1	2	01/23/17 12:17	MET_607C	NDMA/DMN/BROMACIL STD 1NG/UL IS=1NG/UL
A0123701	3	01/23/17 12:51	MET_607C	BLANK_12JAN17 IS=0.2NG/L 608859
A0123702	4	01/23/17 13:25	MET_607C	LCS_12JAN17 IS=0.2NG/L 608860
A0123703	5	01/23/17 13:59	MET_607C	1701051012A (WW-4-419) IS=0.2NG/L 608726
A0123704	6	01/23/17 14:33	MET_607C	1701051013B (100-F-358) IS=0.2NG/L 608727
A0123705	7	01/23/17 15:07	MET_607C	1701051021A (WW-4-589) IS=0.2NG/L 608728
A0123706	8	01/23/17 15:41	MET_607C	1701051451Z (PL-6-1195) IS=0.2NG/L 608729
A0123707	9	01/23/17 16:15	MET_607C	1701060942A (WW-4-848) IS=0.2NG/L 608730
A0123708	10	01/23/17 16:50	MET_607C	1701060952A (WW-4-948) IS=0.2NG/L 608731
A0123709	11	01/23/17 17:24	MET_607C	1701070625 (B650-EFF-1) IS=0.2NG/L 608732
A0123710	12	01/23/17 17:58	MET_607C	1701070645 (B650-INF-1) IS=0.2NG/L 608733
A0123711	13	01/23/17 18:32	MET_607C	1701070702 (PFE-3) IS=0.2NG/L 608734
A0123712	14	01/23/17 19:06	MET_607C	1701070730 (PFE-1) IS=0.2NG/L 608735
A0123713	15	01/23/17 19:40	MET_607C	1701070731 (PFE-1) IS=0.2NG/L 608736
A0123714	16	01/23/17 20:14	MET_607C	1701070753 (PFE-2) IS=0.2NG/L 608737
A0123715	17	01/23/17 20:48	MET_607C	1701070817 (PFE-7) IS=0.2NG/L 608738
A0123716	18	01/23/17 21:22	MET_607C	1701070843 (B655-EFF-2) IS=0.2NG/L 608739
A0123717	19	01/23/17 21:56	MET_607C	1701070921 (B655-INF-2) IS=0.2NG/L 608740
A0123718	20	01/23/17 22:30	MET_607C	1701071408 (400-SB-02) IS=0.2NG/L 608764
A0123719	21	01/23/17 23:05	MET_607C	1701080822 (400-SB-02) IS=0.2NG/L 608766
A0123720	22	01/23/17 23:39	MET_607C	1701090946B (JP-1-424) IS=0.2NG/L 608821
A0123721	23	01/24/17 00:13	MET_607C	1701090947B (JP-1-424) IS=0.2NG/L 608822
A0123722	24	01/24/17 00:47	MET_607C	1701091055Z (PL-6-1335) IS=0.2NG/L 608823
A0123723	25	01/24/17 01:22	MET_607C	1701091408B (BLM-10-517) IS=0.2NG/L 608824
A0123724	26	01/24/17 01:56	MET_607C	1701091409B (BLM-10-517) IS=0.2NG/L 608825MS
A01237S2	2	01/24/17 02:30	MET_607C	NDMA/DMN/BROMACIL STD 1NG/UL IS=1NG/UL
A0123725	27	01/24/17 03:05	MET_607C	BLANK_16JAN17 IS=0.2NG/L 609176
A0123726	28	01/24/17 03:39	MET_607C	LCS_16JAN17 IS=0.2NG/L 609177
A0123727	29	01/24/17 04:14	MET_607C	1701101009A (WW-5-459) IS=0.2NG/L 608915
A0123728	30	01/24/17 04:48	MET_607C	1701101021A (WW-5-579) IS=0.2NG/L 608916
A0123729	31	01/24/17 05:22	MET_607C	1701101030Z (PL-6-915) IS=0.2NG/L 608917
A0123730	32	01/24/17 05:57	MET_607C	1701110916A (WW-5-809) IS=0.2NG/L 608918
A0123731	33	01/24/17 06:32	MET_607C	1701110932A (WW-5-809) IS=0.2NG/L 608919
A0123732	34	01/24/17 07:06	MET_607C	1701100748 (400-SB-05) IS=0.2NG/L 608923
A0123733	35	01/24/17 07:40	MET_607C	BLANK_15JAN17 IS=0.2NG/L 609083
A0123734	36	01/24/17 08:14	MET_607C	LCS_15JAN17 IS=0.2NG/L 609084
A0123735	37	01/24/17 08:49	MET_607C	1701040833 (400-SB-06) IS=0.2NG/L 608584
A0123736	38	01/24/17 09:23	MET_607C	1701040838 (400-SB-01) IS=0.2NG/L 608585
A0123737	39	01/24/17 09:57	MET_607C	1701040849 (400-SB-01) IS=0.2NG/L 608586
A0123738	40	01/24/17 10:31	MET_607C	1701040850 (400-SB-01) IS=0.2NG/L 608587
A0123739	41	01/24/17 11:05	MET_607C	1701040851 (400-SB-01) IS=0.2NG/L 608588MS
A0123740	42	01/24/17 11:39	MET_607C	1701071519 (400-SB-02) 0'-0.5') 608765
A0123741	43	01/24/17 12:13	MET_607C	1701081004 (400-SB-02) 40'-45') 608767
A0123742	44	01/24/17 12:47	MET_607C	1701081634 (400-SB-02) 75'-80') 608768
A0123743	45	01/24/17 13:21	MET_607C	1701100804 (400-SB-05) 5'-10') 608924
A0123744	46	01/24/17 13:55	MET_607C	1701101034 (400-SB-05) 45'-50') 608925
A0123745	47	01/24/17 14:29	MET_607C	1701101044 (400-SB-05) 45'-50') 608926
A0123746	48	01/24/17 15:03	MET_607C	1701101354 (400-SB-05) 80'-85') 608927

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Chemistry and Chemical Engineering Division
Department of Analytical & Environmental Chemistry

January 31, 2017

Navarro Research and Engineering Inc.
NASA - JSC - White Sands Test Facility
Transportation Officer, Building 120
12600 NASA Road
Las Cruces, NM 88012
Tel. 575-524-5452

Attention: Tom Hall

Subject: Reports for Batch-607-#732-T for NDMA/DMN Analysis of Soil Samples

SwRI Project #: 01.16988.103

SwRI Task Orders: **170123-8**

Navarro P.O. #: 15EC092B

Dear Tom,

Enclosed please find the analytical reports for Batch-607- #732-T-Navarro of soil samples.

Southwest Research Institute appreciates the opportunity to provide the service to Navarro Research and Engineering Inc.. If you have any questions, please do not hesitate to call me at 210-522-3954.

Sincerely,



Gang Sun, Ph.D.
Program Manager

APPROVAL:



Michael Dammann
Director



CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 170123-8
NAVARRO PO #: 15EC092B

NARRATIVE

(M-607 - #732-T-Navarro)

Total Page Count: 010001
Fraction: M607 Pages: 010027

CLIENT: NAVARRO
 SwRI PROJECT: 01.16988.01.103
 BATCH #: Batch-607-#732-T
 TASK ORDER: 170123-8
 CLIENT PO#: 15EC092B
 REPORT DATA: 01/31/2017

NARRATIVE FOR NDMA/ DMN/BROMACIL ANALYSIS

1. Samples were extracted with dichloromethane (DCM) and analyzed by GC/MS in selective ion monitoring mode for N-Nitrosodimethylamine (NDMA) and N-Nitrodimethylamine (DMN) according to the modified Method 607.
2. All samples were extracted within 14 days for soil sample of sample collection and were analyzed within 40 days after the extraction.
3. The response factor (RF) values for Calibration curve and/or for continuing calibration standard were less than 25 % for all target compounds. The sample reporting limit is 0.33 ppb for 30 g extracted soil samples.
4. Both blank spike and matrix spike samples were spiked at 17 ppb for soil sample, then extracted and analyzed. The recoveries for all target compounds were within method recovery criteria of 13-110% for NDMA, 30-150% for DMN, and 40-190% for Bromacil, respectively. The soil sample result is reported as received basis and not by dry weight.
5. Surrogate compound was spiked into every sample before sample extraction at 17 ppb for soil sample. The surrogate recoveries for all samples were within method recovery criteria of 40-160%.
6. Laboratory blanks were extracted and analyzed for every sample batch. No analytes were detected above report limits from the blanks.
7. A "J" value was reported if the associated value was below reporting limits but above the MDL value.
8. All analyte concentrations are expressed in ng/g (*ppb*). Sample calculation:

$$\text{for soil: Concentration } (\mu\text{g/kg}) = \frac{C \text{ (ng/}\mu\text{L)} \times V_{\text{extr}} \text{ (}\mu\text{L)} \times \text{DF}}{W_{\text{samp}} \text{ (g)}} \times \frac{1000 \text{ g}}{1 \text{ kg}} \times \frac{1 \mu\text{g}}{1000 \text{ ng}}$$

where:

C	=	result of GC/MS analysis, in ng/μL
V _{extr}	=	final volume of sample extract, in μL
V _{samp}	=	aqueous sample volume taken for extraction, in mL
W _{samp}	=	soil sample weight taken for extraction, in gram
DF	=	dilution factor, if any

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 170123-8
NAVARRO PO #: 15EC092B

TASK ORDER AND CHAIN OF CUSTODY

Laboratory Task Order

TO #: 170123-8 Revision: 2

Project(s): 16988.01.10X
 Manager(s): SUN, GANG
 To Client: 02/10/17

SDG: 609434

SRR #s: 59010
 Client(s): Navarro

Instructions

Documents Related to this task order: 214569[COC for SRR 59010], 214570[Paperwork for SRR 59010], 108294[PO #179 + #180], 113038[PO #179 + #180 Change Order #1], 113134[PO #NAV0000060], 115908[PO #NAV0000060 CO #1], 117303[PO #NAV0000060 CO #2], 118820[PO #179 + #180 Change Order #2], 120319 [PO #104], 122923[PO #179 Change Order #3], 124787[PO #132], 124995[PO #179 Change Order #5]

Deliverables --> Hard Copy: no EDD: -YES- PDF: -YES-

Test: E607S

Holding: 14 days from CED

Section: EXTLAB

EXTRACTION BY METHOD 607.

Cnt: 7

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
609434		1	Soil	1701180923 (400-SB-06)	18 Jan 17	01 Feb 17
609435		1	Soil	1701180928 (400-SB-02)	18 Jan 17	01 Feb 17
609436		1	Soil	1701180933 (400-SB-02)	18 Jan 17	01 Feb 17
609437		1	Soil	1701180938 (400-SB-05)	18 Jan 17	01 Feb 17
609438		1	Soil	1701180949 (400-SB-05)	18 Jan 17	01 Feb 17
609439		1	Soil	1701180950 (400-SB-05)	18 Jan 17	01 Feb 17
609440	MS	1	Soil	1701180951 (400-SB-05)	18 Jan 17	01 Feb 17

Test: T607W

Holding: 40 days from VTSR

Section: TDG



NDMA/DMN ANALYSIS BY GC/MS/SIM

Cnt: 7

System ID	Type	Cont	Matrix	Customer ID	VTSR	Method Date
609434		1	Soil	1701180923 (400-SB-06)	20 Jan 17	01 Mar 17
609435		1	Soil	1701180928 (400-SB-02)	20 Jan 17	01 Mar 17
609436		1	Soil	1701180933 (400-SB-02)	20 Jan 17	01 Mar 17
609437		1	Soil	1701180938 (400-SB-05)	20 Jan 17	01 Mar 17
609438		1	Soil	1701180949 (400-SB-05)	20 Jan 17	01 Mar 17
609439		1	Soil	1701180950 (400-SB-05)	20 Jan 17	01 Mar 17
609440	MS	1	Soil	1701180951 (400-SB-05)	20 Jan 17	01 Mar 17



Date: January 18, 2017

Laboratory PO #15EC092B		Analytical Requirements				Special Instructions
Return Address for Analytical Reports		# of Containers	Sample Type: Soil (S)	EPA method 607M 8 oz Amber Glass Jar, Ice		Comments
Sample No.	Sample Location					
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012 Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453						Please return coolers and reusable packaging materials as soon as possible. Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall
170118	0923 400-SB-06	1	S	X		Container 7487
170118	0928 400-SB-02	1	S	X		Container 7516
170118	0933 400-SB-02	1	S	X		Container 7517
170118	0938 400-SB-05	1	S	X		Container 7523
170118	0949 400-SB-05	1	S	X		Container 7524
170118	0950 400-SB-05	1	S	X		container 7524
170118	0951 400-SB-05	1	S	X		container 7524 MATRIX SPIKE FOR 1701180949
Relinquished By: 		Date/Time: 1-18-17 (1045)		Accepted By: 		Date/Time: 01-20-17 / 15:00

WSTF - 381C (02/15)

Client: Navarro
 SRR # 59010
 Project # 16988.01.10X
 Case: 15EC092B
 VTSR: 01/20/17
 Sample(s) Received: Intact
 Temperature: 1.9 SN # 021055

010006

NASA-WSTF SHIPPING DOCUMENT

① Blue #39

SHIPPED FROM: NASA JSC WHITE SANDS TEST FACILITY 12600 NASA ROAD; BLDG. 120 LAS CRUCES, NEW MEXICO 88012		WSTF ORIGINATOR/MAIL CODE/TELEPHONE NO. Tom Hall 575-524-5453			
SHIP TO: (ADDRESS, PHONE#, POINT OF CONTACT) Southwest Research Institute 6220 Culebra Road San Antonio, TX 782238 Gang Sun 210-522-3954		ORDER OR CONTRACT NUMBER Navarro PO #15EC092B	SHIPMENT CONTROL NO		
PROJECT or TASK NUMBER CP.6EE4IFW.0.71 - 16EE4IFW		SHIP VIA Fed Ex Air			
Contain Batteries NO		NO. PKG. 1	DATE SHIPPED 1/19/2017		
Battery Type-Part # N/A		AUTHORIZED BY: Tom Hall	AirBill/ PRO #/Bol # DEPT. Environmental		
ITEM NO.	EQUIPMENT CONTROL NO.	MODEL NO./ STOCK NO./ PART NO.	ITEM NAME - MANUFACTURER'S NAME AND SERIAL NO.	UNIT OF ISSUE	QTY.
1 Lot-Samples			Soil Samples Navarro PO #15EC092B Line Item #1 NDMA and Bromacil for Soil samples by method 607M	ea. ea.	7
JUSTIFICATION FOR SHIPMENT: (MDR #, Return Authorization #'s, Warranty Replacement, Repair, Overage/Shortage, Damage, Recycling) Sample for analysis as requested (Navarro PO #15EC092B)					
DOT HAZARDOUS MATERIALS INFO; EMERGENCY PHONE NUMBER AND GUIDE NUMBER: Not subject to regulation as a hazard material under 49 CFR.					
PROPERTY REVIEW: <input type="checkbox"/> REMOVE EQUIPMENT TAG <input type="checkbox"/> DO NOT REMOVE EQUIPMENT TAG					
PACKED BY:		# CONTAINERS	TYPE CONTAINERS	DIMENSIONS	WEIGHT
Please check off the applicable labels! <input type="checkbox"/> FRAGILE <input checked="" type="checkbox"/> GLASS <input type="checkbox"/> DELICATE <input type="checkbox"/> DO NOT XRAY <input checked="" type="checkbox"/> REFRIGERATE <input type="checkbox"/> OTHER <input checked="" type="checkbox"/> BUBBLEWRAP <input checked="" type="checkbox"/> FOAM		7	Glass Containers	7 ea. 8 oz. Glass Jars	
		TOTAL CONTAINERS			TOTAL WEIGHT
RECEIVED BY: <i>David Garcia</i>		SHIPPERS CERTIFICATION: This is to certify that the above named materials are properly classified, described, packaged, marked, labeled, and are in proper condition for transportation according to the regulations of the D.O.T. Date			
REPRESENTING: <i>Su/I</i>					

Client: Navarro
 SRR # 59010
 Project # 16988.01.10X
 Case: 15EC092B
 VTSR: 01/20/17
 Sample(s) Received: Intact
 Temperature: 1.9 SN # 021055

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 170123-8
NAVARRO PO #: 15EC092B

ANALYTICAL DATA REPORT SHEETS

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1701180923 (400-SB-06)

Client: Navarro
 Batch: M607-#732-T
 Task Order: 170123-8
 Matrix: Soil
 Sample Wt/Vol: 30.39 g

Project: 16988.01.103
 Date Received: 01/20/17
 Date Extracted: 01/29/17
 Date Analyzed: 01/31/17
 Date Reported: 01/31/17

Lab Sample ID: 609434
 Lab File Name: A0130716.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	1.18	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1701180928 (400-SB-02)

Client: Navarro
 Batch: M607-#732-T
 Task Order: 170123-8
 Matrix: Soil
 Sample Wt/Vol: 30.21 g

Project: 16988.01.103
 Date Received: 01/20/17
 Date Extracted: 01/29/17
 Date Analyzed: 01/31/17
 Date Reported: 01/31/17

Lab Sample ID: 609435
 Lab File Name: A0130717.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	0.23	J

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1701180933 (400-SB-02)

Client: Navarro
 Batch: M607-#732-T
 Task Order: 170123-8
 Matrix: Soil
 Sample Wt/Vol: 30.26 g

Project: 16988.01.103
 Date Received: 01/20/17
 Date Extracted: 01/29/17
 Date Analyzed: 01/31/17
 Date Reported: 01/31/17

Lab Sample ID: 609436
 Lab File Name: A0130718.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1701180938 (400-SB-05)

Client: Navarro
 Batch: M607-#732-T
 Task Order: 170123-8
 Matrix: Soil
 Sample Wt/Vol: 30.14 g

Project: 16988.01.103
 Date Received: 01/20/17
 Date Extracted: 01/29/17
 Date Analyzed: 01/31/17
 Date Reported: 01/31/17

Lab Sample ID: 609437
 Lab File Name: A0130719.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1701180949 (400-SB-05)

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 609438

Batch: M607-#732-T

Date Received: 01/20/17

Lab File Name: A0130720.txt

Task Order: 170123-8

Date Extracted: 01/29/17

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 01/31/17

Dilution Factor: 1

Sample Wt/Vol: 30.16 g

Date Reported: 01/31/17

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1701180950 (400-SB-05)

Client: Navarro
 Batch: M607-#732-T
 Task Order: 170123-8
 Matrix: Soil
 Sample Wt/Vol: 30.12 g

Project: 16988.01.103
 Date Received: 01/20/17
 Date Extracted: 01/29/17
 Date Analyzed: 01/31/17
 Date Reported: 01/31/17

Lab Sample ID: 609439
 Lab File Name: A0130721.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1701180951 (400-SB-05) MS

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 609440 MS

Batch: M607-#732-T

Date Received: 01/20/17

Lab File Name: A0130722.txt

Task Order: 170123-8

Date Extracted: 01/29/17

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 01/31/17

Dilution Factor: 1

Sample Wt/Vol: 30.29 g

Date Reported: 01/31/17

Reporting Unit: ng/g

Compared Sample: 1701180949 (400-SB-05)

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Spike	Recovery	Recovery Limit
62-75-9	N-Nitrosodimethylamine	12.71	17.00	75%	13-110%
4164-28-7	N-Nitrodimethylamine	14.79	17.00	87%	30-150%
314-40-9	Bromacil	21.10	17.00	124%	40-190%

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 170123-8
NAVARRO PO #: 15EC092B

QA DATA SHEETS

**(BLANK, MATRIX SPIKE, SURROGATE,
CALIBRATION)**

Southwest Research Institute

Method 607 Internal Standard Summary

Filename: A01307S1.txt
 Standard ID: IS=1NG/UL
 Project: 16988.01.103

Date Analyzed: 01/30/2017
 Time Analyzed: 04:23:00
 Client: Navarro

		IS1		IS2	
		Area	RT	Area	RT
Mid Point Standard		287515	8.41	165917	15.02
Upper Limit		575030	8.74	331834	15.35
Lower Limit		143757.5	8.08	82958.5	14.69
Client Sample ID	Lab Sample ID				
BLANK-29JAN17	610202	215659	8.41	121180	15.02
LCS_29JAN17 LCS	610203 LCS	236265	8.41	134298	15.02
1701180923 (400-SB-06)	609434	246946	8.41	142033	15.02
1701180928 (400-SB-02)	609435	226269	8.41	129191	15.02
1701180933 (400-SB-02)	609436	226655	8.41	131178	15.02
1701180938 (400-SB-05)	609437	241203	8.41	136652	15.02
1701180949 (400-SB-05)	609438	227622	8.41	135800	15.02
1701180950 (400-SB-05)	609439	234761	8.41	131329	15.02
1701180951 (400-SB-05) MS	609440 MS	222924	8.41	130346	15.02

IS1 = 1,4-Dichlorobenzene-D4

IS2 = Atrazine-D5

* Flag indicating value is outside QC limits

Southwest Research Institute

Method 607 Blank Summary

Blank ID: BLANK-29JAN17

Project: 16988.01.103

Client: Navarro

SDG: 609434

Matrix: Soil

This method blank applies to the following samples, MS, and MSD's

Client Sample ID	Lab Sample ID	Date Acquired	Time Acquired
LCS_29JAN17	610203 LCS	01/31/17	00:55:00
1701180923 (400-SB-06)	609434	01/31/17	01:29:00
1701180928 (400-SB-02)	609435	01/31/17	02:04:00
1701180933 (400-SB-02)	609436	01/31/17	02:38:00
1701180938 (400-SB-05)	609437	01/31/17	03:12:00
1701180949 (400-SB-05)	609438	01/31/17	03:47:00
1701180950 (400-SB-05)	609439	01/31/17	04:21:00
1701180951 (400-SB-05)	609440 MS	01/31/17	04:55:00

Southwest Research Institute

Method 607 Surrogate Recovery Summary

Client: Navarro

Matrix: Soil

SDG: 609434

Project: 16988.01.103

Client Sample ID	Lab Sample ID	N-Nitroso-di-n-propylamine	
		% Recovery	Recovery Limits
2 BLANK-29JAN17	610202	93	40-160
3 LCS_29JAN17	610203 LCS	91	40-160
4 1701180923 (400-SB-06)	609434	89	40-160
5 1701180928 (400-SB-02)	609435	103	40-160
6 1701180933 (400-SB-02)	609436	97	40-160
7 1701180938 (400-SB-05)	609437	98	40-160
8 1701180949 (400-SB-05)	609438	91	40-160
9 1701180950 (400-SB-05)	609439	93	40-160
10 1701180951 (400-SB-05)	609440 MS	98	40-160

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

BLANK-29JAN17

Client: Navarro

Batch: M607-#732-T

Task Order: NA

Matrix: Soil

Sample Wt/Vol: 30.10 g

Project: 16988.01.103

Date Received: NA

Date Extracted: 01/29/17

Date Analyzed: 01/31/17

Date Reported: 01/31/17

Lab Sample ID: 610202

Lab File Name: A0130714.txt

Final Extraction Vol: 1000 uL

Dilution Factor: 1

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

LCS_29JAN17

Client: Navarro

Batch: M607-#732-T

Task Order: NA

Matrix: Soil

Sample Wt/Vol: 30.05 g

Project: 16988.01.103

Date Received: NA

Date Extracted: 01/29/17

Date Analyzed: 01/31/17

Date Reported: 01/31/17

Lab Sample ID: 610203 LCS

Lab File Name: A0130715.txt

Final Extraction Vol: 1000 uL

Dilution Factor: 1

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	10.65	
4164-28-7	N-Nitrodimethylamine	13.58	
314-40-9	Bromacil	18.10	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Blank Spike Recovery Report

Sample ID

LCS_29JAN17

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 610203 LCS

Batch: M607-#732-T

Date Received: NA

Blank ID: BLANK-29JAN17

Task Order: NA

Date Extracted: 01/29/17

Matrix: Soil

Date Analyzed: 01/31/17

Sample Wt/Vol: 30.05 g

Date Reported: 01/31/17

ANALYTE	Spike Added ng/g	Blank Conc ng/g	LCS Conc ng/g	% Recovery	QC % Recovery Limits
N-Nitrosodimethylamine	17	0	11	65	13 - 110
N-Nitrodimethylamine	17	0	14	82	30 - 150
Bromacil	17	0	18	106	40 - 190

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1701180951 (400-SB-05) MS

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 609440 MS

Batch: M607-#732-T

Date Received: 01/20/17

Lab File Name: A0130722.txt

Task Order: NA

Date Extracted: 01/29/17

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 01/31/17

Dilution Factor: 1

Sample Wt/Vol: 30.29 g

Date Reported: 01/31/17

Reporting Unit: ng/g

Compared Sample: 1701180949 (400-SB-05)

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Spike	Recovery	Recovery Limit
62-75-9	N-Nitrosodimethylamine	12.71	17.00	75%	13-110%
4164-28-7	N-Nitrodimethylamine	14.79	17.00	87%	30-150%
314-40-9	Bromacil	21.10	17.00	124%	40-190%

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute***Continuing Calibration Check Sheet***

SwRI Project #: 01.16988.01.103 Calibration Date: 01/30/17
Sponsor: Navarro Analytical Method: TAP-01-0408-031
SwRI Standard ID: 202-04-120408017 Std Concentration: 1 µg/mL
File ID #: A01307S1 Initial Calibration Date: 10/17/16

ANALYTE	Mean RRF	RRF	% Dif.
N-Nitrosodimethylamine	0.361	0.391	-8.4
N-Nitrodimethylamine	0.13	0.137	-5.5
N-Nitroso-di-n-propylamine-d14	0.127	0.123	3.1
Bromacil	1.161	1.078	7.2

Southwest Research Institute

Initial Calibration Data Sheet

SwRI Project #:	01.16988.01.103	Calibration Data:	10/17/16
Sponsor:	Navarro	Analytical Method:	TAP-01-0408-031
SwRI Standard ID:	202-04-120408017	Std Concentration:	0.01-10 µg/mL

ANALYTE	RRF 0.01	RRF 0.05	RRF 0.2	RRF1	RRF5	RRF10	Ave. RRF	RSD%
N-Nitrosodimethylamine	0.291	0.308	0.352	0.369	0.417	0.430	0.361	15.49
N-Nitrodimethylamine	0.109	0.115	0.128	0.134	0.147	0.148	0.13	12.44
N-Nitroso-di-n-propylamine-d14	0.114	0.111	0.124	0.127	1.143	0.145	0.127	11.03
Bromacil	1.435	1.048	1.072	1.081	1.150	1.177	1.161	12.35

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 170123-8
NAVARRO PO #: 15EC092B

EXTRACTION AND INJECTION LOG

SwRI Labs
 Client: Navarro
 Project: 16988.01.10X
 Case: 15EC092B

(E607S) SOIL Extraction By Soxhlet 3540C (Navarro)

010026 X36743

Sample Receipt: 59010
 TO#: 170123-8

DATE EXTRACTED	01/29/17	ADDITIONAL NOTES	Soxhlet extraction began at 4:00pm and ended the following day at 10:00am.
ANALYSTS INVOLVED	Hamed Edrisi (SU,SP,Conc,QT BD,FV) Christina Menn (DB)	EXTRACTION FLOWCHART	Xg >>> FV 1000uL DCM
SURROGATE SOL ID	203-01-120408017 @5.0ng/uL	REFERENCE BOOK &PAGE	16-0402-032 P102
MTX SPK SOL ID	201-01-120408017 @10ng/uL	TAP(S) USED	01-0402-152
EXTRACTS LOCATION	Tracked by LIMS (01/30/17 HE)		
CHEMICAL, BRAND & LOT#	Sodium Sulfate ID:04-0402-004p27J DCM Fisher Optima Lot#164214		
NOTES	Hamilton Co. Syringes: 100uL ID:462905(SURR) 50uL ID:462898(MS) Balance #61 was used.		

System ID	Type	Customer ID	SOLVENT VOL DCM (ML)	SAMPLE WT	SURROGATE SOL VOL
1		1701180923 (400-SB-06)	250	30.39 g	100 uL
2		1701180928 (400-SB-02)	250	30.21 g	100 uL
3		1701180933 (400-SB-02)	250	30.26 g	100 uL
4		1701180938 (400-SB-05)	250	30.14 g	100 uL
5		1701180949 (400-SB-05)	250	30.16 g	100 uL
6		1701180950 (400-SB-05)	250	30.12 g	100 uL
7	MS	1701180951 (400-SB-05)	250	30.29 g	100 uL
8		BLANK-29JAN17	250	30.10 g	100 uL
9		LCS_29JAN17	250	30.05 g	100 uL

System ID	Type	Customer ID	MTX SPK SOL VOL	FV DCM
1		1701180923 (400-SB-06)	0 uL	1000 uL
2		1701180928 (400-SB-02)	0 uL	1000 uL
3		1701180933 (400-SB-02)	0 uL	1000 uL
4		1701180938 (400-SB-05)	0 uL	1000 uL
5		1701180949 (400-SB-05)	0 uL	1000 uL
6		1701180950 (400-SB-05)	0 uL	1000 uL
7	MS	1701180951 (400-SB-05)	50 uL	1000 uL
8		BLANK-29JAN17	0 uL	1000 uL
9		LCS_29JAN17	50 uL	1000 uL

Page created Jan 27 2017 12:23PM by mlebron
 Book: EXTRACTION LAB, Volume: EXT-2017, Page: 40 (Section 1 of 1)
 Approved by CHRISTINA MENN on Jan 31 2017 11:22AM

Date Printed: 1/31/2017

TITLE

M-607

PROJECT NO. 16988.01.103 010027

BOOK NO. 10-0408-024

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Work continued from Page



Southwest Research Institute GC/MS Injection Log injlog

OPERATOR: GS SEQUENCE DATE: 01/30/17, 01/31/17 INSTRUMENT: Amidala
 COLUMN: Agilent 122-0732 DB-1701, 0.25mm * 30m * 0.25um
 CARRIER GAS: Helium SOLVENT: DCM
 METHOD FILE: MET_607C, MET_607C.M
 CLIENT NAME: NAVARRO PROJECT NUMBER: 16988.01.103
 SRR: 58987, 59008, 59023, 59010 METHOD: M-607 MATRIX: water & soil
 DATA PATH: C:\MSDCHEM\1\DATA\2016\A013017

OVEN PROGRAM

Initial temp: 40 'c (on) Maximum temp: 350 'c
 Initial time: 4.00 min Equilibration time: 0.50 min
 Ramps:

#	Rate	Final temp	Final time
1	15.00	150	0.00
2	25.00	270	10.00
3	0.0(off)		

Post temp: 270 'c
 Post time: 5.00 min
 Run time: 29.80 min

CS
 1/31/17

FILENAME	VIAL	DATE/TIME	METHOD	SAMPLE DESCRIPTION
A01307C1	100	01/30/17 15:42	MET_607C	SLUG
A01307C2	1	01/30/17 16:16	MET_607C	DCM
A01307S1	2	01/30/17 16:23	MET_607C	NDMA/DMN/BROMACIL STD 1NG/UL IS=1NG/UL
A0130701	3	01/30/17 16:57	MET_607C	BLANK_19JAN17 IS=0.2NG/L 609378
A0130702	4	01/30/17 17:31	MET_607C	LCS_19JAN17 IS=0.2NG/L 609379
A0130703	5	01/30/17 18:05	MET_607C	1701120822 (WELL M) IS=0.2NG/L 609223
A0130704	6	01/30/17 18:39	MET_607C	1701170832 (302 POND) IS=0.2NG/L 609224
A0130705	7	01/30/17 19:13	MET_607C	BLANK_24JAN17 IS=0.2NG/L 609579
A0130706	8	01/30/17 19:47	MET_607C	LCS_24JAN17 IS=0.2NG/L 609580
A0130707	9	01/30/17 20:22	MET_607C	1701170927A (400-A-151) IS=0.2NG/L 609414
A0130708	10	01/30/17 20:56	MET_607C	1701170928A (400-A-151) IS=0.2NG/L 609415
A0130709	11	01/30/17 21:30	MET_607C	1701180951B (300-F-175) IS=0.2NG/L 609416
A0130710	12	01/30/17 22:04	MET_607C	1701181101A (400-A-151) IS=0.2NG/L 609417
A0130711	13	01/30/17 22:38	MET_607C	1701190907B (100-G-223) IS=0.2NG/L 609531
A0130712	14	01/30/17 23:12	MET_607C	1701200836B (JP-3-689) IS=0.2NG/L 609532
A0130713	15	01/30/17 23:47	MET_607C	1701201027B (JP-3-509) IS=0.2NG/L 609533
A0130714	16	01/31/17 00:21	MET_607C	BLANK_29JAN17 IS=0.2NG/L 610202
A0130715	17	01/31/17 00:55	MET_607C	LCS_29JAN17 IS=0.2NG/L 610203
A0130716	18	01/31/17 01:29	MET_607C	1701180923 (400-SB-06) IS=0.2NG/L 609434
A0130717	19	01/31/17 02:04	MET_607C	1701180928 (400-SB-02) IS=0.2NG/L 609435
A0130718	20	01/31/17 02:38	MET_607C	1701180933 (400-SB-02) IS=0.2NG/L 609436
A0130719	21	01/31/17 03:12	MET_607C	1701180938 (400-SB-05) IS=0.2NG/L 609437
A0130720	22	01/31/17 03:47	MET_607C	1701180949 (400-SB-05) IS=0.2NG/L 609438
A0130721	23	01/31/17 04:21	MET_607C	1701180950 (400-SB-05) IS=0.2NG/L 609439
A0130722	24	01/31/17 04:55	MET_607C	1701180951 (400-SB-05) IS=0.2NG/L 609440MS

REVIEWED BY:
 DATE:

REVIEWED BY: M. Zuniga
 DATE: 01/31/17

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Work continued to Page

SIGNATURE

DATE

CS
 1/31/17

DISCLOSED TO AND UNDERSTOOD BY

DATE

WITNESS

DATE



January 19, 2017

Service Request No:R1700187

Mr. Tom Hall
NASA/WSTF/Navarro
P.O. Box 20
Las Cruces, NM 88004

Laboratory Results for: White Sands Test Facility

Dear Mr.Hall,

Enclosed are the results of the sample(s) submitted to our laboratory January 06, 2017
For your reference, these analyses have been assigned our service request number **R1700187**.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAP standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report. The measurement uncertainty of the results included in this report is within that expected when using the prescribed method(s) for analysis of these samples, and represented by Laboratory Control Sample control limits. Any events, such as QC failures, which may add to the uncertainty are explained in the report narrative.

Please contact me if you have any questions. My extension is 7472. You may also contact me via email at Janice.Jaeger@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Janice Jaeger
Project Manager

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ALS Group USA, Corp.
dba ALS Environmental



Narrative Documents

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com



Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request:R1700187
Date Received:1/6/17

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables, including results of QC samples analyzed from this delivery group. Analytical procedures performed by the lab are validated in accordance with NELAC standards. Any parameters that are not included in the lab’s NELAC accreditation are identified on a “Non-Certified Analytes” report in the Miscellaneous Forms Section of this report. Individual analytical results requiring further explanation are flagged with qualifiers and/or discussed below. The flags are explained in the Report Qualifiers and Definitions page in the Miscellaneous Forms section of this report.

Sample Receipt

Twelve soil samples were received for analysis at ALS Environmental on 01/06/2017. Any discrepancies noted upon initial sample inspection are noted on the cooler receipt and preservation form included in this data package. The samples were received in good condition and consistent with the accompanying chain of custody form. Samples are refrigerated at ≤6°C upon receipt at the lab except for aqueous samples designated for metals analyses, which are stored at room temperature.

Volatile Organic Analyses:

Method 8260c, 01/09/17: The lower control limit was exceeded for one or more analytes in the Continuing Calibration Verification (CCV). Since there were no detections of the analyte(s) in the associated field samples, the quantitation is not affected. The data quality was not significantly affected and no further corrective action was taken.

Metals Analyses:

Method/6010: The reporting limit is elevated for one or more analytes analyzed by ICP/AES. One or more samples contained an element that caused spectral interference that could not be corrected without diluting the samples.

General Chemistry Analyses:

No significant anomalies were noted with this analysis.

Sample Receiving Notes:

Method 8260C: soil samples included in this report were received in jars and not collected using one of the EPA method 5035A low level options. In accordance with the NYSDOH technical notice of October 2012 all results or reporting limits <200 ug/kg should be considered as estimated due to potential low bias.

One or more samples were subcontracted to another laboratory for testing. The certified analytical report from the subcontractor has been included in its entirety at the end of this report and includes the name and address of the subcontracted laboratory.

Approved by  Date 1/19/2017



SAMPLE DETECTION SUMMARY

CLIENT ID: 1701040830 400-SB-06	Lab ID: R1700187-001
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	94.0				Percent	ALS SOP
Acetone	5.9		3.0	5.3	ug/Kg	8260C

CLIENT ID: 1701040831 400-SB-06	Lab ID: R1700187-002
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	92.3				Percent	ALS SOP
Antimony, Total	1.2	BJ	0.5	6.4	mg/Kg	6010C
Arsenic, Total	5.5		0.3	1.1	mg/Kg	6010C
Barium, Total	335		0.2	2.1	mg/Kg	6010C
Beryllium, Total	0.42	B	0.02	0.32	mg/Kg	6010C
Cadmium, Total	0.70		0.04	0.54	mg/Kg	6010C
Chromium, Total	33.8		0.2	1.1	mg/Kg	6010C
Lead, Total	7.3		0.3	5.4	mg/Kg	6010C
Nickel, Total	8.8		0.2	4.3	mg/Kg	6010C
Thallium, Total	3.1		0.6	1.1	mg/Kg	6010C
Vanadium, Total	14.0		0.2	5.4	mg/Kg	6010C
Zinc, Total	40.2		0.2	2.1	mg/Kg	6010C

CLIENT ID: 1701040835 400-SB-01	Lab ID: R1700187-004
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	94.8				Percent	ALS SOP
Tetrachloroethene (PCE)	1.1	J	0.93	5.3	ug/Kg	8260C

CLIENT ID: 1701040836 400-SB-01	Lab ID: R1700187-005
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	94.2				Percent	ALS SOP
Antimony, Total	0.7	BJ	0.5	6.2	mg/Kg	6010C
Arsenic, Total	4.5		0.3	1.0	mg/Kg	6010C
Barium, Total	523		0.2	2.1	mg/Kg	6010C
Beryllium, Total	0.63	B	0.02	0.31	mg/Kg	6010C
Cadmium, Total	0.56		0.04	0.52	mg/Kg	6010C
Chromium, Total	10.5		0.2	1.0	mg/Kg	6010C
Lead, Total	7.4		0.3	5.2	mg/Kg	6010C
Nickel, Total	3.5	J	0.2	4.2	mg/Kg	6010C
Thallium, Total	1.0		0.6	1.0	mg/Kg	6010C
Vanadium, Total	22.7		0.2	5.2	mg/Kg	6010C
Zinc, Total	40.5		0.2	2.1	mg/Kg	6010C

CLIENT ID: 1701040840 400-SB-01	Lab ID: R1700187-007
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	80.5				Percent	ALS SOP
Acetone	3.8	J	3.5	6.2	ug/Kg	8260C
Tetrachloroethene (PCE)	4.3	J	1.1	6.2	ug/Kg	8260C



SAMPLE DETECTION SUMMARY

CLIENT ID: 1701040841 400-SB-01 **Lab ID: R1700187-008**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	85.4				Percent	ALS SOP
Acetone	4.8	J	3.3	5.9	ug/Kg	8260C
Tetrachloroethene (PCE)	1.8	J	1.1	5.9	ug/Kg	8260C

CLIENT ID: 1701040843 400-SB-01 **Lab ID: R1700187-009**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	87.1				Percent	ALS SOP
Antimony, Total	0.6	BJ	0.5	6.6	mg/Kg	6010C
Arsenic, Total	5.9		0.6	2.2	mg/Kg	6010C
Barium, Total	118		0.2	2.2	mg/Kg	6010C
Beryllium, Total	0.43	B	0.02	0.33	mg/Kg	6010C
Cadmium, Total	0.30	J	0.04	0.55	mg/Kg	6010C
Chromium, Total	16.1		0.2	1.1	mg/Kg	6010C
Lead, Total	6.4		0.4	5.5	mg/Kg	6010C
Nickel, Total	6.4		0.2	4.4	mg/Kg	6010C
Selenium, Total	1.0	J	0.7	1.1	mg/Kg	6010C
Vanadium, Total	18.9		0.2	5.5	mg/Kg	6010C
Zinc, Total	24.2		0.2	2.2	mg/Kg	6010C

CLIENT ID: 1701040844 400-SB-01 **Lab ID: R1700187-010**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	90.7				Percent	ALS SOP
Antimony, Total	0.7	BJ	0.5	6.4	mg/Kg	6010C
Arsenic, Total	4.3		0.3	1.1	mg/Kg	6010C
Barium, Total	117		0.2	2.1	mg/Kg	6010C
Beryllium, Total	0.44	B	0.02	0.32	mg/Kg	6010C
Cadmium, Total	0.41	J	0.04	0.53	mg/Kg	6010C
Chromium, Total	24.3		0.2	1.1	mg/Kg	6010C
Lead, Total	6.6		0.3	5.3	mg/Kg	6010C
Nickel, Total	9.2		0.2	4.2	mg/Kg	6010C
Selenium, Total	0.9	J	0.7	1.1	mg/Kg	6010C
Thallium, Total	1.5		0.6	1.1	mg/Kg	6010C
Vanadium, Total	15.4		0.2	5.3	mg/Kg	6010C
Zinc, Total	32.1		0.2	2.1	mg/Kg	6010C



Sample Receipt Information

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www.alsglobal.com

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request:R1700187

SAMPLE CROSS-REFERENCE

<u>SAMPLE #</u>	<u>CLIENT SAMPLE ID</u>	<u>DATE</u>	<u>TIME</u>
R1700187-001	1701040830 400-SB-06	1/4/2017	
R1700187-002	1701040831 400-SB-06	1/4/2017	
R1700187-003	1701040832 400-SB-06	1/4/2017	
R1700187-004	1701040835 400-SB-01	1/4/2017	
R1700187-005	1701040836 400-SB-01	1/4/2017	
R1700187-006	1701040837 400-SB-01	1/4/2017	
R1700187-007	1701040840 400-SB-01	1/4/2017	
R1700187-008	1701040841 400-SB-01	1/4/2017	
R1700187-009	1701040843 400-SB-01	1/4/2017	
R1700187-010	1701040844 400-SB-01	1/4/2017	
R1700187-011	1701040846 400-SB-01	1/4/2017	
R1700187-012	1701040847 400-SB-01	1/4/2017	

Laboratory PO #15EC007B		Analytical Requirements						Special Instructions
Return Address for Analytical Reports		# of Containers	Sample Type: Soil (S)	SW-846 Method 8260B 4 oz. Glass Jar, Ice	Total Metals SW-846-6010C and 7470A 4 oz. Glass Jar, Ice	TCLP Metals EPA Method 1311 incorporating SW-846-6010C and 7470A 8 oz. Glass Jar, Ice	Comments	
Sample No.	Sample Location							
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012 Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453								Please return coolers and reusable packaging materials as possible. Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall
170104 <i>0830</i>	400-SB-06	1	S	X			Container 7486	
170104 <i>0831</i>	400-SB-06	1	S		X		Container 7486	
170104 <i>0832</i>	400-SB-06	1	S			X	Container 7486	
Relinquished By: <i>[Signature]</i>		Date/Time: <i>01-04-2017</i>		Accepted By: <i>[Signature]</i>			Date/Time: <i>1/6 1020</i>	

R1700187 **5**
 NASA/WSTF/Navarro
 White Sands Test Facility


Laboratory PO #15EC007B		Analytical Requirements						Special Instructions
Return Address for Analytical Reports		# of Containers	Sample Type: Soil (S)	SW-846 Method 8260B 4 oz. Glass Jar, Ice	Total Metals SW-846-6010C and 7470A 4 oz. Glass Jar, Ice	TCLP Metals EPA Method 1311 incorporating SW-846-6010C and 7470A 8 oz. Glass Jar, Ice	Comments	
Sample No.	Sample Location							
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012								
Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453								
							Please return coolers and reusable packaging materials as possible. Return Address: NASA WSTF Environmental Department 12600 NASA Road. Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall	
170104	0835	400-SB-01	1	S	X		Container 7489	
170104	0836	400-SB-01	1	S		X	Container 7489	
170104	0837	400-SB-01	1	S			Container 7489	
170104	0840	400-SB-01	1	S	X		Container 7490	
170104	0841	400-SB-01	1	S	X		Container 7490	
170104	0842	400-SB-01	1	S	X		Matrix Spike for 170104 ; Container 7490	
170104	0843	400-SB-01	1	S		X	Container 7490	
170104	0844	400-SB-01	1	S		X	Container 7490	
170104	0845	400-SB-01	1	S		X	Matrix Spike for 170104 ; Container 7490	
170104	0846	400-SB-01	1	S			Container 7490	
170104	0847	400-SB-01	1	S		X	Container 7490	
170104	0848	400-SB-01	1	S		X	Matrix Spike for 170104 ; Container 7490	
Relinquished By: <i>[Signature]</i>		Date/Time: 01-04-2017		Accepted By: <i>[Signature]</i>			Date/Time: 1/6 10:20	





Cooler Receipt and Preservation Check Form

R1700187

NASA/WSTF/Navarro
White Sands Test Facility

5



Project/Client NASA Folder Number _____

Cooler received on 1/6 by: TS

COURIER: ALS UPS FEDEX VELOCITY CLIENT

1	Were Custody seals on outside of cooler?	<input checked="" type="radio"/> Y	<input type="radio"/> N
2	Custody papers properly completed (ink, signed)?	<input checked="" type="radio"/> Y	<input type="radio"/> N
3	Did all bottles arrive in good condition (unbroken)?	<input checked="" type="radio"/> Y	<input type="radio"/> N
4	Circle: <u>Wet Ice</u> Dry Ice Gel packs present?	<input checked="" type="radio"/> Y	<input type="radio"/> N

5a	Perchlorate samples have required headspace?	Y	N	<input checked="" type="radio"/> NA
5b	Did VOA vials, Alk, or Sulfide have sig* bubbles?	Y	N	<input checked="" type="radio"/> NA
6	Where did the bottles originate?	<u>ALS/ROC</u>	CLIENT	
7	Soil VOA received as:	<u>Bulk</u>	Encore	5035set <input checked="" type="radio"/> NA

8. Temperature Readings Date: 1/6 Time: 1025 ID: IR#7 IR#8 From: Temp Blank Sample Bottle

Observed Temp (°C)	<u>2.4</u>							
Correction Factor (°C)	<u>0</u>							
Corrected Temp (°C)	<u>2.9</u>							
Within 0-6°C?	<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N
If <0°C, were samples frozen?	<input type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N

If out of Temperature, note packing/ice condition: _____ Ice melted _____ Poorly Packed _____ Same Day Rule _____
& Client Approval to Run Samples: _____ Standing Approval _____ Client aware at drop-off _____ Client notified by: _____

All samples held in storage location: R-002 by TS on 1/6/17 at 1031
5035 samples placed in storage location: _____ by _____ on _____ at _____

Cooler Breakdown: Date: 1/6/17 Time: 1025 by: TS

- Were all bottle labels complete (i.e. analysis, preservation, etc.)? YES NO
- Did all bottle labels and tags agree with custody papers? YES NO
- Were correct containers used for the tests indicated? YES NO
- Were 5035 vials acceptable (no extra labels, not leaking)? YES NO
- Air Samples: Cassettes / Tubes Intact _____ Canisters Pressurized _____ Tedlar® Bags Inflated N/A

Explain any discrepancies:

pH	Reagent	Yes	No	Lot Received	Exp	Sample ID	Vol. Added	Lot Added	Final pH
≥12	NaOH								
≤2	HNO ₃								
≤2	H ₂ SO ₄								
<4	NaHSO ₄								
Residual Chlorine (-)	For CN Phenol and 522			If +, contact PM to add Na ₂ S ₂ O ₃ (CN), ascorbic (phenol).					
	Na ₂ S ₂ O ₃	-	-						
	ZnAcetate	-	-						
	HCl	**	**						

Yes=All samples OK

No=Samples were preserved at The lab as listed

PM OK to Adjust: _____

**Not to be tested before analysis – pH tested and recorded by VOAs on a separate worksheet

Bottle lot numbers: Client
Other Comments: _____

+ Sample 170104 GS46 + 170104 GS48 had cracked lids

CLRES	<u>BULK</u>
DO	FLDT
HPROD	HGFB
HTR	LL3541
PH	<u>SUB</u>
SO3	MARRS
ALS	REV

PC Secondary Review: MS/1/9/17

Significant air bubbles: VOA > 5-6 mm : WC > 1 in. diameter



Miscellaneous Forms

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REPORT QUALIFIERS AND DEFINITIONS

<p>U Analyte was analyzed for but not detected. The sample quantitation limit has been corrected for dilution and for percent moisture, unless otherwise noted in the case narrative.</p> <p>J Estimated value due to either being a Tentatively Identified Compound (TIC) or that the concentration is between the MRL and the MDL. Concentrations are not verified within the linear range of the calibration. For DoD: concentration >40% difference between two GC columns (pesticides/Aroclors).</p> <p>B Analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.</p> <p>E Inorganics- Concentration is estimated due to the serial dilution was outside control limits.</p> <p>E Organics- Concentration has exceeded the calibration range for that specific analysis.</p> <p>D Concentration is a result of a dilution, typically a secondary analysis of the sample due to exceeding the calibration range or that a surrogate has been diluted out of the sample and cannot be assessed.</p> <p>* Indicates that a quality control parameter has exceeded laboratory limits. Under the “Notes” column of the Form I, this qualifier denotes analysis was performed out of Holding Time.</p> <p>H Analysis was performed out of hold time for tests that have an “immediate” hold time criteria.</p> <p># Spike was diluted out.</p>	<p>+ Correlation coefficient for MSA is <0.995.</p> <p>N Inorganics- Matrix spike recovery was outside laboratory limits.</p> <p>N Organics- Presumptive evidence of a compound (reported as a TIC) based on the MS library search.</p> <p>S Concentration has been determined using Method of Standard Additions (MSA).</p> <p>W Post-Digestion Spike recovery is outside control limits and the sample absorbance is <50% of the spike absorbance.</p> <p>P Concentration >40% (25% for CLP) difference between the two GC columns.</p> <p>C Confirmed by GC/MS</p> <p>Q DoD reports: indicates a pesticide/Aroclor is not confirmed ($\geq 100\%$ Difference between two GC columns).</p> <p>X See Case Narrative for discussion.</p> <p>MRL Method Reporting Limit. Also known as: LOQ Limit of Quantitation (LOQ) The lowest concentration at which the method analyte may be reliably quantified under the method conditions.</p> <p>MDL Method Detection Limit. A statistical value derived from a study designed to provide the lowest concentration that will be detected 99% of the time. Values between the MDL and MRL are estimated (see J qualifier).</p> <p>LOD Limit of Detection. A value at or above the MDL which has been verified to be detectable.</p> <p>ND Non-Detect. Analyte was not detected at the concentration listed. Same as U qualifier.</p>
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Rochester Lab ID # for State Certifications¹

Connecticut ID # PH0556	Maine ID #NY0032	New Hampshire ID #
Delaware Accredited	Nebraska Accredited	294100 A/B
DoD ELAP #65817	New Jersey ID # NY004	Pennsylvania ID# 68-786
Florida ID # E87674	New York ID # 10145	Rhode Island ID # 158
Illinois ID #200047	North Carolina #676	Virginia #460167

¹ Analyses were performed according to our laboratory’s NELAP-approved quality assurance program and any applicable state or agency requirements. The test results meet requirements of the current NELAP/TNI standards or state or agency requirements, where applicable, except as noted in the case narrative. Since not all analyte/method/matrix combinations are offered for state/NELAC accreditation, this report may contain results which are not accredited. For a specific list of accredited analytes, contact the laboratory or go to <http://www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads/North-America-Downloads>

ALS Laboratory Group

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1700187

Sample Name: 1701040830 400-SB-06
Lab Code: R1700187-001
Sample Matrix: Soil

Date Collected: 01/4/17
Date Received: 01/6/17

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1701040831 400-SB-06
Lab Code: R1700187-002
Sample Matrix: Soil

Date Collected: 01/4/17
Date Received: 01/6/17

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By

Analyzed By
NMANSEN
CBURLESON
KWONG

Sample Name: 1701040835 400-SB-01
Lab Code: R1700187-004
Sample Matrix: Soil

Date Collected: 01/4/17
Date Received: 01/6/17

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1701040836 400-SB-01
Lab Code: R1700187-005
Sample Matrix: Soil

Date Collected: 01/4/17
Date Received: 01/6/17

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By

Analyzed By
NMANSEN
CBURLESON
KWONG

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1700187

Sample Name: 1701040840 400-SB-01
Lab Code: R1700187-007
Sample Matrix: Soil

Date Collected: 01/4/17
Date Received: 01/6/17

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1701040841 400-SB-01
Lab Code: R1700187-008
Sample Matrix: Soil

Date Collected: 01/4/17
Date Received: 01/6/17

Analysis Method
8260C
ALS SOP

Extracted/Digested By

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FNAEGLER
KWONG

Sample Name: 1701040843 400-SB-01
Lab Code: R1700187-009
Sample Matrix: Soil

Date Collected: 01/4/17
Date Received: 01/6/17

Analysis Method
6010C
7471B
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Extracted/Digested By

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CBURLESON
KWONG

Sample Name: 1701040844 400-SB-01
Lab Code: R1700187-010
Sample Matrix: Soil

Date Collected: 01/4/17
Date Received: 01/6/17

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By

Analyzed By
NMANSEN
CBURLESON
KWONG



INORGANIC PREPARATION METHODS

The preparation methods associated with this report are found in these tables unless discussed in the case narrative.

Water/Liquid Matrix

Analytical Method	Preparation Method
200.7	200.2
200.8	200.2
6010C	3005A/3010A
6020A	ILM05.3
9014 Cyanide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Acid Soluble	9030B
9056A Bomb (Halogens)	5050A
9066 Manual Distillation	9065
SM 4500-CN-E Residual Cyanide	SM 4500-CN-G
SM 4500-CN-E WAD Cyanide	SM 4500-CN-I

Solid/Soil/Non-Aqueous Matrix

Analytical Method	Preparation Method
6010C	3050B
6020A	3050B
6010C TCLP (1311) extract	3005A/3010A
6010 SPLP (1312) extract	3005A/3010A
7196A	3060A
7199	3060A
9056A Halogens/Halides	5050
300.0 Anions/ 350.1/ 353.2/ SM 2320B/ SM 5210B/ 9056A Anions	DI extraction

For analytical methods not listed, the preparation method is the same as the analytical method reference.



Sample Results

ALS Environmental—Rochester Laboratory
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Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com



Volatile Organic Compounds by GC/MS

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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701040830 400-SB-06
Lab Code: R1700187-001

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17 10:20

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1,1,1,2-Tetrachloroethane	ND U	5.3	0.89	1	01/09/17 13:29	NA	
1,1,1-Trichloroethane (TCA)	ND U	5.3	0.78	1	01/09/17 13:29	NA	
1,1,2,2-Tetrachloroethane	ND U	5.3	0.87	1	01/09/17 13:29	NA	
1,1,2-Trichloroethane	ND U	5.3	0.78	1	01/09/17 13:29	NA	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.3	1.4	1	01/09/17 13:29	NA	
1,1-Dichloroethene (1,1-DCE)	ND U	5.3	1.4	1	01/09/17 13:29	NA	
1,2,3-Trichloropropane	ND U	5.3	1.5	1	01/09/17 13:29	NA	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.3	2.0	1	01/09/17 13:29	NA	
1,2-Dibromoethane	ND U	5.3	1.3	1	01/09/17 13:29	NA	
1,2-Dichlorobenzene	ND U	5.3	0.65	1	01/09/17 13:29	NA	
1,2-Dichloroethane	ND U	5.3	0.65	1	01/09/17 13:29	NA	
1,2-Dichloropropane	ND U	5.3	1.1	1	01/09/17 13:29	NA	
1,3-Dichlorobenzene	ND U	5.3	0.68	1	01/09/17 13:29	NA	
1,4-Dioxane	ND U	110	21	1	01/09/17 13:29	NA	
2-Butanone (MEK)	ND U	5.3	2.5	1	01/09/17 13:29	NA	
2-Chloro-1,3-butadiene	ND U	5.3	1.7	1	01/09/17 13:29	NA	
2-Chloroethyl Vinyl Ether	ND U	5.3	1.9	1	01/09/17 13:29	NA	
Isobutyl Alcohol	ND U	110	25	1	01/09/17 13:29	NA	
Allyl Chloride	ND U	5.3	1.8	1	01/09/17 13:29	NA	
4-Methyl-2-pentanone	ND U	5.3	1.1	1	01/09/17 13:29	NA	
Acetone	5.9	5.3	3.0	1	01/09/17 13:29	NA	
Acetonitrile	ND U	27	18	1	01/09/17 13:29	NA	
Acrolein	ND U	27	3.8	1	01/09/17 13:29	NA	
Acrylonitrile	ND U	27	6.9	1	01/09/17 13:29	NA	
Benzene	ND U	5.3	0.31	1	01/09/17 13:29	NA	
Bromodichloromethane	ND U	5.3	0.65	1	01/09/17 13:29	NA	
Bromoform	ND U	5.3	0.99	1	01/09/17 13:29	NA	
Bromomethane	ND U	5.3	1.5	1	01/09/17 13:29	NA	
Carbon Disulfide	ND U	5.3	1.4	1	01/09/17 13:29	NA	
Carbon Tetrachloride	ND U	5.3	0.98	1	01/09/17 13:29	NA	
Chlorobenzene	ND U	5.3	0.31	1	01/09/17 13:29	NA	
Chloroethane	ND U	5.3	3.1	1	01/09/17 13:29	NA	
Chloroform	ND U	5.3	1.4	1	01/09/17 13:29	NA	
Chloromethane	ND U	5.3	0.43	1	01/09/17 13:29	NA	
Dibromochloromethane	ND U	5.3	0.78	1	01/09/17 13:29	NA	
Dibromomethane	ND U	5.3	0.68	1	01/09/17 13:29	NA	
Dichlorodifluoromethane (CFC 12)	ND U	5.3	2.1	1	01/09/17 13:29	NA	
Dichloromethane	ND U	5.3	0.61	1	01/09/17 13:29	NA	
Ethyl Methacrylate	ND U	5.3	0.80	1	01/09/17 13:29	NA	
Ethylbenzene	ND U	5.3	0.25	1	01/09/17 13:29	NA	
Iodomethane	ND U	11	1.2	1	01/09/17 13:29	NA	
Methacrylonitrile	ND U	5.3	1.7	1	01/09/17 13:29	NA	
Methyl Methacrylate	ND U	5.3	0.78	1	01/09/17 13:29	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701040830 400-SB-06
Lab Code: R1700187-001

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17 10:20
Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Naphthalene	ND U	5.3	0.55	1	01/09/17 13:29	NA	
Propionitrile	ND U	27	7.0	1	01/09/17 13:29	NA	
Tetrachloroethene (PCE)	ND U	5.3	0.94	1	01/09/17 13:29	NA	
Toluene	ND U	5.3	1.1	1	01/09/17 13:29	NA	
Trichloroethene (TCE)	ND U	5.3	1.1	1	01/09/17 13:29	NA	
Trichlorofluoromethane (CFC 11)	ND U	5.3	0.71	1	01/09/17 13:29	NA	
Vinyl Chloride	ND U	5.3	2.0	1	01/09/17 13:29	NA	
cis-1,3-Dichloropropene	ND U	5.3	0.96	1	01/09/17 13:29	NA	
m,p-Xylenes	ND U	11	1.2	1	01/09/17 13:29	NA	
o-Xylene	ND U	5.3	0.52	1	01/09/17 13:29	NA	
trans-1,2-Dichloroethene	ND U	5.3	0.92	1	01/09/17 13:29	NA	
trans-1,3-Dichloropropene	ND U	5.3	0.22	1	01/09/17 13:29	NA	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	97	51 - 136	01/09/17 13:29	
Dibromofluoromethane	93	63 - 138	01/09/17 13:29	
Toluene-d8	103	66 - 138	01/09/17 13:29	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	unknown	13.57	6.5	J

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701040835 400-SB-01
Lab Code: R1700187-004

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17 10:20
Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1,1,1,2-Tetrachloroethane	ND U	5.3	0.88	1	01/09/17 13:53	NA	
1,1,1-Trichloroethane (TCA)	ND U	5.3	0.78	1	01/09/17 13:53	NA	
1,1,2,2-Tetrachloroethane	ND U	5.3	0.86	1	01/09/17 13:53	NA	
1,1,2-Trichloroethane	ND U	5.3	0.78	1	01/09/17 13:53	NA	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.3	1.4	1	01/09/17 13:53	NA	
1,1-Dichloroethene (1,1-DCE)	ND U	5.3	1.4	1	01/09/17 13:53	NA	
1,2,3-Trichloropropane	ND U	5.3	1.4	1	01/09/17 13:53	NA	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.3	2.0	1	01/09/17 13:53	NA	
1,2-Dibromoethane	ND U	5.3	1.3	1	01/09/17 13:53	NA	
1,2-Dichlorobenzene	ND U	5.3	0.65	1	01/09/17 13:53	NA	
1,2-Dichloroethane	ND U	5.3	0.65	1	01/09/17 13:53	NA	
1,2-Dichloropropane	ND U	5.3	1.1	1	01/09/17 13:53	NA	
1,3-Dichlorobenzene	ND U	5.3	0.67	1	01/09/17 13:53	NA	
1,4-Dioxane	ND U	110	21	1	01/09/17 13:53	NA	
2-Butanone (MEK)	ND U	5.3	2.5	1	01/09/17 13:53	NA	
2-Chloro-1,3-butadiene	ND U	5.3	1.7	1	01/09/17 13:53	NA	
2-Chloroethyl Vinyl Ether	ND U	5.3	1.9	1	01/09/17 13:53	NA	
Isobutyl Alcohol	ND U	110	24	1	01/09/17 13:53	NA	
Allyl Chloride	ND U	5.3	1.8	1	01/09/17 13:53	NA	
4-Methyl-2-pentanone	ND U	5.3	1.1	1	01/09/17 13:53	NA	
Acetone	ND U	5.3	3.0	1	01/09/17 13:53	NA	
Acetonitrile	ND U	26	18	1	01/09/17 13:53	NA	
Acrolein	ND U	26	3.7	1	01/09/17 13:53	NA	
Acrylonitrile	ND U	26	6.9	1	01/09/17 13:53	NA	
Benzene	ND U	5.3	0.31	1	01/09/17 13:53	NA	
Bromodichloromethane	ND U	5.3	0.65	1	01/09/17 13:53	NA	
Bromoform	ND U	5.3	0.99	1	01/09/17 13:53	NA	
Bromomethane	ND U	5.3	1.5	1	01/09/17 13:53	NA	
Carbon Disulfide	ND U	5.3	1.4	1	01/09/17 13:53	NA	
Carbon Tetrachloride	ND U	5.3	0.98	1	01/09/17 13:53	NA	
Chlorobenzene	ND U	5.3	0.31	1	01/09/17 13:53	NA	
Chloroethane	ND U	5.3	3.1	1	01/09/17 13:53	NA	
Chloroform	ND U	5.3	1.4	1	01/09/17 13:53	NA	
Chloromethane	ND U	5.3	0.43	1	01/09/17 13:53	NA	
Dibromochloromethane	ND U	5.3	0.78	1	01/09/17 13:53	NA	
Dibromomethane	ND U	5.3	0.67	1	01/09/17 13:53	NA	
Dichlorodifluoromethane (CFC 12)	ND U	5.3	2.0	1	01/09/17 13:53	NA	
Dichloromethane	ND U	5.3	0.61	1	01/09/17 13:53	NA	
Ethyl Methacrylate	ND U	5.3	0.80	1	01/09/17 13:53	NA	
Ethylbenzene	ND U	5.3	0.25	1	01/09/17 13:53	NA	
Iodomethane	ND U	11	1.2	1	01/09/17 13:53	NA	
Methacrylonitrile	ND U	5.3	1.6	1	01/09/17 13:53	NA	
Methyl Methacrylate	ND U	5.3	0.78	1	01/09/17 13:53	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701040835 400-SB-01
Lab Code: R1700187-004

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17 10:20
Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Naphthalene	ND U	5.3	0.54	1	01/09/17 13:53	NA	
Propionitrile	ND U	26	6.9	1	01/09/17 13:53	NA	
Tetrachloroethene (PCE)	1.1 J	5.3	0.93	1	01/09/17 13:53	NA	
Toluene	ND U	5.3	1.1	1	01/09/17 13:53	NA	
Trichloroethene (TCE)	ND U	5.3	1.1	1	01/09/17 13:53	NA	
Trichlorofluoromethane (CFC 11)	ND U	5.3	0.70	1	01/09/17 13:53	NA	
Vinyl Chloride	ND U	5.3	2.0	1	01/09/17 13:53	NA	
cis-1,3-Dichloropropene	ND U	5.3	0.95	1	01/09/17 13:53	NA	
m,p-Xylenes	ND U	11	1.2	1	01/09/17 13:53	NA	
o-Xylene	ND U	5.3	0.51	1	01/09/17 13:53	NA	
trans-1,2-Dichloroethene	ND U	5.3	0.91	1	01/09/17 13:53	NA	
trans-1,3-Dichloropropene	ND U	5.3	0.22	1	01/09/17 13:53	NA	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	100	51 - 136	01/09/17 13:53	
Dibromofluoromethane	100	63 - 138	01/09/17 13:53	
Toluene-d8	102	66 - 138	01/09/17 13:53	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000124-19-6	Nonanal	14.38	6.6	JN

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17 10:20

Sample Name: 1701040840 400-SB-01
Lab Code: R1700187-007

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1,1,1,2-Tetrachloroethane	ND U	6.2	1.1	1	01/09/17 14:17	NA	
1,1,1-Trichloroethane (TCA)	ND U	6.2	0.91	1	01/09/17 14:17	NA	
1,1,2,2-Tetrachloroethane	ND U	6.2	1.1	1	01/09/17 14:17	NA	
1,1,2-Trichloroethane	ND U	6.2	0.91	1	01/09/17 14:17	NA	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	6.2	1.6	1	01/09/17 14:17	NA	
1,1-Dichloroethene (1,1-DCE)	ND U	6.2	1.6	1	01/09/17 14:17	NA	
1,2,3-Trichloropropane	ND U	6.2	1.7	1	01/09/17 14:17	NA	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	6.2	2.4	1	01/09/17 14:17	NA	
1,2-Dibromoethane	ND U	6.2	1.6	1	01/09/17 14:17	NA	
1,2-Dichlorobenzene	ND U	6.2	0.76	1	01/09/17 14:17	NA	
1,2-Dichloroethane	ND U	6.2	0.76	1	01/09/17 14:17	NA	
1,2-Dichloropropane	ND U	6.2	1.3	1	01/09/17 14:17	NA	
1,3-Dichlorobenzene	ND U	6.2	0.79	1	01/09/17 14:17	NA	
1,4-Dioxane	ND U	120	24	1	01/09/17 14:17	NA	
2-Butanone (MEK)	ND U	6.2	2.9	1	01/09/17 14:17	NA	
2-Chloro-1,3-butadiene	ND U	6.2	1.9	1	01/09/17 14:17	NA	
2-Chloroethyl Vinyl Ether	ND U	6.2	2.2	1	01/09/17 14:17	NA	
Isobutyl Alcohol	ND U	120	29	1	01/09/17 14:17	NA	
Allyl Chloride	ND U	6.2	2.1	1	01/09/17 14:17	NA	
4-Methyl-2-pentanone	ND U	6.2	1.3	1	01/09/17 14:17	NA	
Acetone	3.8 J	6.2	3.5	1	01/09/17 14:17	NA	
Acetonitrile	ND U	31	21	1	01/09/17 14:17	NA	
Acrolein	ND U	31	4.4	1	01/09/17 14:17	NA	
Acrylonitrile	ND U	31	8.1	1	01/09/17 14:17	NA	
Benzene	ND U	6.2	0.37	1	01/09/17 14:17	NA	
Bromodichloromethane	ND U	6.2	0.76	1	01/09/17 14:17	NA	
Bromoform	ND U	6.2	1.2	1	01/09/17 14:17	NA	
Bromomethane	ND U	6.2	1.8	1	01/09/17 14:17	NA	
Carbon Disulfide	ND U	6.2	1.6	1	01/09/17 14:17	NA	
Carbon Tetrachloride	ND U	6.2	1.2	1	01/09/17 14:17	NA	
Chlorobenzene	ND U	6.2	0.37	1	01/09/17 14:17	NA	
Chloroethane	ND U	6.2	3.6	1	01/09/17 14:17	NA	
Chloroform	ND U	6.2	1.6	1	01/09/17 14:17	NA	
Chloromethane	ND U	6.2	0.50	1	01/09/17 14:17	NA	
Dibromochloromethane	ND U	6.2	0.91	1	01/09/17 14:17	NA	
Dibromomethane	ND U	6.2	0.79	1	01/09/17 14:17	NA	
Dichlorodifluoromethane (CFC 12)	ND U	6.2	2.4	1	01/09/17 14:17	NA	
Dichloromethane	ND U	6.2	0.71	1	01/09/17 14:17	NA	
Ethyl Methacrylate	ND U	6.2	0.94	1	01/09/17 14:17	NA	
Ethylbenzene	ND U	6.2	0.29	1	01/09/17 14:17	NA	
Iodomethane	ND U	12	1.4	1	01/09/17 14:17	NA	
Methacrylonitrile	ND U	6.2	1.9	1	01/09/17 14:17	NA	
Methyl Methacrylate	ND U	6.2	0.91	1	01/09/17 14:17	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701040840 400-SB-01
Lab Code: R1700187-007

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17 10:20
Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Naphthalene	ND U	6.2	0.64	1	01/09/17 14:17	NA	
Propionitrile	ND U	31	8.1	1	01/09/17 14:17	NA	
Tetrachloroethene (PCE)	4.3 J	6.2	1.1	1	01/09/17 14:17	NA	
Toluene	ND U	6.2	1.3	1	01/09/17 14:17	NA	
Trichloroethene (TCE)	ND U	6.2	1.3	1	01/09/17 14:17	NA	
Trichlorofluoromethane (CFC 11)	ND U	6.2	0.82	1	01/09/17 14:17	NA	
Vinyl Chloride	ND U	6.2	2.3	1	01/09/17 14:17	NA	
cis-1,3-Dichloropropene	ND U	6.2	1.2	1	01/09/17 14:17	NA	
m,p-Xylenes	ND U	12	1.4	1	01/09/17 14:17	NA	
o-Xylene	ND U	6.2	0.60	1	01/09/17 14:17	NA	
trans-1,2-Dichloroethene	ND U	6.2	1.1	1	01/09/17 14:17	NA	
trans-1,3-Dichloropropene	ND U	6.2	0.25	1	01/09/17 14:17	NA	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	98	51 - 136	01/09/17 14:17	
Dibromofluoromethane	96	63 - 138	01/09/17 14:17	
Toluene-d8	101	66 - 138	01/09/17 14:17	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701040841 400-SB-01
Lab Code: R1700187-008

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17 10:20

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1,1,1,2-Tetrachloroethane	ND U	5.9	0.98	1	01/09/17 14:41	NA	
1,1,1-Trichloroethane (TCA)	ND U	5.9	0.86	1	01/09/17 14:41	NA	
1,1,2,2-Tetrachloroethane	ND U	5.9	0.95	1	01/09/17 14:41	NA	
1,1,2-Trichloroethane	ND U	5.9	0.86	1	01/09/17 14:41	NA	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.9	1.5	1	01/09/17 14:41	NA	
1,1-Dichloroethene (1,1-DCE)	ND U	5.9	1.5	1	01/09/17 14:41	NA	
1,2,3-Trichloropropane	ND U	5.9	1.6	1	01/09/17 14:41	NA	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.9	2.2	1	01/09/17 14:41	NA	
1,2-Dibromoethane	ND U	5.9	1.5	1	01/09/17 14:41	NA	
1,2-Dichlorobenzene	ND U	5.9	0.72	1	01/09/17 14:41	NA	
1,2-Dichloroethane	ND U	5.9	0.72	1	01/09/17 14:41	NA	
1,2-Dichloropropane	ND U	5.9	1.2	1	01/09/17 14:41	NA	
1,3-Dichlorobenzene	ND U	5.9	0.74	1	01/09/17 14:41	NA	
1,4-Dioxane	ND U	120	23	1	01/09/17 14:41	NA	
2-Butanone (MEK)	ND U	5.9	2.7	1	01/09/17 14:41	NA	
2-Chloro-1,3-butadiene	ND U	5.9	1.8	1	01/09/17 14:41	NA	
2-Chloroethyl Vinyl Ether	ND U	5.9	2.1	1	01/09/17 14:41	NA	
Isobutyl Alcohol	ND U	120	27	1	01/09/17 14:41	NA	
Allyl Chloride	ND U	5.9	2.0	1	01/09/17 14:41	NA	
4-Methyl-2-pentanone	ND U	5.9	1.2	1	01/09/17 14:41	NA	
Acetone	4.8 J	5.9	3.3	1	01/09/17 14:41	NA	
Acetonitrile	ND U	29	20	1	01/09/17 14:41	NA	
Acrolein	ND U	29	4.1	1	01/09/17 14:41	NA	
Acrylonitrile	ND U	29	7.6	1	01/09/17 14:41	NA	
Benzene	ND U	5.9	0.34	1	01/09/17 14:41	NA	
Bromodichloromethane	ND U	5.9	0.72	1	01/09/17 14:41	NA	
Bromoform	ND U	5.9	1.1	1	01/09/17 14:41	NA	
Bromomethane	ND U	5.9	1.7	1	01/09/17 14:41	NA	
Carbon Disulfide	ND U	5.9	1.5	1	01/09/17 14:41	NA	
Carbon Tetrachloride	ND U	5.9	1.1	1	01/09/17 14:41	NA	
Chlorobenzene	ND U	5.9	0.34	1	01/09/17 14:41	NA	
Chloroethane	ND U	5.9	3.4	1	01/09/17 14:41	NA	
Chloroform	ND U	5.9	1.5	1	01/09/17 14:41	NA	
Chloromethane	ND U	5.9	0.47	1	01/09/17 14:41	NA	
Dibromochloromethane	ND U	5.9	0.86	1	01/09/17 14:41	NA	
Dibromomethane	ND U	5.9	0.74	1	01/09/17 14:41	NA	
Dichlorodifluoromethane (CFC 12)	ND U	5.9	2.3	1	01/09/17 14:41	NA	
Dichloromethane	ND U	5.9	0.67	1	01/09/17 14:41	NA	
Ethyl Methacrylate	ND U	5.9	0.88	1	01/09/17 14:41	NA	
Ethylbenzene	ND U	5.9	0.27	1	01/09/17 14:41	NA	
Iodomethane	ND U	12	1.4	1	01/09/17 14:41	NA	
Methacrylonitrile	ND U	5.9	1.8	1	01/09/17 14:41	NA	
Methyl Methacrylate	ND U	5.9	0.86	1	01/09/17 14:41	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701040841 400-SB-01
Lab Code: R1700187-008

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17 10:20
Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Naphthalene	ND U	5.9	0.60	1	01/09/17 14:41	NA	
Propionitrile	ND U	29	7.7	1	01/09/17 14:41	NA	
Tetrachloroethene (PCE)	1.8 J	5.9	1.1	1	01/09/17 14:41	NA	
Toluene	ND U	5.9	1.2	1	01/09/17 14:41	NA	
Trichloroethene (TCE)	ND U	5.9	1.2	1	01/09/17 14:41	NA	
Trichlorofluoromethane (CFC 11)	ND U	5.9	0.78	1	01/09/17 14:41	NA	
Vinyl Chloride	ND U	5.9	2.2	1	01/09/17 14:41	NA	
cis-1,3-Dichloropropene	ND U	5.9	1.1	1	01/09/17 14:41	NA	
m,p-Xylenes	ND U	12	1.3	1	01/09/17 14:41	NA	
o-Xylene	ND U	5.9	0.57	1	01/09/17 14:41	NA	
trans-1,2-Dichloroethene	ND U	5.9	1.1	1	01/09/17 14:41	NA	
trans-1,3-Dichloropropene	ND U	5.9	0.24	1	01/09/17 14:41	NA	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	100	51 - 136	01/09/17 14:41	
Dibromofluoromethane	98	63 - 138	01/09/17 14:41	
Toluene-d8	101	66 - 138	01/09/17 14:41	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			



Metals

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701040831 400-SB-06
Lab Code: R1700187-002

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17 10:20
Basis: Dry

Antimony, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	1.2 BJ	mg/Kg	6.4	0.5	1	01/16/17 20:06	NA	
Arsenic, Total	6010C	5.5	mg/Kg	1.1	0.3	1	01/18/17 19:28	NA	
Barium, Total	6010C	335	mg/Kg	2.1	0.2	1	01/16/17 20:06	NA	
Beryllium, Total	6010C	0.42 B	mg/Kg	0.32	0.02	1	01/16/17 20:06	NA	
Cadmium, Total	6010C	0.70	mg/Kg	0.54	0.04	1	01/16/17 20:06	NA	
Chromium, Total	6010C	33.8	mg/Kg	1.1	0.2	1	01/16/17 20:06	NA	
Lead, Total	6010C	7.3	mg/Kg	5.4	0.3	1	01/16/17 20:06	NA	
Mercury, Total	7471B	ND U	mg/Kg	0.035	0.004	1	01/10/17 12:20	NA	
Nickel, Total	6010C	8.8	mg/Kg	4.3	0.2	1	01/16/17 20:06	NA	
Selenium, Total	6010C	ND U	mg/Kg	1.1	0.7	1	01/16/17 20:06	NA	
Silver, Total	6010C	ND U	mg/Kg	1.1	0.5	1	01/16/17 20:06	NA	
Thallium, Total	6010C	3.1	mg/Kg	1.1	0.6	1	01/17/17 18:06	NA	
Vanadium, Total	6010C	14.0	mg/Kg	5.4	0.2	1	01/16/17 20:06	NA	
Zinc, Total	6010C	40.2	mg/Kg	2.1	0.2	1	01/16/17 20:06	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701040836 400-SB-01
Lab Code: R1700187-005

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17 10:20

Basis: Dry

Antimony, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	0.7 BJ	mg/Kg	6.2	0.5	1	01/16/17 20:13	NA	
Arsenic, Total	6010C	4.5	mg/Kg	1.0	0.3	1	01/17/17 18:09	NA	
Barium, Total	6010C	523	mg/Kg	2.1	0.2	1	01/16/17 20:13	NA	
Beryllium, Total	6010C	0.63 B	mg/Kg	0.31	0.02	1	01/16/17 20:13	NA	
Cadmium, Total	6010C	0.56	mg/Kg	0.52	0.04	1	01/16/17 20:13	NA	
Chromium, Total	6010C	10.5	mg/Kg	1.0	0.2	1	01/16/17 20:13	NA	
Lead, Total	6010C	7.4	mg/Kg	5.2	0.3	1	01/16/17 20:13	NA	
Mercury, Total	7471B	ND U	mg/Kg	0.034	0.004	1	01/10/17 12:22	NA	
Nickel, Total	6010C	3.5 J	mg/Kg	4.2	0.2	1	01/16/17 20:13	NA	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.7	1	01/16/17 20:13	NA	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/16/17 20:13	NA	
Thallium, Total	6010C	1.0	mg/Kg	1.0	0.6	1	01/17/17 18:09	NA	
Vanadium, Total	6010C	22.7	mg/Kg	5.2	0.2	1	01/16/17 20:13	NA	
Zinc, Total	6010C	40.5	mg/Kg	2.1	0.2	1	01/16/17 20:13	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701040843 400-SB-01
Lab Code: R1700187-009

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17 10:20

Basis: Dry

Antimony, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	0.6 BJ	mg/Kg	6.6	0.5	1	01/16/17 20:19	NA	
Arsenic, Total	6010C	5.9	mg/Kg	2.2	0.6	2	01/18/17 19:31	NA	
Barium, Total	6010C	118	mg/Kg	2.2	0.2	1	01/16/17 20:19	NA	
Beryllium, Total	6010C	0.43 B	mg/Kg	0.33	0.02	1	01/16/17 20:19	NA	
Cadmium, Total	6010C	0.30 J	mg/Kg	0.55	0.04	1	01/16/17 20:19	NA	
Chromium, Total	6010C	16.1	mg/Kg	1.1	0.2	1	01/16/17 20:19	NA	
Lead, Total	6010C	6.4	mg/Kg	5.5	0.4	1	01/16/17 20:19	NA	
Mercury, Total	7471B	ND U	mg/Kg	0.035	0.004	1	01/10/17 12:23	NA	
Nickel, Total	6010C	6.4	mg/Kg	4.4	0.2	1	01/16/17 20:19	NA	
Selenium, Total	6010C	1.0 J	mg/Kg	1.1	0.7	1	01/16/17 20:19	NA	
Silver, Total	6010C	ND U	mg/Kg	1.1	0.5	1	01/16/17 20:19	NA	
Thallium, Total	6010C	ND U	mg/Kg	2.2	1.1	2	01/18/17 19:31	NA	
Vanadium, Total	6010C	18.9	mg/Kg	5.5	0.2	1	01/16/17 20:19	NA	
Zinc, Total	6010C	24.2	mg/Kg	2.2	0.2	1	01/16/17 20:19	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701040844 400-SB-01
Lab Code: R1700187-010

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17 10:20

Basis: Dry

Antimony, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	0.7 BJ	mg/Kg	6.4	0.5	1	01/16/17 21:02	NA	
Arsenic, Total	6010C	4.3	mg/Kg	1.1	0.3	1	01/17/17 18:35	NA	
Barium, Total	6010C	117	mg/Kg	2.1	0.2	1	01/16/17 21:02	NA	
Beryllium, Total	6010C	0.44 B	mg/Kg	0.32	0.02	1	01/16/17 21:02	NA	
Cadmium, Total	6010C	0.41 J	mg/Kg	0.53	0.04	1	01/16/17 21:02	NA	
Chromium, Total	6010C	24.3	mg/Kg	1.1	0.2	1	01/16/17 21:02	NA	
Lead, Total	6010C	6.6	mg/Kg	5.3	0.3	1	01/16/17 21:02	NA	
Mercury, Total	7471B	ND U	mg/Kg	0.034	0.004	1	01/10/17 12:28	NA	
Nickel, Total	6010C	9.2	mg/Kg	4.2	0.2	1	01/16/17 21:02	NA	
Selenium, Total	6010C	0.9 J	mg/Kg	1.1	0.7	1	01/16/17 21:02	NA	
Silver, Total	6010C	ND U	mg/Kg	1.1	0.5	1	01/16/17 21:02	NA	
Thallium, Total	6010C	1.5	mg/Kg	1.1	0.6	1	01/18/17 19:47	NA	
Vanadium, Total	6010C	15.4	mg/Kg	5.3	0.2	1	01/16/17 21:02	NA	
Zinc, Total	6010C	32.1	mg/Kg	2.1	0.2	1	01/16/17 21:02	NA	



General Chemistry

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701040830 400-SB-06
Lab Code: R1700187-001

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17 10:20
Basis: As Received

Total Solids

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Date Extracted</u>	<u>Q</u>
Total Solids	ALS SOP	94.0	Percent	-	1	01/06/17 16:40	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701040831 400-SB-06
Lab Code: R1700187-002

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17 10:20
Basis: As Received

Total Solids

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Date Extracted</u>	<u>Q</u>
Total Solids	ALS SOP	92.3	Percent	-	-	1	01/06/17 16:40	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701040835 400-SB-01
Lab Code: R1700187-004

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17 10:20
Basis: As Received

Total Solids

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Total Solids	ALS SOP	94.8	Percent	-	1	01/06/17 16:40	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701040836 400-SB-01
Lab Code: R1700187-005

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17 10:20
Basis: As Received

Total Solids

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Date Extracted</u>	<u>Q</u>
Total Solids	ALS SOP	94.2	Percent	-	-	1	01/06/17 16:40	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701040840 400-SB-01
Lab Code: R1700187-007

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17 10:20
Basis: As Received

Total Solids

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Date Extracted</u>	<u>Q</u>
Total Solids	ALS SOP	80.5	Percent	-	1	01/06/17 16:40	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701040841 400-SB-01
Lab Code: R1700187-008

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17 10:20
Basis: As Received

Total Solids

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Total Solids	ALS SOP	85.4	Percent	-	1	01/06/17 16:40	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701040843 400-SB-01
Lab Code: R1700187-009

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17 10:20
Basis: As Received

Total Solids

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Date Extracted</u>	<u>Q</u>
Total Solids	ALS SOP	87.1	Percent	-	-	1	01/06/17 16:40	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701040844 400-SB-01
Lab Code: R1700187-010

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17 10:20
Basis: As Received

Total Solids

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Date Extracted</u>	<u>Q</u>
Total Solids	ALS SOP	90.7	Percent	-	-	1	01/06/17 16:40	NA	



QC Summary Forms

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Volatile Organic Compounds by GC/MS

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1700187

SURROGATE RECOVERY SUMMARY
Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Extraction Method: EPA 5030C

Sample Name	Lab Code	4-Bromofluorobenzene	Dibromofluoromethane	Toluene-d8
		51 - 136	63 - 138	66 - 138
1701040830 400-SB-06	R1700187-001	97	93	103
1701040835 400-SB-01	R1700187-004	100	100	102
1701040840 400-SB-01	R1700187-007	98	96	101
1701040841 400-SB-01	R1700187-008	100	98	101
1701040840 400-SB-01 MS	RQ1700228-05	100	98	103
1701040840 400-SB-01 DMS	RQ1700228-06	99	101	103

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17
Date Analyzed: 01/9/17
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1701040840 400-SB-01
Lab Code: R1700187-007
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1700228-05			Duplicate Matrix Spike RQ1700228-06			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
1,1,1,2-Tetrachloroethane	ND U	46.5	62.1	75	47.6	62.1	77	52-133	3	30
1,1,1-Trichloroethane (TCA)	ND U	51.9	62.1	83	53.5	62.1	86	51-132	4	30
1,1,2,2-Tetrachloroethane	ND U	44.0	62.1	71	46.4	62.1	75	53-134	5	30
1,1,2-Trichloroethane	ND U	48.2	62.1	78	49.2	62.1	79	62-126	1	30
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	51.5	62.1	83	53.5	62.1	86	45-136	4	30
1,1-Dichloroethene (1,1-DCE)	ND U	55.6	62.1	89	56.4	62.1	91	61-139	2	30
1,2,3-Trichloropropane	ND U	47.4	62.1	76	47.9	62.1	77	22-167	1	30
1,2-Dibromo-3-chloropropane (DBCP)	ND U	45.4	62.1	73	48.9	62.1	79	27-163	8	30
1,2-Dibromoethane	ND U	50.8	62.1	82	51.9	62.1	84	52-137	2	30
1,2-Dichlorobenzene	ND U	43.4	62.1	70	43.9	62.1	71	22-156	1	30
1,2-Dichloroethane	ND U	46.3	62.1	75	47.2	62.1	76	59-125	1	30
1,2-Dichloropropane	ND U	48.3	62.1	78	48.9	62.1	79	67-126	1	30
1,3-Dichlorobenzene	ND U	44.1	62.1	71	44.7	62.1	72	29-146	1	30
1,4-Dioxane	ND U	1220	1240	98	1270	1240	102	50-148	4	30
2-Butanone (MEK)	ND U	38.8	62.1	62	45.0	62.1	73	43-134	16	30
2-Chloro-1,3-butadiene	ND U	43.0	62.1	69	43.9	62.1	71	45-134	3	30
2-Chloroethyl Vinyl Ether	ND U	50.4	62.1	81	51.5	62.1	83	37-150	2	30
Isobutyl Alcohol	ND U	850	1240	68	942	1240	76	39-146	11	30
Allyl Chloride	ND U	49.3	62.1	79	53.1	62.1	85	34-135	7	30
4-Methyl-2-pentanone	ND U	47.5	62.1	77	50.0	62.1	80	47-145	4	30
Acetone	3.8 J	138	62.1	216	155	62.1	243	11-183	12	30
Acetonitrile	ND U	198	311	64	224	311	72	28-146	12	30
Acrolein	ND U	10.9	124	9	14.7 J	124	12	10-172	29	30
Acrylonitrile	ND U	226	311	73	247	311	80	46-139	9	30
Benzene	ND U	52.4	62.1	84	52.7	62.1	85	63-126	1	30
Bromodichloromethane	ND U	44.9	62.1	72	46.1	62.1	74	47-141	3	30
Bromoform	ND U	45.4	62.1	73	47.5	62.1	76	26-157	4	30
Bromomethane	ND U	60.5	62.1	97	57.5	62.1	93	10-137	4	30
Carbon Disulfide	ND U	41.3	62.1	66	43.5	62.1	70	35-135	6	30
Carbon Tetrachloride	ND U	50.0	62.1	80	50.6	62.1	82	46-137	2	30
Chlorobenzene	ND U	50.0	62.1	80	49.7	62.1	80	51-132	<1	30
Chloroethane	ND U	56.1	62.1	90	54.4	62.1	88	45-132	2	30
Chloroform	ND U	50.2	62.1	81	50.8	62.1	82	61-124	1	30
Chloromethane	ND U	49.4	62.1	80	52.8	62.1	85	50-136	6	30
Dibromochloromethane	ND U	47.3	62.1	76	48.3	62.1	78	40-146	3	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17
Date Analyzed: 01/9/17
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1701040840 400-SB-01
Lab Code: R1700187-007
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1700228-05			Duplicate Matrix Spike RQ1700228-06			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Dibromomethane	ND U	48.7	62.1	78	50.5	62.1	81	61-122	4	30
Dichlorodifluoromethane (CFC 12)	ND U	51.6	62.1	83	53.2	62.1	86	44-138	4	30
Dichloromethane	ND U	50.3	62.1	81	51.4	62.1	83	64-120	2	30
Ethyl Methacrylate	ND U	44.7	62.1	72	48.3	62.1	78	17-166	8	30
Ethylbenzene	ND U	50.9	62.1	82	50.0	62.1	81	44-131	1	30
Iodomethane	ND U	30.4	62.1	49	42.3	62.1	68	10-160	32	30
Methacrylonitrile	ND U	48.5	62.1	78	51.8	62.1	83	44-149	6	30
Methyl Methacrylate	ND U	51.7	62.1	83	53.5	62.1	86	41-162	4	30
Naphthalene	ND U	38.7	62.1	62	40.1	62.1	65	10-187	5	30
Propionitrile	ND U	221	311	71	250	311	80	46-144	12	30
Tetrachloroethene (PCE)	4.3 J	57.0	62.1	85	57.7	62.1	86	45-141	1	30
Toluene	ND U	51.0	62.1	82	50.1	62.1	81	50-140	1	30
Trichloroethene (TCE)	ND U	56.1	62.1	90	55.4	62.1	89	54-136	1	30
Trichlorofluoromethane (CFC 11)	ND U	59.6	62.1	96	55.7	62.1	90	47-129	6	30
Vinyl Chloride	ND U	58.4	62.1	94	60.7	62.1	98	53-128	4	30
cis-1,3-Dichloropropene	ND U	46.1	62.1	74	46.5	62.1	75	31-150	1	30
m,p-Xylenes	ND U	103	124	83	101	124	81	45-141	2	30
o-Xylene	ND U	49.4	62.1	79	48.9	62.1	79	46-139	<1	30
trans-1,2-Dichloroethene	ND U	54.2	62.1	87	55.0	62.1	89	52-128	2	30
trans-1,3-Dichloropropene	ND U	45.8	62.1	74	46.6	62.1	75	23-160	1	30

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Metals

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Analytical Report

Client:
Project:
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: RQ1700375-01

Service Request: RQ1700375
Date Collected: NA
Date Received: NA
Basis: Dry

Antimony, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	0.6 J	mg/Kg	6.0	0.4	1	01/16/17 19:48	NA	
Arsenic, Total	6010C	ND U	mg/Kg	1.0	0.3	1	01/17/17 17:56	NA	
Barium, Total	6010C	0.2 J	mg/Kg	2.0	0.2	1	01/16/17 19:48	NA	
Beryllium, Total	6010C	0.07 J	mg/Kg	0.30	0.02	1	01/16/17 19:48	NA	
Chromium, Total	6010C	0.3 J	mg/Kg	1.0	0.2	1	01/16/17 19:48	NA	
Lead, Total	6010C	ND U	mg/Kg	5.0	0.3	1	01/16/17 19:48	NA	
Nickel, Total	6010C	0.2 J	mg/Kg	4.0	0.2	1	01/16/17 19:48	NA	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/16/17 19:48	NA	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/16/17 19:48	NA	
Thallium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/17/17 17:56	NA	
Vanadium, Total	6010C	ND U	mg/Kg	5.0	0.2	1	01/16/17 19:48	NA	
Zinc, Total	6010C	ND U	mg/Kg	2.0	0.2	1	01/16/17 19:48	NA	

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17
Date Analyzed: 01/10/17
Date Extracted: NA

Duplicate Matrix Spike Summary
Mercury in Solid or Semisolid Waste (Manual CVAA)

Sample Name: 1701040843 400-SB-01
Lab Code: R1700187-009
Analysis Method: 7471B
Prep Method: Method

Units: mg/Kg
Basis: Dry

Analyte Name	Sample Result	Result	Matrix Spike RQ1700192-03		Duplicate Matrix Spike RQ1700192-04		% Rec Limits	RPD	RPD Limit	
			Spike Amount	% Rec	Result	Spike Amount				% Rec
Mercury, Total	ND U	0.193	0.185	104	0.197	0.188	105	75-125	2	35

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ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request:R1700187
Date Collected:01/04/17
Date Received:01/06/17
Date Analyzed:01/16/17 - 01/18/17

Duplicate Matrix Spike Summary
Silver, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Sample Name: 1701040843 400-SB-01 **Units:**mg/Kg
Lab Code: R1700187-009 **Basis:**Dry

Matrix Spike
RQ1700375-03

Duplicate Matrix Spike
RQ1700375-04

Analyte Name	Method	Sample Result	Result	Matrix Spike		Duplicate Matrix Spike		% Rec	% Rec Limits	RPD	RPD Limit
				Amount	% Rec	Result	Amount				
Silver, Total	6010C	ND U	4.7	5.6	83	4.9	5.7	86	75-125	6	20
Arsenic, Total	6010C	5.9	12.2	4.5	139	9.8	4.6	84	75-125	22	20
Barium, Total	6010C	118	297	225	80	323	230	89	75-125	8	20
Beryllium, Total	6010C	0.43 B	5.23	5.63	85	5.40	5.74	87	75-125	3	20
Cadmium, Total	6010C	0.30 J	4.82	5.63	80	4.92	5.74	80	75-125	2	20
Chromium, Total	6010C	16.1	30.4	22.5	64	34.7	23.0	81	75-125	13	20
Nickel, Total	6010C	6.4	50.3	56.3	78	53.4	57.4	82	75-125	6	20
Lead, Total	6010C	6.4	52.4	56.3	82	53.1	57.4	81	75-125	1	20
Antimony, Total	6010C	0.6 BJ	44.9	56.3	79	46.0	57.4	79	75-125	3	20
Selenium, Total	6010C	1.0 J	97.2	114	85	98.7	116	84	75-125	2	20
Thallium, Total	6010C	ND U	225	225	100	230	230	100	75-125	2	20
Vanadium, Total	6010C	18.9	77.4	56.3	104	72.1	57.4	93	75-125	7	20
Zinc, Total	6010C	24.2	66.3	56.3	75	70.8	57.4	81	75-125	7	20

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ALS Group USA, Corp.
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QA/QC Report

Client:
Project:
Sample Matrix: Soil

Service Request: RQ1700375
Date Analyzed: 01/16/17 - 01/17/17

Lab Control Sample Summary
Antimony, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Units:mg/Kg
Basis:Dry

Lab Control Sample
RQ1700375-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Antimony, Total	6010C	43.7	50.0	87	80-120
Arsenic, Total	6010C	3.5	4.0	87	80-120
Barium, Total	6010C	189	200	95	80-120
Beryllium, Total	6010C	4.25	5.00	85	80-120
Chromium, Total	6010C	19.4	20.0	97	80-120
Lead, Total	6010C	45.5	50.0	91	80-120
Nickel, Total	6010C	45.8	50.0	92	80-120
Selenium, Total	6010C	82.5	101	82	80-120
Silver, Total	6010C	4.47	5.0	89	80-120
Thallium, Total	6010C	176	200	88	80-120
Vanadium, Total	6010C	46.2	50.0	92	80-120
Zinc, Total	6010C	43.2	50.0	86	80-120



General Chemistry

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QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17
Date Analyzed: 01/06/17

Replicate Sample Summary

Total Solids

Sample Name: 1701040840 400-SB-01
Lab Code: R1700187-007

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>Sample Result</u>	<u>Duplicate Sample RQ1700173-01 Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	80.5	80.2	80.3	<1	20

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ALS Group USA, Corp.

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QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1700187
Date Collected: 01/04/17
Date Received: 01/06/17
Date Analyzed: 01/06/17

Replicate Sample Summary

Total Solids

Sample Name: 1701040843 400-SB-01
Lab Code: R1700187-009

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>MDL</u>	<u>Sample Result</u>	<u>Duplicate Sample RQ1700173-02 Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	-	87.1	88.3	87.7	1	20

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Subcontracted Analytical Parameters

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January 18, 2017

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Certificate of Analysis

Project Name:	Metals without J values	Workorder:	2200796
Purchase Order:	58R1700187	Workorder ID:	R1700187

Dear Reports Invoices:

Enclosed are the analytical results for samples received by the laboratory on Tuesday, January 10, 2017.

The ALS Environmental laboratory in Middletown, Pennsylvania is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Mr. Brad W Kintzer (Project Coordinator) at (717) 944-5541.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state requirements. The test results meet requirements of the current NELAP standards or state requirements, where applicable. For a specific list of accredited analytes, refer to the certifications section of the ALS website at www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads.

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ALS Spring City: 10 Riverside Drive, Spring City, PA 19475 610-948-4903

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.


Mr. Brad W Kintzer
Project Coordinator

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SAMPLE SUMMARY

Workorder: 2200796 R1700187

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
2200796001	1701040832 400-SB-06	Solid	1/4/2017 00:00	1/10/2017 09:20	Collected by Client
2200796002	1701040837 400-SB-01	Solid	1/4/2017 00:00	1/10/2017 09:20	Collected by Client
2200796003	1701040846 400-SB-01	Solid	1/4/2017 00:00	1/10/2017 09:20	Collected by Client
2200796004	1701040847 400-SB-01	Solid	1/4/2017 00:00	1/10/2017 09:20	Collected by Client

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Mexico: Monterrey

SAMPLE SUMMARY

Workorder: 2200796 R1700187

Notes

- Samples collected by ALS personnel are done so in accordance with the procedures set forth in the ALS Field Sampling Plan (20 - Field Services Sampling Plan).
- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
- The Chain of Custody document is included as part of this report.
- All Library Search analytes should be regarded as tentative identifications based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.
- Parameters identified as "analyze immediately" require analysis within 15 minutes of collection. Any "analyze immediately" parameters not listed under the header "Field Parameters" are performed in the laboratory and are therefore analyzed out of hold time.
- Method references listed on this report beginning with the prefix "S" followed by a method number (such as S2310B-97) refer to methods from "Standard Methods for the Examination of Water and Wastewater".
- For microbiological analyses, the "Prepared" value is the date/time into the incubator and the "Analyzed" value is the date/time out the incubator.

Standard Acronyms/Flags

J	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
N	Indicates presumptive evidence of the presence of a compound
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference
LOD	DoD Limit of Detection
LOQ	DoD Limit of Quantitation
DL	DoD Detection Limit
I	Indicates reported value is greater than or equal to the Method Detection Limit (MDL) but less than the Report Detection Limit (RDL)
(S)	Surrogate Compound
NC	Not Calculated
*	Result outside of QC limits

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ANALYTICAL RESULTS

Workorder: 2200796 R1700187

 Lab ID: **2200796001**
 Sample ID: **1701040832 400-SB-06**

 Date Collected: 1/4/2017 00:00 Matrix: Solid
 Date Received: 1/10/2017 09:20

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	4.4		%	0.1	0.01	S2540G-11		1/17/17 07:17	VKB	
Total Solids	95.6		%	0.1	0.01	S2540G-11		1/17/17 07:17	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/16/17 09:45 TRR	1/16/17 13:18	SRT	A2
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/16/17 09:45 TRR	1/16/17 13:18	SRT	A2
Barium, Total	2.8		mg/L	2.8	0.94	SW846 6010C	1/16/17 09:45 TRR	1/16/17 13:18	SRT	A2
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/16/17 09:45 TRR	1/16/17 13:18	SRT	A2
Cadmium, Total	ND		mg/L	0.011	0.0037	SW846 6010C	1/16/17 09:45 TRR	1/16/17 13:18	SRT	A2
Chromium, Total	0.013J	J	mg/L	0.028	0.010	SW846 6010C	1/16/17 09:45 TRR	1/16/17 13:18	SRT	A2
Lead, Total	0.039		mg/L	0.033	0.011	SW846 6010C	1/16/17 09:45 TRR	1/16/17 13:18	SRT	A2
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/16/17 08:50 AXC	1/16/17 11:58	MNP	A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/16/17 09:45 TRR	1/16/17 13:18	SRT	A2
Selenium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/16/17 09:45 TRR	1/16/17 13:18	SRT	A2
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/16/17 09:45 TRR	1/16/17 13:18	SRT	A2
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/16/17 09:45 TRR	1/16/17 13:18	SRT	A2
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/16/17 09:45 TRR	1/16/17 13:18	SRT	A2
Zinc, Total	0.092J	J	mg/L	0.11	0.037	SW846 6010C	1/16/17 09:45 TRR	1/16/17 13:18	SRT	A2



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ANALYTICAL RESULTS

Workorder: 2200796 R1700187

 Lab ID: **2200796002**
 Sample ID: **1701040837 400-SB-01**

 Date Collected: 1/4/2017 00:00 Matrix: Solid
 Date Received: 1/10/2017 09:20

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	4.6		%	0.1	0.01	S2540G-11		1/17/17 07:17	VKB	
Total Solids	95.4		%	0.1	0.01	S2540G-11		1/17/17 07:17	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:27	SRT	A2
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:27	SRT	A2
Barium, Total	3.4		mg/L	2.8	0.94	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:27	SRT	A2
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:27	SRT	A2
Cadmium, Total	ND		mg/L	0.011	0.0037	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:27	SRT	A2
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:27	SRT	A2
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:27	SRT	A2
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/12/17 23:30 AXC	1/13/17 11:19	MNP	A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:27	SRT	A2
Selenium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:27	SRT	A2
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:27	SRT	A2
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:27	SRT	A2
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:27	SRT	A2
Zinc, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:27	SRT	A2


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ANALYTICAL RESULTS

Workorder: 2200796 R1700187

 Lab ID: **2200796003**
 Sample ID: **1701040846 400-SB-01**

 Date Collected: 1/4/2017 00:00 Matrix: Solid
 Date Received: 1/10/2017 09:20

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	11.5		%	0.1	0.01	S2540G-11		1/17/17 07:17	VKB	
Total Solids	88.5		%	0.1	0.01	S2540G-11		1/17/17 07:17	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:31	SRT	A2
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:31	SRT	A2
Barium, Total	1.1J	J	mg/L	2.8	0.94	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:31	SRT	A2
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:31	SRT	A2
Cadmium, Total	ND		mg/L	0.011	0.0037	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:31	SRT	A2
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:31	SRT	A2
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:31	SRT	A2
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/12/17 23:30 AXC	1/13/17 11:20	MNP	A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:31	SRT	A2
Selenium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:31	SRT	A2
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:31	SRT	A2
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:31	SRT	A2
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:31	SRT	A2
Zinc, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:31	SRT	A2



Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2200796 R1700187

 Lab ID: **2200796004**
 Sample ID: **1701040847 400-SB-01**

 Date Collected: 1/4/2017 00:00 Matrix: Solid
 Date Received: 1/10/2017 09:20

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	11.0		%	0.1	0.01	S2540G-11		1/17/17 07:17	VKB	
Total Solids	89.0		%	0.1	0.01	S2540G-11		1/17/17 07:17	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:42	SRT	A2
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:42	SRT	A2
Barium, Total	ND		mg/L	2.8	0.94	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:42	SRT	A2
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:42	SRT	A2
Cadmium, Total	ND		mg/L	0.011	0.0037	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:42	SRT	A2
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:42	SRT	A2
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:42	SRT	A2
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/12/17 23:30 AXC	1/13/17 11:26	MNP	A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:42	SRT	A2
Selenium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:42	SRT	A2
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:42	SRT	A2
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:42	SRT	A2
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:42	SRT	A2
Zinc, Total	0.12		mg/L	0.11	0.037	SW846 6010C	1/13/17 11:16 TRR	1/16/17 09:42	SRT	A2



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QUALITY CONTROL DATA

Workorder: 2200796 R1700187

QC Batch: MDIG/61948 **Analysis Method:** SW846 7470A
QC Batch Method: SW846 7470A
Associated Lab Samples: 2200796002, 2200796003, 2200796004

METHOD BLANK: 2468860

Parameter	Blank Result	Units	Reporting Limit
Mercury, Total	ND	mg/L	0.0020

LABORATORY CONTROL SAMPLE: 2468861

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Mercury, Total	89.5	mg/L	.002	0.0018J	85 - 115

MATRIX SPIKE: 2468862 DUPLICATE: 2468863 ORIGINAL: 2200596001

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Mercury, Total	.00009	mg/L	.005	.00489	.00475	95.9	93.1	70 - 130	2.9	20

MATRIX SPIKE: 2468864 DUPLICATE: 2468865 ORIGINAL: 2200796003

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Mercury, Total	.00005	mg/L	.005	.00497	.0049	98.5	97.1	70 - 130	1.42	20

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QUALITY CONTROL DATA

Workorder: 2200796 R1700187

QC Batch: MDIG/61959 **Analysis Method:** SW846 6010C

QC Batch Method: SW846 3015

Associated Lab Samples: 2200796002, 2200796003, 2200796004

METHOD BLANK: 2469291

Parameter	Blank Result	Units	Reporting Limit
Antimony, Total	ND	mg/L	0.030
Arsenic, Total	ND	mg/L	0.028
Barium, Total	ND	mg/L	0.56
Beryllium, Total	ND	mg/L	0.0044
Cadmium, Total	ND	mg/L	0.0022
Chromium, Total	ND	mg/L	0.0056
Lead, Total	ND	mg/L	0.0067
Nickel, Total	ND	mg/L	0.022
Selenium, Total	ND	mg/L	0.022
Silver, Total	ND	mg/L	0.0044
Thallium, Total	ND	mg/L	0.022
Vanadium, Total	ND	mg/L	0.0056
Zinc, Total	ND	mg/L	0.022

LABORATORY CONTROL SAMPLE: 2469292

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Antimony, Total	99.8	mg/L	.22	0.22	80 - 120
Arsenic, Total	102	mg/L	.11	0.11	80 - 120
Barium, Total	104	mg/L	1.1	1.2	80 - 120
Beryllium, Total	101	mg/L	.22	0.22	80 - 120
Cadmium, Total	101	mg/L	.11	0.11	80 - 120
Chromium, Total	104	mg/L	.11	0.12	80 - 120
Lead, Total	105	mg/L	.11	0.12	80 - 120
Nickel, Total	103	mg/L	1.1	1.1	80 - 120
Selenium, Total	98.7	mg/L	1.1	1.1	80 - 120
Silver, Total	105	mg/L	.11	0.12	80 - 120
Thallium, Total	103	mg/L	.11	0.11	80 - 120
Vanadium, Total	103	mg/L	.056	0.057	80 - 120
Zinc, Total	103	mg/L	.56	0.57	80 - 120

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QUALITY CONTROL DATA

Workorder: 2200796 R1700187

MATRIX SPIKE: 2469293 DUPLICATE: 2469294 ORIGINAL: 2200796003

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Arsenic, Total	.01833	mg/L	5	6.11105	5.99994	122	120	50 - 150	1.83	20
Barium, Total	1.07888	mg/L	10	12.53876	12.39988	115	113	50 - 150	1.11	20
Cadmium, Total	.00167	mg/L	1	1.19665	1.17943	119	118	50 - 150	1.45	20
Chromium, Total	0	mg/L	5	5.45717	5.41272	109	108	50 - 150	.82	20
Lead, Total	.00333	mg/L	5	5.7055	5.62217	114	112	50 - 150	1.47	20
Selenium, Total	.01722	mg/L	1	1.22777	1.1911	121	117	50 - 150	3.03	20
Silver, Total	0	mg/L	1	.61222	.65222	61.2	65.2	50 - 150	6.33	20

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QUALITY CONTROL DATA

Workorder: 2200796 R1700187

QC Batch: MDIG/61966 **Analysis Method:** SW846 7470A
QC Batch Method: SW846 7470A
Associated Lab Samples: 2200796001

METHOD BLANK: 2469955

Parameter	Blank Result	Units	Reporting Limit
Mercury, Total	ND	mg/L	0.0020

LABORATORY CONTROL SAMPLE: 2469956

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Mercury, Total	101	mg/L	.002	0.0020	85 - 115

MATRIX SPIKE: 2469957 DUPLICATE: 2469958 ORIGINAL: 2200796001

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Mercury, Total	.00021	mg/L	.005	.00496	.00507	95	97.2	70 - 130	2.19	20

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QUALITY CONTROL DATA

Workorder: 2200796 R1700187

QC Batch: MDIG/61974 **Analysis Method:** SW846 6010C
QC Batch Method: SW846 3015
Associated Lab Samples: 2200796001

METHOD BLANK: 2470020

Parameter	Blank Result	Units	Reporting Limit
Antimony, Total	ND	mg/L	0.030
Arsenic, Total	ND	mg/L	0.028
Barium, Total	ND	mg/L	0.56
Beryllium, Total	ND	mg/L	0.0044
Cadmium, Total	ND	mg/L	0.0022
Chromium, Total	ND	mg/L	0.0056
Lead, Total	ND	mg/L	0.0067
Nickel, Total	ND	mg/L	0.022
Selenium, Total	ND	mg/L	0.022
Silver, Total	ND	mg/L	0.0044
Thallium, Total	ND	mg/L	0.022
Vanadium, Total	ND	mg/L	0.0056
Zinc, Total	ND	mg/L	0.022

LABORATORY CONTROL SAMPLE: 2470021

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Antimony, Total	95.8	mg/L	.22	0.21	80 - 120
Arsenic, Total	101	mg/L	.11	0.11	80 - 120
Barium, Total	104	mg/L	1.1	1.2	80 - 120
Beryllium, Total	102	mg/L	.22	0.23	80 - 120
Cadmium, Total	98.5	mg/L	.11	0.11	80 - 120
Chromium, Total	105	mg/L	.11	0.12	80 - 120
Lead, Total	102	mg/L	.11	0.11	80 - 120
Nickel, Total	100	mg/L	1.1	1.1	80 - 120
Selenium, Total	96.2	mg/L	1.1	1.1	80 - 120
Silver, Total	102	mg/L	.11	0.11	80 - 120
Thallium, Total	103	mg/L	.11	0.11	80 - 120
Vanadium, Total	103	mg/L	.056	0.057	80 - 120
Zinc, Total	100	mg/L	.56	0.56	80 - 120

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QUALITY CONTROL DATA

Workorder: 2200796 R1700187

MATRIX SPIKE: 2470022 DUPLICATE: 2470023 ORIGINAL: 2200929001

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Arsenic, Total	.01556	mg/L	5	5.30995	5.23495	106	104	50 - 150	1.42	20
Barium, Total	.14555	mg/L	10	10.63878	10.41656	105	103	50 - 150	2.11	20
Cadmium, Total	0	mg/L	1	1.04277	1.01999	104	102	50 - 150	2.21	20
Chromium, Total	.00056	mg/L	5	5.2255	5.10606	104	102	50 - 150	2.31	20
Lead, Total	.00611	mg/L	5	5.0705	4.99884	101	99.9	50 - 150	1.42	20
Selenium, Total	.01111	mg/L	1	1.0361	1.04832	102	104	50 - 150	1.17	20
Silver, Total	0	mg/L	1	1.04777	1.0361	105	104	50 - 150	1.12	20

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QUALITY CONTROL DATA

Workorder: 2200796 R1700187

QC Batch: WETC/181678 **Analysis Method:** S2540G-11

QC Batch Method: S2540G-11

Associated Lab Samples: 2200796001, 2200796002, 2200796003, 2200796004

SAMPLE DUPLICATE: 2470568 ORIGINAL: 2200380001

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	23.6797	%	22.3913	5.59	10
Total Solids	76.3202	%	77.6086	1.67	5

SAMPLE DUPLICATE: 2470569 ORIGINAL: 2200796002

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	4.6121	%	5.088	9.81	10
Total Solids	95.3878	%	94.9119	.5	5

SAMPLE DUPLICATE: 2470570 ORIGINAL: 2200901003

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	13.3752	%	12.4653	7.04	10
Total Solids	86.6247	%	87.5346	1.04	5

SAMPLE DUPLICATE: 2470571 ORIGINAL: 2201162006

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	14.6264	%	14.8578	1.57	10
Total Solids	85.3735	%	85.1421	.27	5

SAMPLE DUPLICATE: 2470572 ORIGINAL: 2201162016

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	16.5033	%	16.4592	.27	10
Total Solids	83.4966	%	83.5407	.05	5

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QUALITY CONTROL DATA

Workorder: 2200796 R1700187

SAMPLE DUPLICATE: 2470573 ORIGINAL: 2201508001

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	16.6981	%	15.5975	6.82	10
Total Solids	83.3018	%	84.4024	1.31	5

SAMPLE DUPLICATE: 2470574 ORIGINAL: 2201903001

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	11.1959	%	11.6414	3.9	10
Total Solids	88.804	%	88.3585	.5	5

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Workorder: 2200796 R1700187

Lab ID	Sample ID	Prep Method	Prep Batch	Analysis Method	Analysis Batch
2200796002	1701040837 400-SB-01	SW846 7470A	MDIG/61948	SW846 7470A	META/55681
2200796003	1701040846 400-SB-01	SW846 7470A	MDIG/61948	SW846 7470A	META/55681
2200796004	1701040847 400-SB-01	SW846 7470A	MDIG/61948	SW846 7470A	META/55681
2200796002	1701040837 400-SB-01	SW846 3015	MDIG/61959	SW846 6010C	META/55696
2200796003	1701040846 400-SB-01	SW846 3015	MDIG/61959	SW846 6010C	META/55696
2200796004	1701040847 400-SB-01	SW846 3015	MDIG/61959	SW846 6010C	META/55696
2200796001	1701040832 400-SB-06	SW846 7470A	MDIG/61966	SW846 7470A	META/55698
2200796001	1701040832 400-SB-06	SW846 3015	MDIG/61974	SW846 6010C	META/55696
2200796001	1701040832 400-SB-06			S2540G-11	WETC/181678
2200796002	1701040837 400-SB-01			S2540G-11	WETC/181678
2200796003	1701040846 400-SB-01			S2540G-11	WETC/181678
2200796004	1701040847 400-SB-01			S2540G-11	WETC/181678

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ALS Environmental Chain of Custody

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ALS Conta



Project Number: R1700187
 Project Manager: Janice Jaeger
 QAP: LAB QAP

Lab Code	Sample ID	# of Cont.	Matrix	Sample				ALS Cont.
				Date	Time	Lab ID		
1701040832	400-SB-06	1	Soil	1/4/17		Middletown ALS	<input checked="" type="checkbox"/> (A) TCLP 6010C <input checked="" type="checkbox"/> (B) TCLP 6010C <input checked="" type="checkbox"/> (C) TCLP 6010C <input checked="" type="checkbox"/> (H) TCLP 7470A <input checked="" type="checkbox"/> (M) TCLP 6010C <input checked="" type="checkbox"/> (P) TCLP 6010C	
1701040837	400-SB-01	1	Soil	1/4/17		Middletown ALS	<input checked="" type="checkbox"/> (A) TCLP 6010C <input checked="" type="checkbox"/> (B) TCLP 6010C <input checked="" type="checkbox"/> (C) TCLP 6010C <input checked="" type="checkbox"/> (H) TCLP 7470A <input checked="" type="checkbox"/> (M) TCLP 6010C <input checked="" type="checkbox"/> (P) TCLP 6010C	
1701040846	400-SB-01 (OC)	2	Soil	1/4/17		Middletown ALS	<input checked="" type="checkbox"/> (A) TCLP 6010C <input checked="" type="checkbox"/> (B) TCLP 6010C <input checked="" type="checkbox"/> (C) TCLP 6010C <input checked="" type="checkbox"/> (H) TCLP 7470A <input checked="" type="checkbox"/> (M) TCLP 6010C <input checked="" type="checkbox"/> (P) TCLP 6010C	
1701040847	400-SB-01	1	Soil	1/4/17		Middletown ALS	<input checked="" type="checkbox"/> (A) TCLP 6010C <input checked="" type="checkbox"/> (B) TCLP 6010C <input checked="" type="checkbox"/> (C) TCLP 6010C <input checked="" type="checkbox"/> (H) TCLP 7470A <input checked="" type="checkbox"/> (M) TCLP 6010C <input checked="" type="checkbox"/> (P) TCLP 6010C	

RCVR JPS
 AS 1/10/17

Y N Initials Cooler Temp: C
 Custody Seals Present? (if present) Seals intact?
 Received on Ice?
 COC/ILB Complete
 Cont in Good Cond?
 Correct Containers?
 Correct Samp Vol?
 Correct Preservation?
 Headspace/Notables?
 Tracking #: 68268019625
 Therm ID: TH35A
 Ship Carrier: FedEx JPS
 DHL

Folder Comments:
 NDU

AS
 1/10/17

Special Instructions/Comments	Turnaround Requirements	Report Requirements	Invoice Information
	RUSH (Surcharges Apply) PLEASE CIRCLE WORK DAYS 1 2 3 4 5 <input checked="" type="checkbox"/> STANDARD Requested FAX Date: _____ Requested Report Date: 01/17/17	I. Results Only <input checked="" type="checkbox"/> II. Results + QC Summaries <input type="checkbox"/> III. Results + QC and Calibration Summaries <input type="checkbox"/> IV. Data Validation Report with Raw Data PQLMDUJ <input checked="" type="checkbox"/> EDD <input checked="" type="checkbox"/>	PO# 58R1700187 Bill to

H - Test is On Hold P - Test is Authorized for Prep Only

Relinquished By: Scott Say 1/17/17
 Received By: [Signature] 1/10/17
 Airbill Number: _____

R1700187-003	1701040832 400-SB-06	Soil	1/4/17	Middletown ALS	Sb TCLP 6010C	Sa TCLP 6010C	TCLP EPA 1311	Tl TCLP 6010C	V TCLP 6010C	Zn TCLP 6010C
R1700187-006	1701040837 400-SB-01	Soil	1/4/17	Middletown ALS						
R1700187-011	1701040846 400-SB-01	Soil	1/4/17	Middletown ALS						
R1700187-012	1701040847 400-SB-01	Soil	1/4/17	Middletown ALS						

ALS Environmental Chain of Custody

1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475

ALS Contact: Janice Jaeger

Project Number: R1700187
Project Manager: Janice Jaeger
QAP: LAB QAP

Run QC on sample R1700187-011 for 6010C/Ag TCLP, As TCLP, Ba TCLP, Be TCLP, Cd TCLP, Cr TCLP, Ni TCLP, Pb TCLP, Se TCLP, Ti TCLP, V TCLP, Zn TCLP, 7470A/Hg TCLP

R1700187

A Ship To: Middletown ALS
ALS Laboratory Group
34 Dogwood Lane
Middletown, PA 17057

PC *AMS* Date 1/17/17
SMO _____ Date _____

Instructions: _____
Ice _____
Dry Ice _____
No Ice _____
Shipping: _____
Overnight _____
2nd Day _____
Ground _____
Bill to Client Account _____

Comments:

ALS Group USA, Corp.
www.alsglobal.com
An ALS Limited Company



February 01, 2017

Service Request No:R1700596

Mr. Tom Hall
NASA/WSTF/Navarro
P.O. Box 20
Las Cruces, NM 88004

Laboratory Results for: White Sands Test Facility

Dear Mr.Hall,

Enclosed are the results of the sample(s) submitted to our laboratory January 20, 2017
For your reference, these analyses have been assigned our service request number **R1700596**.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAP standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report. The measurement uncertainty of the results included in this report is within that expected when using the prescribed method(s) for analysis of these samples, and represented by Laboratory Control Sample control limits. Any events, such as QC failures, which may add to the uncertainty are explained in the report narrative.

Please contact me if you have any questions. My extension is 7472. You may also contact me via email at Janice.Jaeger@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Janice Jaeger
Project Manager

ADDRESS 1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
PHONE +1 585 288 5380 | **FAX** +1 585 288 8475
ALS Group USA, Corp.
dba ALS Environmental



Narrative Documents

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com



Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request:R1700596
Date Received:1/20/17

CASE NARRATIVE

ALS Environmental

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables, including results of QC samples analyzed from this delivery group. Analytical procedures performed by the lab are validated in accordance with NELAC standards. Any parameters that are not included in the lab's NELAC accreditation are identified on a "Non-Certified Analytes" report in the Miscellaneous Forms Section of this report. Individual analytical results requiring further explanation are flagged with qualifiers and/or discussed below. The flags are explained in the Report Qualifiers and Definitions page in the Miscellaneous Forms section of this report.

Sample Receipt

/ matrix samples were received for analysis at ALS Environmental on 01/20/2017. Any discrepancies noted upon initial sample inspection are noted on the cooler receipt and preservation form included in this data package. The samples were received in good condition and consistent with the accompanying chain of custody form. Samples are refrigerated at ≤6°C upon receipt at the lab except for aqueous samples designated for metals analyses, which are stored at room temperature.

Volatile Organic Analyses:

Method 8260c, 01/30/17: The upper control limit was exceeded for one or more analytes in the Continuing Calibration Verification (CCV). The field samples analyzed in this sequence did not contain the analyte(s) in question above the Method Reporting Limit (MRL). Since the exceedance equates to a potential high bias, the data quality was not significantly affected and no further corrective action was taken.

Method 8260c, 01/30/17: The lower control limit was exceeded for one or more analytes in the Continuing Calibration Verification (CCV). Since there were no detections of the analyte(s) in the associated field samples, the quantitation is not affected. The data quality was not significantly affected and no further corrective action was taken.

Please note: The instrument that 8260 was analyzed on had 1,4-Dioxane contamination and all affected data has been flagged with a "B". The removal of the 1,4-dioxane contamination did cause the response for 2-Chloroethyl vinyl ether to go down. Therefore, 1,4-Dioxane is high and 2-Chloroethyl vinyl ether is low in the CCV, LCS blanks and samples. The client was notified and the samples analyzed as the could not be repeated prior to holding time expiring.

Metals Analyses:

No significant anomalies were noted with this analysis.

General Chemistry Analyses:

No significant anomalies were noted with this analysis.

Sample Receiving Notes:

Method 8260C: soil samples included in this report were received in jars and not collected using one of the EPA method 5035A low level options. In accordance with the NYSDOH technical notice of October 2012 all results or reporting limits <200 ug/kg

Approved by  Date 2/1/2017



should be considered as estimated due to potential low bias.

Approved by *Jamark...* Date 2/1/2017



SAMPLE DETECTION SUMMARY

CLIENT ID: 1701180920 400-SB-06 **Lab ID: R1700596-001**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	94.4				Percent	ALS SOP
1,4-Dioxane	910	B	21	110	ug/Kg	8260C

CLIENT ID: 1701180921 400-SB-06 **Lab ID: R1700596-002**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	94.0				Percent	ALS SOP
Arsenic, Total	6.4		0.3	1.0	mg/Kg	6010C
Barium, Total	667		0.2	2.1	mg/Kg	6010C
Beryllium, Total	0.53		0.02	0.31	mg/Kg	6010C
Chromium, Total	10.4		0.2	1.0	mg/Kg	6010C
Lead, Total	6.1		0.3	5.2	mg/Kg	6010C
Nickel, Total	6.7		0.2	4.2	mg/Kg	6010C
Selenium, Total	1.0	J	0.7	1.0	mg/Kg	6010C
Thallium, Total	3.4		0.6	1.0	mg/Kg	6010C
Vanadium, Total	19.9		0.2	5.2	mg/Kg	6010C
Zinc, Total	55.1		0.2	2.1	mg/Kg	6010C

CLIENT ID: 1701180925 400-SB-02 **Lab ID: R1700596-004**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.7				Percent	ALS SOP
1,4-Dioxane	760	B	20	100	ug/Kg	8260C

CLIENT ID: 1701180926 400-SB-02 **Lab ID: R1700596-005**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.6				Percent	ALS SOP
Arsenic, Total	5.8		0.3	1.0	mg/Kg	6010C
Barium, Total	110		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.49		0.02	0.30	mg/Kg	6010C
Chromium, Total	43.9		0.2	1.0	mg/Kg	6010C
Lead, Total	9.0		0.3	5.0	mg/Kg	6010C
Mercury, Total	0.006	J	0.003	0.033	mg/Kg	7471B
Nickel, Total	8.8		0.2	4.0	mg/Kg	6010C
Thallium, Total	2.4		0.6	1.0	mg/Kg	6010C
Vanadium, Total	14.4		0.2	5.0	mg/Kg	6010C
Zinc, Total	49.5		0.2	2.0	mg/Kg	6010C

CLIENT ID: 1701180930 400-SB-02 **Lab ID: R1700596-007**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	96.6				Percent	ALS SOP
1,4-Dioxane	650	B	20	100	ug/Kg	8260C

CLIENT ID: 1701180931 400-SB-02 **Lab ID: R1700596-008**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	96.8				Percent	ALS SOP



SAMPLE DETECTION SUMMARY

CLIENT ID: 1701180931 400-SB-02	Lab ID: R1700596-008
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Analyte	Results	Flag	MDL	PQL	Units	Method
Arsenic, Total	3.93		0.24	0.99	mg/Kg	6010C
Barium, Total	67.0		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.46		0.02	0.30	mg/Kg	6010C
Chromium, Total	22.1		0.13	0.99	mg/Kg	6010C
Lead, Total	7.5		0.3	5.0	mg/Kg	6010C
Mercury, Total	0.004	J	0.003	0.031	mg/Kg	7471B
Nickel, Total	9.4		0.2	4.0	mg/Kg	6010C
Thallium, Total	0.72	J	0.51	0.99	mg/Kg	6010C
Vanadium, Total	15.0		0.2	5.0	mg/Kg	6010C
Zinc, Total	40.3		0.2	2.0	mg/Kg	6010C

CLIENT ID: 1701180935 400-SB-05	Lab ID: R1700596-010
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.4				Percent	ALS SOP
1,4-Dioxane	720	B	20	100	ug/Kg	8260C

CLIENT ID: 1701180936 400-SB-05	Lab ID: R1700596-011
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	98.0				Percent	ALS SOP
Arsenic, Total	7.2		0.3	1.0	mg/Kg	6010C
Barium, Total	82.2		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.58		0.02	0.30	mg/Kg	6010C
Cadmium, Total	0.15	J	0.04	0.51	mg/Kg	6010C
Chromium, Total	31.9		0.2	1.0	mg/Kg	6010C
Lead, Total	11.9		0.3	5.1	mg/Kg	6010C
Mercury, Total	0.004	J	0.003	0.032	mg/Kg	7471B
Nickel, Total	9.7		0.2	4.0	mg/Kg	6010C
Thallium, Total	2.1		0.6	1.0	mg/Kg	6010C
Vanadium, Total	17.7		0.2	5.1	mg/Kg	6010C
Zinc, Total	63.6		0.2	2.0	mg/Kg	6010C

CLIENT ID: 1701180940 400-SB-05	Lab ID: R1700596-013
--	-----------------------------

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	93.6				Percent	ALS SOP
1,4-Dioxane	660	B	21	110	ug/Kg	8260C

CLIENT ID: 1701180941 400-SB-05	Lab ID: R1700596-014
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	93.2				Percent	ALS SOP
1,4-Dioxane	680	B	21	110	ug/Kg	8260C

CLIENT ID: 1701180943 400-SB-05	Lab ID: R1700596-015
--	-----------------------------

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	92.3				Percent	ALS SOP



SAMPLE DETECTION SUMMARY

CLIENT ID: 1701180943 400-SB-05 **Lab ID: R1700596-015**

Analyte	Results	Flag	MDL	PQL	Units	Method
Arsenic, Total	4.5		0.3	1.1	mg/Kg	6010C
Barium, Total	90.9		0.2	2.1	mg/Kg	6010C
Beryllium, Total	0.38		0.02	0.32	mg/Kg	6010C
Cadmium, Total	0.18	J	0.04	0.53	mg/Kg	6010C
Chromium, Total	24.4		0.2	1.1	mg/Kg	6010C
Lead, Total	11.2		0.3	5.3	mg/Kg	6010C
Nickel, Total	6.0		0.2	4.2	mg/Kg	6010C
Thallium, Total	2.0		0.6	1.1	mg/Kg	6010C
Vanadium, Total	12.9		0.2	5.3	mg/Kg	6010C
Zinc, Total	36.6		0.2	2.1	mg/Kg	6010C

CLIENT ID: 1701180944 400-SB-05 **Lab ID: R1700596-016**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	94.4				Percent	ALS SOP
Arsenic, Total	4.1		0.3	1.0	mg/Kg	6010C
Barium, Total	126		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.41		0.02	0.30	mg/Kg	6010C
Cadmium, Total	0.09	J	0.04	0.50	mg/Kg	6010C
Chromium, Total	32.4		0.2	1.0	mg/Kg	6010C
Lead, Total	8.6		0.3	5.0	mg/Kg	6010C
Nickel, Total	8.0		0.2	4.0	mg/Kg	6010C
Thallium, Total	2.2		0.6	1.0	mg/Kg	6010C
Vanadium, Total	13.6		0.2	5.0	mg/Kg	6010C
Zinc, Total	37.1		0.2	2.0	mg/Kg	6010C



Sample Receipt Information

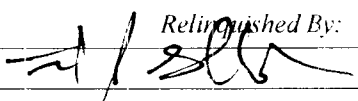
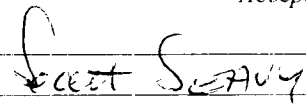
ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

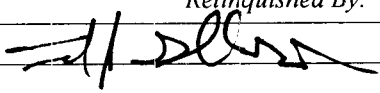
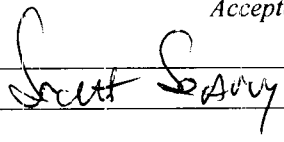
Service Request:R1700596

SAMPLE CROSS-REFERENCE

<u>SAMPLE #</u>	<u>CLIENT SAMPLE ID</u>	<u>DATE</u>	<u>TIME</u>
R1700596-001	1701180920 400-SB-06	1/18/2017	
R1700596-002	1701180921 400-SB-06	1/18/2017	
R1700596-003	1701180922 400-SB-06	1/18/2017	
R1700596-004	1701180925 400-SB-02	1/18/2017	
R1700596-005	1701180926 400-SB-02	1/18/2017	
R1700596-006	1701180927 400-SB-02	1/18/2017	
R1700596-007	1701180930 400-SB-02	1/18/2017	
R1700596-008	1701180931 400-SB-02	1/18/2017	
R1700596-009	1701180932 400-SB-02	1/18/2017	
R1700596-010	1701180935 400-SB-05	1/18/2017	
R1700596-011	1701180936 400-SB-05	1/18/2017	
R1700596-012	1701180937 400-SB-05	1/18/2017	
R1700596-013	1701180940 400-SB-05	1/18/2017	
R1700596-014	1701180941 400-SB-05	1/18/2017	
R1700596-015	1701180943 400-SB-05	1/18/2017	
R1700596-016	1701180944 400-SB-05	1/18/2017	
R1700596-017	1701180946 400-SB-05	1/18/2017	
R1700596-018	1701180947 400-SB-05	1/18/2017	

Laboratory PO #15EC007B		Analytical Requirements						Special Instructions
Return Address for Analytical Reports		# of Containers	Sample Type: Soil (S)	SW-846 Method 8260B 4 oz. Glass Jar, Ice	Total Metals SW-846-6010C and 7470A 4 oz. Glass Jar, Ice	TCLP Metals EPA Method 1311 incorporating SW-846-6010C and 7470A 8 oz. Glass Jar, Ice	Comments	
Sample No.	Sample Location							
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012								
Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453								
							Please return coolers and reusable packaging materials as possible. Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall	
170118 0920	400-SB-06	1	S	X			Container 7487	
170118 0921	400-SB-06	1	S		X		Container 7487	
170118 0922	400-SB-06	1	S			X	Container 7487	
170118 0925	400-SB-02	1	S	X			Container 7516	
170118 0926	400-SB-02	1	S		X		Container 7516	
170118 0927	400-SB-02	1	S			X	Container 7516	
170118 0930	400-SB-02	1	S	X			Container 7517	
170118 0931	400-SB-02	1	S		X		Container 7517	
170118 0932	400-SB-02	1	S			X	Container 7517	
170118 0935	400-SB-05	1	S	X			Container 7523	
170118 0936	400-SB-05	1	S		X		Container 7523	
170118 0937	400-SB-05	1	S			X	Container 7523	
170118 0940	400-SB-05	1	S	X			Container 7524	
170118 0941	400-SB-05	1	S	X			Container 7524	
170118 0942	400-SB-05	1	S	X			Matrix Spike for 1701180940 ; Container 7524	
Relinquished By: 		Date/Time: 1-18-17 (1045)		Accepted By: 			Date/Time: 1/20/17 0925	



Laboratory PO #15EC007B				Analytical Requirements				Special Instructions	
Return Address for Analytical Reports				SW-846 Method 8260B 4 oz. Glass Jar, Ice	Total Metals SW-846-6010C and 7470A 4 oz. Glass Jar, Ice	TCLP Metals EPA Method 1311 incorporating SW-846-6010C and 7470A 8 oz. Glass Jar, Ice		Please return coolers and reusable packaging materials as possible.	
Sample No.	Sample Location	# of Containers	Sample Type: Soil (S)					Comments	
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012 Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453								Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall	
170118	0943	400-SB-05	1	S		X		Container 7524	
170118	0944	400-SB-05	1	S		X		Container 7524	
170118	0945	400-SB-05	1	S		X		Matrix Spike for 170118 0943 ; Container 7524	
170118	0946	400-SB-05	1	S			X	Container 7524	
170118	0947	400-SB-05	1	S			X	Container 7524	
170118	0948	400-SB-05	1	S			X	Matrix Spike for 170118 0946 ; Container 7524	
Relinquished By:			Date/Time:		Accepted By:			Date/Time:	
			1-18-17 (1045)					1/20/17 0925	





Cooler Receipt and Preservation Check Form

R1700596

5

NASA/WSTF/Navarro
White Sands Test Facility



Project/Client NASA Folder Number _____

Cooler received on 1/20/17 by: SAS

COURIER: ALS UPS FEDEX VELOCITY CLIENT

1	Were Custody seals on outside of cooler?	<u>Y</u>	N
2	Custody papers properly completed (ink, signed)?	<u>Y</u>	N
3	Did all bottles arrive in good condition (unbroken)?	<u>Y</u>	N
4	Circle: <u>Wet Ice</u> Dry Ice Gel packs present?	<u>Y</u>	N

5a	Perchlorate samples have required headspace?	Y	N	<u>NA</u>
5b	Did VOA vials, Alk, or Sulfide have sig* bubbles?	<u>Y</u>	N	NA
6	Where did the bottles originate?	<u>ALS/ROS</u>	CLIENT	
7	Soil VOA received as: Bulk Encore 5035set	<u>NA</u>		

8. Temperature Readings Date: 1/20/17 Time: 0930 ID: IR#7 IR#8 From: Temp Blank Sample Bottle

Observed Temp (°C)	<u>3.0</u>	<u>3.3</u>	<u>2.5</u>				
Correction Factor (°C)	<u>-</u>	<u>+ .9</u>	<u>+ .5</u>				
Corrected Temp (°C)	<u>3.0</u>	<u>4.2</u>	<u>3.0</u>				
Temp from: Type of bottle	<u>-</u>	<u>250 PLASTIC</u>	<u>1 L AMBR</u>				
Within 0-6°C?	<u>Y</u> N	<u>Y</u> N	<u>Y</u> N	Y N	Y N	Y N	Y N
If <0°C, were samples frozen?	Y N	Y N	Y N	Y N	Y N	Y N	Y N

If out of Temperature, note packing/ice condition: _____ Ice melted Poorly Packed Same Day Rule
& Client Approval to Run Samples: _____ Standing Approval Client aware at drop-off Client notified by: _____

All samples held in storage location: R-002 by SAS on 1/20/17 at 0930
5035 samples placed in storage location: _____ by _____ on _____ at _____

Cooler Breakdown: Date: 1/20/17 Time: 12/3 by: W

- 9. Were all bottle labels complete (i.e. analysis, preservation, etc.)? YES NO
- 10. Did all bottle labels and tags agree with custody papers? YES NO
- 11. Were correct containers used for the tests indicated? YES NO
- 12. Were 5035 vials acceptable (no extra labels, not leaking)? YES NO
- 13. Air Samples: Cassettes / Tubes Intact Canisters Pressurized Tedlar® Bags Inflated N/A

pH	Lot of test paper	Reagent	Preserved?		Lot Received	Exp	Sample ID	Vol. Added	Lot Added	Final pH
			Yes	No						
≥12		NaOH								
≤2		HNO ₃								
≤2		H ₂ SO ₄								
<4		NaHSO ₄								
Residual Chlorine (-)		For CN Phenol and 522			If +, contact PM to add Na ₂ S ₂ O ₃ (CN), ascorbic (phenol).					
		Na ₂ S ₂ O ₃	-	-						
		ZnAcetate	-	-						
		HCl	**	**						

**Not to be tested before analysis - pH tested and recorded by VOAs on a separate worksheet

Bottle lot numbers: Client
Explain all Discrepancies/ Other Comments:

1 VIAL

CLRES	<u>BULK</u>
DO	FLDT
HPROD	HGFB
HTR	LL3541
PH	<u>SUB</u>
SO3	MARRS
ALS	REV

Labels secondary reviewed by: W
PC Secondary Review: W 1/23/17 *significant air bubbles: VOA > 5-6 mm : WC > 1 in. diameter
P:\NTRANET\QAQC\Forms Controlled\Cooler Receipt r14.doc 1/9/17



Miscellaneous Forms

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
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REPORT QUALIFIERS AND DEFINITIONS

<p>U Analyte was analyzed for but not detected. The sample quantitation limit has been corrected for dilution and for percent moisture, unless otherwise noted in the case narrative.</p> <p>J Estimated value due to either being a Tentatively Identified Compound (TIC) or that the concentration is between the MRL and the MDL. Concentrations are not verified within the linear range of the calibration. For DoD: concentration >40% difference between two GC columns (pesticides/Aroclors).</p> <p>B Analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.</p> <p>E Inorganics- Concentration is estimated due to the serial dilution was outside control limits.</p> <p>E Organics- Concentration has exceeded the calibration range for that specific analysis.</p> <p>D Concentration is a result of a dilution, typically a secondary analysis of the sample due to exceeding the calibration range or that a surrogate has been diluted out of the sample and cannot be assessed.</p> <p>* Indicates that a quality control parameter has exceeded laboratory limits. Under the “Notes” column of the Form I, this qualifier denotes analysis was performed out of Holding Time.</p> <p>H Analysis was performed out of hold time for tests that have an “immediate” hold time criteria.</p> <p># Spike was diluted out.</p>	<p>+ Correlation coefficient for MSA is <0.995.</p> <p>N Inorganics- Matrix spike recovery was outside laboratory limits.</p> <p>N Organics- Presumptive evidence of a compound (reported as a TIC) based on the MS library search.</p> <p>S Concentration has been determined using Method of Standard Additions (MSA).</p> <p>W Post-Digestion Spike recovery is outside control limits and the sample absorbance is <50% of the spike absorbance.</p> <p>P Concentration >40% (25% for CLP) difference between the two GC columns.</p> <p>C Confirmed by GC/MS</p> <p>Q DoD reports: indicates a pesticide/Aroclor is not confirmed ($\geq 100\%$ Difference between two GC columns).</p> <p>X See Case Narrative for discussion.</p> <p>MRL Method Reporting Limit. Also known as: LOQ Limit of Quantitation (LOQ) The lowest concentration at which the method analyte may be reliably quantified under the method conditions.</p> <p>MDL Method Detection Limit. A statistical value derived from a study designed to provide the lowest concentration that will be detected 99% of the time. Values between the MDL and MRL are estimated (see J qualifier).</p> <p>LOD Limit of Detection. A value at or above the MDL which has been verified to be detectable.</p> <p>ND Non-Detect. Analyte was not detected at the concentration listed. Same as U qualifier.</p>
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Rochester Lab ID # for State Certifications¹

Connecticut ID # PH0556	Maine ID #NY0032	New Hampshire ID #
Delaware Accredited	Nebraska Accredited	294100 A/B
DoD ELAP #65817	New Jersey ID # NY004	Pennsylvania ID# 68-786
Florida ID # E87674	New York ID # 10145	Rhode Island ID # 158
Illinois ID #200047	North Carolina #676	Virginia #460167

¹ Analyses were performed according to our laboratory’s NELAP-approved quality assurance program and any applicable state or agency requirements. The test results meet requirements of the current NELAP/TNI standards or state or agency requirements, where applicable, except as noted in the case narrative. Since not all analyte/method/matrix combinations are offered for state/NELAC accreditation, this report may contain results which are not accredited. For a specific list of accredited analytes, contact the laboratory or go to <http://www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads/North-America-Downloads>

ALS Laboratory Group

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

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Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1700596

Sample Name: 1701180920 400-SB-06
Lab Code: R1700596-001
Sample Matrix: Soil

Date Collected: 01/18/17
Date Received: 01/20/17

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1701180921 400-SB-06
Lab Code: R1700596-002
Sample Matrix: Soil

Date Collected: 01/18/17
Date Received: 01/20/17

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
CGILDAY
CBURLESON
KWONG

Sample Name: 1701180925 400-SB-02
Lab Code: R1700596-004
Sample Matrix: Soil

Date Collected: 01/18/17
Date Received: 01/20/17

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1701180926 400-SB-02
Lab Code: R1700596-005
Sample Matrix: Soil

Date Collected: 01/18/17
Date Received: 01/20/17

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
CGILDAY
CBURLESON
KWONG

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1700596

Sample Name: 1701180930 400-SB-02
Lab Code: R1700596-007
Sample Matrix: Soil

Date Collected: 01/18/17
Date Received: 01/20/17

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1701180931 400-SB-02
Lab Code: R1700596-008
Sample Matrix: Soil

Date Collected: 01/18/17
Date Received: 01/20/17

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
CGILDAY
CBURLESON
KWONG

Sample Name: 1701180935 400-SB-05
Lab Code: R1700596-010
Sample Matrix: Soil

Date Collected: 01/18/17
Date Received: 01/20/17

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1701180936 400-SB-05
Lab Code: R1700596-011
Sample Matrix: Soil

Date Collected: 01/18/17
Date Received: 01/20/17

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
CGILDAY
CBURLESON
KWONG

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1700596

Sample Name: 1701180940 400-SB-05
Lab Code: R1700596-013
Sample Matrix: Soil

Date Collected: 01/18/17
Date Received: 01/20/17

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1701180941 400-SB-05
Lab Code: R1700596-014
Sample Matrix: Soil

Date Collected: 01/18/17
Date Received: 01/20/17

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1701180943 400-SB-05
Lab Code: R1700596-015
Sample Matrix: Soil

Date Collected: 01/18/17
Date Received: 01/20/17

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
CGILDAY
CBURLESON
KWONG

Sample Name: 1701180944 400-SB-05
Lab Code: R1700596-016
Sample Matrix: Soil

Date Collected: 01/18/17
Date Received: 01/20/17

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
CGILDAY
CBURLESON
KWONG



INORGANIC PREPARATION METHODS

The preparation methods associated with this report are found in these tables unless discussed in the case narrative.

Water/Liquid Matrix

Analytical Method	Preparation Method
200.7	200.2
200.8	200.2
6010C	3005A/3010A
6020A	ILM05.3
9014 Cyanide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Acid Soluble	9030B
9056A Bomb (Halogens)	5050A
9066 Manual Distillation	9065
SM 4500-CN-E Residual Cyanide	SM 4500-CN-G
SM 4500-CN-E WAD Cyanide	SM 4500-CN-I

Solid/Soil/Non-Aqueous Matrix

Analytical Method	Preparation Method
6010C	3050B
6020A	3050B
6010C TCLP (1311) extract	3005A/3010A
6010 SPLP (1312) extract	3005A/3010A
7196A	3060A
7199	3060A
9056A Halogens/Halides	5050
300.0 Anions/ 350.1/ 353.2/ SM 2320B/ SM 5210B/ 9056A Anions	DI extraction

For analytical methods not listed, the preparation method is the same as the analytical method reference.



Sample Results

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
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Volatile Organic Compounds by GC/MS

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25

Sample Name: 1701180920 400-SB-06
Lab Code: R1700596-001

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.3	0.88	1	01/30/17 17:10	
1,1,1-Trichloroethane (TCA)	ND U	5.3	0.78	1	01/30/17 17:10	
1,1,2,2-Tetrachloroethane	ND U	5.3	0.86	1	01/30/17 17:10	
1,1,2-Trichloroethane	ND U	5.3	0.78	1	01/30/17 17:10	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.3	1.4	1	01/30/17 17:10	
1,1-Dichloroethene (1,1-DCE)	ND U	5.3	1.4	1	01/30/17 17:10	
1,2,3-Trichloropropane	ND U	5.3	1.4	1	01/30/17 17:10	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.3	2.0	1	01/30/17 17:10	
1,2-Dibromoethane	ND U	5.3	1.3	1	01/30/17 17:10	
1,2-Dichlorobenzene	ND U	5.3	0.65	1	01/30/17 17:10	
1,2-Dichloroethane	ND U	5.3	0.65	1	01/30/17 17:10	
1,2-Dichloropropane	ND U	5.3	1.1	1	01/30/17 17:10	
1,3-Dichlorobenzene	ND U	5.3	0.67	1	01/30/17 17:10	
1,4-Dioxane	910 B	110	21	1	01/30/17 17:10	
2-Butanone (MEK)	ND U	5.3	2.5	1	01/30/17 17:10	
2-Chloro-1,3-butadiene	ND U	5.3	1.7	1	01/30/17 17:10	
2-Chloroethyl Vinyl Ether	ND U	5.3	1.9	1	01/30/17 17:10	
Isobutyl Alcohol	ND U	110	25	1	01/30/17 17:10	
Allyl Chloride	ND U	5.3	1.8	1	01/30/17 17:10	
4-Methyl-2-pentanone	ND U	5.3	1.1	1	01/30/17 17:10	
Acetone	ND U	5.3	3.0	1	01/30/17 17:10	
Acetonitrile	ND U	26	18	1	01/30/17 17:10	
Acrolein	ND U	26	3.8	1	01/30/17 17:10	
Acrylonitrile	ND U	26	6.9	1	01/30/17 17:10	
Benzene	ND U	5.3	0.31	1	01/30/17 17:10	
Bromodichloromethane	ND U	5.3	0.65	1	01/30/17 17:10	
Bromoform	ND U	5.3	0.99	1	01/30/17 17:10	
Bromomethane	ND U	5.3	1.5	1	01/30/17 17:10	
Carbon Disulfide	ND U	5.3	1.4	1	01/30/17 17:10	
Carbon Tetrachloride	ND U	5.3	0.98	1	01/30/17 17:10	
Chlorobenzene	ND U	5.3	0.31	1	01/30/17 17:10	
Chloroethane	ND U	5.3	3.1	1	01/30/17 17:10	
Chloroform	ND U	5.3	1.4	1	01/30/17 17:10	
Chloromethane	ND U	5.3	0.43	1	01/30/17 17:10	
Dibromochloromethane	ND U	5.3	0.78	1	01/30/17 17:10	
Dibromomethane	ND U	5.3	0.67	1	01/30/17 17:10	
Dichlorodifluoromethane (CFC 12)	ND U	5.3	2.1	1	01/30/17 17:10	
Dichloromethane	ND U	5.3	0.61	1	01/30/17 17:10	
Ethyl Methacrylate	ND U	5.3	0.80	1	01/30/17 17:10	
Ethylbenzene	ND U	5.3	0.25	1	01/30/17 17:10	
Iodomethane	ND U	11	1.2	1	01/30/17 17:10	
Methacrylonitrile	ND U	5.3	1.6	1	01/30/17 17:10	
Methyl Methacrylate	ND U	5.3	0.78	1	01/30/17 17:10	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180920 400-SB-06
Lab Code: R1700596-001

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.3	0.55	1	01/30/17 17:10	
Propionitrile	ND U	26	6.9	1	01/30/17 17:10	
Tetrachloroethene (PCE)	ND U	5.3	0.94	1	01/30/17 17:10	
Toluene	ND U	5.3	1.1	1	01/30/17 17:10	
Trichloroethene (TCE)	ND U	5.3	1.1	1	01/30/17 17:10	
Trichlorofluoromethane (CFC 11)	ND U	5.3	0.70	1	01/30/17 17:10	
Vinyl Chloride	ND U	5.3	2.0	1	01/30/17 17:10	
cis-1,3-Dichloropropene	ND U	5.3	0.96	1	01/30/17 17:10	
m,p-Xylenes	ND U	11	1.2	1	01/30/17 17:10	
o-Xylene	ND U	5.3	0.51	1	01/30/17 17:10	
trans-1,2-Dichloroethene	ND U	5.3	0.92	1	01/30/17 17:10	
trans-1,3-Dichloropropene	ND U	5.3	0.22	1	01/30/17 17:10	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	104	51 - 136	01/30/17 17:10	
Dibromofluoromethane	104	63 - 138	01/30/17 17:10	
Toluene-d8	104	66 - 138	01/30/17 17:10	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000104-76-7	1-Hexanol, 2-ethyl-	13.57	28	JN

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25

Sample Name: 1701180925 400-SB-02
Lab Code: R1700596-004

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.1	0.85	1	01/30/17 17:34	
1,1,1-Trichloroethane (TCA)	ND U	5.1	0.75	1	01/30/17 17:34	
1,1,2,2-Tetrachloroethane	ND U	5.1	0.83	1	01/30/17 17:34	
1,1,2-Trichloroethane	ND U	5.1	0.75	1	01/30/17 17:34	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.1	1.3	1	01/30/17 17:34	
1,1-Dichloroethene (1,1-DCE)	ND U	5.1	1.4	1	01/30/17 17:34	
1,2,3-Trichloropropane	ND U	5.1	1.4	1	01/30/17 17:34	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.1	2.0	1	01/30/17 17:34	
1,2-Dibromoethane	ND U	5.1	1.3	1	01/30/17 17:34	
1,2-Dichlorobenzene	ND U	5.1	0.63	1	01/30/17 17:34	
1,2-Dichloroethane	ND U	5.1	0.63	1	01/30/17 17:34	
1,2-Dichloropropane	ND U	5.1	1.0	1	01/30/17 17:34	
1,3-Dichlorobenzene	ND U	5.1	0.65	1	01/30/17 17:34	
1,4-Dioxane	760 B	100	20	1	01/30/17 17:34	
2-Butanone (MEK)	ND U	5.1	2.4	1	01/30/17 17:34	
2-Chloro-1,3-butadiene	ND U	5.1	1.6	1	01/30/17 17:34	
2-Chloroethyl Vinyl Ether	ND U	5.1	1.8	1	01/30/17 17:34	
Isobutyl Alcohol	ND U	100	24	1	01/30/17 17:34	
Allyl Chloride	ND U	5.1	1.8	1	01/30/17 17:34	
4-Methyl-2-pentanone	ND U	5.1	1.1	1	01/30/17 17:34	
Acetone	ND U	5.1	2.9	1	01/30/17 17:34	
Acetonitrile	ND U	26	18	1	01/30/17 17:34	
Acrolein	ND U	26	3.6	1	01/30/17 17:34	
Acrylonitrile	ND U	26	6.7	1	01/30/17 17:34	
Benzene	ND U	5.1	0.30	1	01/30/17 17:34	
Bromodichloromethane	ND U	5.1	0.63	1	01/30/17 17:34	
Bromoform	ND U	5.1	0.96	1	01/30/17 17:34	
Bromomethane	ND U	5.1	1.5	1	01/30/17 17:34	
Carbon Disulfide	ND U	5.1	1.3	1	01/30/17 17:34	
Carbon Tetrachloride	ND U	5.1	0.95	1	01/30/17 17:34	
Chlorobenzene	ND U	5.1	0.30	1	01/30/17 17:34	
Chloroethane	ND U	5.1	3.0	1	01/30/17 17:34	
Chloroform	ND U	5.1	1.3	1	01/30/17 17:34	
Chloromethane	ND U	5.1	0.41	1	01/30/17 17:34	
Dibromochloromethane	ND U	5.1	0.75	1	01/30/17 17:34	
Dibromomethane	ND U	5.1	0.65	1	01/30/17 17:34	
Dichlorodifluoromethane (CFC 12)	ND U	5.1	2.0	1	01/30/17 17:34	
Dichloromethane	ND U	5.1	0.59	1	01/30/17 17:34	
Ethyl Methacrylate	ND U	5.1	0.77	1	01/30/17 17:34	
Ethylbenzene	ND U	5.1	0.24	1	01/30/17 17:34	
Iodomethane	ND U	10	1.2	1	01/30/17 17:34	
Methacrylonitrile	ND U	5.1	1.6	1	01/30/17 17:34	
Methyl Methacrylate	ND U	5.1	0.75	1	01/30/17 17:34	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180925 400-SB-02
Lab Code: R1700596-004

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.1	0.53	1	01/30/17 17:34	
Propionitrile	ND U	26	6.7	1	01/30/17 17:34	
Tetrachloroethene (PCE)	ND U	5.1	0.91	1	01/30/17 17:34	
Toluene	ND U	5.1	1.1	1	01/30/17 17:34	
Trichloroethene (TCE)	ND U	5.1	1.1	1	01/30/17 17:34	
Trichlorofluoromethane (CFC 11)	ND U	5.1	0.68	1	01/30/17 17:34	
Vinyl Chloride	ND U	5.1	1.9	1	01/30/17 17:34	
cis-1,3-Dichloropropene	ND U	5.1	0.93	1	01/30/17 17:34	
m,p-Xylenes	ND U	10	1.2	1	01/30/17 17:34	
o-Xylene	ND U	5.1	0.50	1	01/30/17 17:34	
trans-1,2-Dichloroethene	ND U	5.1	0.89	1	01/30/17 17:34	
trans-1,3-Dichloropropene	ND U	5.1	0.21	1	01/30/17 17:34	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	103	51 - 136	01/30/17 17:34	
Dibromofluoromethane	101	63 - 138	01/30/17 17:34	
Toluene-d8	102	66 - 138	01/30/17 17:34	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000124-19-6	Nonanal	14.39	15	JN

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25

Sample Name: 1701180930 400-SB-02
Lab Code: R1700596-007

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.2	0.86	1	01/30/17 17:59	
1,1,1-Trichloroethane (TCA)	ND U	5.2	0.76	1	01/30/17 17:59	
1,1,2,2-Tetrachloroethane	ND U	5.2	0.84	1	01/30/17 17:59	
1,1,2-Trichloroethane	ND U	5.2	0.76	1	01/30/17 17:59	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.2	1.3	1	01/30/17 17:59	
1,1-Dichloroethene (1,1-DCE)	ND U	5.2	1.4	1	01/30/17 17:59	
1,2,3-Trichloropropane	ND U	5.2	1.4	1	01/30/17 17:59	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.2	2.0	1	01/30/17 17:59	
1,2-Dibromoethane	ND U	5.2	1.3	1	01/30/17 17:59	
1,2-Dichlorobenzene	ND U	5.2	0.64	1	01/30/17 17:59	
1,2-Dichloroethane	ND U	5.2	0.64	1	01/30/17 17:59	
1,2-Dichloropropane	ND U	5.2	1.1	1	01/30/17 17:59	
1,3-Dichlorobenzene	ND U	5.2	0.66	1	01/30/17 17:59	
1,4-Dioxane	650 B	100	20	1	01/30/17 17:59	
2-Butanone (MEK)	ND U	5.2	2.4	1	01/30/17 17:59	
2-Chloro-1,3-butadiene	ND U	5.2	1.6	1	01/30/17 17:59	
2-Chloroethyl Vinyl Ether	ND U	5.2	1.8	1	01/30/17 17:59	
Isobutyl Alcohol	ND U	100	24	1	01/30/17 17:59	
Allyl Chloride	ND U	5.2	1.8	1	01/30/17 17:59	
4-Methyl-2-pentanone	ND U	5.2	1.1	1	01/30/17 17:59	
Acetone	ND U	5.2	3.0	1	01/30/17 17:59	
Acetonitrile	ND U	26	18	1	01/30/17 17:59	
Acrolein	ND U	26	3.7	1	01/30/17 17:59	
Acrylonitrile	ND U	26	6.7	1	01/30/17 17:59	
Benzene	ND U	5.2	0.31	1	01/30/17 17:59	
Bromodichloromethane	ND U	5.2	0.64	1	01/30/17 17:59	
Bromoform	ND U	5.2	0.97	1	01/30/17 17:59	
Bromomethane	ND U	5.2	1.5	1	01/30/17 17:59	
Carbon Disulfide	ND U	5.2	1.3	1	01/30/17 17:59	
Carbon Tetrachloride	ND U	5.2	0.96	1	01/30/17 17:59	
Chlorobenzene	ND U	5.2	0.31	1	01/30/17 17:59	
Chloroethane	ND U	5.2	3.0	1	01/30/17 17:59	
Chloroform	ND U	5.2	1.4	1	01/30/17 17:59	
Chloromethane	ND U	5.2	0.42	1	01/30/17 17:59	
Dibromochloromethane	ND U	5.2	0.76	1	01/30/17 17:59	
Dibromomethane	ND U	5.2	0.66	1	01/30/17 17:59	
Dichlorodifluoromethane (CFC 12)	ND U	5.2	2.0	1	01/30/17 17:59	
Dichloromethane	ND U	5.2	0.60	1	01/30/17 17:59	
Ethyl Methacrylate	ND U	5.2	0.78	1	01/30/17 17:59	
Ethylbenzene	ND U	5.2	0.24	1	01/30/17 17:59	
Iodomethane	ND U	10	1.2	1	01/30/17 17:59	
Methacrylonitrile	ND U	5.2	1.6	1	01/30/17 17:59	
Methyl Methacrylate	ND U	5.2	0.76	1	01/30/17 17:59	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180930 400-SB-02
Lab Code: R1700596-007

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25
Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.2	0.53	1	01/30/17 17:59	
Propionitrile	ND U	26	6.8	1	01/30/17 17:59	
Tetrachloroethene (PCE)	ND U	5.2	0.92	1	01/30/17 17:59	
Toluene	ND U	5.2	1.1	1	01/30/17 17:59	
Trichloroethene (TCE)	ND U	5.2	1.1	1	01/30/17 17:59	
Trichlorofluoromethane (CFC 11)	ND U	5.2	0.69	1	01/30/17 17:59	
Vinyl Chloride	ND U	5.2	2.0	1	01/30/17 17:59	
cis-1,3-Dichloropropene	ND U	5.2	0.94	1	01/30/17 17:59	
m,p-Xylenes	ND U	10	1.2	1	01/30/17 17:59	
o-Xylene	ND U	5.2	0.50	1	01/30/17 17:59	
trans-1,2-Dichloroethene	ND U	5.2	0.90	1	01/30/17 17:59	
trans-1,3-Dichloropropene	ND U	5.2	0.21	1	01/30/17 17:59	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	103	51 - 136	01/30/17 17:59	
Dibromofluoromethane	103	63 - 138	01/30/17 17:59	
Toluene-d8	104	66 - 138	01/30/17 17:59	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000104-76-7	1-Hexanol, 2-ethyl-	13.57	19	JN

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25

Sample Name: 1701180935 400-SB-05
Lab Code: R1700596-010

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.1	0.86	1	01/30/17 18:23	
1,1,1-Trichloroethane (TCA)	ND U	5.1	0.75	1	01/30/17 18:23	
1,1,2,2-Tetrachloroethane	ND U	5.1	0.84	1	01/30/17 18:23	
1,1,2-Trichloroethane	ND U	5.1	0.75	1	01/30/17 18:23	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.1	1.3	1	01/30/17 18:23	
1,1-Dichloroethene (1,1-DCE)	ND U	5.1	1.4	1	01/30/17 18:23	
1,2,3-Trichloropropane	ND U	5.1	1.4	1	01/30/17 18:23	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.1	2.0	1	01/30/17 18:23	
1,2-Dibromoethane	ND U	5.1	1.3	1	01/30/17 18:23	
1,2-Dichlorobenzene	ND U	5.1	0.63	1	01/30/17 18:23	
1,2-Dichloroethane	ND U	5.1	0.63	1	01/30/17 18:23	
1,2-Dichloropropane	ND U	5.1	1.0	1	01/30/17 18:23	
1,3-Dichlorobenzene	ND U	5.1	0.65	1	01/30/17 18:23	
1,4-Dioxane	720 B	100	20	1	01/30/17 18:23	
2-Butanone (MEK)	ND U	5.1	2.4	1	01/30/17 18:23	
2-Chloro-1,3-butadiene	ND U	5.1	1.6	1	01/30/17 18:23	
2-Chloroethyl Vinyl Ether	ND U	5.1	1.8	1	01/30/17 18:23	
Isobutyl Alcohol	ND U	100	24	1	01/30/17 18:23	
Allyl Chloride	ND U	5.1	1.8	1	01/30/17 18:23	
4-Methyl-2-pentanone	ND U	5.1	1.1	1	01/30/17 18:23	
Acetone	ND U	5.1	2.9	1	01/30/17 18:23	
Acetonitrile	ND U	26	18	1	01/30/17 18:23	
Acrolein	ND U	26	3.6	1	01/30/17 18:23	
Acrylonitrile	ND U	26	6.7	1	01/30/17 18:23	
Benzene	ND U	5.1	0.30	1	01/30/17 18:23	
Bromodichloromethane	ND U	5.1	0.63	1	01/30/17 18:23	
Bromoform	ND U	5.1	0.96	1	01/30/17 18:23	
Bromomethane	ND U	5.1	1.5	1	01/30/17 18:23	
Carbon Disulfide	ND U	5.1	1.3	1	01/30/17 18:23	
Carbon Tetrachloride	ND U	5.1	0.95	1	01/30/17 18:23	
Chlorobenzene	ND U	5.1	0.30	1	01/30/17 18:23	
Chloroethane	ND U	5.1	3.0	1	01/30/17 18:23	
Chloroform	ND U	5.1	1.3	1	01/30/17 18:23	
Chloromethane	ND U	5.1	0.42	1	01/30/17 18:23	
Dibromochloromethane	ND U	5.1	0.75	1	01/30/17 18:23	
Dibromomethane	ND U	5.1	0.65	1	01/30/17 18:23	
Dichlorodifluoromethane (CFC 12)	ND U	5.1	2.0	1	01/30/17 18:23	
Dichloromethane	ND U	5.1	0.59	1	01/30/17 18:23	
Ethyl Methacrylate	ND U	5.1	0.78	1	01/30/17 18:23	
Ethylbenzene	ND U	5.1	0.24	1	01/30/17 18:23	
Iodomethane	ND U	10	1.2	1	01/30/17 18:23	
Methacrylonitrile	ND U	5.1	1.6	1	01/30/17 18:23	
Methyl Methacrylate	ND U	5.1	0.75	1	01/30/17 18:23	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180935 400-SB-05
Lab Code: R1700596-010

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25
Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.1	0.53	1	01/30/17 18:23	
Propionitrile	ND U	26	6.7	1	01/30/17 18:23	
Tetrachloroethene (PCE)	ND U	5.1	0.91	1	01/30/17 18:23	
Toluene	ND U	5.1	1.1	1	01/30/17 18:23	
Trichloroethene (TCE)	ND U	5.1	1.1	1	01/30/17 18:23	
Trichlorofluoromethane (CFC 11)	ND U	5.1	0.68	1	01/30/17 18:23	
Vinyl Chloride	ND U	5.1	1.9	1	01/30/17 18:23	
cis-1,3-Dichloropropene	ND U	5.1	0.93	1	01/30/17 18:23	
m,p-Xylenes	ND U	10	1.2	1	01/30/17 18:23	
o-Xylene	ND U	5.1	0.50	1	01/30/17 18:23	
trans-1,2-Dichloroethene	ND U	5.1	0.89	1	01/30/17 18:23	
trans-1,3-Dichloropropene	ND U	5.1	0.21	1	01/30/17 18:23	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	97	51 - 136	01/30/17 18:23	
Dibromofluoromethane	99	63 - 138	01/30/17 18:23	
Toluene-d8	101	66 - 138	01/30/17 18:23	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	unknown	13.57	6.2	J
	unknown	14.39	7.0	J

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25

Sample Name: 1701180940 400-SB-05
Lab Code: R1700596-013

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.3	0.89	1	01/30/17 18:48	
1,1,1-Trichloroethane (TCA)	ND U	5.3	0.78	1	01/30/17 18:48	
1,1,2,2-Tetrachloroethane	ND U	5.3	0.87	1	01/30/17 18:48	
1,1,2-Trichloroethane	ND U	5.3	0.78	1	01/30/17 18:48	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.3	1.4	1	01/30/17 18:48	
1,1-Dichloroethene (1,1-DCE)	ND U	5.3	1.4	1	01/30/17 18:48	
1,2,3-Trichloropropane	ND U	5.3	1.5	1	01/30/17 18:48	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.3	2.0	1	01/30/17 18:48	
1,2-Dibromoethane	ND U	5.3	1.3	1	01/30/17 18:48	
1,2-Dichlorobenzene	ND U	5.3	0.66	1	01/30/17 18:48	
1,2-Dichloroethane	ND U	5.3	0.66	1	01/30/17 18:48	
1,2-Dichloropropane	ND U	5.3	1.1	1	01/30/17 18:48	
1,3-Dichlorobenzene	ND U	5.3	0.68	1	01/30/17 18:48	
1,4-Dioxane	660 B	110	21	1	01/30/17 18:48	
2-Butanone (MEK)	ND U	5.3	2.5	1	01/30/17 18:48	
2-Chloro-1,3-butadiene	ND U	5.3	1.7	1	01/30/17 18:48	
2-Chloroethyl Vinyl Ether	ND U	5.3	1.9	1	01/30/17 18:48	
Isobutyl Alcohol	ND U	110	25	1	01/30/17 18:48	
Allyl Chloride	ND U	5.3	1.9	1	01/30/17 18:48	
4-Methyl-2-pentanone	ND U	5.3	1.1	1	01/30/17 18:48	
Acetone	ND U	5.3	3.1	1	01/30/17 18:48	
Acetonitrile	ND U	27	18	1	01/30/17 18:48	
Acrolein	ND U	27	3.8	1	01/30/17 18:48	
Acrylonitrile	ND U	27	7.0	1	01/30/17 18:48	
Benzene	ND U	5.3	0.31	1	01/30/17 18:48	
Bromodichloromethane	ND U	5.3	0.66	1	01/30/17 18:48	
Bromoform	ND U	5.3	1.0	1	01/30/17 18:48	
Bromomethane	ND U	5.3	1.5	1	01/30/17 18:48	
Carbon Disulfide	ND U	5.3	1.4	1	01/30/17 18:48	
Carbon Tetrachloride	ND U	5.3	0.99	1	01/30/17 18:48	
Chlorobenzene	ND U	5.3	0.31	1	01/30/17 18:48	
Chloroethane	ND U	5.3	3.1	1	01/30/17 18:48	
Chloroform	ND U	5.3	1.4	1	01/30/17 18:48	
Chloromethane	ND U	5.3	0.43	1	01/30/17 18:48	
Dibromochloromethane	ND U	5.3	0.78	1	01/30/17 18:48	
Dibromomethane	ND U	5.3	0.68	1	01/30/17 18:48	
Dichlorodifluoromethane (CFC 12)	ND U	5.3	2.1	1	01/30/17 18:48	
Dichloromethane	ND U	5.3	0.61	1	01/30/17 18:48	
Ethyl Methacrylate	ND U	5.3	0.81	1	01/30/17 18:48	
Ethylbenzene	ND U	5.3	0.25	1	01/30/17 18:48	
Iodomethane	ND U	11	1.2	1	01/30/17 18:48	
Methacrylonitrile	ND U	5.3	1.7	1	01/30/17 18:48	
Methyl Methacrylate	ND U	5.3	0.78	1	01/30/17 18:48	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180940 400-SB-05
Lab Code: R1700596-013

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.3	0.55	1	01/30/17 18:48	
Propionitrile	ND U	27	7.0	1	01/30/17 18:48	
Tetrachloroethene (PCE)	ND U	5.3	0.95	1	01/30/17 18:48	
Toluene	ND U	5.3	1.1	1	01/30/17 18:48	
Trichloroethene (TCE)	ND U	5.3	1.1	1	01/30/17 18:48	
Trichlorofluoromethane (CFC 11)	ND U	5.3	0.71	1	01/30/17 18:48	
Vinyl Chloride	ND U	5.3	2.0	1	01/30/17 18:48	
cis-1,3-Dichloropropene	ND U	5.3	0.97	1	01/30/17 18:48	
m,p-Xylenes	ND U	11	1.2	1	01/30/17 18:48	
o-Xylene	ND U	5.3	0.52	1	01/30/17 18:48	
trans-1,2-Dichloroethene	ND U	5.3	0.92	1	01/30/17 18:48	
trans-1,3-Dichloropropene	ND U	5.3	0.22	1	01/30/17 18:48	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	103	51 - 136	01/30/17 18:48	
Dibromofluoromethane	100	63 - 138	01/30/17 18:48	
Toluene-d8	102	66 - 138	01/30/17 18:48	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25

Sample Name: 1701180941 400-SB-05
Lab Code: R1700596-014

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.4	0.90	1	01/30/17 19:12	
1,1,1-Trichloroethane (TCA)	ND U	5.4	0.79	1	01/30/17 19:12	
1,1,2,2-Tetrachloroethane	ND U	5.4	0.87	1	01/30/17 19:12	
1,1,2-Trichloroethane	ND U	5.4	0.79	1	01/30/17 19:12	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.4	1.4	1	01/30/17 19:12	
1,1-Dichloroethene (1,1-DCE)	ND U	5.4	1.4	1	01/30/17 19:12	
1,2,3-Trichloropropane	ND U	5.4	1.5	1	01/30/17 19:12	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.4	2.1	1	01/30/17 19:12	
1,2-Dibromoethane	ND U	5.4	1.3	1	01/30/17 19:12	
1,2-Dichlorobenzene	ND U	5.4	0.66	1	01/30/17 19:12	
1,2-Dichloroethane	ND U	5.4	0.66	1	01/30/17 19:12	
1,2-Dichloropropane	ND U	5.4	1.1	1	01/30/17 19:12	
1,3-Dichlorobenzene	ND U	5.4	0.68	1	01/30/17 19:12	
1,4-Dioxane	680 B	110	21	1	01/30/17 19:12	
2-Butanone (MEK)	ND U	5.4	2.5	1	01/30/17 19:12	
2-Chloro-1,3-butadiene	ND U	5.4	1.7	1	01/30/17 19:12	
2-Chloroethyl Vinyl Ether	ND U	5.4	1.9	1	01/30/17 19:12	
Isobutyl Alcohol	ND U	110	25	1	01/30/17 19:12	
Allyl Chloride	ND U	5.4	1.9	1	01/30/17 19:12	
4-Methyl-2-pentanone	ND U	5.4	1.1	1	01/30/17 19:12	
Acetone	ND U	5.4	3.1	1	01/30/17 19:12	
Acetonitrile	ND U	27	18	1	01/30/17 19:12	
Acrolein	ND U	27	3.8	1	01/30/17 19:12	
Acrylonitrile	ND U	27	7.0	1	01/30/17 19:12	
Benzene	ND U	5.4	0.32	1	01/30/17 19:12	
Bromodichloromethane	ND U	5.4	0.66	1	01/30/17 19:12	
Bromoform	ND U	5.4	1.0	1	01/30/17 19:12	
Bromomethane	ND U	5.4	1.5	1	01/30/17 19:12	
Carbon Disulfide	ND U	5.4	1.4	1	01/30/17 19:12	
Carbon Tetrachloride	ND U	5.4	0.99	1	01/30/17 19:12	
Chlorobenzene	ND U	5.4	0.32	1	01/30/17 19:12	
Chloroethane	ND U	5.4	3.1	1	01/30/17 19:12	
Chloroform	ND U	5.4	1.4	1	01/30/17 19:12	
Chloromethane	ND U	5.4	0.43	1	01/30/17 19:12	
Dibromochloromethane	ND U	5.4	0.79	1	01/30/17 19:12	
Dibromomethane	ND U	5.4	0.68	1	01/30/17 19:12	
Dichlorodifluoromethane (CFC 12)	ND U	5.4	2.1	1	01/30/17 19:12	
Dichloromethane	ND U	5.4	0.62	1	01/30/17 19:12	
Ethyl Methacrylate	ND U	5.4	0.81	1	01/30/17 19:12	
Ethylbenzene	ND U	5.4	0.25	1	01/30/17 19:12	
Iodomethane	ND U	11	1.3	1	01/30/17 19:12	
Methacrylonitrile	ND U	5.4	1.7	1	01/30/17 19:12	
Methyl Methacrylate	ND U	5.4	0.79	1	01/30/17 19:12	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180941 400-SB-05
Lab Code: R1700596-014

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.4	0.55	1	01/30/17 19:12	
Propionitrile	ND U	27	7.0	1	01/30/17 19:12	
Tetrachloroethene (PCE)	ND U	5.4	0.95	1	01/30/17 19:12	
Toluene	ND U	5.4	1.1	1	01/30/17 19:12	
Trichloroethene (TCE)	ND U	5.4	1.1	1	01/30/17 19:12	
Trichlorofluoromethane (CFC 11)	ND U	5.4	0.71	1	01/30/17 19:12	
Vinyl Chloride	ND U	5.4	2.0	1	01/30/17 19:12	
cis-1,3-Dichloropropene	ND U	5.4	0.97	1	01/30/17 19:12	
m,p-Xylenes	ND U	11	1.2	1	01/30/17 19:12	
o-Xylene	ND U	5.4	0.52	1	01/30/17 19:12	
trans-1,2-Dichloroethene	ND U	5.4	0.93	1	01/30/17 19:12	
trans-1,3-Dichloropropene	ND U	5.4	0.22	1	01/30/17 19:12	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	100	51 - 136	01/30/17 19:12	
Dibromofluoromethane	101	63 - 138	01/30/17 19:12	
Toluene-d8	102	66 - 138	01/30/17 19:12	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			



Metals

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180921 400-SB-06
Lab Code: R1700596-002

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.3	0.5	1	01/26/17 09:24	01/24/17	
Arsenic, Total	6010C	6.4	mg/Kg	1.0	0.3	1	01/26/17 09:24	01/24/17	
Barium, Total	6010C	667	mg/Kg	2.1	0.2	1	01/26/17 09:24	01/24/17	
Beryllium, Total	6010C	0.53	mg/Kg	0.31	0.02	1	01/26/17 09:24	01/24/17	
Cadmium, Total	6010C	ND U	mg/Kg	0.52	0.04	1	01/26/17 09:24	01/24/17	
Chromium, Total	6010C	10.4	mg/Kg	1.0	0.2	1	01/26/17 09:24	01/24/17	
Lead, Total	6010C	6.1	mg/Kg	5.2	0.3	1	01/26/17 09:24	01/24/17	
Mercury, Total	7471B	ND U	mg/Kg	0.033	0.003	1	01/25/17 12:43	01/24/17	
Nickel, Total	6010C	6.7	mg/Kg	4.2	0.2	1	01/26/17 09:24	01/24/17	
Selenium, Total	6010C	1.0 J	mg/Kg	1.0	0.7	1	01/26/17 09:24	01/24/17	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/26/17 09:24	01/24/17	
Thallium, Total	6010C	3.4	mg/Kg	1.0	0.6	1	01/26/17 09:24	01/24/17	
Vanadium, Total	6010C	19.9	mg/Kg	5.2	0.2	1	01/26/17 09:24	01/24/17	
Zinc, Total	6010C	55.1	mg/Kg	2.1	0.2	1	01/26/17 09:24	01/24/17	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180926 400-SB-02
Lab Code: R1700596-005

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.0	0.4	1	01/26/17 09:28	01/24/17	
Arsenic, Total	6010C	5.8	mg/Kg	1.0	0.3	1	01/26/17 09:28	01/24/17	
Barium, Total	6010C	110	mg/Kg	2.0	0.2	1	01/26/17 09:28	01/24/17	
Beryllium, Total	6010C	0.49	mg/Kg	0.30	0.02	1	01/26/17 09:28	01/24/17	
Cadmium, Total	6010C	ND U	mg/Kg	0.50	0.04	1	01/26/17 09:28	01/24/17	
Chromium, Total	6010C	43.9	mg/Kg	1.0	0.2	1	01/26/17 09:28	01/24/17	
Lead, Total	6010C	9.0	mg/Kg	5.0	0.3	1	01/26/17 09:28	01/24/17	
Mercury, Total	7471B	0.006 J	mg/Kg	0.033	0.003	1	01/25/17 12:44	01/24/17	
Nickel, Total	6010C	8.8	mg/Kg	4.0	0.2	1	01/26/17 09:28	01/24/17	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/26/17 09:28	01/24/17	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/26/17 09:28	01/24/17	
Thallium, Total	6010C	2.4	mg/Kg	1.0	0.6	1	01/26/17 09:28	01/24/17	
Vanadium, Total	6010C	14.4	mg/Kg	5.0	0.2	1	01/26/17 09:28	01/24/17	
Zinc, Total	6010C	49.5	mg/Kg	2.0	0.2	1	01/26/17 09:28	01/24/17	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180931 400-SB-02
Lab Code: R1700596-008

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.0	0.4	1	01/26/17 09:31	01/24/17	
Arsenic, Total	6010C	3.93	mg/Kg	0.99	0.24	1	01/26/17 09:31	01/24/17	
Barium, Total	6010C	67.0	mg/Kg	2.0	0.2	1	01/26/17 09:31	01/24/17	
Beryllium, Total	6010C	0.46	mg/Kg	0.30	0.02	1	01/26/17 09:31	01/24/17	
Cadmium, Total	6010C	ND U	mg/Kg	0.50	0.04	1	01/26/17 09:31	01/24/17	
Chromium, Total	6010C	22.1	mg/Kg	0.99	0.13	1	01/26/17 09:31	01/24/17	
Lead, Total	6010C	7.5	mg/Kg	5.0	0.3	1	01/26/17 09:31	01/24/17	
Mercury, Total	7471B	0.004 J	mg/Kg	0.031	0.003	1	01/25/17 12:46	01/24/17	
Nickel, Total	6010C	9.4	mg/Kg	4.0	0.2	1	01/26/17 09:31	01/24/17	
Selenium, Total	6010C	ND U	mg/Kg	0.99	0.60	1	01/26/17 09:31	01/24/17	
Silver, Total	6010C	ND U	mg/Kg	0.99	0.44	1	01/26/17 09:31	01/24/17	
Thallium, Total	6010C	0.72 J	mg/Kg	0.99	0.51	1	01/26/17 09:31	01/24/17	
Vanadium, Total	6010C	15.0	mg/Kg	5.0	0.2	1	01/26/17 09:31	01/24/17	
Zinc, Total	6010C	40.3	mg/Kg	2.0	0.2	1	01/26/17 09:31	01/24/17	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180936 400-SB-05
Lab Code: R1700596-011

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.1	0.5	1	01/26/17 09:34	01/24/17	
Arsenic, Total	6010C	7.2	mg/Kg	1.0	0.3	1	01/26/17 09:34	01/24/17	
Barium, Total	6010C	82.2	mg/Kg	2.0	0.2	1	01/26/17 09:34	01/24/17	
Beryllium, Total	6010C	0.58	mg/Kg	0.30	0.02	1	01/26/17 09:34	01/24/17	
Cadmium, Total	6010C	0.15 J	mg/Kg	0.51	0.04	1	01/26/17 09:34	01/24/17	
Chromium, Total	6010C	31.9	mg/Kg	1.0	0.2	1	01/26/17 09:34	01/24/17	
Lead, Total	6010C	11.9	mg/Kg	5.1	0.3	1	01/26/17 09:34	01/24/17	
Mercury, Total	7471B	0.004 J	mg/Kg	0.032	0.003	1	01/25/17 12:48	01/24/17	
Nickel, Total	6010C	9.7	mg/Kg	4.0	0.2	1	01/26/17 09:34	01/24/17	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/26/17 09:34	01/24/17	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/26/17 09:34	01/24/17	
Thallium, Total	6010C	2.1	mg/Kg	1.0	0.6	1	01/26/17 09:34	01/24/17	
Vanadium, Total	6010C	17.7	mg/Kg	5.1	0.2	1	01/26/17 09:34	01/24/17	
Zinc, Total	6010C	63.6	mg/Kg	2.0	0.2	1	01/26/17 09:34	01/24/17	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180943 400-SB-05
Lab Code: R1700596-015

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.4	0.5	1	01/26/17 09:44	01/24/17	
Arsenic, Total	6010C	4.5	mg/Kg	1.1	0.3	1	01/26/17 09:44	01/24/17	
Barium, Total	6010C	90.9	mg/Kg	2.1	0.2	1	01/26/17 09:44	01/24/17	
Beryllium, Total	6010C	0.38	mg/Kg	0.32	0.02	1	01/26/17 09:44	01/24/17	
Cadmium, Total	6010C	0.18 J	mg/Kg	0.53	0.04	1	01/26/17 09:44	01/24/17	
Chromium, Total	6010C	24.4	mg/Kg	1.1	0.2	1	01/26/17 09:44	01/24/17	
Lead, Total	6010C	11.2	mg/Kg	5.3	0.3	1	01/26/17 09:44	01/24/17	
Mercury, Total	7471B	ND U	mg/Kg	0.035	0.004	1	01/25/17 12:49	01/24/17	
Nickel, Total	6010C	6.0	mg/Kg	4.2	0.2	1	01/26/17 09:44	01/24/17	
Selenium, Total	6010C	ND U	mg/Kg	1.1	0.7	1	01/26/17 09:44	01/24/17	
Silver, Total	6010C	ND U	mg/Kg	1.1	0.5	1	01/26/17 09:44	01/24/17	
Thallium, Total	6010C	2.0	mg/Kg	1.1	0.6	1	01/26/17 09:44	01/24/17	
Vanadium, Total	6010C	12.9	mg/Kg	5.3	0.2	1	01/26/17 09:44	01/24/17	
Zinc, Total	6010C	36.6	mg/Kg	2.1	0.2	1	01/26/17 09:44	01/24/17	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180944 400-SB-05
Lab Code: R1700596-016

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25
Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.1	0.4	1	01/26/17 09:59	01/24/17	
Arsenic, Total	6010C	4.1	mg/Kg	1.0	0.3	1	01/26/17 09:59	01/24/17	
Barium, Total	6010C	126	mg/Kg	2.0	0.2	1	01/26/17 09:59	01/24/17	
Beryllium, Total	6010C	0.41	mg/Kg	0.30	0.02	1	01/26/17 09:59	01/24/17	
Cadmium, Total	6010C	0.09 J	mg/Kg	0.50	0.04	1	01/26/17 09:59	01/24/17	
Chromium, Total	6010C	32.4	mg/Kg	1.0	0.2	1	01/26/17 09:59	01/24/17	
Lead, Total	6010C	8.6	mg/Kg	5.0	0.3	1	01/26/17 09:59	01/24/17	
Mercury, Total	7471B	ND U	mg/Kg	0.034	0.004	1	01/25/17 12:57	01/24/17	
Nickel, Total	6010C	8.0	mg/Kg	4.0	0.2	1	01/26/17 09:59	01/24/17	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/26/17 09:59	01/24/17	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/26/17 09:59	01/24/17	
Thallium, Total	6010C	2.2	mg/Kg	1.0	0.6	1	01/26/17 09:59	01/24/17	
Vanadium, Total	6010C	13.6	mg/Kg	5.0	0.2	1	01/26/17 09:59	01/24/17	
Zinc, Total	6010C	37.1	mg/Kg	2.0	0.2	1	01/26/17 09:59	01/24/17	



General Chemistry

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180920 400-SB-06
Lab Code: R1700596-001

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	94.4	Percent	-	1	01/25/17 15:20	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180921 400-SB-06
Lab Code: R1700596-002

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	94.0	Percent	-	-	1	01/23/17 10:33	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180925 400-SB-02
Lab Code: R1700596-004

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	97.7	Percent	-	1	01/25/17 15:20	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180926 400-SB-02
Lab Code: R1700596-005

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	97.6	Percent	-	-	1	01/23/17 10:33	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180930 400-SB-02
Lab Code: R1700596-007

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	96.6	Percent	-	1	01/25/17 15:20	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180931 400-SB-02
Lab Code: R1700596-008

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	96.8	Percent	-	-	1	01/23/17 10:33	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180935 400-SB-05
Lab Code: R1700596-010

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	97.4	Percent	-	1	01/25/17 15:20	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180936 400-SB-05
Lab Code: R1700596-011

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	98.0	Percent	-	-	1	01/23/17 10:33	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180940 400-SB-05
Lab Code: R1700596-013

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	93.6	Percent	-	1	01/25/17 15:20	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180941 400-SB-05
Lab Code: R1700596-014

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	93.2	Percent	-	1	01/25/17 15:20	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180943 400-SB-05
Lab Code: R1700596-015

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	92.3	Percent	-	-	1	01/23/17 10:33	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1701180944 400-SB-05
Lab Code: R1700596-016

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17 09:25
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	94.4	Percent	-	-	1	01/23/17 10:33	



QC Summary Forms

ALS Environmental—Rochester Laboratory
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Volatile Organic Compounds by GC/MS

ALS Environmental—Rochester Laboratory

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1700596

SURROGATE RECOVERY SUMMARY
Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Extraction Method: EPA 5030C

Sample Name	Lab Code	4-Bromofluorobenzene	Dibromofluoromethane	Toluene-d8
		51 - 136	63 - 138	66 - 138
1701180920 400-SB-06	R1700596-001	104	104	104
1701180925 400-SB-02	R1700596-004	103	101	102
1701180930 400-SB-02	R1700596-007	103	103	104
1701180935 400-SB-05	R1700596-010	97	99	101
1701180940 400-SB-05	R1700596-013	103	100	102
1701180941 400-SB-05	R1700596-014	100	101	102
Lab Control Sample	RQ1700977-03	118	117	115
Method Blank	RQ1700977-04	107	105	106
1701180940 400-SB-05 MS	RQ1700977-05	103	107	102
1701180940 400-SB-05 DMS	RQ1700977-06	100	105	100

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17
Date Analyzed: 01/30/17
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1701180940 400-SB-05
Lab Code: R1700596-013
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1700977-05			Duplicate Matrix Spike RQ1700977-06			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
1,1,1,2-Tetrachloroethane	ND U	50.6	53.4	95	49.1	53.4	92	52-133	3	30
1,1,1-Trichloroethane (TCA)	ND U	46.2	53.4	87	44.7	53.4	84	51-132	4	30
1,1,2,2-Tetrachloroethane	ND U	42.3	53.4	79	42.8	53.4	80	53-134	1	30
1,1,2-Trichloroethane	ND U	49.6	53.4	93	47.9	53.4	90	62-126	3	30
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	41.2	53.4	77	38.5	53.4	72	45-136	7	30
1,1-Dichloroethene (1,1-DCE)	ND U	45.6	53.4	85	43.5	53.4	82	61-139	4	30
1,2,3-Trichloropropane	ND U	46.8	53.4	88	45.3	53.4	85	22-167	3	30
1,2-Dibromo-3-chloropropane (DBCP)	ND U	48.8	53.4	91	48.9	53.4	92	27-163	1	30
1,2-Dibromoethane	ND U	47.8	53.4	89	47.0	53.4	88	52-137	1	30
1,2-Dichlorobenzene	ND U	52.6	53.4	98	50.4	53.4	94	22-156	4	30
1,2-Dichloroethane	ND U	48.9	53.4	92	47.1	53.4	88	59-125	4	30
1,2-Dichloropropane	ND U	47.4	53.4	89	46.0	53.4	86	67-126	3	30
1,3-Dichlorobenzene	ND U	50.9	53.4	95	48.1	53.4	90	29-146	5	30
1,4-Dioxane	660 B	1850	1070	112	1800	1070	107	50-148	5	30
2-Butanone (MEK)	ND U	43.9	53.4	82	41.8	53.4	78	43-134	5	30
2-Chloro-1,3-butadiene	ND U	49.4	53.4	93	46.4	53.4	87	45-134	7	30
2-Chloroethyl Vinyl Ether	ND U	ND	53.4	0 *	ND U	53.4	0 *	37-150	NC	30
Isobutyl Alcohol	ND U	933	1070	87	949	1070	89	39-146	2	30
Allyl Chloride	ND U	48.9	53.4	92	47.1	53.4	88	34-135	4	30
4-Methyl-2-pentanone	ND U	46.2	53.4	86	43.5	53.4	81	47-145	6	30
Acetone	ND U	63.5	53.4	119	68.7	53.4	129	11-183	8	30
Acetonitrile	ND U	307	267	115	313	267	117	28-146	2	30
Acrolein	ND U	45.6	107	43	33.8	107	32	10-172	29	30
Acrylonitrile	ND U	238	267	89	232	267	87	46-139	2	30
Benzene	ND U	49.8	53.4	93	47.3	53.4	89	63-126	4	30
Bromodichloromethane	ND U	46.8	53.4	88	45.7	53.4	86	47-141	2	30
Bromoform	ND U	49.2	53.4	92	49.8	53.4	93	26-157	1	30
Bromomethane	ND U	45.5	53.4	85	43.8	53.4	82	10-137	4	30
Carbon Disulfide	ND U	45.2	53.4	85	43.0	53.4	80	35-135	6	30
Carbon Tetrachloride	ND U	46.8	53.4	88	45.5	53.4	85	46-137	3	30
Chlorobenzene	ND U	49.8	53.4	93	47.8	53.4	89	51-132	4	30
Chloroethane	ND U	46.2	53.4	87	43.9	53.4	82	45-132	6	30
Chloroform	ND U	47.8	53.4	90	45.3	53.4	85	61-124	6	30
Chloromethane	ND U	41.8	53.4	78	39.6	53.4	74	50-136	5	30
Dibromochloromethane	ND U	50.5	53.4	95	50.4	53.4	94	40-146	1	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17
Date Analyzed: 01/30/17
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1701180940 400-SB-05
Lab Code: R1700596-013
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1700977-05			Duplicate Matrix Spike RQ1700977-06			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Dibromomethane	ND U	50.8	53.4	95	48.7	53.4	91	61-122	4	30
Dichlorodifluoromethane (CFC 12)	ND U	41.6	53.4	78	38.6	53.4	72	44-138	8	30
Dichloromethane	ND U	47.1	53.4	88	44.9	53.4	84	64-120	5	30
Ethyl Methacrylate	ND U	44.4	53.4	83	41.7	53.4	78	17-166	6	30
Ethylbenzene	ND U	47.4	53.4	89	45.3	53.4	85	44-131	5	30
Iodomethane	ND U	52.9	53.4	99	54.6	53.4	102	10-160	3	30
Methacrylonitrile	ND U	50.7	53.4	95	48.4	53.4	91	44-149	4	30
Methyl Methacrylate	ND U	56.5	53.4	106	55.4	53.4	104	41-162	2	30
Naphthalene	ND U	45.2	53.4	85	44.2	53.4	83	10-187	2	30
Propionitrile	ND U	254	267	95	252	267	94	46-144	1	30
Tetrachloroethene (PCE)	ND U	48.3	53.4	90	45.2	53.4	85	45-141	6	30
Toluene	ND U	47.4	53.4	89	44.9	53.4	84	50-140	6	30
Trichloroethene (TCE)	ND U	55.6	53.4	104	52.5	53.4	98	54-136	6	30
Trichlorofluoromethane (CFC 11)	ND U	46.5	53.4	87	43.2	53.4	81	47-129	7	30
Vinyl Chloride	ND U	48.4	53.4	91	44.6	53.4	84	53-128	8	30
cis-1,3-Dichloropropene	ND U	49.2	53.4	92	47.1	53.4	88	31-150	4	30
m,p-Xylenes	ND U	97.7	107	91	93.6	107	88	45-141	3	30
o-Xylene	ND U	50.7	53.4	95	48.3	53.4	90	46-139	5	30
trans-1,2-Dichloroethene	ND U	47.8	53.4	90	45.6	53.4	85	52-128	6	30
trans-1,3-Dichloropropene	ND U	49.7	53.4	93	48.6	53.4	91	23-160	2	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1700596
Date Collected: NA
Date Received: NA

Sample Name: Method Blank
Lab Code: RQ1700977-04

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.0	0.83	1	01/30/17 13:38	
1,1,1-Trichloroethane (TCA)	ND U	5.0	0.73	1	01/30/17 13:38	
1,1,2,2-Tetrachloroethane	ND U	5.0	0.81	1	01/30/17 13:38	
1,1,2-Trichloroethane	ND U	5.0	0.73	1	01/30/17 13:38	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.0	1.3	1	01/30/17 13:38	
1,1-Dichloroethene (1,1-DCE)	ND U	5.0	1.3	1	01/30/17 13:38	
1,2,3-Trichloropropane	ND U	5.0	1.4	1	01/30/17 13:38	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.0	1.9	1	01/30/17 13:38	
1,2-Dibromoethane	ND U	5.0	1.3	1	01/30/17 13:38	
1,2-Dichlorobenzene	ND U	5.0	0.61	1	01/30/17 13:38	
1,2-Dichloroethane	ND U	5.0	0.61	1	01/30/17 13:38	
1,2-Dichloropropane	ND U	5.0	0.97	1	01/30/17 13:38	
1,3-Dichlorobenzene	ND U	5.0	0.63	1	01/30/17 13:38	
1,4-Dioxane	760	100	20	1	01/30/17 13:38	
2-Butanone (MEK)	ND U	5.0	2.3	1	01/30/17 13:38	
2-Chloro-1,3-butadiene	ND U	5.0	1.6	1	01/30/17 13:38	
2-Chloroethyl Vinyl Ether	ND U	5.0	1.8	1	01/30/17 13:38	
Isobutyl Alcohol	ND U	100	23	1	01/30/17 13:38	
Allyl Chloride	ND U	5.0	1.7	1	01/30/17 13:38	
4-Methyl-2-pentanone	ND U	5.0	0.98	1	01/30/17 13:38	
Acetone	ND U	5.0	2.9	1	01/30/17 13:38	
Acetonitrile	ND U	25	17	1	01/30/17 13:38	
Acrolein	ND U	25	3.5	1	01/30/17 13:38	
Acrylonitrile	ND U	25	6.5	1	01/30/17 13:38	
Benzene	ND U	5.0	0.29	1	01/30/17 13:38	
Bromodichloromethane	ND U	5.0	0.61	1	01/30/17 13:38	
Bromoform	ND U	5.0	0.93	1	01/30/17 13:38	
Bromomethane	ND U	5.0	1.4	1	01/30/17 13:38	
Carbon Disulfide	ND U	5.0	1.3	1	01/30/17 13:38	
Carbon Tetrachloride	ND U	5.0	0.92	1	01/30/17 13:38	
Chlorobenzene	ND U	5.0	0.29	1	01/30/17 13:38	
Chloroethane	ND U	5.0	2.9	1	01/30/17 13:38	
Chloroform	ND U	5.0	1.3	1	01/30/17 13:38	
Chloromethane	ND U	5.0	0.40	1	01/30/17 13:38	
Dibromochloromethane	ND U	5.0	0.73	1	01/30/17 13:38	
Dibromomethane	ND U	5.0	0.63	1	01/30/17 13:38	
Dichlorodifluoromethane (CFC 12)	ND U	5.0	1.9	1	01/30/17 13:38	
Dichloromethane	ND U	5.0	0.57	1	01/30/17 13:38	
Ethyl Methacrylate	ND U	5.0	0.75	1	01/30/17 13:38	
Ethylbenzene	ND U	5.0	0.23	1	01/30/17 13:38	
Iodomethane	ND U	10	1.2	1	01/30/17 13:38	
Methacrylonitrile	ND U	5.0	1.6	1	01/30/17 13:38	
Methyl Methacrylate	ND U	5.0	0.73	1	01/30/17 13:38	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: RQ1700977-04

Service Request: R1700596
Date Collected: NA
Date Received: NA

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.0	0.51	1	01/30/17 13:38	
Propionitrile	ND U	25	6.5	1	01/30/17 13:38	
Tetrachloroethene (PCE)	ND U	5.0	0.88	1	01/30/17 13:38	
Toluene	ND U	5.0	1.0	1	01/30/17 13:38	
Trichloroethene (TCE)	ND U	5.0	1.1	1	01/30/17 13:38	
Trichlorofluoromethane (CFC 11)	ND U	5.0	0.66	1	01/30/17 13:38	
Vinyl Chloride	ND U	5.0	1.9	1	01/30/17 13:38	
cis-1,3-Dichloropropene	ND U	5.0	0.90	1	01/30/17 13:38	
m,p-Xylenes	ND U	10	1.1	1	01/30/17 13:38	
o-Xylene	ND U	5.0	0.48	1	01/30/17 13:38	
trans-1,2-Dichloroethene	ND U	5.0	0.86	1	01/30/17 13:38	
trans-1,3-Dichloropropene	ND U	5.0	0.20	1	01/30/17 13:38	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	107	51 - 136	01/30/17 13:38	
Dibromofluoromethane	105	63 - 138	01/30/17 13:38	
Toluene-d8	106	66 - 138	01/30/17 13:38	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1700596
Date Analyzed: 01/30/17

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Units:ug/Kg
Basis:Dry

Lab Control Sample
RQ1700977-03

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
1,1,1,2-Tetrachloroethane	8260C	21.1	20.0	106	40-140
1,1,1-Trichloroethane (TCA)	8260C	19.7	20.0	98	40-140
1,1,2,2-Tetrachloroethane	8260C	18.0	20.0	90	40-140
1,1,2-Trichloroethane	8260C	19.1	20.0	96	40-140
1,1,2-Trichloro-1,2,2-trifluoroethane	8260C	18.1	20.0	90	40-140
1,1-Dichloroethene (1,1-DCE)	8260C	19.5	20.0	97	40-140
1,2,3-Trichloropropane	8260C	17.6	20.0	88	40-140
1,2-Dibromo-3-chloropropane (DBCP)	8260C	18.0	20.0	90	40-140
1,2-Dibromoethane	8260C	18.6	20.0	93	40-140
1,2-Dichlorobenzene	8260C	22.7	20.0	113	40-140
1,2-Dichloroethane	8260C	19.7	20.0	99	40-140
1,2-Dichloropropane	8260C	19.2	20.0	96	40-140
1,3-Dichlorobenzene	8260C	23.0	20.0	115	40-140
1,4-Dioxane	8260C	1570	400	393 *	40-140
2-Butanone (MEK)	8260C	14.9	20.0	74	40-140
2-Chloro-1,3-butadiene	8260C	20.9	20.0	104	40-140
2-Chloroethyl Vinyl Ether	8260C	ND U	20.0	0 *	40-140
Isobutyl Alcohol	8260C	354	400	88	40-140
Allyl Chloride	8260C	20.7	20.0	104	40-140
4-Methyl-2-pentanone	8260C	15.7	20.0	78	40-140
Acetone	8260C	14.0	20.0	70	40-140
Acetonitrile	8260C	154	100	154 *	40-140
Acrolein	8260C	38.3	40.0	96	40-140
Acrylonitrile	8260C	81.9	100	82	40-140
Benzene	8260C	21.2	20.0	106	40-140
Bromodichloromethane	8260C	19.0	20.0	95	40-140
Bromoform	8260C	19.0	20.0	95	40-140
Bromomethane	8260C	17.3	20.0	86	40-140
Carbon Disulfide	8260C	19.5	20.0	98	40-140
Carbon Tetrachloride	8260C	20.5	20.0	103	40-140
Chlorobenzene	8260C	21.3	20.0	107	40-140
Chloroethane	8260C	17.6	20.0	88	40-140
Chloroform	8260C	19.2	20.0	96	40-140

ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1700596
Date Analyzed: 01/30/17

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Units:ug/Kg
Basis:Dry

Lab Control Sample
RQ1700977-03

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Chloromethane	8260C	17.6	20.0	88	40-140
Dibromochloromethane	8260C	19.5	20.0	97	40-140
Dibromomethane	8260C	19.7	20.0	99	40-140
Dichlorodifluoromethane (CFC 12)	8260C	17.8	20.0	89	40-140
Dichloromethane	8260C	18.7	20.0	93	40-140
Ethyl Methacrylate	8260C	19.5	20.0	98	40-140
Ethylbenzene	8260C	20.7	20.0	104	40-140
Iodomethane	8260C	24.8	20.0	124	40-140
Methacrylonitrile	8260C	17.8	20.0	89	40-140
Methyl Methacrylate	8260C	19.5	20.0	97	40-140
Naphthalene	8260C	18.8	20.0	94	40-140
Propionitrile	8260C	89.2	100	89	40-140
Tetrachloroethene (PCE)	8260C	21.7	20.0	109	40-140
Toluene	8260C	20.3	20.0	101	40-140
Trichloroethene (TCE)	8260C	22.1	20.0	110	40-140
Trichlorofluoromethane (CFC 11)	8260C	20.7	20.0	103	40-140
Vinyl Chloride	8260C	20.1	20.0	100	40-140
cis-1,3-Dichloropropene	8260C	19.5	20.0	98	40-140
m,p-Xylenes	8260C	43.5	40.0	109	40-140
o-Xylene	8260C	21.8	20.0	109	40-140
trans-1,2-Dichloroethene	8260C	20.5	20.0	102	40-140
trans-1,3-Dichloropropene	8260C	19.5	20.0	98	40-140



Metals

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dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: R1700596-MB

Service Request: R1700596
Date Collected: NA
Date Received: NA
Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.0	0.4	1	01/26/17 09:18	01/24/17	
Arsenic, Total	6010C	ND U	mg/Kg	1.0	0.3	1	01/26/17 09:18	01/24/17	
Barium, Total	6010C	ND U	mg/Kg	2.0	0.2	1	01/26/17 09:18	01/24/17	
Beryllium, Total	6010C	ND U	mg/Kg	0.30	0.02	1	01/26/17 09:18	01/24/17	
Cadmium, Total	6010C	ND U	mg/Kg	0.50	0.04	1	01/26/17 09:18	01/24/17	
Chromium, Total	6010C	ND U	mg/Kg	1.0	0.2	1	01/26/17 09:18	01/24/17	
Lead, Total	6010C	ND U	mg/Kg	5.0	0.3	1	01/26/17 09:18	01/24/17	
Mercury, Total	7471B	ND U	mg/Kg	0.033	0.003	1	01/25/17 12:39	01/24/17	
Nickel, Total	6010C	ND U	mg/Kg	4.0	0.2	1	01/26/17 09:18	01/24/17	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/26/17 09:18	01/24/17	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/26/17 09:18	01/24/17	
Thallium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/26/17 09:18	01/24/17	
Vanadium, Total	6010C	ND U	mg/Kg	5.0	0.2	1	01/26/17 09:18	01/24/17	
Zinc, Total	6010C	ND U	mg/Kg	2.0	0.2	1	01/26/17 09:18	01/24/17	

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17
Date Analyzed: 01/25/17 - 01/26/17

**Duplicate Matrix Spike Summary
Inorganic Parameters**

Sample Name: 1701180943 400-SB-05
Lab Code: R1700596-015

Units: mg/Kg
Basis: Dry

Analyte Name	Method	Sample Result	Result	Matrix Spike R1700596-015MS		Duplicate Matrix Spike R1700596-015DMS		% Rec	% Rec Limits	RPD	RPD Limit
				Spike Amount	% Rec	Result	Spike Amount				
Silver, Total	6010C	ND U	5.3	5.2	102	5.5	5.3	103	75-125	3	20
Arsenic, Total	6010C	4.5	9.3	4.2	116	9.2	4.2	111	75-125	1	20
Barium, Total	6010C	90.9	369	208	133 *	332	212	114	75-125	10	20
Beryllium, Total	6010C	0.38	5.39	5.21	96	5.48	5.31	96	75-125	2	20
Cadmium, Total	6010C	0.18 J	4.49	5.21	83	4.73	5.31	86	75-125	5	20
Chromium, Total	6010C	24.4	50.9	20.8	127 *	54.2	21.2	140 *	75-125	6	20
Mercury, Total	7471B	ND U	0.180	0.172	105	0.177	0.167	106	75-125	2	35
Nickel, Total	6010C	6.0	55.0	52.1	94	54.2	53.1	91	75-125	2	20
Lead, Total	6010C	11.2	57.9	52.1	90	60.2	53.1	92	75-125	4	20
Antimony, Total	6010C	ND U	47.3	52.1	91	48.4	53.1	91	75-125	2	20
Selenium, Total	6010C	ND U	98.4	105	94	99.5	107	93	75-125	1	20
Thallium, Total	6010C	2.0	221	208	105	227	212	106	75-125	3	20
Vanadium, Total	6010C	12.9	67.7	52.1	105	67.2	53.1	102	75-125	<1	20
Zinc, Total	6010C	36.6	95.3	52.1	113	99.4	53.1	118	75-125	4	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1700596
Date Analyzed: 01/25/17 - 01/26/17

Lab Control Sample Summary
Inorganic Parameters

Units:mg/Kg
Basis:Dry

Lab Control Sample
R1700596-LCS

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Antimony, Total	6010C	47.5	50.0	95	80-120
Arsenic, Total	6010C	4.09	4.0	102	80-120
Barium, Total	6010C	208	200	104	80-120
Beryllium, Total	6010C	4.88	5.00	98	80-120
Cadmium, Total	6010C	5.11	5.00	102	80-120
Chromium, Total	6010C	20.6	20.0	103	80-120
Lead, Total	6010C	51.0	50.0	102	80-120
Mercury, Total	7471B	0.164	0.167	98	80-120
Nickel, Total	6010C	51.0	50.0	102	80-120
Selenium, Total	6010C	91.0	101	90	80-120
Silver, Total	6010C	4.85	5.0	97	80-120
Thallium, Total	6010C	183	200	91	80-120
Vanadium, Total	6010C	50.7	50.0	101	80-120
Zinc, Total	6010C	48.2	50.0	96	80-120



General Chemistry

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QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17
Date Analyzed: 01/25/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1701180940 400-SB-05
Lab Code: R1700596-013

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>Sample Result</u>	<u>Duplicate Sample R1700596-013DUP Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	93.6	92.7	93.1	<1	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1700596
Date Collected: 01/18/17
Date Received: 01/20/17
Date Analyzed: 01/23/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1701180943 400-SB-05
Lab Code: R1700596-015

Units: Percent
Basis: As Received

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample R1700596-015DUP Result	Average	RPD	RPD Limit
Total Solids	ALS SOP	-	-	92.3	94.2	93.3	2	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.



Subcontracted Analytical Parameters

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January 31, 2017

Reports and Invoices
ALS Environmental
1565 Jefferson Road
Building 300, Suite 360
Rochester, NY 14623

Certificate of Analysis

Project Name:	Metals without J values	Workorder:	2204062
Purchase Order:	58R1700596	Workorder ID:	R1700596

Dear Reports Invoices:

Enclosed are the analytical results for samples received by the laboratory on Wednesday, January 25, 2017.

The ALS Environmental laboratory in Middletown, Pennsylvania is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Mr. Brad W Kintzer (Project Coordinator) at (717) 944-5541.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state requirements. The test results meet requirements of the current NELAP standards or state requirements, where applicable. For a specific list of accredited analytes, refer to the certifications section of the ALS website at www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads.

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ALS Spring City: 10 Riverside Drive, Spring City, PA 19475 610-948-4903

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.


Mr. Brad W Kintzer
Project Coordinator

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SAMPLE SUMMARY

Workorder: 2204062 R1700596

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
2204062001	1701180922 400-SB-06	Solid	1/18/2017 00:00	1/25/2017 09:14	Collected by Client
2204062002	1701180927 400-SB-02	Solid	1/18/2017 00:00	1/25/2017 09:14	Collected by Client
2204062003	1701180932 400-SB-02	Solid	1/18/2017 00:00	1/25/2017 09:14	Collected by Client
2204062004	1701180937 400-SB-05	Solid	1/18/2017 00:00	1/25/2017 09:14	Collected by Client
2204062005	1701180946 400-SB-05	Solid	1/18/2017 00:00	1/25/2017 09:14	Collected by Client
2204062006	1701180947 400-SB-05	Solid	1/18/2017 00:00	1/25/2017 09:14	Collected by Client

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SAMPLE SUMMARY

Workorder: 2204062 R1700596

Notes

- Samples collected by ALS personnel are done so in accordance with the procedures set forth in the ALS Field Sampling Plan (20 - Field Services Sampling Plan).
- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
- The Chain of Custody document is included as part of this report.
- All Library Search analytes should be regarded as tentative identifications based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.
- Parameters identified as "analyze immediately" require analysis within 15 minutes of collection. Any "analyze immediately" parameters not listed under the header "Field Parameters" are performed in the laboratory and are therefore analyzed out of hold time.
- Method references listed on this report beginning with the prefix "S" followed by a method number (such as S2310B-97) refer to methods from "Standard Methods for the Examination of Water and Wastewater".
- For microbiological analyses, the "Prepared" value is the date/time into the incubator and the "Analyzed" value is the date/time out the incubator.

Standard Acronyms/Flags

J	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
N	Indicates presumptive evidence of the presence of a compound
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference
LOD	DoD Limit of Detection
LOQ	DoD Limit of Quantitation
DL	DoD Detection Limit
I	Indicates reported value is greater than or equal to the Method Detection Limit (MDL) but less than the Report Detection Limit (RDL)
(S)	Surrogate Compound
NC	Not Calculated
*	Result outside of QC limits

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ANALYTICAL RESULTS

Workorder: 2204062 R1700596

Lab ID: **2204062001** Date Collected: 1/18/2017 00:00 Matrix: Solid
Sample ID: **1701180922 400-SB-06** Date Received: 1/25/2017 09:14

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
TCLP METALS										
Antimony, Total	0.15 U	U	mg/L	0.15	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:14	TSS	A2
Arsenic, Total	0.14 U	U	mg/L	0.14	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:14	TSS	A2
Barium, Total	3.5		mg/L	2.8	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:14	TSS	A2
Beryllium, Total	0.022 U	U	mg/L	0.022	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:14	TSS	A2
Cadmium, Total	0.011 U	U	mg/L	0.011	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:14	TSS	A2
Chromium, Total	0.038		mg/L	0.028	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:14	TSS	A2
Lead, Total	0.033 U	U	mg/L	0.033	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:14	TSS	A2
Mercury, Total	0.0020 U	U	mg/L	0.0020	SW846 7470A	1/27/17 11:50	AXC	1/30/17 11:33	MNP	A1
Nickel, Total	0.11 U	U	mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:14	TSS	A2
Selenium, Total	0.11 U	U	mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:14	TSS	A2
Silver, Total	0.022 U	U	mg/L	0.022	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:14	TSS	A2
Thallium, Total	0.11 U	U	mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:14	TSS	A2
Vanadium, Total	0.028 U	U	mg/L	0.028	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:14	TSS	A2
Zinc, Total	0.11 U	U	mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:14	TSS	A2



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ANALYTICAL RESULTS

Workorder: 2204062 R1700596

Lab ID: **2204062002** Date Collected: 1/18/2017 00:00 Matrix: Solid
Sample ID: **1701180927 400-SB-02** Date Received: 1/25/2017 09:14

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:34	TSS	A2
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:34	TSS	A2
Barium, Total	ND		mg/L	2.8	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:34	TSS	A2
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:34	TSS	A2
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:34	TSS	A2
Chromium, Total	ND		mg/L	0.028	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:34	TSS	A2
Lead, Total	ND		mg/L	0.033	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:34	TSS	A2
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	1/27/17 11:50	AXC	1/30/17 11:34	MNP	A1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:34	TSS	A2
Selenium, Total	ND		mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:34	TSS	A2
Silver, Total	ND		mg/L	0.022	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:34	TSS	A2
Thallium, Total	ND		mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:34	TSS	A2
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:34	TSS	A2
Zinc, Total	ND		mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:34	TSS	A2



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ANALYTICAL RESULTS

Workorder: 2204062 R1700596

Lab ID: **2204062003** Date Collected: 1/18/2017 00:00 Matrix: Solid
Sample ID: **1701180932 400-SB-02** Date Received: 1/25/2017 09:14

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:39	TSS	A2
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:39	TSS	A2
Barium, Total	ND		mg/L	2.8	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:39	TSS	A2
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:39	TSS	A2
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:39	TSS	A2
Chromium, Total	ND		mg/L	0.028	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:39	TSS	A2
Lead, Total	ND		mg/L	0.033	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:39	TSS	A2
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	1/27/17 11:50	AXC	1/30/17 11:35	MNP	A1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:39	TSS	A2
Selenium, Total	ND		mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:39	TSS	A2
Silver, Total	ND		mg/L	0.022	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:39	TSS	A2
Thallium, Total	ND		mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:39	TSS	A2
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:39	TSS	A2
Zinc, Total	ND		mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:39	TSS	A2



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ANALYTICAL RESULTS

Workorder: 2204062 R1700596

Lab ID: **2204062004** Date Collected: 1/18/2017 00:00 Matrix: Solid
Sample ID: **1701180937 400-SB-05** Date Received: 1/25/2017 09:14

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:45	TSS	A2
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:45	TSS	A2
Barium, Total	ND		mg/L	2.8	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:45	TSS	A2
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:45	TSS	A2
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:45	TSS	A2
Chromium, Total	ND		mg/L	0.028	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:45	TSS	A2
Lead, Total	ND		mg/L	0.033	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:45	TSS	A2
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	1/27/17 11:50	AXC	1/30/17 11:36	MNP	A1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:45	TSS	A2
Selenium, Total	ND		mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:45	TSS	A2
Silver, Total	ND		mg/L	0.022	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:45	TSS	A2
Thallium, Total	ND		mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:45	TSS	A2
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:45	TSS	A2
Zinc, Total	ND		mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:45	TSS	A2



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ANALYTICAL RESULTS

Workorder: 2204062 R1700596

Lab ID: **2204062005** Date Collected: 1/18/2017 00:00 Matrix: Solid
Sample ID: **1701180946 400-SB-05** Date Received: 1/25/2017 09:14

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:49	TSS	A2
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:49	TSS	A2
Barium, Total	ND		mg/L	2.8	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:49	TSS	A2
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:49	TSS	A2
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:49	TSS	A2
Chromium, Total	ND		mg/L	0.028	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:49	TSS	A2
Lead, Total	ND		mg/L	0.033	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:49	TSS	A2
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	1/27/17 11:50	AXC	1/30/17 11:39	MNP	A1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:49	TSS	A2
Selenium, Total	ND		mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:49	TSS	A2
Silver, Total	ND		mg/L	0.022	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:49	TSS	A2
Thallium, Total	ND		mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:49	TSS	A2
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:49	TSS	A2
Zinc, Total	ND		mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 07:49	TSS	A2



Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2204062 R1700596

Lab ID: **2204062006** Date Collected: 1/18/2017 00:00 Matrix: Solid
Sample ID: **1701180947 400-SB-05** Date Received: 1/25/2017 09:14

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	SW846 6010C	1/27/17 11:35	TRR	1/30/17 08:08	TSS	A2
Arsenic, Total	ND		mg/L	0.14	SW846 6010C	1/27/17 11:35	TRR	1/30/17 08:08	TSS	A2
Barium, Total	ND		mg/L	2.8	SW846 6010C	1/27/17 11:35	TRR	1/30/17 08:08	TSS	A2
Beryllium, Total	ND		mg/L	0.022	SW846 6010C	1/27/17 11:35	TRR	1/30/17 08:08	TSS	A2
Cadmium, Total	ND		mg/L	0.011	SW846 6010C	1/27/17 11:35	TRR	1/30/17 08:08	TSS	A2
Chromium, Total	ND		mg/L	0.028	SW846 6010C	1/27/17 11:35	TRR	1/30/17 08:08	TSS	A2
Lead, Total	ND		mg/L	0.033	SW846 6010C	1/27/17 11:35	TRR	1/30/17 08:08	TSS	A2
Mercury, Total	ND		mg/L	0.0020	SW846 7470A	1/27/17 11:50	AXC	1/30/17 11:43	MNP	A1
Nickel, Total	ND		mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 08:08	TSS	A2
Selenium, Total	ND		mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 08:08	TSS	A2
Silver, Total	ND		mg/L	0.022	SW846 6010C	1/27/17 11:35	TRR	1/30/17 08:08	TSS	A2
Thallium, Total	ND		mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 08:08	TSS	A2
Vanadium, Total	ND		mg/L	0.028	SW846 6010C	1/27/17 11:35	TRR	1/30/17 08:08	TSS	A2
Zinc, Total	ND		mg/L	0.11	SW846 6010C	1/27/17 11:35	TRR	1/30/17 08:08	TSS	A2



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QUALITY CONTROL DATA

Workorder: 2204062 R1700596

QC Batch: MDIG/62267 **Analysis Method:** SW846 7470A

QC Batch Method: SW846 7470A

Associated Lab Samples: 2204062001, 2204062002, 2204062003, 2204062004, 2204062005, 2204062006

METHOD BLANK: 2476632

Parameter	Blank Result	Units	Reporting Limit
Mercury, Total	0.0020 U	mg/L	0.0020

LABORATORY CONTROL SAMPLE: 2476633

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Mercury, Total	105	mg/L	.002	0.0021	85 - 115

MATRIX SPIKE: 2476634 DUPLICATE: 2476635 ORIGINAL: 2204062005

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Mercury, Total	0	mg/L	.005	.00527	.00558	105	112	70 - 130	5.71	20

MATRIX SPIKE: 2476636 DUPLICATE: 2476637 ORIGINAL: 2203567005

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Mercury, Total	0	mg/L	.005	.00562	.00529	112	106	70 - 130	6.05	20

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QUALITY CONTROL DATA

Workorder: 2204062 R1700596

QC Batch: MDIG/62268 **Analysis Method:** SW846 6010C

QC Batch Method: SW846 3015

Associated Lab Samples: 2204062001, 2204062002, 2204062003, 2204062004, 2204062005, 2204062006

METHOD BLANK: 2476669

Parameter	Blank Result	Units	Reporting Limit
Antimony, Total	0.030 U	mg/L	0.030
Arsenic, Total	0.028 U	mg/L	0.028
Barium, Total	0.56 U	mg/L	0.56
Beryllium, Total	0.0044 U	mg/L	0.0044
Cadmium, Total	0.0022 U	mg/L	0.0022
Chromium, Total	0.0056 U	mg/L	0.0056
Lead, Total	0.0067 U	mg/L	0.0067
Nickel, Total	0.022 U	mg/L	0.022
Selenium, Total	0.022 U	mg/L	0.022
Silver, Total	0.0044 U	mg/L	0.0044
Thallium, Total	0.022 U	mg/L	0.022
Vanadium, Total	0.0056 U	mg/L	0.0056
Zinc, Total	0.022 U	mg/L	0.022

LABORATORY CONTROL SAMPLE: 2476670

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Antimony, Total	101	mg/L	.22	0.22	80 - 120
Arsenic, Total	101	mg/L	.11	0.11	80 - 120
Barium, Total	105	mg/L	1.1	1.2	80 - 120
Beryllium, Total	105	mg/L	.22	0.23	80 - 120
Cadmium, Total	105	mg/L	.11	0.12	80 - 120
Chromium, Total	108	mg/L	.11	0.12	80 - 120
Lead, Total	105	mg/L	.11	0.12	80 - 120
Nickel, Total	107	mg/L	1.1	1.2	80 - 120
Selenium, Total	100	mg/L	1.1	1.1	80 - 120
Silver, Total	98.2	mg/L	.11	0.11	80 - 120
Thallium, Total	106	mg/L	.11	0.12	80 - 120
Vanadium, Total	108	mg/L	.056	0.060	80 - 120
Zinc, Total	106	mg/L	.56	0.59	80 - 120

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QUALITY CONTROL DATA

Workorder: 2204062 R1700596

MATRIX SPIKE: 2476685 DUPLICATE: 2476686 ORIGINAL: 2204062005

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Arsenic, Total	0	mg/L	5	6.01661	6.12772	120	123	50 - 150	1.83	20
Barium, Total	1.77832	mg/L	10	12.95543	13.46653	112	117	50 - 150	3.87	20
Cadmium, Total	0	mg/L	1	1.33332	1.28499	133	128	50 - 150	3.69	20
Chromium, Total	0	mg/L	5	5.98327	6.0055	120	120	50 - 150	.37	20
Lead, Total	0	mg/L	5	5.71105	5.83328	114	117	50 - 150	2.12	20
Selenium, Total	0	mg/L	1	1.17221	1.19221	117	119	50 - 150	1.69	20
Silver, Total	.00056	mg/L	1	1.13332	1.18999	113	119	50 - 150	4.88	20

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Workorder: 2204062 R1700596

Lab ID	Sample ID	Prep Method	Prep Batch	Analysis Method	Analysis Batch
2204062001	1701180922 400-SB-06	SW846 7470A	MDIG/62267	SW846 7470A	META/55886
2204062002	1701180927 400-SB-02	SW846 7470A	MDIG/62267	SW846 7470A	META/55886
2204062003	1701180932 400-SB-02	SW846 7470A	MDIG/62267	SW846 7470A	META/55886
2204062004	1701180937 400-SB-05	SW846 7470A	MDIG/62267	SW846 7470A	META/55886
2204062005	1701180946 400-SB-05	SW846 7470A	MDIG/62267	SW846 7470A	META/55886
2204062006	1701180947 400-SB-05	SW846 7470A	MDIG/62267	SW846 7470A	META/55886
2204062001	1701180922 400-SB-06	SW846 3015	MDIG/62268	SW846 6010C	META/55883
2204062002	1701180927 400-SB-02	SW846 3015	MDIG/62268	SW846 6010C	META/55883
2204062003	1701180932 400-SB-02	SW846 3015	MDIG/62268	SW846 6010C	META/55883
2204062004	1701180937 400-SB-05	SW846 3015	MDIG/62268	SW846 6010C	META/55883
2204062005	1701180946 400-SB-05	SW846 3015	MDIG/62268	SW846 6010C	META/55883
2204062006	1701180947 400-SB-05	SW846 3015	MDIG/62268	SW846 6010C	META/55883

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ALS Environmental Chain of Custody

1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475

ALS C



Project Number: R1700596
 Project Manager: Janice Jaeger
 QAP: LAB QAP

Lab Code	Sample ID	# of Cont.	Matrix	Sample		Lab ID	As TCLP 6010C	As TCLP 6010C	Ba TCLP 6010C	Be TCLP 6010C	Cd TCLP 6010C	Cr TCLP 6010C	Hg TCLP 7470A	Ni TCLP 6010C	Pb TCLP 6010C
				Date	Time										
[REDACTED]	1701180922 400-SB-06	1	Soil	1/18/17		Middletown ALS	X	X	X	X	X	X	X	X	X
[REDACTED]	1701180927 400-SB-02	↓	Soil	1/18/17		Middletown ALS	X	X	X	X	X	X	X	X	X
[REDACTED]	1701180932 400-SB-02		Soil	1/18/17		Middletown ALS	X	X	X	X	X	X	X	X	X
[REDACTED]	1701180937 400-SB-05		Soil	1/18/17		Middletown ALS	X	X	X	X	X	X	X	X	X
[REDACTED]	1701180946 400-SB-05 (QC)		Soil	1/18/17		Middletown ALS	X	X	X	X	X	X	X	X	X
[REDACTED]	1701180947 400-SB-05 (QC)	2	Soil	1/18/17		Middletown ALS	X	X	X	X	X	X	X	X	X

G-802
AT 1/25/17

AG
1/25/17

Folder Comments:
NDU

Y N Status Cooler Temp

Custody Seals Present? Y 4

(if present) Seals intact? Y

Received on Ice? N

COC/Lbls Complete Y

Cont in Good Cond? Y

Correct Containers? Y

Correct Samp Vol? Y

Correct Preservation? Y

Headspace/Volatiles? Y

Tracking #: 682680151496

Therm ID: TF352

Ship Carrier: FedEx JPS

DHL

H - Test is On Hold P - Test is Authorized for Prep Only

Turnaround Requirements <input type="checkbox"/> RUSH (Surcharges Apply) PLEASE CIRCLE WORK DAYS 1 2 3 4 5 <input checked="" type="checkbox"/> STANDARD Requested FAX Date: _____ Requested Report Date: <u>01/31/17</u>	Report Requirements <input type="checkbox"/> I. Results Only <input checked="" type="checkbox"/> II. Results + QC Summaries <input type="checkbox"/> III. Results + QC and Calibration Summaries <input type="checkbox"/> IV. Data Validation Report with Raw Data PQL/MDL/J <u>Y</u> EDD <u>N</u>	Invoice Information PO# 58R1700596 Bill to
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Relinquished By: [Signature] 1-24-17 14:30

Received By: [Signature] 1/25/17 09/4

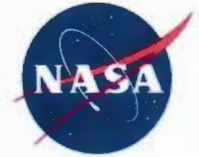
Airbill Number: _____

2204062

Sb TCLP 6010C	Se TCLP 6010C	TCLP EPA 1311	Ti TCLP 6010C	V TCLP 6010C	Zn TCLP 6010C
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R██████████	1701180922 400-SB-06	1	Soil	1/18/17		Middletown ALS	X	X	X	X	X	X
R██████████	1701180927 400-SB-02	1	Soil	1/18/17		Middletown ALS	X	X	X	X	X	X
R██████████	1701180932 400-SB-02	1	Soil	1/18/17		Middletown ALS	X	X	X	X	X	X
██████████	1701180937 400-SB-05	1	Soil	1/18/17		Middletown ALS	X	X	X	X	X	X
██████████	1701180946 400-SB-05	1	Soil	1/18/17		Middletown ALS	X	X	X	X	X	X
R██████████	1701180947 400-SB-05	2	Soil	1/18/17		Middletown ALS	X	X	X	X	X	X

National Aeronautics and
Space Administration
Lyndon B. Johnson Space Center
White Sands Test Facility
P.O. Box 20
Las Cruces, NM 88004-0020



January 26, 2017

Reply to Attn of:

RE-17-014

Mr. John E. Kieling, Chief
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505

Subject: Request for a Fourth "Contained-In" Determination for 400 Area Investigation-Derived Waste (IDW)

NASA is requesting a "No Longer Contained-In" Determination (NLCID) for the investigation-derived waste (IDW soil and IDW debris) generated during activities associated with the 400 Area Closure Investigation Work Plan (IWP), which was approved by NMED on November 8, 2011. This fourth "Contained-In" Determination request for the 400 Area Investigation is for applicable IDW soil from soil boring locations 400-SB-06, 400-SB-07, 400-SB-08, 400-SB-09, 400-SB-11 and 400-SB-13 and IDW contact debris associated with drilling activities. The IDW soil and IDW debris are currently being managed in accordance with 40 CFR § 262.34, as listed hazardous waste carrying EPA Waste Codes F001 and F002. The earliest 90-day accumulation time limit expiration date for the IDW associated with this NLCID will expire on February 13, 2017.

NASA is requesting a NLCID for the F001 and F002 hazardous waste listing. NASA received, reviewed, and compared analytical data generated from the IDW soil to the applicable 40 CFR § 268 Subpart D Treatment Standards, current NMED Residential Soil Screening Level (SSL), and the WSTF Background Soil Screening Levels. In all six boring locations, F001 and F002 contaminants of concern were not detected above regulatory limits. Thallium was detected above the Residential SSL in samples from waste generated at boreholes 400-SB-07 (Container #7448), 400-SB-08 (Container #7439), 400-SB-09 (Container #7396 and #7397), 400-SB-11 (Container #7472, and #7473), and 400-SB-13 (Container #7399 and #7400). There is no available WSTF Background SSL for thallium. NASA also compared N-Nitrosodimethylamine (NDMA) data to the SSLs identified in the NMED Risk Assessment Guidance for Site Investigations and Remediation (2015) for Residential Soil. NDMA was detected in the IDW soil at soil boring location 400-SB-08 however, the concentrations were below the Residential SSL.

If NMED finds the IDW soil does not contain hazardous waste, NASA requests concurrence from the NMED to dispose of IDW soil generated from boreholes 400-SB-07 (Container #7448), 400-SB-08 (Container #7439), 400-SB-09 (Container #7396 and #7397), 400-SB-11 (Containers #7472 and #7473), and 400-SB-13 (Container #7399 and #7400) at an

appropriate waste facility. NASA requests concurrence to land apply IDW soil generated from boreholes 400-SB-06 (All Containers), 400-SB-07 (Container #7441), 400-SB-08 (Container #7440), 400-SB-09 (Container #7395), and 400-SB-13 (Container #7398) in the project area. Upon receipt of an approved NLCID and concurrence from the NMED, NASA will evenly land apply the environmental media to the ground away from potential storm water run-off and document the final disposal location. The IDW contact debris associated with this request will be disposed of as solid waste.

Enclosure 1 provides a background and basis for the NLCID. Enclosure 2 provides a printed copy of detection summary tables of the analytical results and a comparison to applicable regulatory limits. Enclosure 3 provides a CD-ROM containing analytical summaries, laboratory analytical reports, and chain of custody documentation.

I certify under penalty of law that this document and attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have any questions or comments, please contact me at 575-524-5024, or Antonette Sanchez of my staff, at 575-524-5497.



Timothy J. Davis
Chief, Environmental Office

Enclosures (3)

cc: (w/enclosures)
Mr. Gabriel Acevedo
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505

Background

The Resource Conservation and Recovery Act (RCRA) Hazardous Waste Operating Permit (NMED, 2009; Permit) for the White Sands Test Facility (WSTF) required an investigation of soil directly beneath and adjacent to the WSTF 400 Area surface impoundments. Research conducted for the Historical Information Summary (HIS) associated with the 400 Area Investigation Work Plan (IWP) found chemicals meeting the listing descriptions of spent F001 and F002 per 40 CFR §261 Subpart D were used as solvents and referee propellants in the 400 Area. These F001 and F002 listed wastes were included in the waste streams managed within the 400 Area impoundments, but were not treated before discharge to an adjacent arroyo. The NMED Hazardous Waste Bureau approved the 400 Area IWP (November 8, 2011) and an associated abbreviated drilling work plan (August 30, 2016), which identified 15 soil boring locations. Five of the soil borings were designated to be completed as combination soil vapor/groundwater monitoring wells, while the remainder were designated as soil vapor monitoring wells only. The monitoring wells are intended to provide additional vertical delineation of the soil, soil vapor, and groundwater chemistry around the 400 Area Closure. This information will be used to determine if there is a continuing source of contamination near the 400 Area impoundments. NASA initiated the 400 Area Investigation in September 2016, and in consultation with NMED, modified the planned approach to include eight combination soil vapor/groundwater monitoring wells. The seven remaining borings were completed as soil vapor monitoring wells. Investigation-derived waste (IDW) has been generated during the 400 Area Investigation, and initial requests for a "contained-in" determinations for previously generated waste were approved by NMED on December 15, 2016 and January 6, 2017. The non-hazardous determinations were approved for IDW soil generated from borehole locations 400-SB-03, 400-SB-04, 400-SB-10, 400-SB-12, and 400-SB-15, IDW drill cuttings at 400-SB-10 and 400-SB-12, and associated IDW debris. A third "contained-in" determination request was submitted on January 19, 2017 for IDW drill cuttings and associated contact debris associated with boreholes 400-SB-08, 400-SB-13, and 400-SB-14 and remains under NMED review.

Waste material generated during 400 Area Investigation drilling activities includes IDW soil and IDW drill cuttings. IDW soil is defined as environmental media produced using the sonic drilling technique within alluvium from ground surface to the top of cemented alluvium, or conglomerate bedrock. Water is generally not added while using the sonic drilling method in alluvium. IDW drill cuttings are defined as environmental media produced using the air hammer drilling process while drilling boreholes within cemented alluvium and andesite bedrock. The air hammer drilling method allowed for more efficient advancement of the borings through bedrock where groundwater was encountered. Groundwater and water added during drilling produced slurry, or mixed media with aqueous and settleable solid phases, returns from the borehole. All IDW generated as part of the 400 Area Investigation is subject to regulation under the "contained-in" policy carrying EPA Waste Codes F001 and F002 per 40 CFR §261 Subpart D with constituents of concern (COCs): trichloroethene, tetrachloroethene, trichlorofluoromethane, and 1,1,2-trichloro-1,2,2-trifluoroethane.

Waste characterization and hazardous waste determination for 400 Area Investigation IDW is being conducted in accordance with Permit Attachment 12 (Waste Analysis Plan) and 40 CFR §260 and 261. NASA is providing analytical results from waste characterization samples collected from 400 Area Investigation IDW soil generated through December 8, 2016, and is requesting that the NMED perform a "contained-in" determination to determine whether the fourteen 1-cubic yard containers of IDW soil and one 1-cubic yard of IDW debris included in this request pose an unacceptable risk.

Basis for “Contained-In” Determination

NASA is requesting that NMED perform a No Longer Contained-in Determination (NLCID) for environmental media (IDW soil) and associated contaminated IDW contact debris. Aqueous IDW, such as decontamination water and contaminated groundwater, is being managed as hazardous waste and treated at the Mid-plume Interception and Treatment System. IDW decontamination water and groundwater is not part of this request. Analytical sampling data have been received and reviewed for the IDW soil from 400 Area Investigation boreholes 400-SB-06, 400-SB-07, 400-SB-08, 400-SB-09, 400-SB-11, and 400-SB-13. Analytical summary tables are provided in Enclosure 2 and the analytical reports are provided in Enclosure 3. Analytical data may be compared to the applicable 40 CFR §268 Subpart D Treatment Standards, the 2015 NMED Residential Soil Screening Levels (SSL), and WSTF Background SSLs. If the environmental media IDW is found not to pose an unacceptable risk, then the NMED may determine the IDW soil and associated contact IDW debris can be managed as non-hazardous waste.

F001 and F002 Constituents of Concern

F001 and F002 COCs were not detected above the laboratory’s reporting limits in the waste characterization samples, which in all cases were below the regulatory limits included in the 40 CFR §268 Subpart D Treatment Standards and the 2015 NMED Residential SSL. Tetrachloroethene (PCE) was detected at minimal concentrations in borehole locations 400-SB-06, 400-SB-07, 400-SB-09, and 400-SB-11. All detections of PCE included a “J” flag data qualifier, which indicated the reported result was an estimated concentration between the method detection limit and reporting limit. The reported PCE concentrations did not exceed the applicable regulatory limits.

Other Constituents

Metals

Native soils located at WSTF are known to have the potential to contain metals at concentrations that exceed regulatory limits. Metals sampling was performed based on the potential for land application of any environmental media that no longer contains listed hazardous waste. The sampling was performed to address the 40 CFR §261.24 Toxicity Characteristic incorporating the 40 CFR §268 Land Disposal Restrictions and the 2015 NMED Residential SSL. Based on the sampling results, metals were not detected in IDW soil at concentrations exceeding the 40 CFR §261.24 Toxicity Characteristic limits or 40 CFR §268 40 Treatment Standard Limits. Thallium was detected above the 2015 NMED Residential SSL in waste characterization samples associated with borehole 400-SB-07, 400-SB-08, 400-SB-09, 400-SB-11, and 400-SB-13. There is no established WSTF Background SSL concentration available for thallium. In addition, Arsenic was detected in borehole locations 400-SB-06, 400-SB-07, 400-SB-08, 400-SB-09, and 400-SB-13 at concentrations that exceed the 2015 NMED Residential SSL; however, the concentrations are below the WSTF Background Area #2 Screening Level. No other metals were detected at a concentration that exceeded the 2015 NMED Residential SSL.

N-Nitrosodimethylamine (NDMA)

NDMA is a constituent sometimes present as an impurity in hydrazine-based propellants. It is also a byproduct generated from treating hydrazine-based propellants by oxidation (neutralization), which occurred historically at the 400 Area impoundments. The 400 Area Investigation location is within the known boundaries of the WSTF groundwater contamination plume, which is also known to contain NDMA. Based on the waste characterization sampling results, NDMA was not detected above 40 CFR §268 40 Treatment Standard Limit, or the 2015 NMED Residential SSL. A comparison of results to the 2015 NMED Residential SSL was provided for the potential for land application of the IDW soil. The maximum observed concentration of NDMA results from a sample collected from borehole 400-SB-08.

RE-17-014

The IDW soil from this borehole contained a maximum concentration of 0.02251 mg/Kg NDMA, which is below the 2015 NMED Residential SSL concentration of 2.3 mg/Kg.

Other Volatile Organic Compounds

In addition to the F001 and F002 COCs, the laboratory's target analyte list for SW-846 Method 8260C includes the majority of volatile organic compounds typically analyzed for by SW-846 Method 8260C. Acetone and dichloromethane were detected at trace concentrations (< 0.01 mg/Kg). Acetone and dichloromethane are known lab contaminants. Detected volatile organic compounds did not exceed any applicable regulatory limits.

Other Semi-Volatile Organics

N-Nitrodimethylamine (DMN) is included in EPA Method 607M with the reported NDMA results. The maximum observed concentration of DMN was 0.04479 mg/Kg in the IDW soil from 400-SB-08. The 40 CFR §268.40 Treatment Standards do not include a treatment limit for DMN or bromacil. Also, the NMED SSLs do not include a limit for these constituents.

Analytical Reports and Chain of Custodies

Analytical reports and chains of custody are provided in Enclosure 3 for waste characterization samples collected from individual waste containers. Analytical data sheets specific to each analyses are included in the laboratory reports for each sampling event. The complete analytical report includes the laboratory case narrative and supporting documentation. During the receipt of samples shipped on December 20, 2016, the laboratory reported that two sample containers had been broken. A resampling event took place on December 27, 2016 and a separate analytical report was done for those samples.

Other Considerations

If NMED concludes that the IDW soil does not contain hazardous waste, NASA will dispose of IDW soil generated from boreholes 400-SB-07 (Container #7448), 400-SB-08 (Container #7439), 400-SB-09 (Containers #7396 and #7397), 400-SB-11 (Container #7472, and #7473), and 400-SB-13 (Container #7399 and #7400) at an appropriate waste facility. NASA requests concurrence from NMED to land apply IDW soil generated from boreholes 400-SB-06 (All Containers), 400-SB-07 (Container #7441), 400-SB-08 (Container #7440), 400-SB-09 (Container #7395), and 400-SB-13 (Container #7398) in the project area. Upon receipt of an approved NLCID and concurrence from NMED, NASA will evenly land apply the identified environmental media away from potential storm water run-off and document the final disposal location. The IDW contact debris associated with this request will be disposed of as solid waste.

Enclosure 2

Table 1 400-SB-06 IDW Soil VOC Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg unless noted as "mg/L TCLP")	NMED Residential Soil Screening Level (mg/Kg)
<u>1612200840</u> No. 7449 3/4/17	8260C	None	N/A	N/A	N/A	N/A
<u>1612200845</u> No. 7458 3/4/17		Acetone	0.0042J	N/A	160	6.63E+04
<u>1612200846</u> No. 7458 3/4/17		Acetone Tetrachloroethene	0.0033J 0.001J	N/A 0.7	30 6.0 mg/L TCLP	6.63E+04 1.11E+02

Table 2 400-SB-06 IDW Soil Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)
1612200843 No. 7449 3/4/17	607M	N-Nitrosodimethylamine	ND	2.34E-02	2.3
		N-Nitrodimethylamine	ND	N/A	N/A
		Bromacil	ND	N/A	N/A
1612200854 No. 7458 3/4/17		N-Nitrosodimethylamine	ND	2.34E-02	2.3
		N-Nitrodimethylamine	ND	N/A	N/A
		Bromacil	ND	N/A	N/A

Table 3 400-SB-06 IDW Soil TCLP Metals Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	TCLP Result (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewater (mg/L TCLP)
<u>1612200842</u> No. 7449 3/4/17	1311/6010C	Barium Selenium ²	1.7J 0.043J	100 1.0	21 5.7
<u>1612200851</u> No. 7458 3/4/17		Barium Cadmium	1.5J 0.0039J	100 1.0	21 0.11
<u>1612200852</u> No. 7458 3/4/17		Barium Cadmium Selenium ²	1.4J 0.0039J 0.038J	100 1.0 1.0	21 0.11 5.7

Table 4 400-SB-06 IDW Soil Total Metals Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	WSTF Background Area 2 Screening Level (mg/Kg)
1612200841 No. 7449 03/4/17	6010C	Arsenic	5.2B	4.25E+00	12.2
		Barium	90.8	1.56E+04	137
		Beryllium	0.66	1.56E+02	0.609
		Chromium	27.0	9.66E+01	9.38
		Lead	16.2	4.00E+02	10.3
		Nickel	9.5	1.56E+03	12.9
		Vanadium	18.4	3.94E+02	46.5
		Zinc	67.7	2.35E+04	43.5
1612200848 No. 7458 3/4/17		Arsenic	5.3B	4.25E+00	12.2
		Barium	83.2	1.56E+04	137
		Beryllium	0.51	1.56E+02	0.609
		Cadmium	0.06BJ	7.05E+01	1.42*
		Chromium	30.1	9.66E+01	9.38
		Lead	11.5	4.00E+02	10.3
		Nickel	13.0	1.56E+03	12.9
		Vanadium	15.4B	3.94E+02	46.5
Zinc		42.4	2.35E+04	43.5	
1612200849 No. 7458 3/4/17		Arsenic	5.6	4.25E+00	12.2
		Barium	83.5	1.56E+04	137
		Beryllium	0.48	1.56E+02	0.609
		Cadmium	0.15BJ	7.05E+01	1.42*
		Chromium	29.2	9.66E+01	9.38
		Lead	10.1	4.00E+02	10.3
		Nickel	10.5	1.56E+03	12.9
	Vanadium	15.5	3.94E+02	46.5	
Zinc	42.3	2.35E+04	43.5		

Table 5 400-SB-07 IDW Soil VOC Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg unless noted as "mg/L TCLP")	NMED Residential Soil Screening Level (mg/Kg)
1612200900 No. 7441 3/3/17	8260C	Acetone	4.5J	N/A	30	6.63E+04
1612200915 No. 7448 3/3/17		Acetone Tetrachloroethene	0.003J 0.00092J	N/A 0.7	30 6.0 mg/L TCLP	6.63E+04 1.11E+02
1612271300 No. 7448 3/3/17		None	N/A	N/A	N/A	N/A

Table 6 400-SB-07 IDW Soil Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)
1612200903 No. 7441 3/3/17	607M	N-Nitrosodimethylamine	ND	2.34E-02	2.3
1612200924 No. 7448 3/3/17		N-Nitrodimethylamine	ND	N/A	N/A
		Bromacil	ND	N/A	N/A
		N-Nitrosodimethylamine	ND	2.34E-02	2.3
		N-Nitrodimethylamine	0.00016J	N/A	N/A
		Bromacil	ND	N/A	N/A

Table 7 400-SB-07 IDW Soil TCLP Metals Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	TCLP Result (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewater (mg/L TCLP)
<u>1612200902</u> No. 7441 3/3/17	1311/6010C	Barium Cadmium	1.6J 0.0039J	100 1.0	21 0.11
<u>1612200921</u> No. 7448 3/3/17		Barium	1.7J	100	21
<u>1612200922</u> No. 7448 3/3/17		Barium Cadmium	1.7J 0.0039J	100 1.0	21 0.11

Table 8 400-SB-07 IDW Soil Total Metals Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	WSTF Background Area 2 Screening Level (mg/Kg)
1612200901 No. 7441 3/3/17	6010C/7471B	Arsenic	5.3B	4.25E+00	12.2
		Barium	82.6	1.56E+04	137
		Beryllium	0.47	1.56E+02	0.609
		Cadmium	0.24BJ	7.05E+01	1.42*
		Chromium	19.8	9.66E+01	9.38
		Lead	17.9	4.00E+02	10.3
		Mercury	0.004J	2.38E+01	N/A
		Nickel	9.3	1.56E+03	12.9
		Thallium	0.7J	7.82E-01	N/A
		Vanadium	14.8B	3.94E+02	46.5
		Zinc	59.5	2.35E+04	43.5
1612200918 No. 7448 3/3/17	6010C/7471B	Arsenic	5.7	4.25E+00	12.2
		Barium	89.5	1.56E+04	137
		Beryllium	0.47	1.56E+02	0.609
		Cadmium	0.17BJ	7.05E+01	1.42*
		Chromium	25.9	9.66E+01	9.38
		Lead	10.2	4.00E+02	10.3
		Mercury	0.003J	2.38E+01	N/A
		Nickel	8.0	1.56E+03	12.9
		Thallium	1.6	7.82E-01	N/A
		Vanadium	15.0	3.94E+02	46.5
		Zinc	47.2	2.35E+04	43.5
1612200919 No. 7448 3/3/17	6010C/7471B	Arsenic	4.55B	4.25E+00	12.2
		Barium	83.8	1.56E+04	137
		Beryllium	0.48	1.56E+02	0.609
		Cadmium	0.16BJ	7.05E+01	1.42*
		Chromium	13.5	9.66E+01	9.38
		Lead	10.8	4.00E+02	10.3
		Nickel	8.0	1.56E+03	12.9
		Thallium	1.72	7.82E-01	N/A
		Vanadium	14.9B	3.94E+02	46.5
		Zinc	45.7	2.35E+04	43.5

Table 9 400-SB-08 IDW Soil VOC Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)
1612200930 No. 7439 2/18/17	8260C	Acetone	0.0031J	N/A	30	6.63E+04
1612200940 No. 7440 2/18/17		Acetone	0.0031J	N/A	30	6.63E+04
1612200941 No. 7440 2/18/17		Acetone	0.0049J	N/A	160	6.63E+04

Table 10 400-SB-08 IDW Soil Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)
1612200933 No. 7439 2/18/17	607M	N-Nitrosodimethylamine	0.01026	2.34E-02	2.3
		N-Nitrodimethylamine	0.04479	N/A	N/A
		Bromacil	ND	N/A	N/A
1612200949 No. 7440 2/18/17	607M	N-Nitrosodimethylamine	0.02251	2.34E-02	2.3
		N-Nitrodimethylamine	0.02471	N/A	N/A
		Bromacil	ND	N/A	N/A

Table 11 400-SB-08 IDW Soil TCLP Metals Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	TCLP Result (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewater (mg/L TCLP)
<u>1612200932</u> No. 7439 2/18/17	1311/6010C	Barium	1.9J	100	21
		Cadmium	0.0044J	1.0	0.11
		Selenium ²	0.049J	1.0	5.7
<u>1612200946</u> No. 7440 2/18/17		Barium	2.1J	100	21
		Cadmium	0.0039J	1.0	0.11
<u>1612200947</u> No. 7440 2/18/17		Barium	2.0J	100	21
		Selenium ²	0.039J	1.0	5.7

Table 12 400-SB-08 IDW Soil Total Metals Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	WSTF Background Area 2 Screening Level (mg/Kg)
1612271310 No. 7439 2/18/17	6010C/7471B	Arsenic	5.7	4.25E+00	12.2
		Barium	81.7	1.56E+04	137
		Beryllium	0.44	1.56E+02	0.609
		Cadmium	0.35BJ	7.05E+01	1.42*
		Chromium	12.0	9.66E+01	9.38
		Lead	8.1	4.00E+02	10.3
		Mercury	0.004J	2.38E+01	N/A
		Nickel	8.8	1.56E+03	12.9
		Thallium	3.2	7.82E-01	N/A
		Vanadium	13.3	3.94E+02	46.5
		Zinc	43.9	2.35E+04	43.5
1612200943 No. 7440 2/18/17	6010C/7471B	Arsenic	6.0	4.25E+00	12.2
		Barium	124	1.56E+04	137
		Beryllium	0.51	1.56E+02	0.609
		Cadmium	0.40BJ	7.05E+01	1.42*
		Chromium	15.7	9.66E+01	9.38
		Lead	10.6	4.00E+02	10.3
		Nickel	8.9	1.56E+03	12.9
		Thallium	0.7J	7.82E-01	N/A
		Vanadium	16.6	3.94E+02	46.5
		Zinc	62.1	2.35E+04	43.5
		1612200944 No. 7440 2/18/17	6010C/7471B	Arsenic	6.7	4.25E+00	12.2
Barium	129			1.56E+04	137
Beryllium	0.51			1.56E+02	0.609
Cadmium	0.19BJ			7.05E+01	1.42*
Chromium	18.1			9.66E+01	9.38
Lead	10.8			4.00E+02	10.3
Nickel	7.8			1.56E+03	12.9
Vanadium	16.0			3.94E+02	46.5
Zinc	51.4			2.35E+04	43.5

Table 13 400-SB-09 IDW Soil VOC Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg unless noted as "mg/L TCLP")	NMED Residential Soil Screening Level (mg/Kg)
<u>1612201000</u> No. 7395 2/13/17	8260C	Acetone Dichloromethane	0.0039J 0.00065J	N/A N/A	30 30	6.63E+04 4.90E+02
<u>1612201005</u> No. 7396 2/13/17		Acetone Dichloromethane	0.0052J 0.00080J	N/A N/A	30 30	6.63E+04 4.90E+02
<u>1612201015</u> No. 7397 2/14/17		Tetrachloroethene	0.0011J	0.7	6.0 mg/L TCLP	1.11E+02
<u>1612201016</u> No. 7397 2/14/17		Acetone Dichloromethane	0.0037J 0.00078J	N/A N/A	30 30	6.63E+04 4.90E+02

Table 14 400-SB-09 IDW Soil Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)
1612201003 No. 7395 2/13/17	607M	N-Nitrosodimethylamine	ND	2.34E-02	2.3
		N-Nitrodimethylamine	ND	N/A	N/A
		Bromacil	ND	N/A	N/A
1612201008 No. 7396 2/13/17	607M	N-Nitrosodimethylamine	ND	2.34E-02	2.3
		N-Nitrodimethylamine	ND	N/A	N/A
		Bromacil	ND	N/A	N/A
1612201024 No. 7397 2/14/17	607M	N-Nitrosodimethylamine	ND	2.34E-02	2.3
		N-Nitrodimethylamine	ND	N/A	N/A
		Bromacil	ND	N/A	N/A

Table 15 400-SB-09 IDW Soil TCLP Metals Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	TCLP Result (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewater (mg/L TCLP)
<u>1612201002</u> No. 7395 2/13/17	1311/6010C	Barium	2.2J	100	21
		Lead	0.027J	5.0	0.75
		Selenium ²	0.039J	1.0	5.7
<u>1612201007</u> No. 7396 2/13/17		Barium	1.5J	100	21
	Cadmium	0.0050J	1.0	0.11	
	Selenium	0.046J	1.0	5.7	
<u>1612201021</u> No. 7397 2/14/17		Barium	1.8J	100	21
	Cadmium	0.0039J	1.0	0.75	
	Zinc ¹	0.048J	N/A	4.3	
<u>1612201022</u> No. 7397 2/14/17		Barium	1.6J	100	21
	Cadmium	0.0050J	1.0	0.11	
	Selenium ²	0.037J	1.0	5.7	
	Zinc ¹	0.072J	N/A	4.3	

Table 16 400-SB-09 IDW Soil Total Metals Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	WSTF Background Area 2 Screening Level (mg/Kg)
1612201001 No. 7395 2/13/17	6010C/7471B	Arsenic	5.02	4.25E+00	12.2
		Barium	121	1.56E+04	137
		Beryllium	0.47	1.56E+02	0.609
		Cadmium	0.17BJ	7.05E+01	1.42*
		Chromium	37.4	9.66E+01	9.38
		Lead	8.0	4.00E+02	10.3
		Mercury	0.004BJ	2.38E+01	N/A
		Nickel	9.0	1.56E+03	12.9
		Thallium	0.71J	7.82E-01	N/A
		Vanadium	15.5	3.94E+02	46.5
		Zinc	48.6	2.35E+04	43.5
1612201006 No. 7396 2/13/17	6010C/7471B	Arsenic	3.7	4.25E+00	12.2
		Barium	76.3	1.56E+04	137
		Beryllium	0.39	1.56E+02	0.609
		Cadmium	0.13BJ	7.05E+01	1.42*
		Chromium	27.7	9.66E+01	9.38
		Lead	10.4	4.00E+02	10.3
		Nickel	0.003BJ	1.56E+03	12.9
		Thallium	6.9	7.82E-01	N/A
		Vanadium	14.4B	3.94E+02	46.5
		Zinc	43.8	2.35E+04	43.5
		1612201018 No. 7397 2/14/17	6010C/7471B	Arsenic	5.0	4.25E+00	12.2
Barium	92.4			1.56E+04	137
Beryllium	0.49			1.56E+02	0.609
Cadmium	0.11BJ			7.05E+01	1.42*
Chromium	23.4			9.66E+01	9.38
Lead	12.1			4.00E+02	10.3
Nickel	9.6			1.56E+03	12.9
Thallium	0.9 J			7.82E-01	N/A
Vanadium	15.9			3.94E+02	46.5
Zinc	62.8			2.35E+04	43.5

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	WSTF Background Area 2 Screening Level (mg/Kg)
1612201019 No. 7397 2/14/17	6010C/7471B	Arsenic	4.9	4.25E+00	12.2
		Barium	95.1	1.56E+04	137
		Beryllium	0.49	1.56E+02	0.609
		Cadmium	0.13BJ	7.05E+01	1.42*
		Chromium	25.0	9.66E+01	9.38
		Lead	10.8	4.00E+02	10.3
		Nickel	8.6	1.56E+03	12.9
		Vanadium	16.1B	3.94E+02	46.5
		Zinc	63.1	2.35E+04	43.5

Table 17 400-SB-11 IDW Soil VOC Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg unless noted as "mg/L TCLP")	NMED Residential Soil Screening Level (mg/Kg)
1612201030 No. 7472 3/8/17	8260C	Acetone	0.0045J	N/A	30	6.63E+04
		Dichloromethane	0.0011J	N/A	30	4.09E+02
		Tetrachloroethene	0.0024J	0.7	6.0 mg/L TCLP	1.11E+02
1612201040 No. 7473 3/8/17	8260C	Tetrachloroethene	0.0018J	0.7	6.0 mg/L TCLP	1.11E+02
1612201041 No. 7473 3/8/17	8260C	Acetone	0.0068	N/A	30	6.63E+04
		Dichloromethane	0.00093J	N/A	30	4.09E+02
		Tetrachloroethene	0.001J	0.7	6.0 mg/L TCLP	1.11E+02

Table 18 400-SB-11 IDW Soil Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)
1612201033 No. 7472 3/8/17	607M	N-Nitrosodimethylamine	ND	2.34E-02	2.3
1612201049 No. 7473 3/8/17		N-Nitrodimethylamine	ND	N/A	N/A
		Bromacil	ND	N/A	N/A
		N-Nitrosodimethylamine	ND	2.34E-02	2.3
		N-Nitrodimethylamine	ND	N/A	N/A
		Bromacil	ND	N/A	N/A

Table 19 400-SB-11 IDW Soil TCLP Metals Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	TCLP Result (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewater (mg/L TCLP)
1612201032 No. 7472 3/8/17	1311/6010C	Cadmium	0.0044J	1.0	0.11
		Selenium ²	0.037J	1.0	11
		Zinc ¹	0.088J	N/A	4.3
1612201046 No. 7473 3/8/17	1311/6010C	Barium	3.4	100	21
		Cadmium	0.0039J	1.0	0.11
		Selenium ²	0.046J	1.0	11
1612201047 No. 7473 3/8/17	1311/6010C	Barium	3.2	100	21
		Cadmium	0.0039J	1.0	0.11
		Chromium	0.011J	5.0	0.60
		Selenium ²	0.039J	1.0	11

Table 20 400-SB-11 IDW Soil Total Metals Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	WSTF Background Area 2 Screening Level (mg/Kg)
1612201031 No. 7472 3/8/17	6010C	Arsenic	3.2	4.25E+00	12.2
		Barium	76.2	1.56E+04	137
		Beryllium	0.41	1.56E+02	0.609
		Cadmium	0.08BJ	7.05E+01	1.42*
		Chromium	14.0	9.66E+01	9.38
		Lead	7.4	4.00E+02	10.3
		Nickel	8.7	1.56E+03	12.9
		Thallium	2.5	7.82E-01	N/A
		Vanadium	16.0B	3.94E+02	46.5
		Zinc	31.4	2.35E+04	43.5
1612201043 No. 7473 3/8/17	6010C	Arsenic	4.2	4.25E+00	12.2
		Barium	627	1.56E+04	137
		Beryllium	0.52	1.56E+02	0.609
		Cadmium	0.09BJ	7.05E+01	1.42*
		Chromium	16.1	9.66E+01	9.38
		Lead	8.7	4.00E+02	10.3
		Nickel	4.0J	1.56E+03	12.9
		Thallium	0.9J	7.82E-01	N/A
		Vanadium	24.6	3.94E+02	46.5
		Zinc	43.9	2.35E+04	43.5
1612201044 No. 7473 3/8/17	6010C	Arsenic	3.7	4.25E+00	12.2
		Barium	711	1.56E+04	137
		Beryllium	0.60	1.56E+02	0.609
		Chromium	14.8	9.66E+01	9.38
		Lead	9.4	4.00E+02	10.3
		Nickel	4.9	1.56E+03	12.9
		Vanadium	27.8	3.94E+02	46.5
		Zinc	32.3	2.35E+04	43.5

Table 21 400-SB-13 IDW Soil VOC Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration in (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)
1612201100 No. 7398 2/15/17	8260C	Dichloromethane	0.00077J	N/A	30	4.09E+02
1612201315 No. 7399 2/15/17		Dichloromethane	0.00079J	N/A	30	4.09E+02
1612201330 No. 7400 2/16/17		None	N/A	N/A	N/A	N/A
1612201331 No. 7400 2/16/17		Dichloromethane	0.00084J	N/A	30	4.09E+02

Table 22 400-SB-13 IDW Soil Nitrosamine Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewaters Concentration (mg/Kg)
1612201103 No. 7398 2/15/17	607M	N-Nitrosodimethylamine	ND	2.34E-02	2.3
1612201318 No. 7399 2/15/17		N-Nitrodimethylamine	ND	N/A	N/A
1612201339 No. 7400 2/16/17		Bromacil	ND	N/A	N/A
1612201340 No. 7400 2/16/17		N-Nitrosodimethylamine	ND	2.34E-02	2.3
1612201318 No. 7399 2/15/17	607M	N-Nitrodimethylamine	ND	N/A	N/A
1612201339 No. 7400 2/16/17		Bromacil	ND	N/A	N/A
1612201340 No. 7400 2/16/17		N-Nitrosodimethylamine	ND	2.34E-02	2.3
1612201340 No. 7400 2/16/17		N-Nitrodimethylamine	ND	N/A	N/A
1612201340 No. 7400 2/16/17	607M	Bromacil	ND	N/A	N/A

Table 23 400-SB-13 IDW Soil TCLP Metals Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	TCLP Result (mg/L)	Toxicity Limit 40 CFR 261.24 (mg/L)	40 CFR Part 268 Subpart D Treatment Standard Nonwastewater (mg/L TCLP)
1612201102 No. 7398 2/15/17	1311/6010C	Barium Selenium ²	1.4J 0.056	100 1.0	21 5.7
1612201317 No. 7399 2/15/17		Barium Cadmium Selenium ²	3.6 0.0039J 0.051J	100 1.0 1.0	21 0.11 11
1612201336 No. 7400 2/16/17		Barium Selenium ² Zinc ¹	3.4 0.052J 0.057J	100 1.0 N/A	21 5.7 4.3
1612201337 No. 7400 2/16/17		Barium Zinc ¹	3.2 0.037J	100 N/A	21 4.3

Table 24 400-SB-13 IDW Soil Total Metals Analytical Detection Summary

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	WSTF Background Area 2 Screening Level (mg/Kg)
1612201101 No. 7398 2/15/17	6010C/7471B	Arsenic	4.11	4.25E+00	12.2
		Barium	87.4	1.56E+04	137
		Beryllium	0.50	1.56E+02	0.609
		Cadmium	0.05BJ	7.05E+01	1.42*
		Chromium	12.1	9.66E+01	9.38
		Lead	8.2	4.00E+02	10.3
		Nickel	11.5	1.56E+03	12.9
		Vanadium	17.0	3.94E+02	46.5
		Zinc	38.1	2.35E+04	43.5
1612201316 No. 7399 2/15/17		Arsenic	5.1	4.25E+00	12.2
		Barium	484	1.56E+04	137
		Beryllium	0.50	1.56E+02	0.609
		Cadmium	0.09BJ	7.05E+01	1.42*
		Chromium	17.0	9.66E+01	9.38
		Lead	9.5	4.00E+02	10.3
		Mercury	0.0003BJ	2.38E+01	N/A
		Nickel	9.6	1.56E+03	12.9
		Thallium	1.3	7.82E-01	N/A
		Vanadium	16.2B	3.94E+02	46.5
		Zinc	50.2	2.35E+04	43.5
1612201333 No. 7400 2/16/17		Arsenic	5.8	4.25E+00	12.2
		Barium	1370	1.56E+04	137
		Beryllium	0.48	1.56E+02	0.609
		Cadmium	0.25BJ	7.05E+01	1.42*
		Chromium	16.3	9.66E+01	9.38
		Lead	9.9	4.00E+02	10.3
		Nickel	9.5	1.56E+03	12.9
	Thallium	1.8	7.82E-01	N/A	
Vanadium	14.4	3.94E+02	46.5		

Sample ID Container No. 90-Day Exp. Date	Analytical Method	Detected Analyte	Total Result (mg/Kg)	NMED Residential Soil Screening Level (mg/Kg)	WSTF Background Area 2 Screening Level (mg/Kg)
1612201333 No. 7400 2/16/17	6010C/7471B	Zinc	54.3	2.35E+04	43.5
1612201334 No. 7400 2/16/17		Arsenic	5.3	4.25E+00	12.2
		Barium	483	1.56E+04	137
		Beryllium	0.52	1.56E+02	0.609
		Cadmium	0.22BJ	7.05E+01	1.42*
		Chromium	17.5	9.66E+01	9.38
		Lead	9.7	4.00E+02	10.3
		Nickel	9.2	1.56E+03	12.9
		Vanadium	16.7	3.94E+02	46.5
Zinc	63.0	2.35E+04	43.5		

Table Notes:

B: Indicates analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.

J: Indicates result concentration is between the method reporting limit and the method detection limit.

ND: Indicates not detected.

N/A: Indicates not applicable.

* This analyte was not detected at all depths in the WSTF Soil Background Study. This screening level represents the lowest available 95% UTL.

¹: These Constituents are not “underlying hazardous constituents” in characteristic waste, according to the definition at §268.2(i).

²: This constituent is not an underlying hazardous constituents as defined at 40 CFR 268.2(i), because the Universal Treatment Standard (UTS) level is greater than its Toxicity Characteristic (TC level), thus a treated selenium waste would always be characteristically hazardous, unless it is treated to below its characteristic level.



January 10, 2017

Service Request No:R1613412

Mr. Tom Hall
NASA/WSTF/Navarro
P.O. Box 20
Las Cruces, NM 88004

Laboratory Results for: White Sands Test Facility

Dear Mr.Hall,

Enclosed are the results of the sample(s) submitted to our laboratory December 22, 2016
For your reference, these analyses have been assigned our service request number **R1613412**.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAP standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report. The measurement uncertainty of the results included in this report is within that expected when using the prescribed method(s) for analysis of these samples, and represented by Laboratory Control Sample control limits. Any events, such as QC failures, which may add to the uncertainty are explained in the report narrative.

Please contact me if you have any questions. My extension is 7472. You may also contact me via email at Janice.Jaeger@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Janice Jaeger
Project Manager

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dba ALS Environmental



Narrative Documents

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Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Received: 12/22/16

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables, including results of QC samples analyzed from this delivery group. Analytical procedures performed by the lab are validated in accordance with NELAC standards. Any parameters that are not included in the lab's NELAC accreditation are identified on a "Non-Certified Analytes" report in the Miscellaneous Forms Section of this report. Individual analytical results requiring further explanation are flagged with qualifiers and/or discussed below. The flags are explained in the Report Qualifiers and Definitions page in the Miscellaneous Forms section of this report.

Sample Receipt

Twenty seven soil samples were received for analysis at ALS Environmental on 12/22/2016. Any discrepancies noted upon initial sample inspection are noted on the cooler receipt and preservation form included in this data package. The samples were received in good condition and consistent with the accompanying chain of custody form. Samples are refrigerated at $\leq 6^{\circ}\text{C}$ upon receipt at the lab except for aqueous samples designated for metals analyses, which are stored at room temperature.

Volatile Organic Analyses:

No significant anomalies were noted with this analysis.

Metals Analyses:

Method 6010C SE, ICSAB: The upper control limit was exceeded for one or more analytes in the Interference Calibration Standard AB (ICSAB). The field samples analyzed in this sequence did not contain the analyte(s) in question. Since the exceedance equates to a potential high bias, the data quality is not affected. No further corrective action was required.

General Chemistry Analyses:

No significant anomalies were noted with this analysis.

Subcontracted Analytical Parameters:

One or more samples were subcontracted to another laboratory for testing. The certified analytical report from the subcontractor has been included in its entirety at the end of this report and includes the name and address of the subcontracted laboratory.

Sample Receiving Notes:

Method 8260C: soil samples included in this report were received in jars and not collected using one of the EPA method 5035A low level options. In accordance with the NYSDOH technical notice of October 2012 all results or reporting limits $< 200 \text{ ug/kg}$ should be considered as estimated due to potential low bias.

Approved by  Date 1/10/2017



SAMPLE DETECTION SUMMARY

CLIENT ID: 1612200840 400-SB-06 **Lab ID: R1613412-001**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.6				Percent	ALS SOP

CLIENT ID: 1612200841 400-SB-06 **Lab ID: R1613412-002**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.2				Percent	ALS SOP
Arsenic, Total	5.2	B	0.3	1.0	mg/Kg	6010C
Barium, Total	90.8		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.66		0.02	0.30	mg/Kg	6010C
Chromium, Total	27.0		0.2	1.0	mg/Kg	6010C
Lead, Total	16.2		0.3	5.0	mg/Kg	6010C
Nickel, Total	9.5		0.2	4.0	mg/Kg	6010C
Vanadium, Total	18.4	B	0.2	5.0	mg/Kg	6010C
Zinc, Total	67.7		0.2	2.0	mg/Kg	6010C

CLIENT ID: 1612200845 400-SB-06 **Lab ID: R1613412-004**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	96.5				Percent	ALS SOP
Acetone	4.2	J	3.0	5.2	ug/Kg	8260C

CLIENT ID: 1612200846 400-SB-06 **Lab ID: R1613412-005**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	96.4				Percent	ALS SOP
Acetone	3.3	J	3.0	5.2	ug/Kg	8260C
Tetrachloroethene (PCE)	1.0	J	0.92	5.2	ug/Kg	8260C

CLIENT ID: 1612200848 400-SB-06 **Lab ID: R1613412-006**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	95.9				Percent	ALS SOP
Arsenic, Total	5.3	B	0.3	1.0	mg/Kg	6010C
Barium, Total	83.2		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.51		0.02	0.31	mg/Kg	6010C
Cadmium, Total	0.06	BJ	0.04	0.51	mg/Kg	6010C
Chromium, Total	30.1		0.2	1.0	mg/Kg	6010C
Lead, Total	11.5		0.3	5.1	mg/Kg	6010C
Nickel, Total	13.0		0.2	4.1	mg/Kg	6010C
Vanadium, Total	15.4	B	0.2	5.1	mg/Kg	6010C
Zinc, Total	42.4		0.2	2.0	mg/Kg	6010C

CLIENT ID: 1612200849 400-SB-06 **Lab ID: R1613412-007**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	96.6				Percent	ALS SOP
Arsenic, Total	5.6		0.3	1.0	mg/Kg	6010C
Barium, Total	83.5		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.48		0.02	0.30	mg/Kg	6010C



SAMPLE DETECTION SUMMARY

CLIENT ID: 1612200849 400-SB-06 **Lab ID: R1613412-007**

Analyte	Results	Flag	MDL	PQL	Units	Method
Cadmium, Total	0.15	BJ	0.04	0.51	mg/Kg	6010C
Chromium, Total	29.2		0.2	1.0	mg/Kg	6010C
Lead, Total	10.1		0.3	5.1	mg/Kg	6010C
Nickel, Total	10.5		0.2	4.0	mg/Kg	6010C
Vanadium, Total	15.5	B	0.2	5.1	mg/Kg	6010C
Zinc, Total	42.3		0.2	2.0	mg/Kg	6010C

CLIENT ID: 1612200900 400-SB-07 **Lab ID: R1613412-010**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	95.3				Percent	ALS SOP
Acetone	4.5	J	3.0	5.2	ug/Kg	8260C

CLIENT ID: 1612200901 400-SB-07 **Lab ID: R1613412-011**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	95.3				Percent	ALS SOP
Arsenic, Total	5.3	B	0.3	1.0	mg/Kg	6010C
Barium, Total	82.6		0.2	2.1	mg/Kg	6010C
Beryllium, Total	0.47		0.02	0.31	mg/Kg	6010C
Cadmium, Total	0.24	BJ	0.04	0.52	mg/Kg	6010C
Chromium, Total	19.8		0.2	1.0	mg/Kg	6010C
Lead, Total	17.9		0.3	5.2	mg/Kg	6010C
Mercury, Total	0.004	J	0.003	0.033	mg/Kg	7471B
Nickel, Total	9.3		0.2	4.0	mg/Kg	6010C
Thallium, Total	0.7	J	0.6	1.0	mg/Kg	6010C
Vanadium, Total	14.8	B	0.2	5.2	mg/Kg	6010C
Zinc, Total	59.5		0.2	2.1	mg/Kg	6010C

CLIENT ID: 1612200915 400-SB-07 **Lab ID: R1613412-013**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	96.7				Percent	ALS SOP
Acetone	3.0	J	3.0	5.2	ug/Kg	8260C
Tetrachloroethene (PCE)	0.92	J	0.92	5.2	ug/Kg	8260C

CLIENT ID: 1612200918 400-SB-07 **Lab ID: R1613412-015**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	96.8				Percent	ALS SOP
Arsenic, Total	5.7		0.3	1.0	mg/Kg	6010C
Barium, Total	89.5		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.47		0.02	0.31	mg/Kg	6010C
Cadmium, Total	0.17	BJ	0.04	0.51	mg/Kg	6010C
Chromium, Total	25.9		0.2	1.0	mg/Kg	6010C
Lead, Total	10.2		0.3	5.1	mg/Kg	6010C
Mercury, Total	0.003	J	0.003	0.032	mg/Kg	7471B



SAMPLE DETECTION SUMMARY

CLIENT ID: 1612200918 400-SB-07	Lab ID: R1613412-015
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Analyte	Results	Flag	MDL	PQL	Units	Method
Nickel, Total	8.0		0.2	4.0	mg/Kg	6010C
Thallium, Total	1.6		0.6	1.0	mg/Kg	6010C
Vanadium, Total	15.0	B	0.2	5.1	mg/Kg	6010C
Zinc, Total	47.2		0.2	2.0	mg/Kg	6010C

CLIENT ID: 1612200919 400-SB-07	Lab ID: R1613412-016
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.5				Percent	ALS SOP
Arsenic, Total	4.55	B	0.24	0.99	mg/Kg	6010C
Barium, Total	83.8		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.48		0.02	0.30	mg/Kg	6010C
Cadmium, Total	0.16	BJ	0.04	0.49	mg/Kg	6010C
Chromium, Total	13.5		0.13	0.99	mg/Kg	6010C
Lead, Total	10.8		0.3	4.9	mg/Kg	6010C
Nickel, Total	8.0		0.2	4.1	mg/Kg	6010C
Thallium, Total	1.72		0.51	0.99	mg/Kg	6010C
Vanadium, Total	14.9	B	0.2	4.9	mg/Kg	6010C
Zinc, Total	45.7		0.2	2.0	mg/Kg	6010C

CLIENT ID: 1612200930 400-SB-08	Lab ID: R1613412-019
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.1				Percent	ALS SOP
Acetone	3.1	J	2.9	5.1	ug/Kg	8260C

CLIENT ID: 1612200940 400-SB-08	Lab ID: R1613412-022
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	96.0				Percent	ALS SOP
Acetone	3.1	J	3.0	5.2	ug/Kg	8260C

CLIENT ID: 1612200941 400-SB-08	Lab ID: R1613412-023
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	94.8				Percent	ALS SOP
Acetone	4.9	J	3.0	5.3	ug/Kg	8260C

CLIENT ID: 1612200943 400-SB-08	Lab ID: R1613412-024
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	94.9				Percent	ALS SOP
Arsenic, Total	6.0		0.3	1.0	mg/Kg	6010C
Barium, Total	124		0.2	2.1	mg/Kg	6010C
Beryllium, Total	0.51		0.02	0.31	mg/Kg	6010C
Cadmium, Total	0.40	BJ	0.04	0.52	mg/Kg	6010C
Chromium, Total	15.7		0.2	1.0	mg/Kg	6010C
Lead, Total	10.6		0.3	5.2	mg/Kg	6010C
Nickel, Total	8.9		0.2	4.1	mg/Kg	6010C



SAMPLE DETECTION SUMMARY

CLIENT ID: 1612200943 400-SB-08 **Lab ID: R1613412-024**

Analyte	Results	Flag	MDL	PQL	Units	Method
Thallium, Total	0.7	J	0.6	1.0	mg/Kg	6010C
Vanadium, Total	16.6	B	0.2	5.2	mg/Kg	6010C
Zinc, Total	62.1		0.2	2.1	mg/Kg	6010C

CLIENT ID: 1612200944 400-SB-08 **Lab ID: R1613412-025**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	95.6				Percent	ALS SOP
Arsenic, Total	6.7		0.3	1.0	mg/Kg	6010C
Barium, Total	129		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.51		0.02	0.30	mg/Kg	6010C
Cadmium, Total	0.19	BJ	0.04	0.50	mg/Kg	6010C
Chromium, Total	18.1		0.2	1.0	mg/Kg	6010C
Lead, Total	10.8		0.3	5.0	mg/Kg	6010C
Nickel, Total	7.8		0.2	4.0	mg/Kg	6010C
Vanadium, Total	16.0	B	0.2	5.0	mg/Kg	6010C
Zinc, Total	51.4		0.2	2.0	mg/Kg	6010C



Sample Receipt Information

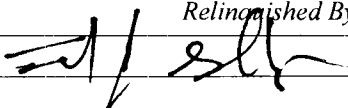
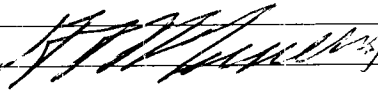
ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B


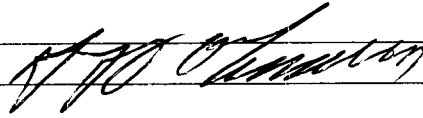
Service Request:R1613412

SAMPLE CROSS-REFERENCE

<u>SAMPLE #</u>	<u>CLIENT SAMPLE ID</u>	<u>DATE</u>	<u>TIME</u>
R1613412-001	1612200840 400-SB-06	12/20/2016	
R1613412-002	1612200841 400-SB-06	12/20/2016	
R1613412-003	1612200842 400-SB-06	12/20/2016	
R1613412-004	1612200845 400-SB-06	12/20/2016	
R1613412-005	1612200846 400-SB-06	12/20/2016	
R1613412-006	1612200848 400-SB-06	12/20/2016	
R1613412-007	1612200849 400-SB-06	12/20/2016	
R1613412-008	1612200851 400-SB-06	12/20/2016	
R1613412-009	1612200852 400-SB-06	12/20/2016	
R1613412-010	1612200900 400-SB-07	12/20/2016	
R1613412-011	1612200901 400-SB-07	12/20/2016	
R1613412-012	1612200902 400-SB-07	12/20/2016	
R1613412-013	1612200915 400-SB-07	12/20/2016	
R1613412-014	1612200916 400-SB-07	12/20/2016	
R1613412-015	1612200918 400-SB-07	12/20/2016	
R1613412-016	1612200919 400-SB-07	12/20/2016	
R1613412-017	1612200921 400-SB-07	12/20/2016	
R1613412-018	1612200922 400-SB-07	12/20/2016	
R1613412-019	1612200930 400-SB-08	12/20/2016	
R1613412-020	1612200931 400-SB-08	12/20/2016	
R1613412-021	1612200932 400-SB-08	12/20/2016	
R1613412-022	1612200940 400-SB-08	12/20/2016	
R1613412-023	1612200941 400-SB-08	12/20/2016	
R1613412-024	1612200943 400-SB-08	12/20/2016	
R1613412-025	1612200944 400-SB-08	12/20/2016	
R1613412-026	1612200946 400-SB-08	12/20/2016	
R1613412-027	1612200947 400-SB-08	12/20/2016	

Laboratory PO #15EC007B		Analytical Requirements						Special Instructions
Return Address for Analytical Reports		# of Containers	Sample Type: Soil (S)	SW-846 Method 8260B 4 oz. Glass Jar, Ice	Total Metals SW-846-6010C and 7470A 4 oz. Glass Jar, Ice	TCLP Metals EPA Method 1311 incorporating SW-846-6010C and 7470A 8 oz. Glass Jar, Ice	Comments	
Sample No.	Sample Location							
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012								
Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453								
							Please return coolers and reusable packaging materials as possible. Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall	
161220 0840	400-SB-06	1	S	X			Container 7449	
161220 0841	400-SB-06	1	S		X		Container 7449	
161220 0842	400-SB-06	1	S			X	Container 7449	
161220 0845	400-SB-06	1	S	X			Container 7458	
161220 0846	400-SB-06	1	S	X			Container 7458	
161220 0847	400-SB-06	1	S	X			Matrix Spike for 161220 ; Container 7458	
161220 0848	400-SB-06	1	S		X		Container 7458	
161220 0849	400-SB-06	1	S		X		Container 7458	
161220 0850	400-SB-06	1	S		X		Matrix Spike for 161220 ; Container 7458	
161220 0851	400-SB-06	1	S			X	Container 7458	
161220 0852	400-SB-06	1	S			X	Container 7458	
161220 0853	400-SB-06	1	S			X	Matrix Spike for 161220 ; Container 7458	
Relinquished By: 		Date/Time: 12-20-16 (1440)			Accepted By: 		Date/Time: 12-22-16 11:10	



Laboratory PO #15EC007B		Analytical Requirements						Special Instructions
Return Address for Analytical Reports		# of Containers	Sample Type: Soil (S)	SW-846 Method 8260B 4 oz. Glass Jar, Ice	Total Metals SW-846-6010C and 7470A 4 oz. Glass Jar, Ice	TCLP Metals EPA Method 1311 incorporating SW-846-6010C and 7470A 8 oz. Glass Jar, Ice	Comments	
Sample No.	Sample Location							
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012 Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453								Please return coolers and reusable packaging materials as possible. Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall
161220	0900	400-SB-07	1	S	X			Container 7441
161220	0901	400-SB-07	1	S		X		Container 7441
161220	0902	400-SB-07	1	S			X	Container 7441
161220	0915	400-SB-07	1	S	X			Container 7448
161220	0916	400-SB-07	1	S	X			Container 7448
161220	0917	400-SB-07	1	S	X			Matrix Spike for 161220 ; Container 7448
161220	0918	400-SB-07	1	S		X		Container 7448
161220	0919	400-SB-07	1	S		X		Container 7448
161220	0920	400-SB-07	1	S		X		Matrix Spike for 161220 ; Container 7448
161220	0921	400-SB-07	1	S			X	Container 7448
161220	0922	400-SB-07	1	S			X	Container 7448
161220	0923	400-SB-07	1	S			X	Matrix Spike for 161220 ; Container 7448
Relinquished By:		Date/Time:		Accepted By:			Date/Time:	
		12-20-16 (1440)					12-22-16 11:10	

Laboratory PO #15EC007B		Analytical Requirements						Special Instructions
Return Address for Analytical Reports		# of Containers	Sample Type: Soil (S)	SW-846 Method 8260B 4 oz. Glass Jar, Ice	Total Metals SW-846-6010C and 7470A 4 oz. Glass Jar, Ice	TCLP Metals EPA Method 1311 incorporating SW-846-6010C and 7470A 8 oz. Glass Jar, Ice	Comments	
Sample No.	Sample Location							
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012								Please return coolers and reusable packaging materials as possible. Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall
Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453								
161220 0930	400-SB-08	1	S	X			Container 7439	
161220 0931	400-SB-08	1	S		X		Container 7439	
161220 0932	400-SB-08	1	S			X	Container 7439	
161220 0940	400-SB-08	1	S	X			Container 7440	
161220 0941	400-SB-08	1	S	X			Container 7440	
161220 0942	400-SB-08	1	S	X			Matrix Spike for 161220 ; Container 7440	
161220 0943	400-SB-08	1	S		X		Container 7440	
161220 0944	400-SB-08	1	S		X		Container 7440	
161220 0945	400-SB-08	1	S		X		Matrix Spike for 161220 ; Container 7440	
161220 0946	400-SB-08	1	S			X	Container 7440	
161220 0947	400-SB-08	1	S			X	Container 7440	
161220 0948	400-SB-08	1	S			X	Matrix Spike for 161220 ; Container 7440	
Relinquished By: <i>[Signature]</i>		Date/Time: 12-20-16 (1440)		Accepted By: <i>[Signature]</i>		Date/Time: 12-22-16 11:10		





Cooler Receipt and Preservation Check Form

R1613412

5

NASA/WSTF/Navarro
White Sands Test Facility

Project/Client NASA Folder Number R1613412

Cooler received on 12-22-16 by FE/BL COURIER: ALS UPS FEDEX VELOCITY CLIENT

1	Were Custody seals on outside of cooler?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N
2	Custody papers properly completed (ink, signed)?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N
3	Did all bottles arrive in good condition (unbroken)?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N
4	Circle: <u>Wet Ice</u> Dry Ice Gel packs present?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N

5a	Perchlorate samples have required headspace?	<input type="checkbox"/> Y <input type="checkbox"/> N <input checked="" type="checkbox"/> NA
5b	Did VOA vials, Alk, or Sulfide have sig* bubbles?	<input type="checkbox"/> Y <input type="checkbox"/> N <input checked="" type="checkbox"/> NA
6	Where did the bottles originate?	ALS/ROC <u>CLIENT</u>
7	Soil VOA received as:	<u>Bulk</u> Encore 5035set <u>NA</u>

8. Temperature Readings Date: 12-22-16 Time: 11:31 ID: IR#7 IR#8 From: Temp Blank Sample Bottle

Observed Temp (°C)	<u>3.7</u>	<u>5.6</u>						
Correction Factor (°C)	<u>0</u>	<u>0</u>						
Corrected Temp (°C)	<u>3.7</u>	<u>5.6</u>						
Within 0-6°C?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N
If <0°C, were samples frozen?	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N

If out of Temperature, note packing/ice condition: Ice melted Poorly Packed Same Day Rule
& Client Approval to Run Samples: Standing Approval Client aware at drop-off Client notified by:

All samples held in storage location: R-002 by FE on 12-22-16 at 11:40
5035 samples placed in storage location: by on at

Cooler Breakdown: Date: 12/22/16 Time: 1542 by: dlw

- Were all bottle labels complete (i.e. analysis, preservation, etc.)? YES NO
- Did all bottle labels and tags agree with custody papers? YES NO
- Were correct containers used for the tests indicated? YES NO
- Were 5035 vials acceptable (no extra labels, not leaking)? YES NO
- Air Samples: Cassettes / Tubes Intact Canisters Pressurized Tedlar® Bags Inflated N/A

Explain any discrepancies:

pH	Reagent	Yes	No	Lot Received	Exp	Sample ID	Vol. Added	Lot Added	Final pH	
≥12	NaOH									Yes=All samples OK
≤2	HNO ₃									No=Samples were preserved at The lab as listed
≤2	H ₂ SO ₄									
<4	NaHSO ₄									
Residual Chlorine (-)	For CN Phenol and 522			If +, contact PM to add Na ₂ S ₂ O ₃ (CN), ascorbic (phenol).						
	Na ₂ S ₂ O ₃	-	-							PM OK to Adjust:
	ZnAcetate	-	-							
	HCl	**	**							

**Not to be tested before analysis – pH tested and recorded by VOAs on a separate worksheet

Bottle lot numbers: circled
Other Comments:

* 1612200916 400-SB-07 (7448)
1612201043 400-SB-11 (7473)
1612200931 400-SB-06 (7439)
1612201040 400-SB-11 (7473)
1612200850 400-SB-06 (7458)
Broken in shipment.

CLRES	<u>BULK</u>
DO	FLDT
HPROD	HGFB
HTR	LL3541
PH	<u>SUB</u>
SO3	MARRS
ALS	REV

PC Secondary Review: 12/27/16 *significant air bubbles: VOA > 5-6 mm : WC > 1 in. diameter



Miscellaneous Forms

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

REPORT QUALIFIERS AND DEFINITIONS

<p>U Analyte was analyzed for but not detected. The sample quantitation limit has been corrected for dilution and for percent moisture, unless otherwise noted in the case narrative.</p> <p>J Estimated value due to either being a Tentatively Identified Compound (TIC) or that the concentration is between the MRL and the MDL. Concentrations are not verified within the linear range of the calibration. For DoD: concentration >40% difference between two GC columns (pesticides/Aroclors).</p> <p>B Analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.</p> <p>E Inorganics- Concentration is estimated due to the serial dilution was outside control limits.</p> <p>E Organics- Concentration has exceeded the calibration range for that specific analysis.</p> <p>D Concentration is a result of a dilution, typically a secondary analysis of the sample due to exceeding the calibration range or that a surrogate has been diluted out of the sample and cannot be assessed.</p> <p>* Indicates that a quality control parameter has exceeded laboratory limits. Under the “Notes” column of the Form I, this qualifier denotes analysis was performed out of Holding Time.</p> <p>H Analysis was performed out of hold time for tests that have an “immediate” hold time criteria.</p> <p># Spike was diluted out.</p>	<p>+ Correlation coefficient for MSA is <0.995.</p> <p>N Inorganics- Matrix spike recovery was outside laboratory limits.</p> <p>N Organics- Presumptive evidence of a compound (reported as a TIC) based on the MS library search.</p> <p>S Concentration has been determined using Method of Standard Additions (MSA).</p> <p>W Post-Digestion Spike recovery is outside control limits and the sample absorbance is <50% of the spike absorbance.</p> <p>P Concentration >40% (25% for CLP) difference between the two GC columns.</p> <p>C Confirmed by GC/MS</p> <p>Q DoD reports: indicates a pesticide/Aroclor is not confirmed ($\geq 100\%$ Difference between two GC columns).</p> <p>X See Case Narrative for discussion.</p> <p>MRL Method Reporting Limit. Also known as: LOQ Limit of Quantitation (LOQ) The lowest concentration at which the method analyte may be reliably quantified under the method conditions.</p> <p>MDL Method Detection Limit. A statistical value derived from a study designed to provide the lowest concentration that will be detected 99% of the time. Values between the MDL and MRL are estimated (see J qualifier).</p> <p>LOD Limit of Detection. A value at or above the MDL which has been verified to be detectable.</p> <p>ND Non-Detect. Analyte was not detected at the concentration listed. Same as U qualifier.</p>
--	---



Rochester Lab ID # for State Certifications¹

Connecticut ID # PH0556	Maine ID #NY0032	New Hampshire ID #
Delaware Accredited	Nebraska Accredited	294100 A/B
DoD ELAP #65817	New Jersey ID # NY004	Pennsylvania ID# 68-786
Florida ID # E87674	New York ID # 10145	Rhode Island ID # 158
Illinois ID #200047	North Carolina #676	Virginia #460167

¹ Analyses were performed according to our laboratory’s NELAP-approved quality assurance program and any applicable state or agency requirements. The test results meet requirements of the current NELAP/TNI standards or state or agency requirements, where applicable, except as noted in the case narrative. Since not all analyte/method/matrix combinations are offered for state/NELAC accreditation, this report may contain results which are not accredited. For a specific list of accredited analytes, contact the laboratory or go to <http://www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads/North-America-Downloads>

ALS Laboratory Group

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1613412

Sample Name: 1612200840 400-SB-06
Lab Code: R1613412-001
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1612200841 400-SB-06
Lab Code: R1613412-002
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CBURLESON
KWONG

Sample Name: 1612200845 400-SB-06
Lab Code: R1613412-004
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1612200846 400-SB-06
Lab Code: R1613412-005
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1613412

Sample Name: 1612200848 400-SB-06
Lab Code: R1613412-006
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CBURLESON
KWONG

Sample Name: 1612200849 400-SB-06
Lab Code: R1613412-007
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CBURLESON
KWONG

Sample Name: 1612200900 400-SB-07
Lab Code: R1613412-010
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1612200901 400-SB-07
Lab Code: R1613412-011
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CBURLESON
KWONG

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1613412

Sample Name: 1612200915 400-SB-07
Lab Code: R1613412-013
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1612200918 400-SB-07
Lab Code: R1613412-015
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CBURLESON
KWONG

Sample Name: 1612200919 400-SB-07
Lab Code: R1613412-016
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CBURLESON
KWONG

Sample Name: 1612200930 400-SB-08
Lab Code: R1613412-019
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1613412

Sample Name: 1612200940 400-SB-08
Lab Code: R1613412-022
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1612200941 400-SB-08
Lab Code: R1613412-023
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1612200943 400-SB-08
Lab Code: R1613412-024
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CBURLESON
KWONG

Sample Name: 1612200944 400-SB-08
Lab Code: R1613412-025
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CBURLESON
KWONG



INORGANIC PREPARATION METHODS

The preparation methods associated with this report are found in these tables unless discussed in the case narrative.

Water/Liquid Matrix

Analytical Method	Preparation Method
200.7	200.2
200.8	200.2
6010C	3005A/3010A
6020A	ILM05.3
9014 Cyanide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Acid Soluble	9030B
9056A Bomb (Halogens)	5050A
9066 Manual Distillation	9065
SM 4500-CN-E Residual Cyanide	SM 4500-CN-G
SM 4500-CN-E WAD Cyanide	SM 4500-CN-I

Solid/Soil/Non-Aqueous Matrix

Analytical Method	Preparation Method
6010C	3050B
6020A	3050B
6010C TCLP (1311) extract	3005A/3010A
6010 SPLP (1312) extract	3005A/3010A
7196A	3060A
7199	3060A
9056A Halogens/Halides	5050
300.0 Anions/ 350.1/ 353.2/ SM 2320B/ SM 5210B/ 9056A Anions	DI extraction

For analytical methods not listed, the preparation method is the same as the analytical method reference.



Sample Results

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com



Volatile Organic Compounds by GC/MS

ALS Environmental—Rochester Laboratory

1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623

Phone (585) 288-5380 Fax (585) 288-8475

www.alsglobal.com

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Sample Name: 1612200840 400-SB-06
Lab Code: R1613412-001

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.1	0.86	1	12/29/16 12:58	
1,1,1-Trichloroethane (TCA)	ND U	5.1	0.75	1	12/29/16 12:58	
1,1,2,2-Tetrachloroethane	ND U	5.1	0.83	1	12/29/16 12:58	
1,1,2-Trichloroethane	ND U	5.1	0.75	1	12/29/16 12:58	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.1	1.3	1	12/29/16 12:58	
1,1-Dichloroethene (1,1-DCE)	ND U	5.1	1.4	1	12/29/16 12:58	
1,2,3-Trichloropropane	ND U	5.1	1.4	1	12/29/16 12:58	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.1	2.0	1	12/29/16 12:58	
1,2-Dibromoethane	ND U	5.1	1.3	1	12/29/16 12:58	
1,2-Dichlorobenzene	ND U	5.1	0.63	1	12/29/16 12:58	
1,2-Dichloroethane	ND U	5.1	0.63	1	12/29/16 12:58	
1,2-Dichloropropane	ND U	5.1	1.0	1	12/29/16 12:58	
1,3-Dichlorobenzene	ND U	5.1	0.65	1	12/29/16 12:58	
1,4-Dioxane	ND U	100	20	1	12/29/16 12:58	
2-Butanone (MEK)	ND U	5.1	2.4	1	12/29/16 12:58	
2-Chloro-1,3-butadiene	ND U	5.1	1.6	1	12/29/16 12:58	
2-Chloroethyl Vinyl Ether	ND U	5.1	1.8	1	12/29/16 12:58	
Isobutyl Alcohol	ND U	100	24	1	12/29/16 12:58	
Allyl Chloride	ND U	5.1	1.8	1	12/29/16 12:58	
4-Methyl-2-pentanone	ND U	5.1	1.1	1	12/29/16 12:58	
Acetone	ND U	5.1	2.9	1	12/29/16 12:58	
Acetonitrile	ND U	26	18	1	12/29/16 12:58	
Acrolein	ND U	26	3.6	1	12/29/16 12:58	
Acrylonitrile	ND U	26	6.7	1	12/29/16 12:58	
Benzene	ND U	5.1	0.30	1	12/29/16 12:58	
Bromodichloromethane	ND U	5.1	0.63	1	12/29/16 12:58	
Bromoform	ND U	5.1	0.96	1	12/29/16 12:58	
Bromomethane	ND U	5.1	1.5	1	12/29/16 12:58	
Carbon Disulfide	ND U	5.1	1.3	1	12/29/16 12:58	
Carbon Tetrachloride	ND U	5.1	0.95	1	12/29/16 12:58	
Chlorobenzene	ND U	5.1	0.30	1	12/29/16 12:58	
Chloroethane	ND U	5.1	3.0	1	12/29/16 12:58	
Chloroform	ND U	5.1	1.3	1	12/29/16 12:58	
Chloromethane	ND U	5.1	0.41	1	12/29/16 12:58	
Dibromochloromethane	ND U	5.1	0.75	1	12/29/16 12:58	
Dibromomethane	ND U	5.1	0.65	1	12/29/16 12:58	
Dichlorodifluoromethane (CFC 12)	ND U	5.1	2.0	1	12/29/16 12:58	
Dichloromethane	ND U	5.1	0.59	1	12/29/16 12:58	
Ethyl Methacrylate	ND U	5.1	0.77	1	12/29/16 12:58	
Ethylbenzene	ND U	5.1	0.24	1	12/29/16 12:58	
Iodomethane	ND U	10	1.2	1	12/29/16 12:58	
Methacrylonitrile	ND U	5.1	1.6	1	12/29/16 12:58	
Methyl Methacrylate	ND U	5.1	0.75	1	12/29/16 12:58	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200840 400-SB-06
Lab Code: R1613412-001

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.1	0.53	1	12/29/16 12:58	
Propionitrile	ND U	26	6.7	1	12/29/16 12:58	
Tetrachloroethene (PCE)	ND U	5.1	0.91	1	12/29/16 12:58	
Toluene	ND U	5.1	1.1	1	12/29/16 12:58	
Trichloroethene (TCE)	ND U	5.1	1.1	1	12/29/16 12:58	
Trichlorofluoromethane (CFC 11)	ND U	5.1	0.68	1	12/29/16 12:58	
Vinyl Chloride	ND U	5.1	1.9	1	12/29/16 12:58	
cis-1,3-Dichloropropene	ND U	5.1	0.93	1	12/29/16 12:58	
m,p-Xylenes	ND U	10	1.2	1	12/29/16 12:58	
o-Xylene	ND U	5.1	0.50	1	12/29/16 12:58	
trans-1,2-Dichloroethene	ND U	5.1	0.89	1	12/29/16 12:58	
trans-1,3-Dichloropropene	ND U	5.1	0.21	1	12/29/16 12:58	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	103	51 - 136	12/29/16 12:58	
Dibromofluoromethane	102	63 - 138	12/29/16 12:58	
Toluene-d8	102	66 - 138	12/29/16 12:58	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000124-19-6	Nonanal	14.39	13	JN

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Sample Name: 1612200845 400-SB-06
Lab Code: R1613412-004

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.2	0.87	1	12/29/16 13:22	
1,1,1-Trichloroethane (TCA)	ND U	5.2	0.76	1	12/29/16 13:22	
1,1,2,2-Tetrachloroethane	ND U	5.2	0.84	1	12/29/16 13:22	
1,1,2-Trichloroethane	ND U	5.2	0.76	1	12/29/16 13:22	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.2	1.3	1	12/29/16 13:22	
1,1-Dichloroethene (1,1-DCE)	ND U	5.2	1.4	1	12/29/16 13:22	
1,2,3-Trichloropropane	ND U	5.2	1.4	1	12/29/16 13:22	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.2	2.0	1	12/29/16 13:22	
1,2-Dibromoethane	ND U	5.2	1.3	1	12/29/16 13:22	
1,2-Dichlorobenzene	ND U	5.2	0.64	1	12/29/16 13:22	
1,2-Dichloroethane	ND U	5.2	0.64	1	12/29/16 13:22	
1,2-Dichloropropane	ND U	5.2	1.1	1	12/29/16 13:22	
1,3-Dichlorobenzene	ND U	5.2	0.66	1	12/29/16 13:22	
1,4-Dioxane	ND U	100	20	1	12/29/16 13:22	
2-Butanone (MEK)	ND U	5.2	2.4	1	12/29/16 13:22	
2-Chloro-1,3-butadiene	ND U	5.2	1.6	1	12/29/16 13:22	
2-Chloroethyl Vinyl Ether	ND U	5.2	1.8	1	12/29/16 13:22	
Isobutyl Alcohol	ND U	100	24	1	12/29/16 13:22	
Allyl Chloride	ND U	5.2	1.8	1	12/29/16 13:22	
4-Methyl-2-pentanone	ND U	5.2	1.1	1	12/29/16 13:22	
Acetone	4.2 J	5.2	3.0	1	12/29/16 13:22	
Acetonitrile	ND U	26	18	1	12/29/16 13:22	
Acrolein	ND U	26	3.7	1	12/29/16 13:22	
Acrylonitrile	ND U	26	6.7	1	12/29/16 13:22	
Benzene	ND U	5.2	0.31	1	12/29/16 13:22	
Bromodichloromethane	ND U	5.2	0.64	1	12/29/16 13:22	
Bromoform	ND U	5.2	0.97	1	12/29/16 13:22	
Bromomethane	ND U	5.2	1.5	1	12/29/16 13:22	
Carbon Disulfide	ND U	5.2	1.3	1	12/29/16 13:22	
Carbon Tetrachloride	ND U	5.2	0.96	1	12/29/16 13:22	
Chlorobenzene	ND U	5.2	0.31	1	12/29/16 13:22	
Chloroethane	ND U	5.2	3.0	1	12/29/16 13:22	
Chloroform	ND U	5.2	1.4	1	12/29/16 13:22	
Chloromethane	ND U	5.2	0.42	1	12/29/16 13:22	
Dibromochloromethane	ND U	5.2	0.76	1	12/29/16 13:22	
Dibromomethane	ND U	5.2	0.66	1	12/29/16 13:22	
Dichlorodifluoromethane (CFC 12)	ND U	5.2	2.0	1	12/29/16 13:22	
Dichloromethane	ND U	5.2	0.60	1	12/29/16 13:22	
Ethyl Methacrylate	ND U	5.2	0.78	1	12/29/16 13:22	
Ethylbenzene	ND U	5.2	0.24	1	12/29/16 13:22	
Iodomethane	ND U	10	1.2	1	12/29/16 13:22	
Methacrylonitrile	ND U	5.2	1.6	1	12/29/16 13:22	
Methyl Methacrylate	ND U	5.2	0.76	1	12/29/16 13:22	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200845 400-SB-06
Lab Code: R1613412-004

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.2	0.53	1	12/29/16 13:22	
Propionitrile	ND U	26	6.8	1	12/29/16 13:22	
Tetrachloroethene (PCE)	ND U	5.2	0.92	1	12/29/16 13:22	
Toluene	ND U	5.2	1.1	1	12/29/16 13:22	
Trichloroethene (TCE)	ND U	5.2	1.1	1	12/29/16 13:22	
Trichlorofluoromethane (CFC 11)	ND U	5.2	0.69	1	12/29/16 13:22	
Vinyl Chloride	ND U	5.2	2.0	1	12/29/16 13:22	
cis-1,3-Dichloropropene	ND U	5.2	0.94	1	12/29/16 13:22	
m,p-Xylenes	ND U	10	1.2	1	12/29/16 13:22	
o-Xylene	ND U	5.2	0.50	1	12/29/16 13:22	
trans-1,2-Dichloroethene	ND U	5.2	0.90	1	12/29/16 13:22	
trans-1,3-Dichloropropene	ND U	5.2	0.21	1	12/29/16 13:22	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	103	51 - 136	12/29/16 13:22	
Dibromofluoromethane	100	63 - 138	12/29/16 13:22	
Toluene-d8	102	66 - 138	12/29/16 13:22	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	unknown	13.57	24	J

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Sample Name: 1612200846 400-SB-06
Lab Code: R1613412-005

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.2	0.87	1	12/29/16 13:46	
1,1,1-Trichloroethane (TCA)	ND U	5.2	0.76	1	12/29/16 13:46	
1,1,2,2-Tetrachloroethane	ND U	5.2	0.85	1	12/29/16 13:46	
1,1,2-Trichloroethane	ND U	5.2	0.76	1	12/29/16 13:46	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.2	1.3	1	12/29/16 13:46	
1,1-Dichloroethene (1,1-DCE)	ND U	5.2	1.4	1	12/29/16 13:46	
1,2,3-Trichloropropane	ND U	5.2	1.4	1	12/29/16 13:46	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.2	2.0	1	12/29/16 13:46	
1,2-Dibromoethane	ND U	5.2	1.3	1	12/29/16 13:46	
1,2-Dichlorobenzene	ND U	5.2	0.64	1	12/29/16 13:46	
1,2-Dichloroethane	ND U	5.2	0.64	1	12/29/16 13:46	
1,2-Dichloropropane	ND U	5.2	1.1	1	12/29/16 13:46	
1,3-Dichlorobenzene	ND U	5.2	0.66	1	12/29/16 13:46	
1,4-Dioxane	ND U	100	20	1	12/29/16 13:46	
2-Butanone (MEK)	ND U	5.2	2.4	1	12/29/16 13:46	
2-Chloro-1,3-butadiene	ND U	5.2	1.6	1	12/29/16 13:46	
2-Chloroethyl Vinyl Ether	ND U	5.2	1.8	1	12/29/16 13:46	
Isobutyl Alcohol	ND U	100	24	1	12/29/16 13:46	
Allyl Chloride	ND U	5.2	1.8	1	12/29/16 13:46	
4-Methyl-2-pentanone	ND U	5.2	1.1	1	12/29/16 13:46	
Acetone	3.3 J	5.2	3.0	1	12/29/16 13:46	
Acetonitrile	ND U	26	18	1	12/29/16 13:46	
Acrolein	ND U	26	3.7	1	12/29/16 13:46	
Acrylonitrile	ND U	26	6.8	1	12/29/16 13:46	
Benzene	ND U	5.2	0.31	1	12/29/16 13:46	
Bromodichloromethane	ND U	5.2	0.64	1	12/29/16 13:46	
Bromoform	ND U	5.2	0.97	1	12/29/16 13:46	
Bromomethane	ND U	5.2	1.5	1	12/29/16 13:46	
Carbon Disulfide	ND U	5.2	1.3	1	12/29/16 13:46	
Carbon Tetrachloride	ND U	5.2	0.96	1	12/29/16 13:46	
Chlorobenzene	ND U	5.2	0.31	1	12/29/16 13:46	
Chloroethane	ND U	5.2	3.0	1	12/29/16 13:46	
Chloroform	ND U	5.2	1.4	1	12/29/16 13:46	
Chloromethane	ND U	5.2	0.42	1	12/29/16 13:46	
Dibromochloromethane	ND U	5.2	0.76	1	12/29/16 13:46	
Dibromomethane	ND U	5.2	0.66	1	12/29/16 13:46	
Dichlorodifluoromethane (CFC 12)	ND U	5.2	2.0	1	12/29/16 13:46	
Dichloromethane	ND U	5.2	0.60	1	12/29/16 13:46	
Ethyl Methacrylate	ND U	5.2	0.78	1	12/29/16 13:46	
Ethylbenzene	ND U	5.2	0.24	1	12/29/16 13:46	
Iodomethane	ND U	10	1.2	1	12/29/16 13:46	
Methacrylonitrile	ND U	5.2	1.6	1	12/29/16 13:46	
Methyl Methacrylate	ND U	5.2	0.76	1	12/29/16 13:46	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200846 400-SB-06
Lab Code: R1613412-005

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.2	0.53	1	12/29/16 13:46	
Propionitrile	ND U	26	6.8	1	12/29/16 13:46	
Tetrachloroethene (PCE)	1.0 J	5.2	0.92	1	12/29/16 13:46	
Toluene	ND U	5.2	1.1	1	12/29/16 13:46	
Trichloroethene (TCE)	ND U	5.2	1.1	1	12/29/16 13:46	
Trichlorofluoromethane (CFC 11)	ND U	5.2	0.69	1	12/29/16 13:46	
Vinyl Chloride	ND U	5.2	2.0	1	12/29/16 13:46	
cis-1,3-Dichloropropene	ND U	5.2	0.94	1	12/29/16 13:46	
m,p-Xylenes	ND U	10	1.2	1	12/29/16 13:46	
o-Xylene	ND U	5.2	0.50	1	12/29/16 13:46	
trans-1,2-Dichloroethene	ND U	5.2	0.90	1	12/29/16 13:46	
trans-1,3-Dichloropropene	ND U	5.2	0.21	1	12/29/16 13:46	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	103	51 - 136	12/29/16 13:46	
Dibromofluoromethane	99	63 - 138	12/29/16 13:46	
Toluene-d8	102	66 - 138	12/29/16 13:46	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000104-76-7	1-Hexanol, 2-ethyl-	13.57	24	JN

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Sample Name: 1612200900 400-SB-07
Lab Code: R1613412-010

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.2	0.88	1	12/29/16 14:11	
1,1,1-Trichloroethane (TCA)	ND U	5.2	0.77	1	12/29/16 14:11	
1,1,2,2-Tetrachloroethane	ND U	5.2	0.85	1	12/29/16 14:11	
1,1,2-Trichloroethane	ND U	5.2	0.77	1	12/29/16 14:11	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.2	1.4	1	12/29/16 14:11	
1,1-Dichloroethene (1,1-DCE)	ND U	5.2	1.4	1	12/29/16 14:11	
1,2,3-Trichloropropane	ND U	5.2	1.4	1	12/29/16 14:11	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.2	2.0	1	12/29/16 14:11	
1,2-Dibromoethane	ND U	5.2	1.3	1	12/29/16 14:11	
1,2-Dichlorobenzene	ND U	5.2	0.65	1	12/29/16 14:11	
1,2-Dichloroethane	ND U	5.2	0.65	1	12/29/16 14:11	
1,2-Dichloropropane	ND U	5.2	1.1	1	12/29/16 14:11	
1,3-Dichlorobenzene	ND U	5.2	0.67	1	12/29/16 14:11	
1,4-Dioxane	ND U	100	21	1	12/29/16 14:11	
2-Butanone (MEK)	ND U	5.2	2.5	1	12/29/16 14:11	
2-Chloro-1,3-butadiene	ND U	5.2	1.6	1	12/29/16 14:11	
2-Chloroethyl Vinyl Ether	ND U	5.2	1.8	1	12/29/16 14:11	
Isobutyl Alcohol	ND U	100	24	1	12/29/16 14:11	
Allyl Chloride	ND U	5.2	1.8	1	12/29/16 14:11	
4-Methyl-2-pentanone	ND U	5.2	1.1	1	12/29/16 14:11	
Acetone	4.5 J	5.2	3.0	1	12/29/16 14:11	
Acetonitrile	ND U	26	18	1	12/29/16 14:11	
Acrolein	ND U	26	3.7	1	12/29/16 14:11	
Acrylonitrile	ND U	26	6.8	1	12/29/16 14:11	
Benzene	ND U	5.2	0.31	1	12/29/16 14:11	
Bromodichloromethane	ND U	5.2	0.65	1	12/29/16 14:11	
Bromoform	ND U	5.2	0.98	1	12/29/16 14:11	
Bromomethane	ND U	5.2	1.5	1	12/29/16 14:11	
Carbon Disulfide	ND U	5.2	1.4	1	12/29/16 14:11	
Carbon Tetrachloride	ND U	5.2	0.97	1	12/29/16 14:11	
Chlorobenzene	ND U	5.2	0.31	1	12/29/16 14:11	
Chloroethane	ND U	5.2	3.1	1	12/29/16 14:11	
Chloroform	ND U	5.2	1.4	1	12/29/16 14:11	
Chloromethane	ND U	5.2	0.42	1	12/29/16 14:11	
Dibromochloromethane	ND U	5.2	0.77	1	12/29/16 14:11	
Dibromomethane	ND U	5.2	0.67	1	12/29/16 14:11	
Dichlorodifluoromethane (CFC 12)	ND U	5.2	2.0	1	12/29/16 14:11	
Dichloromethane	ND U	5.2	0.60	1	12/29/16 14:11	
Ethyl Methacrylate	ND U	5.2	0.79	1	12/29/16 14:11	
Ethylbenzene	ND U	5.2	0.25	1	12/29/16 14:11	
Iodomethane	ND U	10	1.2	1	12/29/16 14:11	
Methacrylonitrile	ND U	5.2	1.6	1	12/29/16 14:11	
Methyl Methacrylate	ND U	5.2	0.77	1	12/29/16 14:11	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200900 400-SB-07
Lab Code: R1613412-010

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.2	0.54	1	12/29/16 14:11	
Propionitrile	ND U	26	6.9	1	12/29/16 14:11	
Tetrachloroethene (PCE)	ND U	5.2	0.93	1	12/29/16 14:11	
Toluene	ND U	5.2	1.1	1	12/29/16 14:11	
Trichloroethene (TCE)	ND U	5.2	1.1	1	12/29/16 14:11	
Trichlorofluoromethane (CFC 11)	ND U	5.2	0.70	1	12/29/16 14:11	
Vinyl Chloride	ND U	5.2	2.0	1	12/29/16 14:11	
cis-1,3-Dichloropropene	ND U	5.2	0.95	1	12/29/16 14:11	
m,p-Xylenes	ND U	10	1.2	1	12/29/16 14:11	
o-Xylene	ND U	5.2	0.51	1	12/29/16 14:11	
trans-1,2-Dichloroethene	ND U	5.2	0.91	1	12/29/16 14:11	
trans-1,3-Dichloropropene	ND U	5.2	0.21	1	12/29/16 14:11	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	101	51 - 136	12/29/16 14:11	
Dibromofluoromethane	98	63 - 138	12/29/16 14:11	
Toluene-d8	102	66 - 138	12/29/16 14:11	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	unknown	13.57	35	J

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Sample Name: 1612200915 400-SB-07
Lab Code: R1613412-013

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.2	0.86	1	12/29/16 14:35	
1,1,1-Trichloroethane (TCA)	ND U	5.2	0.76	1	12/29/16 14:35	
1,1,2,2-Tetrachloroethane	ND U	5.2	0.84	1	12/29/16 14:35	
1,1,2-Trichloroethane	ND U	5.2	0.76	1	12/29/16 14:35	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.2	1.3	1	12/29/16 14:35	
1,1-Dichloroethene (1,1-DCE)	ND U	5.2	1.4	1	12/29/16 14:35	
1,2,3-Trichloropropane	ND U	5.2	1.4	1	12/29/16 14:35	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.2	2.0	1	12/29/16 14:35	
1,2-Dibromoethane	ND U	5.2	1.3	1	12/29/16 14:35	
1,2-Dichlorobenzene	ND U	5.2	0.64	1	12/29/16 14:35	
1,2-Dichloroethane	ND U	5.2	0.64	1	12/29/16 14:35	
1,2-Dichloropropane	ND U	5.2	1.1	1	12/29/16 14:35	
1,3-Dichlorobenzene	ND U	5.2	0.66	1	12/29/16 14:35	
1,4-Dioxane	ND U	100	20	1	12/29/16 14:35	
2-Butanone (MEK)	ND U	5.2	2.4	1	12/29/16 14:35	
2-Chloro-1,3-butadiene	ND U	5.2	1.6	1	12/29/16 14:35	
2-Chloroethyl Vinyl Ether	ND U	5.2	1.8	1	12/29/16 14:35	
Isobutyl Alcohol	ND U	100	24	1	12/29/16 14:35	
Allyl Chloride	ND U	5.2	1.8	1	12/29/16 14:35	
4-Methyl-2-pentanone	ND U	5.2	1.1	1	12/29/16 14:35	
Acetone	3.0 J	5.2	3.0	1	12/29/16 14:35	
Acetonitrile	ND U	26	18	1	12/29/16 14:35	
Acrolein	ND U	26	3.7	1	12/29/16 14:35	
Acrylonitrile	ND U	26	6.7	1	12/29/16 14:35	
Benzene	ND U	5.2	0.30	1	12/29/16 14:35	
Bromodichloromethane	ND U	5.2	0.64	1	12/29/16 14:35	
Bromoform	ND U	5.2	0.97	1	12/29/16 14:35	
Bromomethane	ND U	5.2	1.5	1	12/29/16 14:35	
Carbon Disulfide	ND U	5.2	1.3	1	12/29/16 14:35	
Carbon Tetrachloride	ND U	5.2	0.96	1	12/29/16 14:35	
Chlorobenzene	ND U	5.2	0.30	1	12/29/16 14:35	
Chloroethane	ND U	5.2	3.0	1	12/29/16 14:35	
Chloroform	ND U	5.2	1.4	1	12/29/16 14:35	
Chloromethane	ND U	5.2	0.42	1	12/29/16 14:35	
Dibromochloromethane	ND U	5.2	0.76	1	12/29/16 14:35	
Dibromomethane	ND U	5.2	0.66	1	12/29/16 14:35	
Dichlorodifluoromethane (CFC 12)	ND U	5.2	2.0	1	12/29/16 14:35	
Dichloromethane	ND U	5.2	0.59	1	12/29/16 14:35	
Ethyl Methacrylate	ND U	5.2	0.78	1	12/29/16 14:35	
Ethylbenzene	ND U	5.2	0.24	1	12/29/16 14:35	
Iodomethane	ND U	10	1.2	1	12/29/16 14:35	
Methacrylonitrile	ND U	5.2	1.6	1	12/29/16 14:35	
Methyl Methacrylate	ND U	5.2	0.76	1	12/29/16 14:35	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200915 400-SB-07
Lab Code: R1613412-013

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.2	0.53	1	12/29/16 14:35	
Propionitrile	ND U	26	6.8	1	12/29/16 14:35	
Tetrachloroethene (PCE)	0.92 J	5.2	0.92	1	12/29/16 14:35	
Toluene	ND U	5.2	1.1	1	12/29/16 14:35	
Trichloroethene (TCE)	ND U	5.2	1.1	1	12/29/16 14:35	
Trichlorofluoromethane (CFC 11)	ND U	5.2	0.69	1	12/29/16 14:35	
Vinyl Chloride	ND U	5.2	2.0	1	12/29/16 14:35	
cis-1,3-Dichloropropene	ND U	5.2	0.94	1	12/29/16 14:35	
m,p-Xylenes	ND U	10	1.2	1	12/29/16 14:35	
o-Xylene	ND U	5.2	0.50	1	12/29/16 14:35	
trans-1,2-Dichloroethene	ND U	5.2	0.89	1	12/29/16 14:35	
trans-1,3-Dichloropropene	ND U	5.2	0.21	1	12/29/16 14:35	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	105	51 - 136	12/29/16 14:35	
Dibromofluoromethane	100	63 - 138	12/29/16 14:35	
Toluene-d8	102	66 - 138	12/29/16 14:35	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	unknown	14.39	11	J

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Sample Name: 1612200930 400-SB-08
Lab Code: R1613412-019

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.1	0.86	1	12/29/16 14:59	
1,1,1-Trichloroethane (TCA)	ND U	5.1	0.76	1	12/29/16 14:59	
1,1,2,2-Tetrachloroethane	ND U	5.1	0.84	1	12/29/16 14:59	
1,1,2-Trichloroethane	ND U	5.1	0.76	1	12/29/16 14:59	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.1	1.3	1	12/29/16 14:59	
1,1-Dichloroethene (1,1-DCE)	ND U	5.1	1.4	1	12/29/16 14:59	
1,2,3-Trichloropropane	ND U	5.1	1.4	1	12/29/16 14:59	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.1	2.0	1	12/29/16 14:59	
1,2-Dibromoethane	ND U	5.1	1.3	1	12/29/16 14:59	
1,2-Dichlorobenzene	ND U	5.1	0.63	1	12/29/16 14:59	
1,2-Dichloroethane	ND U	5.1	0.63	1	12/29/16 14:59	
1,2-Dichloropropane	ND U	5.1	1.0	1	12/29/16 14:59	
1,3-Dichlorobenzene	ND U	5.1	0.65	1	12/29/16 14:59	
1,4-Dioxane	ND U	100	20	1	12/29/16 14:59	
2-Butanone (MEK)	ND U	5.1	2.4	1	12/29/16 14:59	
2-Chloro-1,3-butadiene	ND U	5.1	1.6	1	12/29/16 14:59	
2-Chloroethyl Vinyl Ether	ND U	5.1	1.8	1	12/29/16 14:59	
Isobutyl Alcohol	ND U	100	24	1	12/29/16 14:59	
Allyl Chloride	ND U	5.1	1.8	1	12/29/16 14:59	
4-Methyl-2-pentanone	ND U	5.1	1.1	1	12/29/16 14:59	
Acetone	3.1 J	5.1	2.9	1	12/29/16 14:59	
Acetonitrile	ND U	26	18	1	12/29/16 14:59	
Acrolein	ND U	26	3.7	1	12/29/16 14:59	
Acrylonitrile	ND U	26	6.7	1	12/29/16 14:59	
Benzene	ND U	5.1	0.30	1	12/29/16 14:59	
Bromodichloromethane	ND U	5.1	0.63	1	12/29/16 14:59	
Bromoform	ND U	5.1	0.96	1	12/29/16 14:59	
Bromomethane	ND U	5.1	1.5	1	12/29/16 14:59	
Carbon Disulfide	ND U	5.1	1.3	1	12/29/16 14:59	
Carbon Tetrachloride	ND U	5.1	0.95	1	12/29/16 14:59	
Chlorobenzene	ND U	5.1	0.30	1	12/29/16 14:59	
Chloroethane	ND U	5.1	3.0	1	12/29/16 14:59	
Chloroform	ND U	5.1	1.3	1	12/29/16 14:59	
Chloromethane	ND U	5.1	0.42	1	12/29/16 14:59	
Dibromochloromethane	ND U	5.1	0.76	1	12/29/16 14:59	
Dibromomethane	ND U	5.1	0.65	1	12/29/16 14:59	
Dichlorodifluoromethane (CFC 12)	ND U	5.1	2.0	1	12/29/16 14:59	
Dichloromethane	ND U	5.1	0.59	1	12/29/16 14:59	
Ethyl Methacrylate	ND U	5.1	0.78	1	12/29/16 14:59	
Ethylbenzene	ND U	5.1	0.24	1	12/29/16 14:59	
Iodomethane	ND U	10	1.2	1	12/29/16 14:59	
Methacrylonitrile	ND U	5.1	1.6	1	12/29/16 14:59	
Methyl Methacrylate	ND U	5.1	0.76	1	12/29/16 14:59	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200930 400-SB-08
Lab Code: R1613412-019

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.1	0.53	1	12/29/16 14:59	
Propionitrile	ND U	26	6.7	1	12/29/16 14:59	
Tetrachloroethene (PCE)	ND U	5.1	0.91	1	12/29/16 14:59	
Toluene	ND U	5.1	1.1	1	12/29/16 14:59	
Trichloroethene (TCE)	ND U	5.1	1.1	1	12/29/16 14:59	
Trichlorofluoromethane (CFC 11)	ND U	5.1	0.68	1	12/29/16 14:59	
Vinyl Chloride	ND U	5.1	1.9	1	12/29/16 14:59	
cis-1,3-Dichloropropene	ND U	5.1	0.93	1	12/29/16 14:59	
m,p-Xylenes	ND U	10	1.2	1	12/29/16 14:59	
o-Xylene	ND U	5.1	0.50	1	12/29/16 14:59	
trans-1,2-Dichloroethene	ND U	5.1	0.89	1	12/29/16 14:59	
trans-1,3-Dichloropropene	ND U	5.1	0.21	1	12/29/16 14:59	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	102	51 - 136	12/29/16 14:59	
Dibromofluoromethane	98	63 - 138	12/29/16 14:59	
Toluene-d8	101	66 - 138	12/29/16 14:59	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Sample Name: 1612200940 400-SB-08
Lab Code: R1613412-022

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.2	0.87	1	12/29/16 15:23	
1,1,1-Trichloroethane (TCA)	ND U	5.2	0.77	1	12/29/16 15:23	
1,1,2,2-Tetrachloroethane	ND U	5.2	0.85	1	12/29/16 15:23	
1,1,2-Trichloroethane	ND U	5.2	0.77	1	12/29/16 15:23	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.2	1.3	1	12/29/16 15:23	
1,1-Dichloroethene (1,1-DCE)	ND U	5.2	1.4	1	12/29/16 15:23	
1,2,3-Trichloropropane	ND U	5.2	1.4	1	12/29/16 15:23	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.2	2.0	1	12/29/16 15:23	
1,2-Dibromoethane	ND U	5.2	1.3	1	12/29/16 15:23	
1,2-Dichlorobenzene	ND U	5.2	0.64	1	12/29/16 15:23	
1,2-Dichloroethane	ND U	5.2	0.64	1	12/29/16 15:23	
1,2-Dichloropropane	ND U	5.2	1.1	1	12/29/16 15:23	
1,3-Dichlorobenzene	ND U	5.2	0.66	1	12/29/16 15:23	
1,4-Dioxane	ND U	100	20	1	12/29/16 15:23	
2-Butanone (MEK)	ND U	5.2	2.4	1	12/29/16 15:23	
2-Chloro-1,3-butadiene	ND U	5.2	1.6	1	12/29/16 15:23	
2-Chloroethyl Vinyl Ether	ND U	5.2	1.8	1	12/29/16 15:23	
Isobutyl Alcohol	ND U	100	24	1	12/29/16 15:23	
Allyl Chloride	ND U	5.2	1.8	1	12/29/16 15:23	
4-Methyl-2-pentanone	ND U	5.2	1.1	1	12/29/16 15:23	
Acetone	3.1 J	5.2	3.0	1	12/29/16 15:23	
Acetonitrile	ND U	26	18	1	12/29/16 15:23	
Acrolein	ND U	26	3.7	1	12/29/16 15:23	
Acrylonitrile	ND U	26	6.8	1	12/29/16 15:23	
Benzene	ND U	5.2	0.31	1	12/29/16 15:23	
Bromodichloromethane	ND U	5.2	0.64	1	12/29/16 15:23	
Bromoform	ND U	5.2	0.97	1	12/29/16 15:23	
Bromomethane	ND U	5.2	1.5	1	12/29/16 15:23	
Carbon Disulfide	ND U	5.2	1.3	1	12/29/16 15:23	
Carbon Tetrachloride	ND U	5.2	0.96	1	12/29/16 15:23	
Chlorobenzene	ND U	5.2	0.31	1	12/29/16 15:23	
Chloroethane	ND U	5.2	3.0	1	12/29/16 15:23	
Chloroform	ND U	5.2	1.4	1	12/29/16 15:23	
Chloromethane	ND U	5.2	0.42	1	12/29/16 15:23	
Dibromochloromethane	ND U	5.2	0.77	1	12/29/16 15:23	
Dibromomethane	ND U	5.2	0.66	1	12/29/16 15:23	
Dichlorodifluoromethane (CFC 12)	ND U	5.2	2.0	1	12/29/16 15:23	
Dichloromethane	ND U	5.2	0.60	1	12/29/16 15:23	
Ethyl Methacrylate	ND U	5.2	0.79	1	12/29/16 15:23	
Ethylbenzene	ND U	5.2	0.24	1	12/29/16 15:23	
Iodomethane	ND U	10	1.2	1	12/29/16 15:23	
Methacrylonitrile	ND U	5.2	1.6	1	12/29/16 15:23	
Methyl Methacrylate	ND U	5.2	0.77	1	12/29/16 15:23	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200940 400-SB-08
Lab Code: R1613412-022

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.2	0.54	1	12/29/16 15:23	
Propionitrile	ND U	26	6.8	1	12/29/16 15:23	
Tetrachloroethene (PCE)	ND U	5.2	0.92	1	12/29/16 15:23	
Toluene	ND U	5.2	1.1	1	12/29/16 15:23	
Trichloroethene (TCE)	ND U	5.2	1.1	1	12/29/16 15:23	
Trichlorofluoromethane (CFC 11)	ND U	5.2	0.69	1	12/29/16 15:23	
Vinyl Chloride	ND U	5.2	2.0	1	12/29/16 15:23	
cis-1,3-Dichloropropene	ND U	5.2	0.94	1	12/29/16 15:23	
m,p-Xylenes	ND U	10	1.2	1	12/29/16 15:23	
o-Xylene	ND U	5.2	0.50	1	12/29/16 15:23	
trans-1,2-Dichloroethene	ND U	5.2	0.90	1	12/29/16 15:23	
trans-1,3-Dichloropropene	ND U	5.2	0.21	1	12/29/16 15:23	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	104	51 - 136	12/29/16 15:23	
Dibromofluoromethane	95	63 - 138	12/29/16 15:23	
Toluene-d8	104	66 - 138	12/29/16 15:23	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	unknown	13.57	80	J

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Sample Name: 1612200941 400-SB-08
Lab Code: R1613412-023

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.3	0.88	1	12/29/16 15:47	
1,1,1-Trichloroethane (TCA)	ND U	5.3	0.78	1	12/29/16 15:47	
1,1,2,2-Tetrachloroethane	ND U	5.3	0.86	1	12/29/16 15:47	
1,1,2-Trichloroethane	ND U	5.3	0.78	1	12/29/16 15:47	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.3	1.4	1	12/29/16 15:47	
1,1-Dichloroethene (1,1-DCE)	ND U	5.3	1.4	1	12/29/16 15:47	
1,2,3-Trichloropropane	ND U	5.3	1.4	1	12/29/16 15:47	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.3	2.0	1	12/29/16 15:47	
1,2-Dibromoethane	ND U	5.3	1.3	1	12/29/16 15:47	
1,2-Dichlorobenzene	ND U	5.3	0.65	1	12/29/16 15:47	
1,2-Dichloroethane	ND U	5.3	0.65	1	12/29/16 15:47	
1,2-Dichloropropane	ND U	5.3	1.1	1	12/29/16 15:47	
1,3-Dichlorobenzene	ND U	5.3	0.67	1	12/29/16 15:47	
1,4-Dioxane	ND U	110	21	1	12/29/16 15:47	
2-Butanone (MEK)	ND U	5.3	2.5	1	12/29/16 15:47	
2-Chloro-1,3-butadiene	ND U	5.3	1.7	1	12/29/16 15:47	
2-Chloroethyl Vinyl Ether	ND U	5.3	1.9	1	12/29/16 15:47	
Isobutyl Alcohol	ND U	110	24	1	12/29/16 15:47	
Allyl Chloride	ND U	5.3	1.8	1	12/29/16 15:47	
4-Methyl-2-pentanone	ND U	5.3	1.1	1	12/29/16 15:47	
Acetone	4.9 J	5.3	3.0	1	12/29/16 15:47	
Acetonitrile	ND U	26	18	1	12/29/16 15:47	
Acrolein	ND U	26	3.7	1	12/29/16 15:47	
Acrylonitrile	ND U	26	6.9	1	12/29/16 15:47	
Benzene	ND U	5.3	0.31	1	12/29/16 15:47	
Bromodichloromethane	ND U	5.3	0.65	1	12/29/16 15:47	
Bromoform	ND U	5.3	0.99	1	12/29/16 15:47	
Bromomethane	ND U	5.3	1.5	1	12/29/16 15:47	
Carbon Disulfide	ND U	5.3	1.4	1	12/29/16 15:47	
Carbon Tetrachloride	ND U	5.3	0.98	1	12/29/16 15:47	
Chlorobenzene	ND U	5.3	0.31	1	12/29/16 15:47	
Chloroethane	ND U	5.3	3.1	1	12/29/16 15:47	
Chloroform	ND U	5.3	1.4	1	12/29/16 15:47	
Chloromethane	ND U	5.3	0.43	1	12/29/16 15:47	
Dibromochloromethane	ND U	5.3	0.78	1	12/29/16 15:47	
Dibromomethane	ND U	5.3	0.67	1	12/29/16 15:47	
Dichlorodifluoromethane (CFC 12)	ND U	5.3	2.0	1	12/29/16 15:47	
Dichloromethane	ND U	5.3	0.61	1	12/29/16 15:47	
Ethyl Methacrylate	ND U	5.3	0.80	1	12/29/16 15:47	
Ethylbenzene	ND U	5.3	0.25	1	12/29/16 15:47	
Iodomethane	ND U	11	1.2	1	12/29/16 15:47	
Methacrylonitrile	ND U	5.3	1.6	1	12/29/16 15:47	
Methyl Methacrylate	ND U	5.3	0.78	1	12/29/16 15:47	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200941 400-SB-08
Lab Code: R1613412-023

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.3	0.54	1	12/29/16 15:47	
Propionitrile	ND U	26	6.9	1	12/29/16 15:47	
Tetrachloroethene (PCE)	ND U	5.3	0.93	1	12/29/16 15:47	
Toluene	ND U	5.3	1.1	1	12/29/16 15:47	
Trichloroethene (TCE)	ND U	5.3	1.1	1	12/29/16 15:47	
Trichlorofluoromethane (CFC 11)	ND U	5.3	0.70	1	12/29/16 15:47	
Vinyl Chloride	ND U	5.3	2.0	1	12/29/16 15:47	
cis-1,3-Dichloropropene	ND U	5.3	0.95	1	12/29/16 15:47	
m,p-Xylenes	ND U	11	1.2	1	12/29/16 15:47	
o-Xylene	ND U	5.3	0.51	1	12/29/16 15:47	
trans-1,2-Dichloroethene	ND U	5.3	0.91	1	12/29/16 15:47	
trans-1,3-Dichloropropene	ND U	5.3	0.22	1	12/29/16 15:47	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	103	51 - 136	12/29/16 15:47	
Dibromofluoromethane	98	63 - 138	12/29/16 15:47	
Toluene-d8	102	66 - 138	12/29/16 15:47	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	unknown	13.57	96	J



Metals

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200841 400-SB-06
Lab Code: R1613412-002

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.1	0.4	1	01/05/17 10:09	12/28/16	
Arsenic, Total	6010C	5.2 B	mg/Kg	1.0	0.3	1	01/05/17 10:09	12/28/16	
Barium, Total	6010C	90.8	mg/Kg	2.0	0.2	1	01/05/17 10:09	12/28/16	
Beryllium, Total	6010C	0.66	mg/Kg	0.30	0.02	1	01/05/17 10:09	12/28/16	
Cadmium, Total	6010C	ND U	mg/Kg	0.50	0.04	1	01/05/17 10:09	12/28/16	
Chromium, Total	6010C	27.0	mg/Kg	1.0	0.2	1	01/05/17 10:09	12/28/16	
Lead, Total	6010C	16.2	mg/Kg	5.0	0.3	1	01/05/17 10:09	12/28/16	
Mercury, Total	7471B	ND U	mg/Kg	0.031	0.003	1	12/30/16 16:22	12/29/16	
Nickel, Total	6010C	9.5	mg/Kg	4.0	0.2	1	01/06/17 21:13	01/04/17	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/05/17 10:09	12/28/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/05/17 10:09	12/28/16	
Thallium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/09/17 12:46	12/28/16	
Vanadium, Total	6010C	18.4 B	mg/Kg	5.0	0.2	1	01/05/17 10:09	12/28/16	
Zinc, Total	6010C	67.7	mg/Kg	2.0	0.2	1	01/05/17 10:09	12/28/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200848 400-SB-06
Lab Code: R1613412-006

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.1	0.5	1	01/05/17 10:13	12/28/16	
Arsenic, Total	6010C	5.3 B	mg/Kg	1.0	0.3	1	01/05/17 10:13	12/28/16	
Barium, Total	6010C	83.2	mg/Kg	2.0	0.2	1	01/05/17 10:13	12/28/16	
Beryllium, Total	6010C	0.51	mg/Kg	0.31	0.02	1	01/05/17 10:13	12/28/16	
Cadmium, Total	6010C	0.06 BJ	mg/Kg	0.51	0.04	1	01/05/17 10:13	12/28/16	
Chromium, Total	6010C	30.1	mg/Kg	1.0	0.2	1	01/05/17 10:13	12/28/16	
Lead, Total	6010C	11.5	mg/Kg	5.1	0.3	1	01/05/17 10:13	12/28/16	
Mercury, Total	7471B	ND U	mg/Kg	0.033	0.003	1	12/30/16 16:24	12/29/16	
Nickel, Total	6010C	13.0	mg/Kg	4.1	0.2	1	01/06/17 21:16	01/04/17	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.7	1	01/05/17 10:13	12/28/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/05/17 10:13	12/28/16	
Thallium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/09/17 12:49	12/28/16	
Vanadium, Total	6010C	15.4 B	mg/Kg	5.1	0.2	1	01/05/17 10:13	12/28/16	
Zinc, Total	6010C	42.4	mg/Kg	2.0	0.2	1	01/05/17 10:13	12/28/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200849 400-SB-06
Lab Code: R1613412-007

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.1	0.5	1	01/05/17 10:35	12/28/16	
Arsenic, Total	6010C	5.6	mg/Kg	1.0	0.3	1	01/05/17 10:35	12/28/16	
Barium, Total	6010C	83.5	mg/Kg	2.0	0.2	1	01/05/17 10:35	12/28/16	
Beryllium, Total	6010C	0.48	mg/Kg	0.30	0.02	1	01/05/17 10:35	12/28/16	
Cadmium, Total	6010C	0.15 BJ	mg/Kg	0.51	0.04	1	01/05/17 10:35	12/28/16	
Chromium, Total	6010C	29.2	mg/Kg	1.0	0.2	1	01/05/17 10:35	12/28/16	
Lead, Total	6010C	10.1	mg/Kg	5.1	0.3	1	01/05/17 10:35	12/28/16	
Mercury, Total	7471B	ND U	mg/Kg	0.033	0.003	1	12/30/16 16:32	12/29/16	
Nickel, Total	6010C	10.5	mg/Kg	4.0	0.2	1	01/06/17 21:38	01/04/17	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/05/17 10:35	12/28/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/05/17 10:35	12/28/16	
Thallium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/09/17 13:11	12/28/16	
Vanadium, Total	6010C	15.5 B	mg/Kg	5.1	0.2	1	01/05/17 10:35	12/28/16	
Zinc, Total	6010C	42.3	mg/Kg	2.0	0.2	1	01/05/17 10:35	12/28/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200901 400-SB-07
Lab Code: R1613412-011

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.2	0.5	1	01/05/17 10:38	12/28/16	
Arsenic, Total	6010C	5.3 B	mg/Kg	1.0	0.3	1	01/05/17 10:38	12/28/16	
Barium, Total	6010C	82.6	mg/Kg	2.1	0.2	1	01/05/17 10:38	12/28/16	
Beryllium, Total	6010C	0.47	mg/Kg	0.31	0.02	1	01/05/17 10:38	12/28/16	
Cadmium, Total	6010C	0.24 BJ	mg/Kg	0.52	0.04	1	01/05/17 10:38	12/28/16	
Chromium, Total	6010C	19.8	mg/Kg	1.0	0.2	1	01/05/17 10:38	12/28/16	
Lead, Total	6010C	17.9	mg/Kg	5.2	0.3	1	01/05/17 10:38	12/28/16	
Mercury, Total	7471B	0.004 J	mg/Kg	0.033	0.003	1	12/30/16 16:34	12/29/16	
Nickel, Total	6010C	9.3	mg/Kg	4.0	0.2	1	01/06/17 21:42	01/04/17	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.7	1	01/05/17 10:38	12/28/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/05/17 10:38	12/28/16	
Thallium, Total	6010C	0.7 J	mg/Kg	1.0	0.6	1	01/09/17 13:14	12/28/16	
Vanadium, Total	6010C	14.8 B	mg/Kg	5.2	0.2	1	01/05/17 10:38	12/28/16	
Zinc, Total	6010C	59.5	mg/Kg	2.1	0.2	1	01/05/17 10:38	12/28/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200918 400-SB-07
Lab Code: R1613412-015

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.1	0.5	1	01/05/17 10:41	12/28/16	
Arsenic, Total	6010C	5.7	mg/Kg	1.0	0.3	1	01/05/17 10:41	12/28/16	
Barium, Total	6010C	89.5	mg/Kg	2.0	0.2	1	01/05/17 10:41	12/28/16	
Beryllium, Total	6010C	0.47	mg/Kg	0.31	0.02	1	01/05/17 10:41	12/28/16	
Cadmium, Total	6010C	0.17 BJ	mg/Kg	0.51	0.04	1	01/05/17 10:41	12/28/16	
Chromium, Total	6010C	25.9	mg/Kg	1.0	0.2	1	01/05/17 10:41	12/28/16	
Lead, Total	6010C	10.2	mg/Kg	5.1	0.3	1	01/05/17 10:41	12/28/16	
Mercury, Total	7471B	0.003 J	mg/Kg	0.032	0.003	1	12/30/16 16:36	12/29/16	
Nickel, Total	6010C	8.0	mg/Kg	4.0	0.2	1	01/06/17 21:45	01/04/17	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.7	1	01/05/17 10:41	12/28/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/05/17 10:41	12/28/16	
Thallium, Total	6010C	1.6	mg/Kg	1.0	0.6	1	01/09/17 13:18	12/28/16	
Vanadium, Total	6010C	15.0 B	mg/Kg	5.1	0.2	1	01/05/17 10:41	12/28/16	
Zinc, Total	6010C	47.2	mg/Kg	2.0	0.2	1	01/05/17 10:41	12/28/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200919 400-SB-07
Lab Code: R1613412-016

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	5.9	0.4	1	01/05/17 11:03	12/28/16	
Arsenic, Total	6010C	4.55 B	mg/Kg	0.99	0.24	1	01/05/17 11:03	12/28/16	
Barium, Total	6010C	83.8	mg/Kg	2.0	0.2	1	01/05/17 11:03	12/28/16	
Beryllium, Total	6010C	0.48	mg/Kg	0.30	0.02	1	01/05/17 11:03	12/28/16	
Cadmium, Total	6010C	0.16 BJ	mg/Kg	0.49	0.04	1	01/05/17 11:03	12/28/16	
Chromium, Total	6010C	13.5	mg/Kg	0.99	0.13	1	01/05/17 11:03	12/28/16	
Lead, Total	6010C	10.8	mg/Kg	4.9	0.3	1	01/05/17 11:03	12/28/16	
Mercury, Total	7471B	ND U	mg/Kg	0.033	0.003	1	12/30/16 16:41	12/29/16	
Nickel, Total	6010C	8.0	mg/Kg	4.1	0.2	1	01/06/17 22:00	01/04/17	
Selenium, Total	6010C	ND U	mg/Kg	0.99	0.60	1	01/05/17 11:03	12/28/16	
Silver, Total	6010C	ND U	mg/Kg	0.99	0.44	1	01/05/17 11:03	12/28/16	
Thallium, Total	6010C	1.72	mg/Kg	0.99	0.51	1	01/09/17 13:33	12/28/16	
Vanadium, Total	6010C	14.9 B	mg/Kg	4.9	0.2	1	01/05/17 11:03	12/28/16	
Zinc, Total	6010C	45.7	mg/Kg	2.0	0.2	1	01/05/17 11:03	12/28/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200943 400-SB-08
Lab Code: R1613412-024

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.3	0.5	1	01/05/17 11:06	12/28/16	
Arsenic, Total	6010C	6.0	mg/Kg	1.0	0.3	1	01/05/17 11:06	12/28/16	
Barium, Total	6010C	124	mg/Kg	2.1	0.2	1	01/05/17 11:06	12/28/16	
Beryllium, Total	6010C	0.51	mg/Kg	0.31	0.02	1	01/05/17 11:06	12/28/16	
Cadmium, Total	6010C	0.40 BJ	mg/Kg	0.52	0.04	1	01/05/17 11:06	12/28/16	
Chromium, Total	6010C	15.7	mg/Kg	1.0	0.2	1	01/05/17 11:06	12/28/16	
Lead, Total	6010C	10.6	mg/Kg	5.2	0.3	1	01/05/17 11:06	12/28/16	
Mercury, Total	7471B	ND U	mg/Kg	0.034	0.004	1	12/30/16 16:45	12/29/16	
Nickel, Total	6010C	8.9	mg/Kg	4.1	0.2	1	01/06/17 22:04	01/04/17	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.7	1	01/05/17 11:06	12/28/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/05/17 11:06	12/28/16	
Thallium, Total	6010C	0.7 J	mg/Kg	1.0	0.6	1	01/09/17 13:37	12/28/16	
Vanadium, Total	6010C	16.6 B	mg/Kg	5.2	0.2	1	01/05/17 11:06	12/28/16	
Zinc, Total	6010C	62.1	mg/Kg	2.1	0.2	1	01/05/17 11:06	12/28/16	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200944 400-SB-08
Lab Code: R1613412-025

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.0	0.4	1	01/05/17 11:22	12/28/16	
Arsenic, Total	6010C	6.7	mg/Kg	1.0	0.3	1	01/05/17 11:22	12/28/16	
Barium, Total	6010C	129	mg/Kg	2.0	0.2	1	01/05/17 11:22	12/28/16	
Beryllium, Total	6010C	0.51	mg/Kg	0.30	0.02	1	01/05/17 11:22	12/28/16	
Cadmium, Total	6010C	0.19 BJ	mg/Kg	0.50	0.04	1	01/05/17 11:22	12/28/16	
Chromium, Total	6010C	18.1	mg/Kg	1.0	0.2	1	01/05/17 11:22	12/28/16	
Lead, Total	6010C	10.8	mg/Kg	5.0	0.3	1	01/05/17 11:22	12/28/16	
Mercury, Total	7471B	ND U	mg/Kg	0.033	0.003	1	12/30/16 16:50	12/29/16	
Nickel, Total	6010C	7.8	mg/Kg	4.0	0.2	1	01/06/17 22:26	01/04/17	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/05/17 11:22	12/28/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/05/17 11:22	12/28/16	
Thallium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/09/17 13:59	12/28/16	
Vanadium, Total	6010C	16.0 B	mg/Kg	5.0	0.2	1	01/05/17 11:22	12/28/16	
Zinc, Total	6010C	51.4	mg/Kg	2.0	0.2	1	01/05/17 11:22	12/28/16	



General Chemistry

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200840 400-SB-06
Lab Code: R1613412-001

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Q
Total Solids	ALS SOP	97.6	Percent	-	1	12/30/16 11:30	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200841 400-SB-06
Lab Code: R1613412-002

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	97.2	Percent	-	-	1	12/30/16 11:30	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200845 400-SB-06
Lab Code: R1613412-004

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	96.5	Percent	-	1	12/30/16 11:30	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200846 400-SB-06
Lab Code: R1613412-005

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	96.4	Percent	-	1	12/30/16 11:30	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200848 400-SB-06
Lab Code: R1613412-006

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	95.9	Percent	-	-	1	12/30/16 11:30	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200849 400-SB-06
Lab Code: R1613412-007

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	96.6	Percent	-	-	1	12/30/16 11:30	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200900 400-SB-07
Lab Code: R1613412-010

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	95.3	Percent	-	1	12/30/16 11:30	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200901 400-SB-07
Lab Code: R1613412-011

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	95.3	Percent	-	-	1	12/30/16 11:30	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200915 400-SB-07
Lab Code: R1613412-013

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Q
Total Solids	ALS SOP	96.7	Percent	-	1	12/30/16 11:30	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200918 400-SB-07
Lab Code: R1613412-015

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	96.8	Percent	-	-	1	12/30/16 11:30	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200919 400-SB-07
Lab Code: R1613412-016

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	97.5	Percent	-	-	1	12/30/16 11:30	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200930 400-SB-08
Lab Code: R1613412-019

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	97.1	Percent	-	1	12/30/16 11:30	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200940 400-SB-08
Lab Code: R1613412-022

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Q
Total Solids	ALS SOP	96.0	Percent	-	1	12/30/16 11:30	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200941 400-SB-08
Lab Code: R1613412-023

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	94.8	Percent	-	1	12/30/16 11:30	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200943 400-SB-08
Lab Code: R1613412-024

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	94.9	Percent	-	-	1	12/30/16 11:30	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612200944 400-SB-08
Lab Code: R1613412-025

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	95.6	Percent	-	-	1	12/30/16 11:30	



QC Summary Forms

ALS Environmental—Rochester Laboratory
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Volatile Organic Compounds by GC/MS

ALS Environmental—Rochester Laboratory
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Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412

SURROGATE RECOVERY SUMMARY
Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Extraction Method: EPA 5030C

Sample Name	Lab Code	4-Bromofluorobenzene	Dibromofluoromethane	Toluene-d8
		51 - 136	63 - 138	66 - 138
1612200840 400-SB-06	R1613412-001	103	102	102
1612200845 400-SB-06	R1613412-004	103	100	102
1612200846 400-SB-06	R1613412-005	103	99	102
1612200900 400-SB-07	R1613412-010	101	98	102
1612200915 400-SB-07	R1613412-013	105	100	102
1612200930 400-SB-08	R1613412-019	102	98	101
1612200940 400-SB-08	R1613412-022	104	95	104
1612200941 400-SB-08	R1613412-023	103	98	102
Lab Control Sample	RQ1700014-03	105	105	102
Method Blank	RQ1700014-04	103	100	101
1612200845 400-SB-06 MS	RQ1700014-05	105	104	105
1612200845 400-SB-06 DMS	RQ1700014-06	104	104	103
1612200915 400-SB-07 MS	RQ1700014-07	104	104	104
1612200915 400-SB-07 DMS	RQ1700014-08	104	104	103
1612200940 400-SB-08 MS	RQ1700014-09	104	105	104
1612200940 400-SB-08 DMS	RQ1700014-10	105	105	104

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/29/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1612200845 400-SB-06
Lab Code: R1613412-004
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1700014-05			Duplicate Matrix Spike RQ1700014-06			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
1,1,1,2-Tetrachloroethane	ND U	44.3	51.8	86	42.2	51.8	81	52-133	6	30
1,1,1-Trichloroethane (TCA)	ND U	40.5	51.8	78	38.7	51.8	75	51-132	4	30
1,1,2,2-Tetrachloroethane	ND U	43.9	51.8	85	43.2	51.8	83	53-134	2	30
1,1,2-Trichloroethane	ND U	46.7	51.8	90	44.7	51.8	86	62-126	5	30
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	34.2	51.8	66	32.9	51.8	64	45-136	3	30
1,1-Dichloroethene (1,1-DCE)	ND U	42.0	51.8	81	39.7	51.8	77	61-139	5	30
1,2,3-Trichloropropane	ND U	46.1	51.8	89	45.8	51.8	88	22-167	1	30
1,2-Dibromo-3-chloropropane (DBCP)	ND U	50.5	51.8	98	50.1	51.8	97	27-163	1	30
1,2-Dibromoethane	ND U	48.6	51.8	94	46.9	51.8	91	52-137	3	30
1,2-Dichlorobenzene	ND U	43.8	51.8	85	40.2	51.8	78	22-156	9	30
1,2-Dichloroethane	ND U	45.9	51.8	89	44.0	51.8	85	59-125	5	30
1,2-Dichloropropane	ND U	44.9	51.8	87	42.3	51.8	82	67-126	6	30
1,3-Dichlorobenzene	ND U	42.7	51.8	82	39.4	51.8	76	29-146	8	30
1,4-Dioxane	ND U	980	1040	95	874	1040	84	50-148	12	30
2-Butanone (MEK)	ND U	46.1	51.8	89	40.3	51.8	78	43-134	13	30
2-Chloro-1,3-butadiene	ND U	40.0	51.8	77	38.1	51.8	74	45-134	4	30
2-Chloroethyl Vinyl Ether	ND U	47.8	51.8	92	46.1	51.8	89	37-150	3	30
Isobutyl Alcohol	ND U	955	1040	92	885	1040	85	39-146	8	30
Allyl Chloride	ND U	43.4	51.8	84	41.7	51.8	81	34-135	4	30
4-Methyl-2-pentanone	ND U	47.4	51.8	92	46.2	51.8	89	47-145	3	30
Acetone	4.2 J	52.6	51.8	93	44.2	51.8	77	11-183	19	30
Acetonitrile	ND U	244	259	94	160	259	62	28-146	41*	30
Acrolein	ND U	69.9	104	67	61.8	104	60	10-172	11	30
Acrylonitrile	ND U	244	259	94	220	259	85	46-139	10	30
Benzene	ND U	44.9	51.8	87	42.2	51.8	81	63-126	7	30
Bromodichloromethane	ND U	43.2	51.8	83	41.8	51.8	81	47-141	2	30
Bromoform	ND U	47.8	51.8	92	47.2	51.8	91	26-157	1	30
Bromomethane	ND U	48.7	51.8	94	41.4	51.8	80	10-137	16	30
Carbon Disulfide	ND U	34.3	51.8	66	32.2	51.8	62	35-135	6	30
Carbon Tetrachloride	ND U	38.2	51.8	74	36.6	51.8	71	46-137	4	30
Chlorobenzene	ND U	44.1	51.8	85	40.9	51.8	79	51-132	7	30
Chloroethane	ND U	42.1	51.8	81	39.3	51.8	76	45-132	6	30
Chloroform	ND U	44.6	51.8	86	41.8	51.8	81	61-124	6	30
Chloromethane	ND U	42.9	51.8	83	38.0	51.8	73	50-136	13	30
Dibromochloromethane	ND U	47.0	51.8	91	46.2	51.8	89	40-146	2	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/29/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1612200845 400-SB-06
Lab Code: R1613412-004
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1700014-05			Duplicate Matrix Spike RQ1700014-06			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Dibromomethane	ND U	48.5	51.8	94	46.2	51.8	89	61-122	5	30
Dichlorodifluoromethane (CFC 12)	ND U	40.1	51.8	77	37.3	51.8	72	44-138	7	30
Dichloromethane	ND U	47.0	51.8	91	43.7	51.8	84	64-120	8	30
Ethyl Methacrylate	ND U	50.4	51.8	97	48.1	51.8	93	17-166	4	30
Ethylbenzene	ND U	41.0	51.8	79	37.8	51.8	73	44-131	8	30
Iodomethane	ND U	22.2	51.8	43	29.2	51.8	56	10-160	26	30
Methacrylonitrile	ND U	50.4	51.8	97	49.4	51.8	95	44-149	2	30
Methyl Methacrylate	ND U	51.6	51.8	100	50.4	51.8	97	41-162	3	30
Naphthalene	ND U	42.9	51.8	83	38.8	51.8	75	10-187	10	30
Propionitrile	ND U	266	259	103	203	259	78	46-144	28	30
Tetrachloroethene (PCE)	ND U	39.3	51.8	76	37.3	51.8	72	45-141	5	30
Toluene	ND U	42.7	51.8	82	39.9	51.8	77	50-140	6	30
Trichloroethene (TCE)	ND U	45.3	51.8	87	42.7	51.8	82	54-136	6	30
Trichlorofluoromethane (CFC 11)	ND U	38.2	51.8	74	36.4	51.8	70	47-129	6	30
Vinyl Chloride	ND U	44.2	51.8	85	41.0	51.8	79	53-128	7	30
cis-1,3-Dichloropropene	ND U	43.9	51.8	85	42.1	51.8	81	31-150	5	30
m,p-Xylenes	ND U	85.4	104	82	77.9	104	75	45-141	9	30
o-Xylene	ND U	43.8	51.8	84	39.8	51.8	77	46-139	9	30
trans-1,2-Dichloroethene	ND U	43.5	51.8	84	41.4	51.8	80	52-128	5	30
trans-1,3-Dichloropropene	ND U	45.2	51.8	87	43.8	51.8	85	23-160	2	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/29/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1612200915 400-SB-07
Lab Code: R1613412-013
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1700014-07			Duplicate Matrix Spike RQ1700014-08			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
1,1,1,2-Tetrachloroethane	ND U	44.6	51.7	86	42.9	51.7	83	52-133	4	30
1,1,1-Trichloroethane (TCA)	ND U	39.8	51.7	77	38.1	51.7	74	51-132	4	30
1,1,2,2-Tetrachloroethane	ND U	46.5	51.7	90	44.2	51.7	86	53-134	5	30
1,1,2-Trichloroethane	ND U	47.1	51.7	91	45.1	51.7	87	62-126	4	30
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	33.8	51.7	65	32.4	51.7	63	45-136	3	30
1,1-Dichloroethene (1,1-DCE)	ND U	39.9	51.7	77	38.5	51.7	74	61-139	4	30
1,2,3-Trichloropropane	ND U	47.7	51.7	92	44.9	51.7	87	22-167	6	30
1,2-Dibromo-3-chloropropane (DBCP)	ND U	56.1	51.7	109	53.5	51.7	104	27-163	5	30
1,2-Dibromoethane	ND U	49.7	51.7	96	47.7	51.7	92	52-137	4	30
1,2-Dichlorobenzene	ND U	44.7	51.7	86	41.5	51.7	80	22-156	7	30
1,2-Dichloroethane	ND U	45.0	51.7	87	43.4	51.7	84	59-125	4	30
1,2-Dichloropropane	ND U	43.8	51.7	85	42.6	51.7	82	67-126	4	30
1,3-Dichlorobenzene	ND U	42.9	51.7	83	39.9	51.7	77	29-146	8	30
1,4-Dioxane	ND U	1010	1030	97	966	1030	93	50-148	4	30
2-Butanone (MEK)	ND U	42.2	51.7	82	45.2	51.7	87	43-134	6	30
2-Chloro-1,3-butadiene	ND U	37.7	51.7	73	36.8	51.7	71	45-134	3	30
2-Chloroethyl Vinyl Ether	ND U	48.1	51.7	93	46.1	51.7	89	37-150	4	30
Isobutyl Alcohol	ND U	1010	1030	98	944	1030	91	39-146	7	30
Allyl Chloride	ND U	42.7	51.7	83	41.6	51.7	80	34-135	4	30
4-Methyl-2-pentanone	ND U	49.6	51.7	96	46.8	51.7	91	47-145	5	30
Acetone	3.0 J	52.3	51.7	95	50.1	51.7	91	11-183	4	30
Acetonitrile	ND U	243	259	94	224	259	87	28-146	8	30
Acrolein	ND U	70.6	103	68	68.6	103	66	10-172	3	30
Acrylonitrile	ND U	245	259	95	230	259	89	46-139	7	30
Benzene	ND U	42.7	51.7	83	41.1	51.7	80	63-126	4	30
Bromodichloromethane	ND U	43.6	51.7	84	42.1	51.7	81	47-141	4	30
Bromoform	ND U	51.2	51.7	99	48.3	51.7	93	26-157	6	30
Bromomethane	ND U	40.0	51.7	77	38.9	51.7	75	10-137	3	30
Carbon Disulfide	ND U	32.8	51.7	63	31.9	51.7	62	35-135	2	30
Carbon Tetrachloride	ND U	37.6	51.7	73	35.4	51.7	69	46-137	6	30
Chlorobenzene	ND U	43.6	51.7	84	41.1	51.7	80	51-132	5	30
Chloroethane	ND U	39.5	51.7	76	39.2	51.7	76	45-132	<1	30
Chloroform	ND U	43.2	51.7	83	41.3	51.7	80	61-124	4	30
Chloromethane	ND U	39.0	51.7	75	38.3	51.7	74	50-136	1	30
Dibromochloromethane	ND U	48.4	51.7	94	46.8	51.7	91	40-146	3	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/29/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1612200915 400-SB-07
Lab Code: R1613412-013
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1700014-07			Duplicate Matrix Spike RQ1700014-08			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Dibromomethane	ND U	47.1	51.7	91	46.0	51.7	89	61-122	2	30
Dichlorodifluoromethane (CFC 12)	ND U	37.5	51.7	73	36.1	51.7	70	44-138	4	30
Dichloromethane	ND U	45.9	51.7	89	43.8	51.7	85	64-120	5	30
Ethyl Methacrylate	ND U	51.0	51.7	99	49.0	51.7	95	17-166	4	30
Ethylbenzene	ND U	39.9	51.7	77	38.6	51.7	75	44-131	3	30
Iodomethane	ND U	34.4	51.7	67	35.1	51.7	68	10-160	1	30
Methacrylonitrile	ND U	51.3	51.7	99	49.3	51.7	95	44-149	4	30
Methyl Methacrylate	ND U	52.3	51.7	101	49.2	51.7	95	41-162	6	30
Naphthalene	ND U	46.8	51.7	90	42.4	51.7	82	10-187	9	30
Propionitrile	ND U	243	259	94	259	259	100	46-144	6	30
Tetrachloroethene (PCE)	0.92 J	38.8	51.7	73	36.8	51.7	69	45-141	6	30
Toluene	ND U	40.7	51.7	79	39.3	51.7	76	50-140	4	30
Trichloroethene (TCE)	ND U	42.8	51.7	83	40.6	51.7	78	54-136	6	30
Trichlorofluoromethane (CFC 11)	ND U	37.1	51.7	72	35.6	51.7	69	47-129	4	30
Vinyl Chloride	ND U	41.0	51.7	79	39.8	51.7	77	53-128	3	30
cis-1,3-Dichloropropene	ND U	43.8	51.7	85	42.0	51.7	81	31-150	5	30
m,p-Xylenes	ND U	83.8	103	81	78.8	103	76	45-141	6	30
o-Xylene	ND U	43.0	51.7	83	40.5	51.7	78	46-139	6	30
trans-1,2-Dichloroethene	ND U	41.4	51.7	80	40.3	51.7	78	52-128	3	30
trans-1,3-Dichloropropene	ND U	46.1	51.7	89	44.2	51.7	85	23-160	5	30

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Results flagged with a pound (#) indicate the control criteria is not applicable.

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ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/29/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1612200940 400-SB-08
Lab Code: R1613412-022
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1700014-09			Duplicate Matrix Spike RQ1700014-10			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
1,1,1,2-Tetrachloroethane	ND U	45.9	52.1	88	49.7	52.1	95	52-133	8	30
1,1,1-Trichloroethane (TCA)	ND U	43.6	52.1	84	47.5	52.1	91	51-132	8	30
1,1,2,2-Tetrachloroethane	ND U	34.5	52.1	66	36.6	52.1	70	53-134	6	30
1,1,2-Trichloroethane	ND U	47.1	52.1	90	51.4	52.1	99	62-126	10	30
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	39.5	52.1	76	43.3	52.1	83	45-136	9	30
1,1-Dichloroethene (1,1-DCE)	ND U	43.6	52.1	84	48.0	52.1	92	61-139	9	30
1,2,3-Trichloropropane	ND U	45.7	52.1	88	51.8	52.1	99	22-167	12	30
1,2-Dibromo-3-chloropropane (DBCP)	ND U	51.8	52.1	99	56.6	52.1	109	27-163	10	30
1,2-Dibromoethane	ND U	49.8	52.1	96	53.3	52.1	102	52-137	6	30
1,2-Dichlorobenzene	ND U	44.2	52.1	85	48.7	52.1	94	22-156	10	30
1,2-Dichloroethane	ND U	45.7	52.1	88	49.9	52.1	96	59-125	9	30
1,2-Dichloropropane	ND U	45.2	52.1	87	50.0	52.1	96	67-126	10	30
1,3-Dichlorobenzene	ND U	43.2	52.1	83	48.0	52.1	92	29-146	10	30
1,4-Dioxane	ND U	1010	1040	97	954	1040	92	50-148	5	30
2-Butanone (MEK)	ND U	41.8	52.1	80	45.1	52.1	87	43-134	8	30
2-Chloro-1,3-butadiene	ND U	37.9	52.1	73	41.0	52.1	79	45-134	8	30
2-Chloroethyl Vinyl Ether	ND U	47.8	52.1	92	52.7	52.1	101	37-150	9	30
Isobutyl Alcohol	ND U	957	1040	92	1000	1040	96	39-146	4	30
Allyl Chloride	ND U	46.3	52.1	89	49.3	52.1	95	34-135	7	30
4-Methyl-2-pentanone	ND U	47.4	52.1	91	52.5	52.1	101	47-145	10	30
Acetone	3.1 J	59.7	52.1	109	56.3	52.1	102	11-183	7	30
Acetonitrile	ND U	258	260	99	209	260	80	28-146	21	30
Acrolein	ND U	42.1	104	40	47.1	104	45	10-172	12	30
Acrylonitrile	ND U	244	260	94	252	260	97	46-139	3	30
Benzene	ND U	45.1	52.1	87	49.6	52.1	95	63-126	9	30
Bromodichloromethane	ND U	45.2	52.1	87	49.3	52.1	95	47-141	9	30
Bromoform	ND U	50.7	52.1	97	54.6	52.1	105	26-157	8	30
Bromomethane	ND U	42.5	52.1	82	45.1	52.1	87	10-137	6	30
Carbon Disulfide	ND U	32.9	52.1	63	35.7	52.1	69	35-135	9	30
Carbon Tetrachloride	ND U	41.7	52.1	80	47.3	52.1	91	46-137	13	30
Chlorobenzene	ND U	45.0	52.1	86	48.7	52.1	93	51-132	8	30
Chloroethane	ND U	43.6	52.1	84	47.3	52.1	91	45-132	8	30
Chloroform	ND U	45.1	52.1	87	49.5	52.1	95	61-124	9	30
Chloromethane	ND U	42.6	52.1	82	45.4	52.1	87	50-136	6	30
Dibromochloromethane	ND U	49.3	52.1	95	53.1	52.1	102	40-146	7	30

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/29/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1612200940 400-SB-08
Lab Code: R1613412-022
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1700014-09			Duplicate Matrix Spike RQ1700014-10			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Dibromomethane	ND U	47.7	52.1	92	52.7	52.1	101	61-122	9	30
Dichlorodifluoromethane (CFC 12)	ND U	42.5	52.1	82	45.8	52.1	88	44-138	7	30
Dichloromethane	ND U	47.8	52.1	92	51.4	52.1	99	64-120	7	30
Ethyl Methacrylate	ND U	44.4	52.1	85	50.3	52.1	97	17-166	13	30
Ethylbenzene	ND U	43.6	52.1	84	47.1	52.1	91	44-131	8	30
Iodomethane	ND U	38.8	52.1	74	42.5	52.1	82	10-160	10	30
Methacrylonitrile	ND U	49.7	52.1	96	54.6	52.1	105	44-149	9	30
Methyl Methacrylate	ND U	54.1	52.1	104	57.8	52.1	111	41-162	7	30
Naphthalene	ND U	43.5	52.1	84	46.6	52.1	89	10-187	6	30
Propionitrile	ND U	264	260	101	229	260	88	46-144	14	30
Tetrachloroethene (PCE)	ND U	43.0	52.1	82	46.7	52.1	90	45-141	9	30
Toluene	ND U	43.3	52.1	83	47.6	52.1	91	50-140	9	30
Trichloroethene (TCE)	ND U	56.0	52.1	108	62.5	52.1	120	54-136	11	30
Trichlorofluoromethane (CFC 11)	ND U	41.9	52.1	81	46.0	52.1	88	47-129	8	30
Vinyl Chloride	ND U	45.7	52.1	88	49.4	52.1	95	53-128	8	30
cis-1,3-Dichloropropene	ND U	45.4	52.1	87	49.6	52.1	95	31-150	9	30
m,p-Xylenes	ND U	88.2	104	85	96.7	104	93	45-141	9	30
o-Xylene	ND U	44.8	52.1	86	48.2	52.1	93	46-139	8	30
trans-1,2-Dichloroethene	ND U	44.8	52.1	86	48.3	52.1	93	52-128	8	30
trans-1,3-Dichloropropene	ND U	46.3	52.1	89	51.3	52.1	98	23-160	10	30

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ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Collected: NA
Date Received: NA

Sample Name: Method Blank
Lab Code: RQ1700014-04

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.0	0.83	1	12/29/16 12:17	
1,1,1-Trichloroethane (TCA)	ND U	5.0	0.73	1	12/29/16 12:17	
1,1,2,2-Tetrachloroethane	ND U	5.0	0.81	1	12/29/16 12:17	
1,1,2-Trichloroethane	ND U	5.0	0.73	1	12/29/16 12:17	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.0	1.3	1	12/29/16 12:17	
1,1-Dichloroethene (1,1-DCE)	ND U	5.0	1.3	1	12/29/16 12:17	
1,2,3-Trichloropropane	ND U	5.0	1.4	1	12/29/16 12:17	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.0	1.9	1	12/29/16 12:17	
1,2-Dibromoethane	ND U	5.0	1.3	1	12/29/16 12:17	
1,2-Dichlorobenzene	ND U	5.0	0.61	1	12/29/16 12:17	
1,2-Dichloroethane	ND U	5.0	0.61	1	12/29/16 12:17	
1,2-Dichloropropane	ND U	5.0	0.97	1	12/29/16 12:17	
1,3-Dichlorobenzene	ND U	5.0	0.63	1	12/29/16 12:17	
1,4-Dioxane	ND U	100	20	1	12/29/16 12:17	
2-Butanone (MEK)	ND U	5.0	2.3	1	12/29/16 12:17	
2-Chloro-1,3-butadiene	ND U	5.0	1.6	1	12/29/16 12:17	
2-Chloroethyl Vinyl Ether	ND U	5.0	1.8	1	12/29/16 12:17	
Isobutyl Alcohol	ND U	100	23	1	12/29/16 12:17	
Allyl Chloride	ND U	5.0	1.7	1	12/29/16 12:17	
4-Methyl-2-pentanone	ND U	5.0	0.98	1	12/29/16 12:17	
Acetone	ND U	5.0	2.9	1	12/29/16 12:17	
Acetonitrile	ND U	25	17	1	12/29/16 12:17	
Acrolein	ND U	25	3.5	1	12/29/16 12:17	
Acrylonitrile	ND U	25	6.5	1	12/29/16 12:17	
Benzene	ND U	5.0	0.29	1	12/29/16 12:17	
Bromodichloromethane	ND U	5.0	0.61	1	12/29/16 12:17	
Bromoform	ND U	5.0	0.93	1	12/29/16 12:17	
Bromomethane	ND U	5.0	1.4	1	12/29/16 12:17	
Carbon Disulfide	ND U	5.0	1.3	1	12/29/16 12:17	
Carbon Tetrachloride	ND U	5.0	0.92	1	12/29/16 12:17	
Chlorobenzene	ND U	5.0	0.29	1	12/29/16 12:17	
Chloroethane	ND U	5.0	2.9	1	12/29/16 12:17	
Chloroform	ND U	5.0	1.3	1	12/29/16 12:17	
Chloromethane	ND U	5.0	0.40	1	12/29/16 12:17	
Dibromochloromethane	ND U	5.0	0.73	1	12/29/16 12:17	
Dibromomethane	ND U	5.0	0.63	1	12/29/16 12:17	
Dichlorodifluoromethane (CFC 12)	ND U	5.0	1.9	1	12/29/16 12:17	
Dichloromethane	ND U	5.0	0.57	1	12/29/16 12:17	
Ethyl Methacrylate	ND U	5.0	0.75	1	12/29/16 12:17	
Ethylbenzene	ND U	5.0	0.23	1	12/29/16 12:17	
Iodomethane	ND U	10	1.2	1	12/29/16 12:17	
Methacrylonitrile	ND U	5.0	1.6	1	12/29/16 12:17	
Methyl Methacrylate	ND U	5.0	0.73	1	12/29/16 12:17	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: RQ1700014-04

Service Request: R1613412
Date Collected: NA
Date Received: NA
Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.0	0.51	1	12/29/16 12:17	
Propionitrile	ND U	25	6.5	1	12/29/16 12:17	
Tetrachloroethene (PCE)	ND U	5.0	0.88	1	12/29/16 12:17	
Toluene	ND U	5.0	1.0	1	12/29/16 12:17	
Trichloroethene (TCE)	ND U	5.0	1.1	1	12/29/16 12:17	
Trichlorofluoromethane (CFC 11)	ND U	5.0	0.66	1	12/29/16 12:17	
Vinyl Chloride	ND U	5.0	1.9	1	12/29/16 12:17	
cis-1,3-Dichloropropene	ND U	5.0	0.90	1	12/29/16 12:17	
m,p-Xylenes	ND U	10	1.1	1	12/29/16 12:17	
o-Xylene	ND U	5.0	0.48	1	12/29/16 12:17	
trans-1,2-Dichloroethene	ND U	5.0	0.86	1	12/29/16 12:17	
trans-1,3-Dichloropropene	ND U	5.0	0.20	1	12/29/16 12:17	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	103	51 - 136	12/29/16 12:17	
Dibromofluoromethane	100	63 - 138	12/29/16 12:17	
Toluene-d8	101	66 - 138	12/29/16 12:17	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Analyzed: 12/29/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Units:ug/Kg
Basis:Dry

Lab Control Sample
RQ1700014-03

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
1,1,1,2-Tetrachloroethane	8260C	22.6	20.0	113	40-140
1,1,1-Trichloroethane (TCA)	8260C	16.7	20.0	83	40-140
1,1,2,2-Tetrachloroethane	8260C	22.9	20.0	114	40-140
1,1,2-Trichloroethane	8260C	22.5	20.0	112	40-140
1,1,2-Trichloro-1,2,2-trifluoroethane	8260C	9.84	20.0	49	40-140
1,1-Dichloroethene (1,1-DCE)	8260C	16.4	20.0	82	40-140
1,2,3-Trichloropropane	8260C	22.6	20.0	113	40-140
1,2-Dibromo-3-chloropropane (DBCP)	8260C	23.9	20.0	119	40-140
1,2-Dibromoethane	8260C	24.0	20.0	120	40-140
1,2-Dichlorobenzene	8260C	22.2	20.0	111	40-140
1,2-Dichloroethane	8260C	22.9	20.0	114	40-140
1,2-Dichloropropane	8260C	22.4	20.0	112	40-140
1,3-Dichlorobenzene	8260C	22.2	20.0	111	40-140
1,4-Dioxane	8260C	443	400	111	40-140
2-Butanone (MEK)	8260C	16.4	20.0	82	40-140
2-Chloro-1,3-butadiene	8260C	18.8	20.0	94	40-140
2-Chloroethyl Vinyl Ether	8260C	19.1	20.0	96	40-140
Isobutyl Alcohol	8260C	436	400	109	40-140
Allyl Chloride	8260C	21.2	20.0	106	40-140
4-Methyl-2-pentanone	8260C	18.2	20.0	91	40-140
Acetone	8260C	16.4	20.0	82	40-140
Acetonitrile	8260C	124	100	124	40-140
Acrolein	8260C	28.2	40.0	71	40-140
Acrylonitrile	8260C	109	100	109	40-140
Benzene	8260C	21.2	20.0	106	40-140
Bromodichloromethane	8260C	22.3	20.0	112	40-140
Bromoform	8260C	24.5	20.0	122	40-140
Bromomethane	8260C	20.7	20.0	103	40-140
Carbon Disulfide	8260C	16.7	20.0	84	40-140
Carbon Tetrachloride	8260C	15.5	20.0	78	40-140
Chlorobenzene	8260C	22.1	20.0	111	40-140
Chloroethane	8260C	19.2	20.0	96	40-140
Chloroform	8260C	21.4	20.0	107	40-140

ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Analyzed: 12/29/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Units:ug/Kg
Basis:Dry

Lab Control Sample
RQ1700014-03

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Chloromethane	8260C	18.8	20.0	94	40-140
Dibromochloromethane	8260C	24.1	20.0	120	40-140
Dibromomethane	8260C	23.5	20.0	117	40-140
Dichlorodifluoromethane (CFC 12)	8260C	13.1	20.0	65	40-140
Dichloromethane	8260C	21.9	20.0	109	40-140
Ethyl Methacrylate	8260C	24.1	20.0	121	40-140
Ethylbenzene	8260C	18.5	20.0	93	40-140
Iodomethane	8260C	15.7	20.0	78	40-140
Methacrylonitrile	8260C	22.9	20.0	115	40-140
Methyl Methacrylate	8260C	24.4	20.0	122	40-140
Naphthalene	8260C	20.7	20.0	104	40-140
Propionitrile	8260C	103	100	103	40-140
Tetrachloroethene (PCE)	8260C	16.1	20.0	81	40-140
Toluene	8260C	20.0	20.0	100	40-140
Trichloroethene (TCE)	8260C	19.5	20.0	98	40-140
Trichlorofluoromethane (CFC 11)	8260C	13.7	20.0	69	40-140
Vinyl Chloride	8260C	18.1	20.0	90	40-140
cis-1,3-Dichloropropene	8260C	23.0	20.0	115	40-140
m,p-Xylenes	8260C	39.2	40.0	98	40-140
o-Xylene	8260C	20.7	20.0	103	40-140
trans-1,2-Dichloroethene	8260C	20.1	20.0	100	40-140
trans-1,3-Dichloropropene	8260C	23.6	20.0	118	40-140



Metals

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: R1613412-MB

Service Request: R1613412
Date Collected: NA
Date Received: NA
Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.0	0.4	1	01/05/17 09:10	12/28/16	
Arsenic, Total	6010C	0.6 J	mg/Kg	1.0	0.3	1	01/05/17 09:10	12/28/16	
Barium, Total	6010C	0.6 J	mg/Kg	2.0	0.2	1	01/05/17 09:10	12/28/16	
Beryllium, Total	6010C	ND U	mg/Kg	0.30	0.02	1	01/05/17 09:10	12/28/16	
Cadmium, Total	6010C	0.05 J	mg/Kg	0.50	0.04	1	01/05/17 09:10	12/28/16	
Chromium, Total	6010C	0.3 J	mg/Kg	1.0	0.2	1	01/05/17 09:10	12/28/16	
Lead, Total	6010C	ND U	mg/Kg	5.0	0.3	1	01/05/17 09:10	12/28/16	
Mercury, Total	7471B	ND U	mg/Kg	0.033	0.003	1	12/30/16 16:16	12/29/16	
Nickel, Total	6010C	ND U	mg/Kg	4.0	0.2	1	01/06/17 17:04	01/04/17	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/05/17 09:10	12/28/16	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/05/17 09:10	12/28/16	
Thallium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/05/17 09:10	12/28/16	
Vanadium, Total	6010C	2.3 J	mg/Kg	5.0	0.2	1	01/05/17 09:10	12/28/16	
Zinc, Total	6010C	0.2 J	mg/Kg	2.0	0.2	1	01/05/17 09:10	12/28/16	

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request:R1613412
Date Collected:12/20/16
Date Received:12/22/16
Date Analyzed:12/30/16 - 01/09/17

**Duplicate Matrix Spike Summary
Inorganic Parameters**

Sample Name: 1612200848 400-SB-06
Lab Code: R1613412-006

Units:mg/Kg
Basis:Dry

Analyte Name	Method	Sample Result	Result	Matrix Spike R1613412-006MS		Duplicate Matrix Spike R1613412-006DMS		% Rec	% Rec Limits	RPD	RPD Limit
				Spike Amount	% Rec	Result	Spike Amount					% Rec
Silver, Total	6010C	ND U	5.2	5.2	101	5.2	5.2	100	75-125	<1	20
Arsenic, Total	6010C	5.3 B	8.6	4.1	79	9.7	4.1	106	75-125	12	20
Barium, Total	6010C	83.2	282	206	96	280	206	95	75-125	<1	20
Beryllium, Total	6010C	0.51	5.37	5.16	94	5.36	5.16	94	75-125	<1	20
Cadmium, Total	6010C	0.06 BJ	4.83	5.16	92	4.87	5.16	93	75-125	<1	20
Chromium, Total	6010C	30.1	58.5	20.6	138 *	58.4	20.6	137 *	75-125	<1	20
Mercury, Total	7471B	ND U	0.151	0.166	91	0.151	0.166	91	75-125	<1	35
Nickel, Total	6010C	13.0	53.4	50.1	81	53.5	51.1	79	75-125	<1	20
Lead, Total	6010C	11.5	57.2	51.6	89	57.4	51.6	89	75-125	<1	20
Antimony, Total	6010C	ND U	41.7	51.6	81	41.8	51.6	81	75-125	<1	20
Selenium, Total	6010C	ND U	97.8	104	94	95.9	104	92	75-125	2	20
Thallium, Total	6010C	ND U	211	206	102	212	206	103	75-125	<1	20
Vanadium, Total	6010C	15.4 B	65.2	51.6	96	66.4	51.6	99	75-125	2	20
Zinc, Total	6010C	42.4	89.2	51.6	91	91.3	51.6	95	75-125	2	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/30/16 - 01/09/17

**Duplicate Matrix Spike Summary
Inorganic Parameters**

Sample Name: 1612200918 400-SB-07
Lab Code: R1613412-015

Units: mg/Kg
Basis: Dry

Analyte Name	Method	Sample Result	Result	Matrix Spike R1613412-015MS		Duplicate Matrix Spike R1613412-015DMS		% Rec	% Rec Limits	RPD	RPD Limit
				Spike Amount	% Rec	Result	Spike Amount					% Rec
Silver, Total	6010C	ND U	5.06	4.97	102	5.3	5.2	103	75-125	5	20
Arsenic, Total	6010C	5.7	9.20	3.97	88	10.3	4.1	111	75-125	11	20
Barium, Total	6010C	89.5	327	199	119	280	207	92	75-125	15	20
Beryllium, Total	6010C	0.47	5.22	4.97	96	5.28	5.17	93	75-125	1	20
Cadmium, Total	6010C	0.17 BJ	4.74	4.97	92	4.72	5.17	88	75-125	<1	20
Chromium, Total	6010C	25.9	34.6	19.9	44 *	34.7	20.7	43 *	75-125	<1	20
Mercury, Total	7471B	0.003 J	0.151	0.159	93	0.157	0.161	95	75-125	3	35
Nickel, Total	6010C	8.0	52.5	50.6	88	52.9	50.6	89	75-125	<1	20
Lead, Total	6010C	10.2	55.0	49.7	90	56.2	51.7	89	75-125	2	20
Antimony, Total	6010C	ND U	41.2	49.7	83	43.3	51.7	84	75-125	5	20
Selenium, Total	6010C	ND U	95.4	100	95	97.7	104	94	75-125	2	20
Thallium, Total	6010C	1.6	213	199	107	221	207	106	75-125	4	20
Vanadium, Total	6010C	15.0 B	63.2	49.7	97	64.8	51.7	96	75-125	2	20
Zinc, Total	6010C	47.2	94.5	49.7	95	96.9	51.7	96	75-125	3	20

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/30/16 - 01/09/17

**Duplicate Matrix Spike Summary
Inorganic Parameters**

Sample Name: 1612200943 400-SB-08
Lab Code: R1613412-024

Units: mg/Kg
Basis: Dry

Analyte Name	Method	Sample Result	Result	Matrix Spike R1613412-024MS		Duplicate Matrix Spike R1613412-024DMS		% Rec	% Rec Limits	RPD	RPD Limit
				Spike Amount	% Rec	Result	Spike Amount				
Silver, Total	6010C	ND U	5.3	5.2	101	5.2	5.3	99	75-125	<1	20
Arsenic, Total	6010C	6.0	10.6	4.2	108	11.6	4.2	132 *	75-125	9	20
Barium, Total	6010C	124	328	209	98	341	211	103	75-125	4	20
Beryllium, Total	6010C	0.51	5.61	5.22	98	5.62	5.27	97	75-125	<1	20
Cadmium, Total	6010C	0.40 BJ	5.03	5.22	89	5.02	5.27	88	75-125	<1	20
Chromium, Total	6010C	15.7	40.7	20.9	120	39.3	21.1	112	75-125	3	20
Mercury, Total	7471B	ND U	0.161	0.165	98	0.155	0.165	94	75-125	4	35
Nickel, Total	6010C	8.9	54.1	51.7	87	52.1	50.2	86	75-125	4	20
Lead, Total	6010C	10.6	60.4	52.2	95	59.5	52.7	93	75-125	2	20
Antimony, Total	6010C	ND U	42.5	52.2	81	40.9	52.7	78	75-125	4	20
Selenium, Total	6010C	ND U	99.3	105	94	96.9	106	91	75-125	2	20
Thallium, Total	6010C	0.7 J	215	209	103	215	211	102	75-125	<1	20
Vanadium, Total	6010C	16.6 B	70.1	52.2	103	70.1	52.7	102	75-125	<1	20
Zinc, Total	6010C	62.1	105	52.2	82	107	52.7	86	75-125	2	20

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Analyzed: 12/30/16 - 01/06/17

Lab Control Sample Summary
Inorganic Parameters

Units:mg/Kg
Basis:Dry

Lab Control Sample
R1613412-LCS

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Antimony, Total	6010C	47.4	50.0	95	80-120
Arsenic, Total	6010C	4.4	4.0	109	80-120
Barium, Total	6010C	204	200	102	80-120
Beryllium, Total	6010C	4.82	5.00	96	80-120
Cadmium, Total	6010C	4.97	5.00	99	80-120
Chromium, Total	6010C	20.0	20.0	100	80-120
Lead, Total	6010C	49.7	50.0	99	80-120
Mercury, Total	7471B	0.151	0.167	90	80-120
Nickel, Total	6010C	50.4	50.0	101	80-120
Selenium, Total	6010C	89.4	101	89	80-120
Silver, Total	6010C	4.74	5.0	95	80-120
Thallium, Total	6010C	179	200	90	80-120
Vanadium, Total	6010C	50.4	50.0	101	80-120
Zinc, Total	6010C	47.6	50.0	95	80-120



General Chemistry

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/30/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1612200845 400-SB-06
Lab Code: R1613412-004

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>Sample Result</u>	<u>Duplicate Sample R1613412-004DUP Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	96.5	96.7	96.6	<1	20

Results flagged with an asterisk (*) indicate values outside control criteria.

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QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/30/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1612200848 400-SB-06
Lab Code: R1613412-006

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>MDL</u>	<u>Sample Result</u>	<u>Duplicate Sample R1613412-006DUP Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	-	95.9	96.3	96.1	<1	20

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QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/30/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1612200915 400-SB-07
Lab Code: R1613412-013

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>Sample Result</u>	<u>Duplicate Sample R1613412-013DUP Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	96.7	97.4	97.1	<1	20

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QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/30/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1612200918 400-SB-07
Lab Code: R1613412-015

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>MDL</u>	<u>Sample Result</u>	<u>Duplicate Sample R1613412-015DUP Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	-	96.8	97.5	97.2	<1	20

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QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/30/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1612200940 400-SB-08
Lab Code: R1613412-022

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>Sample Result</u>	<u>Duplicate Sample R1613412-022DUP Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	96.0	95.1	95.6	<1	20

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QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613412
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/30/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 1612200943 400-SB-08
Lab Code: R1613412-024

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>MDL</u>	<u>Sample Result</u>	<u>Duplicate Sample R1613412-024DUP Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	-	94.9	95.1	95.0	<1	20

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Subcontracted Analytical Parameters

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January 5, 2017

Reports and Invoices
ALS Environmental
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Rochester, NY 14623

Certificate of Analysis

Project Name:	Metals without J values	Workorder:	2198351
Purchase Order:	58R1613412	Workorder ID:	R1613412

Dear Reports Invoices:

Enclosed are the analytical results for samples received by the laboratory on Wednesday, December 28, 2016.

The ALS Environmental laboratory in Middletown, Pennsylvania is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Mr. Brad W Kintzer (Project Coordinator) at (717) 944-5541.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state requirements. The test results meet requirements of the current NELAP standards or state requirements, where applicable. For a specific list of accredited analytes, refer to the certifications section of the ALS website at www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads.

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This page is included as part of the Analytical Report and must be retained as a permanent record thereof.


Mr. Brad W Kintzer
Project Coordinator

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SAMPLE SUMMARY

Workorder: 2198351 R1613412

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
2198351001	161220842 400-SB-06	Solid	12/20/2016 00:00	12/28/2016 09:30	Collected by Client
2198351002	161220851 400-SB-06	Solid	12/20/2016 00:00	12/28/2016 09:30	Collected by Client
2198351003	161220852 400-SB-06	Solid	12/20/2016 00:00	12/28/2016 09:30	Collected by Client
2198351004	161220902 400-SB-07	Solid	12/20/2016 00:00	12/28/2016 09:30	Collected by Client
2198351005	161220921 400-SB-07	Solid	12/20/2016 00:00	12/28/2016 09:30	Collected by Client
2198351006	161220922 400-SB-07	Solid	12/20/2016 00:00	12/28/2016 09:30	Collected by Client
2198351007	161220932 400-SB-08	Solid	12/20/2016 00:00	12/28/2016 09:30	Collected by Client
2198351008	161220946 400-SB-08	Solid	12/20/2016 00:00	12/28/2016 09:30	Collected by Client
2198351009	161220947 400-SB-08	Solid	12/20/2016 00:00	12/28/2016 09:30	Collected by Client

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 Vancouver Waterloo · Winnipeg · Yellowknife **United States:** Cincinnati · Everett · Fort Collins · Holland · Houston · Middletown · Salt Lake City · Spring City · York **Mexico:** Monterrey

SAMPLE SUMMARY

Workorder: 2198351 R1613412

Notes

- Samples collected by ALS personnel are done so in accordance with the procedures set forth in the ALS Field Sampling Plan (20 - Field Services Sampling Plan).
- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
- The Chain of Custody document is included as part of this report.
- All Library Search analytes should be regarded as tentative identifications based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.
- Parameters identified as "analyze immediately" require analysis within 15 minutes of collection. Any "analyze immediately" parameters not listed under the header "Field Parameters" are performed in the laboratory and are therefore analyzed out of hold time.
- Method references listed on this report beginning with the prefix "S" followed by a method number (such as S2310B-97) refer to methods from "Standard Methods for the Examination of Water and Wastewater".
- For microbiological analyses, the "Prepared" value is the date/time into the incubator and the "Analyzed" value is the date/time out the incubator.

Standard Acronyms/Flags

J	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
N	Indicates presumptive evidence of the presence of a compound
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference
LOD	DoD Limit of Detection
LOQ	DoD Limit of Quantitation
DL	DoD Detection Limit
I	Indicates reported value is greater than or equal to the Method Detection Limit (MDL) but less than the Report Detection Limit (RDL)
(S)	Surrogate Compound
NC	Not Calculated
*	Result outside of QC limits

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Vancouver Waterloo · Winnipeg · Yellowknife United States: Cincinnati · Everett · Fort Collins · Holland · Houston · Middletown · Salt Lake City · Spring City · York Mexico: Monterrey

ANALYTICAL RESULTS

Workorder: 2198351 R1613412

 Lab ID: **2198351001**
 Sample ID: **161220842 400-SB-06**

 Date Collected: 12/20/2016 00:00 Matrix: Solid
 Date Received: 12/28/2016 09:30

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	1.6		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
Total Solids	98.4		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:47	SRT	A2
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:47	SRT	A2
Barium, Total	1.7J	J	mg/L	2.8	0.94	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:47	SRT	A2
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:47	SRT	A2
Cadmium, Total	ND		mg/L	0.011	0.0037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:47	SRT	A2
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:47	SRT	A2
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:47	SRT	A2
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/5/17 00:00 AXC	1/5/17 10:20	MNP	A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:47	SRT	A2
Selenium, Total	0.043J	J	mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:47	SRT	A2
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:47	SRT	A2
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:47	SRT	A2
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:47	SRT	A2
Zinc, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:47	SRT	A2



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ANALYTICAL RESULTS

Workorder: 2198351 R1613412

 Lab ID: **2198351002**
 Sample ID: **161220851 400-SB-06**

 Date Collected: 12/20/2016 00:00 Matrix: Solid
 Date Received: 12/28/2016 09:30

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	3.4		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
Total Solids	96.6		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:43	SRT	A2
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:43	SRT	A2
Barium, Total	1.5J	J	mg/L	2.8	0.94	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:43	SRT	A2
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:43	SRT	A2
Cadmium, Total	0.0039J	J	mg/L	0.011	0.0037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:43	SRT	A2
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:43	SRT	A2
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:43	SRT	A2
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/5/17 00:00 AXC	1/5/17 10:21	MNP	A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:43	SRT	A2
Selenium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:43	SRT	A2
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:43	SRT	A2
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:43	SRT	A2
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:43	SRT	A2
Zinc, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:43	SRT	A2



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ANALYTICAL RESULTS

Workorder: 2198351 R1613412

Lab ID: **2198351003**
Sample ID: **161220852 400-SB-06**

Date Collected: 12/20/2016 00:00 Matrix: Solid
Date Received: 12/28/2016 09:30

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	3.5		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
Total Solids	96.5		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:50	SRT	A2
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:50	SRT	A2
Barium, Total	1.4J	J	mg/L	2.8	0.94	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:50	SRT	A2
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:50	SRT	A2
Cadmium, Total	0.0039J	J	mg/L	0.011	0.0037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:50	SRT	A2
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:50	SRT	A2
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:50	SRT	A2
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/5/17 00:00 AXC	1/5/17 10:26	MNP	A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:50	SRT	A2
Selenium, Total	0.038J	J	mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:50	SRT	A2
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:50	SRT	A2
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:50	SRT	A2
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:50	SRT	A2
Zinc, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:50	SRT	A2


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ANALYTICAL RESULTS

Workorder: 2198351 R1613412

Lab ID: **2198351004**
Sample ID: **161220902 400-SB-07**

Date Collected: 12/20/2016 00:00 Matrix: Solid
Date Received: 12/28/2016 09:30

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	4.6		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
Total Solids	95.4		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:54	SRT A
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:54	SRT A
Barium, Total	1.6J	J	mg/L	2.8	0.94	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:54	SRT A
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:54	SRT A
Cadmium, Total	0.0039J	J	mg/L	0.011	0.0037	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:54	SRT A
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:54	SRT A
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:54	SRT A
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/5/17 00:00	AXC	1/5/17 10:27	MNP A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:54	SRT A
Selenium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:54	SRT A
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:54	SRT A
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:54	SRT A
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:54	SRT A
Zinc, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:54	SRT A


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ANALYTICAL RESULTS

Workorder: 2198351 R1613412

 Lab ID: **2198351005**
 Sample ID: **161220921 400-SB-07**

 Date Collected: 12/20/2016 00:00 Matrix: Solid
 Date Received: 12/28/2016 09:30

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	3.2		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
Total Solids	96.8		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:13	SRT	A2
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:13	SRT	A2
Barium, Total	1.7J	J	mg/L	2.8	0.94	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:13	SRT	A2
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:13	SRT	A2
Cadmium, Total	ND		mg/L	0.011	0.0037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:13	SRT	A2
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:13	SRT	A2
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:13	SRT	A2
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/5/17 00:00 AXC	1/5/17 10:29	MNP	A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:13	SRT	A2
Selenium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:13	SRT	A2
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:13	SRT	A2
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:13	SRT	A2
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:13	SRT	A2
Zinc, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:13	SRT	A2



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ANALYTICAL RESULTS

Workorder: 2198351 R1613412

Lab ID: **2198351006**
Sample ID: **161220922 400-SB-07**

Date Collected: 12/20/2016 00:00 Matrix: Solid
Date Received: 12/28/2016 09:30

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	3.2		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
Total Solids	96.8		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:58	SRT	A
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:58	SRT	A
Barium, Total	1.7J	J	mg/L	2.8	0.94	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:58	SRT	A
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:58	SRT	A
Cadmium, Total	0.0039J	J	mg/L	0.011	0.0037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:58	SRT	A
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:58	SRT	A
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:58	SRT	A
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/5/17 00:00 AXC	1/5/17 10:32	MNP	A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:58	SRT	A
Selenium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:58	SRT	A
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:58	SRT	A
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:58	SRT	A
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:58	SRT	A
Zinc, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:58	SRT	A



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ANALYTICAL RESULTS

Workorder: 2198351 R1613412

Lab ID: **2198351007**
Sample ID: **161220932 400-SB-08**

Date Collected: 12/20/2016 00:00 Matrix: Solid
Date Received: 12/28/2016 09:30

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	11.6		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
Total Solids	88.4		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/4/17 13:54	TRR	1/5/17 12:02	SRT A
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/4/17 13:54	TRR	1/5/17 12:02	SRT A
Barium, Total	1.9J	J	mg/L	2.8	0.94	SW846 6010C	1/4/17 13:54	TRR	1/5/17 12:02	SRT A
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54	TRR	1/5/17 12:02	SRT A
Cadmium, Total	0.0044J	J	mg/L	0.011	0.0037	SW846 6010C	1/4/17 13:54	TRR	1/5/17 12:02	SRT A
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54	TRR	1/5/17 12:02	SRT A
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	1/4/17 13:54	TRR	1/5/17 12:02	SRT A
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/5/17 00:00	AXC	1/5/17 10:33	MNP A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54	TRR	1/5/17 12:02	SRT A
Selenium, Total	0.049J	J	mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54	TRR	1/5/17 12:02	SRT A
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54	TRR	1/5/17 12:02	SRT A
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54	TRR	1/5/17 12:02	SRT A
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54	TRR	1/5/17 12:02	SRT A
Zinc, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54	TRR	1/5/17 12:02	SRT A


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ANALYTICAL RESULTS

Workorder: 2198351 R1613412

 Lab ID: **2198351008**
 Sample ID: **161220946 400-SB-08**

 Date Collected: 12/20/2016 00:00 Matrix: Solid
 Date Received: 12/28/2016 09:30

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	4.6		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
Total Solids	95.4		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:27	SRT	A2
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:27	SRT	A2
Barium, Total	2.1J	J	mg/L	2.8	0.94	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:27	SRT	A2
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:27	SRT	A2
Cadmium, Total	0.0039J	J	mg/L	0.011	0.0037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:27	SRT	A2
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:27	SRT	A2
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:27	SRT	A2
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/5/17 00:00 AXC	1/5/17 10:34	MNP	A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:27	SRT	A2
Selenium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:27	SRT	A2
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:27	SRT	A2
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:27	SRT	A2
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:27	SRT	A2
Zinc, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 13:27	SRT	A2



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ANALYTICAL RESULTS

Workorder: 2198351 R1613412

Lab ID: **2198351009**
Sample ID: **161220947 400-SB-08**

Date Collected: 12/20/2016 00:00 Matrix: Solid
Date Received: 12/28/2016 09:30

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	5.0		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
Total Solids	95.0		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:58	SRT	A2
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:58	SRT	A2
Barium, Total	2.0J	J	mg/L	2.8	0.94	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:58	SRT	A2
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:58	SRT	A2
Cadmium, Total	ND		mg/L	0.011	0.0037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:58	SRT	A2
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:58	SRT	A2
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:58	SRT	A2
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/5/17 00:00 AXC	1/5/17 10:39	MNP	A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:58	SRT	A2
Selenium, Total	0.039J	J	mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:58	SRT	A2
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:58	SRT	A2
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:58	SRT	A2
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:58	SRT	A2
Zinc, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:58	SRT	A2


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QUALITY CONTROL DATA

Workorder: 2198351 R1613412

QC Batch: MDIG/61776 **Analysis Method:** SW846 7470A

QC Batch Method: SW846 7470A

Associated Lab Samples: 2198351001, 2198351002, 2198351003, 2198351004, 2198351005, 2198351006, 2198351007, 2198351008, 2198351009

METHOD BLANK: 2464241

Parameter	Blank Result	Units	Reporting Limit
Mercury, Total	ND	mg/L	0.0020

LABORATORY CONTROL SAMPLE: 2464242

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Mercury, Total	88	mg/L	.002	0.0018J	85 - 115

MATRIX SPIKE: 2464243 DUPLICATE: 2464244 ORIGINAL: 2198351002

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Mercury, Total	0	mg/L	.005	.00466	.00465	93.2	93	70 - 130	.21	20

MATRIX SPIKE: 2464245 DUPLICATE: 2464246 ORIGINAL: 2198351005

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Mercury, Total	0	mg/L	.005	.00489	.00471	97.8	94.2	70 - 130	3.75	20

MATRIX SPIKE: 2464247 DUPLICATE: 2464248 ORIGINAL: 2198351008

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Mercury, Total	0	mg/L	.005	.00499	.00502	99.8	100	70 - 130	.6	20

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QUALITY CONTROL DATA

Workorder: 2198351 R1613412

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QUALITY CONTROL DATA

Workorder: 2198351 R1613412

QC Batch: MDIG/61777 **Analysis Method:** SW846 6010C

QC Batch Method: SW846 3015

Associated Lab Samples: 2198351001, 2198351003, 2198351004, 2198351006, 2198351007

METHOD BLANK: 2464259

Parameter	Blank Result	Units	Reporting Limit
Antimony, Total	ND	mg/L	0.030
Arsenic, Total	ND	mg/L	0.028
Barium, Total	ND	mg/L	0.56
Beryllium, Total	ND	mg/L	0.0044
Cadmium, Total	ND	mg/L	0.0022
Chromium, Total	ND	mg/L	0.0056
Lead, Total	ND	mg/L	0.0067
Nickel, Total	ND	mg/L	0.022
Selenium, Total	ND	mg/L	0.022
Silver, Total	ND	mg/L	0.0044
Thallium, Total	ND	mg/L	0.022
Vanadium, Total	ND	mg/L	0.0056
Zinc, Total	ND	mg/L	0.022

LABORATORY CONTROL SAMPLE: 2464260

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Antimony, Total	107	mg/L	.22	0.24	80 - 120
Arsenic, Total	106	mg/L	.11	0.12	80 - 120
Barium, Total	108	mg/L	1.1	1.2	80 - 120
Beryllium, Total	106	mg/L	.22	0.24	80 - 120
Cadmium, Total	108	mg/L	.11	0.12	80 - 120
Chromium, Total	109	mg/L	.11	0.12	80 - 120
Lead, Total	106	mg/L	.11	0.12	80 - 120
Nickel, Total	109	mg/L	1.1	1.2	80 - 120
Selenium, Total	106	mg/L	1.1	1.2	80 - 120
Silver, Total	104	mg/L	.11	0.12	80 - 120
Thallium, Total	109	mg/L	.11	0.12	80 - 120
Vanadium, Total	109	mg/L	.056	0.061	80 - 120
Zinc, Total	110	mg/L	.56	0.61	80 - 120

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QUALITY CONTROL DATA

Workorder: 2198351 R1613412

MATRIX SPIKE: 2464261 DUPLICATE: 2464262 ORIGINAL: 2198350003

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Antimony, Total	.02167	mg/L	.22	.13055	.14833	49*	57	50 - 150	12.7	20
Arsenic, Total	.01444	mg/L	5.1	5.94994	6.16105	116	120	50 - 150	3.49	20
Barium, Total	1.78832	mg/L	11.1	13.69986	14.03875	107	110	50 - 150	2.44	20
Beryllium, Total	0	mg/L	.22	.23944	.24722	108	111	50 - 150	3.2	20
Cadmium, Total	.00389	mg/L	1.1	1.26832	1.30832	114	117	50 - 150	3.1	20
Chromium, Total	.00333	mg/L	5.1	5.32828	5.41606	104	106	50 - 150	1.63	20
Lead, Total	0	mg/L	5.1	5.57217	5.72217	109	112	50 - 150	2.66	20
Nickel, Total	.02	mg/L	1.1	1.28054	1.33999	113	119	50 - 150	4.54	20
Selenium, Total	.02667	mg/L	2.1	2.51997	2.64553	118	124	50 - 150	4.86	20
Silver, Total	0	mg/L	1.1	1.21721	1.23554	110	111	50 - 150	1.49	20
Thallium, Total	0	mg/L	.11	.14111	.11389	127	102	50 - 150	21.4	20
Vanadium, Total	.00556	mg/L	.056	.06167	.06055	101	99	50 - 150	1.82	20
Zinc, Total	.04778	mg/L	.56	.71333	.74666	120	126	50 - 150	4.57	20

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QUALITY CONTROL DATA

Workorder: 2198351 R1613412

QC Batch: MDIG/61778 **Analysis Method:** SW846 6010C

QC Batch Method: SW846 3015

Associated Lab Samples: 2198351002, 2198351005, 2198351008, 2198351009

METHOD BLANK: 2464263

Parameter	Blank Result	Units	Reporting Limit
Antimony, Total	ND	mg/L	0.030
Arsenic, Total	ND	mg/L	0.028
Barium, Total	ND	mg/L	0.56
Beryllium, Total	ND	mg/L	0.0044
Cadmium, Total	ND	mg/L	0.0022
Chromium, Total	ND	mg/L	0.0056
Lead, Total	ND	mg/L	0.0067
Nickel, Total	ND	mg/L	0.022
Selenium, Total	ND	mg/L	0.022
Silver, Total	ND	mg/L	0.0044
Thallium, Total	ND	mg/L	0.022
Vanadium, Total	ND	mg/L	0.0056
Zinc, Total	ND	mg/L	0.022

LABORATORY CONTROL SAMPLE: 2464264

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Antimony, Total	105	mg/L	.22	0.23	80 - 120
Arsenic, Total	106	mg/L	.11	0.12	80 - 120
Barium, Total	107	mg/L	1.1	1.2	80 - 120
Beryllium, Total	105	mg/L	.22	0.23	80 - 120
Cadmium, Total	106	mg/L	.11	0.12	80 - 120
Chromium, Total	106	mg/L	.11	0.12	80 - 120
Lead, Total	106	mg/L	.11	0.12	80 - 120
Nickel, Total	108	mg/L	1.1	1.2	80 - 120
Selenium, Total	106	mg/L	1.1	1.2	80 - 120
Silver, Total	101	mg/L	.11	0.11	80 - 120
Thallium, Total	110	mg/L	.11	0.12	80 - 120
Vanadium, Total	108	mg/L	.056	0.060	80 - 120
Zinc, Total	109	mg/L	.56	0.60	80 - 120

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QUALITY CONTROL DATA

Workorder: 2198351 R1613412

MATRIX SPIKE: 2464265 DUPLICATE: 2464266 ORIGINAL: 2198350006

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Antimony, Total	.01556	mg/L	.22	.14833	.13222	59.7	52.5	50 - 150	11.5	20
Arsenic, Total	.01611	mg/L	5.1	5.96661	6.01661	116	117	50 - 150	.83	20
Barium, Total	3.43608	mg/L	11.1	15.36651	15.37762	107	107	50 - 150	.07	20
Beryllium, Total	0	mg/L	.22	.25222	.23889	113	107	50 - 150	5.43	20
Cadmium, Total	.00389	mg/L	1.1	1.2511	1.25665	112	113	50 - 150	.44	20
Chromium, Total	.00278	mg/L	5.1	5.18328	5.22773	101	102	50 - 150	.85	20
Lead, Total	0	mg/L	5.1	5.49328	5.52717	107	108	50 - 150	.62	20
Nickel, Total	.00611	mg/L	1.1	1.33999	1.27165	120	114	50 - 150	5.23	20
Selenium, Total	.04556	mg/L	2.1	2.63608	2.57886	123	120	50 - 150	2.19	20
Silver, Total	0	mg/L	1.1	1.19499	1.19332	108	107	50 - 150	.14	20
Thallium, Total	0	mg/L	.11	.13667	.13444	123	121	50 - 150	1.64	20
Vanadium, Total	.00444	mg/L	.056	.06222	.05889	104	98	50 - 150	5.5	20
Zinc, Total	.01667	mg/L	.56	.71944	.67722	126	119	50 - 150	6.05	20

MATRIX SPIKE: 2464267 DUPLICATE: 2464268 ORIGINAL: 2198350010

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Antimony, Total	.01778	mg/L	.22	.14333	.12944	56.5	50.2	50 - 150	10.2	20
Arsenic, Total	.01833	mg/L	5.1	5.98883	5.73328	117	112	50 - 150	4.36	20
Barium, Total	3.37719	mg/L	11.1	15.32762	14.6943	108	102	50 - 150	4.22	20
Beryllium, Total	0	mg/L	.22	.25222	.23944	113	108	50 - 150	5.2	20
Cadmium, Total	.00333	mg/L	1.1	1.2661	1.20554	114	108	50 - 150	4.9	20
Chromium, Total	0	mg/L	5.1	5.22884	5.03662	102	98.5	50 - 150	3.74	20
Lead, Total	0	mg/L	5.1	5.54106	5.29939	108	104	50 - 150	4.46	20
Nickel, Total	.02444	mg/L	1.1	1.36832	1.29276	121	114	50 - 150	5.68	20
Selenium, Total	.05167	mg/L	2.1	2.65108	2.51553	123	117	50 - 150	5.25	20
Silver, Total	0	mg/L	1.1	1.20499	1.15388	108	104	50 - 150	4.33	20
Thallium, Total	0	mg/L	.11	.10944	.11555	98.5	104	50 - 150	5.43	20
Vanadium, Total	.00556	mg/L	.056	.06444	.06	106	98	50 - 150	7.14	20
Zinc, Total	.05667	mg/L	.56	.73721	.69444	122	115	50 - 150	5.98	20

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QUALITY CONTROL DATA

Workorder: 2198351 R1613412

MATRIX SPIKE: 2464269 DUPLICATE: 2464270 ORIGINAL: 2198351002

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Antimony, Total	.02	mg/L	.22	.13222	.12722	50.5	48.2*	50 - 150	3.85	20
Arsenic, Total	.01889	mg/L	5.1	5.99438	5.91661	117	115	50 - 150	1.31	20
Barium, Total	1.53721	mg/L	11.1	13.5832	13.42209	108	107	50 - 150	1.19	20
Beryllium, Total	0	mg/L	.22	.24833	.24166	112	109	50 - 150	2.72	20
Cadmium, Total	.00389	mg/L	1.1	1.25943	1.23777	113	111	50 - 150	1.74	20
Chromium, Total	.00056	mg/L	5.1	5.30884	5.24884	104	103	50 - 150	1.14	20
Lead, Total	0	mg/L	5.1	5.58328	5.47106	109	107	50 - 150	2.03	20
Nickel, Total	.01944	mg/L	1.1	1.31388	1.28721	116	114	50 - 150	2.05	20
Selenium, Total	.03056	mg/L	2.1	2.57831	2.5372	121	119	50 - 150	1.61	20
Silver, Total	0	mg/L	1.1	.6261	.6211	56.3	55.9	50 - 150	.8	20
Thallium, Total	.00056	mg/L	.11	.12778	.11833	114	106	50 - 150	7.67	20
Vanadium, Total	.005	mg/L	.056	.06055	.06055	100	100	50 - 150	0	20
Zinc, Total	.01333	mg/L	.56	.68888	.66833	122	118	50 - 150	3.03	20

MATRIX SPIKE: 2464271 DUPLICATE: 2464272 ORIGINAL: 2198351005

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Antimony, Total	.01722	mg/L	.22	.12833	.125	50	48.5*	50 - 150	2.63	20
Arsenic, Total	.015	mg/L	5.1	5.91661	5.93327	115	116	50 - 150	.28	20
Barium, Total	1.73554	mg/L	11.1	13.66097	13.72209	107	108	50 - 150	.45	20
Beryllium, Total	0	mg/L	.22	.24333	.24166	109	109	50 - 150	.69	20
Cadmium, Total	.00278	mg/L	1.1	1.24221	1.24499	112	112	50 - 150	.22	20
Chromium, Total	0	mg/L	5.1	5.28606	5.32884	103	104	50 - 150	.81	20
Lead, Total	0	mg/L	5.1	5.50661	5.52828	108	108	50 - 150	.39	20
Nickel, Total	.00889	mg/L	1.1	1.28221	1.27277	115	114	50 - 150	.74	20
Selenium, Total	.03444	mg/L	2.1	2.52886	2.53886	118	119	50 - 150	.39	20
Silver, Total	0	mg/L	1.1	1.19054	1.2011	107	108	50 - 150	.88	20
Thallium, Total	0	mg/L	.11	.12667	.12722	114	114	50 - 150	.44	20
Vanadium, Total	.00222	mg/L	.056	.05889	.05778	102	100	50 - 150	1.9	20
Zinc, Total	.01611	mg/L	.56	.67777	.67444	119	118	50 - 150	.49	20

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QUALITY CONTROL DATA

Workorder: 2198351 R1613412

MATRIX SPIKE: 2464273 DUPLICATE: 2464274 ORIGINAL: 2198351008

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Antimony, Total	.01389	mg/L	.22	.12667	.12333	50.7	49.2*	50 - 150	2.67	20
Arsenic, Total	.01778	mg/L	5.1	5.83328	5.88883	114	115	50 - 150	.95	20
Barium, Total	2.09387	mg/L	11.1	13.88875	14.02208	106	107	50 - 150	.96	20
Beryllium, Total	0	mg/L	.22	.24111	.24611	108	111	50 - 150	2.05	20
Cadmium, Total	.00389	mg/L	1.1	1.22221	1.23499	110	111	50 - 150	1.04	20
Chromium, Total	.00056	mg/L	5.1	5.28606	5.36717	103	105	50 - 150	1.52	20
Lead, Total	0	mg/L	5.1	5.45217	5.53494	107	108	50 - 150	1.51	20
Nickel, Total	.01278	mg/L	1.1	1.26832	1.29888	113	116	50 - 150	2.38	20
Selenium, Total	.03611	mg/L	2.1	2.47831	2.53109	116	118	50 - 150	2.11	20
Silver, Total	0	mg/L	1.1	1.19332	1.20332	107	108	50 - 150	.83	20
Thallium, Total	0	mg/L	.11	.13722	.11278	123	101	50 - 150	19.6	20
Vanadium, Total	.00556	mg/L	.056	.05722	.05944	93	97	50 - 150	3.81	20
Zinc, Total	.02167	mg/L	.56	.68166	.68499	119	119	50 - 150	.49	20

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QUALITY CONTROL DATA

Workorder: 2198351 R1613412

QC Batch: WETC/181028 **Analysis Method:** S2540G-11

QC Batch Method: S2540G-11

Associated Lab Samples: 2198351001, 2198351002, 2198351003, 2198351004, 2198351005, 2198351006, 2198351007, 2198351008, 2198351009

SAMPLE DUPLICATE: 2462903 ORIGINAL: 2197762001

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	33.1446	%	27.4959	18.6*	10
Total Solids	66.8553	%	72.504	8.11*	5

SAMPLE DUPLICATE: 2462904 ORIGINAL: 2197975004

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	20.8443	%	25.9228	21.7*	10
Total Solids	79.1556	%	74.0771	6.63*	5

SAMPLE DUPLICATE: 2462905 ORIGINAL: 2198190009

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	11.0652	%	11.8897	7.18	10
Total Solids	88.9347	%	88.1102	.93	5

SAMPLE DUPLICATE: 2462906 ORIGINAL: 2198190019

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	9.2468	%	9.3183	.77	10
Total Solids	90.7531	%	90.6816	.08	5

SAMPLE DUPLICATE: 2462907 ORIGINAL: 2198350001

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	2.497	%	3.1173	22.1*	10
Total Solids	97.5029	%	96.8826	.64	5

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QUALITY CONTROL DATA

Workorder: 2198351 R1613412

SAMPLE DUPLICATE: 2462908 ORIGINAL: 2198350011

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	5.3093	%	6.9484	26.7*	10
Total Solids	94.6906	%	93.0515	1.75	5

SAMPLE DUPLICATE: 2462909 ORIGINAL: 2198363001

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	75.9045	%	78.2982	3.1	10
Total Solids	24.0954	%	21.7017	10.5*	5

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 Vancouver Waterloo · Winnipeg · Yellowknife **United States:** Cincinnati · Everett · Fort Collins · Holland · Houston · Middletown · Salt Lake City · Spring City · York **Mexico:** Monterrey

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Workorder: 2198351 R1613412

Lab ID	Sample ID	Prep Method	Prep Batch	Analysis Method	Analysis Batch
2198351001	161220842 400-SB-06			S2540G-11	WETC/181028
2198351002	161220851 400-SB-06			S2540G-11	WETC/181028
2198351003	161220852 400-SB-06			S2540G-11	WETC/181028
2198351004	161220902 400-SB-07			S2540G-11	WETC/181028
2198351005	161220921 400-SB-07			S2540G-11	WETC/181028
2198351006	161220922 400-SB-07			S2540G-11	WETC/181028
2198351007	161220932 400-SB-08			S2540G-11	WETC/181028
2198351008	161220946 400-SB-08			S2540G-11	WETC/181028
2198351009	161220947 400-SB-08			S2540G-11	WETC/181028
2198351001	161220842 400-SB-06	SW846 7470A	MDIG/61776	SW846 7470A	META/55567
2198351002	161220851 400-SB-06	SW846 7470A	MDIG/61776	SW846 7470A	META/55567
2198351003	161220852 400-SB-06	SW846 7470A	MDIG/61776	SW846 7470A	META/55567
2198351004	161220902 400-SB-07	SW846 7470A	MDIG/61776	SW846 7470A	META/55567
2198351005	161220921 400-SB-07	SW846 7470A	MDIG/61776	SW846 7470A	META/55567
2198351006	161220922 400-SB-07	SW846 7470A	MDIG/61776	SW846 7470A	META/55567
2198351007	161220932 400-SB-08	SW846 7470A	MDIG/61776	SW846 7470A	META/55567
2198351008	161220946 400-SB-08	SW846 7470A	MDIG/61776	SW846 7470A	META/55567
2198351009	161220947 400-SB-08	SW846 7470A	MDIG/61776	SW846 7470A	META/55567
2198351001	161220842 400-SB-06	SW846 3015	MDIG/61777	SW846 6010C	META/55562
2198351003	161220852 400-SB-06	SW846 3015	MDIG/61777	SW846 6010C	META/55562
2198351004	161220902 400-SB-07	SW846 3015	MDIG/61777	SW846 6010C	META/55562
2198351006	161220922 400-SB-07	SW846 3015	MDIG/61777	SW846 6010C	META/55562
2198351007	161220932 400-SB-08	SW846 3015	MDIG/61777	SW846 6010C	META/55562
2198351002	161220851 400-SB-06	SW846 3015	MDIG/61778	SW846 6010C	META/55562
2198351005	161220921 400-SB-07	SW846 3015	MDIG/61778	SW846 6010C	META/55562
2198351008	161220946 400-SB-08	SW846 3015	MDIG/61778	SW846 6010C	META/55562
2198351009	161220947 400-SB-08	SW846 3015	MDIG/61778	SW846 6010C	META/55562

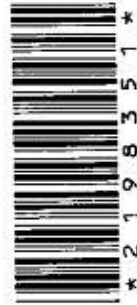
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ALS Environmental Chain of Custody

1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475

ALS Contact: Janice Jaeger

Project Number: R1613412
 Project Manager: Janice Jaeger
 QAP: LAB QAP



Lab Code	Sample ID	# of Cont.	Matrix	Sample		ALS Test Results												
				Date	Time	Lab ID	Ag TCLP 6010C	As TCLP 6010C	Ba TCLP 6010C	Be TCLP 6010C	Cd TCLP 6010C	Cr TCLP 6010C	Hg TCLP 7470A	Ni TCLP 6010C	Pb TCLP 6010C			
[REDACTED]	1612200842 400-SB-06	1	Soil	12/20/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X
[REDACTED]	1612200851 400-SB-06	2	Soil	12/20/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X
[REDACTED]	1612200852 400-SB-06	1	Soil	12/20/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X
[REDACTED]	1612200902 400-SB-07	1	Soil	12/20/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X
[REDACTED]	1612200921 400-SB-07	2	Soil	12/20/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X
[REDACTED]	1612200922 400-SB-07	1	Soil	12/20/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X
[REDACTED]	1612200932 400-SB-08	1	Soil	12/20/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X
[REDACTED]	1612200946 400-SB-08	2	Soil	12/20/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X
[REDACTED]	1612200947 400-SB-08	1	Soil	12/20/16		Middletown ALS	X	X	X	X	X	X	X	X	X	X	X	X

Folder Comments:
 ND U

AS
 12/20/16

Special Instructions/Comments NABAWSTF EDD	Turnaround Requirements ___ RUSH (Surcharges Apply) PLEASE CIRCLE WORK DAYS 1 2 3 4 5 <input checked="" type="checkbox"/> STANDARD Requested FAX Date: _____ Requested Report Date: 01/06/17	Report Requirements ___ I. Results Only <input checked="" type="checkbox"/> II. Results + QC Summaries ___ III. Results + QC and Calibration Summaries ___ IV. Data Validation Report with Raw Data PQL/MDL/J <u>Y</u> <u>N</u> EDD <u>Y</u> <u>N</u>	Invoice Information PO# 58R1613412 Bill to _____
	H - Test is On Hold P - Test is Authorized for Prep Only		

Relinquished By: Scott Sany 12/16/16 1500
 Received By: Janice Jaeger 0930
 Airbill Number: _____

2198351

SP TCLP 6010C	Se TCLP 6010C	TCLP EPA 1311	T1 TCLP 6010C	V TCLP 6010C	Zn TCLP 6010C
1612200842 400-SB-06	X	X	X	X	X
1612200851 400-SB-06	X	X	X	X	X
1612200852 400-SB-06	X	X	X	X	X
1612200902 400-SB-07	X	X	X	X	X
1612200921 400-SB-07	X	X	X	X	X
1612200922 400-SB-07	X	X	X	X	X
1612200932 400-SB-08	X	X	X	X	X
1612200946 400-SB-08	X	X	X	X	X
1612200947 400-SB-08	X	X	X	X	X

Y N Initials Cooler Temp

Custody Seals Present? (if present) Seals Intact? **AT** 2

Received on Ice? **AT**

COC/Lbls Complete **TH35a**

Cont in Good Cond? **TH35a**

Correct Containers? **TH35a**

Correct Samp Vol? **TH35a**

Correct Preservation? **TH35a**

Headspace/Volatiles? **TH35a**

Therm ID **TH35a**

Ship Carrier: **FedEx JPS**

DHL

Tracking #: **68268078320**

ALS Environmental Chain of Custody

1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475

ALS Contact: Janice Jaeger

Project Number: R1613412
Project Manager: Janice Jaeger
QAP: LAB QAP

Run QC on sample R1613412-008 for 6010C/Ag TCLP, As TCLP, Ba TCLP, Be TCLP, Cd TCLP, Cr TCLP, Ni TCLP, Pb TCLP, Sb TCLP, Se TCLP, Ti TCLP, V TCLP, Zn TCLP, 7470A/Hg TCLP
Run QC on sample R1613412-017 for 6010C/Ag TCLP, As TCLP, Ba TCLP, Be TCLP, Cd TCLP, Cr TCLP, Ni TCLP, Pb TCLP, Sb TCLP, Se TCLP, Ti TCLP, V TCLP, Zn TCLP, 7470A/Hg TCLP
Run QC on sample R1613412-026 for 6010C/Ag TCLP, As TCLP, Ba TCLP, Be TCLP, Cd TCLP, Cr TCLP, Ni TCLP, Pb TCLP, Sb TCLP, Se TCLP, Ti TCLP, V TCLP, Zn TCLP, 7470A/Hg TCLP

Comments:

ALS Group USA, Corp.
www.alsglobal.com
An ALS Limited Company

R1613412

Ship To: Middletown ALS
ALS Laboratory Group
34 Dogwood Lane
Middletown, PA 17057

PC AMS Date 12/27/16
SMO _____ Date _____

Instructions:

Ice _____
Dry Ice _____
No Ice _____

Shipping:

Overnight _____
2nd Day _____
Ground _____

Bill to Client Account _____

Comments:

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January 10, 2017

Service Request No:R1613413

Mr. Tom Hall
NASA/WSTF/Navarro
P.O. Box 20
Las Cruces, NM 88004

Laboratory Results for: White Sands Test Facility

Dear Mr.Hall,

Enclosed are the results of the sample(s) submitted to our laboratory December 22, 2016
For your reference, these analyses have been assigned our service request number **R1613413**.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAP standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report. The measurement uncertainty of the results included in this report is within that expected when using the prescribed method(s) for analysis of these samples, and represented by Laboratory Control Sample control limits. Any events, such as QC failures, which may add to the uncertainty are explained in the report narrative.

Please contact me if you have any questions. My extension is 7472. You may also contact me via email at Janice.Jaeger@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Janice Jaeger
Project Manager

ADDRESS 1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
PHONE +1 585 288 5380 | **FAX** +1 585 288 8475
ALS Group USA, Corp.
dba ALS Environmental



Narrative Documents

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com



Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request:R1613413
Date Received:12/22/16

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables, including results of QC samples analyzed from this delivery group. Analytical procedures performed by the lab are validated in accordance with NELAC standards. Any parameters that are not included in the lab’s NELAC accreditation are identified on a “Non-Certified Analytes” report in the Miscellaneous Forms Section of this report. Individual analytical results requiring further explanation are flagged with qualifiers and/or discussed below. The flags are explained in the Report Qualifiers and Definitions page in the Miscellaneous Forms section of this report.

Sample Receipt

Thirty three soil samples were received for analysis at ALS Environmental on 12/22/2016. Any discrepancies noted upon initial sample inspection are noted on the cooler receipt and preservation form included in this data package. The samples were received in good condition and consistent with the accompanying chain of custody form. Samples are refrigerated at ≤6°C upon receipt at the lab except for aqueous samples designated for metals analyses, which are stored at room temperature.

Volatile Organic Analyses:

Method 8260c, 12/30/16: The lower control limit was exceeded for one or more analytes in the Continuing Calibration Verification (CCV). Since there were no detections of the analyte(s) in the associated field samples, the quantitation is not affected. The data quality was not significantly affected and no further corrective action was taken.

Metals Analyses:

Method 6010C SE, ICSAB: The upper control limit was exceeded for one or more analytes in the Interference Calibration Standard AB (ICSAB). The field samples analyzed in this sequence did not contain the analyte(s) in question. Since the exceedance equates to a potential high bias, the data quality is not affected. No further corrective action was required

General Chemistry Analyses:

No significant anomalies were noted with this analysis.

Subcontracted Analytical Parameters:

One or more samples were subcontracted to another laboratory for testing. The certified analytical report from the subcontractor has been included in its entirety at the end of this report and includes the name and address of the subcontracted laboratory.

Sample Receiving Notes:

Method 8260C: soil samples included in this report were received in jars and not collected using one of the EPA method 5035A low level options. In accordance with the NYSDOH technical notice of October 2012 all results or reporting limits <200 ug/kg should be considered as estimated due to potential low bias.

Approved by  Date 1/10/2017



SAMPLE DETECTION SUMMARY

CLIENT ID: 1612201000 400-SB-09	Lab ID: R1613413-001
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.4				Percent	ALS SOP
Acetone	3.9	J	2.9	5.1	ug/Kg	8260C
Dichloromethane	0.65	J	0.59	5.1	ug/Kg	8260C

CLIENT ID: 1612201001 400-SB-09	Lab ID: R1613413-002
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.4				Percent	ALS SOP
Arsenic, Total	5.02		0.24	0.98	mg/Kg	6010C
Barium, Total	121		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.47		0.02	0.29	mg/Kg	6010C
Cadmium, Total	0.17	BJ	0.04	0.49	mg/Kg	6010C
Chromium, Total	37.4		0.13	0.98	mg/Kg	6010C
Lead, Total	8.0		0.3	4.9	mg/Kg	6010C
Mercury, Total	0.004	BJ	0.003	0.033	mg/Kg	7471B
Nickel, Total	9.0		0.2	4.0	mg/Kg	6010C
Thallium, Total	0.71	J	0.51	0.98	mg/Kg	6010C
Vanadium, Total	15.5	B	0.2	4.9	mg/Kg	6010C
Zinc, Total	48.6		0.2	2.0	mg/Kg	6010C

CLIENT ID: 1612201005 400-SB-09	Lab ID: R1613413-004
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	96.3				Percent	ALS SOP
Acetone	5.2		3.0	5.2	ug/Kg	8260C
Dichloromethane	0.80	J	0.60	5.2	ug/Kg	8260C

CLIENT ID: 1612201006 400-SB-09	Lab ID: R1613413-005
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	96.6				Percent	ALS SOP
Arsenic, Total	3.7		0.3	1.0	mg/Kg	6010C
Barium, Total	76.3		0.2	2.1	mg/Kg	6010C
Beryllium, Total	0.39		0.02	0.31	mg/Kg	6010C
Cadmium, Total	0.13	BJ	0.04	0.52	mg/Kg	6010C
Chromium, Total	27.7		0.2	1.0	mg/Kg	6010C
Lead, Total	10.4		0.3	5.2	mg/Kg	6010C
Mercury, Total	0.003	BJ	0.003	0.033	mg/Kg	7471B
Nickel, Total	6.9		0.2	4.1	mg/Kg	6010C
Vanadium, Total	14.4	B	0.2	5.2	mg/Kg	6010C
Zinc, Total	43.8		0.2	2.1	mg/Kg	6010C

CLIENT ID: 1612201015 400-SB-09	Lab ID: R1613413-007
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.3				Percent	ALS SOP
Tetrachloroethene (PCE)	1.1	J	0.91	5.1	ug/Kg	8260C



SAMPLE DETECTION SUMMARY

CLIENT ID: 1612201016 400-SB-09	Lab ID: R1613413-008
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.5				Percent	ALS SOP
Acetone	3.7	J	2.9	5.1	ug/Kg	8260C
Dichloromethane	0.78	J	0.59	5.1	ug/Kg	8260C

CLIENT ID: 1612201018 400-SB-09	Lab ID: R1613413-009
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.4				Percent	ALS SOP
Arsenic, Total	5.0		0.3	1.0	mg/Kg	6010C
Barium, Total	92.4		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.49		0.02	0.30	mg/Kg	6010C
Cadmium, Total	0.11	BJ	0.04	0.51	mg/Kg	6010C
Chromium, Total	23.4		0.2	1.0	mg/Kg	6010C
Lead, Total	12.1		0.3	5.1	mg/Kg	6010C
Nickel, Total	9.6		0.2	4.1	mg/Kg	6010C
Thallium, Total	0.9	J	0.6	1.0	mg/Kg	6010C
Vanadium, Total	15.9	B	0.2	5.1	mg/Kg	6010C
Zinc, Total	62.8		0.2	2.0	mg/Kg	6010C

CLIENT ID: 1612201019 400-SB-09	Lab ID: R1613413-010
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.1				Percent	ALS SOP
Arsenic, Total	4.9		0.3	1.0	mg/Kg	6010C
Barium, Total	95.1		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.49		0.02	0.31	mg/Kg	6010C
Cadmium, Total	0.13	BJ	0.04	0.51	mg/Kg	6010C
Chromium, Total	25.0		0.2	1.0	mg/Kg	6010C
Lead, Total	10.8		0.3	5.1	mg/Kg	6010C
Nickel, Total	8.6		0.2	4.0	mg/Kg	6010C
Vanadium, Total	16.1	B	0.2	5.1	mg/Kg	6010C
Zinc, Total	63.1		0.2	2.0	mg/Kg	6010C

CLIENT ID: 1612201030 400-SB-11	Lab ID: R1613413-013
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	88.9				Percent	ALS SOP
Acetone	4.5	J	3.2	5.6	ug/Kg	8260C
Dichloromethane	1.1	J	0.65	5.6	ug/Kg	8260C
Tetrachloroethene (PCE)	2.4	J	0.99	5.6	ug/Kg	8260C

CLIENT ID: 1612201031 400-SB-11	Lab ID: R1613413-014
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	87.9				Percent	ALS SOP
Arsenic, Total	3.2		0.3	1.1	mg/Kg	6010C
Barium, Total	76.2		0.2	2.3	mg/Kg	6010C



SAMPLE DETECTION SUMMARY

CLIENT ID: 1612201031 400-SB-11	Lab ID: R1613413-014
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Analyte	Results	Flag	MDL	PQL	Units	Method
Beryllium, Total	0.41		0.02	0.34	mg/Kg	6010C
Cadmium, Total	0.08	BJ	0.04	0.56	mg/Kg	6010C
Chromium, Total	14.0		0.2	1.1	mg/Kg	6010C
Lead, Total	7.4		0.4	5.6	mg/Kg	6010C
Nickel, Total	8.7		0.2	4.4	mg/Kg	6010C
Thallium, Total	2.5		0.6	1.1	mg/Kg	6010C
Vanadium, Total	16.0	B	0.2	5.6	mg/Kg	6010C
Zinc, Total	31.4		0.2	2.3	mg/Kg	6010C

CLIENT ID: 1612201040 400-SB-11	Lab ID: R1613413-016
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	94.3				Percent	ALS SOP
Tetrachloroethene (PCE)	1.8	J	0.94	5.3	ug/Kg	8260C

CLIENT ID: 1612201041 400-SB-11	Lab ID: R1613413-017
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	93.8				Percent	ALS SOP
Acetone	6.8		3.0	5.3	ug/Kg	8260C
Dichloromethane	0.93	J	0.61	5.3	ug/Kg	8260C
Tetrachloroethene (PCE)	1.0	J	0.94	5.3	ug/Kg	8260C

CLIENT ID: 1612201043 400-SB-11	Lab ID: R1613413-018
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	94.1				Percent	ALS SOP
Arsenic, Total	4.2		0.3	1.0	mg/Kg	6010C
Barium, Total	627		0.2	2.1	mg/Kg	6010C
Beryllium, Total	0.52		0.02	0.31	mg/Kg	6010C
Cadmium, Total	0.09	BJ	0.04	0.52	mg/Kg	6010C
Chromium, Total	16.1		0.2	1.0	mg/Kg	6010C
Lead, Total	8.7		0.3	5.2	mg/Kg	6010C
Nickel, Total	4.0	J	0.2	4.2	mg/Kg	6010C
Thallium, Total	0.9	J	0.6	1.0	mg/Kg	6010C
Vanadium, Total	24.6		0.2	5.2	mg/Kg	6010C
Zinc, Total	43.9		0.2	2.1	mg/Kg	6010C

CLIENT ID: 1612201044 400-SB-11	Lab ID: R1613413-019
--	-----------------------------

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	93.9				Percent	ALS SOP
Arsenic, Total	3.7		0.3	1.0	mg/Kg	6010C
Barium, Total	711		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.60		0.02	0.30	mg/Kg	6010C
Chromium, Total	14.8		0.2	1.0	mg/Kg	6010C
Lead, Total	9.4		0.3	5.1	mg/Kg	6010C



SAMPLE DETECTION SUMMARY

CLIENT ID: 1612201044 400-SB-11	Lab ID: R1613413-019
--	-----------------------------

Analyte	Results	Flag	MDL	PQL	Units	Method
Nickel, Total	4.9		0.2	4.1	mg/Kg	6010C
Vanadium, Total	27.8		0.2	5.1	mg/Kg	6010C
Zinc, Total	32.3		0.2	2.0	mg/Kg	6010C

CLIENT ID: 1612201100 400-SB-13	Lab ID: R1613413-022
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	95.8				Percent	ALS SOP
Dichloromethane	0.77	J	0.60	5.2	ug/Kg	8260C

CLIENT ID: 1612201101 400-SB-13	Lab ID: R1613413-023
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	95.4				Percent	ALS SOP
Arsenic, Total	4.11		0.24	1.0	mg/Kg	6010C
Barium, Total	87.4		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.50		0.02	0.30	mg/Kg	6010C
Cadmium, Total	0.05	BJ	0.04	0.50	mg/Kg	6010C
Chromium, Total	12.1		0.13	1.0	mg/Kg	6010C
Lead, Total	8.2		0.3	5.0	mg/Kg	6010C
Nickel, Total	11.5		0.2	4.1	mg/Kg	6010C
Vanadium, Total	17.0	B	0.2	5.0	mg/Kg	6010C
Zinc, Total	38.1		0.2	2.0	mg/Kg	6010C

CLIENT ID: 1612201315 400-SB-13	Lab ID: R1613413-025
--	-----------------------------

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	96.8				Percent	ALS SOP
Dichloromethane	0.79	J	0.59	5.2	ug/Kg	8260C

CLIENT ID: 1612201316 400-SB-13	Lab ID: R1613413-026
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Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	96.8				Percent	ALS SOP
Arsenic, Total	5.1		0.3	1.0	mg/Kg	6010C
Barium, Total	484		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.50		0.02	0.30	mg/Kg	6010C
Cadmium, Total	0.09	BJ	0.04	0.51	mg/Kg	6010C
Chromium, Total	17.0		0.2	1.0	mg/Kg	6010C
Lead, Total	9.5		0.3	5.1	mg/Kg	6010C
Mercury, Total	0.003	BJ	0.003	0.033	mg/Kg	7471B
Nickel, Total	9.6		0.2	4.1	mg/Kg	6010C
Thallium, Total	1.3		0.6	1.0	mg/Kg	6010C
Vanadium, Total	16.2	B	0.2	5.1	mg/Kg	6010C
Zinc, Total	50.2		0.2	2.0	mg/Kg	6010C



SAMPLE DETECTION SUMMARY

CLIENT ID: 1612201330 400-SB-13 **Lab ID: R1613413-028**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	93.6				Percent	ALS SOP

CLIENT ID: 1612201331 400-SB-13 **Lab ID: R1613413-029**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	93.6				Percent	ALS SOP
Dichloromethane	0.84	J	0.61	5.3	ug/Kg	8260C

CLIENT ID: 1612201333 400-SB-13 **Lab ID: R1613413-030**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	92.3				Percent	ALS SOP
Arsenic, Total	5.8		0.3	1.0	mg/Kg	6010C
Barium, Total	1370		0.2	2.1	mg/Kg	6010C
Beryllium, Total	0.48		0.02	0.31	mg/Kg	6010C
Cadmium, Total	0.25	BJ	0.04	0.52	mg/Kg	6010C
Chromium, Total	16.3		0.2	1.0	mg/Kg	6010C
Lead, Total	9.9		0.3	5.2	mg/Kg	6010C
Nickel, Total	9.5		0.2	4.3	mg/Kg	6010C
Thallium, Total	1.8		0.6	1.0	mg/Kg	6010C
Vanadium, Total	14.4	B	0.2	5.2	mg/Kg	6010C
Zinc, Total	54.3		0.2	2.1	mg/Kg	6010C

CLIENT ID: 1612201334 400-SB-13 **Lab ID: R1613413-031**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	93.0				Percent	ALS SOP
Arsenic, Total	5.3		0.3	1.1	mg/Kg	6010C
Barium, Total	483		0.2	2.2	mg/Kg	6010C
Beryllium, Total	0.52		0.02	0.32	mg/Kg	6010C
Cadmium, Total	0.22	BJ	0.04	0.54	mg/Kg	6010C
Chromium, Total	17.5		0.2	1.1	mg/Kg	6010C
Lead, Total	9.7		0.3	5.4	mg/Kg	6010C
Nickel, Total	9.2		0.2	4.2	mg/Kg	6010C
Vanadium, Total	16.7	B	0.2	5.4	mg/Kg	6010C
Zinc, Total	63.0		0.2	2.2	mg/Kg	6010C



Sample Receipt Information

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

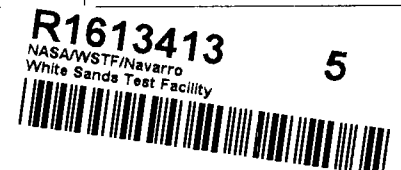
Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request:R1613413

SAMPLE CROSS-REFERENCE

<u>SAMPLE #</u>	<u>CLIENT SAMPLE ID</u>	<u>DATE</u>	<u>TIME</u>
R1613413-001	1612201000 400-SB-09	12/20/2016	
R1613413-002	1612201001 400-SB-09	12/20/2016	
R1613413-003	1612201002 400-SB-09	12/20/2016	
R1613413-004	1612201005 400-SB-09	12/20/2016	
R1613413-005	1612201006 400-SB-09	12/20/2016	
R1613413-006	1612201007 400-SB-09	12/20/2016	
R1613413-007	1612201015 400-SB-09	12/20/2016	
R1613413-008	1612201016 400-SB-09	12/20/2016	
R1613413-009	1612201018 400-SB-09	12/20/2016	
R1613413-010	1612201019 400-SB-09	12/20/2016	
R1613413-011	1612201021 400-SB-09	12/20/2016	
R1613413-012	1612201022 400-SB-09	12/20/2016	
R1613413-013	1612201030 400-SB-11	12/20/2016	
R1613413-014	1612201031 400-SB-11	12/20/2016	
R1613413-015	1612201032 400-SB-11	12/20/2016	
R1613413-016	1612201040 400-SB-11	12/20/2016	
R1613413-017	1612201041 400-SB-11	12/20/2016	
R1613413-018	1612201043 400-SB-11	12/20/2016	
R1613413-019	1612201044 400-SB-11	12/20/2016	
R1613413-020	1612201046 400-SB-11	12/20/2016	
R1613413-021	1612201047 400-SB-11	12/20/2016	
R1613413-022	1612201100 400-SB-13	12/20/2016	
R1613413-023	1612201101 400-SB-13	12/20/2016	
R1613413-024	1612201102 400-SB-13	12/20/2016	
R1613413-025	1612201315 400-SB-13	12/20/2016	
R1613413-026	1612201316 400-SB-13	12/20/2016	
R1613413-027	1612201317 400-SB-13	12/20/2016	
R1613413-028	1612201330 400-SB-13	12/20/2016	
R1613413-029	1612201331 400-SB-13	12/20/2016	
R1613413-030	1612201333 400-SB-13	12/20/2016	
R1613413-031	1612201334 400-SB-13	12/20/2016	
R1613413-032	1612201336 400-SB-13	12/20/2016	
R1613413-033	1612201337 400-SB-13	12/20/2016	

Laboratory PO #15EC007B				Analytical Requirements				Special Instructions	
Return Address for Analytical Reports				# of Containers	Sample Type: Soil (S)	SW-846 Method 8260B 4 oz. Glass Jar, Ice	Total Metals SW-846-6010C and 7470A 4 oz. Glass Jar, Ice	TCLP Metals EPA Method 1311 incorporating SW-846-6010C and 7470A 8 oz. Glass Jar, Ice	Comments
Sample No.	Sample Location								
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012									Please return coolers and reusable packaging materials as possible. Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall
Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453									
161220	1000	400-SB-09	1	S	X				Container 7395
161220	1001	400-SB-09	1	S		X			Container 7395
161220	1002	400-SB-09	1	S			X		Container 7395
161220	1005	400-SB-09	1	S	X				Container 7396
161220	1006	400-SB-09	1	S		X			Container 7396
161220	1007	400-SB-09	1	S			X		Container 7396
161220	1015	400-SB-09	1	S	X				Container 7397
161220	1016	400-SB-09	1	S	X				Container 7397
161220	1017	400-SB-09	1	S	X				Matrix Spike for 161220 ; Container 7397
161220	1018	400-SB-09	1	S		X			Container 7397
161220	1019	400-SB-09	1	S		X			Container 7397
161220	1020	400-SB-09	1	S		X			Matrix Spike for 161220 ; Container 7397
161220	1021	400-SB-09	1	S			X		Container 7397
161220	1022	400-SB-09	1	S			X		Container 7397
161220	1023	400-SB-09	1	S			X		Matrix Spike for 161220 ; Container 7397
Relinquished By:			Date/Time:		Accepted By:			Date/Time:	
			12-20-16 (1440)					12-20-16 11:10	



Laboratory PO #15EC007B		Analytical Requirements							Special Instructions
Return Address for Analytical Reports		# of Containers	Sample Type: Soil (S)	SW-846 Method 8260B 4 oz. Glass Jar, Ice	Total Metals SW-846-6010C and 7470A 4 oz. Glass Jar, Ice	TCLP Metals EPA Method 1311 incorporating SW-846-6010C and 7470A 8 oz. Glass Jar, Ice			Comments
Sample No.	Sample Location								
161220 1030	400-SB-11	1	S	X					Container 7472
161220 1031	400-SB-11	1	S		X				Container 7472
161220 1032	400-SB-11	1	S			X			Container 7472
161220 1040	400-SB-11	1	S	X					Container 7473
161220 1041	400-SB-11	1	S	X					Container 7473
161220 1042	400-SB-11	1	S	X					Matrix Spike for 161220 ; Container 747
161220 1043	400-SB-11	1	S		X				Container 7473
161220 1044	400-SB-11	1	S		X				Container 7473
161220 1045	400-SB-11	1	S		X				Matrix Spike for 161220 ; Container 7473
161220 1046	400-SB-11	1	S			X			Container 7473
161220 1047	400-SB-11	1	S			X			Container 7473
161220 1048	400-SB-11	1	S			X			Matrix Spike for 161220 ; Container 7473

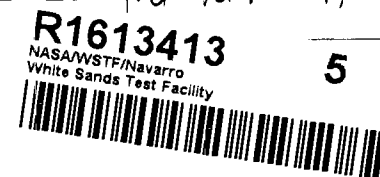
Special Instructions
 Please return coolers and reusable packaging materials as possible.
 Return Address:
 NASA WSTF Environmental Department
 12600 NASA Road, Bldg. 120
 Las Cruces, NM 88012
 Attn: Tom Hall

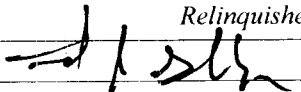
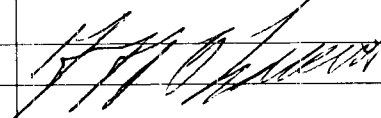
NASA WSTF Environmental Department
 12,600 NASA Road
 Las Cruces, NM 88012

Attn: Tom Hall
 Other _____
 (575) 524-5453

Relinquished By: <i>[Signature]</i>	Date/Time: 12-20-16 (1440)	Accepted By: <i>[Signature]</i>	Date/Time: 12-22-16 11:10
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WSTF - 381C (02/15)



Laboratory PO #15EC007B				Analytical Requirements				Special Instructions			
Return Address for Analytical Reports				# of Containers	Sample Type: Soil (S)	SW-846 Method 8260B 4 oz. Glass Jar, Ice	Total Metals SW-846-6010C and 7470A 4 oz. Glass Jar, Ice	TCLP Metals EPA Method 1311 incorporating SW-846-6010C and 7470A 8 oz. Glass Jar, Ice	Comments		
Sample No.	Sample Location										
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012 Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453								Please return coolers and reusable packaging materials as possible. Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall			
161220	1100	400-SB-13	1	S	X				Container 7398		
161220	1101	400-SB-13	1	S		X			Container 7398		
161220	1102	400-SB-13	1	S			X		Container 7398		
161220	1315	400-SB-13	1	S	X				Container 7399		
161220	1316	400-SB-13	1	S		X			Container 7399		
161220	1317	400-SB-13	1	S			X		Container 7399		
161220	1330	400-SB-13	1	S	X				Container 7400		
161220	1331	400-SB-13	1	S	X				Container 7400		
161220	1332	400-SB-13	1	S	X				Matrix Spike for 161220 ; Container 7400		
161220	1333	400-SB-13	1	S		X			Container 7400		
161220	1334	400-SB-13	1	S		X			Container 7400		
161220	1335	400-SB-13	1	S		X			Matrix Spike for 161220 ; Container 7400		
161220	1336	400-SB-13					X		Container 7400		
161220	1337	400-SB-13					X		Container 7400		
161220	1338	400-SB-13					X		Matrix Spike for 161220 ; Container 7400		
Relinquished By:			Date/Time:		Accepted By:			Date/Time:			
			12-20-16 (1440)					12-22-16 11:30			

R1613413 5

NASA/WSTF/Navarro
White Sands Test Facility





Cooler Receipt and Preservation Check Form

R1613413
NASA/WSTF/Navarro
White Sands Test Facility

5

Project/Client NASA Folder Number _____

Cooler received on 12-22-16 by ME/BL

COURIER: ALS UPS FEDEX VELOCITY CLIENT

1	Were Custody seals on outside of cooler?	<input checked="" type="radio"/> Y <input type="radio"/> N
2	Custody papers properly completed (ink, signed)?	<input checked="" type="radio"/> Y <input type="radio"/> N
3	Did all bottles arrive in good condition (unbroken)?	<input checked="" type="radio"/> Y <input type="radio"/> N
4	Circle: <u>Wet Ice</u> Dry Ice Gel packs present?	<input checked="" type="radio"/> Y <input type="radio"/> N

5a	Perchlorate samples have required headspace?	Y N <u>NA</u>
5b	Did VOA vials, Alk, or Sulfide have sig* bubbles?	Y N <u>NA</u>
6	Where did the bottles originate?	ALS/ROC <u>CLIENT</u>
7	Soil VOA received as:	<u>Bulk</u> Encore 5035set <u>NA</u>

8. Temperature Readings Date: 12-22-16 Time: 11:31 ID: IR#7 IR#8 From: Temp Blank Sample Bottle

Observed Temp (°C)	<u>3.7</u>	<u>5.6</u>						
Correction Factor (°C)	<u>0</u>	<u>0</u>						
Corrected Temp (°C)	<u>3.7</u>	<u>5.6</u>						
Within 0-6°C?	<input checked="" type="radio"/> Y <input type="radio"/> N	<input checked="" type="radio"/> Y <input type="radio"/> N	Y N	Y N	Y N	Y N	Y N	Y N
If <0°C, were samples frozen?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N

If out of Temperature, note packing/ice condition: _____ Ice melted _____ Poorly Packed _____ Same Day Rule _____
& Client Approval to Run Samples: _____ Standing Approval _____ Client aware at drop-off _____ Client notified by: _____

All samples held in storage location: R-002 by ME on 12-22-16 at 11:40
5035 samples placed in storage location: _____ by _____ on _____ at _____

Cooler Breakdown: Date: 12/22 Time: 1945 by: JS

- Were all bottle labels complete (i.e. analysis, preservation, etc.)? YES NO
- Did all bottle labels and tags agree with custody papers? YES NO
- Were correct containers used for the tests indicated? YES NO
- Were 5035 vials acceptable (no extra labels, not leaking)? YES NO
- Air Samples: Cassettes / Tubes Intact _____ Canisters Pressurized _____ Tedlar® Bags Inflated N/A

Explain any discrepancies:

pH	Reagent	Yes	No	Lot Received	Exp	Sample ID	Vol. Added	Lot Added	Final pH
≥12	NaOH								
≤2	HNO ₃								
≤2	H ₂ SO ₄								
<4	NaHSO ₄								
Residual Chlorine (-)	For CN Phenol and 522			If +, contact PM to add Na ₂ S ₂ O ₃ (CN), ascorbic (phenol).					
	Na ₂ S ₂ O ₃	-	-						
	ZnAcetate	-	-						
	HCl	**	**						

Yes=All samples OK
No=Samples were preserved at The lab as listed
PM OK to Adjust: _____

Bottle lot numbers: Client bottle
Other Comments: _____

* 1612200916 400-SB-07 (7448) }
1612201043 400-SB-11 (7473) } was matrix spike
1612200931 400-SB-08 (7439) } Broken in shipment.
1612201040 400-SB-11 (7473) }
1612200850 400-SB-06 (7458) } was matrix spike

CLRES	<u>BULK</u>
DO	FLDT
HPROD	HGFB
HTR	LL3541
PH	<u>SUB</u>
SO3	MARRS
ALS	REV

PC Secondary Review: _____ *significant air bubbles: VOA > 5-6 mm : WC > 1 in. diameter



Miscellaneous Forms

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

REPORT QUALIFIERS AND DEFINITIONS

- | | |
|---|--|
| <p>U Analyte was analyzed for but not detected. The sample quantitation limit has been corrected for dilution and for percent moisture, unless otherwise noted in the case narrative.</p> <p>J Estimated value due to either being a Tentatively Identified Compound (TIC) or that the concentration is between the MRL and the MDL. Concentrations are not verified within the linear range of the calibration. For DoD: concentration >40% difference between two GC columns (pesticides/Aroclors).</p> <p>B Analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.</p> <p>E Inorganics- Concentration is estimated due to the serial dilution was outside control limits.</p> <p>E Organics- Concentration has exceeded the calibration range for that specific analysis.</p> <p>D Concentration is a result of a dilution, typically a secondary analysis of the sample due to exceeding the calibration range or that a surrogate has been diluted out of the sample and cannot be assessed.</p> <p>* Indicates that a quality control parameter has exceeded laboratory limits. Under the “Notes” column of the Form I, this qualifier denotes analysis was performed out of Holding Time.</p> <p>H Analysis was performed out of hold time for tests that have an “immediate” hold time criteria.</p> <p># Spike was diluted out.</p> | <p>+ Correlation coefficient for MSA is <0.995.</p> <p>N Inorganics- Matrix spike recovery was outside laboratory limits.</p> <p>N Organics- Presumptive evidence of a compound (reported as a TIC) based on the MS library search.</p> <p>S Concentration has been determined using Method of Standard Additions (MSA).</p> <p>W Post-Digestion Spike recovery is outside control limits and the sample absorbance is <50% of the spike absorbance.</p> <p>P Concentration >40% (25% for CLP) difference between the two GC columns.</p> <p>C Confirmed by GC/MS</p> <p>Q DoD reports: indicates a pesticide/Aroclor is not confirmed ($\geq 100\%$ Difference between two GC columns).</p> <p>X See Case Narrative for discussion.</p> <p>MRL Method Reporting Limit. Also known as:</p> <p>LOQ Limit of Quantitation (LOQ)
The lowest concentration at which the method analyte may be reliably quantified under the method conditions.</p> <p>MDL Method Detection Limit. A statistical value derived from a study designed to provide the lowest concentration that will be detected 99% of the time. Values between the MDL and MRL are estimated (see J qualifier).</p> <p>LOD Limit of Detection. A value at or above the MDL which has been verified to be detectable.</p> <p>ND Non-Detect. Analyte was not detected at the concentration listed. Same as U qualifier.</p> |
|---|--|



Rochester Lab ID # for State Certifications¹

Connecticut ID # PH0556	Maine ID #NY0032	New Hampshire ID #
Delaware Accredited	Nebraska Accredited	294100 A/B
DoD ELAP #65817	New Jersey ID # NY004	Pennsylvania ID# 68-786
Florida ID # E87674	New York ID # 10145	Rhode Island ID # 158
Illinois ID #200047	North Carolina #676	Virginia #460167

¹ Analyses were performed according to our laboratory’s NELAP-approved quality assurance program and any applicable state or agency requirements. The test results meet requirements of the current NELAP/TNI standards or state or agency requirements, where applicable, except as noted in the case narrative. Since not all analyte/method/matrix combinations are offered for state/NELAC accreditation, this report may contain results which are not accredited. For a specific list of accredited analytes, contact the laboratory or go to <http://www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads/North-America-Downloads>

ALS Laboratory Group

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1613413

Sample Name: 1612201000 400-SB-09
Lab Code: R1613413-001
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1612201001 400-SB-09
Lab Code: R1613413-002
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By

Analyzed By
NMANSEN
CBURLESON
KWONG

Sample Name: 1612201005 400-SB-09
Lab Code: R1613413-004
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1612201006 400-SB-09
Lab Code: R1613413-005
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By

Analyzed By
NMANSEN
CBURLESON
KWONG

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1613413

Sample Name: 1612201015 400-SB-09
Lab Code: R1613413-007
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1612201016 400-SB-09
Lab Code: R1613413-008
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1612201018 400-SB-09
Lab Code: R1613413-009
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By

Analyzed By
NMANSEN
CBURLESON
KWONG

Sample Name: 1612201019 400-SB-09
Lab Code: R1613413-010
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By

Analyzed By
NMANSEN
CBURLESON
KWONG

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Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1613413

Sample Name: 1612201030 400-SB-11
Lab Code: R1613413-013
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1612201031 400-SB-11
Lab Code: R1613413-014
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By

Analyzed By
NMANSEN
CBURLESON
KWONG

Sample Name: 1612201040 400-SB-11
Lab Code: R1613413-016
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1612201041 400-SB-11
Lab Code: R1613413-017
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
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KWONG

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Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1613413

Sample Name: 1612201043 400-SB-11
Lab Code: R1613413-018
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By

Analyzed By
NMANSEN
CBURLESON
KWONG

Sample Name: 1612201044 400-SB-11
Lab Code: R1613413-019
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By

Analyzed By
NMANSEN
CBURLESON
KWONG

Sample Name: 1612201100 400-SB-13
Lab Code: R1613413-022
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1612201101 400-SB-13
Lab Code: R1613413-023
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By

Analyzed By
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KWONG

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Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1613413

Sample Name: 1612201315 400-SB-13
Lab Code: R1613413-025
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1612201316 400-SB-13
Lab Code: R1613413-026
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By

Analyzed By
NMANSEN
CBURLESON
KWONG

Sample Name: 1612201330 400-SB-13
Lab Code: R1613413-028
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1612201331 400-SB-13
Lab Code: R1613413-029
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

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Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1613413

Sample Name: 1612201333 400-SB-13
Lab Code: R1613413-030
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By

Analyzed By
NMANSEN
CBURLESON
KWONG

Sample Name: 1612201334 400-SB-13
Lab Code: R1613413-031
Sample Matrix: Soil

Date Collected: 12/20/16
Date Received: 12/22/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By

Analyzed By
NMANSEN
CBURLESON
KWONG

Water/Liquid Matrix

Analytical Method	Preparation Method
200.7	200.2
200.8	200.2
6010C	3005A/3010A
6020A	ILM05.3
9014 Cyanide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Acid Soluble	9030B
9056A Bomb (Halogens)	5050A
9066 Manual Distillation	9065
SM 4500-CN-E Residual Cyanide	SM 4500-CN-G
SM 4500-CN-E WAD Cyanide	SM 4500-CN-I

Solid/Soil/Non-Aqueous Matrix

Analytical Method	Preparation Method
6010C	3050B
6020A	3050B
6010C TCLP (1311) extract	3005A/3010A
6010 SPLP (1312) extract	3005A/3010A
7196A	3060A
7199	3060A
9056A Halogens/Halides	5050
300.0 Anions/ 350.1/ 353.2/ SM 2320B/ SM 5210B/ 9056A Anions	DI extraction

For analytical methods not listed, the preparation method is the same as the analytical method reference.



Sample Results

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
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Volatile Organic Compounds by GC/MS

ALS Environmental—Rochester Laboratory

1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623

Phone (585) 288-5380 Fax (585) 288-8475

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201000 400-SB-09
Lab Code: R1613413-001

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1,1,1,2-Tetrachloroethane	ND U	5.1	0.86	1	12/29/16 16:12	NA	
1,1,1-Trichloroethane (TCA)	ND U	5.1	0.75	1	12/29/16 16:12	NA	
1,1,2,2-Tetrachloroethane	ND U	5.1	0.84	1	12/29/16 16:12	NA	
1,1,2-Trichloroethane	ND U	5.1	0.75	1	12/29/16 16:12	NA	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.1	1.3	1	12/29/16 16:12	NA	
1,1-Dichloroethene (1,1-DCE)	ND U	5.1	1.4	1	12/29/16 16:12	NA	
1,2,3-Trichloropropane	ND U	5.1	1.4	1	12/29/16 16:12	NA	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.1	2.0	1	12/29/16 16:12	NA	
1,2-Dibromoethane	ND U	5.1	1.3	1	12/29/16 16:12	NA	
1,2-Dichlorobenzene	ND U	5.1	0.63	1	12/29/16 16:12	NA	
1,2-Dichloroethane	ND U	5.1	0.63	1	12/29/16 16:12	NA	
1,2-Dichloropropane	ND U	5.1	1.0	1	12/29/16 16:12	NA	
1,3-Dichlorobenzene	ND U	5.1	0.65	1	12/29/16 16:12	NA	
1,4-Dioxane	ND U	100	20	1	12/29/16 16:12	NA	
2-Butanone (MEK)	ND U	5.1	2.4	1	12/29/16 16:12	NA	
2-Chloro-1,3-butadiene	ND U	5.1	1.6	1	12/29/16 16:12	NA	
2-Chloroethyl Vinyl Ether	ND U	5.1	1.8	1	12/29/16 16:12	NA	
Isobutyl Alcohol	ND U	100	24	1	12/29/16 16:12	NA	
Allyl Chloride	ND U	5.1	1.8	1	12/29/16 16:12	NA	
4-Methyl-2-pentanone	ND U	5.1	1.1	1	12/29/16 16:12	NA	
Acetone	3.9 J	5.1	2.9	1	12/29/16 16:12	NA	
Acetonitrile	ND U	26	18	1	12/29/16 16:12	NA	
Acrolein	ND U	26	3.6	1	12/29/16 16:12	NA	
Acrylonitrile	ND U	26	6.7	1	12/29/16 16:12	NA	
Benzene	ND U	5.1	0.30	1	12/29/16 16:12	NA	
Bromodichloromethane	ND U	5.1	0.63	1	12/29/16 16:12	NA	
Bromoform	ND U	5.1	0.96	1	12/29/16 16:12	NA	
Bromomethane	ND U	5.1	1.5	1	12/29/16 16:12	NA	
Carbon Disulfide	ND U	5.1	1.3	1	12/29/16 16:12	NA	
Carbon Tetrachloride	ND U	5.1	0.95	1	12/29/16 16:12	NA	
Chlorobenzene	ND U	5.1	0.30	1	12/29/16 16:12	NA	
Chloroethane	ND U	5.1	3.0	1	12/29/16 16:12	NA	
Chloroform	ND U	5.1	1.3	1	12/29/16 16:12	NA	
Chloromethane	ND U	5.1	0.42	1	12/29/16 16:12	NA	
Dibromochloromethane	ND U	5.1	0.75	1	12/29/16 16:12	NA	
Dibromomethane	ND U	5.1	0.65	1	12/29/16 16:12	NA	
Dichlorodifluoromethane (CFC 12)	ND U	5.1	2.0	1	12/29/16 16:12	NA	
Dichloromethane	0.65 J	5.1	0.59	1	12/29/16 16:12	NA	
Ethyl Methacrylate	ND U	5.1	0.78	1	12/29/16 16:12	NA	
Ethylbenzene	ND U	5.1	0.24	1	12/29/16 16:12	NA	
Iodomethane	ND U	10	1.2	1	12/29/16 16:12	NA	
Methacrylonitrile	ND U	5.1	1.6	1	12/29/16 16:12	NA	
Methyl Methacrylate	ND U	5.1	0.75	1	12/29/16 16:12	NA	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201000 400-SB-09
Lab Code: R1613413-001

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Naphthalene	ND U	5.1	0.53	1	12/29/16 16:12	NA	
Propionitrile	ND U	26	6.7	1	12/29/16 16:12	NA	
Tetrachloroethene (PCE)	ND U	5.1	0.91	1	12/29/16 16:12	NA	
Toluene	ND U	5.1	1.1	1	12/29/16 16:12	NA	
Trichloroethene (TCE)	ND U	5.1	1.1	1	12/29/16 16:12	NA	
Trichlorofluoromethane (CFC 11)	ND U	5.1	0.68	1	12/29/16 16:12	NA	
Vinyl Chloride	ND U	5.1	1.9	1	12/29/16 16:12	NA	
cis-1,3-Dichloropropene	ND U	5.1	0.93	1	12/29/16 16:12	NA	
m,p-Xylenes	ND U	10	1.2	1	12/29/16 16:12	NA	
o-Xylene	ND U	5.1	0.50	1	12/29/16 16:12	NA	
trans-1,2-Dichloroethene	ND U	5.1	0.89	1	12/29/16 16:12	NA	
trans-1,3-Dichloropropene	ND U	5.1	0.21	1	12/29/16 16:12	NA	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	102	51 - 136	12/29/16 16:12	
Dibromofluoromethane	94	63 - 138	12/29/16 16:12	
Toluene-d8	102	66 - 138	12/29/16 16:12	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201005 400-SB-09
Lab Code: R1613413-004

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1,1,1,2-Tetrachloroethane	ND U	5.2	0.87	1	12/29/16 16:36	NA	
1,1,1-Trichloroethane (TCA)	ND U	5.2	0.76	1	12/29/16 16:36	NA	
1,1,2,2-Tetrachloroethane	ND U	5.2	0.85	1	12/29/16 16:36	NA	
1,1,2-Trichloroethane	ND U	5.2	0.76	1	12/29/16 16:36	NA	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.2	1.3	1	12/29/16 16:36	NA	
1,1-Dichloroethene (1,1-DCE)	ND U	5.2	1.4	1	12/29/16 16:36	NA	
1,2,3-Trichloropropane	ND U	5.2	1.4	1	12/29/16 16:36	NA	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.2	2.0	1	12/29/16 16:36	NA	
1,2-Dibromoethane	ND U	5.2	1.3	1	12/29/16 16:36	NA	
1,2-Dichlorobenzene	ND U	5.2	0.64	1	12/29/16 16:36	NA	
1,2-Dichloroethane	ND U	5.2	0.64	1	12/29/16 16:36	NA	
1,2-Dichloropropane	ND U	5.2	1.1	1	12/29/16 16:36	NA	
1,3-Dichlorobenzene	ND U	5.2	0.66	1	12/29/16 16:36	NA	
1,4-Dioxane	ND U	100	20	1	12/29/16 16:36	NA	
2-Butanone (MEK)	ND U	5.2	2.4	1	12/29/16 16:36	NA	
2-Chloro-1,3-butadiene	ND U	5.2	1.6	1	12/29/16 16:36	NA	
2-Chloroethyl Vinyl Ether	ND U	5.2	1.8	1	12/29/16 16:36	NA	
Isobutyl Alcohol	ND U	100	24	1	12/29/16 16:36	NA	
Allyl Chloride	ND U	5.2	1.8	1	12/29/16 16:36	NA	
4-Methyl-2-pentanone	ND U	5.2	1.1	1	12/29/16 16:36	NA	
Acetone	5.2	5.2	3.0	1	12/29/16 16:36	NA	
Acetonitrile	ND U	26	18	1	12/29/16 16:36	NA	
Acrolein	ND U	26	3.7	1	12/29/16 16:36	NA	
Acrylonitrile	ND U	26	6.8	1	12/29/16 16:36	NA	
Benzene	ND U	5.2	0.31	1	12/29/16 16:36	NA	
Bromodichloromethane	ND U	5.2	0.64	1	12/29/16 16:36	NA	
Bromoform	ND U	5.2	0.97	1	12/29/16 16:36	NA	
Bromomethane	ND U	5.2	1.5	1	12/29/16 16:36	NA	
Carbon Disulfide	ND U	5.2	1.3	1	12/29/16 16:36	NA	
Carbon Tetrachloride	ND U	5.2	0.96	1	12/29/16 16:36	NA	
Chlorobenzene	ND U	5.2	0.31	1	12/29/16 16:36	NA	
Chloroethane	ND U	5.2	3.0	1	12/29/16 16:36	NA	
Chloroform	ND U	5.2	1.4	1	12/29/16 16:36	NA	
Chloromethane	ND U	5.2	0.42	1	12/29/16 16:36	NA	
Dibromochloromethane	ND U	5.2	0.76	1	12/29/16 16:36	NA	
Dibromomethane	ND U	5.2	0.66	1	12/29/16 16:36	NA	
Dichlorodifluoromethane (CFC 12)	ND U	5.2	2.0	1	12/29/16 16:36	NA	
Dichloromethane	0.80 J	5.2	0.60	1	12/29/16 16:36	NA	
Ethyl Methacrylate	ND U	5.2	0.78	1	12/29/16 16:36	NA	
Ethylbenzene	ND U	5.2	0.24	1	12/29/16 16:36	NA	
Iodomethane	ND U	10	1.2	1	12/29/16 16:36	NA	
Methacrylonitrile	ND U	5.2	1.6	1	12/29/16 16:36	NA	
Methyl Methacrylate	ND U	5.2	0.76	1	12/29/16 16:36	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201005 400-SB-09
Lab Code: R1613413-004

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Naphthalene	ND U	5.2	0.53	1	12/29/16 16:36	NA	
Propionitrile	ND U	26	6.8	1	12/29/16 16:36	NA	
Tetrachloroethene (PCE)	ND U	5.2	0.92	1	12/29/16 16:36	NA	
Toluene	ND U	5.2	1.1	1	12/29/16 16:36	NA	
Trichloroethene (TCE)	ND U	5.2	1.1	1	12/29/16 16:36	NA	
Trichlorofluoromethane (CFC 11)	ND U	5.2	0.69	1	12/29/16 16:36	NA	
Vinyl Chloride	ND U	5.2	2.0	1	12/29/16 16:36	NA	
cis-1,3-Dichloropropene	ND U	5.2	0.94	1	12/29/16 16:36	NA	
m,p-Xylenes	ND U	10	1.2	1	12/29/16 16:36	NA	
o-Xylene	ND U	5.2	0.50	1	12/29/16 16:36	NA	
trans-1,2-Dichloroethene	ND U	5.2	0.90	1	12/29/16 16:36	NA	
trans-1,3-Dichloropropene	ND U	5.2	0.21	1	12/29/16 16:36	NA	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	105	51 - 136	12/29/16 16:36	
Dibromofluoromethane	99	63 - 138	12/29/16 16:36	
Toluene-d8	104	66 - 138	12/29/16 16:36	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	unknown	13.57	24	J

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201015 400-SB-09
Lab Code: R1613413-007

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1,1,1,2-Tetrachloroethane	ND U	5.1	0.86	1	12/30/16 13:52	NA	
1,1,1-Trichloroethane (TCA)	ND U	5.1	0.76	1	12/30/16 13:52	NA	
1,1,2,2-Tetrachloroethane	ND U	5.1	0.84	1	12/30/16 13:52	NA	
1,1,2-Trichloroethane	ND U	5.1	0.76	1	12/30/16 13:52	NA	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.1	1.3	1	12/30/16 13:52	NA	
1,1-Dichloroethene (1,1-DCE)	ND U	5.1	1.4	1	12/30/16 13:52	NA	
1,2,3-Trichloropropane	ND U	5.1	1.4	1	12/30/16 13:52	NA	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.1	2.0	1	12/30/16 13:52	NA	
1,2-Dibromoethane	ND U	5.1	1.3	1	12/30/16 13:52	NA	
1,2-Dichlorobenzene	ND U	5.1	0.63	1	12/30/16 13:52	NA	
1,2-Dichloroethane	ND U	5.1	0.63	1	12/30/16 13:52	NA	
1,2-Dichloropropane	ND U	5.1	1.0	1	12/30/16 13:52	NA	
1,3-Dichlorobenzene	ND U	5.1	0.65	1	12/30/16 13:52	NA	
1,4-Dioxane	ND U	100	20	1	12/30/16 13:52	NA	
2-Butanone (MEK)	ND U	5.1	2.4	1	12/30/16 13:52	NA	
2-Chloro-1,3-butadiene	ND U	5.1	1.6	1	12/30/16 13:52	NA	
2-Chloroethyl Vinyl Ether	ND U	5.1	1.8	1	12/30/16 13:52	NA	
Isobutyl Alcohol	ND U	100	24	1	12/30/16 13:52	NA	
Allyl Chloride	ND U	5.1	1.8	1	12/30/16 13:52	NA	
4-Methyl-2-pentanone	ND U	5.1	1.1	1	12/30/16 13:52	NA	
Acetone	ND U	5.1	2.9	1	12/30/16 13:52	NA	
Acetonitrile	ND U	26	18	1	12/30/16 13:52	NA	
Acrolein	ND U	26	3.6	1	12/30/16 13:52	NA	
Acrylonitrile	ND U	26	6.7	1	12/30/16 13:52	NA	
Benzene	ND U	5.1	0.30	1	12/30/16 13:52	NA	
Bromodichloromethane	ND U	5.1	0.63	1	12/30/16 13:52	NA	
Bromoform	ND U	5.1	0.96	1	12/30/16 13:52	NA	
Bromomethane	ND U	5.1	1.5	1	12/30/16 13:52	NA	
Carbon Disulfide	ND U	5.1	1.3	1	12/30/16 13:52	NA	
Carbon Tetrachloride	ND U	5.1	0.95	1	12/30/16 13:52	NA	
Chlorobenzene	ND U	5.1	0.30	1	12/30/16 13:52	NA	
Chloroethane	ND U	5.1	3.0	1	12/30/16 13:52	NA	
Chloroform	ND U	5.1	1.3	1	12/30/16 13:52	NA	
Chloromethane	ND U	5.1	0.42	1	12/30/16 13:52	NA	
Dibromochloromethane	ND U	5.1	0.76	1	12/30/16 13:52	NA	
Dibromomethane	ND U	5.1	0.65	1	12/30/16 13:52	NA	
Dichlorodifluoromethane (CFC 12)	ND U	5.1	2.0	1	12/30/16 13:52	NA	
Dichloromethane	ND U	5.1	0.59	1	12/30/16 13:52	NA	
Ethyl Methacrylate	ND U	5.1	0.78	1	12/30/16 13:52	NA	
Ethylbenzene	ND U	5.1	0.24	1	12/30/16 13:52	NA	
Iodomethane	ND U	10	1.2	1	12/30/16 13:52	NA	
Methacrylonitrile	ND U	5.1	1.6	1	12/30/16 13:52	NA	
Methyl Methacrylate	ND U	5.1	0.76	1	12/30/16 13:52	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201015 400-SB-09
Lab Code: R1613413-007

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Naphthalene	ND U	5.1	0.53	1	12/30/16 13:52	NA	
Propionitrile	ND U	26	6.7	1	12/30/16 13:52	NA	
Tetrachloroethene (PCE)	1.1 J	5.1	0.91	1	12/30/16 13:52	NA	
Toluene	ND U	5.1	1.1	1	12/30/16 13:52	NA	
Trichloroethene (TCE)	ND U	5.1	1.1	1	12/30/16 13:52	NA	
Trichlorofluoromethane (CFC 11)	ND U	5.1	0.68	1	12/30/16 13:52	NA	
Vinyl Chloride	ND U	5.1	1.9	1	12/30/16 13:52	NA	
cis-1,3-Dichloropropene	ND U	5.1	0.93	1	12/30/16 13:52	NA	
m,p-Xylenes	ND U	10	1.2	1	12/30/16 13:52	NA	
o-Xylene	ND U	5.1	0.50	1	12/30/16 13:52	NA	
trans-1,2-Dichloroethene	ND U	5.1	0.89	1	12/30/16 13:52	NA	
trans-1,3-Dichloropropene	ND U	5.1	0.21	1	12/30/16 13:52	NA	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	107	51 - 136	12/30/16 13:52	
Dibromofluoromethane	102	63 - 138	12/30/16 13:52	
Toluene-d8	106	66 - 138	12/30/16 13:52	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000104-76-7	1-Hexanol, 2-ethyl-	13.57	56	JN

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201016 400-SB-09
Lab Code: R1613413-008

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1,1,1,2-Tetrachloroethane	ND U	5.1	0.86	1	12/29/16 17:00	NA	
1,1,1-Trichloroethane (TCA)	ND U	5.1	0.75	1	12/29/16 17:00	NA	
1,1,2,2-Tetrachloroethane	ND U	5.1	0.84	1	12/29/16 17:00	NA	
1,1,2-Trichloroethane	ND U	5.1	0.75	1	12/29/16 17:00	NA	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.1	1.3	1	12/29/16 17:00	NA	
1,1-Dichloroethene (1,1-DCE)	ND U	5.1	1.4	1	12/29/16 17:00	NA	
1,2,3-Trichloropropane	ND U	5.1	1.4	1	12/29/16 17:00	NA	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.1	2.0	1	12/29/16 17:00	NA	
1,2-Dibromoethane	ND U	5.1	1.3	1	12/29/16 17:00	NA	
1,2-Dichlorobenzene	ND U	5.1	0.63	1	12/29/16 17:00	NA	
1,2-Dichloroethane	ND U	5.1	0.63	1	12/29/16 17:00	NA	
1,2-Dichloropropane	ND U	5.1	1.0	1	12/29/16 17:00	NA	
1,3-Dichlorobenzene	ND U	5.1	0.65	1	12/29/16 17:00	NA	
1,4-Dioxane	ND U	100	20	1	12/29/16 17:00	NA	
2-Butanone (MEK)	ND U	5.1	2.4	1	12/29/16 17:00	NA	
2-Chloro-1,3-butadiene	ND U	5.1	1.6	1	12/29/16 17:00	NA	
2-Chloroethyl Vinyl Ether	ND U	5.1	1.8	1	12/29/16 17:00	NA	
Isobutyl Alcohol	ND U	100	24	1	12/29/16 17:00	NA	
Allyl Chloride	ND U	5.1	1.8	1	12/29/16 17:00	NA	
4-Methyl-2-pentanone	ND U	5.1	1.1	1	12/29/16 17:00	NA	
Acetone	3.7 J	5.1	2.9	1	12/29/16 17:00	NA	
Acetonitrile	ND U	26	18	1	12/29/16 17:00	NA	
Acrolein	ND U	26	3.6	1	12/29/16 17:00	NA	
Acrylonitrile	ND U	26	6.7	1	12/29/16 17:00	NA	
Benzene	ND U	5.1	0.30	1	12/29/16 17:00	NA	
Bromodichloromethane	ND U	5.1	0.63	1	12/29/16 17:00	NA	
Bromoform	ND U	5.1	0.96	1	12/29/16 17:00	NA	
Bromomethane	ND U	5.1	1.5	1	12/29/16 17:00	NA	
Carbon Disulfide	ND U	5.1	1.3	1	12/29/16 17:00	NA	
Carbon Tetrachloride	ND U	5.1	0.95	1	12/29/16 17:00	NA	
Chlorobenzene	ND U	5.1	0.30	1	12/29/16 17:00	NA	
Chloroethane	ND U	5.1	3.0	1	12/29/16 17:00	NA	
Chloroform	ND U	5.1	1.3	1	12/29/16 17:00	NA	
Chloromethane	ND U	5.1	0.42	1	12/29/16 17:00	NA	
Dibromochloromethane	ND U	5.1	0.75	1	12/29/16 17:00	NA	
Dibromomethane	ND U	5.1	0.65	1	12/29/16 17:00	NA	
Dichlorodifluoromethane (CFC 12)	ND U	5.1	2.0	1	12/29/16 17:00	NA	
Dichloromethane	0.78 J	5.1	0.59	1	12/29/16 17:00	NA	
Ethyl Methacrylate	ND U	5.1	0.77	1	12/29/16 17:00	NA	
Ethylbenzene	ND U	5.1	0.24	1	12/29/16 17:00	NA	
Iodomethane	ND U	10	1.2	1	12/29/16 17:00	NA	
Methacrylonitrile	ND U	5.1	1.6	1	12/29/16 17:00	NA	
Methyl Methacrylate	ND U	5.1	0.75	1	12/29/16 17:00	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201016 400-SB-09
Lab Code: R1613413-008

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Naphthalene	ND U	5.1	0.53	1	12/29/16 17:00	NA	
Propionitrile	ND U	26	6.7	1	12/29/16 17:00	NA	
Tetrachloroethene (PCE)	ND U	5.1	0.91	1	12/29/16 17:00	NA	
Toluene	ND U	5.1	1.1	1	12/29/16 17:00	NA	
Trichloroethene (TCE)	ND U	5.1	1.1	1	12/29/16 17:00	NA	
Trichlorofluoromethane (CFC 11)	ND U	5.1	0.68	1	12/29/16 17:00	NA	
Vinyl Chloride	ND U	5.1	1.9	1	12/29/16 17:00	NA	
cis-1,3-Dichloropropene	ND U	5.1	0.93	1	12/29/16 17:00	NA	
m,p-Xylenes	ND U	10	1.2	1	12/29/16 17:00	NA	
o-Xylene	ND U	5.1	0.50	1	12/29/16 17:00	NA	
trans-1,2-Dichloroethene	ND U	5.1	0.89	1	12/29/16 17:00	NA	
trans-1,3-Dichloropropene	ND U	5.1	0.21	1	12/29/16 17:00	NA	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	102	51 - 136	12/29/16 17:00	
Dibromofluoromethane	99	63 - 138	12/29/16 17:00	
Toluene-d8	102	66 - 138	12/29/16 17:00	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	unknown	13.57	74	J

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201030 400-SB-11
Lab Code: R1613413-013

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1,1,1,2-Tetrachloroethane	ND U	5.6	0.94	1	12/29/16 17:24	NA	
1,1,1-Trichloroethane (TCA)	ND U	5.6	0.83	1	12/29/16 17:24	NA	
1,1,2,2-Tetrachloroethane	ND U	5.6	0.92	1	12/29/16 17:24	NA	
1,1,2-Trichloroethane	ND U	5.6	0.83	1	12/29/16 17:24	NA	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.6	1.4	1	12/29/16 17:24	NA	
1,1-Dichloroethene (1,1-DCE)	ND U	5.6	1.5	1	12/29/16 17:24	NA	
1,2,3-Trichloropropane	ND U	5.6	1.5	1	12/29/16 17:24	NA	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.6	2.2	1	12/29/16 17:24	NA	
1,2-Dibromoethane	ND U	5.6	1.4	1	12/29/16 17:24	NA	
1,2-Dichlorobenzene	ND U	5.6	0.69	1	12/29/16 17:24	NA	
1,2-Dichloroethane	ND U	5.6	0.69	1	12/29/16 17:24	NA	
1,2-Dichloropropane	ND U	5.6	1.1	1	12/29/16 17:24	NA	
1,3-Dichlorobenzene	ND U	5.6	0.71	1	12/29/16 17:24	NA	
1,4-Dioxane	ND U	110	22	1	12/29/16 17:24	NA	
2-Butanone (MEK)	ND U	5.6	2.6	1	12/29/16 17:24	NA	
2-Chloro-1,3-butadiene	ND U	5.6	1.8	1	12/29/16 17:24	NA	
2-Chloroethyl Vinyl Ether	ND U	5.6	2.0	1	12/29/16 17:24	NA	
Isobutyl Alcohol	ND U	110	26	1	12/29/16 17:24	NA	
Allyl Chloride	ND U	5.6	2.0	1	12/29/16 17:24	NA	
4-Methyl-2-pentanone	ND U	5.6	1.2	1	12/29/16 17:24	NA	
Acetone	4.5 J	5.6	3.2	1	12/29/16 17:24	NA	
Acetonitrile	ND U	28	19	1	12/29/16 17:24	NA	
Acrolein	ND U	28	4.0	1	12/29/16 17:24	NA	
Acrylonitrile	ND U	28	7.3	1	12/29/16 17:24	NA	
Benzene	ND U	5.6	0.33	1	12/29/16 17:24	NA	
Bromodichloromethane	ND U	5.6	0.69	1	12/29/16 17:24	NA	
Bromoform	ND U	5.6	1.1	1	12/29/16 17:24	NA	
Bromomethane	ND U	5.6	1.6	1	12/29/16 17:24	NA	
Carbon Disulfide	ND U	5.6	1.4	1	12/29/16 17:24	NA	
Carbon Tetrachloride	ND U	5.6	1.1	1	12/29/16 17:24	NA	
Chlorobenzene	ND U	5.6	0.33	1	12/29/16 17:24	NA	
Chloroethane	ND U	5.6	3.3	1	12/29/16 17:24	NA	
Chloroform	ND U	5.6	1.5	1	12/29/16 17:24	NA	
Chloromethane	ND U	5.6	0.45	1	12/29/16 17:24	NA	
Dibromochloromethane	ND U	5.6	0.83	1	12/29/16 17:24	NA	
Dibromomethane	ND U	5.6	0.71	1	12/29/16 17:24	NA	
Dichlorodifluoromethane (CFC 12)	ND U	5.6	2.2	1	12/29/16 17:24	NA	
Dichloromethane	1.1 J	5.6	0.65	1	12/29/16 17:24	NA	
Ethyl Methacrylate	ND U	5.6	0.85	1	12/29/16 17:24	NA	
Ethylbenzene	ND U	5.6	0.26	1	12/29/16 17:24	NA	
Iodomethane	ND U	11	1.3	1	12/29/16 17:24	NA	
Methacrylonitrile	ND U	5.6	1.7	1	12/29/16 17:24	NA	
Methyl Methacrylate	ND U	5.6	0.83	1	12/29/16 17:24	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201030 400-SB-11
Lab Code: R1613413-013

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Naphthalene	ND U	5.6	0.58	1	12/29/16 17:24	NA	
Propionitrile	ND U	28	7.4	1	12/29/16 17:24	NA	
Tetrachloroethene (PCE)	2.4 J	5.6	0.99	1	12/29/16 17:24	NA	
Toluene	ND U	5.6	1.2	1	12/29/16 17:24	NA	
Trichloroethene (TCE)	ND U	5.6	1.2	1	12/29/16 17:24	NA	
Trichlorofluoromethane (CFC 11)	ND U	5.6	0.75	1	12/29/16 17:24	NA	
Vinyl Chloride	ND U	5.6	2.1	1	12/29/16 17:24	NA	
cis-1,3-Dichloropropene	ND U	5.6	1.1	1	12/29/16 17:24	NA	
m,p-Xylenes	ND U	11	1.3	1	12/29/16 17:24	NA	
o-Xylene	ND U	5.6	0.54	1	12/29/16 17:24	NA	
trans-1,2-Dichloroethene	ND U	5.6	0.97	1	12/29/16 17:24	NA	
trans-1,3-Dichloropropene	ND U	5.6	0.23	1	12/29/16 17:24	NA	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	102	51 - 136	12/29/16 17:24	
Dibromofluoromethane	98	63 - 138	12/29/16 17:24	
Toluene-d8	101	66 - 138	12/29/16 17:24	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201040 400-SB-11
Lab Code: R1613413-016

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1,1,1,2-Tetrachloroethane	ND U	5.3	0.89	1	12/30/16 14:16	NA	
1,1,1-Trichloroethane (TCA)	ND U	5.3	0.78	1	12/30/16 14:16	NA	
1,1,2,2-Tetrachloroethane	ND U	5.3	0.86	1	12/30/16 14:16	NA	
1,1,2-Trichloroethane	ND U	5.3	0.78	1	12/30/16 14:16	NA	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.3	1.4	1	12/30/16 14:16	NA	
1,1-Dichloroethene (1,1-DCE)	ND U	5.3	1.4	1	12/30/16 14:16	NA	
1,2,3-Trichloropropane	ND U	5.3	1.4	1	12/30/16 14:16	NA	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.3	2.0	1	12/30/16 14:16	NA	
1,2-Dibromoethane	ND U	5.3	1.3	1	12/30/16 14:16	NA	
1,2-Dichlorobenzene	ND U	5.3	0.65	1	12/30/16 14:16	NA	
1,2-Dichloroethane	ND U	5.3	0.65	1	12/30/16 14:16	NA	
1,2-Dichloropropane	ND U	5.3	1.1	1	12/30/16 14:16	NA	
1,3-Dichlorobenzene	ND U	5.3	0.67	1	12/30/16 14:16	NA	
1,4-Dioxane	ND U	110	21	1	12/30/16 14:16	NA	
2-Butanone (MEK)	ND U	5.3	2.5	1	12/30/16 14:16	NA	
2-Chloro-1,3-butadiene	ND U	5.3	1.7	1	12/30/16 14:16	NA	
2-Chloroethyl Vinyl Ether	ND U	5.3	1.9	1	12/30/16 14:16	NA	
Isobutyl Alcohol	ND U	110	25	1	12/30/16 14:16	NA	
Allyl Chloride	ND U	5.3	1.8	1	12/30/16 14:16	NA	
4-Methyl-2-pentanone	ND U	5.3	1.1	1	12/30/16 14:16	NA	
Acetone	ND U	5.3	3.0	1	12/30/16 14:16	NA	
Acetonitrile	ND U	27	18	1	12/30/16 14:16	NA	
Acrolein	ND U	27	3.8	1	12/30/16 14:16	NA	
Acrylonitrile	ND U	27	6.9	1	12/30/16 14:16	NA	
Benzene	ND U	5.3	0.31	1	12/30/16 14:16	NA	
Bromodichloromethane	ND U	5.3	0.65	1	12/30/16 14:16	NA	
Bromoform	ND U	5.3	0.99	1	12/30/16 14:16	NA	
Bromomethane	ND U	5.3	1.5	1	12/30/16 14:16	NA	
Carbon Disulfide	ND U	5.3	1.4	1	12/30/16 14:16	NA	
Carbon Tetrachloride	ND U	5.3	0.98	1	12/30/16 14:16	NA	
Chlorobenzene	ND U	5.3	0.31	1	12/30/16 14:16	NA	
Chloroethane	ND U	5.3	3.1	1	12/30/16 14:16	NA	
Chloroform	ND U	5.3	1.4	1	12/30/16 14:16	NA	
Chloromethane	ND U	5.3	0.43	1	12/30/16 14:16	NA	
Dibromochloromethane	ND U	5.3	0.78	1	12/30/16 14:16	NA	
Dibromomethane	ND U	5.3	0.67	1	12/30/16 14:16	NA	
Dichlorodifluoromethane (CFC 12)	ND U	5.3	2.1	1	12/30/16 14:16	NA	
Dichloromethane	ND U	5.3	0.61	1	12/30/16 14:16	NA	
Ethyl Methacrylate	ND U	5.3	0.80	1	12/30/16 14:16	NA	
Ethylbenzene	ND U	5.3	0.25	1	12/30/16 14:16	NA	
Iodomethane	ND U	11	1.2	1	12/30/16 14:16	NA	
Methacrylonitrile	ND U	5.3	1.7	1	12/30/16 14:16	NA	
Methyl Methacrylate	ND U	5.3	0.78	1	12/30/16 14:16	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201040 400-SB-11
Lab Code: R1613413-016

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Naphthalene	ND U	5.3	0.55	1	12/30/16 14:16	NA	
Propionitrile	ND U	27	6.9	1	12/30/16 14:16	NA	
Tetrachloroethene (PCE)	1.8 J	5.3	0.94	1	12/30/16 14:16	NA	
Toluene	ND U	5.3	1.1	1	12/30/16 14:16	NA	
Trichloroethene (TCE)	ND U	5.3	1.1	1	12/30/16 14:16	NA	
Trichlorofluoromethane (CFC 11)	ND U	5.3	0.70	1	12/30/16 14:16	NA	
Vinyl Chloride	ND U	5.3	2.0	1	12/30/16 14:16	NA	
cis-1,3-Dichloropropene	ND U	5.3	0.96	1	12/30/16 14:16	NA	
m,p-Xylenes	ND U	11	1.2	1	12/30/16 14:16	NA	
o-Xylene	ND U	5.3	0.51	1	12/30/16 14:16	NA	
trans-1,2-Dichloroethene	ND U	5.3	0.92	1	12/30/16 14:16	NA	
trans-1,3-Dichloropropene	ND U	5.3	0.22	1	12/30/16 14:16	NA	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	103	51 - 136	12/30/16 14:16	
Dibromofluoromethane	102	63 - 138	12/30/16 14:16	
Toluene-d8	107	66 - 138	12/30/16 14:16	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	unknown	13.57	5.3	J

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Sample Name: 1612201041 400-SB-11
Lab Code: R1613413-017

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1,1,1,2-Tetrachloroethane	ND U	5.3	0.89	1	12/29/16 17:48	NA	
1,1,1-Trichloroethane (TCA)	ND U	5.3	0.78	1	12/29/16 17:48	NA	
1,1,2,2-Tetrachloroethane	ND U	5.3	0.87	1	12/29/16 17:48	NA	
1,1,2-Trichloroethane	ND U	5.3	0.78	1	12/29/16 17:48	NA	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.3	1.4	1	12/29/16 17:48	NA	
1,1-Dichloroethene (1,1-DCE)	ND U	5.3	1.4	1	12/29/16 17:48	NA	
1,2,3-Trichloropropane	ND U	5.3	1.5	1	12/29/16 17:48	NA	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.3	2.0	1	12/29/16 17:48	NA	
1,2-Dibromoethane	ND U	5.3	1.3	1	12/29/16 17:48	NA	
1,2-Dichlorobenzene	ND U	5.3	0.66	1	12/29/16 17:48	NA	
1,2-Dichloroethane	ND U	5.3	0.66	1	12/29/16 17:48	NA	
1,2-Dichloropropane	ND U	5.3	1.1	1	12/29/16 17:48	NA	
1,3-Dichlorobenzene	ND U	5.3	0.68	1	12/29/16 17:48	NA	
1,4-Dioxane	ND U	110	21	1	12/29/16 17:48	NA	
2-Butanone (MEK)	ND U	5.3	2.5	1	12/29/16 17:48	NA	
2-Chloro-1,3-butadiene	ND U	5.3	1.7	1	12/29/16 17:48	NA	
2-Chloroethyl Vinyl Ether	ND U	5.3	1.9	1	12/29/16 17:48	NA	
Isobutyl Alcohol	ND U	110	25	1	12/29/16 17:48	NA	
Allyl Chloride	ND U	5.3	1.9	1	12/29/16 17:48	NA	
4-Methyl-2-pentanone	ND U	5.3	1.1	1	12/29/16 17:48	NA	
Acetone	6.8	5.3	3.0	1	12/29/16 17:48	NA	
Acetonitrile	ND U	27	18	1	12/29/16 17:48	NA	
Acrolein	ND U	27	3.8	1	12/29/16 17:48	NA	
Acrylonitrile	ND U	27	6.9	1	12/29/16 17:48	NA	
Benzene	ND U	5.3	0.31	1	12/29/16 17:48	NA	
Bromodichloromethane	ND U	5.3	0.66	1	12/29/16 17:48	NA	
Bromoform	ND U	5.3	1.0	1	12/29/16 17:48	NA	
Bromomethane	ND U	5.3	1.5	1	12/29/16 17:48	NA	
Carbon Disulfide	ND U	5.3	1.4	1	12/29/16 17:48	NA	
Carbon Tetrachloride	ND U	5.3	0.99	1	12/29/16 17:48	NA	
Chlorobenzene	ND U	5.3	0.31	1	12/29/16 17:48	NA	
Chloroethane	ND U	5.3	3.1	1	12/29/16 17:48	NA	
Chloroform	ND U	5.3	1.4	1	12/29/16 17:48	NA	
Chloromethane	ND U	5.3	0.43	1	12/29/16 17:48	NA	
Dibromochloromethane	ND U	5.3	0.78	1	12/29/16 17:48	NA	
Dibromomethane	ND U	5.3	0.68	1	12/29/16 17:48	NA	
Dichlorodifluoromethane (CFC 12)	ND U	5.3	2.1	1	12/29/16 17:48	NA	
Dichloromethane	0.93 J	5.3	0.61	1	12/29/16 17:48	NA	
Ethyl Methacrylate	ND U	5.3	0.80	1	12/29/16 17:48	NA	
Ethylbenzene	ND U	5.3	0.25	1	12/29/16 17:48	NA	
Iodomethane	ND U	11	1.2	1	12/29/16 17:48	NA	
Methacrylonitrile	ND U	5.3	1.7	1	12/29/16 17:48	NA	
Methyl Methacrylate	ND U	5.3	0.78	1	12/29/16 17:48	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201041 400-SB-11
Lab Code: R1613413-017

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Naphthalene	ND U	5.3	0.55	1	12/29/16 17:48	NA	
Propionitrile	ND U	27	7.0	1	12/29/16 17:48	NA	
Tetrachloroethene (PCE)	1.0 J	5.3	0.94	1	12/29/16 17:48	NA	
Toluene	ND U	5.3	1.1	1	12/29/16 17:48	NA	
Trichloroethene (TCE)	ND U	5.3	1.1	1	12/29/16 17:48	NA	
Trichlorofluoromethane (CFC 11)	ND U	5.3	0.71	1	12/29/16 17:48	NA	
Vinyl Chloride	ND U	5.3	2.0	1	12/29/16 17:48	NA	
cis-1,3-Dichloropropene	ND U	5.3	0.96	1	12/29/16 17:48	NA	
m,p-Xylenes	ND U	11	1.2	1	12/29/16 17:48	NA	
o-Xylene	ND U	5.3	0.52	1	12/29/16 17:48	NA	
trans-1,2-Dichloroethene	ND U	5.3	0.92	1	12/29/16 17:48	NA	
trans-1,3-Dichloropropene	ND U	5.3	0.22	1	12/29/16 17:48	NA	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	100	51 - 136	12/29/16 17:48	
Dibromofluoromethane	95	63 - 138	12/29/16 17:48	
Toluene-d8	104	66 - 138	12/29/16 17:48	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201100 400-SB-13
Lab Code: R1613413-022

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1,1,1,2-Tetrachloroethane	ND U	5.2	0.87	1	12/29/16 18:12	NA	
1,1,1-Trichloroethane (TCA)	ND U	5.2	0.77	1	12/29/16 18:12	NA	
1,1,2,2-Tetrachloroethane	ND U	5.2	0.85	1	12/29/16 18:12	NA	
1,1,2-Trichloroethane	ND U	5.2	0.77	1	12/29/16 18:12	NA	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.2	1.3	1	12/29/16 18:12	NA	
1,1-Dichloroethene (1,1-DCE)	ND U	5.2	1.4	1	12/29/16 18:12	NA	
1,2,3-Trichloropropane	ND U	5.2	1.4	1	12/29/16 18:12	NA	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.2	2.0	1	12/29/16 18:12	NA	
1,2-Dibromoethane	ND U	5.2	1.3	1	12/29/16 18:12	NA	
1,2-Dichlorobenzene	ND U	5.2	0.64	1	12/29/16 18:12	NA	
1,2-Dichloroethane	ND U	5.2	0.64	1	12/29/16 18:12	NA	
1,2-Dichloropropane	ND U	5.2	1.1	1	12/29/16 18:12	NA	
1,3-Dichlorobenzene	ND U	5.2	0.66	1	12/29/16 18:12	NA	
1,4-Dioxane	ND U	100	20	1	12/29/16 18:12	NA	
2-Butanone (MEK)	ND U	5.2	2.4	1	12/29/16 18:12	NA	
2-Chloro-1,3-butadiene	ND U	5.2	1.6	1	12/29/16 18:12	NA	
2-Chloroethyl Vinyl Ether	ND U	5.2	1.8	1	12/29/16 18:12	NA	
Isobutyl Alcohol	ND U	100	24	1	12/29/16 18:12	NA	
Allyl Chloride	ND U	5.2	1.8	1	12/29/16 18:12	NA	
4-Methyl-2-pentanone	ND U	5.2	1.1	1	12/29/16 18:12	NA	
Acetone	ND U	5.2	3.0	1	12/29/16 18:12	NA	
Acetonitrile	ND U	26	18	1	12/29/16 18:12	NA	
Acrolein	ND U	26	3.7	1	12/29/16 18:12	NA	
Acrylonitrile	ND U	26	6.8	1	12/29/16 18:12	NA	
Benzene	ND U	5.2	0.31	1	12/29/16 18:12	NA	
Bromodichloromethane	ND U	5.2	0.64	1	12/29/16 18:12	NA	
Bromoform	ND U	5.2	0.98	1	12/29/16 18:12	NA	
Bromomethane	ND U	5.2	1.5	1	12/29/16 18:12	NA	
Carbon Disulfide	ND U	5.2	1.3	1	12/29/16 18:12	NA	
Carbon Tetrachloride	ND U	5.2	0.97	1	12/29/16 18:12	NA	
Chlorobenzene	ND U	5.2	0.31	1	12/29/16 18:12	NA	
Chloroethane	ND U	5.2	3.0	1	12/29/16 18:12	NA	
Chloroform	ND U	5.2	1.4	1	12/29/16 18:12	NA	
Chloromethane	ND U	5.2	0.42	1	12/29/16 18:12	NA	
Dibromochloromethane	ND U	5.2	0.77	1	12/29/16 18:12	NA	
Dibromomethane	ND U	5.2	0.66	1	12/29/16 18:12	NA	
Dichlorodifluoromethane (CFC 12)	ND U	5.2	2.0	1	12/29/16 18:12	NA	
Dichloromethane	0.77 J	5.2	0.60	1	12/29/16 18:12	NA	
Ethyl Methacrylate	ND U	5.2	0.79	1	12/29/16 18:12	NA	
Ethylbenzene	ND U	5.2	0.25	1	12/29/16 18:12	NA	
Iodomethane	ND U	10	1.2	1	12/29/16 18:12	NA	
Methacrylonitrile	ND U	5.2	1.6	1	12/29/16 18:12	NA	
Methyl Methacrylate	ND U	5.2	0.77	1	12/29/16 18:12	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201100 400-SB-13
Lab Code: R1613413-022

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Naphthalene	ND U	5.2	0.54	1	12/29/16 18:12	NA	
Propionitrile	ND U	26	6.8	1	12/29/16 18:12	NA	
Tetrachloroethene (PCE)	ND U	5.2	0.92	1	12/29/16 18:12	NA	
Toluene	ND U	5.2	1.1	1	12/29/16 18:12	NA	
Trichloroethene (TCE)	ND U	5.2	1.1	1	12/29/16 18:12	NA	
Trichlorofluoromethane (CFC 11)	ND U	5.2	0.69	1	12/29/16 18:12	NA	
Vinyl Chloride	ND U	5.2	2.0	1	12/29/16 18:12	NA	
cis-1,3-Dichloropropene	ND U	5.2	0.94	1	12/29/16 18:12	NA	
m,p-Xylenes	ND U	10	1.2	1	12/29/16 18:12	NA	
o-Xylene	ND U	5.2	0.51	1	12/29/16 18:12	NA	
trans-1,2-Dichloroethene	ND U	5.2	0.90	1	12/29/16 18:12	NA	
trans-1,3-Dichloropropene	ND U	5.2	0.21	1	12/29/16 18:12	NA	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	105	51 - 136	12/29/16 18:12	
Dibromofluoromethane	99	63 - 138	12/29/16 18:12	
Toluene-d8	104	66 - 138	12/29/16 18:12	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201315 400-SB-13
Lab Code: R1613413-025

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1,1,1,2-Tetrachloroethane	ND U	5.2	0.86	1	12/29/16 18:36	NA	
1,1,1-Trichloroethane (TCA)	ND U	5.2	0.76	1	12/29/16 18:36	NA	
1,1,2,2-Tetrachloroethane	ND U	5.2	0.84	1	12/29/16 18:36	NA	
1,1,2-Trichloroethane	ND U	5.2	0.76	1	12/29/16 18:36	NA	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.2	1.3	1	12/29/16 18:36	NA	
1,1-Dichloroethene (1,1-DCE)	ND U	5.2	1.4	1	12/29/16 18:36	NA	
1,2,3-Trichloropropane	ND U	5.2	1.4	1	12/29/16 18:36	NA	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.2	2.0	1	12/29/16 18:36	NA	
1,2-Dibromoethane	ND U	5.2	1.3	1	12/29/16 18:36	NA	
1,2-Dichlorobenzene	ND U	5.2	0.64	1	12/29/16 18:36	NA	
1,2-Dichloroethane	ND U	5.2	0.64	1	12/29/16 18:36	NA	
1,2-Dichloropropane	ND U	5.2	1.1	1	12/29/16 18:36	NA	
1,3-Dichlorobenzene	ND U	5.2	0.66	1	12/29/16 18:36	NA	
1,4-Dioxane	ND U	100	20	1	12/29/16 18:36	NA	
2-Butanone (MEK)	ND U	5.2	2.4	1	12/29/16 18:36	NA	
2-Chloro-1,3-butadiene	ND U	5.2	1.6	1	12/29/16 18:36	NA	
2-Chloroethyl Vinyl Ether	ND U	5.2	1.8	1	12/29/16 18:36	NA	
Isobutyl Alcohol	ND U	100	24	1	12/29/16 18:36	NA	
Allyl Chloride	ND U	5.2	1.8	1	12/29/16 18:36	NA	
4-Methyl-2-pentanone	ND U	5.2	1.1	1	12/29/16 18:36	NA	
Acetone	ND U	5.2	3.0	1	12/29/16 18:36	NA	
Acetonitrile	ND U	26	18	1	12/29/16 18:36	NA	
Acrolein	ND U	26	3.7	1	12/29/16 18:36	NA	
Acrylonitrile	ND U	26	6.7	1	12/29/16 18:36	NA	
Benzene	ND U	5.2	0.30	1	12/29/16 18:36	NA	
Bromodichloromethane	ND U	5.2	0.64	1	12/29/16 18:36	NA	
Bromoform	ND U	5.2	0.97	1	12/29/16 18:36	NA	
Bromomethane	ND U	5.2	1.5	1	12/29/16 18:36	NA	
Carbon Disulfide	ND U	5.2	1.3	1	12/29/16 18:36	NA	
Carbon Tetrachloride	ND U	5.2	0.96	1	12/29/16 18:36	NA	
Chlorobenzene	ND U	5.2	0.30	1	12/29/16 18:36	NA	
Chloroethane	ND U	5.2	3.0	1	12/29/16 18:36	NA	
Chloroform	ND U	5.2	1.4	1	12/29/16 18:36	NA	
Chloromethane	ND U	5.2	0.42	1	12/29/16 18:36	NA	
Dibromochloromethane	ND U	5.2	0.76	1	12/29/16 18:36	NA	
Dibromomethane	ND U	5.2	0.66	1	12/29/16 18:36	NA	
Dichlorodifluoromethane (CFC 12)	ND U	5.2	2.0	1	12/29/16 18:36	NA	
Dichloromethane	0.79 J	5.2	0.59	1	12/29/16 18:36	NA	
Ethyl Methacrylate	ND U	5.2	0.78	1	12/29/16 18:36	NA	
Ethylbenzene	ND U	5.2	0.24	1	12/29/16 18:36	NA	
Iodomethane	ND U	10	1.2	1	12/29/16 18:36	NA	
Methacrylonitrile	ND U	5.2	1.6	1	12/29/16 18:36	NA	
Methyl Methacrylate	ND U	5.2	0.76	1	12/29/16 18:36	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201315 400-SB-13
Lab Code: R1613413-025

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Naphthalene	ND U	5.2	0.53	1	12/29/16 18:36	NA	
Propionitrile	ND U	26	6.8	1	12/29/16 18:36	NA	
Tetrachloroethene (PCE)	ND U	5.2	0.91	1	12/29/16 18:36	NA	
Toluene	ND U	5.2	1.1	1	12/29/16 18:36	NA	
Trichloroethene (TCE)	ND U	5.2	1.1	1	12/29/16 18:36	NA	
Trichlorofluoromethane (CFC 11)	ND U	5.2	0.69	1	12/29/16 18:36	NA	
Vinyl Chloride	ND U	5.2	2.0	1	12/29/16 18:36	NA	
cis-1,3-Dichloropropene	ND U	5.2	0.93	1	12/29/16 18:36	NA	
m,p-Xylenes	ND U	10	1.2	1	12/29/16 18:36	NA	
o-Xylene	ND U	5.2	0.50	1	12/29/16 18:36	NA	
trans-1,2-Dichloroethene	ND U	5.2	0.89	1	12/29/16 18:36	NA	
trans-1,3-Dichloropropene	ND U	5.2	0.21	1	12/29/16 18:36	NA	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	106	51 - 136	12/29/16 18:36	
Dibromofluoromethane	101	63 - 138	12/29/16 18:36	
Toluene-d8	105	66 - 138	12/29/16 18:36	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Sample Name: 1612201330 400-SB-13
Lab Code: R1613413-028

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1,1,1,2-Tetrachloroethane	ND U	5.3	0.89	1	12/30/16 14:40	NA	
1,1,1-Trichloroethane (TCA)	ND U	5.3	0.78	1	12/30/16 14:40	NA	
1,1,2,2-Tetrachloroethane	ND U	5.3	0.87	1	12/30/16 14:40	NA	
1,1,2-Trichloroethane	ND U	5.3	0.78	1	12/30/16 14:40	NA	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.3	1.4	1	12/30/16 14:40	NA	
1,1-Dichloroethene (1,1-DCE)	ND U	5.3	1.4	1	12/30/16 14:40	NA	
1,2,3-Trichloropropane	ND U	5.3	1.5	1	12/30/16 14:40	NA	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.3	2.0	1	12/30/16 14:40	NA	
1,2-Dibromoethane	ND U	5.3	1.3	1	12/30/16 14:40	NA	
1,2-Dichlorobenzene	ND U	5.3	0.66	1	12/30/16 14:40	NA	
1,2-Dichloroethane	ND U	5.3	0.66	1	12/30/16 14:40	NA	
1,2-Dichloropropane	ND U	5.3	1.1	1	12/30/16 14:40	NA	
1,3-Dichlorobenzene	ND U	5.3	0.68	1	12/30/16 14:40	NA	
1,4-Dioxane	ND U	110	21	1	12/30/16 14:40	NA	
2-Butanone (MEK)	ND U	5.3	2.5	1	12/30/16 14:40	NA	
2-Chloro-1,3-butadiene	ND U	5.3	1.7	1	12/30/16 14:40	NA	
2-Chloroethyl Vinyl Ether	ND U	5.3	1.9	1	12/30/16 14:40	NA	
Isobutyl Alcohol	ND U	110	25	1	12/30/16 14:40	NA	
Allyl Chloride	ND U	5.3	1.9	1	12/30/16 14:40	NA	
4-Methyl-2-pentanone	ND U	5.3	1.1	1	12/30/16 14:40	NA	
Acetone	ND U	5.3	3.1	1	12/30/16 14:40	NA	
Acetonitrile	ND U	27	18	1	12/30/16 14:40	NA	
Acrolein	ND U	27	3.8	1	12/30/16 14:40	NA	
Acrylonitrile	ND U	27	7.0	1	12/30/16 14:40	NA	
Benzene	ND U	5.3	0.31	1	12/30/16 14:40	NA	
Bromodichloromethane	ND U	5.3	0.66	1	12/30/16 14:40	NA	
Bromoform	ND U	5.3	1.0	1	12/30/16 14:40	NA	
Bromomethane	ND U	5.3	1.5	1	12/30/16 14:40	NA	
Carbon Disulfide	ND U	5.3	1.4	1	12/30/16 14:40	NA	
Carbon Tetrachloride	ND U	5.3	0.99	1	12/30/16 14:40	NA	
Chlorobenzene	ND U	5.3	0.31	1	12/30/16 14:40	NA	
Chloroethane	ND U	5.3	3.1	1	12/30/16 14:40	NA	
Chloroform	ND U	5.3	1.4	1	12/30/16 14:40	NA	
Chloromethane	ND U	5.3	0.43	1	12/30/16 14:40	NA	
Dibromochloromethane	ND U	5.3	0.78	1	12/30/16 14:40	NA	
Dibromomethane	ND U	5.3	0.68	1	12/30/16 14:40	NA	
Dichlorodifluoromethane (CFC 12)	ND U	5.3	2.1	1	12/30/16 14:40	NA	
Dichloromethane	ND U	5.3	0.61	1	12/30/16 14:40	NA	
Ethyl Methacrylate	ND U	5.3	0.81	1	12/30/16 14:40	NA	
Ethylbenzene	ND U	5.3	0.25	1	12/30/16 14:40	NA	
Iodomethane	ND U	11	1.2	1	12/30/16 14:40	NA	
Methacrylonitrile	ND U	5.3	1.7	1	12/30/16 14:40	NA	
Methyl Methacrylate	ND U	5.3	0.78	1	12/30/16 14:40	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201330 400-SB-13
Lab Code: R1613413-028

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Naphthalene	ND U	5.3	0.55	1	12/30/16 14:40	NA	
Propionitrile	ND U	27	7.0	1	12/30/16 14:40	NA	
Tetrachloroethene (PCE)	ND U	5.3	0.95	1	12/30/16 14:40	NA	
Toluene	ND U	5.3	1.1	1	12/30/16 14:40	NA	
Trichloroethene (TCE)	ND U	5.3	1.1	1	12/30/16 14:40	NA	
Trichlorofluoromethane (CFC 11)	ND U	5.3	0.71	1	12/30/16 14:40	NA	
Vinyl Chloride	ND U	5.3	2.0	1	12/30/16 14:40	NA	
cis-1,3-Dichloropropene	ND U	5.3	0.97	1	12/30/16 14:40	NA	
m,p-Xylenes	ND U	11	1.2	1	12/30/16 14:40	NA	
o-Xylene	ND U	5.3	0.52	1	12/30/16 14:40	NA	
trans-1,2-Dichloroethene	ND U	5.3	0.92	1	12/30/16 14:40	NA	
trans-1,3-Dichloropropene	ND U	5.3	0.22	1	12/30/16 14:40	NA	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	103	51 - 136	12/30/16 14:40	
Dibromofluoromethane	95	63 - 138	12/30/16 14:40	
Toluene-d8	106	66 - 138	12/30/16 14:40	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201331 400-SB-13
Lab Code: R1613413-029

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1,1,1,2-Tetrachloroethane	ND U	5.3	0.89	1	12/29/16 19:01	NA	
1,1,1-Trichloroethane (TCA)	ND U	5.3	0.78	1	12/29/16 19:01	NA	
1,1,2,2-Tetrachloroethane	ND U	5.3	0.87	1	12/29/16 19:01	NA	
1,1,2-Trichloroethane	ND U	5.3	0.78	1	12/29/16 19:01	NA	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.3	1.4	1	12/29/16 19:01	NA	
1,1-Dichloroethene (1,1-DCE)	ND U	5.3	1.4	1	12/29/16 19:01	NA	
1,2,3-Trichloropropane	ND U	5.3	1.5	1	12/29/16 19:01	NA	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.3	2.0	1	12/29/16 19:01	NA	
1,2-Dibromoethane	ND U	5.3	1.3	1	12/29/16 19:01	NA	
1,2-Dichlorobenzene	ND U	5.3	0.66	1	12/29/16 19:01	NA	
1,2-Dichloroethane	ND U	5.3	0.66	1	12/29/16 19:01	NA	
1,2-Dichloropropane	ND U	5.3	1.1	1	12/29/16 19:01	NA	
1,3-Dichlorobenzene	ND U	5.3	0.68	1	12/29/16 19:01	NA	
1,4-Dioxane	ND U	110	21	1	12/29/16 19:01	NA	
2-Butanone (MEK)	ND U	5.3	2.5	1	12/29/16 19:01	NA	
2-Chloro-1,3-butadiene	ND U	5.3	1.7	1	12/29/16 19:01	NA	
2-Chloroethyl Vinyl Ether	ND U	5.3	1.9	1	12/29/16 19:01	NA	
Isobutyl Alcohol	ND U	110	25	1	12/29/16 19:01	NA	
Allyl Chloride	ND U	5.3	1.9	1	12/29/16 19:01	NA	
4-Methyl-2-pentanone	ND U	5.3	1.1	1	12/29/16 19:01	NA	
Acetone	ND U	5.3	3.1	1	12/29/16 19:01	NA	
Acetonitrile	ND U	27	18	1	12/29/16 19:01	NA	
Acrolein	ND U	27	3.8	1	12/29/16 19:01	NA	
Acrylonitrile	ND U	27	7.0	1	12/29/16 19:01	NA	
Benzene	ND U	5.3	0.31	1	12/29/16 19:01	NA	
Bromodichloromethane	ND U	5.3	0.66	1	12/29/16 19:01	NA	
Bromoform	ND U	5.3	1.0	1	12/29/16 19:01	NA	
Bromomethane	ND U	5.3	1.5	1	12/29/16 19:01	NA	
Carbon Disulfide	ND U	5.3	1.4	1	12/29/16 19:01	NA	
Carbon Tetrachloride	ND U	5.3	0.99	1	12/29/16 19:01	NA	
Chlorobenzene	ND U	5.3	0.31	1	12/29/16 19:01	NA	
Chloroethane	ND U	5.3	3.1	1	12/29/16 19:01	NA	
Chloroform	ND U	5.3	1.4	1	12/29/16 19:01	NA	
Chloromethane	ND U	5.3	0.43	1	12/29/16 19:01	NA	
Dibromochloromethane	ND U	5.3	0.78	1	12/29/16 19:01	NA	
Dibromomethane	ND U	5.3	0.68	1	12/29/16 19:01	NA	
Dichlorodifluoromethane (CFC 12)	ND U	5.3	2.1	1	12/29/16 19:01	NA	
Dichloromethane	0.84 J	5.3	0.61	1	12/29/16 19:01	NA	
Ethyl Methacrylate	ND U	5.3	0.81	1	12/29/16 19:01	NA	
Ethylbenzene	ND U	5.3	0.25	1	12/29/16 19:01	NA	
Iodomethane	ND U	11	1.2	1	12/29/16 19:01	NA	
Methacrylonitrile	ND U	5.3	1.7	1	12/29/16 19:01	NA	
Methyl Methacrylate	ND U	5.3	0.78	1	12/29/16 19:01	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201331 400-SB-13
Lab Code: R1613413-029

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Naphthalene	ND U	5.3	0.55	1	12/29/16 19:01	NA	
Propionitrile	ND U	27	7.0	1	12/29/16 19:01	NA	
Tetrachloroethene (PCE)	ND U	5.3	0.95	1	12/29/16 19:01	NA	
Toluene	ND U	5.3	1.1	1	12/29/16 19:01	NA	
Trichloroethene (TCE)	ND U	5.3	1.1	1	12/29/16 19:01	NA	
Trichlorofluoromethane (CFC 11)	ND U	5.3	0.71	1	12/29/16 19:01	NA	
Vinyl Chloride	ND U	5.3	2.0	1	12/29/16 19:01	NA	
cis-1,3-Dichloropropene	ND U	5.3	0.97	1	12/29/16 19:01	NA	
m,p-Xylenes	ND U	11	1.2	1	12/29/16 19:01	NA	
o-Xylene	ND U	5.3	0.52	1	12/29/16 19:01	NA	
trans-1,2-Dichloroethene	ND U	5.3	0.92	1	12/29/16 19:01	NA	
trans-1,3-Dichloropropene	ND U	5.3	0.22	1	12/29/16 19:01	NA	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	102	51 - 136	12/29/16 19:01	
Dibromofluoromethane	97	63 - 138	12/29/16 19:01	
Toluene-d8	104	66 - 138	12/29/16 19:01	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			



Metals

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201001 400-SB-09
Lab Code: R1613413-002

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Basis: Dry

Antimony, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	5.9	0.4	1	01/05/17 17:00	NA	
Arsenic, Total	6010C	5.02	mg/Kg	0.98	0.24	1	01/05/17 17:00	NA	
Barium, Total	6010C	121	mg/Kg	2.0	0.2	1	01/05/17 17:00	NA	
Beryllium, Total	6010C	0.47	mg/Kg	0.29	0.02	1	01/05/17 17:00	NA	
Cadmium, Total	6010C	0.17 BJ	mg/Kg	0.49	0.04	1	01/05/17 17:00	NA	
Chromium, Total	6010C	37.4	mg/Kg	0.98	0.13	1	01/05/17 17:00	NA	
Lead, Total	6010C	8.0	mg/Kg	4.9	0.3	1	01/05/17 17:00	NA	
Mercury, Total	7471B	0.004 BJ	mg/Kg	0.033	0.003	1	12/30/16 15:33	NA	
Nickel, Total	6010C	9.0	mg/Kg	4.0	0.2	1	01/06/17 18:26	NA	
Selenium, Total	6010C	ND U	mg/Kg	0.98	0.60	1	01/05/17 17:00	NA	
Silver, Total	6010C	ND U	mg/Kg	0.98	0.44	1	01/05/17 17:00	NA	
Thallium, Total	6010C	0.71 J	mg/Kg	0.98	0.51	1	01/09/17 18:50	NA	
Vanadium, Total	6010C	15.5 B	mg/Kg	4.9	0.2	1	01/05/17 17:00	NA	
Zinc, Total	6010C	48.6	mg/Kg	2.0	0.2	1	01/05/17 17:00	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201006 400-SB-09
Lab Code: R1613413-005

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Basis: Dry

Antimony, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.2	0.5	1	01/05/17 17:03	NA	
Arsenic, Total	6010C	3.7	mg/Kg	1.0	0.3	1	01/05/17 17:03	NA	
Barium, Total	6010C	76.3	mg/Kg	2.1	0.2	1	01/05/17 17:03	NA	
Beryllium, Total	6010C	0.39	mg/Kg	0.31	0.02	1	01/05/17 17:03	NA	
Cadmium, Total	6010C	0.13 BJ	mg/Kg	0.52	0.04	1	01/05/17 17:03	NA	
Chromium, Total	6010C	27.7	mg/Kg	1.0	0.2	1	01/05/17 17:03	NA	
Lead, Total	6010C	10.4	mg/Kg	5.2	0.3	1	01/05/17 17:03	NA	
Mercury, Total	7471B	0.003 BJ	mg/Kg	0.033	0.003	1	12/30/16 15:35	NA	
Nickel, Total	6010C	6.9	mg/Kg	4.1	0.2	1	01/06/17 18:36	NA	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.7	1	01/05/17 17:03	NA	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/05/17 17:03	NA	
Thallium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/09/17 18:53	NA	
Vanadium, Total	6010C	14.4 B	mg/Kg	5.2	0.2	1	01/05/17 17:03	NA	
Zinc, Total	6010C	43.8	mg/Kg	2.1	0.2	1	01/05/17 17:03	NA	

ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201018 400-SB-09
Lab Code: R1613413-009

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Basis: Dry

Antimony, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.1	0.5	1	01/05/17 17:06	NA	
Arsenic, Total	6010C	5.0	mg/Kg	1.0	0.3	1	01/05/17 17:06	NA	
Barium, Total	6010C	92.4	mg/Kg	2.0	0.2	1	01/05/17 17:06	NA	
Beryllium, Total	6010C	0.49	mg/Kg	0.30	0.02	1	01/05/17 17:06	NA	
Cadmium, Total	6010C	0.11 BJ	mg/Kg	0.51	0.04	1	01/05/17 17:06	NA	
Chromium, Total	6010C	23.4	mg/Kg	1.0	0.2	1	01/05/17 17:06	NA	
Lead, Total	6010C	12.1	mg/Kg	5.1	0.3	1	01/05/17 17:06	NA	
Mercury, Total	7471B	ND U	mg/Kg	0.034	0.004	1	12/30/16 15:36	NA	
Nickel, Total	6010C	9.6	mg/Kg	4.1	0.2	1	01/06/17 18:39	NA	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.7	1	01/05/17 17:06	NA	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/05/17 17:06	NA	
Thallium, Total	6010C	0.9 J	mg/Kg	1.0	0.6	1	01/09/17 18:56	NA	
Vanadium, Total	6010C	15.9 B	mg/Kg	5.1	0.2	1	01/05/17 17:06	NA	
Zinc, Total	6010C	62.8	mg/Kg	2.0	0.2	1	01/05/17 17:06	NA	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201019 400-SB-09
Lab Code: R1613413-010

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: Dry

Antimony, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.1	0.5	1	01/05/17 17:22	NA	
Arsenic, Total	6010C	4.9	mg/Kg	1.0	0.3	1	01/05/17 17:22	NA	
Barium, Total	6010C	95.1	mg/Kg	2.0	0.2	1	01/05/17 17:22	NA	
Beryllium, Total	6010C	0.49	mg/Kg	0.31	0.02	1	01/05/17 17:22	NA	
Cadmium, Total	6010C	0.13 BJ	mg/Kg	0.51	0.04	1	01/05/17 17:22	NA	
Chromium, Total	6010C	25.0	mg/Kg	1.0	0.2	1	01/05/17 17:22	NA	
Lead, Total	6010C	10.8	mg/Kg	5.1	0.3	1	01/05/17 17:22	NA	
Mercury, Total	7471B	ND U	mg/Kg	0.033	0.003	1	12/30/16 15:48	NA	
Nickel, Total	6010C	8.6	mg/Kg	4.0	0.2	1	01/06/17 18:55	NA	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.7	1	01/05/17 17:22	NA	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/05/17 17:22	NA	
Thallium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/09/17 19:12	NA	
Vanadium, Total	6010C	16.1 B	mg/Kg	5.1	0.2	1	01/05/17 17:22	NA	
Zinc, Total	6010C	63.1	mg/Kg	2.0	0.2	1	01/05/17 17:22	NA	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201031 400-SB-11
Lab Code: R1613413-014

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Basis: Dry

Antimony, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.8	0.5	1	01/05/17 17:31	NA	
Arsenic, Total	6010C	3.2	mg/Kg	1.1	0.3	1	01/05/17 17:31	NA	
Barium, Total	6010C	76.2	mg/Kg	2.3	0.2	1	01/05/17 17:31	NA	
Beryllium, Total	6010C	0.41	mg/Kg	0.34	0.02	1	01/05/17 17:31	NA	
Cadmium, Total	6010C	0.08 BJ	mg/Kg	0.56	0.04	1	01/05/17 17:31	NA	
Chromium, Total	6010C	14.0	mg/Kg	1.1	0.2	1	01/05/17 17:31	NA	
Lead, Total	6010C	7.4	mg/Kg	5.6	0.4	1	01/05/17 17:31	NA	
Mercury, Total	7471B	ND U	mg/Kg	0.036	0.004	1	12/30/16 15:50	NA	
Nickel, Total	6010C	8.7	mg/Kg	4.4	0.2	1	01/06/17 18:58	NA	
Selenium, Total	6010C	ND U	mg/Kg	1.1	0.7	1	01/05/17 17:31	NA	
Silver, Total	6010C	ND U	mg/Kg	1.1	0.5	1	01/05/17 17:31	NA	
Thallium, Total	6010C	2.5	mg/Kg	1.1	0.6	1	01/09/17 19:22	NA	
Vanadium, Total	6010C	16.0 B	mg/Kg	5.6	0.2	1	01/05/17 17:31	NA	
Zinc, Total	6010C	31.4	mg/Kg	2.3	0.2	1	01/05/17 17:31	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201043 400-SB-11
Lab Code: R1613413-018

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: Dry

Antimony, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.3	0.5	1	01/05/17 17:34	NA	
Arsenic, Total	6010C	4.2	mg/Kg	1.0	0.3	1	01/05/17 17:34	NA	
Barium, Total	6010C	627	mg/Kg	2.1	0.2	1	01/05/17 17:34	NA	
Beryllium, Total	6010C	0.52	mg/Kg	0.31	0.02	1	01/05/17 17:34	NA	
Cadmium, Total	6010C	0.09 BJ	mg/Kg	0.52	0.04	1	01/05/17 17:34	NA	
Chromium, Total	6010C	16.1	mg/Kg	1.0	0.2	1	01/05/17 17:34	NA	
Lead, Total	6010C	8.7	mg/Kg	5.2	0.3	1	01/05/17 17:34	NA	
Mercury, Total	7471B	ND U	mg/Kg	0.034	0.004	1	12/30/16 15:51	NA	
Nickel, Total	6010C	4.0 J	mg/Kg	4.2	0.2	1	01/06/17 19:01	NA	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.7	1	01/05/17 17:34	NA	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/05/17 17:34	NA	
Thallium, Total	6010C	0.9 J	mg/Kg	1.0	0.6	1	01/09/17 19:25	NA	
Vanadium, Total	6010C	24.6	mg/Kg	5.2	0.2	1	01/05/17 17:34	NA	
Zinc, Total	6010C	43.9	mg/Kg	2.1	0.2	1	01/05/17 17:34	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201044 400-SB-11
Lab Code: R1613413-019

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Basis: Dry

Antimony, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.1	0.5	1	01/05/17 17:50	NA	
Arsenic, Total	6010C	3.7	mg/Kg	1.0	0.3	1	01/05/17 17:50	NA	
Barium, Total	6010C	711	mg/Kg	2.0	0.2	1	01/05/17 17:50	NA	
Beryllium, Total	6010C	0.60	mg/Kg	0.30	0.02	1	01/05/17 17:50	NA	
Cadmium, Total	6010C	ND U	mg/Kg	0.51	0.04	1	01/05/17 17:50	NA	
Chromium, Total	6010C	14.8	mg/Kg	1.0	0.2	1	01/05/17 17:50	NA	
Lead, Total	6010C	9.4	mg/Kg	5.1	0.3	1	01/05/17 17:50	NA	
Mercury, Total	7471B	ND U	mg/Kg	0.035	0.004	1	12/30/16 15:59	NA	
Nickel, Total	6010C	4.9	mg/Kg	4.1	0.2	1	01/06/17 19:23	NA	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/05/17 17:50	NA	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/05/17 17:50	NA	
Thallium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/09/17 19:41	NA	
Vanadium, Total	6010C	27.8	mg/Kg	5.1	0.2	1	01/05/17 17:50	NA	
Zinc, Total	6010C	32.3	mg/Kg	2.0	0.2	1	01/05/17 17:50	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201101 400-SB-13
Lab Code: R1613413-023

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Basis: Dry

Antimony, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.0	0.4	1	01/05/17 17:53	NA	
Arsenic, Total	6010C	4.11	mg/Kg	1.0	0.24	1	01/05/17 17:53	NA	
Barium, Total	6010C	87.4	mg/Kg	2.0	0.2	1	01/05/17 17:53	NA	
Beryllium, Total	6010C	0.50	mg/Kg	0.30	0.02	1	01/05/17 17:53	NA	
Cadmium, Total	6010C	0.05 BJ	mg/Kg	0.50	0.04	1	01/05/17 17:53	NA	
Chromium, Total	6010C	12.1	mg/Kg	1.0	0.13	1	01/05/17 17:53	NA	
Lead, Total	6010C	8.2	mg/Kg	5.0	0.3	1	01/05/17 17:53	NA	
Mercury, Total	7471B	ND U	mg/Kg	0.034	0.004	1	12/30/16 16:01	NA	
Nickel, Total	6010C	11.5	mg/Kg	4.1	0.2	1	01/06/17 19:26	NA	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.60	1	01/05/17 17:53	NA	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.44	1	01/05/17 17:53	NA	
Thallium, Total	6010C	ND U	mg/Kg	1.0	0.51	1	01/09/17 19:44	NA	
Vanadium, Total	6010C	17.0 B	mg/Kg	5.0	0.2	1	01/05/17 17:53	NA	
Zinc, Total	6010C	38.1	mg/Kg	2.0	0.2	1	01/05/17 17:53	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201316 400-SB-13
Lab Code: R1613413-026

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Basis: Dry

Antimony, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.1	0.5	1	01/05/17 17:56	NA	
Arsenic, Total	6010C	5.1	mg/Kg	1.0	0.3	1	01/05/17 17:56	NA	
Barium, Total	6010C	484	mg/Kg	2.0	0.2	1	01/05/17 17:56	NA	
Beryllium, Total	6010C	0.50	mg/Kg	0.30	0.02	1	01/05/17 17:56	NA	
Cadmium, Total	6010C	0.09 BJ	mg/Kg	0.51	0.04	1	01/05/17 17:56	NA	
Chromium, Total	6010C	17.0	mg/Kg	1.0	0.2	1	01/05/17 17:56	NA	
Lead, Total	6010C	9.5	mg/Kg	5.1	0.3	1	01/05/17 17:56	NA	
Mercury, Total	7471B	0.003 BJ	mg/Kg	0.033	0.003	1	12/30/16 16:03	NA	
Nickel, Total	6010C	9.6	mg/Kg	4.1	0.2	1	01/06/17 19:29	NA	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/05/17 17:56	NA	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/05/17 17:56	NA	
Thallium, Total	6010C	1.3	mg/Kg	1.0	0.6	1	01/09/17 19:47	NA	
Vanadium, Total	6010C	16.2 B	mg/Kg	5.1	0.2	1	01/05/17 17:56	NA	
Zinc, Total	6010C	50.2	mg/Kg	2.0	0.2	1	01/05/17 17:56	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201333 400-SB-13
Lab Code: R1613413-030

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Basis: Dry

Antimony, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.3	0.5	1	01/05/17 18:06	NA	
Arsenic, Total	6010C	5.8	mg/Kg	1.0	0.3	1	01/05/17 18:06	NA	
Barium, Total	6010C	1370	mg/Kg	2.1	0.2	1	01/05/17 18:06	NA	
Beryllium, Total	6010C	0.48	mg/Kg	0.31	0.02	1	01/05/17 18:06	NA	
Cadmium, Total	6010C	0.25 BJ	mg/Kg	0.52	0.04	1	01/05/17 18:06	NA	
Chromium, Total	6010C	16.3	mg/Kg	1.0	0.2	1	01/05/17 18:06	NA	
Lead, Total	6010C	9.9	mg/Kg	5.2	0.3	1	01/05/17 18:06	NA	
Mercury, Total	7471B	ND U	mg/Kg	0.034	0.003	1	12/30/16 16:04	NA	
Nickel, Total	6010C	9.5	mg/Kg	4.3	0.2	1	01/06/17 19:33	NA	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.7	1	01/05/17 18:06	NA	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/05/17 18:06	NA	
Thallium, Total	6010C	1.8	mg/Kg	1.0	0.6	1	01/09/17 19:50	NA	
Vanadium, Total	6010C	14.4 B	mg/Kg	5.2	0.2	1	01/05/17 18:06	NA	
Zinc, Total	6010C	54.3	mg/Kg	2.1	0.2	1	01/05/17 18:06	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201334 400-SB-13
Lab Code: R1613413-031

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10

Basis: Dry

Antimony, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.5	0.5	1	01/05/17 18:22	NA	
Arsenic, Total	6010C	5.3	mg/Kg	1.1	0.3	1	01/05/17 18:22	NA	
Barium, Total	6010C	483	mg/Kg	2.2	0.2	1	01/05/17 18:22	NA	
Beryllium, Total	6010C	0.52	mg/Kg	0.32	0.02	1	01/05/17 18:22	NA	
Cadmium, Total	6010C	0.22 BJ	mg/Kg	0.54	0.04	1	01/05/17 18:22	NA	
Chromium, Total	6010C	17.5	mg/Kg	1.1	0.2	1	01/05/17 18:22	NA	
Lead, Total	6010C	9.7	mg/Kg	5.4	0.3	1	01/05/17 18:22	NA	
Mercury, Total	7471B	ND U	mg/Kg	0.034	0.004	1	12/30/16 16:09	NA	
Nickel, Total	6010C	9.2	mg/Kg	4.2	0.2	1	01/06/17 19:55	NA	
Selenium, Total	6010C	ND U	mg/Kg	1.1	0.7	1	01/05/17 18:22	NA	
Silver, Total	6010C	ND U	mg/Kg	1.1	0.5	1	01/05/17 18:22	NA	
Thallium, Total	6010C	ND U	mg/Kg	1.1	0.6	1	01/09/17 20:13	NA	
Vanadium, Total	6010C	16.7 B	mg/Kg	5.4	0.2	1	01/05/17 18:22	NA	
Zinc, Total	6010C	63.0	mg/Kg	2.2	0.2	1	01/05/17 18:22	NA	



General Chemistry

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201000 400-SB-09
Lab Code: R1613413-001

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Total Solids

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Total Solids	ALS SOP	97.4	Percent	-	1	12/30/16 11:30	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201001 400-SB-09
Lab Code: R1613413-002

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Total Solids

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Date Extracted</u>	<u>Q</u>
Total Solids	ALS SOP	97.4	Percent	-	-	1	12/30/16 11:30	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201005 400-SB-09
Lab Code: R1613413-004

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Total Solids

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Date Extracted</u>	<u>Q</u>
Total Solids	ALS SOP	96.3	Percent	-	1	12/30/16 11:30	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201006 400-SB-09
Lab Code: R1613413-005

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Total Solids

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Total Solids	ALS SOP	96.6	Percent	-	-	1	12/30/16 11:30	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201015 400-SB-09
Lab Code: R1613413-007

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Total Solids

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Total Solids	ALS SOP	97.3	Percent	-	1	12/30/16 11:30	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201016 400-SB-09
Lab Code: R1613413-008

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Total Solids

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Date Extracted</u>	<u>Q</u>
Total Solids	ALS SOP	97.5	Percent	-	1	12/30/16 11:30	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201018 400-SB-09
Lab Code: R1613413-009

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Total Solids

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Date Extracted</u>	<u>Q</u>
Total Solids	ALS SOP	97.4	Percent	-	-	1	12/30/16 11:30	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201019 400-SB-09
Lab Code: R1613413-010

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Total Solids

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Date Extracted</u>	<u>Q</u>
Total Solids	ALS SOP	97.1	Percent	-	-	1	12/30/16 11:30	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201030 400-SB-11
Lab Code: R1613413-013

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Total Solids

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Total Solids	ALS SOP	88.9	Percent	-	1	12/30/16 11:30	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201031 400-SB-11
Lab Code: R1613413-014

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Total Solids

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Date Extracted</u>	<u>Q</u>
Total Solids	ALS SOP	87.9	Percent	-	-	1	12/30/16 11:30	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201040 400-SB-11
Lab Code: R1613413-016

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Total Solids

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Date Extracted</u>	<u>Q</u>
Total Solids	ALS SOP	94.3	Percent	-	1	12/30/16 11:30	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201041 400-SB-11
Lab Code: R1613413-017

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Total Solids

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Total Solids	ALS SOP	93.8	Percent	-	1	12/30/16 11:30	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201043 400-SB-11
Lab Code: R1613413-018

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Total Solids

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Total Solids	ALS SOP	94.1	Percent	-	-	1	12/30/16 11:30	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201044 400-SB-11
Lab Code: R1613413-019

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Total Solids

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Date Extracted</u>	<u>Q</u>
Total Solids	ALS SOP	93.9	Percent	-	-	1	12/30/16 11:30	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201100 400-SB-13
Lab Code: R1613413-022

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Total Solids

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Total Solids	ALS SOP	95.8	Percent	-	1	12/30/16 11:30	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201101 400-SB-13
Lab Code: R1613413-023

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Total Solids

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Date Extracted</u>	<u>Q</u>
Total Solids	ALS SOP	95.4	Percent	-	-	1	12/30/16 11:30	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201315 400-SB-13
Lab Code: R1613413-025

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Total Solids

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Total Solids	ALS SOP	96.8	Percent	-	1	12/30/16 11:30	NA	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201316 400-SB-13
Lab Code: R1613413-026

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Total Solids

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Date Extracted</u>	<u>Q</u>
Total Solids	ALS SOP	96.8	Percent	-	-	1	12/30/16 11:30	NA	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201330 400-SB-13
Lab Code: R1613413-028

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Total Solids

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Total Solids	ALS SOP	93.6	Percent	-	1	12/30/16 11:30	NA	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201331 400-SB-13
Lab Code: R1613413-029

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Total Solids

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Date Extracted</u>	<u>Q</u>
Total Solids	ALS SOP	93.6	Percent	-	1	12/30/16 11:30	NA	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201333 400-SB-13
Lab Code: R1613413-030

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Total Solids

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Date Extracted</u>	<u>Q</u>
Total Solids	ALS SOP	92.3	Percent	-	-	1	12/30/16 11:30	NA	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612201334 400-SB-13
Lab Code: R1613413-031

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16 11:10
Basis: As Received

Total Solids

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Date Extracted</u>	<u>Q</u>
Total Solids	ALS SOP	93.0	Percent	-	-	1	12/30/16 11:30	NA	



QC Summary Forms

ALS Environmental—Rochester Laboratory
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Volatile Organic Compounds by GC/MS

ALS Environmental—Rochester Laboratory

1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623

Phone (585) 288-5380 Fax (585) 288-8475

www.alsglobal.com

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413

SURROGATE RECOVERY SUMMARY
Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Extraction Method: EPA 5030C

Sample Name	Lab Code	4-Bromofluorobenzene	Dibromofluoromethane	Toluene-d8
		51 - 136	63 - 138	66 - 138
1612201000 400-SB-09	R1613413-001	102	94	102
1612201005 400-SB-09	R1613413-004	105	99	104
1612201015 400-SB-09	R1613413-007	107	102	106
1612201016 400-SB-09	R1613413-008	102	99	102
1612201030 400-SB-11	R1613413-013	102	98	101
1612201040 400-SB-11	R1613413-016	103	102	107
1612201041 400-SB-11	R1613413-017	100	95	104
1612201100 400-SB-13	R1613413-022	105	99	104
1612201315 400-SB-13	R1613413-025	106	101	105
1612201330 400-SB-13	R1613413-028	103	95	106
1612201331 400-SB-13	R1613413-029	102	97	104
1612201015 400-SB-09 MS	RQ1700034-05	104	104	105
1612201015 400-SB-09 DMS	RQ1700034-06	106	108	107
1612201040 400-SB-11 MS	RQ1700034-07	102	107	107
1612201040 400-SB-11 DMS	RQ1700034-08	106	106	107
1612201330 400-SB-13 MS	RQ1700034-09	107	106	106
1612201330 400-SB-13 DMS	RQ1700034-10	106	107	107

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/30/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1612201015 400-SB-09
Lab Code: R1613413-007
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1700034-05			Duplicate Matrix Spike RQ1700034-06			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
1,1,1,2-Tetrachloroethane	ND U	37.5	51.4	73	39.2	51.4	76	52-133	4	30
1,1,1-Trichloroethane (TCA)	ND U	33.5	51.4	65	34.7	51.4	68	51-132	5	30
1,1,2,2-Tetrachloroethane	ND U	33.8	51.4	66	33.4	51.4	65	53-134	2	30
1,1,2-Trichloroethane	ND U	42.9	51.4	83	42.9	51.4	84	62-126	1	30
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	28.0	51.4	54	30.5	51.4	59	45-136	9	30
1,1-Dichloroethene (1,1-DCE)	ND U	33.8	51.4	66	34.2	51.4	67	61-139	2	30
1,2,3-Trichloropropane	ND U	43.5	51.4	85	43.4	51.4	84	22-167	1	30
1,2-Dibromo-3-chloropropane (DBCP)	ND U	46.7	51.4	91	48.3	51.4	94	27-163	3	30
1,2-Dibromoethane	ND U	44.4	51.4	86	44.4	51.4	86	52-137	<1	30
1,2-Dichlorobenzene	ND U	36.4	51.4	71	38.9	51.4	76	22-156	7	30
1,2-Dichloroethane	ND U	41.7	51.4	81	41.0	51.4	80	59-125	1	30
1,2-Dichloropropane	ND U	39.4	51.4	77	39.7	51.4	77	67-126	<1	30
1,3-Dichlorobenzene	ND U	35.0	51.4	68	37.2	51.4	72	29-146	6	30
1,4-Dioxane	ND U	834	1030	81	892	1030	87	50-148	7	30
2-Butanone (MEK)	ND U	42.5	51.4	83	41.6	51.4	81	43-134	2	30
2-Chloro-1,3-butadiene	ND U	35.2	51.4	68	35.6	51.4	69	45-134	1	30
2-Chloroethyl Vinyl Ether	ND U	44.6	51.4	87	44.5	51.4	87	37-150	<1	30
Isobutyl Alcohol	ND U	857	1030	83	871	1030	85	39-146	2	30
Allyl Chloride	ND U	36.2	51.4	70	37.4	51.4	73	34-135	4	30
4-Methyl-2-pentanone	ND U	46.8	51.4	91	46.6	51.4	91	47-145	<1	30
Acetone	ND U	50.6	51.4	99	48.6	51.4	95	11-183	4	30
Acetonitrile	ND U	263	257	102	229	257	89	28-146	14	30
Acrolein	ND U	66.6	103	65	64.6	103	63	10-172	3	30
Acrylonitrile	ND U	233	257	91	235	257	91	46-139	<1	30
Benzene	ND U	37.9	51.4	74	38.2	51.4	74	63-126	<1	30
Bromodichloromethane	ND U	38.6	51.4	75	39.4	51.4	77	47-141	3	30
Bromoform	ND U	44.0	51.4	86	44.8	51.4	87	26-157	1	30
Bromomethane	ND U	38.8	51.4	75	37.2	51.4	72	10-137	4	30
Carbon Disulfide	ND U	29.8	51.4	58	30.4	51.4	59	35-135	2	30
Carbon Tetrachloride	ND U	31.0	51.4	60	32.4	51.4	63	46-137	5	30
Chlorobenzene	ND U	37.1	51.4	72	38.0	51.4	74	51-132	3	30
Chloroethane	ND U	34.2	51.4	67	34.7	51.4	68	45-132	1	30
Chloroform	ND U	39.0	51.4	76	38.8	51.4	76	61-124	<1	30
Chloromethane	ND U	32.8	51.4	64	33.9	51.4	66	50-136	3	30
Dibromochloromethane	ND U	42.7	51.4	83	43.1	51.4	84	40-146	1	30

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Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/30/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1612201015 400-SB-09
Lab Code: R1613413-007
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1700034-05			Duplicate Matrix Spike RQ1700034-06			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Dibromomethane	ND U	44.3	51.4	86	43.6	51.4	85	61-122	1	30
Dichlorodifluoromethane (CFC 12)	ND U	29.7	51.4	58	30.8	51.4	60	44-138	3	30
Dichloromethane	ND U	40.7	51.4	79	41.7	51.4	81	64-120	3	30
Ethyl Methacrylate	ND U	45.7	51.4	89	45.1	51.4	88	17-166	1	30
Ethylbenzene	ND U	32.8	51.4	64	35.7	51.4	69	44-131	8	30
Iodomethane	ND U	24.7	51.4	48	31.8	51.4	62	10-160	25	30
Methacrylonitrile	ND U	48.5	51.4	94	47.9	51.4	93	44-149	1	30
Methyl Methacrylate	ND U	46.8	51.4	91	47.1	51.4	92	41-162	1	30
Naphthalene	ND U	35.4	51.4	69	39.1	51.4	76	10-187	10	30
Propionitrile	ND U	223	257	87	225	257	87	46-144	<1	30
Tetrachloroethene (PCE)	1.1 J	31.4	51.4	59	34.6	51.4	65	45-141	10	30
Toluene	ND U	35.4	51.4	69	36.8	51.4	72	50-140	4	30
Trichloroethene (TCE)	ND U	44.5	51.4	87	45.3	51.4	88	54-136	1	30
Trichlorofluoromethane (CFC 11)	ND U	31.7	51.4	62	32.5	51.4	63	47-129	2	30
Vinyl Chloride	ND U	33.6	51.4	65	34.3	51.4	67	53-128	3	30
cis-1,3-Dichloropropene	ND U	39.3	51.4	77	40.0	51.4	78	31-150	1	30
m,p-Xylenes	ND U	66.5	103	65	72.4	103	70	45-141	7	30
o-Xylene	ND U	35.1	51.4	68	37.6	51.4	73	46-139	7	30
trans-1,2-Dichloroethene	ND U	35.9	51.4	70	36.5	51.4	71	52-128	1	30
trans-1,3-Dichloropropene	ND U	40.8	51.4	79	41.2	51.4	80	23-160	1	30

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/30/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1612201040 400-SB-11
Lab Code: R1613413-016
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1700034-07			Duplicate Matrix Spike RQ1700034-08			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
1,1,1,2-Tetrachloroethane	ND U	40.4	53.0	76	45.8	53.0	86	52-133	12	30
1,1,1-Trichloroethane (TCA)	ND U	37.7	53.0	71	45.3	53.0	85	51-132	18	30
1,1,2,2-Tetrachloroethane	ND U	42.8	53.0	81	44.6	53.0	84	53-134	4	30
1,1,2-Trichloroethane	ND U	42.8	53.0	81	48.2	53.0	91	62-126	12	30
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	34.0	53.0	64	41.9	53.0	79	45-136	21	30
1,1-Dichloroethene (1,1-DCE)	ND U	37.7	53.0	71	45.8	53.0	86	61-139	19	30
1,2,3-Trichloropropane	ND U	46.0	53.0	87	47.9	53.0	90	22-167	3	30
1,2-Dibromo-3-chloropropane (DBCP)	ND U	53.8	53.0	101	53.0	53.0	100	27-163	<1	30
1,2-Dibromoethane	ND U	45.0	53.0	85	48.7	53.0	92	52-137	8	30
1,2-Dichlorobenzene	ND U	39.4	53.0	74	44.7	53.0	84	22-156	13	30
1,2-Dichloroethane	ND U	41.1	53.0	78	47.4	53.0	89	59-125	13	30
1,2-Dichloropropane	ND U	40.7	53.0	77	46.8	53.0	88	67-126	13	30
1,3-Dichlorobenzene	ND U	38.9	53.0	73	43.9	53.0	83	29-146	13	30
1,4-Dioxane	ND U	964	1060	91	1050	1060	99	50-148	8	30
2-Butanone (MEK)	ND U	48.1	53.0	91	45.7	53.0	86	43-134	6	30
2-Chloro-1,3-butadiene	ND U	38.7	53.0	73	43.8	53.0	83	45-134	13	30
2-Chloroethyl Vinyl Ether	ND U	45.7	53.0	86	50.7	53.0	96	37-150	11	30
Isobutyl Alcohol	ND U	985	1060	93	1000	1060	94	39-146	1	30
Allyl Chloride	ND U	40.3	53.0	76	47.7	53.0	90	34-135	17	30
4-Methyl-2-pentanone	ND U	48.9	53.0	92	50.8	53.0	96	47-145	4	30
Acetone	ND U	50.8	53.0	96	52.5	53.0	99	11-183	3	30
Acetonitrile	ND U	240	265	90	257	265	97	28-146	7	30
Acrolein	ND U	71.5	106	67	74.5	106	70	10-172	4	30
Acrylonitrile	ND U	249	265	94	253	265	95	46-139	1	30
Benzene	ND U	40.3	53.0	76	46.9	53.0	88	63-126	15	30
Bromodichloromethane	ND U	40.7	53.0	77	46.4	53.0	87	47-141	12	30
Bromoform	ND U	45.0	53.0	85	50.3	53.0	95	26-157	11	30
Bromomethane	ND U	38.3	53.0	72	44.6	53.0	84	10-137	15	30
Carbon Disulfide	ND U	33.4	53.0	63	38.2	53.0	72	35-135	13	30
Carbon Tetrachloride	ND U	34.4	53.0	65	43.2	53.0	82	46-137	23	30
Chlorobenzene	ND U	39.4	53.0	74	44.4	53.0	84	51-132	13	30
Chloroethane	ND U	38.1	53.0	72	44.9	53.0	85	45-132	17	30
Chloroform	ND U	41.5	53.0	78	47.1	53.0	89	61-124	13	30
Chloromethane	ND U	36.5	53.0	69	44.2	53.0	83	50-136	18	30
Dibromochloromethane	ND U	43.1	53.0	81	49.0	53.0	92	40-146	13	30

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Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/30/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1612201040 400-SB-11
Lab Code: R1613413-016
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1700034-07			Duplicate Matrix Spike RQ1700034-08			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Dibromomethane	ND U	43.6	53.0	82	50.0	53.0	94	61-122	14	30
Dichlorodifluoromethane (CFC 12)	ND U	34.2	53.0	64	44.2	53.0	83	44-138	26	30
Dichloromethane	ND U	42.8	53.0	81	48.4	53.0	91	64-120	12	30
Ethyl Methacrylate	ND U	45.9	53.0	86	52.1	53.0	98	17-166	13	30
Ethylbenzene	ND U	38.0	53.0	72	43.0	53.0	81	44-131	12	30
Iodomethane	ND U	35.2	53.0	66	43.4	53.0	82	10-160	22	30
Methacrylonitrile	ND U	51.3	53.0	97	53.0	53.0	100	44-149	3	30
Methyl Methacrylate	ND U	49.7	53.0	94	52.9	53.0	100	41-162	6	30
Naphthalene	ND U	39.8	53.0	75	43.4	53.0	82	10-187	9	30
Propionitrile	ND U	288	265	109	246	265	93	46-144	16	30
Tetrachloroethene (PCE)	1.8 J	38.6	53.0	69	43.4	53.0	78	45-141	12	30
Toluene	ND U	38.8	53.0	73	45.0	53.0	85	50-140	15	30
Trichloroethene (TCE)	ND U	41.3	53.0	78	48.7	53.0	92	54-136	16	30
Trichlorofluoromethane (CFC 11)	ND U	35.9	53.0	68	44.4	53.0	84	47-129	21	30
Vinyl Chloride	ND U	37.6	53.0	71	47.5	53.0	90	53-128	24	30
cis-1,3-Dichloropropene	ND U	40.2	53.0	76	46.2	53.0	87	31-150	13	30
m,p-Xylenes	ND U	78.0	106	74	87.9	106	83	45-141	11	30
o-Xylene	ND U	39.9	53.0	75	44.7	53.0	84	46-139	11	30
trans-1,2-Dichloroethene	ND U	39.6	53.0	75	46.4	53.0	88	52-128	16	30
trans-1,3-Dichloropropene	ND U	41.1	53.0	77	47.8	53.0	90	23-160	16	30

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Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/30/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1612201330 400-SB-13
Lab Code: R1613413-028
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1700034-09			Duplicate Matrix Spike RQ1700034-10			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
1,1,1,2-Tetrachloroethane	ND U	48.8	53.4	91	48.1	53.4	90	52-133	1	30
1,1,1-Trichloroethane (TCA)	ND U	48.6	53.4	91	47.5	53.4	89	51-132	2	30
1,1,2,2-Tetrachloroethane	ND U	45.1	53.4	84	44.4	53.4	83	53-134	1	30
1,1,2-Trichloroethane	ND U	51.0	53.4	95	49.9	53.4	93	62-126	2	30
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	45.1	53.4	84	43.8	53.4	82	45-136	2	30
1,1-Dichloroethene (1,1-DCE)	ND U	50.4	53.4	94	49.4	53.4	92	61-139	2	30
1,2,3-Trichloropropane	ND U	48.0	53.4	90	46.9	53.4	88	22-167	2	30
1,2-Dibromo-3-chloropropane (DBCP)	ND U	54.7	53.4	102	50.1	53.4	94	27-163	8	30
1,2-Dibromoethane	ND U	50.6	53.4	95	51.3	53.4	96	52-137	1	30
1,2-Dichlorobenzene	ND U	46.9	53.4	88	45.5	53.4	85	22-156	3	30
1,2-Dichloroethane	ND U	49.9	53.4	93	49.3	53.4	92	59-125	1	30
1,2-Dichloropropane	ND U	49.6	53.4	93	48.3	53.4	90	67-126	3	30
1,3-Dichlorobenzene	ND U	46.5	53.4	87	44.5	53.4	83	29-146	5	30
1,4-Dioxane	ND U	1000	1070	94	920	1070	86	50-148	9	30
2-Butanone (MEK)	ND U	42.4	53.4	79	39.9	53.4	75	43-134	5	30
2-Chloro-1,3-butadiene	ND U	48.0	53.4	90	46.3	53.4	87	45-134	3	30
2-Chloroethyl Vinyl Ether	ND U	52.5	53.4	98	51.6	53.4	97	37-150	1	30
Isobutyl Alcohol	ND U	953	1070	89	896	1070	84	39-146	6	30
Allyl Chloride	ND U	50.0	53.4	94	48.8	53.4	91	34-135	3	30
4-Methyl-2-pentanone	ND U	50.7	53.4	95	50.1	53.4	94	47-145	1	30
Acetone	ND U	85.3	53.4	160	78.7	53.4	147	11-183	8	30
Acetonitrile	ND U	223	267	84	235	267	88	28-146	5	30
Acrolein	ND U	33.0	107	31	31.9	107	30	10-172	3	30
Acrylonitrile	ND U	253	267	95	246	267	92	46-139	3	30
Benzene	ND U	49.8	53.4	93	49.1	53.4	92	63-126	1	30
Bromodichloromethane	ND U	48.9	53.4	91	48.9	53.4	92	47-141	1	30
Bromoform	ND U	52.5	53.4	98	52.1	53.4	97	26-157	1	30
Bromomethane	ND U	46.3	53.4	87	45.2	53.4	85	10-137	2	30
Carbon Disulfide	ND U	41.4	53.4	77	40.3	53.4	75	35-135	3	30
Carbon Tetrachloride	ND U	47.6	53.4	89	46.6	53.4	87	46-137	2	30
Chlorobenzene	ND U	47.3	53.4	89	47.1	53.4	88	51-132	1	30
Chloroethane	ND U	49.7	53.4	93	48.0	53.4	90	45-132	3	30
Chloroform	ND U	49.8	53.4	93	49.1	53.4	92	61-124	1	30
Chloromethane	ND U	48.2	53.4	90	45.6	53.4	85	50-136	6	30
Dibromochloromethane	ND U	52.2	53.4	98	51.2	53.4	96	40-146	2	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/30/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Sample Name: 1612201330 400-SB-13
Lab Code: R1613413-028
Analysis Method: 8260C
Prep Method: EPA 5030C

Units: ug/Kg
Basis: Dry

Analyte Name	Sample Result	Matrix Spike RQ1700034-09			Duplicate Matrix Spike RQ1700034-10			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Dibromomethane	ND U	52.1	53.4	98	50.8	53.4	95	61-122	3	30
Dichlorodifluoromethane (CFC 12)	ND U	48.5	53.4	91	47.0	53.4	88	44-138	3	30
Dichloromethane	ND U	52.0	53.4	97	50.5	53.4	94	64-120	3	30
Ethyl Methacrylate	ND U	36.2	53.4	68	36.3	53.4	68	17-166	<1	30
Ethylbenzene	ND U	45.8	53.4	86	45.1	53.4	84	44-131	2	30
Iodomethane	ND U	47.8	53.4	90	46.0	53.4	86	10-160	5	30
Methacrylonitrile	ND U	53.0	53.4	99	52.1	53.4	98	44-149	1	30
Methyl Methacrylate	ND U	64.7	53.4	121	64.2	53.4	120	41-162	<1	30
Naphthalene	ND U	45.3	53.4	85	42.0	53.4	79	10-187	7	30
Propionitrile	ND U	242	267	91	229	267	86	46-144	6	30
Tetrachloroethene (PCE)	ND U	45.9	53.4	86	45.4	53.4	85	45-141	1	30
Toluene	ND U	47.5	53.4	89	46.8	53.4	88	50-140	1	30
Trichloroethene (TCE)	ND U	52.2	53.4	98	51.5	53.4	96	54-136	2	30
Trichlorofluoromethane (CFC 11)	ND U	48.4	53.4	91	47.1	53.4	88	47-129	3	30
Vinyl Chloride	ND U	52.5	53.4	98	51.3	53.4	96	53-128	2	30
cis-1,3-Dichloropropene	ND U	49.1	53.4	92	48.2	53.4	90	31-150	2	30
m,p-Xylenes	ND U	94.2	107	88	91.5	107	86	45-141	2	30
o-Xylene	ND U	47.6	53.4	89	46.1	53.4	86	46-139	3	30
trans-1,2-Dichloroethene	ND U	50.2	53.4	94	48.9	53.4	92	52-128	2	30
trans-1,3-Dichloropropene	ND U	50.4	53.4	94	49.6	53.4	93	23-160	1	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp. dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: RQ1700014-04

Service Request: R1613413
Date Collected: NA
Date Received: NA
Units: µg/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analytical Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Analysis Lot	Note
1,1,1,2-Tetrachloroethane	ND	U	5.0	0.83	1	NA	12/29/16 12:17		529417	
1,1,1-Trichloroethane (TCA)	ND	U	5.0	0.73	1	NA	12/29/16 12:17		529417	
1,1,2,2-Tetrachloroethane	ND	U	5.0	0.81	1	NA	12/29/16 12:17		529417	
1,1,2-Trichloroethane	ND	U	5.0	0.73	1	NA	12/29/16 12:17		529417	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	U	5.0	1.3	1	NA	12/29/16 12:17		529417	
1,1-Dichloroethene (1,1-DCE)	ND	U	5.0	1.3	1	NA	12/29/16 12:17		529417	
1,2,3-Trichloropropane	ND	U	5.0	1.4	1	NA	12/29/16 12:17		529417	
1,2-Dibromo-3-chloropropane (DBCP)	ND	U	5.0	1.9	1	NA	12/29/16 12:17		529417	
1,2-Dibromoethane	ND	U	5.0	1.3	1	NA	12/29/16 12:17		529417	
1,2-Dichlorobenzene	ND	U	5.0	0.61	1	NA	12/29/16 12:17		529417	
1,2-Dichloroethane	ND	U	5.0	0.61	1	NA	12/29/16 12:17		529417	
1,2-Dichloropropane	ND	U	5.0	0.97	1	NA	12/29/16 12:17		529417	
1,3-Dichlorobenzene	ND	U	5.0	0.63	1	NA	12/29/16 12:17		529417	
1,4-Dioxane	ND	U	100	20	1	NA	12/29/16 12:17		529417	
2-Butanone (MEK)	ND	U	5.0	2.3	1	NA	12/29/16 12:17		529417	
2-Chloro-1,3-butadiene	ND	U	5.0	1.6	1	NA	12/29/16 12:17		529417	
2-Chloroethyl Vinyl Ether	ND	U	5.0	1.8	1	NA	12/29/16 12:17		529417	
Isobutyl Alcohol	ND	U	100	23	1	NA	12/29/16 12:17		529417	
Allyl Chloride	ND	U	5.0	1.7	1	NA	12/29/16 12:17		529417	
4-Methyl-2-pentanone	ND	U	5.0	0.98	1	NA	12/29/16 12:17		529417	
Acetone	ND	U	5.0	2.9	1	NA	12/29/16 12:17		529417	
Acetonitrile	ND	U	25	17	1	NA	12/29/16 12:17		529417	
Acrolein	ND	U	25	3.5	1	NA	12/29/16 12:17		529417	
Acrylonitrile	ND	U	25	6.5	1	NA	12/29/16 12:17		529417	
Benzene	ND	U	5.0	0.29	1	NA	12/29/16 12:17		529417	
Bromodichloromethane	ND	U	5.0	0.61	1	NA	12/29/16 12:17		529417	
Bromoform	ND	U	5.0	0.93	1	NA	12/29/16 12:17		529417	
Bromomethane	ND	U	5.0	1.4	1	NA	12/29/16 12:17		529417	
Carbon Disulfide	ND	U	5.0	1.3	1	NA	12/29/16 12:17		529417	
Carbon Tetrachloride	ND	U	5.0	0.92	1	NA	12/29/16 12:17		529417	
Chlorobenzene	ND	U	5.0	0.29	1	NA	12/29/16 12:17		529417	
Chloroethane	ND	U	5.0	2.9	1	NA	12/29/16 12:17		529417	
Chloroform	ND	U	5.0	1.3	1	NA	12/29/16 12:17		529417	
Chloromethane	ND	U	5.0	0.40	1	NA	12/29/16 12:17		529417	
Dibromochloromethane	ND	U	5.0	0.73	1	NA	12/29/16 12:17		529417	
Dibromomethane	ND	U	5.0	0.63	1	NA	12/29/16 12:17		529417	

ALS Group USA, Corp. dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: RQ1700014-04

Service Request: R1613413
Date Collected: NA
Date Received: NA
Units: µg/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analytical Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Analysis Lot	Note
Dichlorodifluoromethane (CFC 12)	ND	U	5.0	1.9	1	NA	12/29/16 12:17		529417	
Dichloromethane	ND	U	5.0	0.57	1	NA	12/29/16 12:17		529417	
Ethyl Methacrylate	ND	U	5.0	0.75	1	NA	12/29/16 12:17		529417	
Ethylbenzene	ND	U	5.0	0.23	1	NA	12/29/16 12:17		529417	
Iodomethane	ND	U	10	1.2	1	NA	12/29/16 12:17		529417	
Methacrylonitrile	ND	U	5.0	1.6	1	NA	12/29/16 12:17		529417	
Methyl Methacrylate	ND	U	5.0	0.73	1	NA	12/29/16 12:17		529417	
Naphthalene	ND	U	5.0	0.51	1	NA	12/29/16 12:17		529417	
Propionitrile	ND	U	25	6.5	1	NA	12/29/16 12:17		529417	
Tetrachloroethene (PCE)	ND	U	5.0	0.88	1	NA	12/29/16 12:17		529417	
Toluene	ND	U	5.0	1.0	1	NA	12/29/16 12:17		529417	
Trichloroethene (TCE)	ND	U	5.0	1.1	1	NA	12/29/16 12:17		529417	
Trichlorofluoromethane (CFC 11)	ND	U	5.0	0.66	1	NA	12/29/16 12:17		529417	
Vinyl Chloride	ND	U	5.0	1.9	1	NA	12/29/16 12:17		529417	
cis-1,3-Dichloropropene	ND	U	5.0	0.90	1	NA	12/29/16 12:17		529417	
m,p-Xylenes	ND	U	10	1.1	1	NA	12/29/16 12:17		529417	
o-Xylene	ND	U	5.0	0.48	1	NA	12/29/16 12:17		529417	
trans-1,2-Dichloroethene	ND	U	5.0	0.86	1	NA	12/29/16 12:17		529417	
trans-1,3-Dichloropropene	ND	U	5.0	0.20	1	NA	12/29/16 12:17		529417	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	103	51-136	12/29/16 12:17	
Dibromofluoromethane	100	63-138	12/29/16 12:17	
Toluene-d8	101	66-138	12/29/16 12:17	

ALS Group USA, Corp. dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: RQ1700034-11

Service Request: R1613413
Date Collected: NA
Date Received: NA
Units: µg/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analytical Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Analysis Lot	Note
1,1,1,2-Tetrachloroethane	ND	U	5.0	0.83	1	NA	12/30/16 13:20		529515	
1,1,1-Trichloroethane (TCA)	ND	U	5.0	0.73	1	NA	12/30/16 13:20		529515	
1,1,2,2-Tetrachloroethane	ND	U	5.0	0.81	1	NA	12/30/16 13:20		529515	
1,1,2-Trichloroethane	ND	U	5.0	0.73	1	NA	12/30/16 13:20		529515	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	U	5.0	1.3	1	NA	12/30/16 13:20		529515	
1,1-Dichloroethene (1,1-DCE)	ND	U	5.0	1.3	1	NA	12/30/16 13:20		529515	
1,2,3-Trichloropropane	ND	U	5.0	1.4	1	NA	12/30/16 13:20		529515	
1,2-Dibromo-3-chloropropane (DBCP)	ND	U	5.0	1.9	1	NA	12/30/16 13:20		529515	
1,2-Dibromoethane	ND	U	5.0	1.3	1	NA	12/30/16 13:20		529515	
1,2-Dichlorobenzene	ND	U	5.0	0.61	1	NA	12/30/16 13:20		529515	
1,2-Dichloroethane	ND	U	5.0	0.61	1	NA	12/30/16 13:20		529515	
1,2-Dichloropropane	ND	U	5.0	0.97	1	NA	12/30/16 13:20		529515	
1,3-Dichlorobenzene	ND	U	5.0	0.63	1	NA	12/30/16 13:20		529515	
1,4-Dioxane	ND	U	100	20	1	NA	12/30/16 13:20		529515	
2-Butanone (MEK)	ND	U	5.0	2.3	1	NA	12/30/16 13:20		529515	
2-Chloro-1,3-butadiene	ND	U	5.0	1.6	1	NA	12/30/16 13:20		529515	
2-Chloroethyl Vinyl Ether	ND	U	5.0	1.8	1	NA	12/30/16 13:20		529515	
Isobutyl Alcohol	ND	U	100	23	1	NA	12/30/16 13:20		529515	
Allyl Chloride	ND	U	5.0	1.7	1	NA	12/30/16 13:20		529515	
4-Methyl-2-pentanone	ND	U	5.0	0.98	1	NA	12/30/16 13:20		529515	
Acetone	ND	U	5.0	2.9	1	NA	12/30/16 13:20		529515	
Acetonitrile	ND	U	25	17	1	NA	12/30/16 13:20		529515	
Acrolein	ND	U	25	3.5	1	NA	12/30/16 13:20		529515	
Acrylonitrile	ND	U	25	6.5	1	NA	12/30/16 13:20		529515	
Benzene	ND	U	5.0	0.29	1	NA	12/30/16 13:20		529515	
Bromodichloromethane	ND	U	5.0	0.61	1	NA	12/30/16 13:20		529515	
Bromoform	ND	U	5.0	0.93	1	NA	12/30/16 13:20		529515	
Bromomethane	ND	U	5.0	1.4	1	NA	12/30/16 13:20		529515	
Carbon Disulfide	ND	U	5.0	1.3	1	NA	12/30/16 13:20		529515	
Carbon Tetrachloride	ND	U	5.0	0.92	1	NA	12/30/16 13:20		529515	
Chlorobenzene	ND	U	5.0	0.29	1	NA	12/30/16 13:20		529515	
Chloroethane	ND	U	5.0	2.9	1	NA	12/30/16 13:20		529515	
Chloroform	ND	U	5.0	1.3	1	NA	12/30/16 13:20		529515	
Chloromethane	ND	U	5.0	0.40	1	NA	12/30/16 13:20		529515	
Dibromochloromethane	ND	U	5.0	0.73	1	NA	12/30/16 13:20		529515	
Dibromomethane	ND	U	5.0	0.63	1	NA	12/30/16 13:20		529515	

ALS Group USA, Corp. dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: RQ1700034-11

Service Request: R1613413
Date Collected: NA
Date Received: NA
Units: µg/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analytical Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Analysis Lot	Note
Dichlorodifluoromethane (CFC 12)	ND	U	5.0	1.9	1	NA	12/30/16 13:20		529515	
Dichloromethane	ND	U	5.0	0.57	1	NA	12/30/16 13:20		529515	
Ethyl Methacrylate	ND	U	5.0	0.75	1	NA	12/30/16 13:20		529515	
Ethylbenzene	ND	U	5.0	0.23	1	NA	12/30/16 13:20		529515	
Iodomethane	ND	U	10	1.2	1	NA	12/30/16 13:20		529515	
Methacrylonitrile	ND	U	5.0	1.6	1	NA	12/30/16 13:20		529515	
Methyl Methacrylate	ND	U	5.0	0.73	1	NA	12/30/16 13:20		529515	
Naphthalene	ND	U	5.0	0.51	1	NA	12/30/16 13:20		529515	
Propionitrile	ND	U	25	6.5	1	NA	12/30/16 13:20		529515	
Tetrachloroethene (PCE)	ND	U	5.0	0.88	1	NA	12/30/16 13:20		529515	
Toluene	ND	U	5.0	1.0	1	NA	12/30/16 13:20		529515	
Trichloroethene (TCE)	ND	U	5.0	1.1	1	NA	12/30/16 13:20		529515	
Trichlorofluoromethane (CFC 11)	ND	U	5.0	0.66	1	NA	12/30/16 13:20		529515	
Vinyl Chloride	ND	U	5.0	1.9	1	NA	12/30/16 13:20		529515	
cis-1,3-Dichloropropene	ND	U	5.0	0.90	1	NA	12/30/16 13:20		529515	
m,p-Xylenes	ND	U	10	1.1	1	NA	12/30/16 13:20		529515	
o-Xylene	ND	U	5.0	0.48	1	NA	12/30/16 13:20		529515	
trans-1,2-Dichloroethene	ND	U	5.0	0.86	1	NA	12/30/16 13:20		529515	
trans-1,3-Dichloropropene	ND	U	5.0	0.20	1	NA	12/30/16 13:20		529515	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	104	51-136	12/30/16 13:20	
Dibromofluoromethane	101	63-138	12/30/16 13:20	
Toluene-d8	104	66-138	12/30/16 13:20	

ALS Group USA, Corp. dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Analyzed: 12/29/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Analytical Method: 8260C

Units: µg/Kg
Basis: Dry

Analysis Lot: 529417

Lab Control Sample
 RQ1700014-03

Analyte Name	Result	Spike Amount	% Rec	% Rec Limits
1,1,1,2-Tetrachloroethane	22.6	20.0	113	40 - 140
1,1,1-Trichloroethane (TCA)	16.7	20.0	83	40 - 140
1,1,2,2-Tetrachloroethane	22.9	20.0	114	40 - 140
1,1,2-Trichloroethane	22.5	20.0	112	40 - 140
1,1,2-Trichloro-1,2,2-trifluoroethane	9.84	20.0	49	40 - 140
1,1-Dichloroethene (1,1-DCE)	16.4	20.0	82	40 - 140
1,2,3-Trichloropropane	22.6	20.0	113	40 - 140
1,2-Dibromo-3-chloropropane (DBCP)	23.9	20.0	119	40 - 140
1,2-Dibromoethane	24.0	20.0	120	40 - 140
1,2-Dichlorobenzene	22.2	20.0	111	40 - 140
1,2-Dichloroethane	22.9	20.0	114	40 - 140
1,2-Dichloropropane	22.4	20.0	112	40 - 140
1,3-Dichlorobenzene	22.2	20.0	111	40 - 140
1,4-Dioxane	443	400	111	40 - 140
2-Butanone (MEK)	16.4	20.0	82	40 - 140
2-Chloro-1,3-butadiene	18.8	20.0	94	40 - 140
2-Chloroethyl Vinyl Ether	19.1	20.0	96	40 - 140
Isobutyl Alcohol	436	400	109	40 - 140
Allyl Chloride	21.2	20.0	106	40 - 140
4-Methyl-2-pentanone	18.2	20.0	91	40 - 140
Acetone	16.4	20.0	82	40 - 140
Acetonitrile	124	100	124	40 - 140
Acrolein	28.2	40.0	71	40 - 140
Acrylonitrile	109	100	109	40 - 140
Benzene	21.2	20.0	106	40 - 140
Bromodichloromethane	22.3	20.0	112	40 - 140
Bromoform	24.5	20.0	122	40 - 140
Bromomethane	20.7	20.0	103	40 - 140
Carbon Disulfide	16.7	20.0	84	40 - 140
Carbon Tetrachloride	15.5	20.0	78	40 - 140
Chlorobenzene	22.1	20.0	111	40 - 140
Chloroethane	19.2	20.0	96	40 - 140
Chloroform	21.4	20.0	107	40 - 140

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ALS Group USA, Corp. dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Analyzed: 12/29/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Analytical Method: 8260C

Units: µg/Kg
Basis: Dry

Analysis Lot: 529417

Lab Control Sample
 RQ1700014-03

Analyte Name	Result	Spike Amount	% Rec	% Rec Limits
Chloromethane	18.8	20.0	94	40 - 140
Dibromochloromethane	24.1	20.0	120	40 - 140
Dibromomethane	23.5	20.0	117	40 - 140
Dichlorodifluoromethane (CFC 12)	13.1	20.0	65	40 - 140
Dichloromethane	21.9	20.0	109	40 - 140
Ethyl Methacrylate	24.1	20.0	121	40 - 140
Ethylbenzene	18.5	20.0	93	40 - 140
Iodomethane	15.7	20.0	78	40 - 140
Methacrylonitrile	22.9	20.0	115	40 - 140
Methyl Methacrylate	24.4	20.0	122	40 - 140
Naphthalene	20.7	20.0	104	40 - 140
Propionitrile	103	100	103	40 - 140
Tetrachloroethene (PCE)	16.1	20.0	81	40 - 140
Toluene	20.0	20.0	100	40 - 140
Trichloroethene (TCE)	19.5	20.0	98	40 - 140
Trichlorofluoromethane (CFC 11)	13.7	20.0	69	40 - 140
Vinyl Chloride	18.1	20.0	90	40 - 140
cis-1,3-Dichloropropene	23.0	20.0	115	40 - 140
m,p-Xylenes	39.2	40.0	98	40 - 140
o-Xylene	20.7	20.0	103	40 - 140
trans-1,2-Dichloroethene	20.1	20.0	100	40 - 140
trans-1,3-Dichloropropene	23.6	20.0	118	40 - 140

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ALS Group USA, Corp. dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Analyzed: 12/30/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Analytical Method: 8260C

Units: µg/Kg
Basis: Dry

Analysis Lot: 529515

Lab Control Sample
 RQ1700034-03

Analyte Name	Result	Spike Amount	% Rec	% Rec Limits
1,1,1,2-Tetrachloroethane	18.7	20.0	94	40 - 140
1,1,1-Trichloroethane (TCA)	19.2	20.0	96	40 - 140
1,1,2,2-Tetrachloroethane	18.7	20.0	93	40 - 140
1,1,2-Trichloroethane	19.3	20.0	97	40 - 140
1,1,2-Trichloro-1,2,2-trifluoroethane	18.2	20.0	91	40 - 140
1,1-Dichloroethene (1,1-DCE)	19.7	20.0	98	40 - 140
1,2,3-Trichloropropane	18.7	20.0	93	40 - 140
1,2-Dibromo-3-chloropropane (DBCP)	19.5	20.0	98	40 - 140
1,2-Dibromoethane	19.6	20.0	98	40 - 140
1,2-Dichlorobenzene	19.4	20.0	97	40 - 140
1,2-Dichloroethane	18.9	20.0	95	40 - 140
1,2-Dichloropropane	18.9	20.0	95	40 - 140
1,3-Dichlorobenzene	19.7	20.0	98	40 - 140
1,4-Dioxane	349	400	87	40 - 140
2-Butanone (MEK)	16.3	20.0	82	40 - 140
2-Chloro-1,3-butadiene	18.6	20.0	93	40 - 140
2-Chloroethyl Vinyl Ether	18.6	20.0	93	40 - 140
Isobutyl Alcohol	316	400	79	40 - 140
Allyl Chloride	19.7	20.0	99	40 - 140
4-Methyl-2-pentanone	17.9	20.0	90	40 - 140
Acetone	18.7	20.0	93	40 - 140
Acetonitrile	95.5	100	95	40 - 140
Acrolein	30.8	40.0	77	40 - 140
Acrylonitrile	94.3	100	94	40 - 140
Benzene	19.5	20.0	98	40 - 140
Bromodichloromethane	18.6	20.0	93	40 - 140
Bromoform	19.5	20.0	97	40 - 140
Bromomethane	19.2	20.0	96	40 - 140
Carbon Disulfide	16.2	20.0	81	40 - 140
Carbon Tetrachloride	19.1	20.0	95	40 - 140
Chlorobenzene	19.4	20.0	97	40 - 140
Chloroethane	19.6	20.0	98	40 - 140
Chloroform	19.1	20.0	95	40 - 140

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ALS Group USA, Corp. dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Analyzed: 12/30/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Analytical Method: 8260C

Units: µg/Kg
Basis: Dry

Analysis Lot: 529515

Lab Control Sample
 RQ1700034-03

Analyte Name	Result	Spike Amount	% Rec	% Rec Limits
Chloromethane	18.5	20.0	92	40 - 140
Dibromochloromethane	19.4	20.0	97	40 - 140
Dibromomethane	19.8	20.0	99	40 - 140
Dichlorodifluoromethane (CFC 12)	19.3	20.0	97	40 - 140
Dichloromethane	19.0	20.0	95	40 - 140
Ethyl Methacrylate	19.6	20.0	98	40 - 140
Ethylbenzene	18.9	20.0	95	40 - 140
Iodomethane	16.8	20.0	84	40 - 140
Methacrylonitrile	20.0	20.0	100	40 - 140
Methyl Methacrylate	20.0	20.0	100	40 - 140
Naphthalene	18.1	20.0	90	40 - 140
Propionitrile	90.5	100	91	40 - 140
Tetrachloroethene (PCE)	19.4	20.0	97	40 - 140
Toluene	18.9	20.0	95	40 - 140
Trichloroethene (TCE)	19.8	20.0	99	40 - 140
Trichlorofluoromethane (CFC 11)	19.6	20.0	98	40 - 140
Vinyl Chloride	20.7	20.0	104	40 - 140
cis-1,3-Dichloropropene	18.6	20.0	93	40 - 140
m,p-Xylenes	39.1	40.0	98	40 - 140
o-Xylene	19.1	20.0	95	40 - 140
trans-1,2-Dichloroethene	20.2	20.0	101	40 - 140
trans-1,3-Dichloropropene	18.9	20.0	94	40 - 140

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Metals

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ALS Group USA, Corp.
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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: RQ1615653-01

Service Request: R1613413
Date Collected: NA
Date Received: NA
Basis: Dry

Antimony, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.0	0.4	1	01/05/17 16:16	NA	
Arsenic, Total	6010C	ND U	mg/Kg	1.0	0.3	1	01/05/17 16:16	NA	
Barium, Total	6010C	ND U	mg/Kg	2.0	0.2	1	01/05/17 16:16	NA	
Beryllium, Total	6010C	ND U	mg/Kg	0.30	0.02	1	01/05/17 16:16	NA	
Cadmium, Total	6010C	0.04 J	mg/Kg	0.50	0.04	1	01/05/17 16:16	NA	
Chromium, Total	6010C	0.3 J	mg/Kg	1.0	0.2	1	01/05/17 16:16	NA	
Lead, Total	6010C	ND U	mg/Kg	5.0	0.3	1	01/05/17 16:16	NA	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/05/17 16:16	NA	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/05/17 16:16	NA	
Thallium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/05/17 16:16	NA	
Vanadium, Total	6010C	1.9 J	mg/Kg	5.0	0.2	1	01/05/17 16:16	NA	
Zinc, Total	6010C	0.9 J	mg/Kg	2.0	0.2	1	01/05/17 16:16	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: RQ1615710-01

Service Request: R1613413
Date Collected: NA
Date Received: NA
Basis: Dry

Mercury in Solid or Semisolid Waste (Manual CVAA)

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Mercury, Total	7471B	0.004 J	mg/Kg	0.033	0.003	1	12/30/16 15:10	NA	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: RQ1700060-01

Service Request: R1613413
Date Collected: NA
Date Received: NA
Basis: Dry

Nickel, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Nickel, Total	6010C	ND U	mg/Kg	4.0	0.2	1	01/06/17 16:26	NA	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request:R1613413
Date Collected:12/20/16
Date Received:12/22/16
Date Analyzed:01/05/17 - 01/09/17

Duplicate Matrix Spike Summary
Silver, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Sample Name: 1612201018 400-SB-09
Lab Code: R1613413-009

Units:mg/Kg
Basis:Dry

Matrix Spike
RQ1615653-03

Duplicate Matrix Spike
RQ1615653-04

Analyte Name	Method	Matrix Spike				Duplicate Matrix Spike				RPD	RPD Limit
		Sample Result	Result	Spike Amount	% Rec	Result	Spike Amount	% Rec	% Rec Limits		
Silver, Total	6010C	ND U	5.1	5.1	100	4.88	4.89	100	75-125	4	20
Arsenic, Total	6010C	5.0	10.7	4.1	142	8.91	3.91	101	75-125	19	20
Barium, Total	6010C	92.4	282	203	93	293	196	103	75-125	4	20
Beryllium, Total	6010C	0.49	5.30	5.08	95	5.10	4.89	94	75-125	4	20
Cadmium, Total	6010C	0.11 BJ	4.68	5.08	90	4.49	4.89	90	75-125	4	20
Chromium, Total	6010C	23.4	41.2	20.3	87	42.0	19.6	95	75-125	2	20
Lead, Total	6010C	12.1	57.3	50.8	89	56.4	48.9	91	75-125	1	20
Antimony, Total	6010C	ND U	39.9	50.8	79	37.9	48.9	78	75-125	5	20
Selenium, Total	6010C	ND U	95.9	103	93	91.7	98.8	93	75-125	4	20
Thallium, Total	6010C	0.9 J	211	203	103	201	196	102	75-125	5	20
Vanadium, Total	6010C	15.9 B	66.2	50.8	99	62.4	48.9	95	75-125	6	20
Zinc, Total	6010C	62.8	114	50.8	101	117	48.9	110	75-125	2	20

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request:R1613413
Date Collected:12/20/16
Date Received:12/22/16
Date Analyzed:01/05/17 - 01/09/17

Duplicate Matrix Spike Summary
Silver, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Sample Name: 1612201043 400-SB-11
Lab Code: R1613413-018

Units:mg/Kg
Basis:Dry

Analyte Name	Method	Sample Result	Result	Matrix Spike RQ1615653-05		Duplicate Matrix Spike RQ1615653-06		% Rec	% Rec Limits	RPD	RPD Limit
				Spike Amount	% Rec	Result	Spike Amount				
Silver, Total	6010C	ND U	4.9	5.1	97	5.0	5.2	97	75-125	2	20
Arsenic, Total	6010C	4.2	8.7	4.0	110	8.8	4.1	111	75-125	1	20
Barium, Total	6010C	627	1080	202	224	803	206	85	75-125	29	20
Beryllium, Total	6010C	0.52	5.28	5.06	94	5.33	5.16	93	75-125	<1	20
Cadmium, Total	6010C	0.09 BJ	4.62	5.06	89	4.56	5.16	87	75-125	1	20
Chromium, Total	6010C	16.1	32.6	20.2	82	33.7	20.6	85	75-125	3	20
Lead, Total	6010C	8.7	54.5	50.6	91	55.2	51.6	90	75-125	1	20
Antimony, Total	6010C	ND U	27.1	50.6	53	29.4	51.6	57	75-125	8	20
Selenium, Total	6010C	ND U	93.1	102	91	93.7	104	90	75-125	<1	20
Thallium, Total	6010C	0.9 J	204	202	100	206	206	99	75-125	<1	20
Vanadium, Total	6010C	24.6	71.4	50.6	92	74.4	51.6	96	75-125	4	20
Zinc, Total	6010C	43.9	82.7	50.6	77	84.6	51.6	79	75-125	2	20

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ALS Group USA, Corp.
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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request:R1613413
Date Collected:12/20/16
Date Received:12/22/16
Date Analyzed:01/05/17 - 01/09/17

Duplicate Matrix Spike Summary
Silver, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Sample Name: 1612201333 400-SB-13
Lab Code: R1613413-030

Units:mg/Kg
Basis:Dry

Matrix Spike
RQ1615653-07

Duplicate Matrix Spike
RQ1615653-08

Analyte Name	Method	Sample		Spike		Duplicate Matrix Spike		% Rec	% Rec	Limits	RPD	RPD Limit
		Result	Result	Amount	% Rec	Result	Amount					
Silver, Total	6010C	ND U	5.2	5.3	98	5.3	5.3	101	75-125	3	20	
Arsenic, Total	6010C	5.8	9.1	4.2	79	10.1	4.2	101	75-125	10	20	
Barium, Total	6010C	1370	696	210	-319	961	212	-191	75-125	32	20	
Beryllium, Total	6010C	0.48	5.38	5.26	93	5.49	5.31	94	75-125	2	20	
Cadmium, Total	6010C	0.25 BJ	4.74	5.26	85	4.91	5.31	88	75-125	3	20	
Chromium, Total	6010C	16.3	42.8	21.0	126	36.5	21.2	95	75-125	16	20	
Lead, Total	6010C	9.9	58.6	52.6	93	57.9	53.1	90	75-125	1	20	
Antimony, Total	6010C	ND U	42.2	52.6	80	42.8	53.1	81	75-125	1	20	
Selenium, Total	6010C	ND U	95.7	106	90	97.9	107	91	75-125	2	20	
Thallium, Total	6010C	1.8	212	210	100	222	212	103	75-125	4	20	
Vanadium, Total	6010C	14.4 B	64.8	52.6	96	67.2	53.1	99	75-125	4	20	
Zinc, Total	6010C	54.3	104	52.6	95	111	53.1	106	75-125	6	20	

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/30/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Mercury in Solid or Semisolid Waste (Manual CVAA)

Sample Name: 1612201018 400-SB-09
Lab Code: R1613413-009
Analysis Method: 7471B
Prep Method: Method

Units: mg/Kg
Basis: Dry

Analyte Name	Sample Result	Result	Matrix Spike RQ1615710-03		Result	Duplicate Matrix Spike RQ1615710-04		% Rec Limits	RPD	RPD Limit
			Spike Amount	% Rec		Spike Amount	% Rec			
Mercury, Total	ND U	0.165	0.171	97	0.166	0.171	97	75-125	<1	35

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/30/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Mercury in Solid or Semisolid Waste (Manual CVAA)

Sample Name: 1612201043 400-SB-11
Lab Code: R1613413-018
Analysis Method: 7471B
Prep Method: Method

Units: mg/Kg
Basis: Dry

Analyte Name	Sample Result	Result	Matrix Spike RQ1615710-05		Duplicate Matrix Spike RQ1615710-06		% Rec Limits	RPD	RPD Limit	
			Spike Amount	% Rec	Result	Spike Amount				% Rec
Mercury, Total	ND U	0.168	0.177	95	0.162	0.174	93	75-125	4	35

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/30/16
Date Extracted: NA

Duplicate Matrix Spike Summary
Mercury in Solid or Semisolid Waste (Manual CVAA)

Sample Name: 1612201333 400-SB-13
Lab Code: R1613413-030
Analysis Method: 7471B
Prep Method: Method

Units: mg/Kg
Basis: Dry

Analyte Name	Sample Result	Result	Matrix Spike RQ1615710-07		Duplicate Matrix Spike RQ1615710-08		% Rec Limits	RPD	RPD Limit	
			Spike Amount	% Rec	Result	Spike Amount				% Rec
Mercury, Total	ND U	0.164	0.172	95	0.161	0.172	94	75-125	1	35

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 01/6/17
Date Extracted: NA

Duplicate Matrix Spike Summary

Nickel, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Sample Name: 1612201018 400-SB-09
Lab Code: R1613413-009
Analysis Method: 6010C
Prep Method: EPA 3050B

Units: mg/Kg
Basis: Dry

Analyte Name	Sample Result	Result	Matrix Spike RQ1700060-03		Duplicate Matrix Spike RQ1700060-04		% Rec Limits	RPD	RPD Limit	
			Spike Amount	% Rec	Result	Spike Amount				% Rec
Nickel, Total	9.6	53.5	50.3	87	52.5	49.8	86	75-125	2	20

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Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 01/6/17
Date Extracted: NA

Duplicate Matrix Spike Summary

Nickel, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Sample Name: 1612201043 400-SB-11
Lab Code: R1613413-018
Analysis Method: 6010C
Prep Method: EPA 3050B

Units: mg/Kg
Basis: Dry

Analyte Name	Sample Result	Result	Matrix Spike RQ1700060-05		Result	Duplicate Matrix Spike RQ1700060-06		% Rec Limits	RPD	RPD Limit
			Spike Amount	% Rec		Spike Amount	% Rec			
Nickel, Total	4.0 J	51.9	52.6	91	53.5	52.6	94	75-125	3	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 01/6/17
Date Extracted: NA

Duplicate Matrix Spike Summary

Nickel, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Sample Name: 1612201333 400-SB-13
Lab Code: R1613413-030
Analysis Method: 6010C
Prep Method: EPA 3050B

Units: mg/Kg
Basis: Dry

Analyte Name	Sample Result	Result	Matrix Spike RQ1700060-07		Result	Duplicate Matrix Spike RQ1700060-08		% Rec Limits	RPD	RPD Limit
			Spike Amount	% Rec		Spike Amount	% Rec			
Nickel, Total	9.5	55.1	52.6	87	57.4	53.6	89	75-125	4	20

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Analyzed: 01/05/17

Lab Control Sample Summary
Antimony, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Units:mg/Kg
Basis:Dry

Lab Control Sample
RQ1615653-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Antimony, Total	6010C	46.0	50.0	92	80-120
Arsenic, Total	6010C	3.51	4.0	88	80-120
Barium, Total	6010C	198	200	99	80-120
Beryllium, Total	6010C	4.69	5.00	94	80-120
Cadmium, Total	6010C	4.83	5.00	97	80-120
Chromium, Total	6010C	19.3	20.0	97	80-120
Lead, Total	6010C	48.6	50.0	97	80-120
Selenium, Total	6010C	86.2	101	85	80-120
Silver, Total	6010C	4.62	5.0	92	80-120
Thallium, Total	6010C	174	200	87	80-120
Vanadium, Total	6010C	50.3	50.0	101	80-120
Zinc, Total	6010C	47.1	50.0	94	80-120

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Analyzed: 12/30/16

Lab Control Sample Summary
Mercury in Solid or Semisolid Waste (Manual CVAA)

Units:mg/Kg
Basis:Dry

Lab Control Sample
RQ1615710-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Mercury, Total	7471B	0.165	0.167	99	80-120

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413

Date Analyzed: 01/06/17

Lab Control Sample Summary
Nickel, Total, by Inductively Coupled Plasma-Atomic Emission Spectrometry

Units:mg/Kg

Basis:Dry

Lab Control Sample

RQ1700060-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Nickel, Total	6010C	50.4	50.0	101	80-120



General Chemistry

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QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/30/16

Replicate Sample Summary

Total Solids

Sample Name: 1612201015 400-SB-09
Lab Code: R1613413-007

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>Sample Result</u>	<u>Duplicate Sample RQ1615798-01 Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	97.3	97.6	97.4	<1	20

Results flagged with an asterisk (*) indicate values outside control criteria.

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ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/30/16

Replicate Sample Summary

Total Solids

Sample Name: 1612201018 400-SB-09
Lab Code: R1613413-009

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>MDL</u>	<u>Sample Result</u>	<u>Duplicate Sample RQ1615798-02 Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	-	97.4	97.1	97.2	<1	20

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ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/30/16

Replicate Sample Summary

Total Solids

Sample Name: 1612201040 400-SB-11
Lab Code: R1613413-016

Units: Percent
Basis: As Received

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate	Average	RPD	RPD Limit
				Sample RQ1615798-03 Result			
Total Solids	ALS SOP	-	94.3	94.2	94.3	<1	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

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ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/30/16

Replicate Sample Summary

Total Solids

Sample Name: 1612201043 400-SB-11
Lab Code: R1613413-018

Units: Percent
Basis: As Received

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample	Average	RPD	RPD Limit
					RQ1615798-04			
Total Solids	ALS SOP	-	-	94.1	94.1	94.1	<1	20

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dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/30/16

Replicate Sample Summary

Total Solids

Sample Name: 1612201330 400-SB-13
Lab Code: R1613413-028

Units: Percent
Basis: As Received

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate	Average	RPD	RPD Limit
				Sample RQ1615798-05 Result			
Total Solids	ALS SOP	-	93.6	93.8	93.7	<1	20

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dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613413
Date Collected: 12/20/16
Date Received: 12/22/16
Date Analyzed: 12/30/16

Replicate Sample Summary

Total Solids

Sample Name: 1612201333 400-SB-13
Lab Code: R1613413-030

Units: Percent
Basis: As Received

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>MRL</u>	<u>MDL</u>	<u>Sample Result</u>	<u>Duplicate Sample RQ1615798-06 Result</u>	<u>Average</u>	<u>RPD</u>	<u>RPD Limit</u>
Total Solids	ALS SOP	-	-	92.3	92.8	92.5	<1	20

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Subcontracted Analytical Parameters

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January 5, 2017

Reports and Invoices
ALS Environmental
1565 Jefferson Road
Building 300, Suite 360
Rochester, NY 14623

Certificate of Analysis

Project Name:	Metals without J values	Workorder:	2198350
Purchase Order:	58R1613413	Workorder ID:	R1613413

Dear Reports Invoices:

Enclosed are the analytical results for samples received by the laboratory on Wednesday, December 28, 2016.

The ALS Environmental laboratory in Middletown, Pennsylvania is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Mr. Brad W Kintzer (Project Coordinator) at (717) 944-5541.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state requirements. The test results meet requirements of the current NELAP standards or state requirements, where applicable. For a specific list of accredited analytes, refer to the certifications section of the ALS website at www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads.

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ALS Spring City: 10 Riverside Drive, Spring City, PA 19475 610-948-4903

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.


Mr. Brad W Kintzer
Project Coordinator

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SAMPLE SUMMARY

Workorder: 2198350 R1613413

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
2198350001	1612201002 400-SB-09	Solid	12/20/2016 00:00	12/28/2016 09:30	Collected by Client
2198350002	1612201007 400-SB-09	Solid	12/20/2016 00:00	12/28/2016 09:30	Collected by Client
2198350003	1612201021 400-SB-09	Solid	12/20/2016 00:00	12/28/2016 09:30	Collected by Client
2198350004	1612201022 400-SB-09	Solid	12/20/2016 00:00	12/28/2016 09:30	Collected by Client
2198350005	1612201032 400-SB-11	Solid	12/20/2016 00:00	12/28/2016 09:30	Collected by Client
2198350006	1612201046 400-SB-11	Solid	12/20/2016 00:00	12/28/2016 09:30	Collected by Client
2198350007	1612201047 400-SB-11	Solid	12/20/2016 00:00	12/28/2016 09:30	Collected by Client
2198350008	1612201102 400-SB-13	Solid	12/20/2016 00:00	12/28/2016 09:30	Collected by Client
2198350009	1612201317 400-SB-13	Solid	12/20/2016 00:00	12/28/2016 09:30	Collected by Client
2198350010	1612201336 400-SB-13	Solid	12/20/2016 00:00	12/28/2016 09:30	Collected by Client
2198350011	1612201337 400-SB-13	Solid	12/20/2016 00:00	12/28/2016 09:30	Collected by Client

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SAMPLE SUMMARY

Workorder: 2198350 R1613413

Notes

- Samples collected by ALS personnel are done so in accordance with the procedures set forth in the ALS Field Sampling Plan (20 - Field Services Sampling Plan).
- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
- The Chain of Custody document is included as part of this report.
- All Library Search analytes should be regarded as tentative identifications based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.
- Parameters identified as "analyze immediately" require analysis within 15 minutes of collection. Any "analyze immediately" parameters not listed under the header "Field Parameters" are performed in the laboratory and are therefore analyzed out of hold time.
- Method references listed on this report beginning with the prefix "S" followed by a method number (such as S2310B-97) refer to methods from "Standard Methods for the Examination of Water and Wastewater".
- For microbiological analyses, the "Prepared" value is the date/time into the incubator and the "Analyzed" value is the date/time out the incubator.

Standard Acronyms/Flags

J	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
N	Indicates presumptive evidence of the presence of a compound
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference
LOD	DoD Limit of Detection
LOQ	DoD Limit of Quantitation
DL	DoD Detection Limit
I	Indicates reported value is greater than or equal to the Method Detection Limit (MDL) but less than the Report Detection Limit (RDL)
(S)	Surrogate Compound
NC	Not Calculated
*	Result outside of QC limits

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ANALYTICAL RESULTS

Workorder: 2198350 R1613413

Lab ID: **2198350001**
Sample ID: **1612201002 400-SB-09**

Date Collected: 12/20/2016 00:00 Matrix: Solid
Date Received: 12/28/2016 09:30

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	2.5		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
Total Solids	97.5		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/4/17 13:54 TRR	1/5/17 10:57	SRT	A2
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/4/17 13:54 TRR	1/5/17 10:57	SRT	A2
Barium, Total	2.2J	J	mg/L	2.8	0.94	SW846 6010C	1/4/17 13:54 TRR	1/5/17 10:57	SRT	A2
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54 TRR	1/5/17 10:57	SRT	A2
Cadmium, Total	ND		mg/L	0.011	0.0037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 10:57	SRT	A2
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54 TRR	1/5/17 10:57	SRT	A2
Lead, Total	0.027J	J	mg/L	0.033	0.011	SW846 6010C	1/4/17 13:54 TRR	1/5/17 10:57	SRT	A2
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/5/17 00:00 AXC	1/5/17 09:55	MNP	A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 10:57	SRT	A2
Selenium, Total	0.039J	J	mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 10:57	SRT	A2
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54 TRR	1/5/17 10:57	SRT	A2
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 10:57	SRT	A2
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54 TRR	1/5/17 10:57	SRT	A2
Zinc, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 10:57	SRT	A2



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ANALYTICAL RESULTS

Workorder: 2198350 R1613413

 Lab ID: **2198350002** Date Collected: 12/20/2016 00:00 Matrix: Solid
 Sample ID: **1612201007 400-SB-09** Date Received: 12/28/2016 09:30

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	4.0		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
Total Solids	96.0		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:01	SRT	A2
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:01	SRT	A2
Barium, Total	1.5J	J	mg/L	2.8	0.94	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:01	SRT	A2
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:01	SRT	A2
Cadmium, Total	0.0050J	J	mg/L	0.011	0.0037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:01	SRT	A2
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:01	SRT	A2
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:01	SRT	A2
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/5/17 00:00 AXC	1/5/17 09:56	MNP	A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:01	SRT	A2
Selenium, Total	0.046J	J	mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:01	SRT	A2
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:01	SRT	A2
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:01	SRT	A2
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:01	SRT	A2
Zinc, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:01	SRT	A2



Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2198350 R1613413

Lab ID: **2198350003**
Sample ID: **1612201021 400-SB-09**

Date Collected: 12/20/2016 00:00 Matrix: Solid
Date Received: 12/28/2016 09:30

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	2.3		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
Total Solids	97.7		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:05	SRT	A2
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:05	SRT	A2
Barium, Total	1.8J	J	mg/L	2.8	0.94	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:05	SRT	A2
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:05	SRT	A2
Cadmium, Total	0.0039J	J	mg/L	0.011	0.0037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:05	SRT	A2
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:05	SRT	A2
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:05	SRT	A2
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/5/17 00:00 AXC	1/5/17 09:57	MNP	A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:05	SRT	A2
Selenium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:05	SRT	A2
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:05	SRT	A2
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:05	SRT	A2
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:05	SRT	A2
Zinc, Total	0.048J	J	mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:05	SRT	A2


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ANALYTICAL RESULTS

Workorder: 2198350 R1613413

Lab ID: **2198350004**
Sample ID: **1612201022 400-SB-09**

Date Collected: 12/20/2016 00:00 Matrix: Solid
Date Received: 12/28/2016 09:30

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	2.9		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
Total Solids	97.1		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:16	SRT	A2
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:16	SRT	A2
Barium, Total	1.6J	J	mg/L	2.8	0.94	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:16	SRT	A2
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:16	SRT	A2
Cadmium, Total	0.0050J	J	mg/L	0.011	0.0037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:16	SRT	A2
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:16	SRT	A2
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:16	SRT	A2
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/5/17 00:00 AXC	1/5/17 10:02	MNP	A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:16	SRT	A2
Selenium, Total	0.037J	J	mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:16	SRT	A2
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:16	SRT	A2
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:16	SRT	A2
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:16	SRT	A2
Zinc, Total	0.072J	J	mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:16	SRT	A2



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ANALYTICAL RESULTS

Workorder: 2198350 R1613413

Lab ID: **2198350005**
Sample ID: **1612201032 400-SB-11**

Date Collected: 12/20/2016 00:00 Matrix: Solid
Date Received: 12/28/2016 09:30

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	12.8		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
Total Solids	87.2		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:20	SRT	A2
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:20	SRT	A2
Barium, Total	ND		mg/L	2.8	0.94	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:20	SRT	A2
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:20	SRT	A2
Cadmium, Total	0.0044J	J	mg/L	0.011	0.0037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:20	SRT	A2
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:20	SRT	A2
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:20	SRT	A2
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/5/17 00:00 AXC	1/5/17 10:03	MNP	A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:20	SRT	A2
Selenium, Total	0.037J	J	mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:20	SRT	A2
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:20	SRT	A2
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:20	SRT	A2
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:20	SRT	A2
Zinc, Total	0.088J	J	mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:20	SRT	A2



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ANALYTICAL RESULTS

Workorder: 2198350 R1613413

Lab ID: **2198350006**
Sample ID: **1612201046 400-SB-11**

Date Collected: 12/20/2016 00:00 Matrix: Solid
Date Received: 12/28/2016 09:30

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	5.1		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
Total Solids	94.9		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:06	SRT	A2
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:06	SRT	A2
Barium, Total	3.4		mg/L	2.8	0.94	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:06	SRT	A2
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:06	SRT	A2
Cadmium, Total	0.0039J	J	mg/L	0.011	0.0037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:06	SRT	A2
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:06	SRT	A2
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:06	SRT	A2
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/5/17 00:00 AXC	1/5/17 10:05	MNP	A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:06	SRT	A2
Selenium, Total	0.046J	J	mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:06	SRT	A2
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:06	SRT	A2
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:06	SRT	A2
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:06	SRT	A2
Zinc, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:06	SRT	A2


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ANALYTICAL RESULTS

Workorder: 2198350 R1613413

 Lab ID: **2198350007**
 Sample ID: **1612201047 400-SB-11**

 Date Collected: 12/20/2016 00:00 Matrix: Solid
 Date Received: 12/28/2016 09:30

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	5.6		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
Total Solids	94.4		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:24	SRT	A2
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:24	SRT	A2
Barium, Total	3.2		mg/L	2.8	0.94	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:24	SRT	A2
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:24	SRT	A2
Cadmium, Total	0.0039J	J	mg/L	0.011	0.0037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:24	SRT	A2
Chromium, Total	0.011J	J	mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:24	SRT	A2
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:24	SRT	A2
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/5/17 00:00 AXC	1/5/17 10:08	MNP	A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:24	SRT	A2
Selenium, Total	0.039J	J	mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:24	SRT	A2
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:24	SRT	A2
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:24	SRT	A2
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:24	SRT	A2
Zinc, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:24	SRT	A2



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ANALYTICAL RESULTS

Workorder: 2198350 R1613413

 Lab ID: **2198350008**
 Sample ID: **1612201102 400-SB-13**

 Date Collected: 12/20/2016 00:00 Matrix: Solid
 Date Received: 12/28/2016 09:30

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	4.3		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
Total Solids	95.7		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:28	SRT A2
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:28	SRT A2
Barium, Total	1.4J	J	mg/L	2.8	0.94	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:28	SRT A2
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:28	SRT A2
Cadmium, Total	ND		mg/L	0.011	0.0037	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:28	SRT A2
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:28	SRT A2
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:28	SRT A2
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/5/17 00:00	AXC	1/5/17 10:09	MNP A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:28	SRT A2
Selenium, Total	0.056J	J	mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:28	SRT A2
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:28	SRT A2
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:28	SRT A2
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:28	SRT A2
Zinc, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54	TRR	1/5/17 11:28	SRT A2



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ANALYTICAL RESULTS

Workorder: 2198350 R1613413

 Lab ID: **2198350009**
 Sample ID: **1612201317 400-SB-13**

 Date Collected: 12/20/2016 00:00 Matrix: Solid
 Date Received: 12/28/2016 09:30

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	3.4		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
Total Solids	96.6		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:32	SRT	A2
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:32	SRT	A2
Barium, Total	3.6		mg/L	2.8	0.94	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:32	SRT	A2
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:32	SRT	A2
Cadmium, Total	0.0039J	J	mg/L	0.011	0.0037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:32	SRT	A2
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:32	SRT	A2
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:32	SRT	A2
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/5/17 00:00 AXC	1/5/17 10:10	MNP	A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:32	SRT	A2
Selenium, Total	0.051J	J	mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:32	SRT	A2
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:32	SRT	A2
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:32	SRT	A2
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:32	SRT	A2
Zinc, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:32	SRT	A2



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ANALYTICAL RESULTS

Workorder: 2198350 R1613413

 Lab ID: **2198350010**
 Sample ID: **1612201336 400-SB-13**

 Date Collected: 12/20/2016 00:00 Matrix: Solid
 Date Received: 12/28/2016 09:30

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	6.1		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
Total Solids	93.9		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:28	SRT	A2
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:28	SRT	A2
Barium, Total	3.4		mg/L	2.8	0.94	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:28	SRT	A2
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:28	SRT	A2
Cadmium, Total	ND		mg/L	0.011	0.0037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:28	SRT	A2
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:28	SRT	A2
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:28	SRT	A2
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/5/17 00:00 AXC	1/5/17 10:13	MNP	A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:28	SRT	A2
Selenium, Total	0.052J	J	mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:28	SRT	A2
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:28	SRT	A2
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:28	SRT	A2
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:28	SRT	A2
Zinc, Total	0.057J	J	mg/L	0.11	0.037	SW846 6010C	1/4/17 14:21 TRR	1/5/17 12:28	SRT	A2



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ANALYTICAL RESULTS

Workorder: 2198350 R1613413

Lab ID: **2198350011**
Sample ID: **1612201337 400-SB-13**

Date Collected: 12/20/2016 00:00 Matrix: Solid
Date Received: 12/28/2016 09:30

Parameters	Results	Flag	Units	RDL	MDL	Method	Prepared By	Analyzed	By	Cntr
WET CHEMISTRY										
Moisture	5.3		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
Total Solids	94.7		%	0.1	0.01	S2540G-11		12/30/16 11:33	VKB	
TCLP METALS										
Antimony, Total	ND		mg/L	0.15	0.050	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:43	SRT	A2
Arsenic, Total	ND		mg/L	0.14	0.046	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:43	SRT	A2
Barium, Total	3.2		mg/L	2.8	0.94	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:43	SRT	A2
Beryllium, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:43	SRT	A2
Cadmium, Total	ND		mg/L	0.011	0.0037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:43	SRT	A2
Chromium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:43	SRT	A2
Lead, Total	ND		mg/L	0.033	0.011	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:43	SRT	A2
Mercury, Total	ND		mg/L	0.0020	0.00066	SW846 7470A	1/5/17 00:00 AXC	1/5/17 10:19	MNP	A1
Nickel, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:43	SRT	A2
Selenium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:43	SRT	A2
Silver, Total	ND		mg/L	0.022	0.0070	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:43	SRT	A2
Thallium, Total	ND		mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:43	SRT	A2
Vanadium, Total	ND		mg/L	0.028	0.010	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:43	SRT	A2
Zinc, Total	0.037J	J	mg/L	0.11	0.037	SW846 6010C	1/4/17 13:54 TRR	1/5/17 11:43	SRT	A2



Mr. Brad W Kintzer
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QUALITY CONTROL DATA

Workorder: 2198350 R1613413

QC Batch: MDIG/61775 **Analysis Method:** SW846 7470A

QC Batch Method: SW846 7470A

Associated Lab Samples: 2198350001, 2198350002, 2198350003, 2198350004, 2198350005, 2198350006, 2198350007, 2198350008, 2198350009, 2198350010

METHOD BLANK: 2464233

Parameter	Blank Result	Units	Reporting Limit
Mercury, Total	ND	mg/L	0.0020

LABORATORY CONTROL SAMPLE: 2464234

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Mercury, Total	90.5	mg/L	.002	0.0018J	85 - 115

MATRIX SPIKE: 2464235 DUPLICATE: 2464236 ORIGINAL: 2198350003

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Mercury, Total	0	mg/L	.005	.00485	.00466	97	93.2	70 - 130	4	20

MATRIX SPIKE: 2464237 DUPLICATE: 2464238 ORIGINAL: 2198350006

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Mercury, Total	0	mg/L	.005	.00485	.00467	97	93.4	70 - 130	3.78	20

MATRIX SPIKE: 2464239 DUPLICATE: 2464240 ORIGINAL: 2198350010

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Mercury, Total	.00001	mg/L	.005	.00451	.00429	90.1	85.7	70 - 130	5	20

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QUALITY CONTROL DATA

Workorder: 2198350 R1613413

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QUALITY CONTROL DATA

Workorder: 2198350 R1613413

QC Batch: MDIG/61776 **Analysis Method:** SW846 7470A
QC Batch Method: SW846 7470A
Associated Lab Samples: 2198350011

METHOD BLANK: 2464241

Parameter	Blank Result	Units	Reporting Limit
Mercury, Total	ND	mg/L	0.0020

LABORATORY CONTROL SAMPLE: 2464242

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Mercury, Total	88	mg/L	.002	0.0018J	85 - 115

MATRIX SPIKE: 2464243 DUPLICATE: 2464244 ORIGINAL: 2198351002

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Mercury, Total	0	mg/L	.005	.00466	.00465	93.2	93	70 - 130	.21	20

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QUALITY CONTROL DATA

Workorder: 2198350 R1613413

QC Batch: MDIG/61777 **Analysis Method:** SW846 6010C

QC Batch Method: SW846 3015

Associated Lab Samples: 2198350001, 2198350002, 2198350003, 2198350004, 2198350005, 2198350007, 2198350008, 2198350009, 2198350011

METHOD BLANK: 2464259

Parameter	Blank Result	Units	Reporting Limit
Antimony, Total	ND	mg/L	0.030
Arsenic, Total	ND	mg/L	0.028
Barium, Total	ND	mg/L	0.56
Beryllium, Total	ND	mg/L	0.0044
Cadmium, Total	ND	mg/L	0.0022
Chromium, Total	ND	mg/L	0.0056
Lead, Total	ND	mg/L	0.0067
Nickel, Total	ND	mg/L	0.022
Selenium, Total	ND	mg/L	0.022
Silver, Total	ND	mg/L	0.0044
Thallium, Total	ND	mg/L	0.022
Vanadium, Total	ND	mg/L	0.0056
Zinc, Total	ND	mg/L	0.022

LABORATORY CONTROL SAMPLE: 2464260

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Antimony, Total	107	mg/L	.22	0.24	80 - 120
Arsenic, Total	106	mg/L	.11	0.12	80 - 120
Barium, Total	108	mg/L	1.1	1.2	80 - 120
Beryllium, Total	106	mg/L	.22	0.24	80 - 120
Cadmium, Total	108	mg/L	.11	0.12	80 - 120
Chromium, Total	109	mg/L	.11	0.12	80 - 120
Lead, Total	106	mg/L	.11	0.12	80 - 120
Nickel, Total	109	mg/L	1.1	1.2	80 - 120
Selenium, Total	106	mg/L	1.1	1.2	80 - 120
Silver, Total	104	mg/L	.11	0.12	80 - 120
Thallium, Total	109	mg/L	.11	0.12	80 - 120
Vanadium, Total	109	mg/L	.056	0.061	80 - 120
Zinc, Total	110	mg/L	.56	0.61	80 - 120

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QUALITY CONTROL DATA

Workorder: 2198350 R1613413

MATRIX SPIKE: 2464261 DUPLICATE: 2464262 ORIGINAL: 2198350003

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Antimony, Total	.02167	mg/L	.22	.13055	.14833	49*	57	50 - 150	12.7	20
Arsenic, Total	.01444	mg/L	5.1	5.94994	6.16105	116	120	50 - 150	3.49	20
Barium, Total	1.78832	mg/L	11.1	13.69986	14.03875	107	110	50 - 150	2.44	20
Beryllium, Total	0	mg/L	.22	.23944	.24722	108	111	50 - 150	3.2	20
Cadmium, Total	.00389	mg/L	1.1	1.26832	1.30832	114	117	50 - 150	3.1	20
Chromium, Total	.00333	mg/L	5.1	5.32828	5.41606	104	106	50 - 150	1.63	20
Lead, Total	0	mg/L	5.1	5.57217	5.72217	109	112	50 - 150	2.66	20
Nickel, Total	.02	mg/L	1.1	1.28054	1.33999	113	119	50 - 150	4.54	20
Selenium, Total	.02667	mg/L	2.1	2.51997	2.64553	118	124	50 - 150	4.86	20
Silver, Total	0	mg/L	1.1	1.21721	1.23554	110	111	50 - 150	1.49	20
Thallium, Total	0	mg/L	.11	.14111	.11389	127	102	50 - 150	21.4	20
Vanadium, Total	.00556	mg/L	.056	.06167	.06055	101	99	50 - 150	1.82	20
Zinc, Total	.04778	mg/L	.56	.71333	.74666	120	126	50 - 150	4.57	20

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QUALITY CONTROL DATA

Workorder: 2198350 R1613413

QC Batch: MDIG/61778 **Analysis Method:** SW846 6010C

QC Batch Method: SW846 3015

Associated Lab Samples: 2198350006, 2198350010

METHOD BLANK: 2464263

Parameter	Blank Result	Units	Reporting Limit
Antimony, Total	ND	mg/L	0.030
Arsenic, Total	ND	mg/L	0.028
Barium, Total	ND	mg/L	0.56
Beryllium, Total	ND	mg/L	0.0044
Cadmium, Total	ND	mg/L	0.0022
Chromium, Total	ND	mg/L	0.0056
Lead, Total	ND	mg/L	0.0067
Nickel, Total	ND	mg/L	0.022
Selenium, Total	ND	mg/L	0.022
Silver, Total	ND	mg/L	0.0044
Thallium, Total	ND	mg/L	0.022
Vanadium, Total	ND	mg/L	0.0056
Zinc, Total	ND	mg/L	0.022

LABORATORY CONTROL SAMPLE: 2464264

Parameter	LCS % Rec	Units	Spike Conc.	LCS Result	% Rec Limit
Antimony, Total	105	mg/L	.22	0.23	80 - 120
Arsenic, Total	106	mg/L	.11	0.12	80 - 120
Barium, Total	107	mg/L	1.1	1.2	80 - 120
Beryllium, Total	105	mg/L	.22	0.23	80 - 120
Cadmium, Total	106	mg/L	.11	0.12	80 - 120
Chromium, Total	106	mg/L	.11	0.12	80 - 120
Lead, Total	106	mg/L	.11	0.12	80 - 120
Nickel, Total	108	mg/L	1.1	1.2	80 - 120
Selenium, Total	106	mg/L	1.1	1.2	80 - 120
Silver, Total	101	mg/L	.11	0.11	80 - 120
Thallium, Total	110	mg/L	.11	0.12	80 - 120
Vanadium, Total	108	mg/L	.056	0.060	80 - 120
Zinc, Total	109	mg/L	.56	0.60	80 - 120

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QUALITY CONTROL DATA

Workorder: 2198350 R1613413

MATRIX SPIKE: 2464265 DUPLICATE: 2464266 ORIGINAL: 2198350006

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Antimony, Total	.01556	mg/L	.22	.14833	.13222	59.7	52.5	50 - 150	11.5	20
Arsenic, Total	.01611	mg/L	5.1	5.96661	6.01661	116	117	50 - 150	.83	20
Barium, Total	3.43608	mg/L	11.1	15.36651	15.37762	107	107	50 - 150	.07	20
Beryllium, Total	0	mg/L	.22	.25222	.23889	113	107	50 - 150	5.43	20
Cadmium, Total	.00389	mg/L	1.1	1.2511	1.25665	112	113	50 - 150	.44	20
Chromium, Total	.00278	mg/L	5.1	5.18328	5.22773	101	102	50 - 150	.85	20
Lead, Total	0	mg/L	5.1	5.49328	5.52717	107	108	50 - 150	.62	20
Nickel, Total	.00611	mg/L	1.1	1.33999	1.27165	120	114	50 - 150	5.23	20
Selenium, Total	.04556	mg/L	2.1	2.63608	2.57886	123	120	50 - 150	2.19	20
Silver, Total	0	mg/L	1.1	1.19499	1.19332	108	107	50 - 150	.14	20
Thallium, Total	0	mg/L	.11	.13667	.13444	123	121	50 - 150	1.64	20
Vanadium, Total	.00444	mg/L	.056	.06222	.05889	104	98	50 - 150	5.5	20
Zinc, Total	.01667	mg/L	.56	.71944	.67722	126	119	50 - 150	6.05	20

MATRIX SPIKE: 2464267 DUPLICATE: 2464268 ORIGINAL: 2198350010

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Antimony, Total	.01778	mg/L	.22	.14333	.12944	56.5	50.2	50 - 150	10.2	20
Arsenic, Total	.01833	mg/L	5.1	5.98883	5.73328	117	112	50 - 150	4.36	20
Barium, Total	3.37719	mg/L	11.1	15.32762	14.6943	108	102	50 - 150	4.22	20
Beryllium, Total	0	mg/L	.22	.25222	.23944	113	108	50 - 150	5.2	20
Cadmium, Total	.00333	mg/L	1.1	1.2661	1.20554	114	108	50 - 150	4.9	20
Chromium, Total	0	mg/L	5.1	5.22884	5.03662	102	98.5	50 - 150	3.74	20
Lead, Total	0	mg/L	5.1	5.54106	5.29939	108	104	50 - 150	4.46	20
Nickel, Total	.02444	mg/L	1.1	1.36832	1.29276	121	114	50 - 150	5.68	20
Selenium, Total	.05167	mg/L	2.1	2.65108	2.51553	123	117	50 - 150	5.25	20
Silver, Total	0	mg/L	1.1	1.20499	1.15388	108	104	50 - 150	4.33	20
Thallium, Total	0	mg/L	.11	.10944	.11555	98.5	104	50 - 150	5.43	20
Vanadium, Total	.00556	mg/L	.056	.06444	.06	106	98	50 - 150	7.14	20
Zinc, Total	.05667	mg/L	.56	.73721	.69444	122	115	50 - 150	5.98	20

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QUALITY CONTROL DATA

Workorder: 2198350 R1613413

MATRIX SPIKE: 2464269 DUPLICATE: 2464270 ORIGINAL: 2198351002

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Antimony, Total	.02	mg/L	.22	.13222	.12722	50.5	48.2*	50 - 150	3.85	20
Arsenic, Total	.01889	mg/L	5.1	5.99438	5.91661	117	115	50 - 150	1.31	20
Barium, Total	1.53721	mg/L	11.1	13.5832	13.42209	108	107	50 - 150	1.19	20
Beryllium, Total	0	mg/L	.22	.24833	.24166	112	109	50 - 150	2.72	20
Cadmium, Total	.00389	mg/L	1.1	1.25943	1.23777	113	111	50 - 150	1.74	20
Chromium, Total	.00056	mg/L	5.1	5.30884	5.24884	104	103	50 - 150	1.14	20
Lead, Total	0	mg/L	5.1	5.58328	5.47106	109	107	50 - 150	2.03	20
Nickel, Total	.01944	mg/L	1.1	1.31388	1.28721	116	114	50 - 150	2.05	20
Selenium, Total	.03056	mg/L	2.1	2.57831	2.5372	121	119	50 - 150	1.61	20
Silver, Total	0	mg/L	1.1	.6261	.6211	56.3	55.9	50 - 150	.8	20
Thallium, Total	.00056	mg/L	.11	.12778	.11833	114	106	50 - 150	7.67	20
Vanadium, Total	.005	mg/L	.056	.06055	.06055	100	100	50 - 150	0	20
Zinc, Total	.01333	mg/L	.56	.68888	.66833	122	118	50 - 150	3.03	20

MATRIX SPIKE: 2464271 DUPLICATE: 2464272 ORIGINAL: 2198351005

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Antimony, Total	.01722	mg/L	.22	.12833	.125	50	48.5*	50 - 150	2.63	20
Arsenic, Total	.015	mg/L	5.1	5.91661	5.93327	115	116	50 - 150	.28	20
Barium, Total	1.73554	mg/L	11.1	13.66097	13.72209	107	108	50 - 150	.45	20
Beryllium, Total	0	mg/L	.22	.24333	.24166	109	109	50 - 150	.69	20
Cadmium, Total	.00278	mg/L	1.1	1.24221	1.24499	112	112	50 - 150	.22	20
Chromium, Total	0	mg/L	5.1	5.28606	5.32884	103	104	50 - 150	.81	20
Lead, Total	0	mg/L	5.1	5.50661	5.52828	108	108	50 - 150	.39	20
Nickel, Total	.00889	mg/L	1.1	1.28221	1.27277	115	114	50 - 150	.74	20
Selenium, Total	.03444	mg/L	2.1	2.52886	2.53886	118	119	50 - 150	.39	20
Silver, Total	0	mg/L	1.1	1.19054	1.2011	107	108	50 - 150	.88	20
Thallium, Total	0	mg/L	.11	.12667	.12722	114	114	50 - 150	.44	20
Vanadium, Total	.00222	mg/L	.056	.05889	.05778	102	100	50 - 150	1.9	20
Zinc, Total	.01611	mg/L	.56	.67777	.67444	119	118	50 - 150	.49	20

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QUALITY CONTROL DATA

Workorder: 2198350 R1613413

MATRIX SPIKE: 2464273 DUPLICATE: 2464274 ORIGINAL: 2198351008

****NOTE - The Original Result shown below is a raw result and is only used for the purpose of calculating Matrix Spike percent recoveries. This result is not a final value and cannot be used as such.

Parameter	Original Result	Units	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD
Antimony, Total	.01389	mg/L	.22	.12667	.12333	50.7	49.2*	50 - 150	2.67	20
Arsenic, Total	.01778	mg/L	5.1	5.83328	5.88883	114	115	50 - 150	.95	20
Barium, Total	2.09387	mg/L	11.1	13.88875	14.02208	106	107	50 - 150	.96	20
Beryllium, Total	0	mg/L	.22	.24111	.24611	108	111	50 - 150	2.05	20
Cadmium, Total	.00389	mg/L	1.1	1.22221	1.23499	110	111	50 - 150	1.04	20
Chromium, Total	.00056	mg/L	5.1	5.28606	5.36717	103	105	50 - 150	1.52	20
Lead, Total	0	mg/L	5.1	5.45217	5.53494	107	108	50 - 150	1.51	20
Nickel, Total	.01278	mg/L	1.1	1.26832	1.29888	113	116	50 - 150	2.38	20
Selenium, Total	.03611	mg/L	2.1	2.47831	2.53109	116	118	50 - 150	2.11	20
Silver, Total	0	mg/L	1.1	1.19332	1.20332	107	108	50 - 150	.83	20
Thallium, Total	0	mg/L	.11	.13722	.11278	123	101	50 - 150	19.6	20
Vanadium, Total	.00556	mg/L	.056	.05722	.05944	93	97	50 - 150	3.81	20
Zinc, Total	.02167	mg/L	.56	.68166	.68499	119	119	50 - 150	.49	20

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QUALITY CONTROL DATA

Workorder: 2198350 R1613413

QC Batch: WETC/181028 **Analysis Method:** S2540G-11

QC Batch Method: S2540G-11

Associated Lab Samples: 2198350001, 2198350002, 2198350003, 2198350004, 2198350005, 2198350006, 2198350007, 2198350008, 2198350009, 2198350010, 2198350011

SAMPLE DUPLICATE: 2462903 ORIGINAL: 2197762001

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	33.1446	%	27.4959	18.6*	10
Total Solids	66.8553	%	72.504	8.11*	5

SAMPLE DUPLICATE: 2462904 ORIGINAL: 2197975004

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	20.8443	%	25.9228	21.7*	10
Total Solids	79.1556	%	74.0771	6.63*	5

SAMPLE DUPLICATE: 2462905 ORIGINAL: 2198190009

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	11.0652	%	11.8897	7.18	10
Total Solids	88.9347	%	88.1102	.93	5

SAMPLE DUPLICATE: 2462906 ORIGINAL: 2198190019

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	9.2468	%	9.3183	.77	10
Total Solids	90.7531	%	90.6816	.08	5

SAMPLE DUPLICATE: 2462907 ORIGINAL: 2198350001

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	2.497	%	3.1173	22.1*	10
Total Solids	97.5029	%	96.8826	.64	5

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Vancouver Waterloo · Winnipeg · Yellowknife **United States:** Cincinnati · Everett · Fort Collins · Holland · Houston · Middletown · Salt Lake City · Spring City · York **Mexico:** Monterrey

QUALITY CONTROL DATA

Workorder: 2198350 R1613413

SAMPLE DUPLICATE: 2462908 ORIGINAL: 2198350011

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	5.3093	%	6.9484	26.7*	10
Total Solids	94.6906	%	93.0515	1.75	5

SAMPLE DUPLICATE: 2462909 ORIGINAL: 2198363001

Parameter	Original Result	Units	DUP Result	RPD	Max RPD
Moisture	75.9045	%	78.2982	3.1	10
Total Solids	24.0954	%	21.7017	10.5*	5

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 Vancouver Waterloo · Winnipeg · Yellowknife United States: Cincinnati · Everett · Fort Collins · Holland · Houston · Middletown · Salt Lake City · Spring City · York Mexico: Monterrey

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Workorder: 2198350 R1613413

Lab ID	Sample ID	Prep Method	Prep Batch	Analysis Method	Analysis Batch
2198350001	1612201002 400-SB-09			S2540G-11	WETC/181028
2198350002	1612201007 400-SB-09			S2540G-11	WETC/181028
2198350003	1612201021 400-SB-09			S2540G-11	WETC/181028
2198350004	1612201022 400-SB-09			S2540G-11	WETC/181028
2198350005	1612201032 400-SB-11			S2540G-11	WETC/181028
2198350006	1612201046 400-SB-11			S2540G-11	WETC/181028
2198350007	1612201047 400-SB-11			S2540G-11	WETC/181028
2198350008	1612201102 400-SB-13			S2540G-11	WETC/181028
2198350009	1612201317 400-SB-13			S2540G-11	WETC/181028
2198350010	1612201336 400-SB-13			S2540G-11	WETC/181028
2198350011	1612201337 400-SB-13			S2540G-11	WETC/181028
2198350001	1612201002 400-SB-09	SW846 7470A	MDIG/61775	SW846 7470A	META/55567
2198350002	1612201007 400-SB-09	SW846 7470A	MDIG/61775	SW846 7470A	META/55567
2198350003	1612201021 400-SB-09	SW846 7470A	MDIG/61775	SW846 7470A	META/55567
2198350004	1612201022 400-SB-09	SW846 7470A	MDIG/61775	SW846 7470A	META/55567
2198350005	1612201032 400-SB-11	SW846 7470A	MDIG/61775	SW846 7470A	META/55567
2198350006	1612201046 400-SB-11	SW846 7470A	MDIG/61775	SW846 7470A	META/55567
2198350007	1612201047 400-SB-11	SW846 7470A	MDIG/61775	SW846 7470A	META/55567
2198350008	1612201102 400-SB-13	SW846 7470A	MDIG/61775	SW846 7470A	META/55567
2198350009	1612201317 400-SB-13	SW846 7470A	MDIG/61775	SW846 7470A	META/55567
2198350010	1612201336 400-SB-13	SW846 7470A	MDIG/61775	SW846 7470A	META/55567
2198350011	1612201337 400-SB-13	SW846 7470A	MDIG/61776	SW846 7470A	META/55567
2198350001	1612201002 400-SB-09	SW846 3015	MDIG/61777	SW846 6010C	META/55562
2198350002	1612201007 400-SB-09	SW846 3015	MDIG/61777	SW846 6010C	META/55562
2198350003	1612201021 400-SB-09	SW846 3015	MDIG/61777	SW846 6010C	META/55562
2198350004	1612201022 400-SB-09	SW846 3015	MDIG/61777	SW846 6010C	META/55562
2198350005	1612201032 400-SB-11	SW846 3015	MDIG/61777	SW846 6010C	META/55562
2198350007	1612201047 400-SB-11	SW846 3015	MDIG/61777	SW846 6010C	META/55562
2198350008	1612201102 400-SB-13	SW846 3015	MDIG/61777	SW846 6010C	META/55562

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Vancouver Waterloo · Winnipeg · Yellowknife United States: Cincinnati · Everett · Fort Collins · Holland · Houston · Middletown · Salt Lake City · Spring City · York Mexico: Monterrey

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Workorder: 2198350 R1613413

Lab ID	Sample ID	Prep Method	Prep Batch	Analysis Method	Analysis Batch
2198350009	1612201317 400-SB-13	SW846 3015	MDIG/61777	SW846 6010C	META/55562
2198350011	1612201337 400-SB-13	SW846 3015	MDIG/61777	SW846 6010C	META/55562
2198350006	1612201046 400-SB-11	SW846 3015	MDIG/61778	SW846 6010C	META/55562
2198350010	1612201336 400-SB-13	SW846 3015	MDIG/61778	SW846 6010C	META/55562

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ALS Environmental Chain of Custody

1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475

ALS Contact: Janice Jaeger

Project Number: R1613413
 Project Manager: Janice Jaeger
 QAP: LAB QAP



Sample Time Lab ID

Lab Code	Sample ID	# of Cont.	Matrix	Date	Time	Lab ID	Ve TCLP 6010C	As TCLP 6010C	Ba TCLP 6010C	Be TCLP 6010C	Cd TCLP 6010C	Cr TCLP 6010C	Hg TCLP 7470A	Mn TCLP 6010C	Pb TCLP 6010C
[REDACTED]	1612201002 400-SB-09	1	Soil	12/20/16		Middletown ALS	X	X	X	X	X	X	X	X	X
[REDACTED]	1612201007 400-SB-09	1	Soil	12/20/16		Middletown ALS	X	X	X	X	X	X	X	X	X
[REDACTED]	1612201021 400-SB-09	2	Soil	12/20/16		Middletown ALS	X	X	X	X	X	X	X	X	X
[REDACTED]	1612201022 400-SB-09	1	Soil	12/20/16		Middletown ALS	X	X	X	X	X	X	X	X	X
[REDACTED]	1612201032 400-SB-11	1	Soil	12/20/16		Middletown ALS	X	X	X	X	X	X	X	X	X
[REDACTED]	1612201046 400-SB-11	2	Soil	12/20/16		Middletown ALS	X	X	X	X	X	X	X	X	X
[REDACTED]	1612201047 400-SB-11	1	Soil	12/20/16		Middletown ALS	X	X	X	X	X	X	X	X	X
[REDACTED]	1612201102 400-SB-13	1	Soil	12/20/16		Middletown ALS	X	X	X	X	X	X	X	X	X
[REDACTED]	1612201317 400-SB-13	1	Soil	12/20/16		Middletown ALS	X	X	X	X	X	X	X	X	X
[REDACTED]	1612201336 400-SB-13	2	Soil	12/20/16		Middletown ALS	X	X	X	X	X	X	X	X	X
[REDACTED]	1612201337 400-SB-13	1	Soil	12/20/16		Middletown ALS	X	X	X	X	X	X	X	X	X

Special Instructions/Comments
 AA&A/WSTF EDD

Turnaround Requirements
 RUSH (Surcharges Apply)
 PLEASE CIRCLE WORK DAYS
 1 2 3 4 5
 STANDARD
 Requested FAX Date: _____
 Requested Report Date: 01/06/17

Report Requirements
 I. Results Only
 II. Results + QC Summaries
 III. Results + QC and Calibration Summaries
 IV. Data Validation Report with Raw Data
 PQL/MDL/J Y N
 EDD Y N

Invoice Information
 PO# 58R1613413
 Bill to _____

H - Test is On Hold P - Test is Authorized for Prep Only

Relinquished By: Scott Soy 12/21/16 1500 Received By: [Signature] Airbill Number: _____

2198350

Site ID	Sample ID	Soil	Date	Location	Seal TCLP 6010C	Seal TCLP 6010C	TCLP EPA 1311	TI TCLP 6010C	V TCLP 6010C	Zn TCLP 6010C
[REDACTED]	1612201002 400-SB-09	Soil	12/20/16	Middletown ALS	X	X	X	X	X	X
[REDACTED]	1612201007 400-SB-09	Soil	12/20/16	Middletown ALS	X	X	X	X	X	X
[REDACTED]	1612201021 400-SB-09	Soil	12/20/16	Middletown ALS	X	X	X	X	X	X
[REDACTED]	1612201022 400-SB-09	Soil	12/20/16	Middletown ALS	X	X	X	X	X	X
[REDACTED]	1612201032 400-SB-11	Soil	12/20/16	Middletown ALS	X	X	X	X	X	X
[REDACTED]	1612201046 400-SB-11	Soil	12/20/16	Middletown ALS	X	X	X	X	X	X
[REDACTED]	1612201047 400-SB-11	Soil	12/20/16	Middletown ALS	X	X	X	X	X	X
[REDACTED]	1612201102 400-SB-13	Soil	12/20/16	Middletown ALS	X	X	X	X	X	X
[REDACTED]	1612201317 400-SB-13	Soil	12/20/16	Middletown ALS	X	X	X	X	X	X
[REDACTED]	1612201336 400-SB-13	Soil	12/20/16	Middletown ALS	X	X	X	X	X	X
[REDACTED]	1612201337 400-SB-13	Soil	12/20/16	Middletown ALS	X	X	X	X	X	X

Y N Initials Cooler Temp: C
 AT 2
 Cooler #:
 Custody Seals Present? (if present) Seals Intact?
 Received on Ice?
 COC/Lbls Complete
 Cont in Good Cond?
 Correct Containers?
 Correct Smp Vol?
 Correct Preservation?
 Headspace/Volatiles?
 Therm ID: #1852
 Ship Carrier: FedEx JPS
 DHL
 Tracking #: 6826 80178320

ALS Environmental Chain of Custody

1565 Jefferson Rd, Building 300 - Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475

ALS Contact: Janice Jaeger

Project Number: R1613413
Project Manager: Janice Jaeger
QAP: LAB QAP

Folder Comments:
ND U

Special Instructions/Comments H - Test is On Hold P - Test is Authorized for Prep Only	Turnaround Requirements <input type="checkbox"/> RUSH (Surcharges Apply) PLEASE CIRCLE WORK DAYS 1 2 3 4 5 <input type="checkbox"/> STANDARD Requested FAX Date: _____ Requested Report Date: 01/06/17	Report Requirements <input type="checkbox"/> I. Results Only <input type="checkbox"/> II. Results + QC Summaries <input type="checkbox"/> III. Results + QC and Calibration Summaries <input type="checkbox"/> IV. Data Validation Report with Raw Data PQL/MDL/J <input checked="" type="checkbox"/> Y <input type="checkbox"/> N EDD <input type="checkbox"/> N <input type="checkbox"/> N	Invoice Information
			PO# 58R.1613413 Bill to

Relinquished By:

Received By:

Airbill Number:

ALS Environmental Chain of Custody

1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475

ALS Contact: Janice Jaeger

Project Number: R1613413
Project Manager: Janice Jaeger
QAP: LAB QAP

Run QC on sample R1613413-011 for 6010C/Ag TCLP, As TCLP, Ba TCLP, Be TCLP, Cd TCLP, Cr TCLP, Ni TCLP, Pb TCLP, Sb TCLP, Se TCLP, Ti TCLP, V TCLP, Zn TCLP, 7470A/Hg TCLP
Run QC on sample R1613413-020 for 6010C/Ag TCLP, As TCLP, Ba TCLP, Be TCLP, Cd TCLP, Cr TCLP, Ni TCLP, Pb TCLP, Sb TCLP, Se TCLP, Ti TCLP, V TCLP, Zn TCLP, 7470A/Hg TCLP
Run QC on sample R1613413-032 for 6010C/Ag TCLP, As TCLP, Ba TCLP, Be TCLP, Cd TCLP, Cr TCLP, Ni TCLP, Pb TCLP, Sb TCLP, Se TCLP, Ti TCLP, V TCLP, Zn TCLP, 7470A/Hg TCLP

Comments:

ALS Group USA, Corp.
www.alsglobal.com
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RI613413

A Ship To: Middletown ALS
ALS Laboratory Group
34 Dogwood Lane
Middletown, PA 17057

PC AMS Date 12/27/16
SMO _____ Date _____

Instructions:

Ice _____
Dry Ice _____
No Ice _____

Shipping:

Overnight _____
2nd Day _____
Ground _____

Bill to Client Account _____

Comments:

ALS Group USA, Corp.
www.alsglobal.com
An ALS Limited Company



January 10, 2017

Service Request No:R1613527

Mr. Tom Hall
NASA/WSTF/Navarro
P.O. Box 20
Las Cruces, NM 88004

Laboratory Results for: White Sands Test Facility

Dear Mr.Hall,

Enclosed are the results of the sample(s) submitted to our laboratory December 29, 2016
For your reference, these analyses have been assigned our service request number **R1613527**.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAP standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report. The measurement uncertainty of the results included in this report is within that expected when using the prescribed method(s) for analysis of these samples, and represented by Laboratory Control Sample control limits. Any events, such as QC failures, which may add to the uncertainty are explained in the report narrative.

Please contact me if you have any questions. My extension is 7472. You may also contact me via email at Janice.Jaeger@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Janice Jaeger
Project Manager

ADDRESS 1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
PHONE +1 585 288 5380 | **FAX** +1 585 288 8475
ALS Group USA, Corp.
dba ALS Environmental



Narrative Documents

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com



Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request:R1613527
Date Received:12/29/16

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables, including results of QC samples analyzed from this delivery group. Analytical procedures performed by the lab are validated in accordance with NELAC standards. Any parameters that are not included in the lab's NELAC accreditation are identified on a "Non-Certified Analytes" report in the Miscellaneous Forms Section of this report. Individual analytical results requiring further explanation are flagged with qualifiers and/or discussed below. The flags are explained in the Report Qualifiers and Definitions page in the Miscellaneous Forms section of this report.

Sample Receipt

Two soil samples were received for analysis at ALS Environmental on 12/29/2016. Any discrepancies noted upon initial sample inspection are noted on the cooler receipt and preservation form included in this data package. The samples were received in good condition and consistent with the accompanying chain of custody form. Samples are refrigerated at $\leq 6^{\circ}\text{C}$ upon receipt at the lab except for aqueous samples designated for metals analyses, which are stored at room temperature.

Volatile Organic Analyses:

Method 8260c, 12/30/16: The lower control limit was exceeded for one or more analytes in the Continuing Calibration Verification (CCV). Since there were no detections of the analyte(s) in the associated field samples, the quantitation is not affected. The data quality was not significantly affected and no further corrective action was taken.

Metals Analyses:

Method 6010C SE, CRDL: The upper control limit was exceeded for one or more analytes in the Contract Required Detection Limit Standard (CRDL). The field samples analyzed in this sequence did not contain the analyte(s) in question. Since the exceedance equates to a potential high bias, the data quality is not affected. No further corrective action was required.

General Chemistry Analyses:

No significant anomalies were noted with this analysis.

Sample Receiving Notes:

Method 8260C: soil samples included in this report were received in jars and not collected using one of the EPA method 5035A low level options. In accordance with the NYSDOH technical notice of October 2012 all results or reporting limits $< 200 \text{ ug/kg}$ should be considered as estimated due to potential low bias.

Approved by  Date 1/10/2017



SAMPLE DETECTION SUMMARY

CLIENT ID: 1612271300 400-SB-07 **Lab ID: R1613527-001**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.1				Percent	ALS SOP

CLIENT ID: 1612271310 400-SB-08 **Lab ID: R1613527-002**

Analyte	Results	Flag	MDL	PQL	Units	Method
Total Solids	97.0				Percent	ALS SOP
Arsenic, Total	5.7		0.3	1.0	mg/Kg	6010C
Barium, Total	81.7		0.2	2.0	mg/Kg	6010C
Beryllium, Total	0.44		0.02	0.31	mg/Kg	6010C
Cadmium, Total	0.35	BJ	0.04	0.51	mg/Kg	6010C
Chromium, Total	12.0		0.2	1.0	mg/Kg	6010C
Lead, Total	8.1		0.3	5.1	mg/Kg	6010C
Mercury, Total	0.004	J	0.003	0.033	mg/Kg	7471B
Nickel, Total	8.8		0.2	4.1	mg/Kg	6010C
Thallium, Total	3.2		0.6	1.0	mg/Kg	6010C
Vanadium, Total	13.3		0.2	5.1	mg/Kg	6010C
Zinc, Total	43.9		0.2	2.0	mg/Kg	6010C



Sample Receipt Information

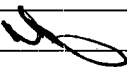
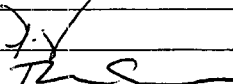

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request:R1613527

SAMPLE CROSS-REFERENCE

<u>SAMPLE #</u>	<u>CLIENT SAMPLE ID</u>	<u>DATE</u>	<u>TIME</u>
R1613527-001	1612271300 400-SB-07	12/27/2016	
R1613527-002	1612271310 400-SB-08	12/27/2016	

Laboratory PO #15EC007B		Analytical Requirements						Special Instructions	
Return Address for Analytical Reports		# of Containers	Sample Type: Soil (S)	SW-846 Method 8260B 4 oz. Glass Jar, Ice	Total Metals SW-846-6010C and 7470A 4 oz. Glass Jar, Ice			Please return coolers and reusable packaging materials as possible. Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall	
Sample No.	Sample Location								Comments
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012									
Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453									
161227 1300	400-SB-07	1	S	X				Container 7448	
161227 1310	400-SB-08	1	S		X			Container 7489	
Relinquished By: 		Date/Time: 12-27-16 1330		Accepted By: 				R1613527 5 NASA/WSTF/Navarro White Sands Test Facility 	
								12/29 100B 12-2816 9:10	



Cooler Receipt and Preservation Check Form

R1613527

5

NASA/WSTF/Navarro
White Sands Test Facility



Project/Client NASA Folder Number _____

Cooler received on 12/29 by: FS COURIER: ALS UPS FEDEX VELOCITY CLIENT

1	Were Custody seals on outside of cooler?	<input checked="" type="radio"/> Y	<input type="radio"/> N
2	Custody papers properly completed (ink, signed)?	<input checked="" type="radio"/> Y	<input type="radio"/> N
3	Did all bottles arrive in good condition (unbroken)?	<input checked="" type="radio"/> Y	<input type="radio"/> N
4	Circle: <u>Wet Ice</u> Dry Ice Gel packs present?	<input checked="" type="radio"/> Y	<input type="radio"/> N

5a	Perchlorate samples have required headspace?	Y	N	<input checked="" type="radio"/> NA
5b	Did VOA vials, Alk, or Sulfide have sig* bubbles?	Y	N	<input checked="" type="radio"/> NA
6	Where did the bottles originate?	<u>ALS/ROC</u>	CLIENT	
7	Soil VOA received as:	<u>Bulk</u>	Encore	5035set <u>NA</u>

8. Temperature Readings Date: 12/29 Time: 1015 ID: IR#7 IR#8 From: Temp Blank Sample Bottle

Observed Temp (°C)	<u>2.7</u>							
Correction Factor (°C)	<u>0</u>							
Corrected Temp (°C)	<u>2.7</u>							
Within 0-6°C?	<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N
If <0°C, were samples frozen?	<input type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> Y	<input type="radio"/> N

If out of Temperature, note packing/ice condition: _____ Ice melted Poorly Packed Same Day Rule
& Client Approval to Run Samples: _____ Standing Approval Client aware at drop-off Client notified by: _____

All samples held in storage location: R002 by FS on 12/29 at 1015
5035 samples placed in storage location: _____ by _____ on _____ at _____

Cooler Breakdown: Date: 12/29 Time: 1220 by: FS

- Were all bottle labels complete (i.e. analysis, preservation, etc.)? YES NO
- Did all bottle labels and tags agree with custody papers? YES NO
- Were correct containers used for the tests indicated? YES NO
- Were 5035 vials acceptable (no extra labels, not leaking)? YES NO
- Air Samples: Cassettes / Tubes Intact Canisters Pressurized Tedlar® Bags Inflated N/A N/A

Explain any discrepancies:

pH	Reagent	Yes	No	Lot Received	Exp	Sample ID	Vol. Added	Lot Added	Final pH
≥12	NaOH								
≤2	HNO ₃								
≤2	H ₂ SO ₄								
<4	NaHSO ₄								
Residual Chlorine (-)	For CN Phenol and 522			If +, contact PM to add Na ₂ S ₂ O ₃ (CN), ascorbic (phenol).					
	Na ₂ S ₂ O ₃	-	-						
	ZnAcetate	-	-						
	HCl	**	**						

Yes=All samples OK
No=Samples were preserved at The lab as listed
PM OK to Adjust: _____

**Not to be tested before analysis – pH tested and recorded by VOAs on a separate worksheet

Bottle lot numbers: _____
Other Comments: _____

CLRES	<u>BULK</u>
DO	FLDT
HPROD	HGFB
HTR	LL3541
PH	SUB
SO3	MARRS
ALS	REV

PC Secondary Review: [Signature] 12/29/16

*significant air bubbles: VOA > 5-6 mm : WC > 1 in. diameter



Miscellaneous Forms

ALS Environmental—Rochester Laboratory
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Phone (585) 288-5380 Fax (585) 288-8475
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REPORT QUALIFIERS AND DEFINITIONS

- | | |
|---|--|
| <p>U Analyte was analyzed for but not detected. The sample quantitation limit has been corrected for dilution and for percent moisture, unless otherwise noted in the case narrative.</p> <p>J Estimated value due to either being a Tentatively Identified Compound (TIC) or that the concentration is between the MRL and the MDL. Concentrations are not verified within the linear range of the calibration. For DoD: concentration >40% difference between two GC columns (pesticides/Aroclors).</p> <p>B Analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.</p> <p>E Inorganics- Concentration is estimated due to the serial dilution was outside control limits.</p> <p>E Organics- Concentration has exceeded the calibration range for that specific analysis.</p> <p>D Concentration is a result of a dilution, typically a secondary analysis of the sample due to exceeding the calibration range or that a surrogate has been diluted out of the sample and cannot be assessed.</p> <p>* Indicates that a quality control parameter has exceeded laboratory limits. Under the “Notes” column of the Form I, this qualifier denotes analysis was performed out of Holding Time.</p> <p>H Analysis was performed out of hold time for tests that have an “immediate” hold time criteria.</p> <p># Spike was diluted out.</p> | <p>+ Correlation coefficient for MSA is <0.995.</p> <p>N Inorganics- Matrix spike recovery was outside laboratory limits.</p> <p>N Organics- Presumptive evidence of a compound (reported as a TIC) based on the MS library search.</p> <p>S Concentration has been determined using Method of Standard Additions (MSA).</p> <p>W Post-Digestion Spike recovery is outside control limits and the sample absorbance is <50% of the spike absorbance.</p> <p>P Concentration >40% (25% for CLP) difference between the two GC columns.</p> <p>C Confirmed by GC/MS</p> <p>Q DoD reports: indicates a pesticide/Aroclor is not confirmed ($\geq 100\%$ Difference between two GC columns).</p> <p>X See Case Narrative for discussion.</p> <p>MRL Method Reporting Limit. Also known as:</p> <p>LOQ Limit of Quantitation (LOQ)
The lowest concentration at which the method analyte may be reliably quantified under the method conditions.</p> <p>MDL Method Detection Limit. A statistical value derived from a study designed to provide the lowest concentration that will be detected 99% of the time. Values between the MDL and MRL are estimated (see J qualifier).</p> <p>LOD Limit of Detection. A value at or above the MDL which has been verified to be detectable.</p> <p>ND Non-Detect. Analyte was not detected at the concentration listed. Same as U qualifier.</p> |
|---|--|



Rochester Lab ID # for State Certifications¹

Connecticut ID # PH0556	Maine ID #NY0032	New Hampshire ID #
Delaware Accredited	Nebraska Accredited	294100 A/B
DoD ELAP #65817	New Jersey ID # NY004	Pennsylvania ID# 68-786
Florida ID # E87674	New York ID # 10145	Rhode Island ID # 158
Illinois ID #200047	North Carolina #676	Virginia #460167

¹ Analyses were performed according to our laboratory’s NELAP-approved quality assurance program and any applicable state or agency requirements. The test results meet requirements of the current NELAP/TNI standards or state or agency requirements, where applicable, except as noted in the case narrative. Since not all analyte/method/matrix combinations are offered for state/NELAC accreditation, this report may contain results which are not accredited. For a specific list of accredited analytes, contact the laboratory or go to <http://www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads/North-America-Downloads>

ALS Laboratory Group

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

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Analyst Summary report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B

Service Request: R1613527

Sample Name: 1612271300 400-SB-07
Lab Code: R1613527-001
Sample Matrix: Soil

Date Collected: 12/27/16
Date Received: 12/29/16

Analysis Method
8260C
ALS SOP

Extracted/Digested By

Analyzed By
FNAEGLER
KWONG

Sample Name: 1612271310 400-SB-08
Lab Code: R1613527-002
Sample Matrix: Soil

Date Collected: 12/27/16
Date Received: 12/29/16

Analysis Method
6010C
7471B
ALS SOP

Extracted/Digested By
CBURLESON
CBURLESON

Analyzed By
NMANSEN
CBURLESON
KWONG



INORGANIC PREPARATION METHODS

The preparation methods associated with this report are found in these tables unless discussed in the case narrative.

Water/Liquid Matrix

Analytical Method	Preparation Method
200.7	200.2
200.8	200.2
6010C	3005A/3010A
6020A	ILM05.3
9014 Cyanide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Acid Soluble	9030B
9056A Bomb (Halogens)	5050A
9066 Manual Distillation	9065
SM 4500-CN-E Residual Cyanide	SM 4500-CN-G
SM 4500-CN-E WAD Cyanide	SM 4500-CN-I

Solid/Soil/Non-Aqueous Matrix

Analytical Method	Preparation Method
6010C	3050B
6020A	3050B
6010C TCLP (1311) extract	3005A/3010A
6010 SPLP (1312) extract	3005A/3010A
7196A	3060A
7199	3060A
9056A Halogens/Halides	5050
300.0 Anions/ 350.1/ 353.2/ SM 2320B/ SM 5210B/ 9056A Anions	DI extraction

For analytical methods not listed, the preparation method is the same as the analytical method reference.



Sample Results

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Volatile Organic Compounds by GC/MS

ALS Environmental—Rochester Laboratory

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613527
Date Collected: 12/27/16
Date Received: 12/29/16 10:05

Sample Name: 1612271300 400-SB-07
Lab Code: R1613527-001

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.1	0.86	1	12/30/16 15:04	
1,1,1-Trichloroethane (TCA)	ND U	5.1	0.76	1	12/30/16 15:04	
1,1,2,2-Tetrachloroethane	ND U	5.1	0.84	1	12/30/16 15:04	
1,1,2-Trichloroethane	ND U	5.1	0.76	1	12/30/16 15:04	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.1	1.3	1	12/30/16 15:04	
1,1-Dichloroethene (1,1-DCE)	ND U	5.1	1.4	1	12/30/16 15:04	
1,2,3-Trichloropropane	ND U	5.1	1.4	1	12/30/16 15:04	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.1	2.0	1	12/30/16 15:04	
1,2-Dibromoethane	ND U	5.1	1.3	1	12/30/16 15:04	
1,2-Dichlorobenzene	ND U	5.1	0.63	1	12/30/16 15:04	
1,2-Dichloroethane	ND U	5.1	0.63	1	12/30/16 15:04	
1,2-Dichloropropane	ND U	5.1	1.0	1	12/30/16 15:04	
1,3-Dichlorobenzene	ND U	5.1	0.65	1	12/30/16 15:04	
1,4-Dioxane	ND U	100	20	1	12/30/16 15:04	
2-Butanone (MEK)	ND U	5.1	2.4	1	12/30/16 15:04	
2-Chloro-1,3-butadiene	ND U	5.1	1.6	1	12/30/16 15:04	
2-Chloroethyl Vinyl Ether	ND U	5.1	1.8	1	12/30/16 15:04	
Isobutyl Alcohol	ND U	100	24	1	12/30/16 15:04	
Allyl Chloride	ND U	5.1	1.8	1	12/30/16 15:04	
4-Methyl-2-pentanone	ND U	5.1	1.1	1	12/30/16 15:04	
Acetone	ND U	5.1	2.9	1	12/30/16 15:04	
Acetonitrile	ND U	26	18	1	12/30/16 15:04	
Acrolein	ND U	26	3.7	1	12/30/16 15:04	
Acrylonitrile	ND U	26	6.7	1	12/30/16 15:04	
Benzene	ND U	5.1	0.30	1	12/30/16 15:04	
Bromodichloromethane	ND U	5.1	0.63	1	12/30/16 15:04	
Bromoform	ND U	5.1	0.96	1	12/30/16 15:04	
Bromomethane	ND U	5.1	1.5	1	12/30/16 15:04	
Carbon Disulfide	ND U	5.1	1.3	1	12/30/16 15:04	
Carbon Tetrachloride	ND U	5.1	0.95	1	12/30/16 15:04	
Chlorobenzene	ND U	5.1	0.30	1	12/30/16 15:04	
Chloroethane	ND U	5.1	3.0	1	12/30/16 15:04	
Chloroform	ND U	5.1	1.3	1	12/30/16 15:04	
Chloromethane	ND U	5.1	0.42	1	12/30/16 15:04	
Dibromochloromethane	ND U	5.1	0.76	1	12/30/16 15:04	
Dibromomethane	ND U	5.1	0.65	1	12/30/16 15:04	
Dichlorodifluoromethane (CFC 12)	ND U	5.1	2.0	1	12/30/16 15:04	
Dichloromethane	ND U	5.1	0.59	1	12/30/16 15:04	
Ethyl Methacrylate	ND U	5.1	0.78	1	12/30/16 15:04	
Ethylbenzene	ND U	5.1	0.24	1	12/30/16 15:04	
Iodomethane	ND U	10	1.2	1	12/30/16 15:04	
Methacrylonitrile	ND U	5.1	1.6	1	12/30/16 15:04	
Methyl Methacrylate	ND U	5.1	0.76	1	12/30/16 15:04	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612271300 400-SB-07
Lab Code: R1613527-001

Service Request: R1613527
Date Collected: 12/27/16
Date Received: 12/29/16 10:05

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.1	0.53	1	12/30/16 15:04	
Propionitrile	ND U	26	6.7	1	12/30/16 15:04	
Tetrachloroethene (PCE)	ND U	5.1	0.91	1	12/30/16 15:04	
Toluene	ND U	5.1	1.1	1	12/30/16 15:04	
Trichloroethene (TCE)	ND U	5.1	1.1	1	12/30/16 15:04	
Trichlorofluoromethane (CFC 11)	ND U	5.1	0.68	1	12/30/16 15:04	
Vinyl Chloride	ND U	5.1	1.9	1	12/30/16 15:04	
cis-1,3-Dichloropropene	ND U	5.1	0.93	1	12/30/16 15:04	
m,p-Xylenes	ND U	10	1.2	1	12/30/16 15:04	
o-Xylene	ND U	5.1	0.50	1	12/30/16 15:04	
trans-1,2-Dichloroethene	ND U	5.1	0.89	1	12/30/16 15:04	
trans-1,3-Dichloropropene	ND U	5.1	0.21	1	12/30/16 15:04	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	103	51 - 136	12/30/16 15:04	
Dibromofluoromethane	99	63 - 138	12/30/16 15:04	
Toluene-d8	105	66 - 138	12/30/16 15:04	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
000124-19-6	Nonanal	14.39	12	JN



Metals

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612271310 400-SB-08
Lab Code: R1613527-002

Service Request: R1613527
Date Collected: 12/27/16
Date Received: 12/29/16 10:05

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.1	0.5	1	01/09/17 21:03	01/09/17	
Arsenic, Total	6010C	5.7	mg/Kg	1.0	0.3	1	01/09/17 21:03	01/09/17	
Barium, Total	6010C	81.7	mg/Kg	2.0	0.2	1	01/09/17 21:03	01/09/17	
Beryllium, Total	6010C	0.44	mg/Kg	0.31	0.02	1	01/09/17 21:03	01/09/17	
Cadmium, Total	6010C	0.35 BJ	mg/Kg	0.51	0.04	1	01/09/17 21:03	01/09/17	
Chromium, Total	6010C	12.0	mg/Kg	1.0	0.2	1	01/09/17 21:03	01/09/17	
Lead, Total	6010C	8.1	mg/Kg	5.1	0.3	1	01/09/17 21:03	01/09/17	
Mercury, Total	7471B	0.004 J	mg/Kg	0.033	0.003	1	01/10/17 12:08	01/09/17	
Nickel, Total	6010C	8.8	mg/Kg	4.1	0.2	1	01/09/17 21:03	01/09/17	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.7	1	01/09/17 21:03	01/09/17	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/09/17 21:03	01/09/17	
Thallium, Total	6010C	3.2	mg/Kg	1.0	0.6	1	01/09/17 21:03	01/09/17	
Vanadium, Total	6010C	13.3	mg/Kg	5.1	0.2	1	01/09/17 21:03	01/09/17	
Zinc, Total	6010C	43.9	mg/Kg	2.0	0.2	1	01/09/17 21:03	01/09/17	



General Chemistry

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612271300 400-SB-07
Lab Code: R1613527-001

Service Request: R1613527
Date Collected: 12/27/16
Date Received: 12/29/16 10:05
Basis: As Received

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Q
Total Solids	ALS SOP	97.1	Percent	-	1	12/30/16 11:30	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: 1612271310 400-SB-08
Lab Code: R1613527-002

Service Request: R1613527
Date Collected: 12/27/16
Date Received: 12/29/16 10:05
Basis: As Received

Inorganic Parameters

<u>Analyte Name</u>	<u>Analysis Method</u>	<u>Result</u>	<u>Units</u>	<u>MRL</u>	<u>MDL</u>	<u>Dil.</u>	<u>Date Analyzed</u>	<u>Q</u>
Total Solids	ALS SOP	97.0	Percent	-	-	1	12/30/16 11:30	



QC Summary Forms

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Volatile Organic Compounds by GC/MS

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QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613527

SURROGATE RECOVERY SUMMARY
Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Extraction Method: EPA 5030C

Sample Name	Lab Code	4-Bromofluorobenzene	Dibromofluoromethane	Toluene-d8
		51 - 136	63 - 138	66 - 138
1612271300 400-SB-07	R1613527-001	103	99	105
Lab Control Sample	RQ1700034-03	106	107	106
Method Blank	RQ1700034-11	104	101	104

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613527
Date Collected: NA
Date Received: NA

Sample Name: Method Blank
Lab Code: RQ1700034-11

Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
1,1,1,2-Tetrachloroethane	ND U	5.0	0.83	1	12/30/16 13:20	
1,1,1-Trichloroethane (TCA)	ND U	5.0	0.73	1	12/30/16 13:20	
1,1,2,2-Tetrachloroethane	ND U	5.0	0.81	1	12/30/16 13:20	
1,1,2-Trichloroethane	ND U	5.0	0.73	1	12/30/16 13:20	
1,1,2-Trichloro-1,2,2-trifluoroethane	ND U	5.0	1.3	1	12/30/16 13:20	
1,1-Dichloroethene (1,1-DCE)	ND U	5.0	1.3	1	12/30/16 13:20	
1,2,3-Trichloropropane	ND U	5.0	1.4	1	12/30/16 13:20	
1,2-Dibromo-3-chloropropane (DBCP)	ND U	5.0	1.9	1	12/30/16 13:20	
1,2-Dibromoethane	ND U	5.0	1.3	1	12/30/16 13:20	
1,2-Dichlorobenzene	ND U	5.0	0.61	1	12/30/16 13:20	
1,2-Dichloroethane	ND U	5.0	0.61	1	12/30/16 13:20	
1,2-Dichloropropane	ND U	5.0	0.97	1	12/30/16 13:20	
1,3-Dichlorobenzene	ND U	5.0	0.63	1	12/30/16 13:20	
1,4-Dioxane	ND U	100	20	1	12/30/16 13:20	
2-Butanone (MEK)	ND U	5.0	2.3	1	12/30/16 13:20	
2-Chloro-1,3-butadiene	ND U	5.0	1.6	1	12/30/16 13:20	
2-Chloroethyl Vinyl Ether	ND U	5.0	1.8	1	12/30/16 13:20	
Isobutyl Alcohol	ND U	100	23	1	12/30/16 13:20	
Allyl Chloride	ND U	5.0	1.7	1	12/30/16 13:20	
4-Methyl-2-pentanone	ND U	5.0	0.98	1	12/30/16 13:20	
Acetone	ND U	5.0	2.9	1	12/30/16 13:20	
Acetonitrile	ND U	25	17	1	12/30/16 13:20	
Acrolein	ND U	25	3.5	1	12/30/16 13:20	
Acrylonitrile	ND U	25	6.5	1	12/30/16 13:20	
Benzene	ND U	5.0	0.29	1	12/30/16 13:20	
Bromodichloromethane	ND U	5.0	0.61	1	12/30/16 13:20	
Bromoform	ND U	5.0	0.93	1	12/30/16 13:20	
Bromomethane	ND U	5.0	1.4	1	12/30/16 13:20	
Carbon Disulfide	ND U	5.0	1.3	1	12/30/16 13:20	
Carbon Tetrachloride	ND U	5.0	0.92	1	12/30/16 13:20	
Chlorobenzene	ND U	5.0	0.29	1	12/30/16 13:20	
Chloroethane	ND U	5.0	2.9	1	12/30/16 13:20	
Chloroform	ND U	5.0	1.3	1	12/30/16 13:20	
Chloromethane	ND U	5.0	0.40	1	12/30/16 13:20	
Dibromochloromethane	ND U	5.0	0.73	1	12/30/16 13:20	
Dibromomethane	ND U	5.0	0.63	1	12/30/16 13:20	
Dichlorodifluoromethane (CFC 12)	ND U	5.0	1.9	1	12/30/16 13:20	
Dichloromethane	ND U	5.0	0.57	1	12/30/16 13:20	
Ethyl Methacrylate	ND U	5.0	0.75	1	12/30/16 13:20	
Ethylbenzene	ND U	5.0	0.23	1	12/30/16 13:20	
Iodomethane	ND U	10	1.2	1	12/30/16 13:20	
Methacrylonitrile	ND U	5.0	1.6	1	12/30/16 13:20	
Methyl Methacrylate	ND U	5.0	0.73	1	12/30/16 13:20	

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Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: RQ1700034-11

Service Request: R1613527
Date Collected: NA
Date Received: NA
Units: ug/Kg
Basis: Dry

Volatile Organic Compounds by GC/MS, Unpreserved

Analysis Method: 8260C
Prep Method: EPA 5030C

Analyte Name	Result	MRL	MDL	Dil.	Date Analyzed	Q
Naphthalene	ND U	5.0	0.51	1	12/30/16 13:20	
Propionitrile	ND U	25	6.5	1	12/30/16 13:20	
Tetrachloroethene (PCE)	ND U	5.0	0.88	1	12/30/16 13:20	
Toluene	ND U	5.0	1.0	1	12/30/16 13:20	
Trichloroethene (TCE)	ND U	5.0	1.1	1	12/30/16 13:20	
Trichlorofluoromethane (CFC 11)	ND U	5.0	0.66	1	12/30/16 13:20	
Vinyl Chloride	ND U	5.0	1.9	1	12/30/16 13:20	
cis-1,3-Dichloropropene	ND U	5.0	0.90	1	12/30/16 13:20	
m,p-Xylenes	ND U	10	1.1	1	12/30/16 13:20	
o-Xylene	ND U	5.0	0.48	1	12/30/16 13:20	
trans-1,2-Dichloroethene	ND U	5.0	0.86	1	12/30/16 13:20	
trans-1,3-Dichloropropene	ND U	5.0	0.20	1	12/30/16 13:20	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	104	51 - 136	12/30/16 13:20	
Dibromofluoromethane	101	63 - 138	12/30/16 13:20	
Toluene-d8	104	66 - 138	12/30/16 13:20	

Tentatively Identified Compounds

CAS#	Compound Identification	RT	Result ug/Kg	Q
	No Tentatively Identified Compounds Detected			

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613527
Date Analyzed: 12/30/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Units:ug/Kg
Basis:Dry

Lab Control Sample
RQ1700034-03

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
1,1,1,2-Tetrachloroethane	8260C	18.7	20.0	94	40-140
1,1,1-Trichloroethane (TCA)	8260C	19.2	20.0	96	40-140
1,1,2,2-Tetrachloroethane	8260C	18.7	20.0	93	40-140
1,1,2-Trichloroethane	8260C	19.3	20.0	97	40-140
1,1,2-Trichloro-1,2,2-trifluoroethane	8260C	18.2	20.0	91	40-140
1,1-Dichloroethene (1,1-DCE)	8260C	19.7	20.0	98	40-140
1,2,3-Trichloropropane	8260C	18.7	20.0	93	40-140
1,2-Dibromo-3-chloropropane (DBCP)	8260C	19.5	20.0	98	40-140
1,2-Dibromoethane	8260C	19.6	20.0	98	40-140
1,2-Dichlorobenzene	8260C	19.4	20.0	97	40-140
1,2-Dichloroethane	8260C	18.9	20.0	95	40-140
1,2-Dichloropropane	8260C	18.9	20.0	95	40-140
1,3-Dichlorobenzene	8260C	19.7	20.0	98	40-140
1,4-Dioxane	8260C	349	400	87	40-140
2-Butanone (MEK)	8260C	16.3	20.0	82	40-140
2-Chloro-1,3-butadiene	8260C	18.6	20.0	93	40-140
2-Chloroethyl Vinyl Ether	8260C	18.6	20.0	93	40-140
Isobutyl Alcohol	8260C	316	400	79	40-140
Allyl Chloride	8260C	19.7	20.0	99	40-140
4-Methyl-2-pentanone	8260C	17.9	20.0	90	40-140
Acetone	8260C	18.7	20.0	93	40-140
Acetonitrile	8260C	95.5	100	95	40-140
Acrolein	8260C	30.8	40.0	77	40-140
Acrylonitrile	8260C	94.3	100	94	40-140
Benzene	8260C	19.5	20.0	98	40-140
Bromodichloromethane	8260C	18.6	20.0	93	40-140
Bromoform	8260C	19.5	20.0	97	40-140
Bromomethane	8260C	19.2	20.0	96	40-140
Carbon Disulfide	8260C	16.2	20.0	81	40-140
Carbon Tetrachloride	8260C	19.1	20.0	95	40-140
Chlorobenzene	8260C	19.4	20.0	97	40-140
Chloroethane	8260C	19.6	20.0	98	40-140
Chloroform	8260C	19.1	20.0	95	40-140

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613527
Date Analyzed: 12/30/16

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS, Unpreserved

Units:ug/Kg
Basis:Dry

Lab Control Sample
RQ1700034-03

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Chloromethane	8260C	18.5	20.0	92	40-140
Dibromochloromethane	8260C	19.4	20.0	97	40-140
Dibromomethane	8260C	19.8	20.0	99	40-140
Dichlorodifluoromethane (CFC 12)	8260C	19.3	20.0	97	40-140
Dichloromethane	8260C	19.0	20.0	95	40-140
Ethyl Methacrylate	8260C	19.6	20.0	98	40-140
Ethylbenzene	8260C	18.9	20.0	95	40-140
Iodomethane	8260C	16.8	20.0	84	40-140
Methacrylonitrile	8260C	20.0	20.0	100	40-140
Methyl Methacrylate	8260C	20.0	20.0	100	40-140
Naphthalene	8260C	18.1	20.0	90	40-140
Propionitrile	8260C	90.5	100	91	40-140
Tetrachloroethene (PCE)	8260C	19.4	20.0	97	40-140
Toluene	8260C	18.9	20.0	95	40-140
Trichloroethene (TCE)	8260C	19.8	20.0	99	40-140
Trichlorofluoromethane (CFC 11)	8260C	19.6	20.0	98	40-140
Vinyl Chloride	8260C	20.7	20.0	104	40-140
cis-1,3-Dichloropropene	8260C	18.6	20.0	93	40-140
m,p-Xylenes	8260C	39.1	40.0	98	40-140
o-Xylene	8260C	19.1	20.0	95	40-140
trans-1,2-Dichloroethene	8260C	20.2	20.0	101	40-140
trans-1,3-Dichloropropene	8260C	18.9	20.0	94	40-140



Metals

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil
Sample Name: Method Blank
Lab Code: R1613527-MB

Service Request: R1613527
Date Collected: NA
Date Received: NA
Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Antimony, Total	6010C	ND U	mg/Kg	6.0	0.4	1	01/09/17 20:57	01/09/17	
Arsenic, Total	6010C	ND U	mg/Kg	1.0	0.3	1	01/09/17 20:57	01/09/17	
Barium, Total	6010C	ND U	mg/Kg	2.0	0.2	1	01/09/17 20:57	01/09/17	
Beryllium, Total	6010C	ND U	mg/Kg	0.30	0.02	1	01/09/17 20:57	01/09/17	
Cadmium, Total	6010C	0.05 J	mg/Kg	0.50	0.04	1	01/09/17 20:57	01/09/17	
Chromium, Total	6010C	ND U	mg/Kg	1.0	0.2	1	01/09/17 20:57	01/09/17	
Lead, Total	6010C	ND U	mg/Kg	5.0	0.3	1	01/09/17 20:57	01/09/17	
Mercury, Total	7471B	ND U	mg/Kg	0.033	0.003	1	01/10/17 12:05	01/09/17	
Nickel, Total	6010C	ND U	mg/Kg	4.0	0.2	1	01/09/17 20:57	01/09/17	
Selenium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/09/17 20:57	01/09/17	
Silver, Total	6010C	ND U	mg/Kg	1.0	0.5	1	01/09/17 20:57	01/09/17	
Thallium, Total	6010C	ND U	mg/Kg	1.0	0.6	1	01/09/17 20:57	01/09/17	
Vanadium, Total	6010C	ND U	mg/Kg	5.0	0.2	1	01/09/17 20:57	01/09/17	
Zinc, Total	6010C	ND U	mg/Kg	2.0	0.2	1	01/09/17 20:57	01/09/17	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613527
Date Collected: 12/27/16
Date Received: 12/29/16
Date Analyzed: 1/9/17

**Duplicate Matrix Spike Summary
Inorganic Parameters**

Sample Name: 1612271310 400-SB-08
Lab Code: R1613527-002

Units: mg/Kg
Basis: Dry

Analyte Name	Method	Matrix Spike R1613527-002MS				Duplicate Matrix Spike R1613527-002DMS				RPD	RPD Limit
		Sample Result	Result	Spike Amount	% Rec	Result	Spike Amount	% Rec	% Rec Limits		
Silver, Total	6010C	ND U	5.3	5.1	105	5.3	5.1	105	75-125	<1	20
Arsenic, Total	6010C	5.7	10.5	4.0	119	11.5	4.1	144 *	75-125	10	20
Barium, Total	6010C	81.7	284	202	100	294	204	104	75-125	4	20
Beryllium, Total	6010C	0.44	5.41	5.05	98	5.49	5.10	99	75-125	2	20
Cadmium, Total	6010C	0.35 BJ	5.03	5.05	93	5.25	5.10	96	75-125	4	20
Chromium, Total	6010C	12.0	33.5	20.2	106	37.3	20.4	124	75-125	11	20
Nickel, Total	6010C	8.8	56.9	50.5	95	57.6	51.0	95	75-125	1	20
Lead, Total	6010C	8.1	64.5	50.5	112	60.3	51.0	102	75-125	7	20
Antimony, Total	6010C	ND U	47.3	50.5	94	47.5	51.0	93	75-125	<1	20
Selenium, Total	6010C	ND U	99.2	102	97	99.0	103	96	75-125	<1	20
Thallium, Total	6010C	3.2	218	202	106	219	204	106	75-125	<1	20
Vanadium, Total	6010C	13.3	66.6	50.5	105	67.7	51.0	107	75-125	2	20
Zinc, Total	6010C	43.9	105	50.5	121	127	51.0	163 *	75-125	19	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: NASA/WSTF/Navarro
Project: White Sands Test Facility/15EC007B
Sample Matrix: Soil

Service Request: R1613527
Date Analyzed: 01/09/17 - 01/10/17

Lab Control Sample Summary
Inorganic Parameters

Units:mg/Kg
Basis:Dry

Lab Control Sample
R1613527-LCS

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Antimony, Total	6010C	49.4	50.0	99	80-120
Arsenic, Total	6010C	3.48	4.0	87	80-120
Barium, Total	6010C	214	200	107	80-120
Beryllium, Total	6010C	5.00	5.00	100	80-120
Cadmium, Total	6010C	5.28	5.00	106	80-120
Chromium, Total	6010C	20.6	20.0	103	80-120
Lead, Total	6010C	52.3	50.0	105	80-120
Mercury, Total	7471B	0.163	0.167	98	80-120
Nickel, Total	6010C	52.0	50.0	104	80-120
Selenium, Total	6010C	92.4	101	91	80-120
Silver, Total	6010C	4.93	5.0	99	80-120
Thallium, Total	6010C	187	200	94	80-120
Vanadium, Total	6010C	52.3	50.0	105	80-120
Zinc, Total	6010C	49.3	50.0	99	80-120

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Chemistry and Chemical Engineering Division
Department of Analytical & Environmental Chemistry

January 3, 2017

Navarro Research and Engineering Inc.
NASA - JSC - White Sands Test Facility
Transportation Officer, Building 120
12600 NASA Road
Las Cruces, NM 88012
Tel. 575-524-5452

Attention: Tom Hall

Subject: Reports for Batch-607-#728-T for NDMA/DMN Analysis of water & Soil Samples

SwRI Project #: 01.16988.103

SwRI Task Orders: **161216-6, 161222-3**


Navarro P.O. #: 15EC092B, 16EC038B

Dear Tom,

Enclosed please find the analytical reports for Batch-607- #728-T-Navarro of water & soil samples.

Southwest Research Institute appreciates the opportunity to provide the service to Navarro Research and Engineering Inc.. If you have any questions, please do not hesitate to call me at 210-522-3954.

Sincerely,



Gang Sun, Ph.D.
Program Manager

APPROVAL:



Michael Dammann
Director



CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161216-6, 161222-3
NAVARRO PO #: 15EC092B,16EC038B

NARRATIVE

(M-607 - #728-T-Navarro)

CLIENT: NAVARRO
SwRI PROJECT: 01.16988.01.103
BATCH #: Batch-607-#728-T
TASK ORDER: 161216-6, 161222-3
CLIENT PO#: 15EC092B, 16EC038B
REPORT DATA: 01/03/2016

NARRATIVE FOR NDMA/ DMN/BROMACIL ANALYSIS

1. Samples were extracted with dichloromethane (DCM) and analyzed by GC/MS in selective ion monitoring mode for N-Nitrosodimethylamine (NDMA), N-Nitrodimethylamine (DMN) and Bromacil according to the modified Method 607.
2. All water samples were extracted within 7 days and soil samples within 14 days of sample collection and were analyzed within 40 days of the extraction.
3. The response factor (RF) values for Calibration curve and/or for continuing calibration standard were less than 25 % for all target compounds. The water sample reporting limit is 0.01 ppb for 1-L extraction of aqueous samples. The sample reporting limit is 0.33 ng/g for 30g extraction of soil samples.
4. Lab control spike for aqueous samples at 0.50 µg/L level were extracted and analyzed. Lab control spike for soil samples at 17 µg/g level were extracted and analyzed. The recoveries for all target compounds were within method recovery criteria of 13-110% for NDMA, 30-150% for DMN, and 40-190% for Bromacil.
4. Surrogate compound was spiked into all samples before sample extraction at 0.50 µg/L level for final extracts. The surrogate recoveries for all samples were within method recovery criteria of 40-160%.
5. Laboratory solvent blanks were extracted and analyzed for every sample batch. No analytes were detected above report limits from the blanks.
6. A "J" value was reported if the associated value was below reporting limits but above the MDL value.
7. All analyte concentrations are expressed in µg/L (*ppb*). Sample calculation:

$$\text{Concentration } (\mu\text{g/L}) = \frac{C \text{ (ng/}\mu\text{L)} \times V_{\text{extr}} \text{ (}\mu\text{L)} \times \text{DF}}{V_{\text{samp}} \text{ (mL)}} \times \frac{1000 \text{ mL}}{1 \text{ L}} \times \frac{1 \mu\text{g}}{1000 \text{ ng}}$$

where: C = result of GC/MS analysis, in ng/µL
 V_{extr} = final volume of sample extract, in µL
 V_{samp} = sample volume taken for extraction, in mL
 DF = dilution factor, if any

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161216-6, 161222-3
NAVARRO PO #: 15EC092B,16EC038B

TASK ORDER AND CHAIN OF CUSTODY

Laboratory Task Order

TO #: 161216-6 Revision: 0

Project(s): 16988.01.10X
 Manager(s): SUN, GANG
 To Client: 01/06/17

SDG: 608011

SRR #s: 58846
 Client(s): Navarro

Instructions

Documents Related to this task order: 212748[COC for SRR 58846], 212749[Paperwork for SRR 58846], 108294[PO #179 + #180], 113038[PO #179 + #180 Change Order #1], 113134[PO #NAV0000060], 115908[PO #NAV0000060 CO #1], 117303[PO #NAV0000060 CO #2], 118820[PO #179 + #180 Change Order #2], 120319 [PO #104], 122923[PO #179 Change Order #3], 124787[PO #132], 124995[PO #179 Change Order #5]

Deliverables --> Hard Copy: no EDD: -YES- PDF: -YES-

Test: E607S

Holding: 14 days from CED

Section: EXTLAB

EXTRACTION BY METHOD 607.

Cnt: 6

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
608011		1	Soil	1612141325 (400-SB-08)	14 Dec 16	28 Dec 16
608012		1	Soil	1612141326 (400-SB-08)	14 Dec 16	28 Dec 16
608013		1	Soil	1612141340 (400-SB-13)	14 Dec 16	28 Dec 16
608014		1	Soil	1612141341 (400-SB-13)	14 Dec 16	28 Dec 16
608015		1	Soil	1612141355 (400-SB-14)	14 Dec 16	28 Dec 16
608016		1	Soil	1612141356 (400-SB-14)	14 Dec 16	28 Dec 16

Test: E607W

Holding: 7 days from CED

Section: EXTLAB

EXTRACTION BY METHOD 607

Cnt: 6

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
608011		1	Soil	1612141325 (400-SB-08)	14 Dec 16	21 Dec 16
608012		1	Soil	1612141326 (400-SB-08)	14 Dec 16	21 Dec 16
608013		1	Soil	1612141340 (400-SB-13)	14 Dec 16	21 Dec 16
608014		1	Soil	1612141341 (400-SB-13)	14 Dec 16	21 Dec 16
608015		1	Soil	1612141355 (400-SB-14)	14 Dec 16	21 Dec 16
608016		1	Soil	1612141356 (400-SB-14)	14 Dec 16	21 Dec 16

Test: T607W

Holding: 40 days from VTSR

Section: TDG

NDMA/DMN ANALYSIS BY GC/MS/SIM

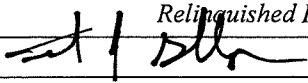
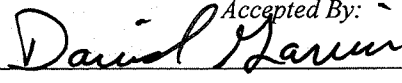
Cnt: 6

System ID	Type	Cont	Matrix	Customer ID	VTSR	Method Date
608011		1	Soil	1612141325 (400-SB-08)	16 Dec 16	25 Jan 17
608012		1	Soil	1612141326 (400-SB-08)	16 Dec 16	25 Jan 17
608013		1	Soil	1612141340 (400-SB-13)	16 Dec 16	25 Jan 17
608014		1	Soil	1612141341 (400-SB-13)	16 Dec 16	25 Jan 17
608015		1	Soil	1612141355 (400-SB-14)	16 Dec 16	25 Jan 17
608016		1	Soil	1612141356 (400-SB-14)	16 Dec 16	25 Jan 17



Date: December 14, 2016

Page 1 of 1

Laboratory PO #15EC092B & 16ECO38B		Analytical Requirements				Special Instructions	
Return Address for Analytical Reports		# of Containers	Sample Type: Aqueous (A); Slurry (S)	EPA method 607M 1 liter glass amber bottle Ice	EPA method 607M 8 oz Amber Glass Jar, Ice	Please return coolers and reusable packaging materials as soon as possible.	
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012 Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453						Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall	
Sample No.	Sample Location					Comments	
161214* 1324	400-SB-08	1	A	X			
161214** 1325	400-SB-08	1	S		X		
161214** 1326	400-SB-08	1	S		X		
161214* 1339	400-SB-13	1	A	X			
161214** 1340	400-SB-13	1	S		X		
161214** 1341	400-SB-13	1	S		X		
161214* 1354	400-SB-14	1	A	X			
161214** 1355	400-SB-14	1	S		X		
161214** 1356	400-SB-14	1	S		X		
Relinquished By: 		Date/Time: 12-14-16 (1445)		Accepted By: 		Date/Time: 12-16-16 / 08:30	

WSTF - 381C (02/15)

Client: Navarro
 SRR # 58846
 Project # 16988.01.10X
 Case: 16EC038B
 VTSR: 12/16/16
 Sample(s) Received: Intact
 Temperature: 1.9 SN # 021055

NASA-WSTF SHIPPING DOCUMENT

① Red RD-72

SHIPPED FROM: NASA JSC WHITE SANDS TEST FACILITY 12600 NASA ROAD; BLDG. 120 LAS CRUCES, NEW MEXICO 88012		WSTF ORIGINATOR/MAIL CODE/TELEPHONE NO. Tom Hall 575-524-5453			
SHIP TO: (ADDRESS, PHONE#, POINT OF CONTACT) Southwest Research Institute 6220 Culebra Raod San Antonio, TX 782238 Gang Sun 210-522-3954		ORDER OR CONTRACT NUMBER Navarro PO #15EC092B & 16ECO38	SHIPMENT CONTROL NO		
PROJECT or TASK NUMBER CP.6EE4IFW.0.71		SHIP VIA Fed Ex Air <i>12/15/16</i>			
Contain Batteries NO		NO. PKG. 1	DATE SHIPPED 12/14/2016		
AUTHORIZED BY: Tom Hall		DEPT. Environmental			
ITEM NO.	EQUIPMENT CONTROL NO.	MODEL NO./STOCK NO./PART NO.	ITEM NAME - MANUFACTURER'S NAME AND SERIAL NO.	UNIT OF ISSUE	QTY.
			Navarro PO #15EC092B: Line Item #1 NDMA and Bromacil for Soil samples by method 607M Line Item #2 NDMA and Bromacil for aqueous samples by method 607M Navarro PO #16ECO38: Line Item #1 NDMA and Bromacil for Mixed Media samples by method 607M	ea. ea. ea.	3 6
JUSTIFICATION FOR SHIPMENT: (MDR #, Return Authorization #'s, Warranty Replacement, Repair, Overage/Shortage, Damage, Recycling) Sample for analysis as requested (Navarro PO #15EC0092B)					
DOT HAZARDOUS MATERIALS INFO; EMERGENCY PHONE NUMBER AND GUIDE NUMBER: Not subject to regulation as a hazard material under 49 CFR.					
PROPERTY REVIEW: <input type="checkbox"/> REMOVE EQUIPMENT TAG <input type="checkbox"/> DO NOT REMOVE EQUIPMENT TAG					
PACKED BY:		# CONTAINERS	TYPE CONTAINERS	DIMENSIONS	WEIGHT
Please check off the applicable labels! <input type="checkbox"/> FRAGILE <input checked="" type="checkbox"/> GLASS <input type="checkbox"/> DELICATE <input type="checkbox"/> DO NOT XRAY <input checked="" type="checkbox"/> REFRIGERATE <input type="checkbox"/> OTHER <input checked="" type="checkbox"/> BUBBLEWRAP <input checked="" type="checkbox"/> FOAM		6	Glass	8 oz. Glass Jar	
		3	Glass	1 Liter Glass Bottle	
		TOTAL CONTAINERS			TOTAL WEIGHT
RECEIVED BY: <i>David Garcia</i>		SHIPPERS CERTIFICATION: This is to certify that the above named materials are properly classified, described, packaged, marked, labeled, and are in proper condition for transportation according to the regulations of the D.O.T. Date			
REPRESENTING: <i>SWRI</i>					

Client: Navarro
 SRR # 58846
 Project # 16988.01.10X
 Case: 16EC038B
 VTSR: 12/16/16
 Sample(s) Received: Intact
 Temperature: 1.9 SN # 021055

Laboratory Task Order

TO #: 161222-3 Revision: 1

Project(s): 16988.01.10X
 Manager(s): SUN, GANG
 To Client: 01/12/17

SDG: 608238

SRR #'s: 58883
 Client(s): Navarro

Instructions

Documents Related to this task order: 213166[COC for SRR 58883], 213167[Paperwork for SRR 58883], 108294[PO #179 + #180], 113038[PO #179 + #180 Change Order #1], 113134[PO #NAV0000060], 115908[PO #NAV0000060 CO #1], 117303[PO #NAV0000060 CO #2], 118820[PO #179 + #180 Change Order #2], 120319 [PO #104], 122923[PO #179 Change Order #3], 124787[PO #132], 124995[PO #179 Change Order #5]

Deliverables --> Hard Copy: no EDD: -YES- PDF: -YES-

Test: E607S

Holding: 14 days from CED

Section: EXTLAB

EXTRACTION BY METHOD 607.

Cnt: 16

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
608238		1	Soil	1612200843 (400-SB-06)	22 Dec 16	05 Jan 17
608239		1	Soil	1612200854 (400-SB-06)	22 Dec 16	05 Jan 17
608240		1	Soil	1612200903 (400-SB-07)	22 Dec 16	05 Jan 17
608241		1	Soil	1612200924 (400-SB-07)	22 Dec 16	05 Jan 17
608242		1	Soil	1612200933 (400-SB-08)	22 Dec 16	05 Jan 17
608243		1	Soil	1612200949 (400-SB-08)	22 Dec 16	05 Jan 17
608244		1	Soil	1612201003 (400-SB-09)	22 Dec 16	05 Jan 17
608245		1	Soil	1612201008 (400-SB-09)	22 Dec 16	05 Jan 17
608246		1	Soil	1612201024 (400-SB-09)	22 Dec 16	05 Jan 17
608247		1	Soil	1612201033 (400-SB-11)	22 Dec 16	05 Jan 17
608248		1	Soil	1612201049 (400-SB-11)	22 Dec 16	05 Jan 17
608249		1	Soil	1612201103 (400-SB-13)	22 Dec 16	05 Jan 17
608250		1	Soil	1612201318 (400-SB-13)	22 Dec 16	05 Jan 17
608251		1	Soil	1612201339 (400-SB-13)	22 Dec 16	05 Jan 17
608252		1	Soil	1612201340 (400-SB-13)	22 Dec 16	05 Jan 17
608253	MS	1	Soil	1612201341 (400-SB-13)	22 Dec 16	05 Jan 17

Test: T607W

Holding: 40 days from VTSR

Section: TDG

NDMA/DMN ANALYSIS BY GC/MS/SIM

Cnt: 16

System ID	Type	Cont	Matrix	Customer ID	VTSR	Method Date
608238		1	Soil	1612200843 (400-SB-06)	22 Dec 16	31 Jan 17
608239		1	Soil	1612200854 (400-SB-06)	22 Dec 16	31 Jan 17
608240		1	Soil	1612200903 (400-SB-07)	22 Dec 16	31 Jan 17
608241		1	Soil	1612200924 (400-SB-07)	22 Dec 16	31 Jan 17
608242		1	Soil	1612200933 (400-SB-08)	22 Dec 16	31 Jan 17
608243		1	Soil	1612200949 (400-SB-08)	22 Dec 16	31 Jan 17
608244		1	Soil	1612201003 (400-SB-09)	22 Dec 16	31 Jan 17
608245		1	Soil	1612201008 (400-SB-09)	22 Dec 16	31 Jan 17
608246		1	Soil	1612201024 (400-SB-09)	22 Dec 16	31 Jan 17
608247		1	Soil	1612201033 (400-SB-11)	22 Dec 16	31 Jan 17
608248		1	Soil	1612201049 (400-SB-11)	22 Dec 16	31 Jan 17
608249		1	Soil	1612201103 (400-SB-13)	22 Dec 16	31 Jan 17
608250		1	Soil	1612201318 (400-SB-13)	22 Dec 16	31 Jan 17
608251		1	Soil	1612201339 (400-SB-13)	22 Dec 16	31 Jan 17
608252		1	Soil	1612201340 (400-SB-13)	22 Dec 16	31 Jan 17
608253	MS	1	Soil	1612201341 (400-SB-13)	22 Dec 16	31 Jan 17



Date: December 20, 2016

Laboratory PO #15EC092B		Analytical Requirements				Special Instructions
Return Address for Analytical Reports		# of Containers	Sample Type: Soil (S)	EPA method 607M 8 oz Amber Glass Jar, Ice		
Sample No.	Sample Location						Comments
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012 Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453						
						Please return coolers and reusable packaging materials as soon as possible. Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall
161220	0843 400-SB-06	1	S	X		Container 7449
161220	0854 400-SB-06	1	S	X		Container 7458
161220	0903 400-SB-07	1	S	X		Container 7441
161220	0924 400-SB-07	1	S	X		Container 7448
161220	0933 400-SB-08	1	S	X		Container 7439
161220	0949 400-SB-08	1	S	X		Container 7440
161220	1003 400-SB-09	1	S	X		Container 7395
161220	1008 400-SB-09	1	S	X		Container 7396
161220	1024 400-SB-09	1	S	X		Container 7397
161220	1037 400-SB-11	1	S	X		Container 7472
161220	1049 400-SB-11	1	S	X		Container 7473
Relinquished By:		Date/Time:		Accepted By:		Date/Time:
<i>[Signature]</i>		12-20-16 (1500)		<i>[Signature]</i>		12-22-16 / 10:00

WSTF - 381C (02/15)

Client: Navarro
 SRR # 58883
 Project # 16988.01.10X
 Case: 15EC092B
 VTSR: 12/22/16
 Sample(s) Received: Intact
 Temperature: 2.0 SN # 021055

Laboratory PO #15EC092B		Analytical Requirements				Special Instructions
Return Address for Analytical Reports		# of Containers	Sample Type: Soil (S)	EPA method 607M 8 oz Amber Glass Jar, Ice		
Sample No.	Sample Location						Comments
NASA WSTF Environmental Department 12,600 NASA Road Las Cruces, NM 88012 Attn: <input checked="" type="checkbox"/> Tom Hall <input checked="" type="checkbox"/> Other _____ (575) 524-5453						Please return coolers and reusable packaging materials as soon as possible. Return Address: NASA WSTF Environmental Department 12600 NASA Road, Bldg. 120 Las Cruces, NM 88012 Attn: Tom Hall
161220	1103 400-SB-13	1	S	X		Container 7398
161220	1718 400-SB-13	1	S	X		Container 7399
161220	1339 400-SB-13	1	S	X		Container 7400
161220	1340 400-SB-13	1	S	X		Container 7400
161220	1341 400-SB-13	1	S	X		Matrix Spike for 161220 ; Container 7400
						Received 2 extra samples that were not on this COC, 1612201050 (400-SB-11), 1612201051 (-400-SB-11) was held by PM to dispose them. 12-22-16 David Garcia
Relinquished By: <i>[Signature]</i>		Date/Time: 12-20-16 (1440)		Accepted By: <i>[Signature]</i>		Date/Time: 12-22-16 / 10:00

NASA-WSTF SHIPPING DOCUMENT

① BLUE # XB47

SHIPPED FROM:			WSTF ORIGINATOR/MAIL CODE/TELEPHONE NO.				
NASA JSC WHITE SANDS TEST FACILITY			Patricia Melendrez/Purchasing Dept/ 524-5334		Tom Hall 575-524-5453		
12600 NASA ROAD; BLDG. 120			ORDER OR CONTRACT NUMBER	SHIPMENT CONTROL NO			
LAS CRUCES, NEW MEXICO 88012			PO 16EC038B				
SHIP TO: (ADDRESS, PHONE#, POINT OF CONTACT)			PROJECT or TASK NUMBER		SHIP VIA		
Southwest Research Institute			41FW 505-100				
6220 Culebra Road			Contain Batteries	NO. PKG.	DATE SHIPPED		
San Antonio, TX 78238			NO		12-21-16		
Gang Sun			Battery Type-Part #	AUTHORIZED BY:	DEPT.		
210-522-3954							
ITEM NO.	EQUIPMENT CONTROL NO.	MODEL NO./ STOCK NO./ PART NO.	ITEM NAME - MANUFACTURER'S NAME AND SERIAL NO.			UNIT OF ISSUE	QTY.
1			Mixed Media Samples (Water/Soil) for NDMA, DMN & Bromacil by EPA Method 607M			EA	16
JUSTIFICATION FOR SHIPMENT: (MDR #, Return Authorization #'s, Warranty Replacement, Repair, Overage/Shortage, Damage, Recycling)							
Mixed Media Samples for Analysis							
DOT HAZARDOUS MATERIALS INFO; EMERGENCY PHONE NUMBER AND GUIDE NUMBER:							
PROPERTY REVIEW:		<input type="checkbox"/> REMOVE EQUIPMENT TAG		<input type="checkbox"/> DO NOT REMOVE EQUIPMENT TAG			
PACKED BY:	#	TYPE	DIMENSIONS		WEIGHT		
	CONTAINERS	CONTAINERS					
Please check off the applicable labels!							
<input type="checkbox"/> FRAGILE							
<input type="checkbox"/> GLASS							
<input type="checkbox"/> DELICATE							
<input type="checkbox"/> DO NOT XRAY							
<input type="checkbox"/> REFRIGERATE							
<input type="checkbox"/> OTHER							
					TOTAL	TOTAL	
<input type="checkbox"/> BUBBLEWRAP					CONTAINERS	WEIGHT	
<input type="checkbox"/> FOAM							
RECEIVED BY:	<i>David Garcia</i>		SHIPPERS CERTIFICATION: This is to certify that the above				
REPRESENTING:	<i>SWRI</i>		named materials are properly classified, described, packaged, marked,				
			labeled, and are in proper condition for transportation according to the				
			regulations of the D.O.T. _____ Date _____				

Client: Navarro
 SRR # 58883
 Project # 16988.01.10X
 Case: 15EC092B
 VTSR: 12/22/16
 Sample(s) Received: Intact
 Temperature: 2.0 SN # 021055

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161216-6, 161222-3
NAVARRO PO #: 15EC092B,16EC038B

ANALYTICAL DATA REPORT SHEETS

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612141325 (400-SB-08)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161216-6
 Matrix: Soil
 Sample Wt/Vol: 31.09 g

Project: 16988.01.103
 Date Received: 12/16/16
 Date Extracted: 12/21/16
 Date Analyzed: 12/29/16
 Date Reported: 01/03/17

Lab Sample ID: 608011
 Lab File Name: A1229603.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	1.38	
4164-28-7	N-Nitrodimethylamine	0.55	
314-40-9	Bromacil	0.93	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612141326 (400-SB-08)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161216-6
 Matrix: Soil
 Sample Wt/Vol: 32.70 g

Project: 16988.01.103
 Date Received: 12/16/16
 Date Extracted: 12/21/16
 Date Analyzed: 12/29/16
 Date Reported: 01/03/17

Lab Sample ID: 608012
 Lab File Name: A1229604.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	2.11	
4164-28-7	N-Nitrodimethylamine	0.67	
314-40-9	Bromacil	<0.31	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612141340 (400-SB-13)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161216-6
 Matrix: Soil
 Sample Wt/Vol: 30.86 g

Project: 16988.01.103
 Date Received: 12/16/16
 Date Extracted: 12/21/16
 Date Analyzed: 12/29/16
 Date Reported: 01/03/17

Lab Sample ID: 608013
 Lab File Name: A1229605.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.32	U
4164-28-7	N-Nitrodimethylamine	<0.32	U
314-40-9	Bromacil	<0.32	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612141341 (400-SB-13)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161216-6
 Matrix: Soil
 Sample Wt/Vol: 31.60 g

Project: 16988.01.103
 Date Received: 12/16/16
 Date Extracted: 12/21/16
 Date Analyzed: 12/29/16
 Date Reported: 01/03/17

Lab Sample ID: 608014
 Lab File Name: A1229606.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.32	U
4164-28-7	N-Nitrodimethylamine	<0.32	U
314-40-9	Bromacil	<0.32	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612141355 (400-SB-14)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161216-6
 Matrix: Soil
 Sample Wt/Vol: 31.99 g

Project: 16988.01.103
 Date Received: 12/16/16
 Date Extracted: 12/21/16
 Date Analyzed: 12/29/16
 Date Reported: 01/03/17

Lab Sample ID: 608015
 Lab File Name: A1229607.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.31	U
4164-28-7	N-Nitrodimethylamine	<0.31	U
314-40-9	Bromacil	<0.31	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612141356 (400-SB-14)

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 608016

Batch: M607-#728T

Date Received: 12/16/16

Lab File Name: A1229608.txt

Task Order: 161216-6

Date Extracted: 12/21/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/29/16

Dilution Factor: 1

Sample Wt/Vol: 32.35 g

Date Reported: 01/03/17

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.31	U
4164-28-7	N-Nitrodimethylamine	<0.31	U
314-40-9	Bromacil	<0.31	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612200843 (400-SB-06)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.26 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608238
 Lab File Name: A1230607.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612200854 (400-SB-06)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.21 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608239
 Lab File Name: A1230608.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimehylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612200903 (400-SB-07)

Client: Navarro
Batch: M607-#728T
Task Order: 161222-3
Matrix: Soil
Sample Wt/Vol: 30.35 g

Project: 16988.01.103
Date Received: 12/22/16
Date Extracted: 12/28/16
Date Analyzed: 12/30/16
Date Reported: 01/03/17

Lab Sample ID: 608240
Lab File Name: A1230609.txt
Final Extraction Vol: 1000 uL
Dilution Factor: 1
Reporting Unit: ng/g
Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612200924 (400-SB-07)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.45 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608241
 Lab File Name: A1230610.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	0.16	J
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612200933 (400-SB-08)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.21 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608242
 Lab File Name: A1230611.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	10.26	
4164-28-7	N-Nitrodimethylamine	44.79	
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612200949 (400-SB-08)

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 608243

Batch: M607-#728T

Date Received: 12/22/16

Lab File Name: A1230612.txt

Task Order: 161222-3

Date Extracted: 12/28/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/30/16

Dilution Factor: 1

Sample Wt/Vol: 30.52 g

Date Reported: 01/03/17

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	22.51	
4164-28-7	N-Nitrodimethylamine	24.71	
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612201003 (400-SB-09)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.37 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608244
 Lab File Name: A1230613.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612201008 (400-SB-09)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.20 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608245
 Lab File Name: A1230614.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612201024 (400-SB-09)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.26 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608246
 Lab File Name: A1230615.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612201033 (400-SB-11)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.69 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608247
 Lab File Name: A1230616.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612201049 (400-SB-11)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.76 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608248
 Lab File Name: A1230617.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612201103 (400-SB-13)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.12 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608249
 Lab File Name: A1230618.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612201318 (400-SB-13)

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 608250

Batch: M607-#728T

Date Received: 12/22/16

Lab File Name: A1230619.txt

Task Order: 161222-3

Date Extracted: 12/28/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/30/16

Dilution Factor: 1

Sample Wt/Vol: 30.10 g

Date Reported: 01/03/17

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612201339 (400-SB-13)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.80 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608251
 Lab File Name: A1230620.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.32	U
4164-28-7	N-Nitrodimethylamine	<0.32	U
314-40-9	Bromacil	<0.32	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612201340 (400-SB-13)

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.39 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/31/16
 Date Reported: 01/03/17

Lab Sample ID: 608252
 Lab File Name: A1230621.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161216-6, 161222-3
NAVARRO PO #: 15EC092B,16EC038B

QA DATA SHEETS

**(BLANK, MATRIX SPIKE, SURROGATE,
CALIBRATION)**

Southwest Research Institute

Method 607 Internal Standard Summary

Filename: A12306S1.txt
 Standard ID: IS=ING/UL
 Project: 16988.01.103

Date Analyzed: 12/30/2016
 Time Analyzed: 12:16:00
 Client: Navarro

		IS1		IS2	
		Area	RT	Area	RT
Mid Point Standard		276005	8.4	166031	15.01
Upper Limit		552010	8.73	332062	15.34
Lower Limit		138002.5	8.07	83015.5	14.68
Client Sample ID	Lab Sample ID				
BLANK_28DEC16	608376	213169	8.40	127557	15.01
LCS_28DEC16 LCS	608377 LCS	216814	8.40	132948	15.01
1612200843 (400-SB-06)	608238	216582	8.40	126722	15.01
1612200854 (400-SB-06)	608239	231538	8.40	132520	15.01
1612200903 (400-SB-07)	608240	230734	8.40	130254	15.01
1612200924 (400-SB-07)	608241	225654	8.40	128837	15.01
1612200933 (400-SB-08)	608242	219383	8.40	131088	15.01
1612200949 (400-SB-08)	608243	233470	8.40	131198	15.01
1612201003 (400-SB-09)	608244	214368	8.40	127091	15.01
1612201008 (400-SB-09)	608245	225260	8.40	130184	15.01
1612201024 (400-SB-09)	608246	225569	8.40	128573	15.02
1612201033 (400-SB-11)	608247	217401	8.40	128443	15.01
1612201049 (400-SB-11)	608248	226089	8.40	130444	15.01
1612201103 (400-SB-13)	608249	228404	8.40	132612	15.01
1612201318 (400-SB-13)	608250	223528	8.40	128702	15.02
1612201339 (400-SB-13)	608251	218995	8.40	125827	15.01
1612201340 (400-SB-13)	608252	220380	8.40	130621	15.01
1612201341 (400-SB-13) MS	608253 MS	207440	8.40	122369	15.01

IS1 = 1,4-Dichlorobenzene-D4

IS2 = Atrazine-D5

* Flag indicating value is outside QC limits

Southwest Research Institute

Method 607 Internal Standard Summary

Filename: A12296S1.txt
 Standard ID: IS=1NG/UL
 Project: 16988.01.103

Date Analyzed: 12/29/2016
 Time Analyzed: 11:39:00
 Client: Navarro

		IS1		IS2	
		Area	RT	Area	RT
Mid Point Standard		279030	8.4	158470	15.02
Upper Limit		558060	8.73	316940	15.35
Lower Limit		139515	8.07	79235	14.69
Client Sample ID	Lab Sample ID				
BLANK_21DEC16	608273	223521	8.40	132087	15.01
LCS_21DEC16 LCS	608274 LCS	226050	8.40	132067	15.01
1612141325 (400-SB-08)	608011	232376	8.40	130809	15.01
1612141326 (400-SB-08)	608012	235549	8.40	132074	15.01
1612141340 (400-SB-13)	608013	228864	8.40	134895	15.01
1612141341 (400-SB-13)	608014	239651	8.40	138602	15.01
1612141355 (400-SB-14)	608015	229826	8.40	129228	15.01
1612141356 (400-SB-14)	608016	235836	8.40	134657	15.01

IS1 = 1,4-Dichlorobenzene-D4

IS2 = Atrazine-D5

* Flag indicating value is outside QC limits

Southwest Research Institute

Method 607 Blank Summary

Blank ID: BLANK_28DEC16

Project: 16988.01.103

Client: Navarro

SDG: 608238

Matrix: Soil

This method blank applies to the following samples, MS, and MSD's

Client Sample ID	Lab Sample ID	Date Acquired	Time Acquired
LCS_28DEC16	608377 LCS	12/30/16	13:25:00
1612200843 (400-SB-06)	608238	12/30/16	16:17:00
1612200854 (400-SB-06)	608239	12/30/16	16:51:00
1612200903 (400-SB-07)	608240	12/30/16	17:26:00
1612200924 (400-SB-07)	608241	12/30/16	18:00:00
1612200933 (400-SB-08)	608242	12/30/16	18:34:00
1612200949 (400-SB-08)	608243	12/30/16	19:09:00
1612201003 (400-SB-09)	608244	12/30/16	19:43:00
1612201008 (400-SB-09)	608245	12/30/16	20:18:00
1612201024 (400-SB-09)	608246	12/30/16	20:52:00
1612201033 (400-SB-11)	608247	12/30/16	21:27:00
1612201049 (400-SB-11)	608248	12/30/16	22:01:00
1612201103 (400-SB-13)	608249	12/30/16	22:36:00
1612201318 (400-SB-13)	608250	12/30/16	23:11:00
1612201339 (400-SB-13)	608251	12/30/16	23:45:00
1612201340 (400-SB-13)	608252	12/31/16	00:19:00
1612201341 (400-SB-13)	608253 MS	12/31/16	00:54:00

Southwest Research Institute

Method 607 Blank Summary

Blank ID: BLANK_21DEC16

Project: 16988.01.103

Client: Navarro

SDG: 608011

Matrix: Soil

This method blank applies to the following samples, MS, and MSD's

Client Sample ID	Lab Sample ID	Date Acquired	Time Acquired
LCS_21DEC16	608274 LCS	12/29/16	12:46:00
1612141325 (400-SB-08)	608011	12/29/16	13:20:00
1612141326 (400-SB-08)	608012	12/29/16	13:54:00
1612141340 (400-SB-13)	608013	12/29/16	14:28:00
1612141341 (400-SB-13)	608014	12/29/16	15:02:00
1612141355 (400-SB-14)	608015	12/29/16	15:36:00
1612141356 (400-SB-14)	608016	12/29/16	16:09:00

Southwest Research Institute

Method 607 Surrogate Recovery Summary

Client: Navarro

Matrix: Soil

SDG: 608011, 608238

Project: 16988.01.103

	Client Sample ID	Lab Sample ID	N-Nitroso-di-n-propylamine	
			% Recovery	Recovery Limits
3	BLANK_21DEC16	608273	96	40-160
4	LCS_21DEC16	608274 LCS	102	40-160
5	1612141325 (400-SB-08)	608011	111	40-160
6	1612141326 (400-SB-08)	608012	107	40-160
7	1612141340 (400-SB-13)	608013	118	40-160
8	1612141341 (400-SB-13)	608014	112	40-160
9	1612141355 (400-SB-14)	608015	114	40-160
10	1612141356 (400-SB-14)	608016	110	40-160
11	BLANK_28DEC16	608376	83	40-160
12	LCS_28DEC16	608377 LCS	89	40-160
13	1612200843 (400-SB-06)	608238	87	40-160
14	1612200854 (400-SB-06)	608239	89	40-160
15	1612200903 (400-SB-07)	608240	91	40-160
16	1612200924 (400-SB-07)	608241	83	40-160
17	1612200933 (400-SB-08)	608242	82	40-160
18	1612200949 (400-SB-08)	608243	87	40-160
19	1612201003 (400-SB-09)	608244	83	40-160
20	1612201008 (400-SB-09)	608245	89	40-160
21	1612201024 (400-SB-09)	608246	92	40-160
22	1612201033 (400-SB-11)	608247	77	40-160
23	1612201049 (400-SB-11)	608248	95	40-160
24	1612201103 (400-SB-13)	608249	79	40-160
25	1612201318 (400-SB-13)	608250	83	40-160
26	1612201339 (400-SB-13)	608251	86	40-160
27	1612201340 (400-SB-13)	608252	87	40-160
28	1612201341 (400-SB-13)	608253 MS	96	40-160

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

BLANK_21DEC16

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 608273

Batch: M607-#728T

Date Received: NA

Lab File Name: A1229601.txt

Task Order: NA

Date Extracted: 12/21/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/29/16

Dilution Factor: 1

Sample Wt/Vol: 31.21 g

Date Reported: 01/03/17

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.32	U
4164-28-7	N-Nitrodimethylamine	<0.32	U
314-40-9	Bromacil	<0.32	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

LCS_21DEC16

Client: Navarro
 Batch: M607-#728T
 Task Order: NA
 Matrix: Soil
 Sample Wt/Vol: 30.86 g

Project: 16988.01.103
 Date Received: NA
 Date Extracted: 12/21/16
 Date Analyzed: 12/29/16
 Date Reported: 01/03/17

Lab Sample ID: 608274 LCS
 Lab File Name: A1229602.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	11.86	
4164-28-7	N-Nitrodimethylamine	14.48	
314-40-9	Bromacil	21.39	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Blank Spike Recovery Report

Sample ID

LCS_21DEC16

Client: Navarro
 Batch: M607-#728T
 Task Order: NA
 Matrix: Soil
 Sample Wt/Vol: 30.86 g

Project: 16988.01.103
 Date Received: NA
 Date Extracted: 12/21/16
 Date Analyzed: 12/29/16
 Date Reported: 01/03/17

Lab Sample ID: 608274 LCS
 Blank ID: BLANK_21DEC16

ANALYTE	Spike Added ng/g	Blank Conc ng/g	LCS Conc ng/g	% Recovery	QC % Recovery Limits
N-Nitrosodimethylamine	16	0	12	75	13 - 110
N-Nitrodimethylamine	16	0	14	88	30 - 150
Bromacil	16	0	21	131	40 - 190

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

BLANK_28DEC16

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 608376

Batch: M607-#728T

Date Received: NA

Lab File Name: A1230601.txt

Task Order: NA

Date Extracted: 12/28/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/30/16

Dilution Factor: 1

Sample Wt/Vol: 30.21 g

Date Reported: 01/03/17

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	<0.33	U
4164-28-7	N-Nitrodimethylamine	<0.33	U
314-40-9	Bromacil	<0.33	U

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

LCS_28DEC16

Client: Navarro

Project: 16988.01.103

Lab Sample ID: 608377 LCS

Batch: M607-#728T

Date Received: NA

Lab File Name: A1230602.txt

Task Order: NA

Date Extracted: 12/28/16

Final Extraction Vol: 1000 uL

Matrix: Soil

Date Analyzed: 12/30/16

Dilution Factor: 1

Sample Wt/Vol: 30.05 g

Date Reported: 01/03/17

Reporting Unit: ng/g

Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Q
62-75-9	N-Nitrosodimethylamine	12.65	
4164-28-7	N-Nitrodimethylamine	14.58	
314-40-9	Bromacil	23.46	

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute

Method 607 Blank Spike Recovery Report

Sample ID

LCS_28DEC16

Client: Navarro
 Batch: M607-#728T
 Task Order: NA
 Matrix: Soil
 Sample Wt/Vol: 30.05 g

Project: 16988.01.103
 Date Received: NA
 Date Extracted: 12/28/16
 Date Analyzed: 12/30/16
 Date Reported: 01/03/17

Lab Sample ID: 608377 LCS

Blank ID: BLANK_28DEC16

ANALYTE	Spike Added ng/g	Blank Conc ng/g	LCS Conc ng/g	% Recovery	QC % Recovery Limits
N-Nitrosodimethylamine	17	0	13	76	13 - 110
N-Nitrodimethylamine	17	0	15	88	30 - 150
Bromacil	17	0	23	135	40 - 190

Southwest Research Institute

Method 607 Analysis Data Sheet

Sample ID

1612201341 (400-SB-13) MS

Client: Navarro
 Batch: M607-#728T
 Task Order: 161222-3
 Matrix: Soil
 Sample Wt/Vol: 30.63 g

Project: 16988.01.103
 Date Received: 12/22/16
 Date Extracted: 12/28/16
 Date Analyzed: 12/31/16
 Date Reported: 01/03/17

Lab Sample ID: 608253 MS
 Lab File Name: A1230622.txt
 Final Extraction Vol: 1000 uL
 Dilution Factor: 1
 Reporting Unit: ng/g
 Method: TAP 01-0408-031

CAS No.	ANALYTE	RESULT	Spike	Recovery	Recovery Limit
62-75-9	N-Nitrosodimethylamine	12.57	17.00	74%	13-110%
4164-28-7	N-Nitrodimethylamine	14.76	17.00	87%	30-150%
314-40-9	Bromacil	24.22	17.00	142%	40-190%

U - Undetected, indicates not found above the detection limit

J - Estimated value, greater than the MDL but less than the PQL

Southwest Research Institute***Continuing Calibration Check Sheet***

SwRI Project #: 01.16988.01.103 Calibration Date: 12/29/16
Sponsor: Navarro Analytical Method: TAP-01-0408-031
SwRI Standard ID: 202-04-120408017 Std Concentration: 1 µg/mL
File ID #: A12296S1 Initial Calibration Date: 10/17/16

ANALYTE	Mean RRF	RRF	% Dif.
N-Nitrosodimethylamine	0.361	0.401	-11.1
N-Nitrodimethylamine	0.13	0.140	-7.6
N-Nitroso-di-n-propylamine-d14	0.127	0.128	-0.2
Bromacil	1.161	0.935	19.4

Southwest Research Institute***Continuing Calibration Check Sheet***

SwRI Project #: 01.16988.01.103 Calibration Date: 12/30/16
Sponsor: Navarro Analytical Method: TAP-01-0408-031
SwRI Standard ID: 202-04-120408017 Std Concentration: 1 µg/mL
File ID #: A12306S1 Initial Calibration Date: 10/17/16

ANALYTE	Mean RRF	RRF	% Dif.
N-Nitrosodimethylamine	0.361	0.402	-11.4
N-Nitrodimethylamine	0.13	0.139	-7
N-Nitroso-di-n-propylamine-d14	0.127	0.133	-4
Bromacil	1.161	0.934	19.5

Southwest Research Institute

Initial Calibration Data Sheet

SwRI Project #:	01.16988.01.103	Calibration Data:	10/17/16
Sponsor:	Navarro	Analytical Method:	TAP-01-0408-031
SwRI Standard ID:	202-04-120408017	Std Concentration:	0.01-10 µg/mL

ANALYTE	RRF 0.01	RRF 0.05	RRF 0.2	RRF1	RRF5	RRF10	Ave. RRF	RSD%
N-Nitrosodimethylamine	0.291	0.308	0.352	0.369	0.417	0.430	0.361	15.49
N-Nitrodimethylamine	0.109	0.115	0.128	0.134	0.147	0.148	0.13	12.44
N-Nitroso-di-n-propylamine-d14	0.114	0.111	0.124	0.127	1.143	0.145	0.127	11.03
Bromacil	1.435	1.048	1.072	1.081	1.150	1.177	1.161	12.35

CLIENT: Navarro Research and Engineering Inc.
SwRI PROJECT: 01.16988
TASK ORDER: 161216-6, 161222-3
NAVARRO PO #: 15EC092B,16EC038B

EXTRACTION AND INJECTION LOG

SwRI Labs
 Client: Navarro
 Project: 16988.01.10X
 Case: 16EC038B

(E607S) SOIL/Water Ext By Sep-Funnel / Soxhlet 3540 C (Navarro) **010050** X36579

Sample Receipt: 58846
 TO#: 161216-6

DATE EXTRACTED	12/21/16
ANALYSTS INVOLVED	Hamed Edrisi (SU,SP,EXT) Christina Menn (SW,Conc,QT,FV)
SURROGATE SOL ID	203-01-120408017 @5.0ng/uL
MTX SPK SOL ID	201-01-120408017 @10ng/uL
EXTRACTS LOCATION	Tracked by LIMS (12/29/16 CM)
CHEMICAL, BRAND & LOT#	Ozarka water ID:04-0402-003p22C3 Sodium Sulfate ID:04-0402-004p27E DCM Fisher Optima Lot#164214
NOTES	Hamilton Co. Syringes: 100uL ID:462905(SURR) 50uL ID:462898(MS) Thermometer ID: G-076
ADDITIONAL NOTES I	These samples contained approximately 6 to 27% water. As per PM's instructions, approximately 30 g of the water/soil sample mixture was weighed and separated into its aqueous and solid phase. The aqueous phase was extracted by sep-funnel method three times, and the solid phase was extracted by Soxhlet, extracts from both phases were combine and concentrated to FV for GC/MS analysis.

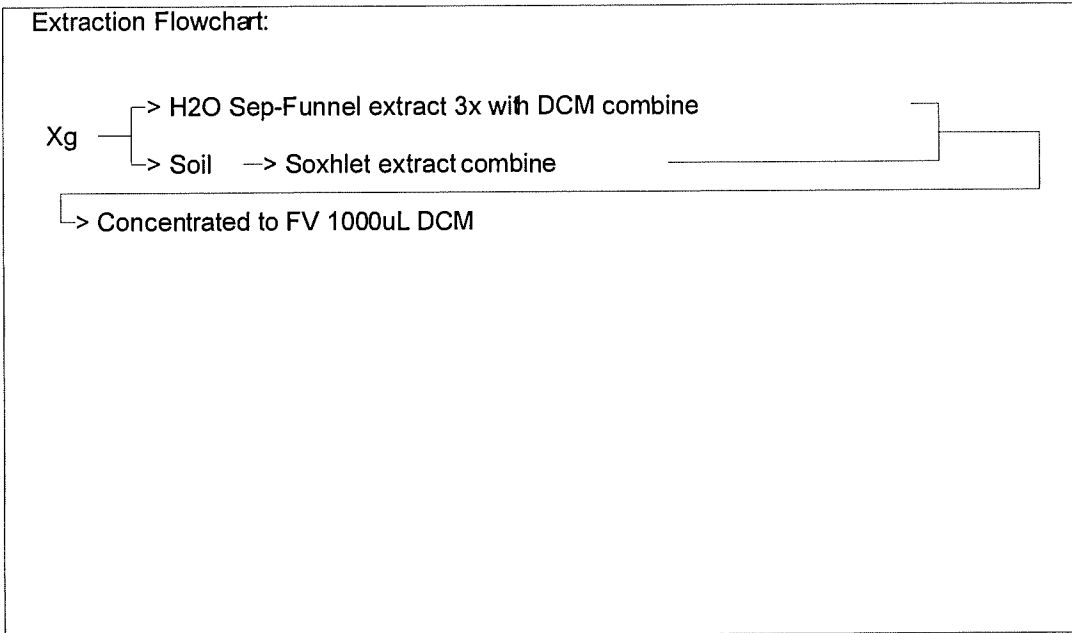
ADDITIONAL NOTES II	1.Soxhlet extraction began at 4:00pm and ended the following day at 10:00am. 2.The aqueous portion was spiked with 20% and the solid portion was spike with 80% of surrogate, MS'S and LCS also spiked with 20% in aqueous and 80% in solid of matrix spike prior to extraction.
EMULSION	C= Centrifuged,W= Wired,T= Tilted
REFERENCE BOOK & PAGE	16-0402-032 p76
TAP(S) USED	Water 01-0402-074 (Modified) Soil 01-0402-152

System ID	Type	Customer ID	SOLVENT VOL DCM (ML)	SAMPLE WT	SURROGATE SOL VOL
1	608011	1612141325 (400-SB-08)	250	31.09 g	100 uL
2	608012	1612141326 (400-SB-08)	250	32.70 g	100 uL
3	608013	1612141340 (400-SB-13)	250	30.86 g	100 uL
4	608014	1612141341 (400-SB-13)	250	31.60 g	100 uL
5	608015	1612141355 (400-SB-14)	250	31.99 g	100 uL
6	608016	1612141356 (400-SB-14)	250	32.35 g	100 uL
7	608273	BLANK_21DEC16	250	31.21 g	100 uL
8	608274	LCS_21DEC16	250	30.86 g	100 uL

System ID	Type	Customer ID	MTX SPK SOL VOL	FV DCM
1	608011	1612141325 (400-SB-08)	0 uL	1000 uL
2	608012	1612141326 (400-SB-08)	0 uL	1000 uL
3	608013	1612141340 (400-SB-13)	0 uL	1000 uL
4	608014	1612141341 (400-SB-13)	0 uL	1000 uL
5	608015	1612141355 (400-SB-14)	0 uL	1000 uL
6	608016	1612141356 (400-SB-14)	0 uL	1000 uL
7	608273	BLANK_21DEC16	0 uL	1000 uL
8	608274	LCS_21DEC16	50 uL	1000 uL

Page created Dec 21 2016 2:35PM by mlebron
 Book: EXTRACTION LAB, Volume: EXT-2016, Page: 551 (Section 1 of 2)
 Approved by HAMED EDRISI on Dec 29 2016 3:59PM

Date Printed: 1/03/2017



(E607S) SOIL Extraction By Soxhlet 3540C (Navarro)

010052 X36598

SwRI Labs

Client: Navarro

Project: 16988.01.10X

Case: 15EC092B

Sample Receipt: 58867, 58876, 58883

TO#s: 161221-4, 161220-4, 161222-3

DATE EXTRACTED	12/28/16
ANALYSTS INVOLVED	Hamed Edrisi (SU,SP,BD,QT,FV) Christina Menn (SW,Conc)
SURROGATE SOL ID	203-01-120408017 @5.0ng/uL
MTX SPK SOL ID	201-01-120408017 @10ng/uL
EXTRACTS LOCATION	Tracked by LIMS (12/30/16 HE)
CHEMICAL,BRAND & LOT#	Sodium Sulfate ID:04-0402-004p27F DCM Fisher Optima Lot#164214
NOTES	Hamilton Co. Syringes: 100uL ID:462905(SURR) 50uL ID:462898(MS)

ADDITIONAL NOTES	Soxhlet extraction began at 5:00pm and ended the following day at 11:00am.
EXTRACTION FLOWCHART	Xg >>> FV 1000uL DCM
REFERENCE BOOK & PAGE	16-0402-032 P82
TAP(S) USED	01-0402-152

System ID	Type	Customer ID	SOLVENT VOL DCM (ML)	SAMPLE WT
1	608158	1612190954 (400-SB--01)9'-10')	250	30.46 g
2	608220	1612191134 (400-SB-01)44'-45'))	250	30.88 g
3	608221	1612191144 (400-SB-01)44'-45'))	250	30.52 g
4	608222	1612191444 (400-SB-01)79'-80'))	250	30.39 g
5	608238	1612200843 (400-SB-06)	250	30.26 g
6	608239	1612200854 (400-SB-06)	250	30.21 g
7	608240	1612200903 (400-SB-07)	250	30.35 g
8	608241	1612200924 (400-SB-07)	250	30.45 g
9	608242	1612200933 (400-SB-08)	250	30.21 g
10	608243	1612200949 (400-SB-08)	250	30.52 g
11	608244	1612201003 (400-SB-09)	250	30.37 g
12	608245	1612201008 (400-SB-09)	250	30.20 g
13	608246	1612201024 (400-SB-09)	250	30.26 g
14	608247	1612201033 (400-SB-11)	250	30.69 g
15	608248	1612201049 (400-SB-11)	250	30.76 g
16	608249	1612201103 (400-SB-13)	250	30.12 g
17	608250	1612201318 (400-SB-13)	250	30.10 g
18	608251	1612201339 (400-SB-13)	250	30.80 g
19	608252	1612201340 (400-SB-13)	250	30.39 g
20	608253 MS	1612201341 (400-SB-13)	250	30.63 g
21	608376	BLANK_28DEC16	250	30.21 g
22	608377	LCS_28DEC16	250	30.05 g

System ID	Type	Customer ID	SURROGATE SOL VOL	MTX SPK SOL VOL
-----------	------	-------------	-------------------	-----------------

(E607S) SOIL Extraction By Soxhlet 3540C (Navarro)

SwRI Labs

Client: Navarro

Project: 16988.01.10X

Case: 15EC092B

Sample Receipt: 58867, 58876, 58883

TO#s: 161221-4, 161220-4, 161222-3

	System ID	Type	Customer ID	SURROGATE SOL VOL	MTX SPK SOL VOL
1	608158		1612190954 (400-SB--01)9'-10')	100 uL	0 uL
2	608220		1612191134 (400-SB-01)44'-45'))	100 uL	0 uL
3	608221		1612191144 (400-SB-01)44'-45'))	100 uL	0 uL
4	608222		1612191444 (400-SB-01)79'-80'))	100 uL	0 uL
5	608238		1612200843 (400-SB-06)	100 uL	0 uL
6	608239		1612200854 (400-SB-06)	100 uL	0 uL
7	608240		1612200903 (400-SB-07)	100 uL	0 uL
8	608241		1612200924 (400-SB-07)	100 uL	0 uL
9	608242		1612200933 (400-SB-08)	100 uL	0 uL
10	608243		1612200949 (400-SB-08)	100 uL	0 uL
11	608244		1612201003 (400-SB-09)	100 uL	0 uL
12	608245		1612201008 (400-SB-09)	100 uL	0 uL
13	608246		1612201024 (400-SB-09)	100 uL	0 uL
14	608247		1612201033 (400-SB-11)	100 uL	0 uL
15	608248		1612201049 (400-SB-11)	100 uL	0 uL
16	608249		1612201103 (400-SB-13)	100 uL	0 uL
17	608250		1612201318 (400-SB-13)	100 uL	0 uL
18	608251		1612201339 (400-SB-13)	100 uL	0 uL
19	608252		1612201340 (400-SB-13)	100 uL	0 uL
20	608253	MS	1612201341 (400-SB-13)	100 uL	50 uL
21	608376		BLANK_28DEC16	100 uL	0 uL
22	608377		LCS_28DEC16	100 uL	50 uL

	System ID	Type	Customer ID	FV DCM
1	608158		1612190954 (400-SB--01)9'-10')	1000 uL
2	608220		1612191134 (400-SB-01)44'-45'))	1000 uL
3	608221		1612191144 (400-SB-01)44'-45'))	1000 uL
4	608222		1612191444 (400-SB-01)79'-80'))	1000 uL
5	608238		1612200843 (400-SB-06)	1000 uL
6	608239		1612200854 (400-SB-06)	1000 uL
7	608240		1612200903 (400-SB-07)	1000 uL
8	608241		1612200924 (400-SB-07)	1000 uL

(E607S) SOIL Extraction By Soxhlet 3540C (Navarro)

SwRI Labs

Client: Navarro

Project: 16988.01.10X

Case: 15EC092B

Sample Receipt: 58867, 58876, 58883

TO#s: 161221-4, 161220-4, 161222-3

	System ID	Type	Customer ID	FV DCM
9	608242		1612200933 (400-SB-08)	1000 uL
10	608243		1612200949 (400-SB-08)	1000 uL
11	608244		1612201003 (400-SB-09)	1000 uL
12	608245		1612201008 (400-SB-09)	1000 uL
13	608246		1612201024 (400-SB-09)	1000 uL
14	608247		1612201033 (400-SB-11)	1000 uL
15	608248		1612201049 (400-SB-11)	1000 uL
16	608249		1612201103 (400-SB-13)	1000 uL
17	608250		1612201318 (400-SB-13)	1000 uL
18	608251		1612201339 (400-SB-13)	1000 uL
19	608252		1612201340 (400-SB-13)	1000 uL
20	608253	MS	1612201341 (400-SB-13)	1000 uL
21	608376		BLANK_28DEC16	1000 uL
22	608377		LCS_28DEC16	1000 uL

Page created Dec 28 2016 1:57PM by mlebron
 Book: EXTRACTION LAB, Volume: EXT-2016, Page: 559 (Section 3 of 3)
 Approved by CHRISTINA MENN on Jan 3 2017 1:34PM

Date Printed: 1/03/2017

M-607

Work continued from Data

injlog

Southwest Research Institute GC/MS Injection Log

OPERATOR: GS SEQUENCE DATE: 12/29/16, 12/30/16 INSTRUMENT: Amida1a
COLUMN: Agilent 122-0732 DB-1701, 0.25mm * 30m * 0.25um
CARRIER GAS: Helium SOLVENT: DCM
METHOD FILE: MET_607C, MET_607C.M
CLIENT NAME: NAVARRO PROJECT NUMBER: 16988.01.103
SRR: 58866, 58875, 58876, 58846, 58883 METHOD: M-607 MATRIX: water&soil
DATA PATH: C:\MSDCHEM\1\DATA\2016\A122916

OVEN PROGRAM

Initial temp: 40 'C (on)
Initial time: 4.00 min

Maximum temp: 350 'C
Equilibration time: 0.50 min

Ramps:
Rate Final temp Final time
1 15.00 150 0.00
2 25.00 270 10.00
3 0.0(off)

Post temp: 270 'C
Post time: 5.00 min
Run time: 29.80 min

REVIEWED BY: [Signature]

DATE: 1/3/17

Table with columns: FILENAME, VIAL, DATE/TIME, METHOD, SAMPLE DESCRIPTION. Contains detailed chromatography data for two dates: 12/29/16 and 12/30/16.

SIGNATURE

REVIEWED BY: [Signature]

DATE

1/3/17

DISCLOSED TO AND UNDERSTOOD BY

DATE

01/03/17

DATE

WITNESS

DATE



SUSANA MARTINEZ
Governor

JOHN A. SANCHEZ
Lieutenant Governor

NEW MEXICO ENVIRONMENT DEPARTMENT

2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303
Phone (505) 476-6000 Fax (505) 476-6030
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BUTCH TONGATE
Cabinet Secretary-Designate

J.C. BORREGO
Deputy Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

February 6, 2017

Timothy J. Davis
Chief, Environmental Office
National Aeronautics and Space Administration
White Sands Test Facility
P.O. Box 20
Las Cruces, NM 88004-0020

Attention of: RE-17-014

**RE: APPROVAL
REQUEST FOR FOURTH "CONTAINED-IN" DETERMINATION
FOR 400 AREA INVESTIGATION-DERIVED WASTE (IDW)
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WHITE SANDS TEST FACILITY
DOÑA ANA COUNTY, NEW MEXICO
EPA ID #NM08800019434
HWB-NASA-11-006**

Dear Mr. Davis:

The New Mexico Environment Department (NMED) has received the National Aeronautics and Space Administration's (NASA WSTF) (Permittee) *Request for a Fourth "Contained-In" Determination for 400 Area Investigation-Derived Waste (IDW)* (Request), dated January 26, 2017 and received January 27, 2017.

The IDW was generated during investigation activities at the 400 Area at boring locations 400-SB-06, 400-SB-07, 400-SB-08, 400-SB-09, 400-SB-11, and 400-SB-13. The IDW is comprised of fourteen one-cubic yard containers of soil and one one-cubic yard container of debris.

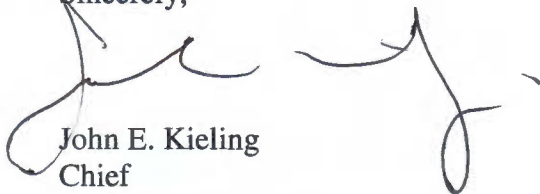
Waste characterization soil samples were collected and analyzed to determine if applicable F001 and F002 hazardous waste constituents or other chemicals of concern were present in the waste generated during investigation activities at the 400 Area Closure.

With the exception of thallium and arsenic in various waste soil samples, the concentrations of constituents detected in the samples do not exceed NMED soil screening levels (SSLs) for the residential, construction or industrial worker exposure scenario. No site-specific background concentration information is available for thallium. Reported arsenic concentrations which exceeded the residential SSL did not exceed the site specific background concentration. Based on the provided information, the IDW does not exhibit properties of a characteristic hazardous waste as defined in 40 CFR Part 261 Subpart C. Additionally, all applicable 40 CFR Part 261 Subpart D listed hazardous waste (F001 and F002) concentrations were either below laboratory detection limits or below the applicable NMED screening levels.

NMED has reviewed the Permittee's Request and determined that the IDW can be managed as a nonhazardous waste. The waste soil from 400-SB-06 and waste soil containers No. 7441, No. 7395, and No.7398 may be evenly land applied at the project area away from locations subject to potential storm water run-off. All other waste must be disposed at an appropriate permitted waste disposal facility.

If you have any questions regarding this letter, please contact Gabriel Acevedo at (505) 476-6043.

Sincerely,



John E. Kieling
Chief
Hazardous Waste Bureau

cc: D. Cobrain, NMED HWB
B. Wear, NMED HWB
G. Acevedo, NMED HWB
L. King, EPA 6PD-N
M. Zigmond, NASA WSTF
A. Sanchez, NASA WSTF

File: NASA WSTF 2016 and Reading, NASA-11-006

HWB 3391
New Mexico Environment Department
Hazardous Waste Bureau
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Timothy J. Davis
Chief, Environmental Office
NASA/WSTF
P.O. Box 20
Las Cruces, New Mexico 88004-0020

8800430020 8900



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Santa Fe, New Mexico 87505-6303
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BUTCH TONGATE
Cabinet Secretary

J.C. BORREGO
Deputy Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

February 27, 2017

Timothy J. Davis
Chief, Environmental Office
National Aeronautics and Space Administration
White Sands Test Facility
P.O. Box 20
Las Cruces, NM 88004-0020

Attention of: RE-17-022

**RE: APPROVAL
REQUEST FOR FIFTH "CONTAINED-IN" DETERMINATION
FOR 400 AREA INVESTIGATION-DERIVED WASTE (IDW)
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WHITE SANDS TEST FACILITY
DOÑA ANA COUNTY, NEW MEXICO
EPA ID #NM08800019434
HWB-NASA-11-006**

Dear Mr. Davis:

The New Mexico Environment Department (NMED) has received the National Aeronautics and Space Administration's (NASA WSTF) (Permittee) *Request for a Fifth "Contained-In" Determination for 400 Area Investigation-Derived Waste (IDW)* (Request), dated January 13, 2017 and received February 14, 2017.

The IDW was generated during investigation activities at the 400 Area at boring locations 400-SB-01, 400-SB-02, 400-SB-05, and 400-SB-06. The IDW is comprised of seven one-cubic yard containers of soil, one 55-gallon drum, and one one-cubic yard container of debris.

Mr. Timothy J. Davis
February 27, 2017
Page 3

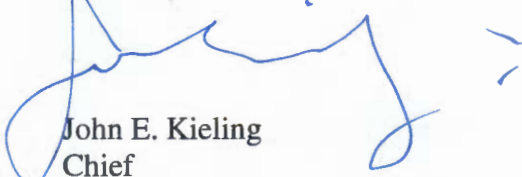
Waste characterization soil samples were collected and analyzed to determine if applicable F001 and F002 hazardous waste constituents or other chemicals of concern were present in the waste generated during investigation activities at the 400 Area Closure.

With the exception of thallium and arsenic in various waste soil samples, the concentrations of constituents detected in the samples do not exceed NMED soil screening levels (SSLs) for the residential, construction or industrial worker exposure scenario. No site-specific background concentration information is available for thallium. Reported arsenic concentrations which exceeded the residential SSL did not exceed the site specific background concentration. Based on the provided information, the IDW does not exhibit properties of a characteristic hazardous waste as defined in 40 CFR Part 261 Subpart C. Additionally, all applicable 40 CFR Part 261 Subpart D listed hazardous waste (F001 and F002) concentrations were either below laboratory detection limits or below the applicable NMED screening levels.

NMED has reviewed the Permittee's Request and determined that the IDW can be managed as a nonhazardous waste. The waste soil from waste soil container No. 7517 may be evenly land applied at the project area away from locations subject to potential storm water run-off. All other waste must be disposed at an appropriate permitted waste disposal facility.

If you have any questions regarding this letter, please contact Gabriel Acevedo at (505) 476-6043.

Sincerely,



John E. Kieling
Chief
Hazardous Waste Bureau

cc: D. Cobrain, NMED HWB
B. Wear, NMED HWB
G. Acevedo, NMED HWB
L. King, EPA 6PD-N
M. Zigmond, NASA WSTF
A. Sanchez, NASA WSTF

File: NASA WSTF 2017 and Reading, NASA-11-006

HWB 3391
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Bldg. 1
Santa Fe, New Mexico 87505-6313

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Timothy J. Davis
Chief, Environmental Office
NASA/WSIF
P.O. Box 20
Las Cruces, New Mexico 88004-0020

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BUTCH TONGATE
Cabinet Secretary - Designate

J. C. BORREGO
Deputy Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

January 27, 2017

Timothy J. Davis
Chief, Environmental Office
National Aeronautics and Space Administration
White Sands Test Facility
P.O. Box 20
Las Cruces, NM 88004-0020

Attention of: RE-17-007

**RE: APPROVAL
REQUEST FOR THIRD "CONTAINED-IN" DETERMINATION
FOR 400 AREA INVESTIGATION-DERIVED WASTE (IDW)
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WHITE SANDS TEST FACILITY
DOÑA ANA COUNTY, NEW MEXICO
EPA ID #NM08800019434
HWB-NASA-11-006**

Dear Mr. Davis:

The New Mexico Environment Department (NMED) has received the National Aeronautics and Space Administration's (NASA WSTF) (Permittee) *Request for a Third "Contained-In" Determination for 400 Area Investigation-Derived Waste (IDW)* (Request), dated January 1, 2017 and received January 20, 2017.

The IDW was generated during investigation activities at the 400 Area at boring locations 400-SB-08, 400-SB-13, and 400-SB-14. The IDW is comprised of three 330-gallon containers of aqueous and solid phase drill cutting material and one 1-cubic yard container of debris.

Mr. Timothy J. Davis
January 27, 2017
Page 3

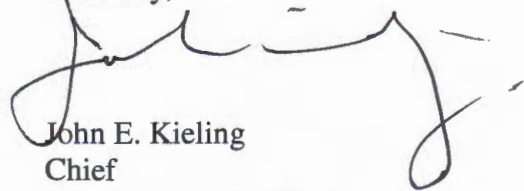
Waste characterization samples were collected and analyzed to determine if applicable F001 and F002 hazardous waste constituents or other chemicals of concern were present in the waste generated during investigation activities at the 400 Area Closure.

Based on the information provided in the Request, the concentrations of constituents detected in the drill cuttings do not exceed NMED soil screening levels (SSLs) for the residential, construction, or industrial worker exposure scenario. However, reported concentrations of thallium in waste soil from borings 400-SB-13 and 400-SB-14 exceeded the NMED residential SSL. No site-specific background concentration information is available for thallium. Based on the provided information, the IDW does not exhibit properties of a characteristic hazardous waste per 40 CFR Part 261 Subpart C. Additionally, all applicable 40 CFR Part 261 Subpart D listed hazardous waste (F001 and F002) concentrations were either below laboratory detection limits or below the applicable NMED screening levels.

NMED has reviewed the Permittee's Request and determined that the IDW can be managed as a nonhazardous waste. All aqueous phase waste materials must be treated at the Mid-Plume Interception Treatment System. The drill cuttings from boring 400-SB-08 may be evenly land applied at the project area away from potential storm water run-off. All other waste must be disposed at an appropriate permitted waste disposal facility.

If you have any questions regarding this letter, please contact Gabriel Acevedo at (505) 476-6043.

Sincerely,



John E. Kieling
Chief
Hazardous Waste Bureau

cc: D. Cobrain, NMED HWB
B. Wear, NMED HWB
G. Acevedo, NMED HWB
L. King, EPA 6PD-N
M. Zigmund, NASA WSTF
A. Sanchez, NASA WSTF

File: NASA WSTF 2016 and Reading, NASA-11-006

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New Mexico Environment Department
Hazardous Waste Bureau
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Chief, Environmental Office
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Appendix D
Geotechnical Testing Report



Technologies to manage risk for infrastructure

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Transmittal

TO:

Patricia Melendrez

Navarro Research & Engineering, Inc.

NASA White Sands Test Facility, 12600 NASA Road

Las Cruces, NM 88012

DATE: 5/3/2017

GTX NO: 305503

RE: Soil Property Testing from NASA
White Sands Test F

COPIES	DATE	DESCRIPTION
	5/3/2017	December 2016 – April 2017 Laboratory Test Report

REMARKS:

CC:

SIGNED:

Ethan Marro, Assistant Laboratory Manager

APPROVED BY:

Joe Tomei, Laboratory Manager

May 3, 2017

Patricia Melendrez
Navarro Research & Engineering, Inc.
NASA White Sands Test Facility, 12600 NASA Road
Las Cruces, NM 88012

RE: Soil Property Testing from NASA White Sands Test F, Las Cruces, NM (GTX-305503)

Dear Patricia:

Enclosed are the test results you requested for the above referenced project. GeoTesting Express, Inc. (GTX) received 22 samples from you between 10/21/2016 and 1/25/2017. These samples were labeled as follows:

Sample	Depth
400-SB-02	0-10 ft
400-SB-03	30-35 ft
400-SB-03	35-40 ft
400-SB-04	90-93 ft
400-SB-05	0-10 ft
400-SB-06	20-24 ft
400-SB-06	25-30 ft
400-SB-08	10-15 ft
400-SB-08	5-10 ft
400-SB-09	12.5-15 ft
400-SB-09	20-25 ft
400-SB-10	15-20 ft
400-SB-10	20-25 ft
400-SB-11	15-20 ft
400-SB-11	20-25 ft
400-SB-12	40-45 ft
400-SB-12	45-50 ft
400-SB-13	60-65 ft
400-SB-14	65-70 ft
400-SB-14	70-75 ft
400-SB-15	15-20 ft
400-SB-15 #2	15-20 #2 ft

GTX performed the following tests on these samples:

22 ASTM D2216 - Moisture Content
22 ASTM D854 - Specific Gravity

- 22 ASTM D2487 - Soil Classification
- 22 ASTM D7263 - Density (Unit Weight) of Soil Specimens
- 22 ASTM D422 - Grain Size Analysis - Sieve Only
- 22 ASTM D4318 - Atterberg Limits
- 1 ASTM D2434 - Fixed Wall Permeability
- 21 ASTM D5084 - Flexible Wall Permeability
- 22 ASTM D6836 - Soil Water Characteristic Curve
- 22 Determinations of Unsaturated Hydraulic Conductivity

The results presented in this report apply only to the items tested. This report shall not be reproduced except in full, without written approval from GeoTesting Express. The remainder of these samples will be retained for a period of sixty (60) days and will then be discarded unless otherwise notified by you. Please call me if you have any questions or require additional information. Thank you for allowing GeoTesting Express the opportunity of providing you with testing services. We look forward to working with you again in the future.

Respectfully yours,



Ethan Marro
Assistant Laboratory Manager



*Technologies to manage risk
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Geotechnical Test Report

5/3/2017

GTX-305503

Soil Property Testing from NASA

White Sands Test F

Las Cruces, NM

Client Project No.: 6EE4IFW 505-100

Prepared for:

Navarro Research & Engineering, Inc.



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	---
Sample ID:	---	Test Date:	02/03/17
Depth :	---	Test Id:	403382
		Tested By:	jbr
		Checked By:	jdt

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
---	400- SB-02	0-10 ft	Moist, light reddish brown silty sand with gravel	3.7
---	400- SB-03	35-40 ft	Moist, pale brown clayey gravel with sand	1.7
---	400- SB-03	30-35 ft	Moist, reddish brown gravel with clay and sand	1.2
---	400- SB-04	90-93 ft	Moist, brown clayey gravel with sand	3.5
---	400- SB-05	0-10 ft	Moist, light reddish brown clayey sand with gravel	8.0
---	400- SB-06	20-24 ft	Moist, light reddish brown gravel with silty clay and sand	2.2
---	400- SB-06	25-30 ft	Moist, light reddish brown gravel with silty clay and sand	2.2

Notes: Temperature of Drying : 110° Celsius



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	---
Sample ID:	---	Test Date:	02/03/17
Depth :	---	Test Id:	403400

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
---	400- SB-08	5-10 ft	Moist, light brown clayey sand with gravel	9.1
---	400- SB-08	10-15 ft	Moist, light brown gravel with silt and sand	3.3
---	400- SB-09	12.5-15 ft	Moist, light brown gravel with clay and sand	1.4
---	400- SB-09	20-25 ft	Moist, light brown gravel with clay and sand	1.0
---	400- SB-10	20-25 ft	Moist, reddish brown silty, clayey gravel with sand	1.5
---	400- SB-10	15-20 ft	Moist, reddish brown silty gravel with sand	1.9
---	400- SB-11	15-20 ft	Moist, light reddish brown gravel with silt and sand	.9
---	400- SB-11	20-25 ft	Moist, light reddish brown gravel with clay and sand	1.5

Notes: Temperature of Drying : 110° Celsius



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	---
Sample ID:	---	Test Date:	11/09/16
Depth :	---	Test Id:	396801
		Tested By:	jbr
		Checked By:	jdt

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
---	400- SB-12	40-45 ft	Moist, reddish brown gravel with silt and sand	1.5
---	400- SB-12	45-50 ft	Moist, light brown gravel with silt and sand	1.7
---	400- SB-13	60-65 ft	Moist, light brown gravel with clay and sand	2.4
---	400- SB-14	65-70 ft	Moist, reddish brown gravel with silt and sand	7.2
---	400- SB-14	70-75 ft	Moist, light brown clayey gravel with sand	3.7
---	400- SB-15	15-20 ft	Moist, light brown gravel with silt and sand	1.2
---	400- SB-15 #2	15-20 #2 ft	Moist, light brown gravel with silt and sand	1.8

Notes: Temperature of Drying : 110° Celsius



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	---
Sample ID:	---	Test Date:	02/06/17
Depth :	---	Test Id:	403381
		Tested By:	jbr
		Checked By:	jdt

Specific Gravity of Soils by ASTM D854

Boring ID	Sample ID	Depth	Visual Description	Specific Gravity	Comment
---	400- SB-02	0-10 ft	Moist, light reddish brown silty sand with gravel	2.69	
---	400- SB-03	35-40 ft	Moist, pale brown clayey gravel with sand	2.64	
---	400- SB-03	30-35 ft	Moist, reddish brown gravel with clay and sand	2.68	
---	400- SB-04	90-93 ft	Moist, brown clayey gravel with sand	2.67	
---	400- SB-05	0-10 ft	Moist, light reddish brown clayey sand with gravel	2.70	
---	400- SB-06	20-24 ft	Moist, light reddish brown gravel with silty clay and sand	2.70	
---	400- SB-06	25-30 ft	Moist, light reddish brown gravel with silty clay and sand	2.70	

Notes: Specific Gravity performed by using method B (oven dried specimens) of ASTM D854

Moisture Content determined by ASTM D2216.

* Only minus No.4 Sieve material tested. Insufficient quantity of material greater than the No.4 Sieve available to perform ASTM C127 Specific Gravity of Aggregate.



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	---
Sample ID:	---	Test Date:	02/06/17
Depth :	---	Test Id:	403399
		Tested By:	jbr
		Checked By:	jdt

Specific Gravity of Soils by ASTM D854

Boring ID	Sample ID	Depth	Visual Description	Specific Gravity	Comment
---	400- SB-08	5-10 ft	Moist, light brown clayey sand with gravel	2.68	
---	400- SB-08	10-15 ft	Moist, light brown gravel with silt and sand	2.69	
---	400- SB-09	12.5-15 ft	Moist, light brown gravel with clay and sand	2.64	
---	400- SB-09	20-25 ft	Moist, light brown gravel with clay and sand	2.63	
---	400- SB-10	20-25 ft	Moist, reddish brown silty, clayey gravel with sand	2.69	
---	400- SB-10	15-20 ft	Moist, reddish brown silty gravel with sand	2.69	
---	400- SB-11	15-20 ft	Moist, light reddish brown gravel with silt and sand	2.68	
---	400- SB-11	20-25 ft	Moist, light reddish brown gravel with clay and sand	2.70	

Notes: Specific Gravity performed by using method B (oven dried specimens) of ASTM D854

Moisture Content determined by ASTM D2216.

* Only minus No.4 Sieve material tested. Insufficient quantity of material greater than the No.4 Sieve available to perform ASTM C127 Specific Gravity of Aggregate.



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	---
Sample ID:	---	Test Date:	11/10/16
Depth :	---	Test Id:	396792
		Tested By:	jbr
		Checked By:	jdt

Specific Gravity of Soils by ASTM D854

Boring ID	Sample ID	Depth	Visual Description	Specific Gravity	Comment
---	400- SB-12	40-45 ft	Moist, reddish brown gravel with silt and sand	2.72	
---	400- SB-12	45-50 ft	Moist, light brown gravel with silt and sand	2.66	
---	400- SB-13	60-65 ft	Moist, light brown gravel with clay and sand	2.69	
---	400- SB-14	65-70 ft	Moist, reddish brown gravel with silt and sand	2.70	
---	400- SB-14	70-75 ft	Moist, light brown clayey gravel with sand	2.69	
---	400- SB-15	15-20 ft	Moist, light brown gravel with silt and sand	2.68	
---	400- SB-15 #2	15-20 #2 ft	Moist, light brown gravel with silt and sand	2.70	

Notes: Specific Gravity performed by using method B (oven dried specimens) of ASTM D854

Moisture Content determined by ASTM D2216.

* Only minus No.4 Sieve material tested. Insufficient quantity of material greater than the No.4 Sieve available to perform ASTM C127 Specific Gravity of Aggregate.



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	---
Sample ID:	---	Test Date:	02/16/17
Depth :	---	Test Id:	403377
		Tested By:	cam
		Checked By:	jdt

USCS Classification - ASTM D2487

Boring ID	Sample ID	Depth	Group Name	Group Symbol	Gravel, %	Sand, %	Fines, %
---	400-SB-02	0-10 ft	Silty sand with gravel	SM	32.4	43.8	23.8
---	400-SB-03	35-40 ft	Clayey gravel with sand	GC	58.8	25.3	15.9
---	400-SB-04	90-93 ft	Clayey gravel with sand	GC	43.9	42.8	13.3
---	400-SB-05	0-10 ft	Clayey sand with gravel	SC	32.0	41.2	26.8
---	400-SB-06	20-24 ft	Well-graded gravel with Silty clay and sand	GW-GC	56.5	33.7	9.8
---	400-SB-06	25-30 ft	Well-graded gravel with Silty clay and sand	GW-GC	60.4	31.1	8.5

Remarks: Grain Size analysis performed by ASTM D422 results enclosed
 Atterberg Limits performed by ASTM D4318, results enclosed



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	---
Sample ID:	---	Test Date:	02/16/17
Depth :	---	Test Id:	403395

USCS Classification - ASTM D2487

Boring ID	Sample ID	Depth	Group Name	Group Symbol	Gravel, %	Sand, %	Fines, %
---	400-SB-08	5-10 ft	Clayey sand with gravel	SC	22.0	46.9	31.1
---	400-SB-08	10-15 ft	Well-graded gravel with silt and sand	GW-GM	39.3	26.2	7.8
---	400-SB-09	12.5-15 ft	Well-graded gravel with clay and sand	GW-GC	60.5	30.3	9.2
---	400-SB-09	20-25 ft	Well-graded gravel with clay and sand	GW-GC	57.1	31.5	11.4
---	400-SB-10	20-25 ft	Silty, clayey gravel with sand	GC-GM	51.7	35.9	12.4
---	400-SB-10	15-20 ft	Silty gravel with sand	GM	49.5	38.2	12.3
---	400-SB-11	15-20 ft	Poorly graded gravel with silt and sand	GP-GM	53.8	39.8	6.4
---	400-SB-11	20-25 ft	Poorly graded gravel with clay and sand	GP-GC	68.5	22.5	9.0

Remarks: Grain Size analysis performed by ASTM D422 results enclosed
 Atterberg Limits performed by ASTM D4318, results enclosed



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	---
Sample ID:	---	Test Date:	11/16/16
Depth :	---	Test Id:	396756
		Tested By:	cam
		Checked By:	jdt

USCS Classification - ASTM D2487

Boring ID	Sample ID	Depth	Group Name	Group Symbol	Gravel, %	Sand, %	Fines, %
---	400-SB-12	40-45 ft	Poorly graded gravel with silt and sand	GP-GM	51.8	41.8	6.4
---	400-SB-12	45-50 ft	Well-graded gravel with silt and sand	GW-GM	59.9	32.3	7.8
---	400-SB-13	60-65 ft	Well-graded gravel with clay and sand	GW-GC	59.2	29.2	11.6
---	400-SB-14	65-70 ft	Poorly graded gravel with silt and sand	GP-GM	67.8	22.6	9.6
---	400-SB-14	70-75 ft	Clayey gravel with sand	GC	60.8	24.7	14.5
---	400-SB-15	15-20 ft	Well-graded gravel with silt and sand	GW-GM	56.4	26.8	6.6
---	400-SB-15 #2	15-20 #2 ft	Well-graded gravel with silt and sand	GW-GM	60.2	30.9	8.9

Remarks: Grain Size analysis performed by ASTM D422 results enclosed
 Atterberg Limits performed by ASTM D4318, results enclosed



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	---
Sample ID:	---	Test Date:	02/03/17
Depth :	---	Test Id:	403380

Laboratory Determination of Density (Unit Weight) of Soil Specimens by ASTM D7263

Boring ID	Sample ID	Depth	Visual Description	Bulk Density pcf	Moisture Content %	Dry Density pcf	*
---	400-SB-02	0-10 ft	Moist, light reddish brown silty sand with gravel	111.7	3.651	107.8	(1)
---	400-SB-03	35-40 ft	Moist, pale brown clayey gravel with sand	122.4	1.719	120.3	(2)
---	400-SB-03	30-35 ft	Moist, reddish brown gravel with clay and sand	121.6	1.153	120.2	(3)
---	400-SB-04	90-93 ft	Moist, brown clayey gravel with sand	115.1	3.492	111.2	(4)
---	400-SB-05	0-10 ft	Moist, light reddish brown clayey sand with gravel	105.4	8.034	97.59	(5)
---	400-SB-06	20-24 ft	Moist, light reddish brown gravel with silty clay and sand	116.5	2.167	114.1	(6)
---	400-SB-06	25-30 ft	Moist, light reddish brown gravel with silty clay and sand	116.9	2.196	114.4	(7)

* Sample Comments

- (1): Method B-Cylinder, Reconstituted (compacted)
- (2): Method B-Cylinder, Reconstituted (compacted)
- (3): Method B-Cylinder, Reconstituted (compacted)
- (4): Method B-Cylinder, Reconstituted (compacted)
- (5): Method B-Cylinder, Reconstituted (compacted)
- (6): Method B-Cylinder, Reconstituted (compacted)
- (7): Method B-Cylinder, Reconstituted (compacted)

Notes: Moisture Content determined by ASTM D2216.



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	---
Sample ID:	---	Test Date:	11/09/16
Depth :	---	Test Id:	396777
		Tested By:	jbr
		Checked By:	jdt

Laboratory Determination of Density (Unit Weight) of Soil Specimens by ASTM D7263

Boring ID	Sample ID	Depth	Visual Description	Bulk Density pcf	Moisture Content %	Dry Density pcf	*
---	400-SB-08	5-10 ft	Moist, light brown clayey sand with gravel	105.2	9.119	96.45	(1)
---	400-SB-08	10-15 ft	Moist, light brown gravel with silt and sand	107.7	3.341	104.2	(2)
---	400-SB-09	12.5-15 ft	Moist, light brown gravel with clay and sand	113.4	1.359	111.9	(3)
---	400-SB-09	20-25 ft	Moist, light brown gravel with clay and sand	120.6	1.020	119.4	(4)
---	400-SB-10	20-25 ft	Moist, reddish brown silty, clayey gravel with sand	121.9	1.451	120.2	(5)
---	400-SB-10	15-20 ft	Moist, reddish brown silty gravel with sand	125.3	1.882	123.0	(6)

* Sample Comments

- (1): Method B-Cylinder, Reconstituted (compacted)
- (2): Method B-Cylinder, Reconstituted (compacted)
- (3): Method B-Cylinder, Reconstituted (compacted)
- (4): Method B-Cylinder, Reconstituted (compacted)
- (5): Method B-Cylinder, Reconstituted (compacted)
- (6): Method B-Cylinder, Reconstituted (compacted)

Notes: Moisture Content determined by ASTM D2216.



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	---
Sample ID:	---	Test Date:	12/15/16
Depth :	---	Test Id:	399947
		Tested By:	jbr
		Checked By:	jdt

Laboratory Determination of Density (Unit Weight) of Soil Specimens by ASTM D7263

Boring ID	Sample ID	Depth	Visual Description	Bulk Density pcf	Moisture Content %	Dry Density pcf	*
---	400-SB-11	15-20 ft	Moist, light reddish brown gravel with silt and sand	124.4	0.8769	123.4	(1)
---	400-SB-11	20-25 ft	Moist, light reddish brown gravel with clay and sand	110.1	1.464	108.5	(2)
---	400-SB-12	40-45 ft	Moist, reddish brown gravel with silt and sand	124.5	1.459	122.7	(3)
---	400-SB-12	45-50 ft	Moist, light brown gravel with silt and sand	123.2	1.687	121.2	(4)
---	400-SB-13	60-65 ft	Moist, light brown gravel with clay and sand	120.2	2.407	117.4	(5)

* Sample Comments

- (1): Method B-Cylinder, Reconstituted (compacted)
- (2): Method B-Cylinder, Reconstituted (compacted)
- (3): Method B-Cylinder, Reconstituted (compacted)
- (4): Method B-Cylinder, Reconstituted (compacted)
- (5): Method B-Cylinder, Reconstituted (compacted)

Notes: Moisture Content determined by ASTM D2216.



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	---
Sample ID:	---	Test Date:	11/09/16
Depth :	---	Test Id:	396783

Laboratory Determination of Density (Unit Weight) of Soil Specimens by ASTM D7263

Boring ID	Sample ID	Depth	Visual Description	Bulk Density pcf	Moisture Content %	Dry Density pcf	*
---	400-SB-14	65-70 ft	Moist, reddish brown gravel with silt and sand	125.0	7.215	116.6	(1)
---	400-SB-14	70-75 ft	Moist, light brown clayey gravel with sand	110.1	3.693	106.2	(2)
---	400-SB-15	15-20 ft	Moist, light brown gravel with silt and sand	122.3	1.216	120.8	(3)
---	400-SB-15 #2	15-20 #2 ft	Moist, light brown gravel with silt and sand	119.0	1.773	116.9	(4)

* Sample Comments

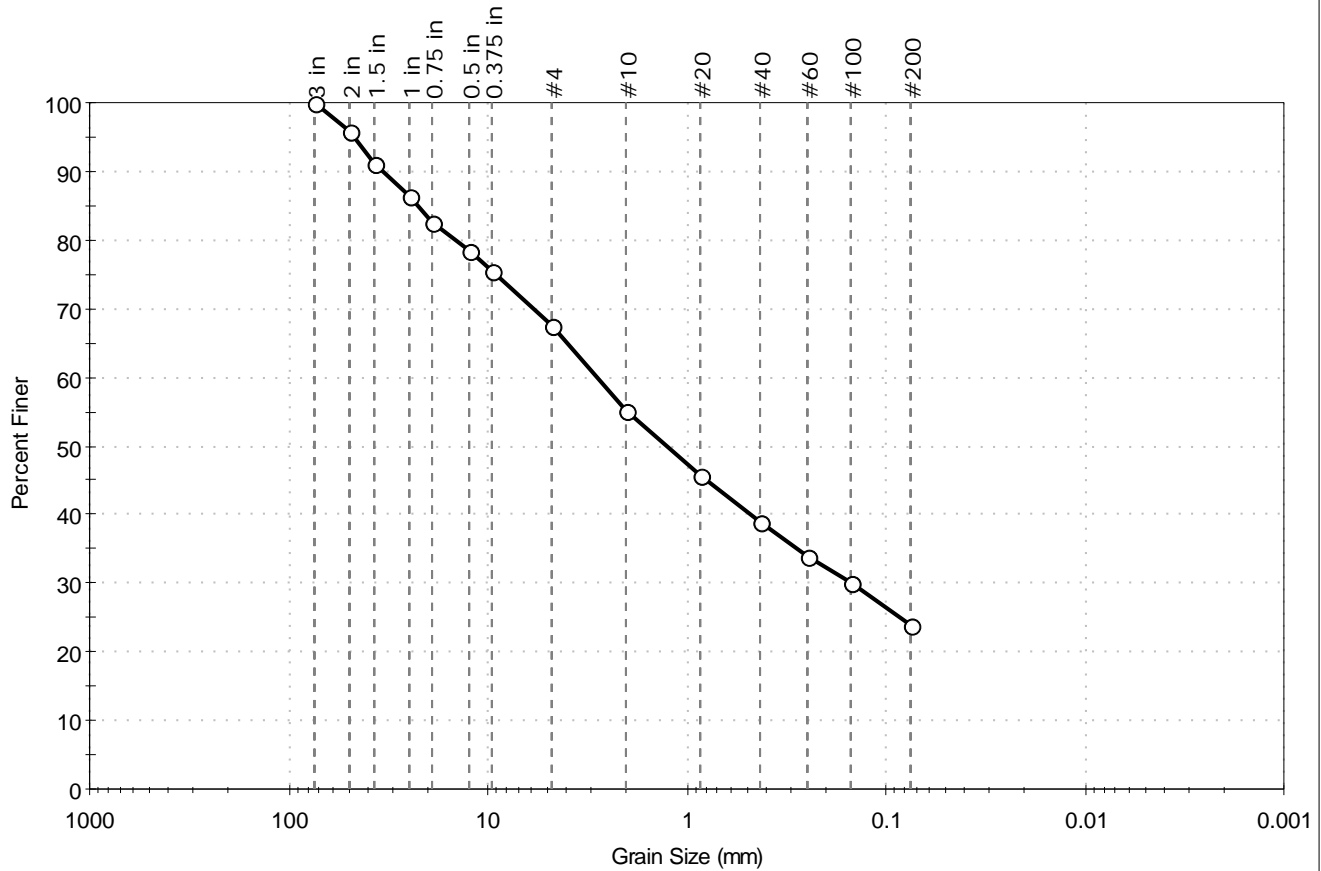
- (1): Method B-Cylinder, Reconstituted (compacted)
- (2): Method B-Cylinder, Reconstituted (compacted)
- (3): Method B-Cylinder, Reconstituted (compacted)
- (4): Method B-Cylinder, Reconstituted (compacted)

Notes: Moisture Content determined by ASTM D2216.



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-02	Test Date:	02/02/17
Depth:	0-10 ft	Test Id:	403351
Test Comment:	---		
Visual Description:	Moist, light reddish brown silty sand with gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	32.4	43.8	23.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	96		
1.5 in	37.50	91		
1 in	25.00	86		
0.75 in	19.00	83		
0.5 in	12.50	78		
0.375 in	9.50	75		
#4	4.75	68		
#10	2.00	55		
#20	0.85	46		
#40	0.42	39		
#60	0.25	34		
#100	0.15	30		
#200	0.075	24		

<u>Coefficients</u>	
D ₈₅ = 22.5954 mm	D ₃₀ = 0.1509 mm
D ₆₀ = 2.7907 mm	D ₁₅ = N/A
D ₅₀ = 1.2436 mm	D ₁₀ = N/A
C _u = N/A	C _c = N/A

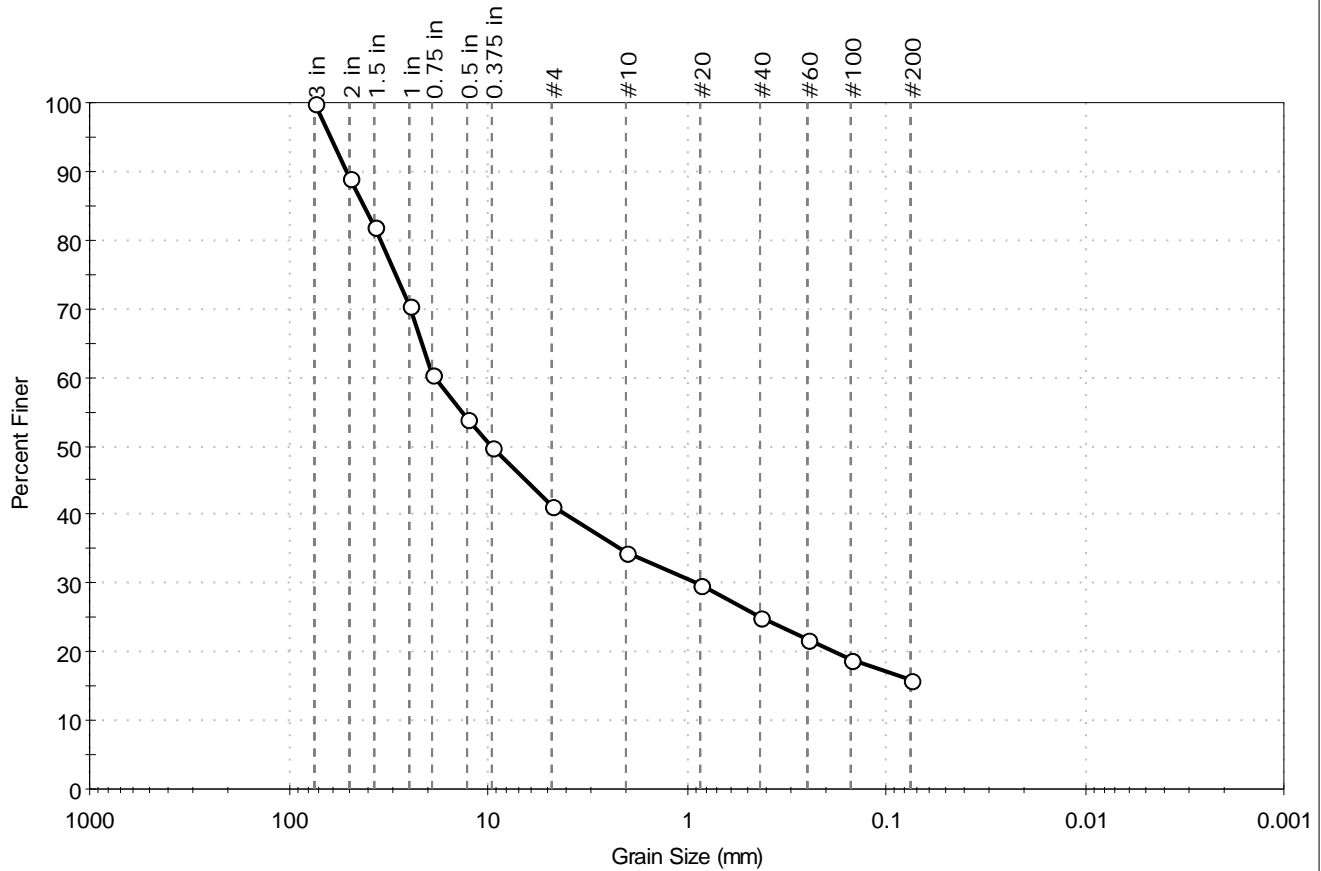
<u>Classification</u>	
<u>ASTM</u>	Silty sand with gravel (SM)
<u>AASHTO</u>	Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description
 Sand/Gravel Particle Shape : ANGULAR
 Sand/Gravel Hardness : HARD



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-03	Test Date:	11/10/16
Depth:	35-40 ft	Test Id:	396758
Test Comment:	---		
Visual Description:	Moist, pale brown clayey gravel with sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	58.8	25.3	15.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	89		
1.5 in	37.50	82		
1 in	25.00	71		
0.75 in	19.00	60		
0.5 in	12.70	54		
0.375 in	9.50	50		
#4	4.75	41		
#10	2.00	35		
#20	0.85	30		
#40	0.42	25		
#60	0.25	22		
#100	0.15	19		
#200	0.075	16		

<u>Coefficients</u>	
D ₈₅ = 42.2521 mm	D ₃₀ = 0.8834 mm
D ₆₀ = 18.5947 mm	D ₁₅ = N/A
D ₅₀ = 9.6507 mm	D ₁₀ = N/A
C _u = N/A	C _c = N/A

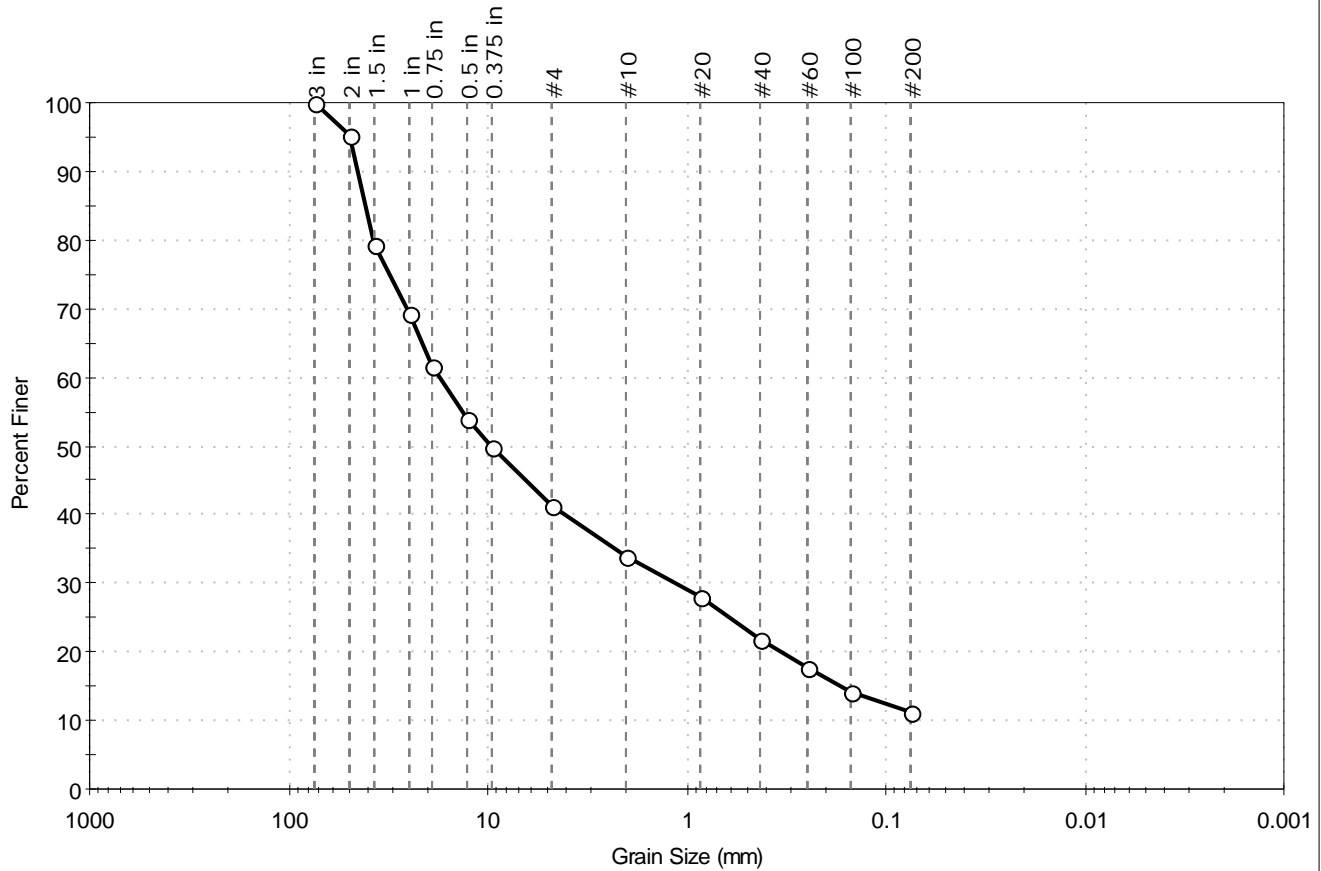
<u>Classification</u>	
<u>ASTM</u>	Clayey gravel with sand (GC)
<u>AASHTO</u>	Clayey Gravel and Sand (A-2-6 (0))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape : ANGULAR	
Sand/Gravel Hardness : HARD	



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-03	Test Date:	11/11/16
Depth:	30-35 ft	Test Id:	396760
Test Comment:	---		
Visual Description:	Moist, reddish brown gravel with clay and sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	58.8	30.0	11.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	95		
1.5 in	37.50	79		
1 in	25.00	69		
0.75 in	19.00	62		
0.5 in	12.70	54		
0.375 in	9.50	50		
#4	4.75	41		
#10	2.00	34		
#20	0.85	28		
#40	0.42	22		
#60	0.25	18		
#100	0.15	14		
#200	0.075	11		

<u>Coefficients</u>	
D ₈₅ = 41.6084 mm	D ₃₀ = 1.1298 mm
D ₆₀ = 17.3330 mm	D ₁₅ = 0.1724 mm
D ₅₀ = 9.6854 mm	D ₁₀ = N/A
C _u = N/A	C _c = N/A

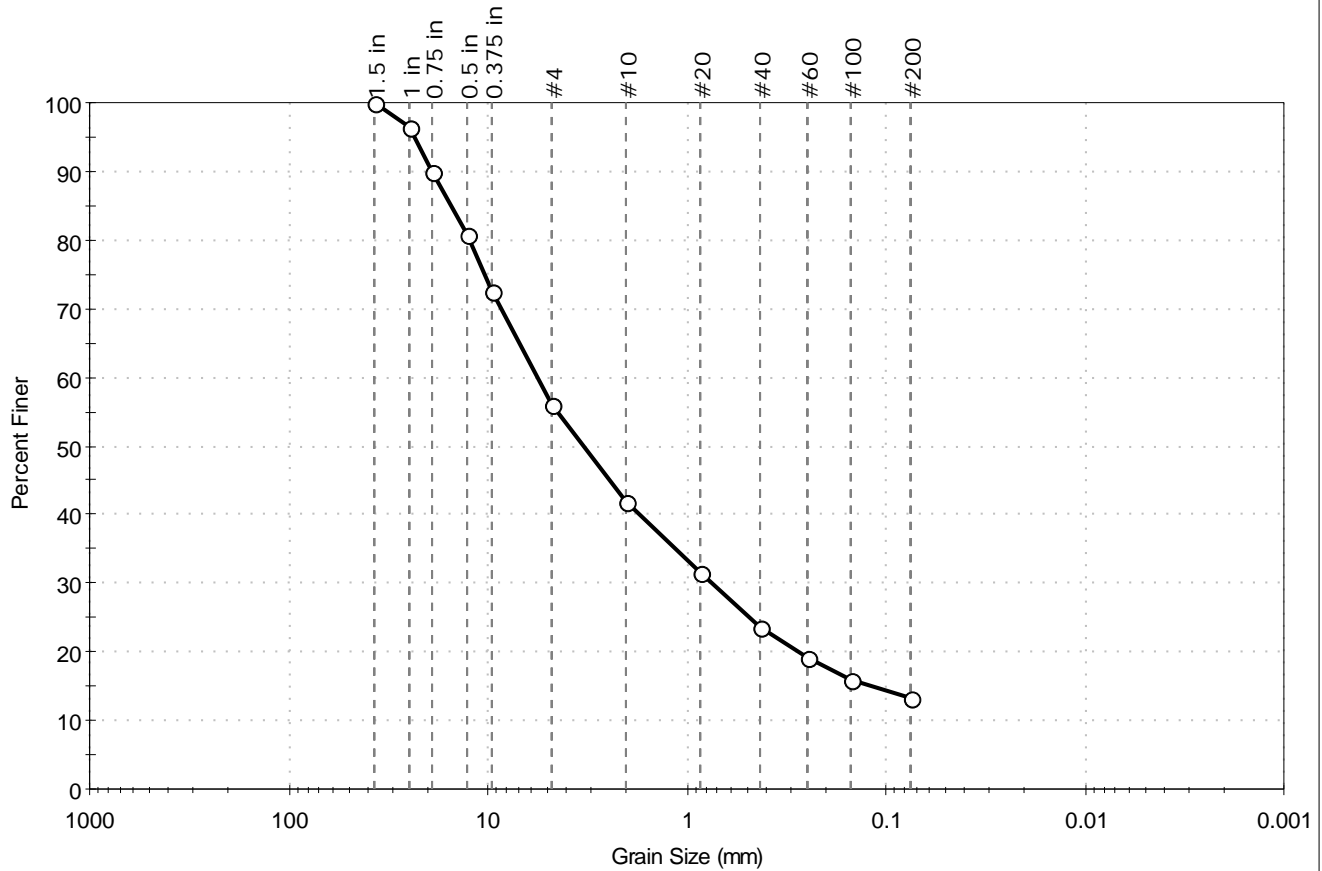
<u>Classification</u>	
ASTM	N/A
AASHTO	Silty Gravel and Sand (A-2-4 (0))

<u>Sample/Test Description</u>
Sand/Gravel Particle Shape : ANGULAR
Sand/Gravel Hardness : HARD



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-04	Test Date:	11/10/16
Depth :	90-93 ft	Test Id:	396762
Test Comment:	---		
Visual Description:	Moist, brown clayey gravel with sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	43.9	42.8	13.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	96		
0.75 in	19.00	90		
0.5 in	12.70	81		
0.375 in	9.50	73		
#4	4.75	56		
#10	2.00	42		
#20	0.85	31		
#40	0.42	24		
#60	0.25	19		
#100	0.15	16		
#200	0.075	13		

<u>Coefficients</u>	
D ₈₅ = 15.3198 mm	D ₃₀ = 0.7444 mm
D ₆₀ = 5.5962 mm	D ₁₅ = 0.1154 mm
D ₅₀ = 3.2878 mm	D ₁₀ = N/A
C _u = N/A	C _c = N/A

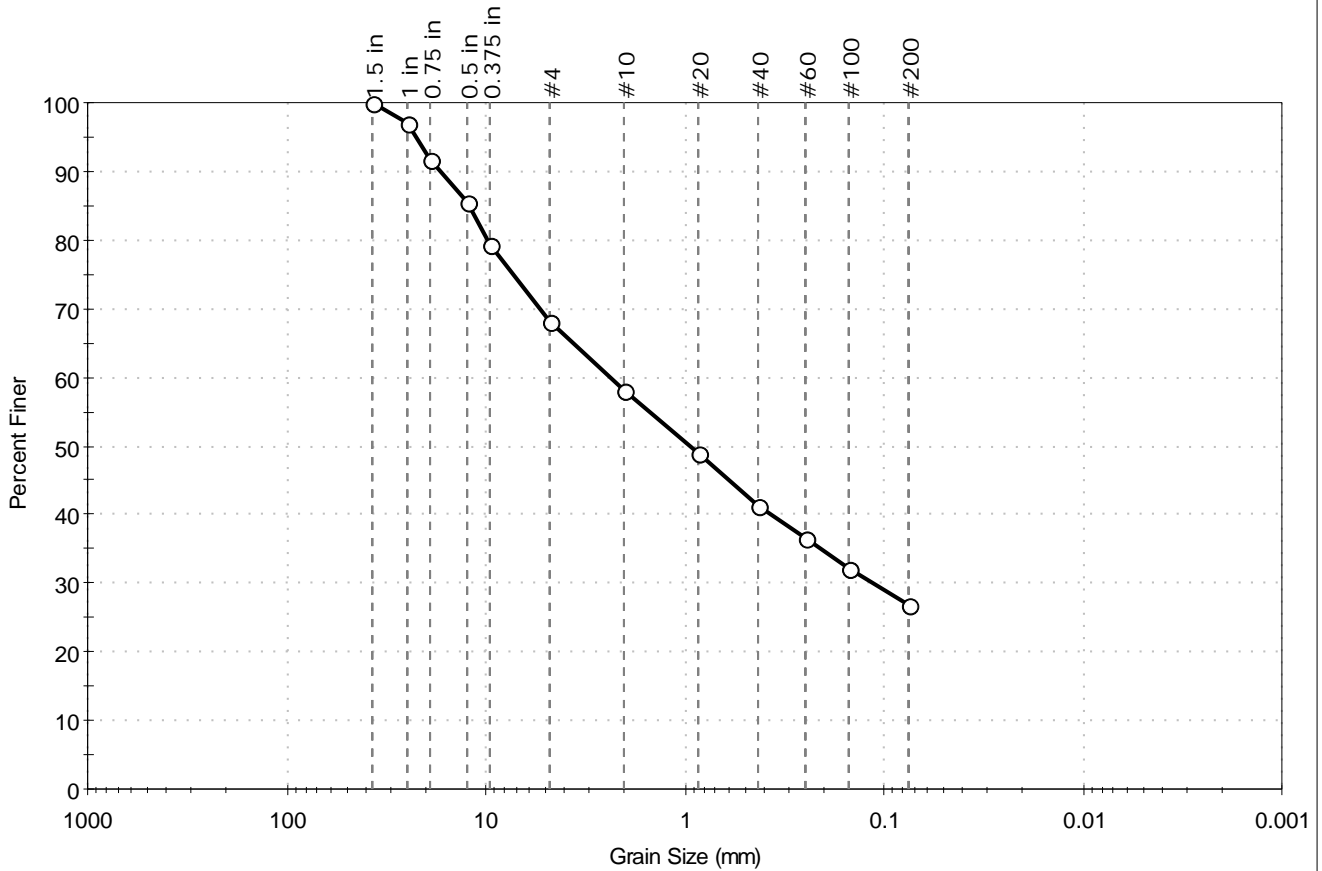
<u>Classification</u>	
<u>ASTM</u>	Clayey gravel with sand (GC)
<u>AASHTO</u>	Silty Gravel and Sand (A-2-4 (0))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape : ANGULAR	
Sand/Gravel Hardness : HARD	



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-05	Test Date:	02/03/17
Depth :	0-10 ft	Test Id:	403360
Test Comment:	---		
Visual Description:	Moist, light reddish brown clayey sand with gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	32.0	41.2	26.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	97		
0.75 in	19.00	92		
0.5 in	12.50	86		
0.375 in	9.50	79		
#4	4.75	68		
#10	2.00	58		
#20	0.85	49		
#40	0.42	41		
#60	0.25	37		
#100	0.15	32		
#200	0.075	27		

<u>Coefficients</u>	
D ₈₅ = 12.1296 mm	D ₃₀ = 0.1121 mm
D ₆₀ = 2.3679 mm	D ₁₅ = N/A
D ₅₀ = 0.9330 mm	D ₁₀ = N/A
C _u = N/A	C _c = N/A

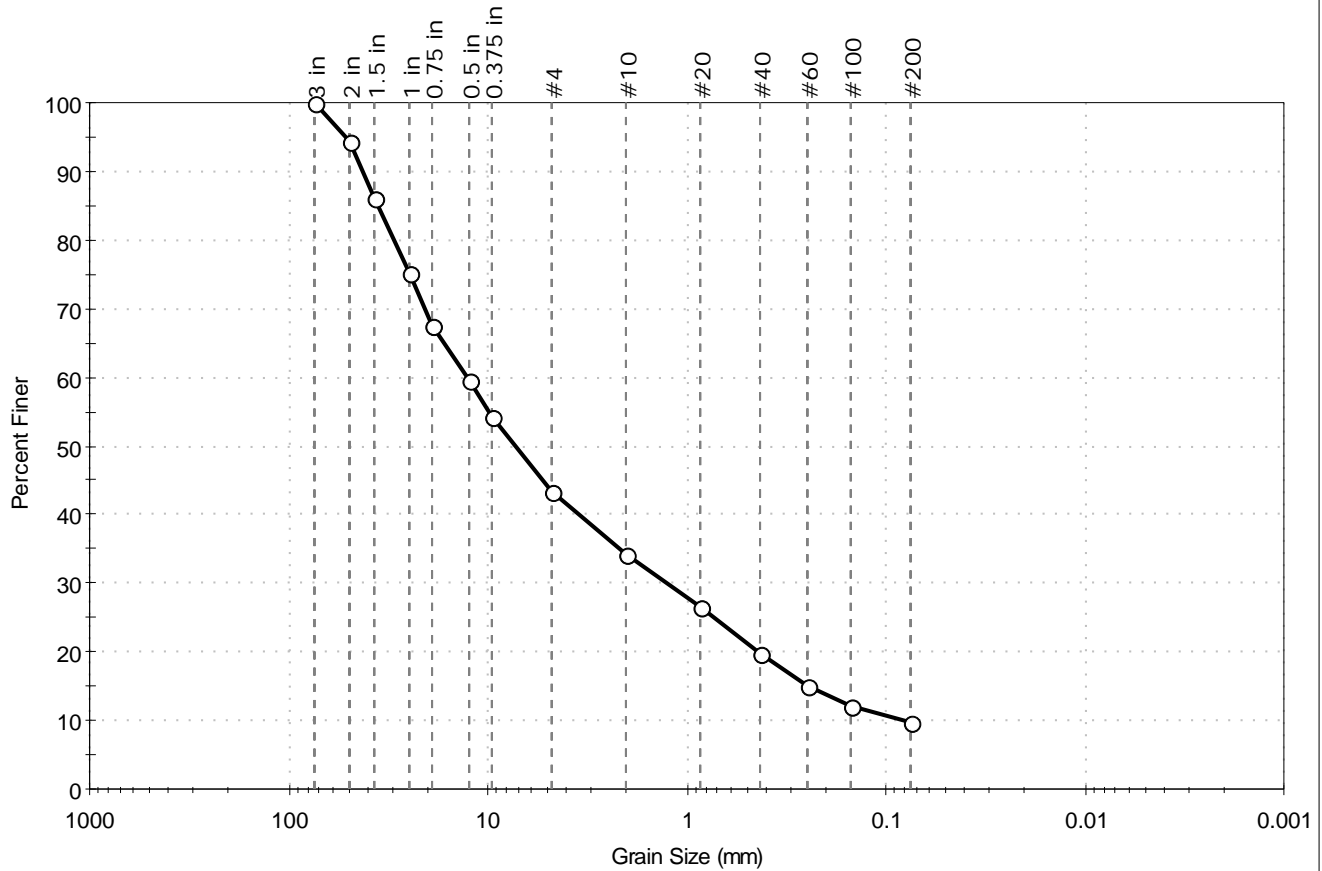
<u>Classification</u>	
<u>ASTM</u>	Clayey sand with gravel (SC)
<u>AASHTO</u>	Clayey Gravel and Sand (A-2-6 (0))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape : ANGULAR	
Sand/Gravel Hardness : HARD	



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-06	Test Date:	02/02/17
Depth:	20-24 ft	Test Id:	403369
Test Comment:	---		
Visual Description:	Moist, light reddish brown gravel with silty clay and sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	56.5	33.7	9.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	94		
1.5 in	37.50	86		
1 in	25.00	75		
0.75 in	19.00	68		
0.5 in	12.50	60		
0.375 in	9.50	54		
#4	4.75	43		
#10	2.00	34		
#20	0.85	26		
#40	0.42	20		
#60	0.25	15		
#100	0.15	12		
#200	0.075	9.8		

<u>Coefficients</u>	
D ₈₅ = 36.1285 mm	D ₃₀ = 1.2638 mm
D ₆₀ = 12.7512 mm	D ₁₅ = 0.2433 mm
D ₅₀ = 7.2537 mm	D ₁₀ = 0.0805 mm
C _u = 158.400	C _c = 1.556

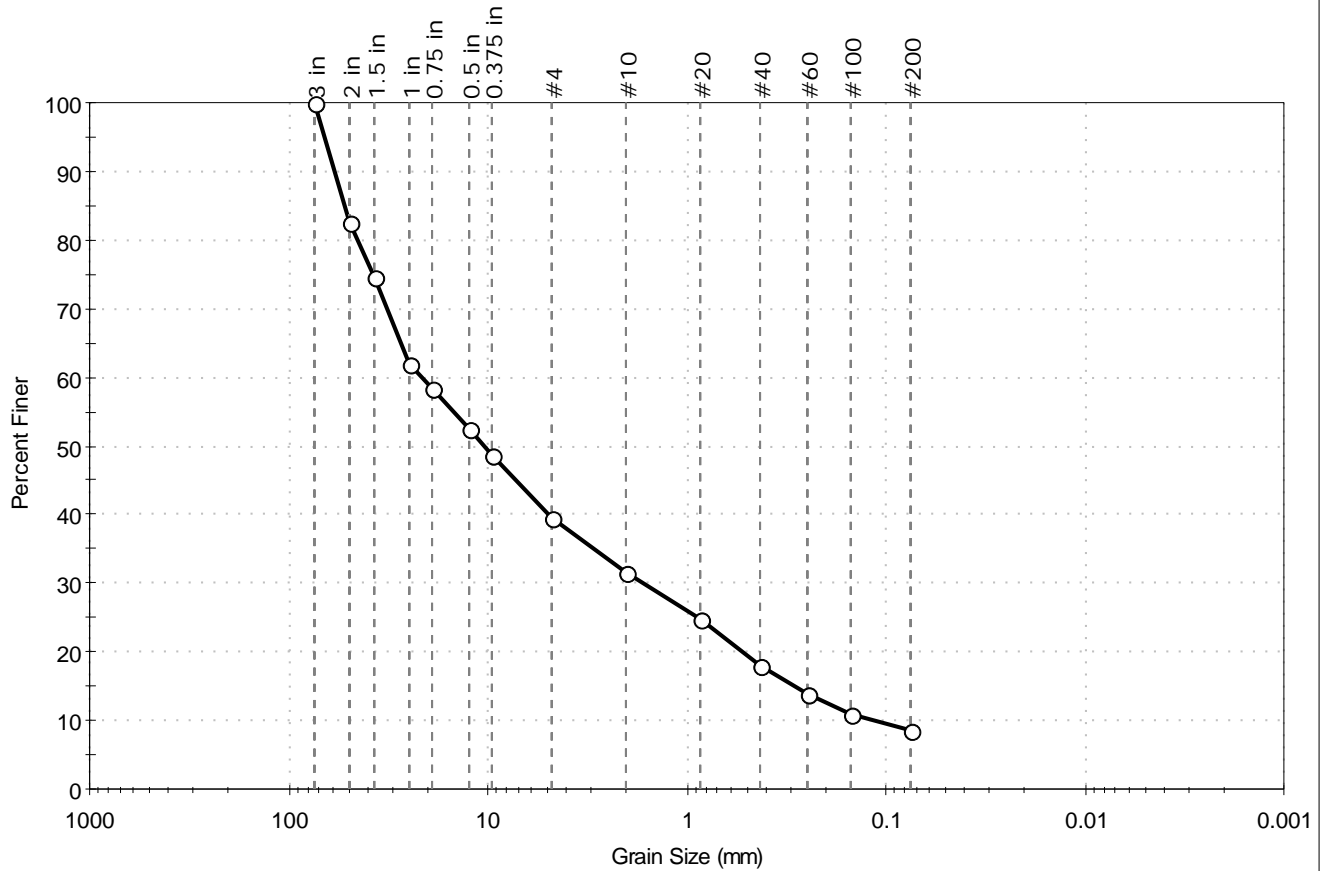
<u>Classification</u>	
<u>ASTM</u>	Well-graded gravel with Silty clay and sand (GW-GC)
<u>AASHTO</u>	Silty Gravel and Sand (A-2-4 (0))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape : ANGULAR	
Sand/Gravel Hardness : HARD	



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-06	Test Date:	02/03/17
Depth:	25-30 ft	Test Id:	403378
Test Comment:	---		
Visual Description:	Moist, light reddish brown gravel with silty clay and sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	60.4	31.1	8.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	83		
1.5 in	37.50	75		
1 in	25.00	62		
0.75 in	19.00	58		
0.5 in	12.50	52		
0.375 in	9.50	49		
#4	4.75	40		
#10	2.00	32		
#20	0.85	25		
#40	0.42	18		
#60	0.25	14		
#100	0.15	11		
#200	0.075	8.5		

<u>Coefficients</u>	
D ₈₅ = 52.7246 mm	D ₃₀ = 1.6385 mm
D ₆₀ = 21.4723 mm	D ₁₅ = 0.2893 mm
D ₅₀ = 10.4965 mm	D ₁₀ = 0.1166 mm
C _u = 184.154	C _c = 1.072

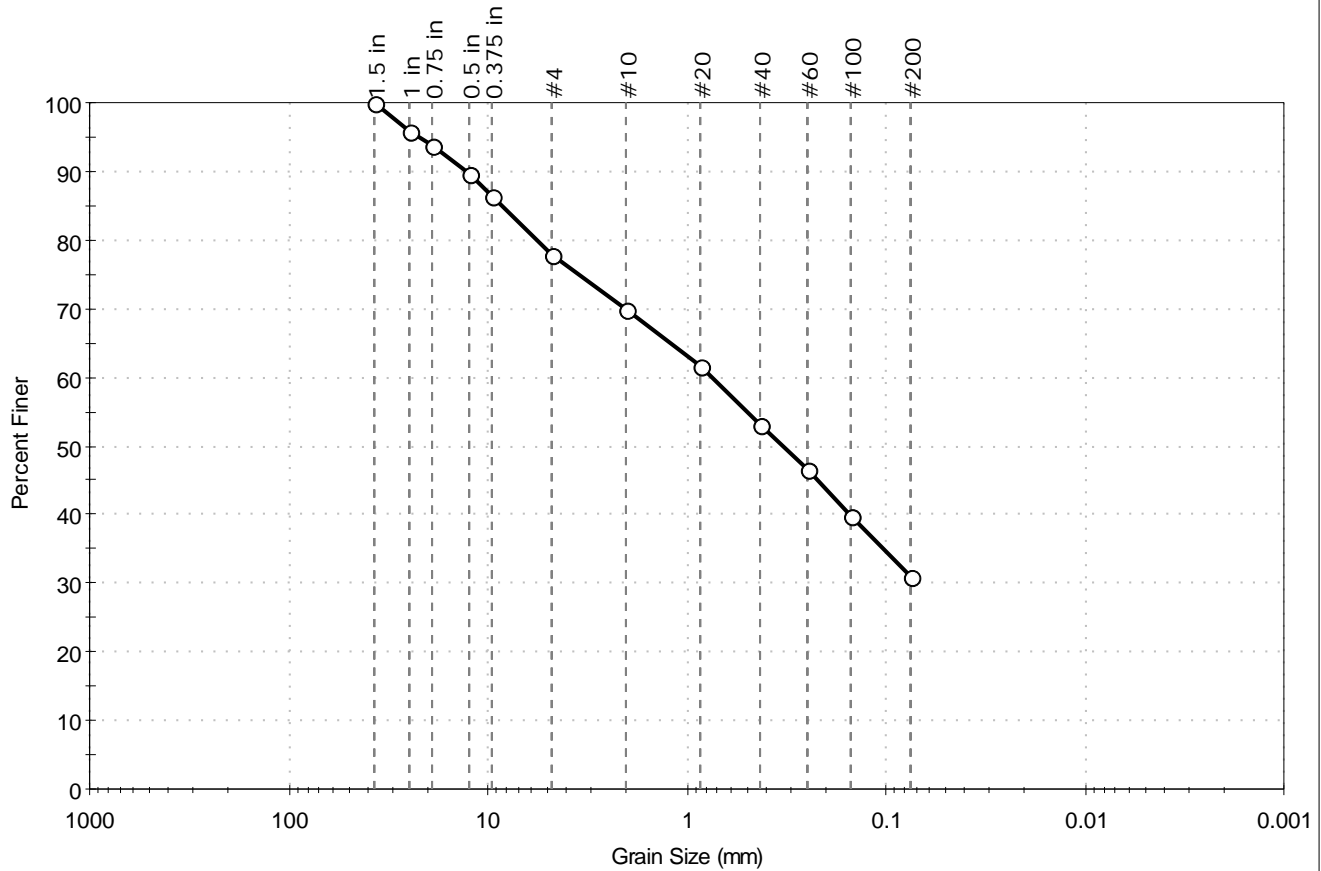
<u>Classification</u>	
<u>ASTM</u>	Well-graded gravel with Silty clay and sand (GW-GC)
<u>AASHTO</u>	Silty Gravel and Sand (A-2-4 (0))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape : ANGULAR	
Sand/Gravel Hardness : HARD	



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-08	Test Date:	12/15/16
Depth :	5-10 ft	Test Id:	399909
Test Comment:	---		
Visual Description:	Moist, light brown clayey sand with gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	22.0	46.9	31.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	96		
0.75 in	19.00	94		
0.5 in	12.50	90		
0.375 in	9.50	86		
#4	4.75	78		
#10	2.00	70		
#20	0.85	62		
#40	0.42	53		
#60	0.25	47		
#100	0.15	40		
#200	0.075	31		

<u>Coefficients</u>	
D ₈₅ = 8.4602 mm	D ₃₀ = N/A
D ₆₀ = 0.7463 mm	D ₁₅ = N/A
D ₅₀ = 0.3304 mm	D ₁₀ = N/A
C _u = N/A	C _c = N/A

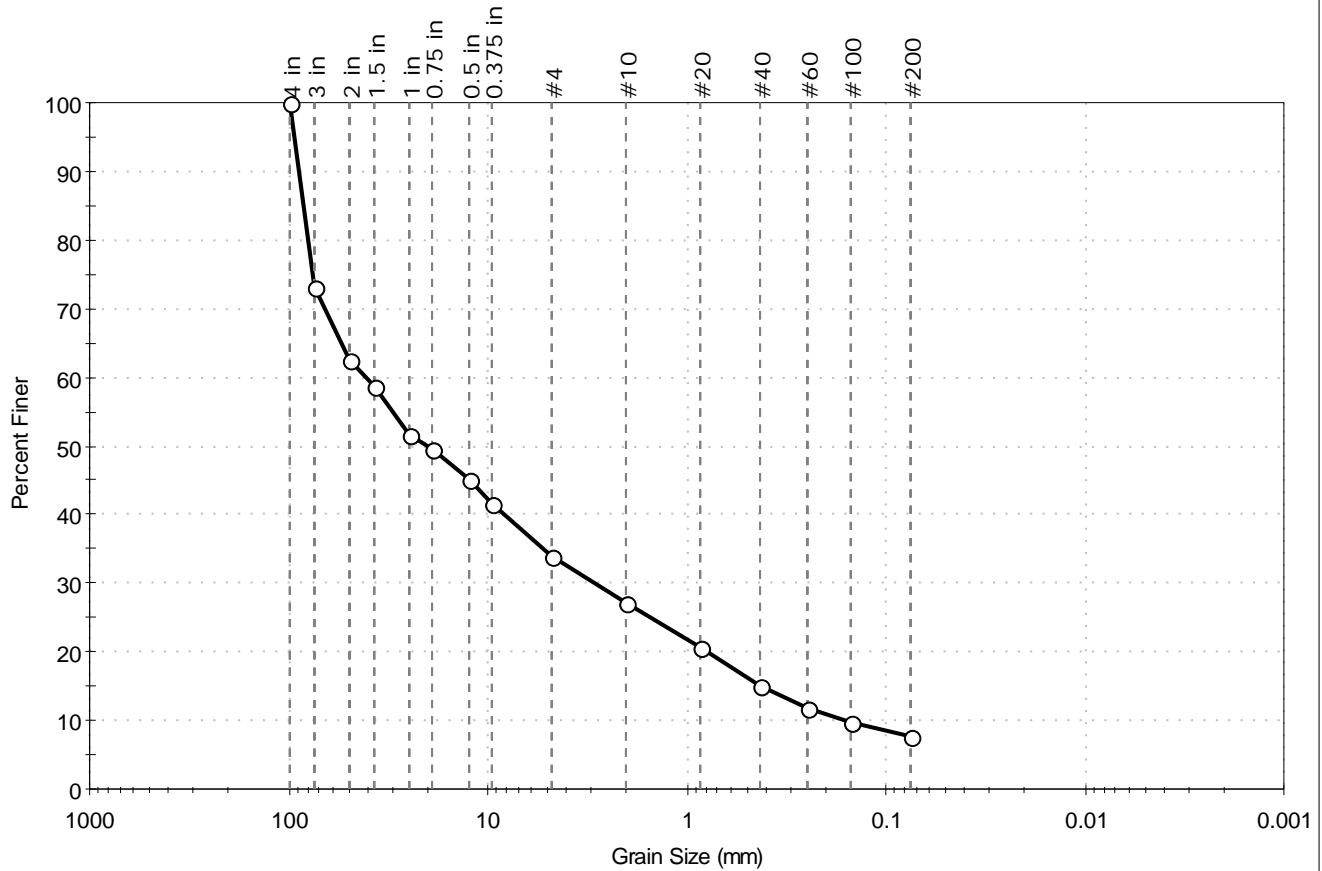
<u>Classification</u>	
<u>ASTM</u>	Clayey sand with gravel (SC)
<u>AASHTO</u>	Silty Gravel and Sand (A-2-4 (0))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape : ANGULAR	
Sand/Gravel Hardness : HARD	



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-08	Test Date:	12/15/16
Depth:	10-15 ft	Test Id:	399918
Test Comment:	---		
Visual Description:	Moist, light brown gravel with silt and sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
26.7	39.3	26.2	7.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
4 in	100.00	100		
3 in	75.00	73		
2 in	50.00	63		
1.5 in	37.50	59		
1 in	25.00	52		
0.75 in	19.00	50		
0.5 in	12.50	45		
0.375 in	9.50	42		
#4	4.75	34		
#10	2.00	27		
#20	0.85	21		
#40	0.42	15		
#60	0.25	12		
#100	0.15	10		
#200	0.075	7.8		

<u>Coefficients</u>	
D ₈₅ = 85.0877 mm	D ₃₀ = 2.8749 mm
D ₆₀ = 41.1648 mm	D ₁₅ = 0.4207 mm
D ₅₀ = 20.1848 mm	D ₁₀ = 0.1618 mm
C _u = 254.418	C _c = 1.241

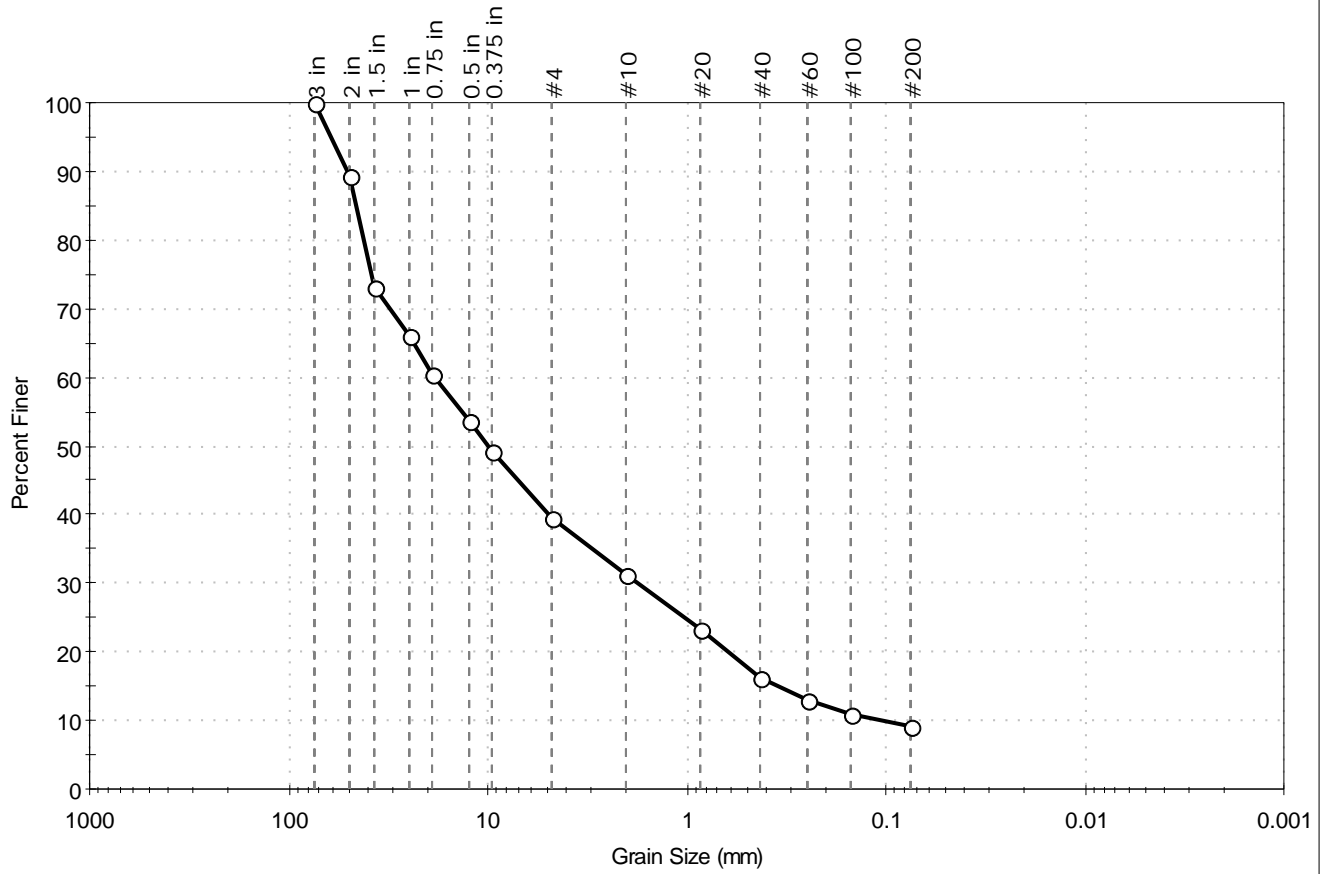
<u>Classification</u>	
<u>ASTM</u>	Well-graded gravel with silt and sand (GW-GM)
<u>AASHTO</u>	Stone Fragments, Gravel and Sand (A-1-a (1))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape : ANGULAR	
Sand/Gravel Hardness : HARD	



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-09	Test Date:	12/15/16
Depth:	12.5-15 ft	Test Id:	399927
Test Comment:	---		
Visual Description:	Moist, light brown gravel with clay and sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	60.5	30.3	9.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	89		
1.5 in	37.50	73		
1 in	25.00	66		
0.75 in	19.00	60		
0.5 in	12.50	54		
0.375 in	9.50	49		
#4	4.75	40		
#10	2.00	31		
#20	0.85	23		
#40	0.42	16		
#60	0.25	13		
#100	0.15	11		
#200	0.075	9.2		

<u>Coefficients</u>	
D ₈₅ = 46.3091 mm	D ₃₀ = 1.7378 mm
D ₆₀ = 18.5625 mm	D ₁₅ = 0.3447 mm
D ₅₀ = 10.0050 mm	D ₁₀ = 0.1016 mm
C _u = 182.702	C _c = 1.601

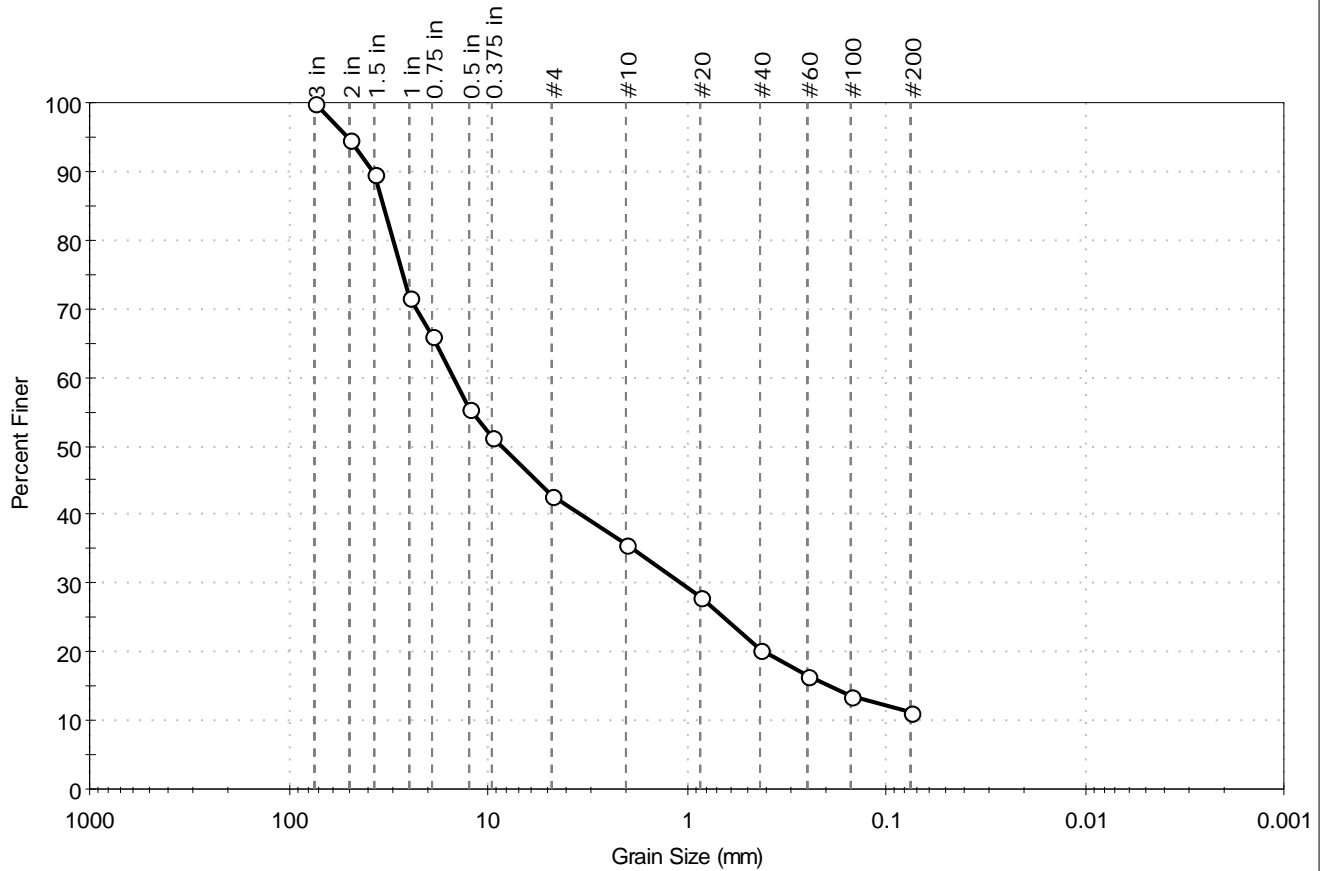
<u>Classification</u>	
<u>ASTM</u>	Well-graded gravel with clay and sand (GW-GC)
<u>AASHTO</u>	Clayey Gravel and Sand (A-2-6 (0))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape : ANGULAR	
Sand/Gravel Hardness : HARD	



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-09	Test Date:	12/15/16
Depth:	20-25 ft	Test Id:	399936
Test Comment:	D10 value interpolated for USCS classification		
Visual Description:	Moist, light brown gravel with clay and sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	57.1	31.5	11.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	95		
1.5 in	37.50	90		
1 in	25.00	72		
0.75 in	19.00	66		
0.5 in	12.50	56		
0.375 in	9.50	51		
#4	4.75	43		
#10	2.00	36		
#20	0.85	28		
#40	0.42	20		
#60	0.25	16		
#100	0.15	14		
#200	0.075	11		

<u>Coefficients</u>	
D ₈₅ = 33.7715 mm	D ₃₀ = 1.0701 mm
D ₆₀ = 14.8963 mm	D ₁₅ = 0.1912 mm
D ₅₀ = 8.5115 mm	D ₁₀ = N/A
C _u = N/A	C _c = N/A

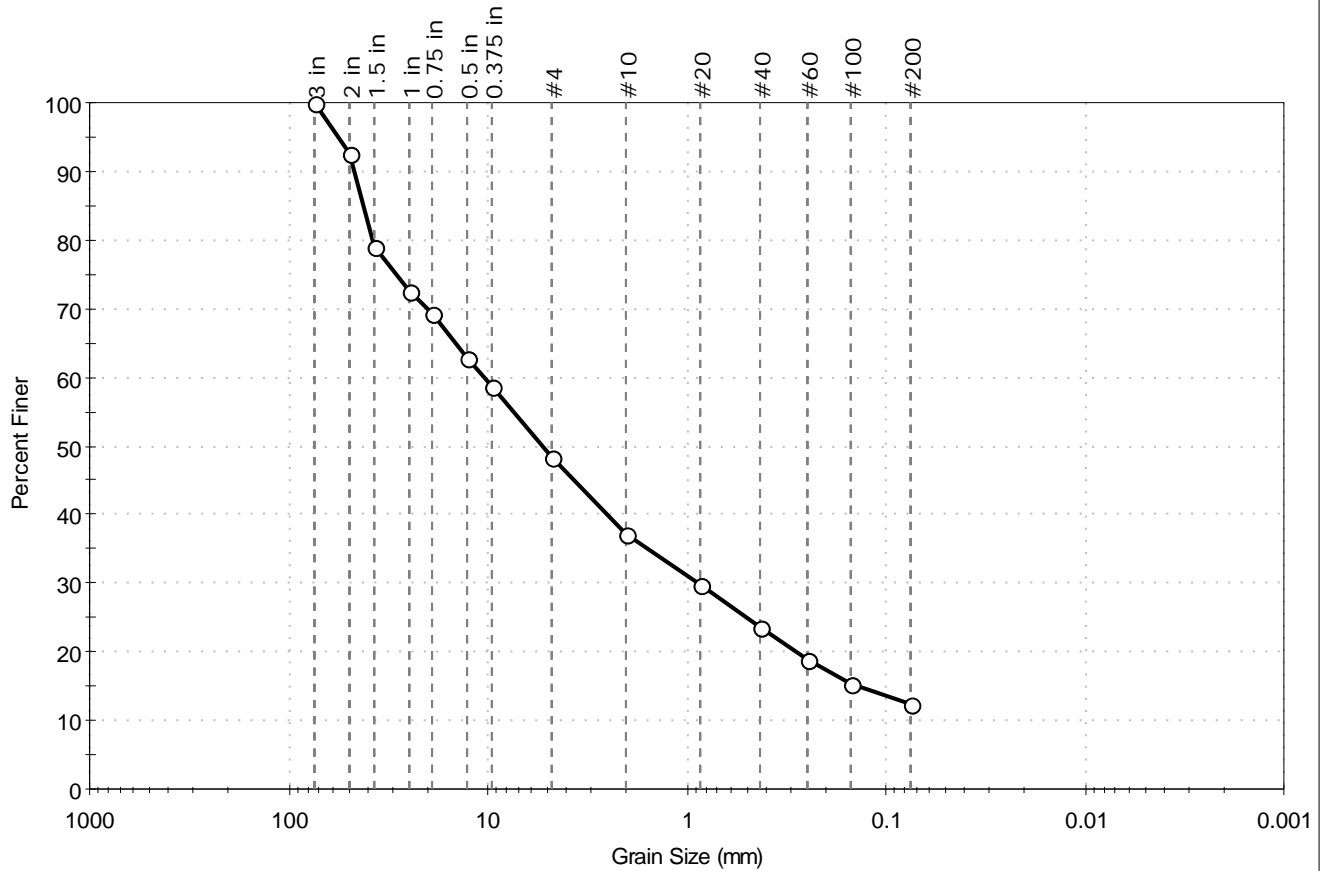
<u>Classification</u>	
<u>ASTM</u>	Well-graded gravel with clay and sand (GW-GC)
<u>AASHTO</u>	Silty Gravel and Sand (A-2-4 (0))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape : ANGULAR	
Sand/Gravel Hardness : HARD	



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-10	Test Date:	11/10/16
Depth:	20-25 ft	Test Id:	396761
Test Comment:	---		
Visual Description:	Moist, reddish brown silty, clayey gravel with sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	51.7	35.9	12.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	93		
1.5 in	37.50	79		
1 in	25.00	73		
0.75 in	19.00	69		
0.5 in	12.70	63		
0.375 in	9.50	59		
#4	4.75	48		
#10	2.00	37		
#20	0.85	30		
#40	0.42	24		
#60	0.25	19		
#100	0.15	15		
#200	0.075	12		

<u>Coefficients</u>	
D ₈₅ = 42.4387 mm	D ₃₀ = 0.8662 mm
D ₆₀ = 10.4360 mm	D ₁₅ = 0.1375 mm
D ₅₀ = 5.3051 mm	D ₁₀ = N/A
C _u = N/A	C _c = N/A

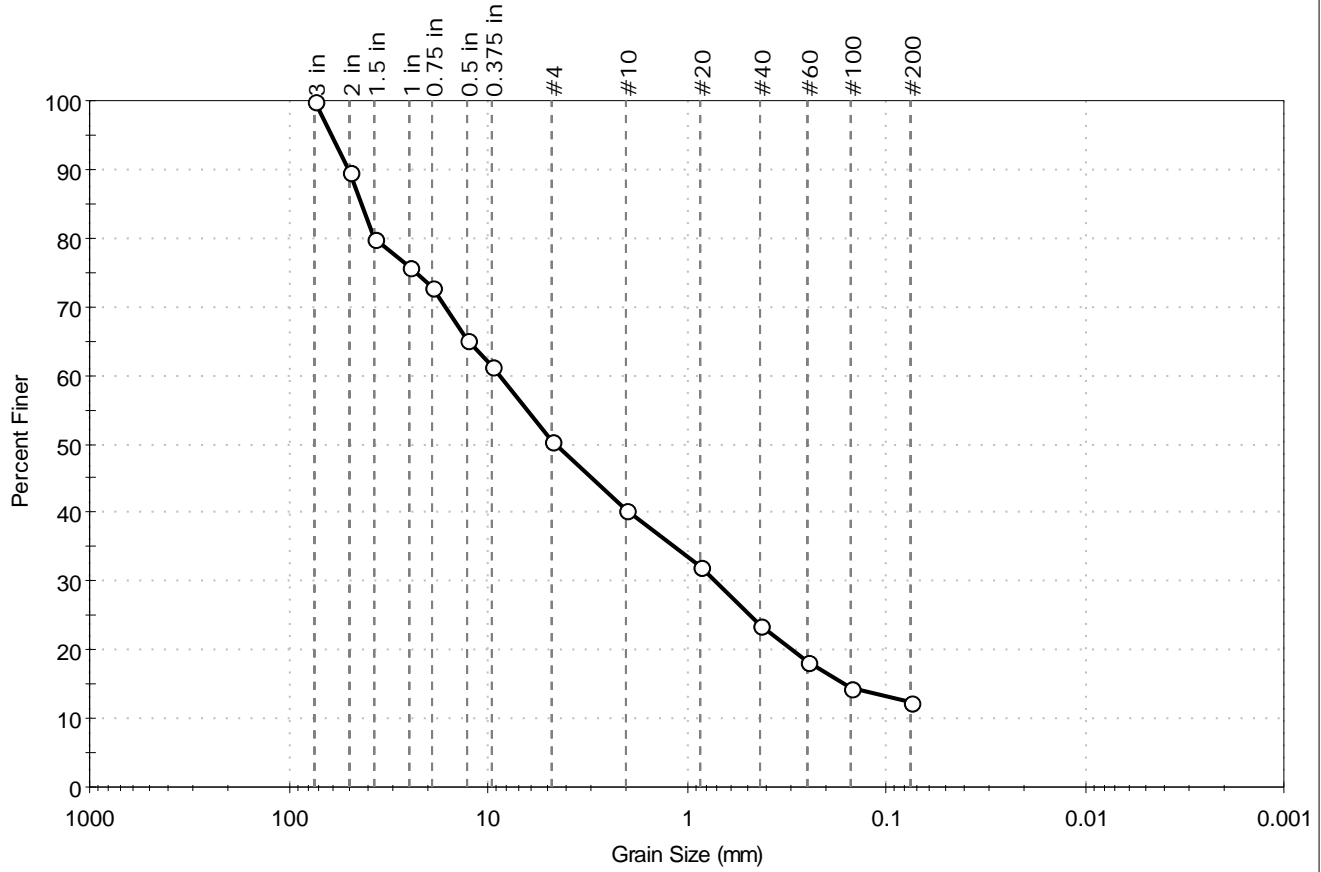
<u>Classification</u>	
<u>ASTM</u>	Silty, clayey gravel with sand (GC-GM)
<u>AASHTO</u>	Stone Fragments, Gravel and Sand (A-1-a (0))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape : ANGULAR	
Sand/Gravel Hardness : HARD	



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-10	Test Date:	11/10/16
Depth:	15-20 ft	Test Id:	396759
Test Comment:	---		
Visual Description:	Moist, reddish brown silty gravel with sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	49.5	38.2	12.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	90		
1.5 in	37.50	80		
1 in	25.00	76		
0.75 in	19.00	73		
0.5 in	12.70	65		
0.375 in	9.50	61		
#4	4.75	51		
#10	2.00	40		
#20	0.85	32		
#40	0.42	24		
#60	0.25	18		
#100	0.15	15		
#200	0.075	12		

<u>Coefficients</u>	
D ₈₅ = 43.4815 mm	D ₃₀ = 0.7186 mm
D ₆₀ = 8.7689 mm	D ₁₅ = 0.1595 mm
D ₅₀ = 4.5382 mm	D ₁₀ = N/A
C _u = N/A	C _c = N/A

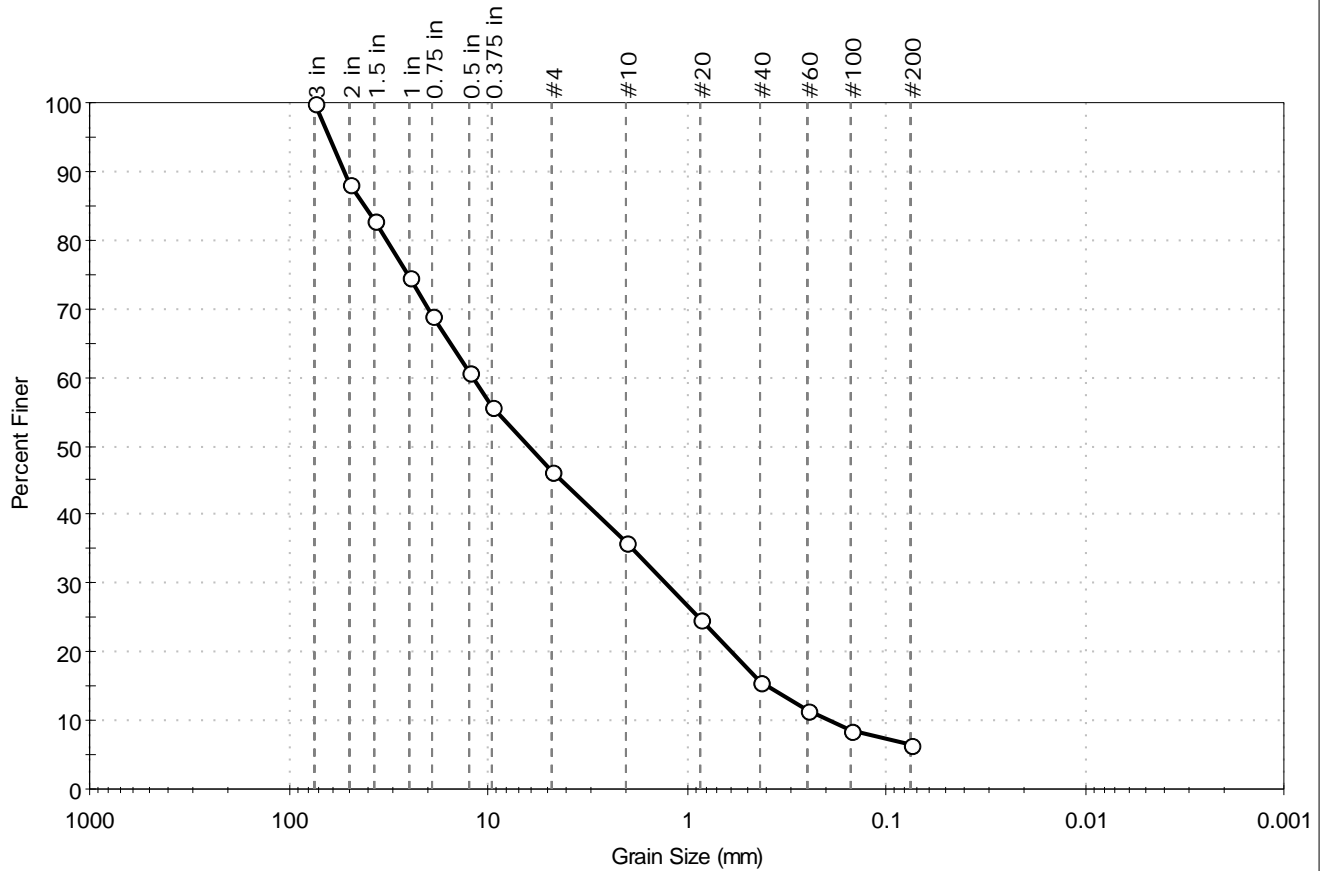
<u>Classification</u>	
<u>ASTM</u>	Silty gravel with sand (GM)
<u>AASHTO</u>	Stone Fragments, Gravel and Sand (A-1-a (0))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape : ANGULAR	
Sand/Gravel Hardness : HARD	



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-11	Test Date:	02/06/17
Depth:	15-20 ft	Test Id:	403387
Test Comment:	---		
Visual Description:	Moist, light reddish brown gravel with silt and sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	53.8	39.8	6.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	88		
1.5 in	37.50	83		
1 in	25.00	75		
0.75 in	19.00	69		
0.5 in	12.50	61		
0.375 in	9.50	56		
#4	4.75	46		
#10	2.00	36		
#20	0.85	25		
#40	0.42	16		
#60	0.25	11		
#100	0.15	9		
#200	0.075	6.4		

<u>Coefficients</u>	
D ₈₅ = 42.0778 mm	D ₃₀ = 1.2614 mm
D ₆₀ = 11.9919 mm	D ₁₅ = 0.3863 mm
D ₅₀ = 6.2437 mm	D ₁₀ = 0.1944 mm
C _u = 61.687	C _c = 0.683

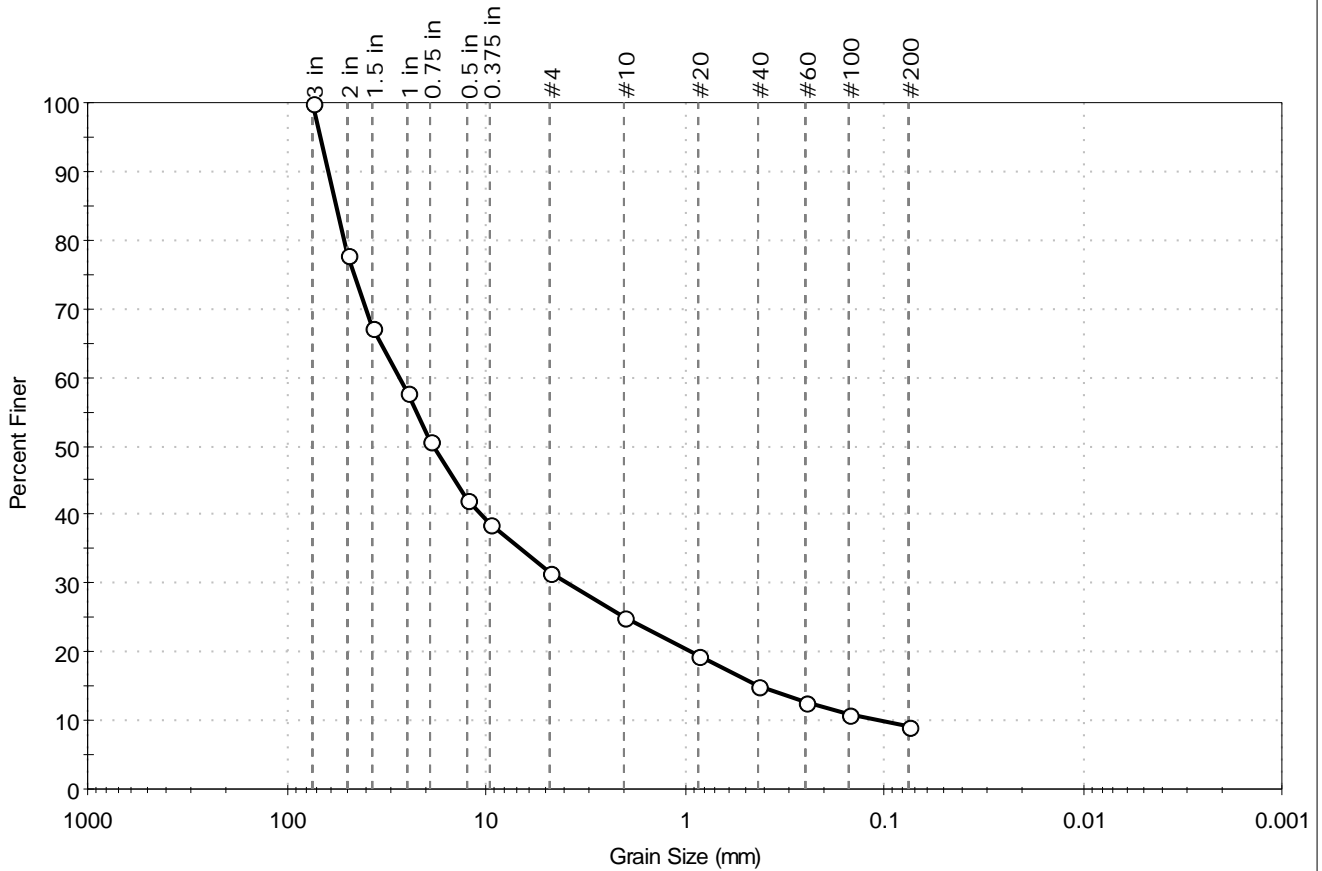
<u>Classification</u>	
<u>ASTM</u>	Poorly graded gravel with silt and sand (GP-GM)
<u>AASHTO</u>	Stone Fragments, Gravel and Sand (A-1-a (1))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape : ANGULAR	
Sand/Gravel Hardness : HARD	



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-11	Test Date:	02/03/17
Depth:	20-25 ft	Test Id:	403396
Tested By:	jbr		
Checked By:	jdt		
Test Comment:	---		
Visual Description:	Moist, light reddish brown gravel with clay and sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	68.5	22.5	9.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	78		
1.5 in	37.50	67		
1 in	25.00	58		
0.75 in	19.00	51		
0.5 in	12.50	42		
0.375 in	9.50	39		
#4	4.75	32		
#10	2.00	25		
#20	0.85	19		
#40	0.42	15		
#60	0.25	13		
#100	0.15	11		
#200	0.075	9.0		

<u>Coefficients</u>	
D ₈₅ = 56.8735 mm	D ₃₀ = 3.8620 mm
D ₆₀ = 27.4869 mm	D ₁₅ = 0.4187 mm
D ₅₀ = 18.2837 mm	D ₁₀ = 0.1102 mm
C _u = 249.427	C _c = 4.924

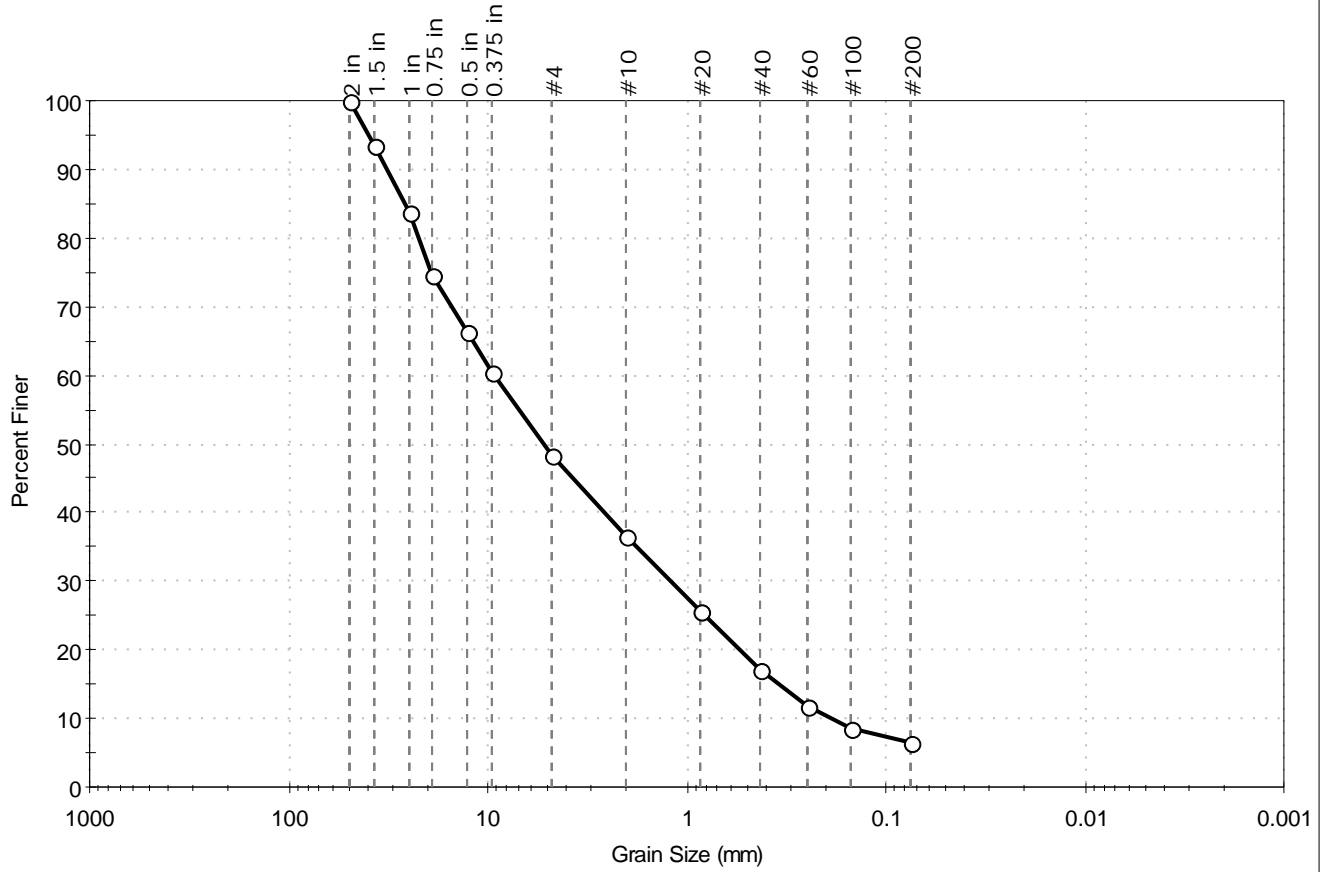
<u>Classification</u>	
<u>ASTM</u>	Poorly graded gravel with clay and sand (GP-GC)
<u>AASHTO</u>	Silty Gravel and Sand (A-2-4 (0))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape : ANGULAR	
Sand/Gravel Hardness : HARD	



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-12	Test Date:	11/10/16
Depth:	40-45 ft	Test Id:	396763
Test Comment:	---		
Visual Description:	Moist, reddish brown gravel with silt and sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	51.8	41.8	6.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
2 in	50.00	100		
1.5 in	37.50	93		
1 in	25.00	84		
0.75 in	19.00	75		
0.5 in	12.70	66		
0.375 in	9.50	60		
#4	4.75	48		
#10	2.00	37		
#20	0.85	26		
#40	0.42	17		
#60	0.25	12		
#100	0.15	9		
#200	0.075	6.4		

<u>Coefficients</u>	
D ₈₅ = 26.4566 mm	D ₃₀ = 1.1904 mm
D ₆₀ = 9.3121 mm	D ₁₅ = 0.3419 mm
D ₅₀ = 5.2454 mm	D ₁₀ = 0.1855 mm
C _u = 50.200	C _c = 0.820

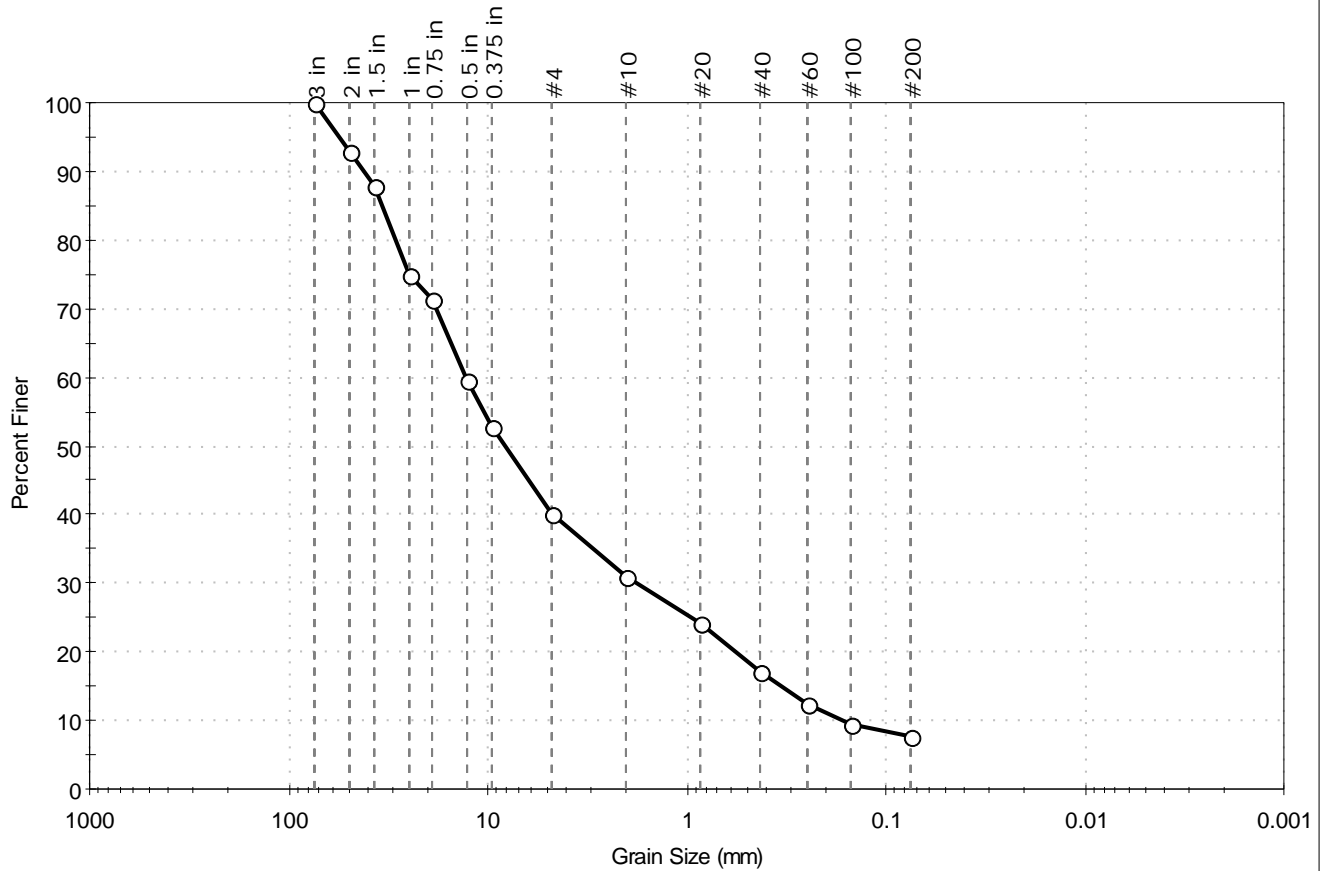
<u>Classification</u>	
ASTM	Poorly graded gravel with silt and sand (GP-GM)
AASHTO	Stone Fragments, Gravel and Sand (A-1-a (1))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape : ANGULAR	
Sand/Gravel Hardness : HARD	



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-12	Test Date:	11/10/16
Depth:	45-50 ft	Test Id:	396766
Test Comment:	---		
Visual Description:	Moist, light brown gravel with silt and sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	59.9	32.3	7.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	93		
1.5 in	37.50	88		
1 in	25.00	75		
0.75 in	19.00	71		
0.5 in	12.70	60		
0.375 in	9.50	53		
#4	4.75	40		
#10	2.00	31		
#20	0.85	24		
#40	0.42	17		
#60	0.25	12		
#100	0.15	9		
#200	0.075	7.8		

<u>Coefficients</u>	
D ₈₅ = 34.2115 mm	D ₃₀ = 1.7932 mm
D ₆₀ = 12.9140 mm	D ₁₅ = 0.3334 mm
D ₅₀ = 8.1256 mm	D ₁₀ = 0.1675 mm
C _u = 77.099	C _c = 1.487

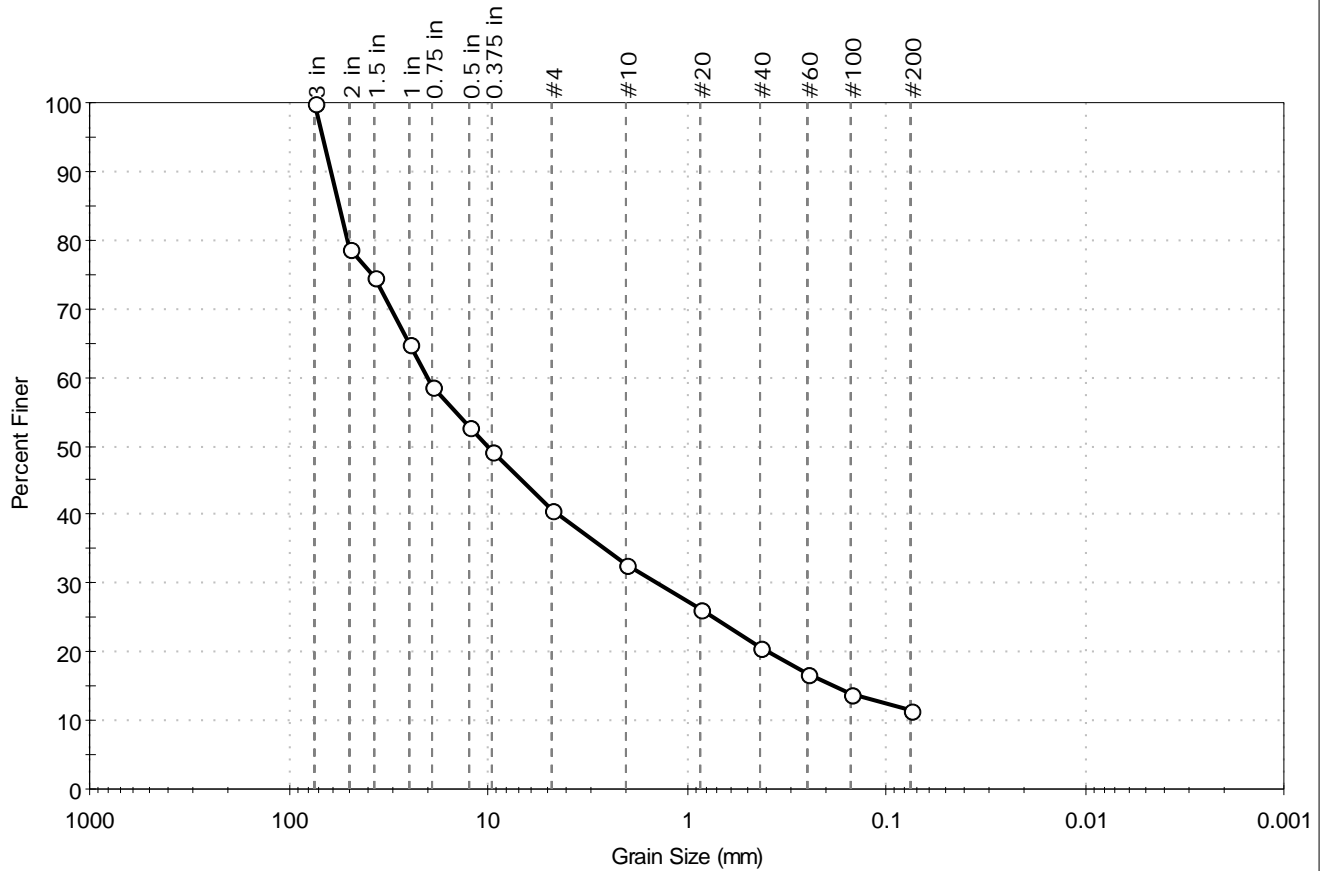
<u>Classification</u>	
<u>ASTM</u>	Well-graded gravel with silt and sand (GW-GM)
<u>AASHTO</u>	Stone Fragments, Gravel and Sand (A-1-a (1))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape : ANGULAR	
Sand/Gravel Hardness : HARD	



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-13	Test Date:	12/15/16
Depth:	60-65 ft	Test Id:	399945
Test Comment:	D10 value interpolated for USCS classification		
Visual Description:	Moist, light brown gravel with clay and sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	59.2	29.2	11.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	79		
1.5 in	37.50	75		
1 in	25.00	65		
0.75 in	19.00	59		
0.5 in	12.50	53		
0.375 in	9.50	49		
#4	4.75	41		
#10	2.00	33		
#20	0.85	26		
#40	0.42	21		
#60	0.25	17		
#100	0.15	14		
#200	0.075	12		

<u>Coefficients</u>	
D ₈₅ = 56.3082 mm	D ₃₀ = 1.3861 mm
D ₆₀ = 20.1683 mm	D ₁₅ = 0.1840 mm
D ₅₀ = 10.1087 mm	D ₁₀ = N/A
C _u = N/A	C _c = N/A

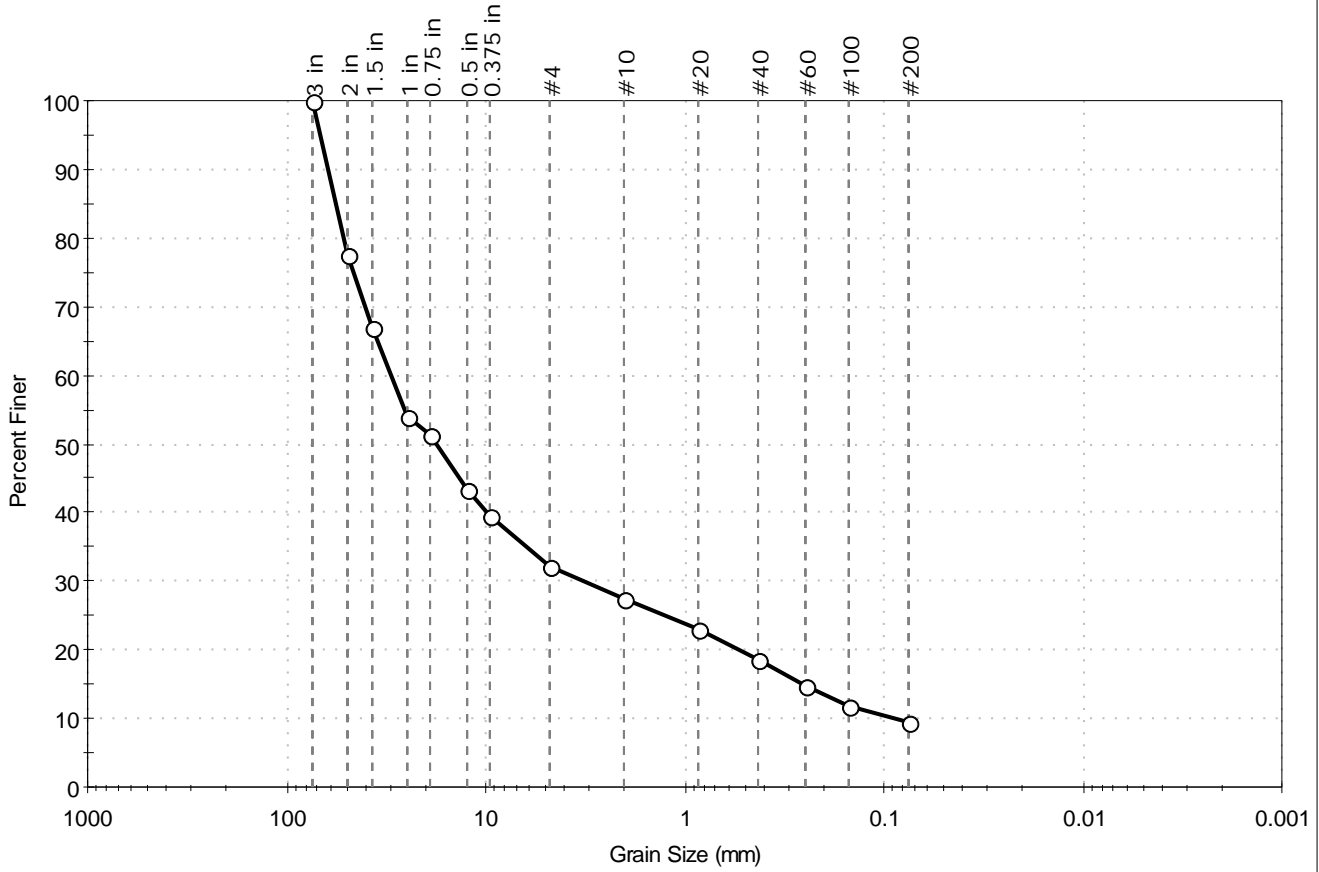
<u>Classification</u>	
<u>ASTM</u>	Well-graded gravel with clay and sand (GW-GC)
<u>AASHTO</u>	Silty Gravel and Sand (A-2-4 (0))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape : ANGULAR	
Sand/Gravel Hardness : HARD	



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-14	Test Date:	12/15/16
Depth:	65-70 ft	Test Id:	399954
Test Comment:	---		
Visual Description:	Moist, reddish brown gravel with silt and sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	67.8	22.6	9.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	78		
1.5 in	37.50	67		
1 in	25.00	54		
0.75 in	19.00	51		
0.5 in	12.50	43		
0.375 in	9.50	40		
#4	4.75	32		
#10	2.00	28		
#20	0.85	23		
#40	0.42	18		
#60	0.25	15		
#100	0.15	12		
#200	0.075	9.6		

<u>Coefficients</u>	
D ₈₅ = 57.1960 mm	D ₃₀ = 3.1507 mm
D ₆₀ = 30.2434 mm	D ₁₅ = 0.2574 mm
D ₅₀ = 17.8294 mm	D ₁₀ = 0.0849 mm
C _u = 356.224	C _c = 3.866

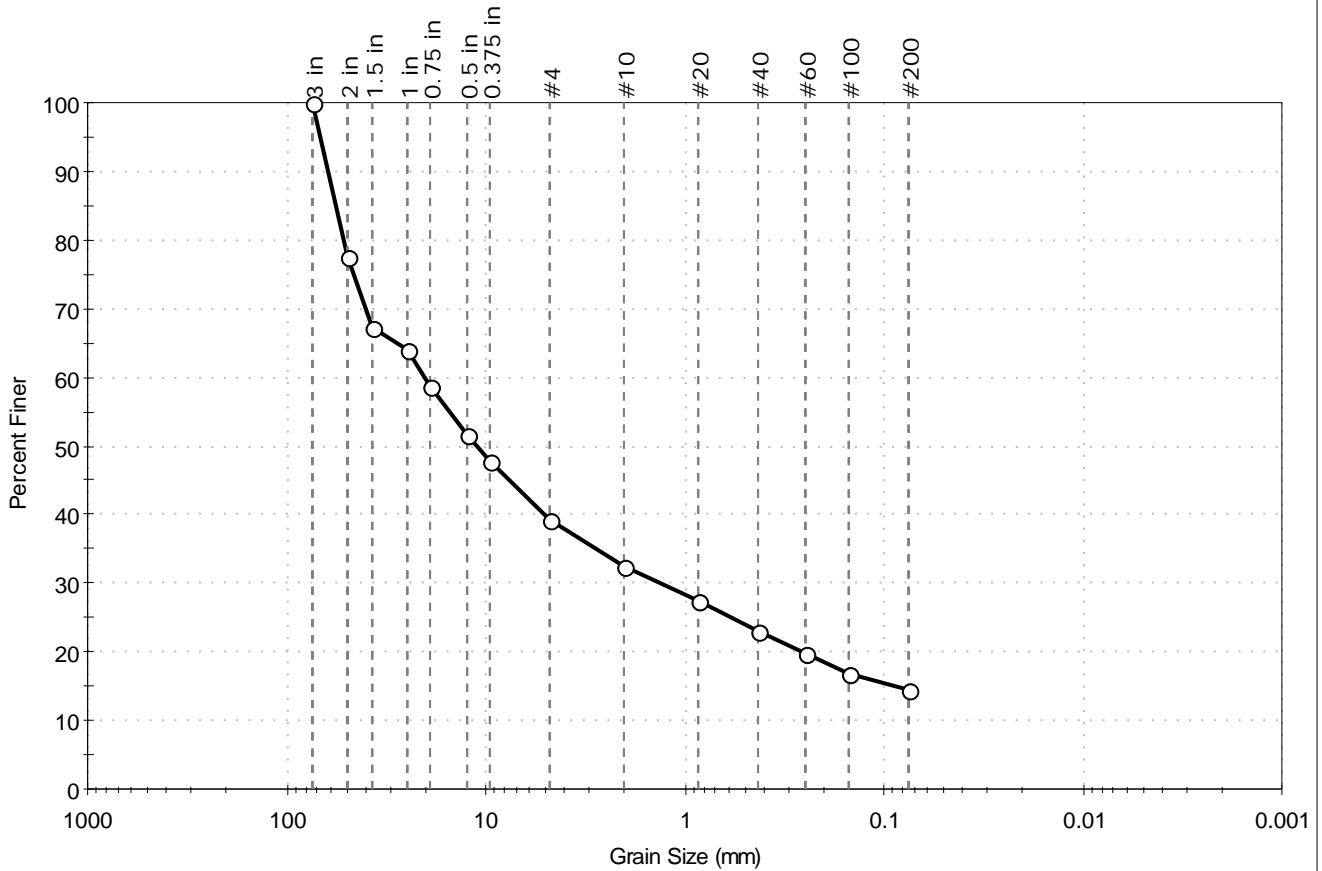
<u>Classification</u>	
<u>ASTM</u>	Poorly graded gravel with silt and sand (GP-GM)
<u>AASHTO</u>	Stone Fragments, Gravel and Sand (A-1-a (1))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape : ANGULAR	
Sand/Gravel Hardness : HARD	



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-14	Test Date:	12/15/16
Depth:	70-75 ft	Test Id:	399963
Test Comment:	---		
Visual Description:	Moist, light brown clayey gravel with sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	60.8	24.7	14.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	78		
1.5 in	37.50	67		
1 in	25.00	64		
0.75 in	19.00	59		
0.5 in	12.50	51		
0.375 in	9.50	48		
#4	4.75	39		
#10	2.00	32		
#20	0.85	28		
#40	0.42	23		
#60	0.25	20		
#100	0.15	17		
#200	0.075	15		

<u>Coefficients</u>	
D ₈₅ = 57.1270 mm	D ₃₀ = 1.3024 mm
D ₆₀ = 20.3529 mm	D ₁₅ = 0.0861 mm
D ₅₀ = 11.2466 mm	D ₁₀ = N/A
C _u = N/A	C _c = N/A

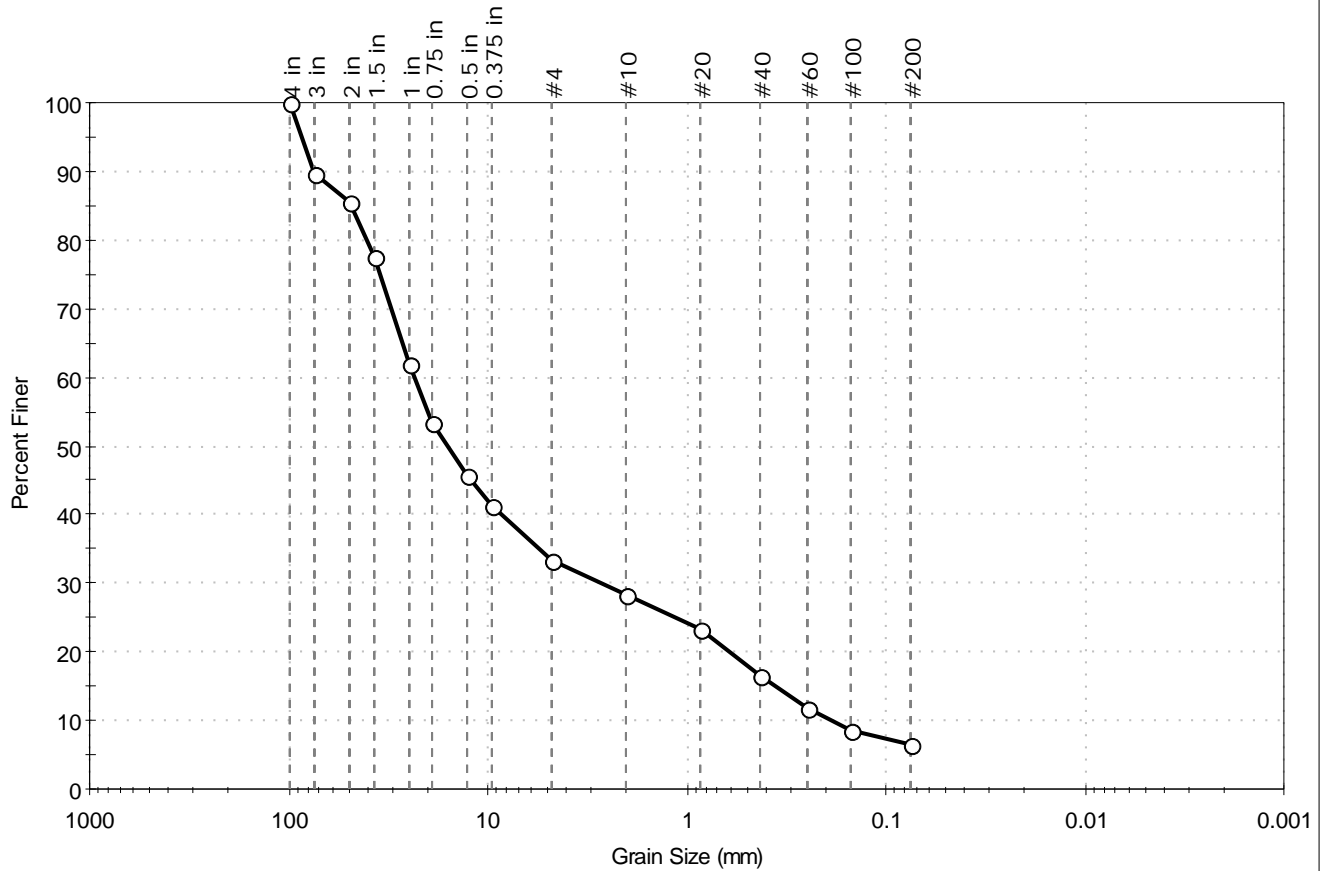
<u>Classification</u>	
<u>ASTM</u>	Clayey gravel with sand (GC)
<u>AASHTO</u>	Silty Gravel and Sand (A-2-4 (0))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape : ANGULAR	
Sand/Gravel Hardness : HARD	



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-15	Test Date:	11/10/16
Depth:	15-20 ft	Test Id:	396764
Test Comment:	---		
Visual Description:	Moist, light brown gravel with silt and sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
10.2	56.4	26.8	6.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
4 in	100.00	100		
3 in	75.00	90		
2 in	50.00	86		
1.5 in	37.50	78		
1 in	25.00	62		
0.75 in	19.00	53		
0.5 in	12.70	46		
0.375 in	9.50	41		
#4	4.75	33		
#10	2.00	28		
#20	0.85	23		
#40	0.42	17		
#60	0.25	12		
#100	0.15	9		
#200	0.075	6.6		

<u>Coefficients</u>	
D ₈₅ = 48.9257 mm	D ₃₀ = 2.6625 mm
D ₆₀ = 23.4288 mm	D ₁₅ = 0.3568 mm
D ₅₀ = 15.8271 mm	D ₁₀ = 0.1907 mm
C _u = 122.857	C _c = 1.587

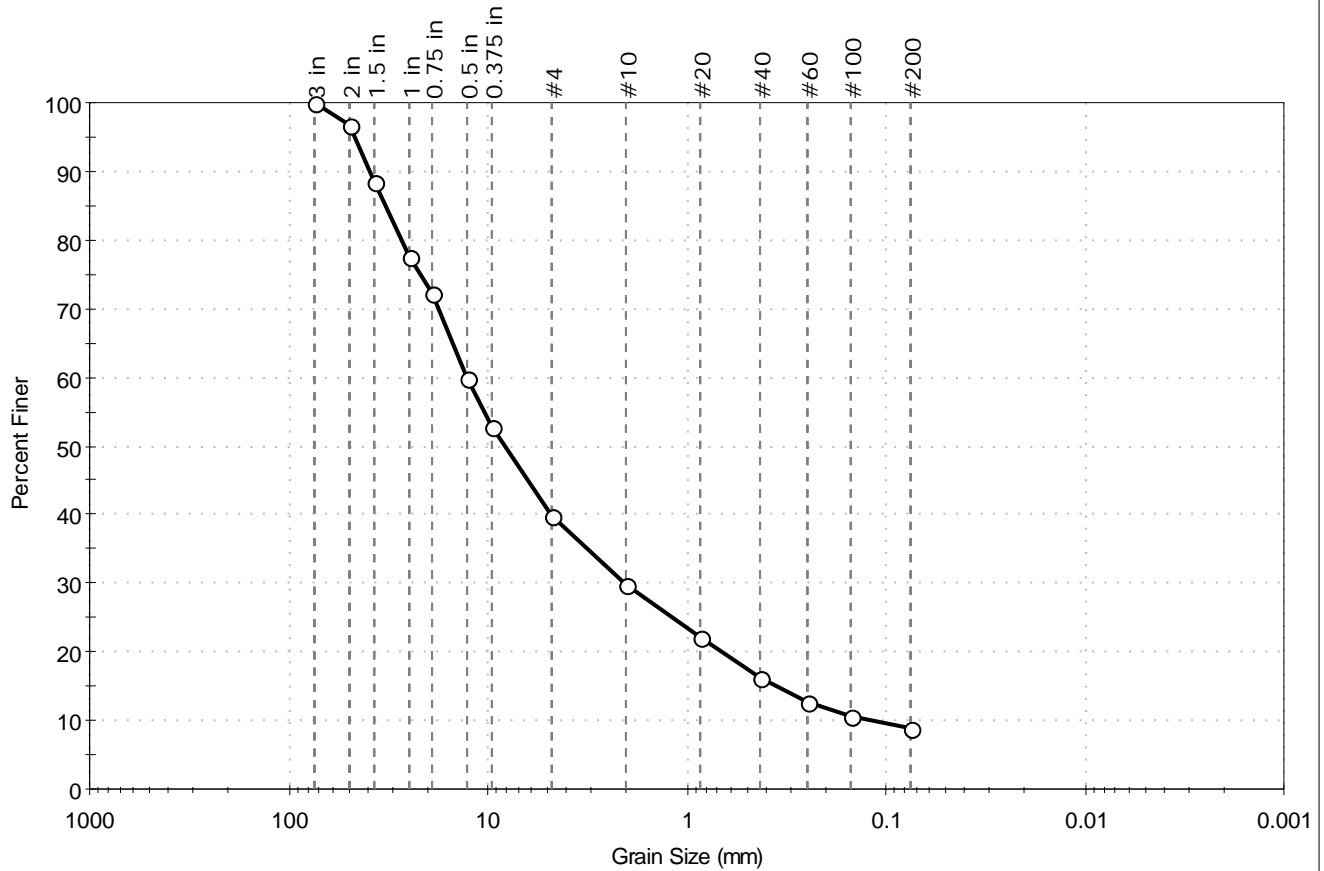
<u>Classification</u>	
ASTM	Well-graded gravel with silt and sand (GW-GM)
AASHTO	Stone Fragments, Gravel and Sand (A-1-a (1))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape : ANGULAR	
Sand/Gravel Hardness : HARD	



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-15 #2	Test Date:	11/10/16
Depth:	15-20 #2 ft	Test Id:	396765
Test Comment:	---		
Visual Description:	Moist, light brown gravel with silt and sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	60.2	30.9	8.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	97		
1.5 in	37.50	89		
1 in	25.00	78		
0.75 in	19.00	72		
0.5 in	12.70	60		
0.375 in	9.50	53		
#4	4.75	40		
#10	2.00	30		
#20	0.85	22		
#40	0.42	16		
#60	0.25	13		
#100	0.15	11		
#200	0.075	8.9		

<u>Coefficients</u>	
D ₈₅ = 32.8365 mm	D ₃₀ = 2.0531 mm
D ₆₀ = 12.7274 mm	D ₁₅ = 0.3559 mm
D ₅₀ = 8.1809 mm	D ₁₀ = 0.1143 mm
C _u = 111.351	C _c = 2.898

<u>Classification</u>	
<u>ASTM</u>	Well-graded gravel with silt and sand (GW-GM)
<u>AASHTO</u>	Stone Fragments, Gravel and Sand (A-1-a (1))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape : ANGULAR	
Sand/Gravel Hardness : HARD	



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-02	Test Date:	02/03/17
Depth :	0-10 ft	Checked By:	jdt
		Test Id:	403352
Test Comment:	---		
Visual Description:	Moist, light reddish brown silty sand with gravel		
Sample Comment:	---		

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

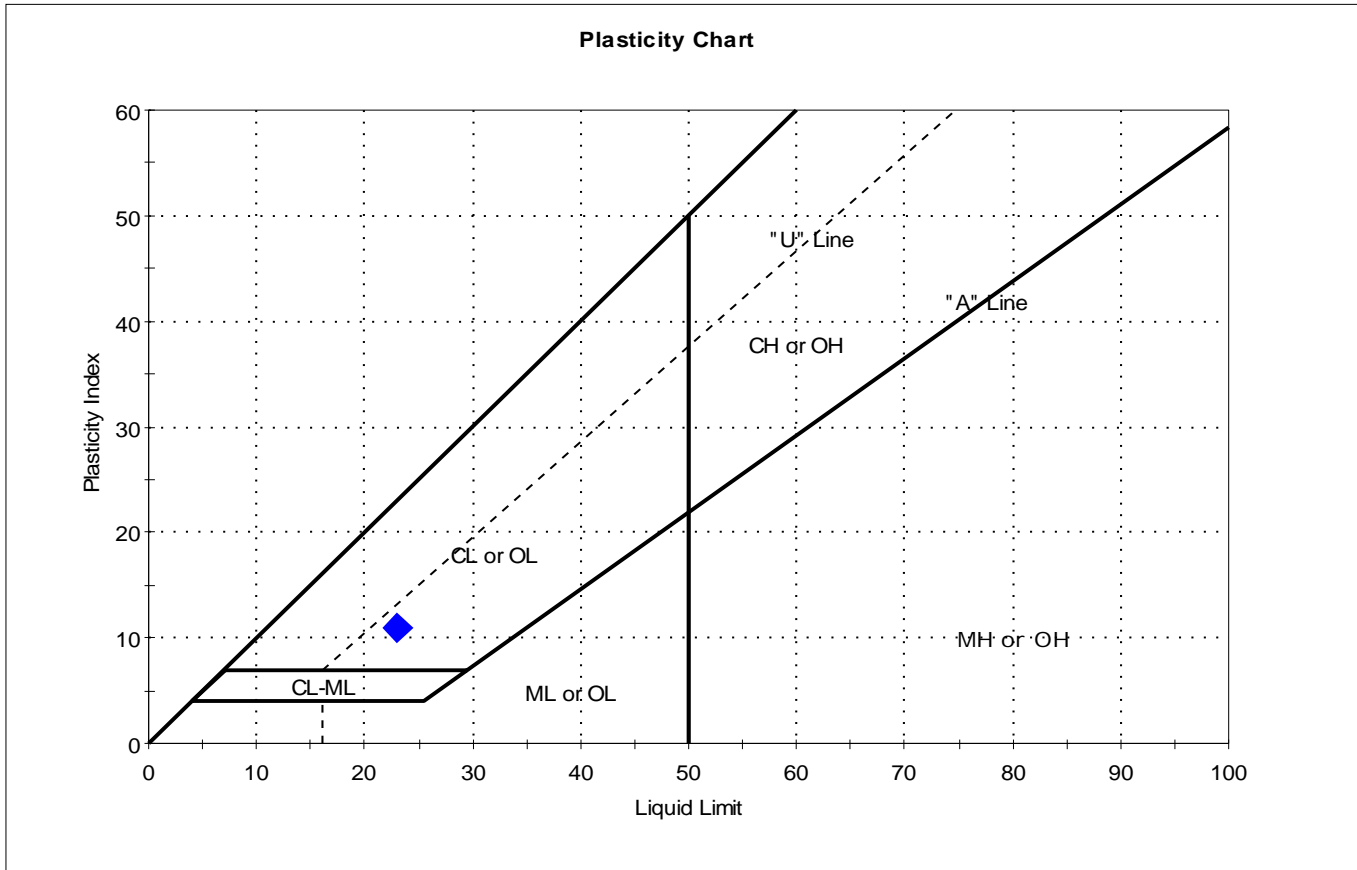
Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	400-SB-02	---	0-10 ft	4	n/a	n/a	n/a	n/a	Silty sand with gravel (SM)

61% Retained on #40 Sieve
 Dry Strength: HIGH
 Dilatancy: RAPID
 Toughness: n/a
 The sample was determined to be Non-Plastic



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-03	Test Date:	11/14/16
Depth:	35-40 ft	Test Id:	396767
Tested By:	cam		
Checked By:	jdt		
Test Comment:	---		
Visual Description:	Moist, pale brown clayey gravel with sand		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



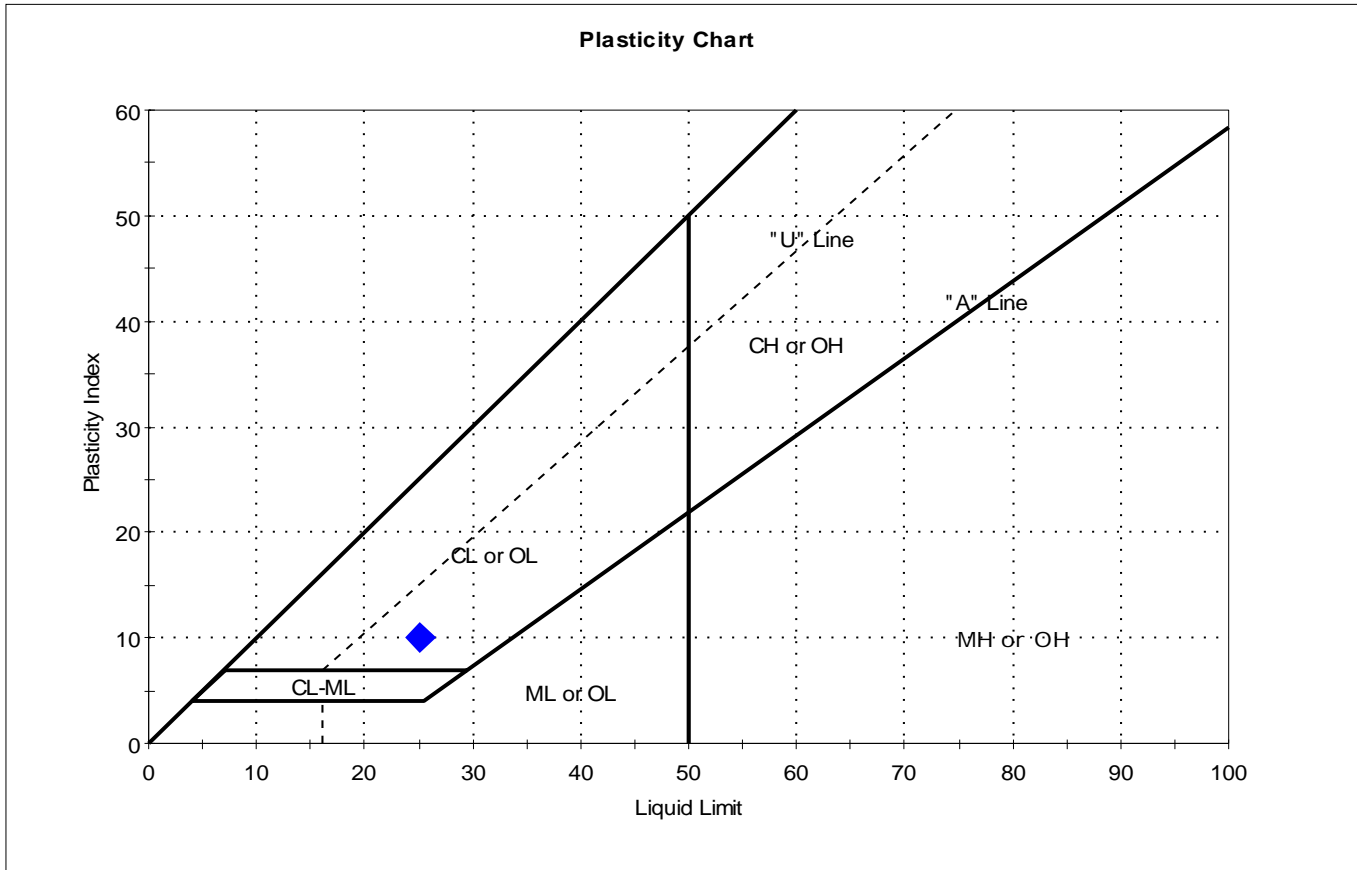
Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	400-SB-03	---	35-40 ft	2	23	12	11	-0.9	Clayey gravel with sand (GC)

Sample Prepared using the WET method
 75% Retained on #40 Sieve
 Dry Strength: VERY HIGH
 Dilatancy: SLOW
 Toughness: LOW



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-03	Test Date:	11/14/16
Depth:	30-35 ft	Test Id:	396769
Test Comment:	---		
Visual Description:	Moist, reddish brown gravel with clay and sand		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



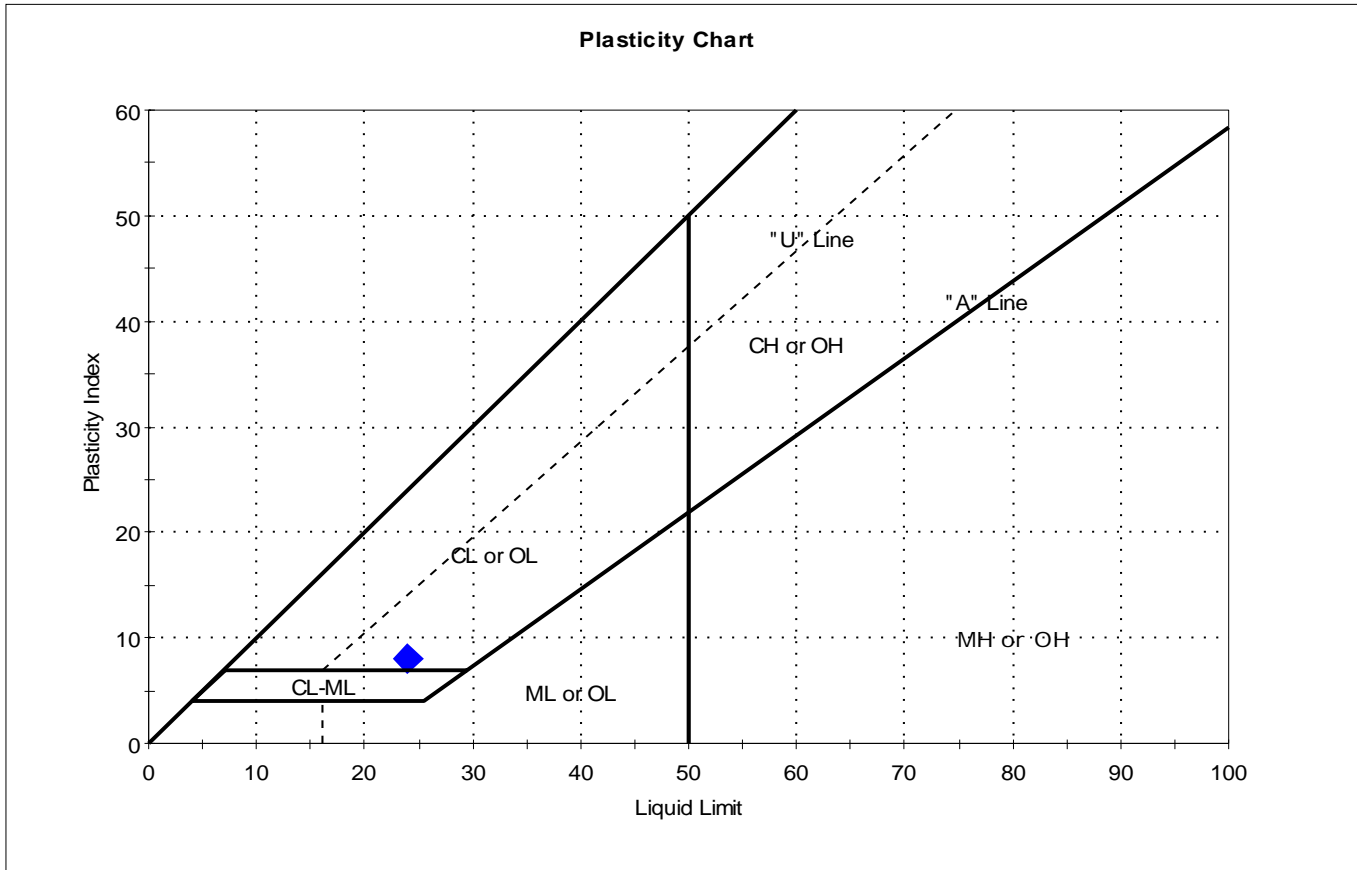
Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	400-SB-03	---	30-35 ft	1	25	15	10	-1.4	

Sample Prepared using the WET method
 78% Retained on #40 Sieve
 Dry Strength: VERY HIGH
 Dilatancy: SLOW
 Toughness: LOW



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-04	Test Date:	11/14/16
Depth:	90-93 ft	Test Id:	396771
Test Comment:	---		
Visual Description:	Moist, brown clayey gravel with sand		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



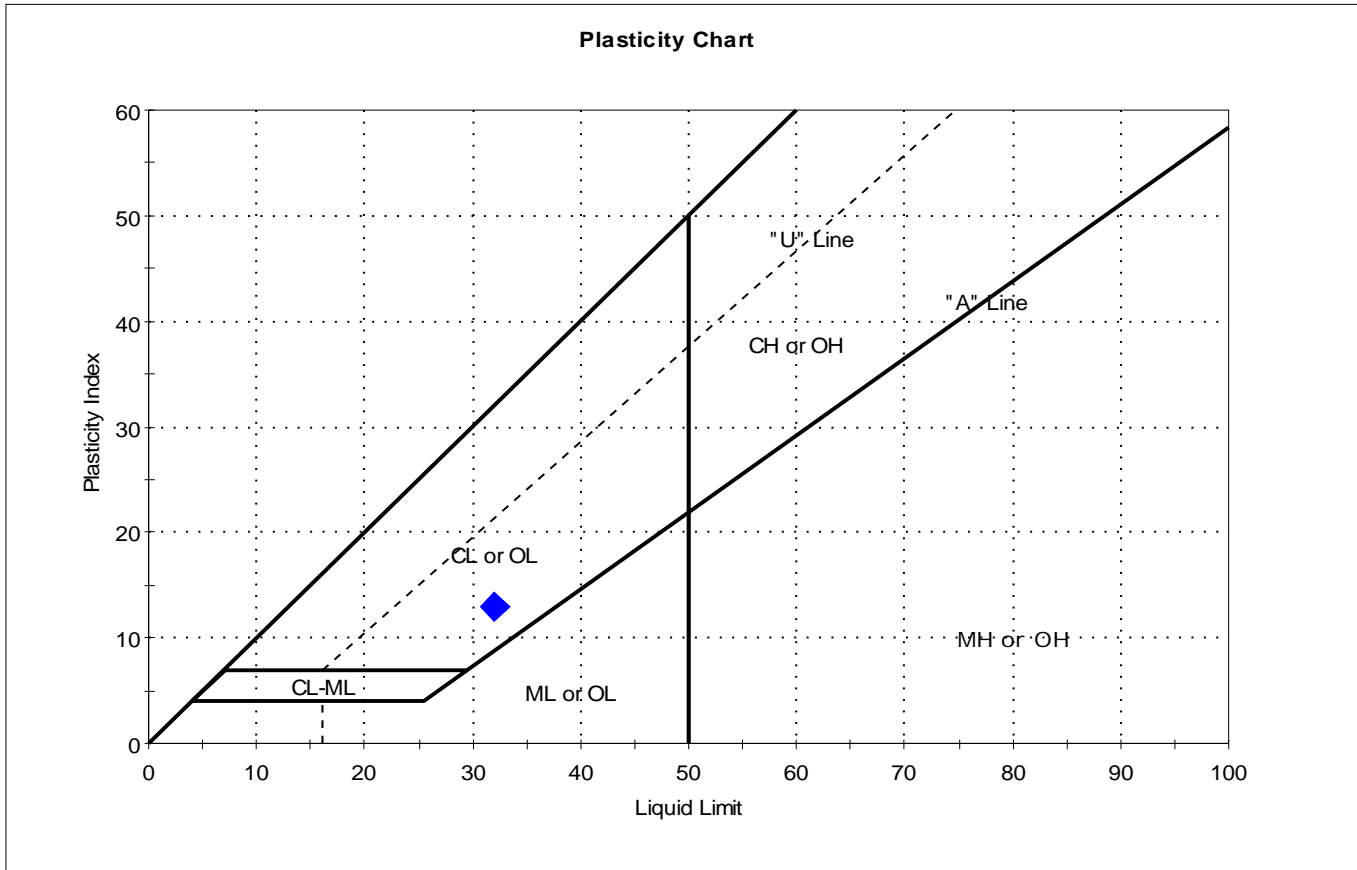
Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	400-SB-04	---	90-93 ft	3	24	16	8	-1.6	Clayey gravel with sand (GC)

Sample Prepared using the WET method
 76% Retained on #40 Sieve
 Dry Strength: VERY HIGH
 Dilatancy: SLOW
 Toughness: LOW



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-05	Test Date:	02/03/17
Depth:	0-10 ft	Test Id:	403361
Test Comment:	---		
Visual Description:	Moist, light reddish brown clayey sand with gravel		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



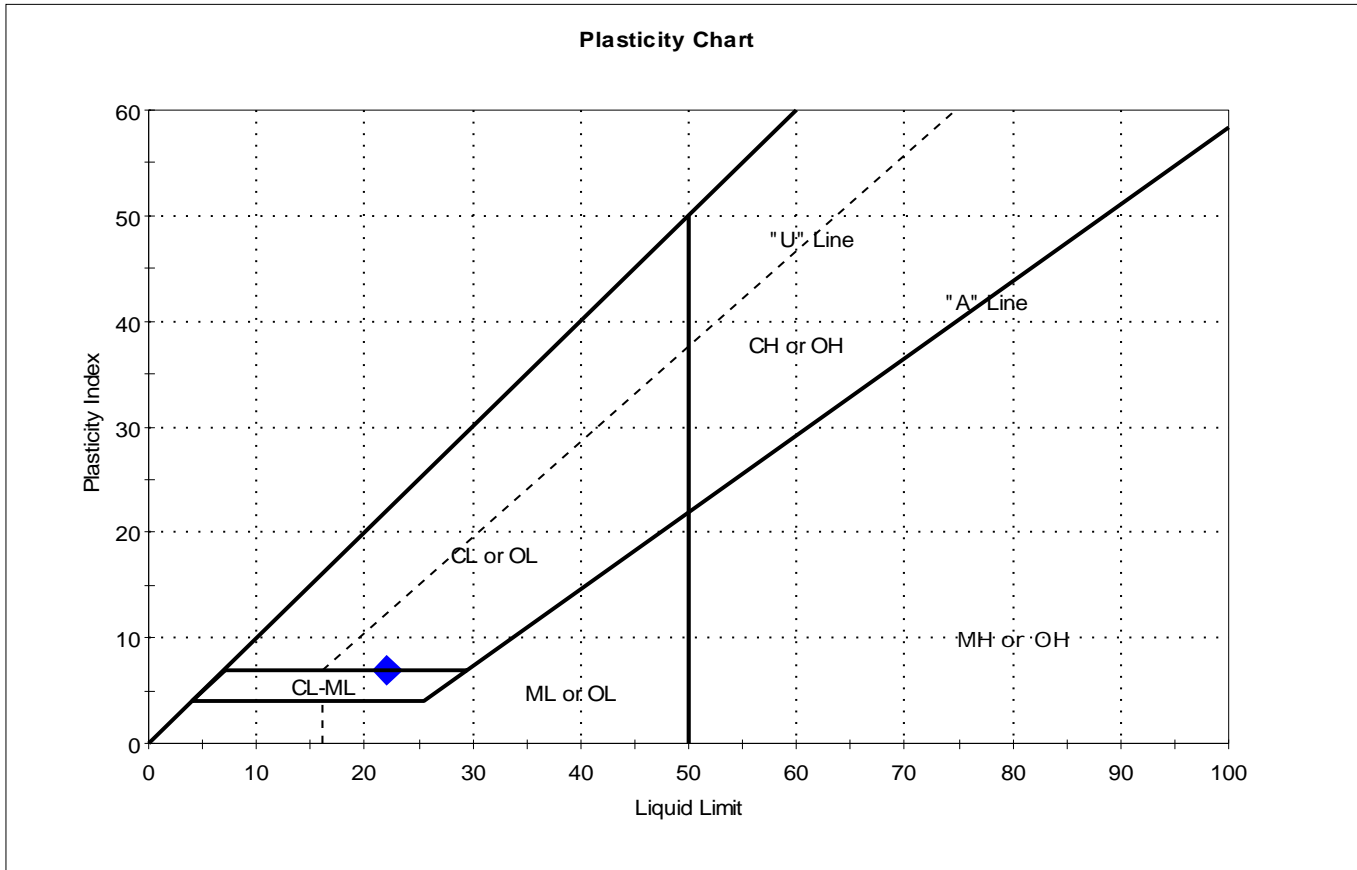
Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	400-SB-05	---	0-10 ft	8	32	19	13	-0.8	Clayey sand with gravel (SC)

Sample Prepared using the WET method
 59% Retained on #40 Sieve
 Dry Strength: VERY HIGH
 Dilatancy: SLOW
 Toughness: LOW



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-06	Test Date:	02/03/17
Depth:	20-24 ft	Test Id:	403370
Tested By:	cam		
Checked By:	jdt		
Test Comment:	---		
Visual Description:	Moist, light reddish brown gravel with silty clay and sand		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



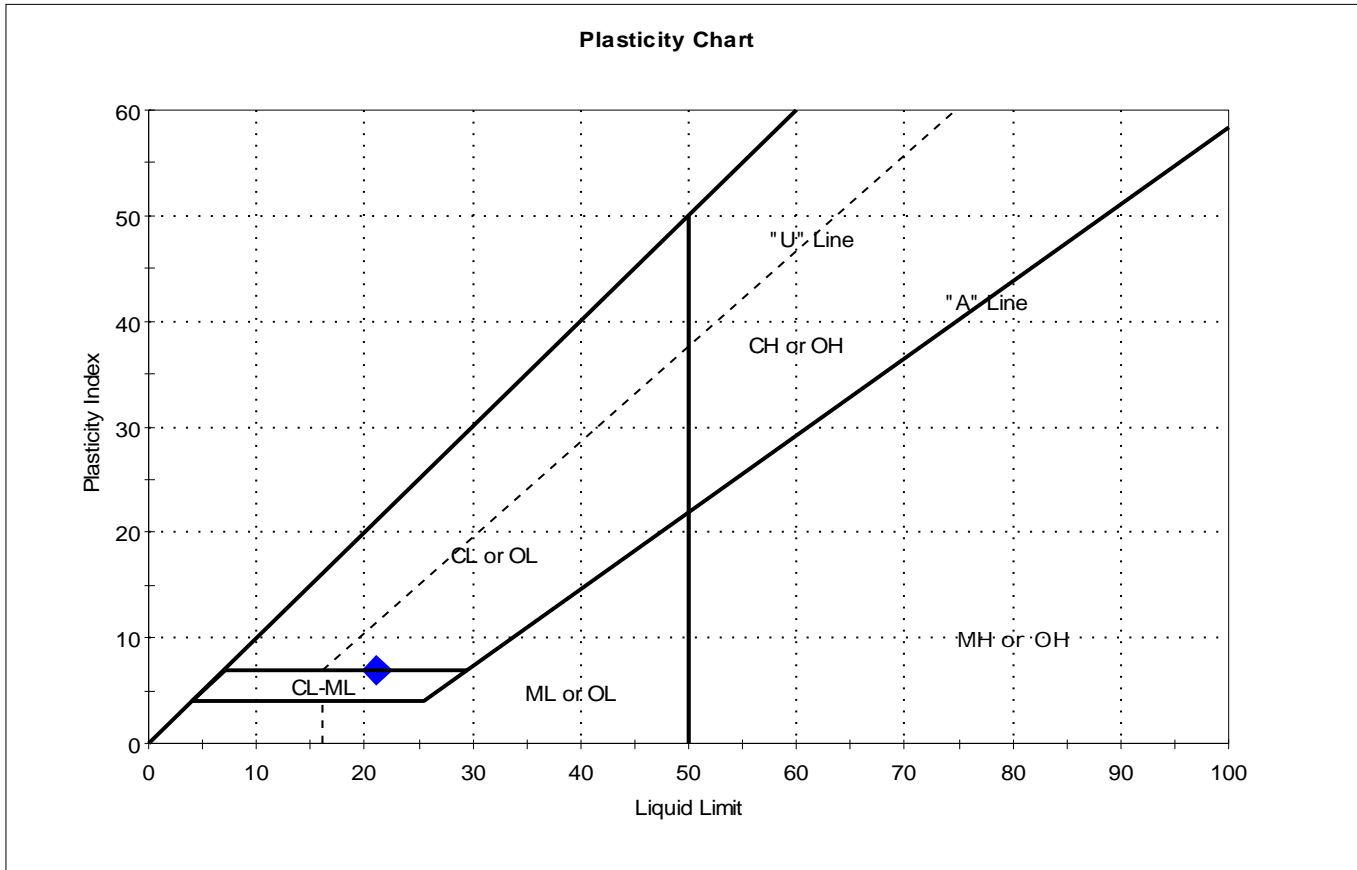
Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	400-SB-06	---	20-24 ft	2	22	15	7	-1.8	Well-graded gravel with Silty clay and sand (GW-GC)

Sample Prepared using the WET method
 80% Retained on #40 Sieve
 Dry Strength: VERY HIGH
 Dilatancy: SLOW
 Toughness: LOW



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-06	Test Date:	02/03/17
Depth:	25-30 ft	Test Id:	403379
Tested By:	cam		
Checked By:	jdt		
Test Comment:	---		
Visual Description:	Moist, light reddish brown gravel with silty clay and sand		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



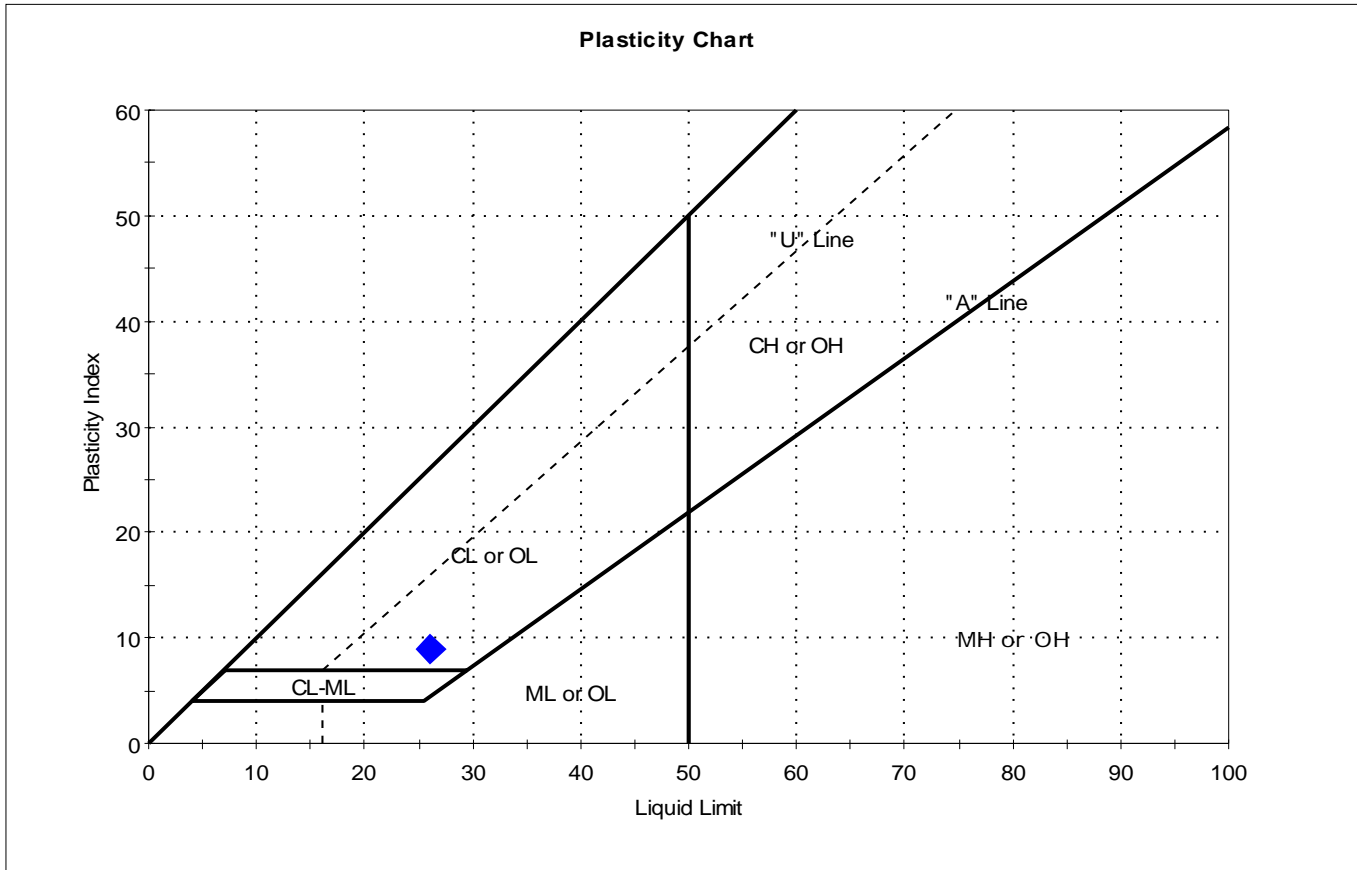
Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	400-SB-06	---	25-30 ft	2	21	14	7	-1.7	Well-graded gravel with Silty clay and sand (GW-GC)

Sample Prepared using the WET method
 82% Retained on #40 Sieve
 Dry Strength: VERY HIGH
 Dilatancy: SLOW
 Toughness: LOW



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-08	Test Date:	12/22/16
Depth:	5-10 ft	Test Id:	399910
Test Comment:	---		
Visual Description:	Moist, light brown clayey sand with gravel		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	400-SB-08	---	5-10 ft	9	26	17	9	-0.9	Clayey sand with gravel (SC)

Sample Prepared using the WET method
 47% Retained on #40 Sieve
 Dry Strength: VERY HIGH
 Dilatancy: SLOW
 Toughness: LOW



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-08	Test Date:	12/20/16
Depth :	10-15 ft	Test Id:	399919
Test Comment:	---		
Visual Description:	Moist, light brown gravel with silt and sand		
Sample Comment:	---		

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

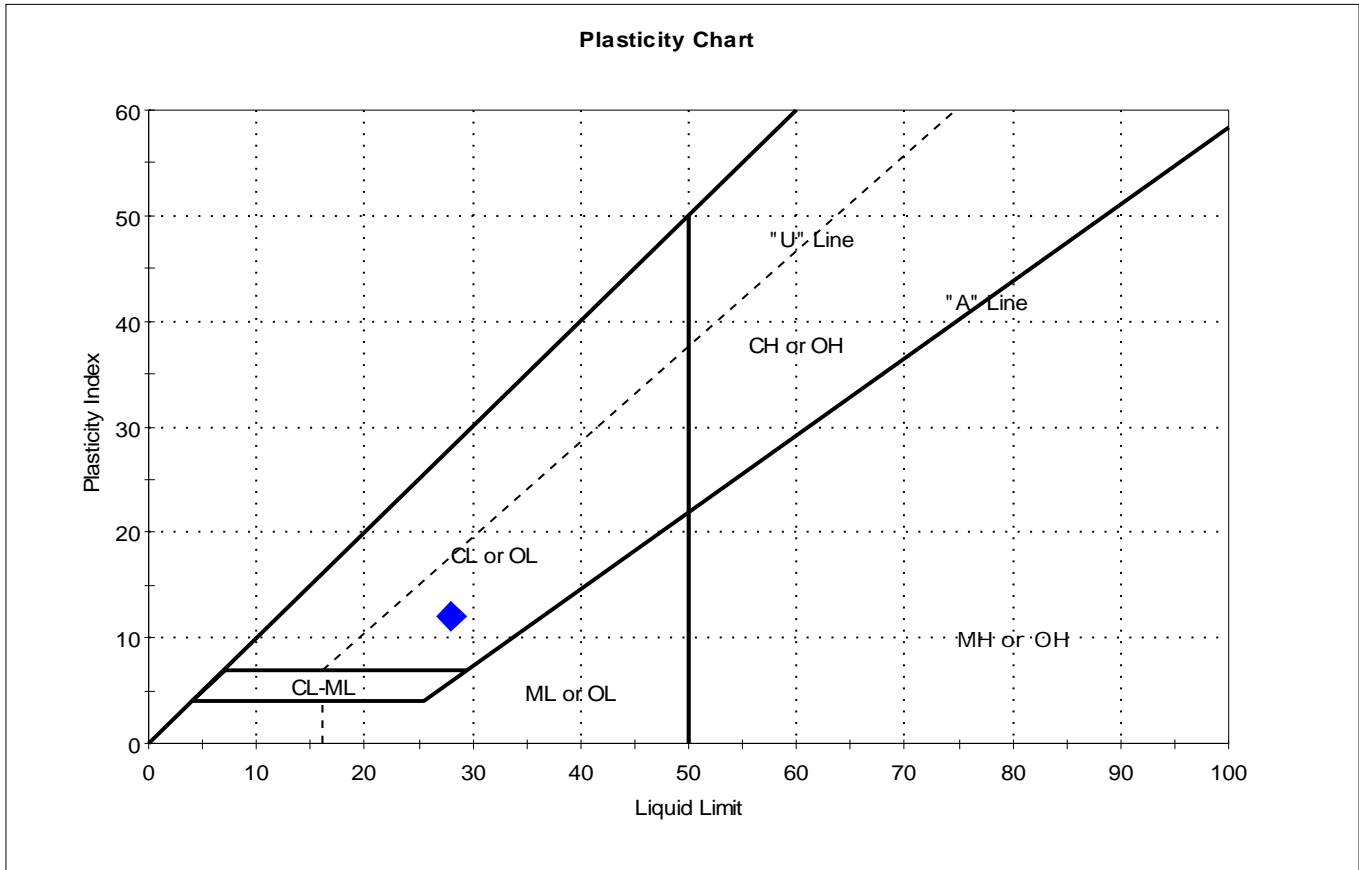
Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	400-SB-08	---	10-15 ft	3	n/a	n/a	n/a	n/a	Well-graded gravel with silt and sand (GW-GM)

85% Retained on #40 Sieve
 Dry Strength: HIGH
 Dilatancy: RAPID
 Toughness: n/a
 The sample was determined to be Non-Plastic



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-09	Test Date:	12/22/16
Depth:	12.5-15 ft	Test Id:	399928
Test Comment:	---		
Visual Description:	Moist, light brown gravel with clay and sand		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



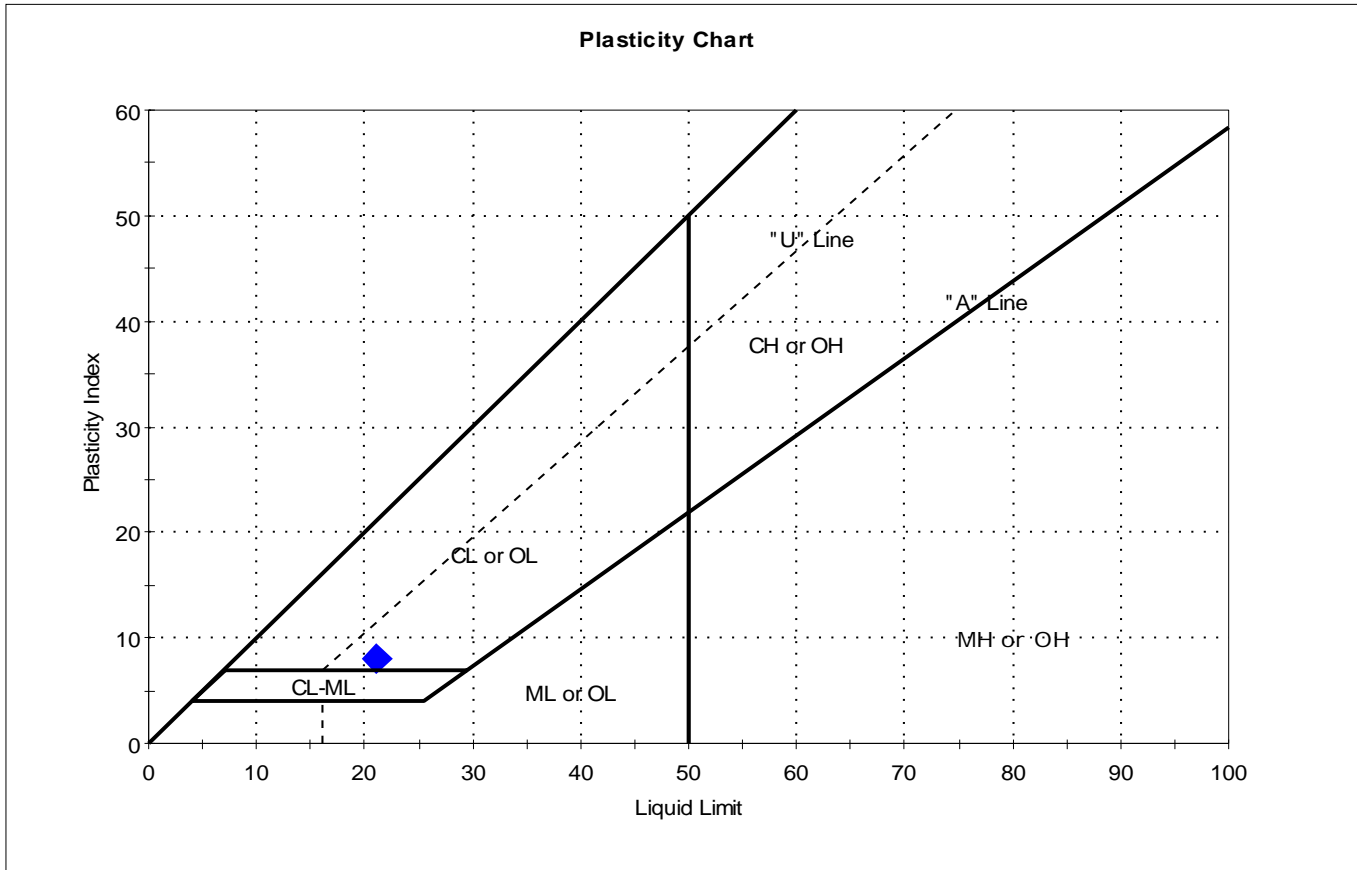
Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	400-SB-09	---	12.5-15 ft	1	28	16	12	-1.2	Well-graded gravel with clay and sand (GW-GC)

Sample Prepared using the WET method
 84% Retained on #40 Sieve
 Dry Strength: VERY HIGH
 Dilatancy: SLOW
 Toughness: LOW



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-09	Test Date:	12/21/16
Depth:	20-25 ft	Test Id:	399937
Tested By:	cam		
Checked By:	jdt		
Test Comment:	---		
Visual Description:	Moist, light brown gravel with clay and sand		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



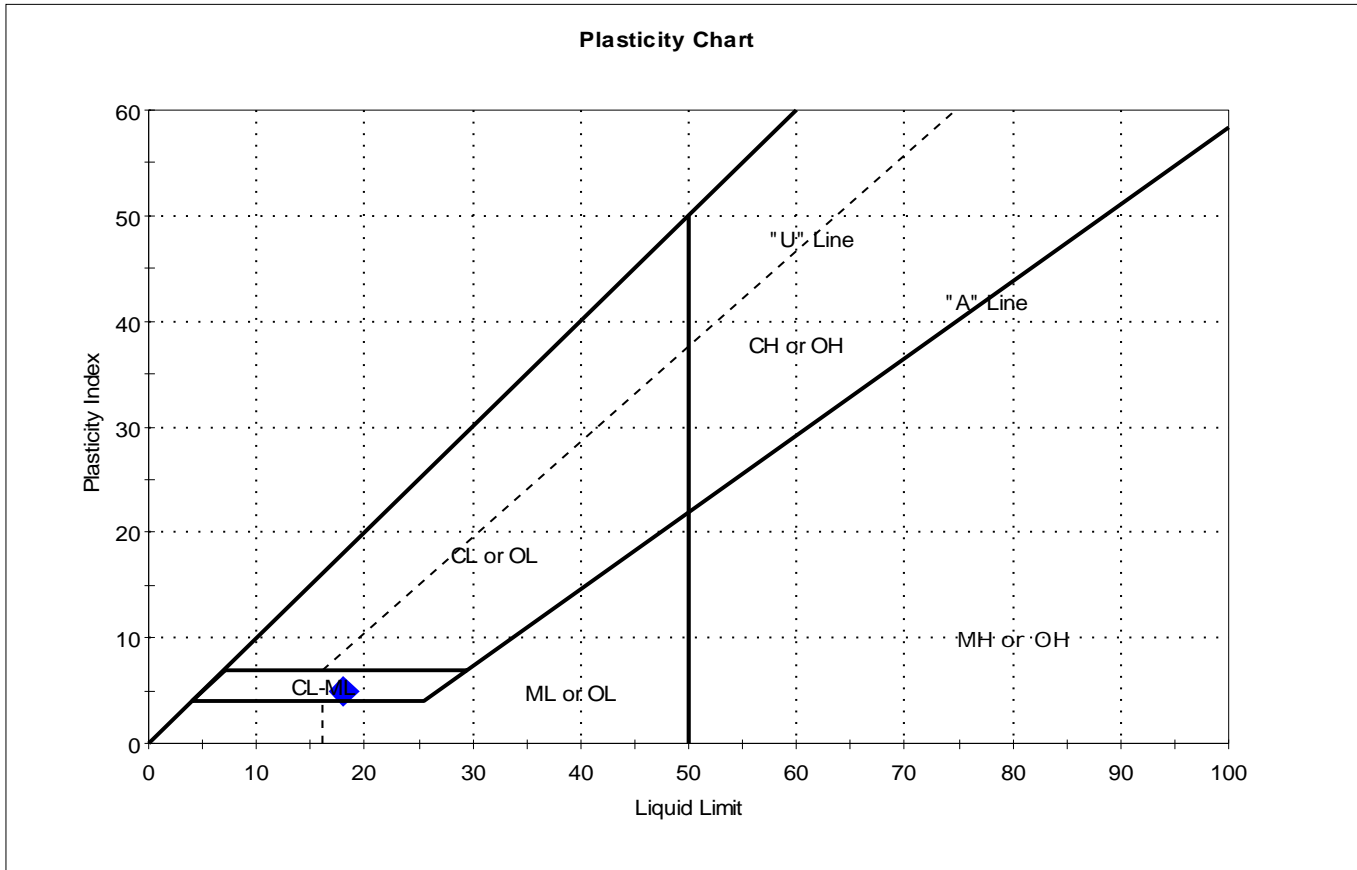
Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	400-SB-09	---	20-25 ft	1	21	13	8	-1.5	Well-graded gravel with clay and sand (GW-GC)

Sample Prepared using the WET method
 80% Retained on #40 Sieve
 Dry Strength: VERY HIGH
 Dilatancy: SLOW
 Toughness: LOW



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-10	Test Date:	11/14/16
Depth:	20-25 ft	Test Id:	396770
Test Comment:	---		
Visual Description:	Moist, reddish brown silty, clayey gravel with sand		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	400-SB-10	---	20-25 ft	1	18	13	5	-2.3	Silty, clayey gravel with sand (GC-GM)

Sample Prepared using the WET method
 76% Retained on #40 Sieve
 Dry Strength: VERY HIGH
 Dilatancy: SLOW
 Toughness: LOW



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-10	Test Date:	11/09/16
Depth :	15-20 ft	Test Id:	396768
Test Comment:	---		
Visual Description:	Moist, reddish brown silty gravel with sand		
Sample Comment:	---		

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	400-SB-10	---	15-20 ft	2	n/a	n/a	n/a	n/a	Silty gravel with sand (GM)

76% Retained on #40 Sieve
 Dry Strength: LOW
 Dilatancy: RAPID
 Toughness: n/a
 The sample was determined to be Non-Plastic



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-11	Test Date:	02/03/17
Depth :	15-20 ft	Test Id:	403388
Test Comment:	---		
Visual Description:	Moist, light reddish brown gravel with silt and sand		
Sample Comment:	---		

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

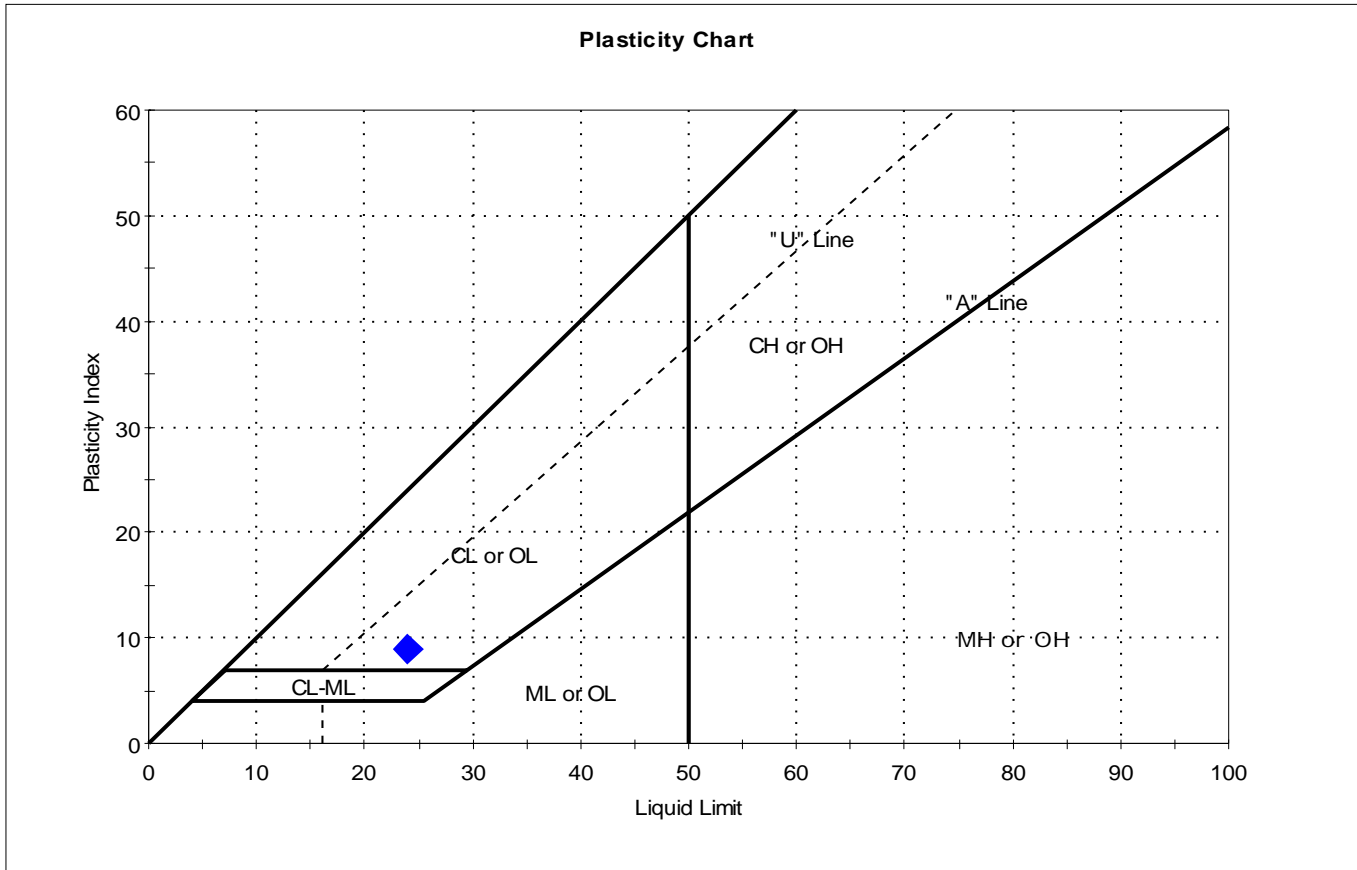
Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	400-SB-11	---	15-20 ft	1	n/a	n/a	n/a	n/a	Poorly graded gravel with silt and sand (GP-GM)

84% Retained on #40 Sieve
 Dry Strength: MEDIUM
 Dilatancy: RAPID
 Toughness: n/a
 The sample was determined to be Non-Plastic



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-11	Test Date:	02/03/17
Depth:	20-25 ft	Test Id:	403397
Tested By:	cam		
Checked By:	jdt		
Test Comment:	---		
Visual Description:	Moist, light reddish brown gravel with clay and sand		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	400-SB-11	---	20-25 ft	1	24	15	9	-1.5	Poorly graded gravel with clay and sand (GP-GC)

Sample Prepared using the WET method
 85% Retained on #40 Sieve
 Dry Strength: VERY HIGH
 Dilatancy: SLOW
 Toughness: LOW



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-12	Test Date:	11/10/16
Depth :	40-45 ft	Test Id:	396772
Test Comment:	---		
Visual Description:	Moist, reddish brown gravel with silt and sand		
Sample Comment:	---		

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	400-SB-12	---	40-45 ft	1	n/a	n/a	n/a	n/a	Poorly graded gravel with silt and sand (GP-GM)

83% Retained on #40 Sieve
 Dry Strength: LOW
 Dilatancy: RAPID
 Toughness: n/a
 The sample was determined to be Non-Plastic



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-12	Test Date:	11/11/16
Depth :	45-50 ft	Test Id:	396775
Test Comment:	---		
Visual Description:	Moist, light brown gravel with silt and sand		
Sample Comment:	---		

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

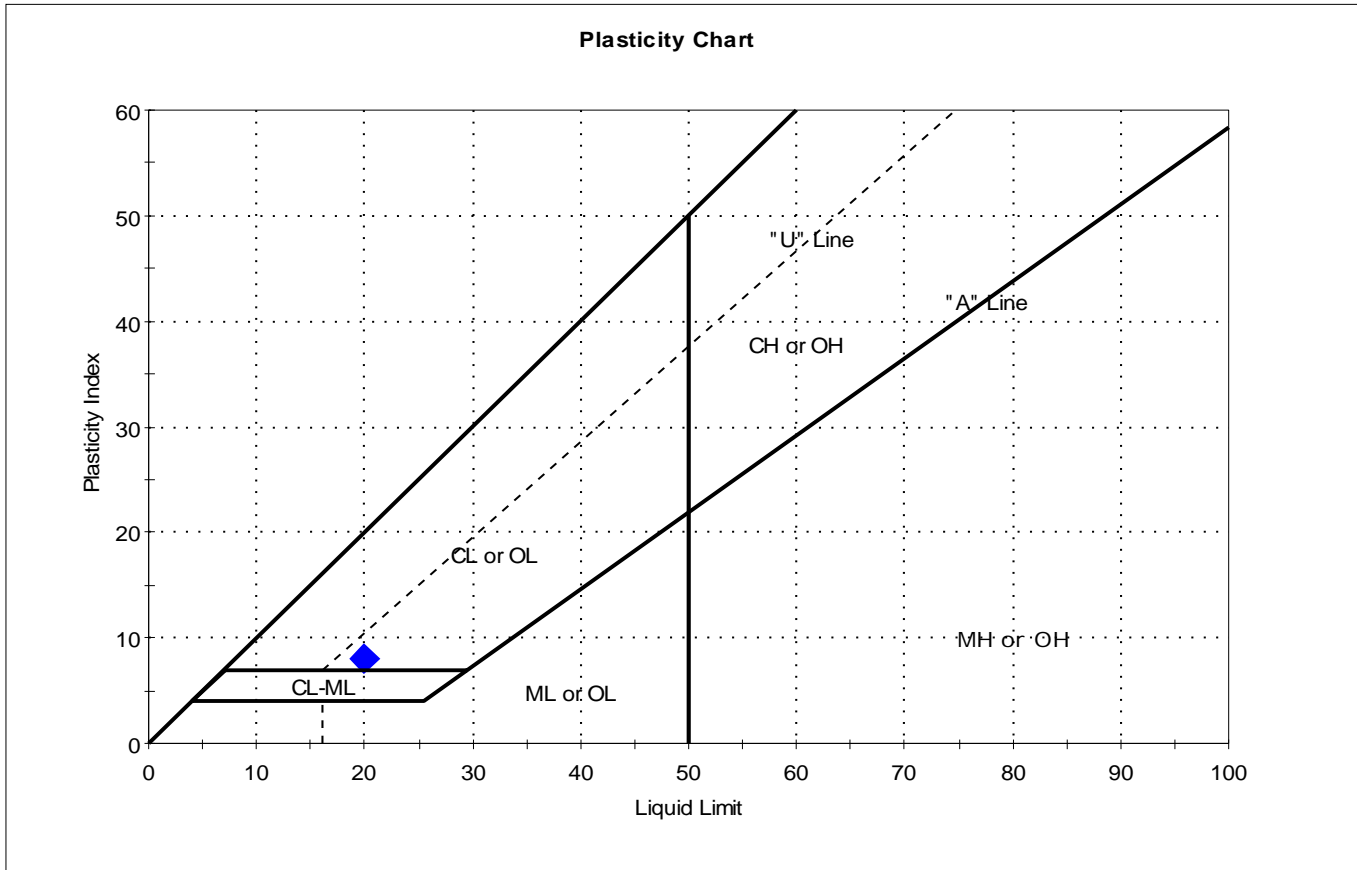
Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	400-SB-12	---	45-50 ft	2	n/a	n/a	n/a	n/a	Well-graded gravel with silt and sand (GW-GM)

83% Retained on #40 Sieve
 Dry Strength: MEDIUM
 Dilatancy: RAPID
 Toughness: n/a
 The sample was determined to be Non-Plastic



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-13	Test Date:	12/21/16
Depth:	60-65 ft	Test Id:	399946
Tested By:	cam		
Checked By:	jdt		
Test Comment:	---		
Visual Description:	Moist, light brown gravel with clay and sand		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	400-SB-13	---	60-65 ft	2	20	12	8	-1.2	Well-graded gravel with clay and sand (GW-GC)

Sample Prepared using the WET method
 79% Retained on #40 Sieve
 Dry Strength: VERY HIGH
 Dilatancy: SLOW
 Toughness: LOW



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-14	Test Date:	12/20/16
Depth :	65-70 ft	Test Id:	399955
Test Comment:	---		
Visual Description:	Moist, reddish brown gravel with silt and sand		
Sample Comment:	---		

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

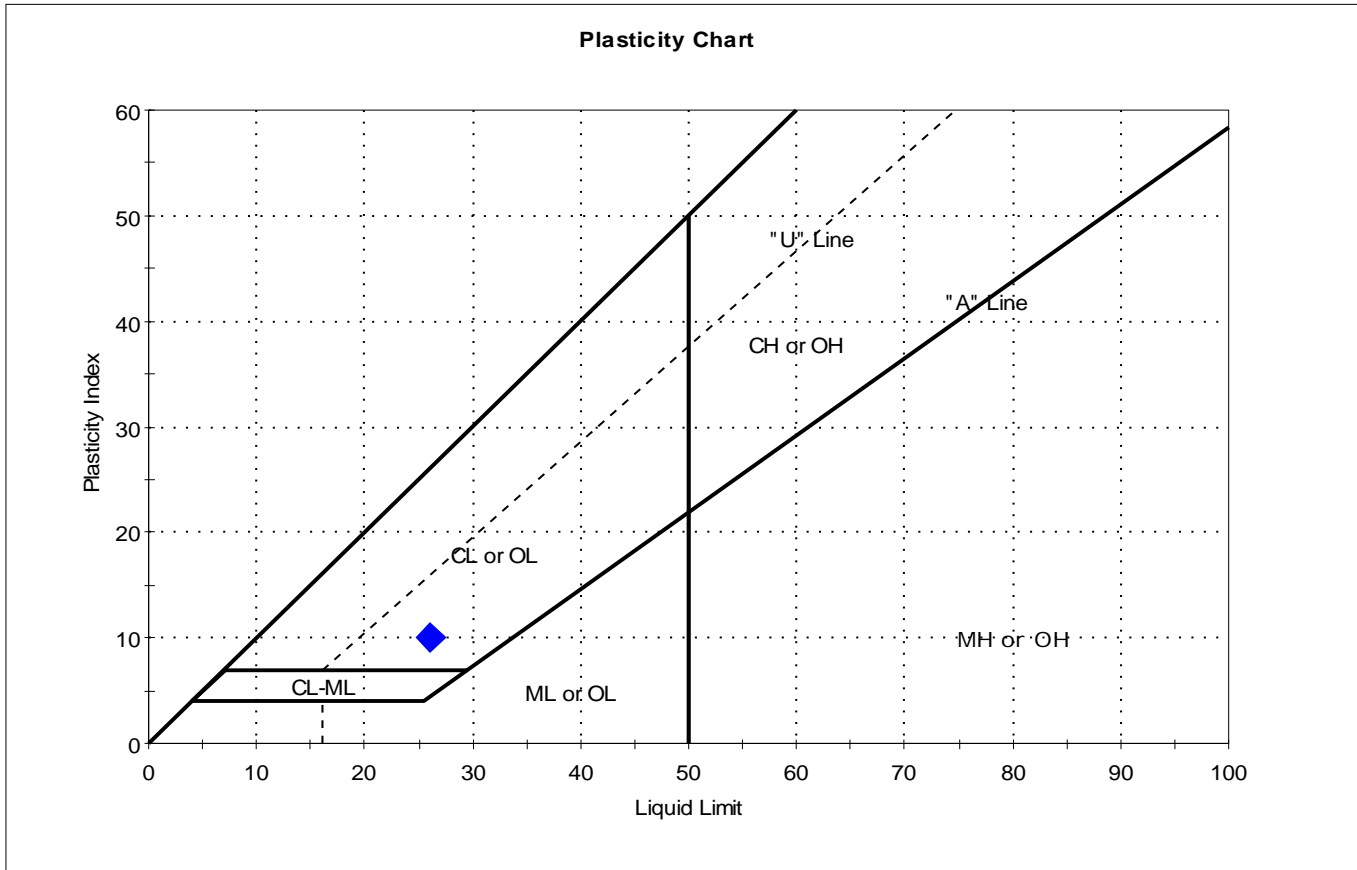
Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	400-SB-14	---	65-70 ft	7	n/a	n/a	n/a	n/a	Poorly graded gravel with silt and sand (GP-GM)

82% Retained on #40 Sieve
 Dry Strength: HIGH
 Dilatancy: RAPID
 Toughness: n/a
 The sample was determined to be Non-Plastic



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-14	Test Date:	12/22/16
Depth:	70-75 ft	Test Id:	399964
Tested By:	cam		
Checked By:	jdt		
Test Comment:	---		
Visual Description:	Moist, light brown clayey gravel with sand		
Sample Comment:	---		

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	400-SB-14	---	70-75 ft	4	26	16	10	-1.2	Clayey gravel with sand (GC)

Sample Prepared using the WET method
 77% Retained on #40 Sieve
 Dry Strength: VERY HIGH
 Dilatancy: SLOW
 Toughness: LOW



Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-15	Test Date:	11/10/16
Depth :	15-20 ft	Test Id:	396773
Test Comment:	---		
Visual Description:	Moist, light brown gravel with silt and sand		
Sample Comment:	---		

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	400-SB-15	---	15-20 ft	1	n/a	n/a	n/a	n/a	Well-graded gravel with silt and sand (GW-GM)

83% Retained on #40 Sieve
 Dry Strength: MEDIUM
 Dilatancy: RAPID
 Toughness: n/a
 The sample was determined to be Non-Plastic



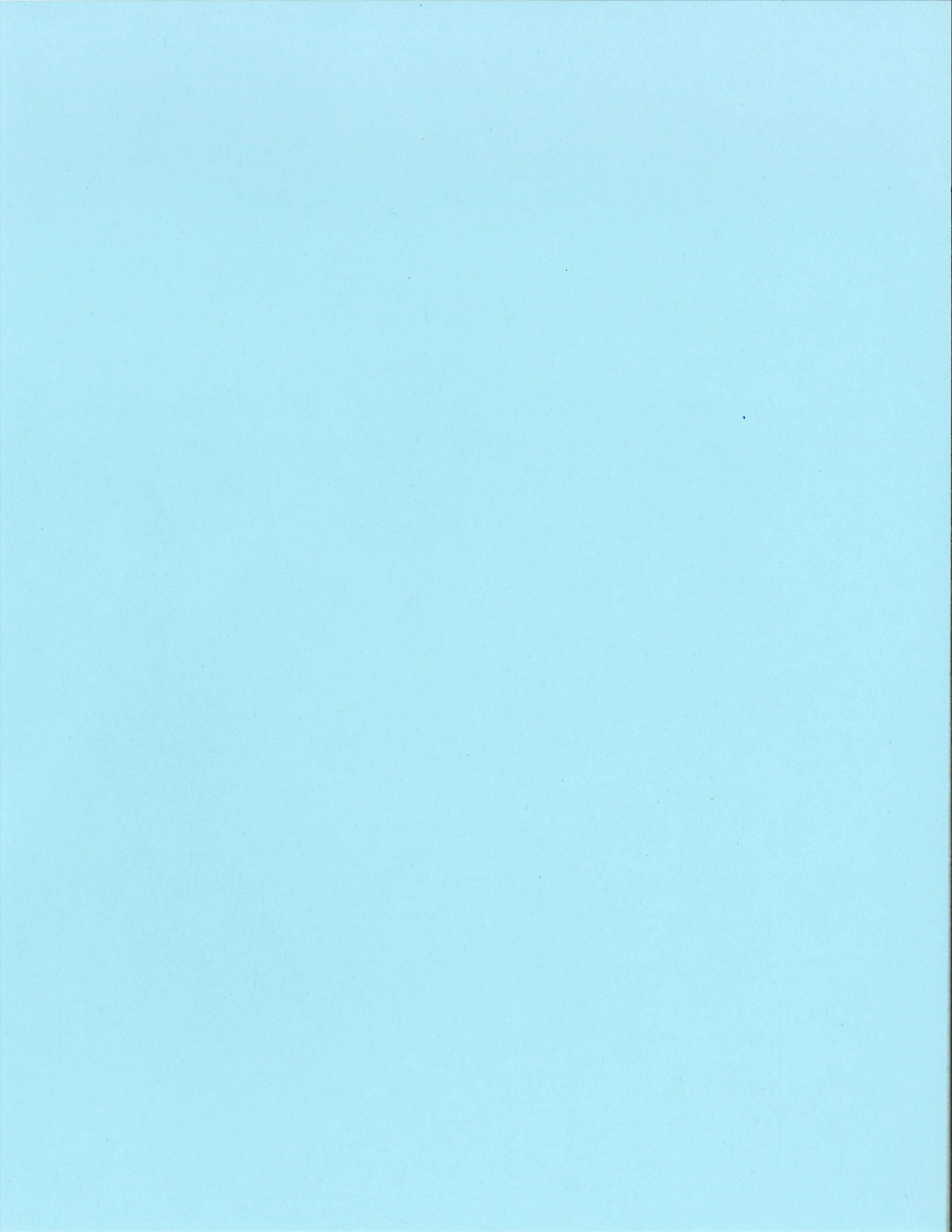
Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test F		
Location:	Las Cruces, NM	Project No:	GTX-305503
Boring ID:	---	Sample Type:	bag
Sample ID:	400-SB-15 #2	Test Date:	11/10/16
Depth :	15-20 #2 ft	Test Id:	396774
Test Comment:	---		
Visual Description:	Moist, light brown gravel with silt and sand		
Sample Comment:	---		

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	400-SB-15 #2	---	15-20 #2 ft	2	n/a	n/a	n/a	n/a	Well-graded gravel with silt and sand (GW-GM)

84% Retained on #40 Sieve
 Dry Strength: LOW
 Dilatancy: RAPID
 Toughness: n/a
 The sample was determined to be Non-Plastic





Client:	Navarro Research & Engineering, Inc.		
Project Name:	Soil Property Testing from NASA White Sands Test Facility		
Project Location:	Las Cruces, NM		
GTX #:	305503		
Start Date:	2/10/2017	Tested By:	jcw
End Date:	2/15/2017	Checked By:	emm
Boring #:	---		
Sample #:	400-SB-02		
Depth:	0-10 ft		
Visual Description:	Moist, light reddish brown silty sand with gravel		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084 Constant Gradient

Sample Type:	Remolded	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	4/5

Sample Preparation: Target Compaction: 113-122 pcf at the as-received moisture content (3.7%). Values specified by client. Material >3/8-inch screened out of sample prior to testing (25%). Trimmings moisture content = 3.6%

Measured Specific Gravity: 2.69

Parameter	Initial	Final
Height, in	3.00	3.00
Diameter, in	2.86	2.86
Area, in ²	6.42	6.42
Volume, in ³	19.3	19.3
Mass, g	597.0	673.0
Bulk Density, pcf	117.8	132.8
Moisture Content, %	4.1	17.4
Dry Density, pcf	113.1	113.1
Degree of Saturation, %	23	97

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	91.96	Increased Cell Pressure, psi:	96.95	Cell Pressure Increment, ps	4.99
Sample Pressure, psi:	86.95	Corresponding Sample Pressure, psi:	91.30	Sample Pressure Increment	4.35
				B Coefficient:	0.87

FLOW DATA
*B value did not increase with increase in pressure.
Final degree of saturation >95%.

Date	Time, sec	Pressure, psi			Gradient	Flow Volume, cc				Temp, °C	R _t	Permeability K @ 20 °C, cm/sec
		Cell	Inlet	Outlet		In	Out	Δ In	Δ Out			
2/14	---	92.0	87.2	86.8	3.7	12.60	13.30	---	---	---	---	---
2/14	40	92.0	87.2	86.8	3.7	12.90	13.00	0.30	0.30	19.7	1.008	4.9E-05
2/14	----	92.0	87.2	86.8	3.7	12.90	13.40	---	---	---	---	---
2/14	38	92.0	87.2	86.8	3.7	13.20	13.10	0.30	0.30	19.7	1.008	5.2E-05
2/14	----	92.0	87.2	86.8	3.7	13.10	13.50	---	---	---	---	---
2/14	37	92.0	87.2	86.8	3.7	13.40	13.20	0.30	0.30	19.7	1.008	5.3E-05
2/14	----	92.0	87.2	86.8	3.7	13.10	13.50	---	---	---	---	---
2/14	38	92.0	87.2	86.8	3.7	13.40	13.20	0.30	0.30	19.7	1.008	5.2E-05

PERMEABILITY AT 20° C: 5.2 x 10⁻⁵ cm/sec (@ 5 psi effective stress)



Client:	Navarro Research & Engineering, Inc.		
Project Name:	Soil Property Testing from NASA White Sands Test Facility		
Project Location:	Las Cruces, NM		
GTX #:	305503		
Start Date:	11/14/2016	Tested By:	jcw
End Date:	11/18/2016	Checked By:	emm
Boring #:	---		
Sample #:	400-SB-3		
Depth:	30-35 ft		
Visual Description:	Moist, reddish brown gravel with clay and sand		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084 Constant Gradient

Sample Type:	Remolded	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	6/9

Sample Preparation: Target Compaction: 113-122 pcf at the as-received moisture content (1.2%). Values specified by client. Material >3/8-inch screened out of sample prior to testing (50%). Trimmings moisture content = 1.2%

Measured Specific Gravity: 2.68

Parameter	Initial	Final
Height, in	3.15	3.15
Diameter, in	2.86	2.86
Area, in ²	6.42	6.42
Volume, in ³	20.2	20.2
Mass, g	614.4	706.3
Bulk Density, pcf	115.4	132.7
Moisture Content, %	1.5	16.6
Dry Density, pcf	113.8	113.8
Degree of Saturation, %	8	95

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	92.04	Increased Cell Pressure, psi:	97.17	Cell Pressure Increment, ps	5.13
Sample Pressure, psi:	86.97	Corresponding Sample Pressure, psi:	91.70	Sample Pressure Increment	4.73
				B Coefficient:	0.92

FLOW DATA
*B value did not increase with increase in pressure.
Final degree of saturation >95%.

Date	Time, sec	Pressure, psi			Gradient	Flow Volume, cc				Temp, °C	R _t	Permeability K @ 20 °C, cm/sec
		Cell	Inlet	Outlet		In	Out	Δ In	Δ Out			
11/17	---	92.0	87.2	86.8	3.5	13.50	13.90	---	---	---	---	---
11/17	32	92.0	87.2	86.8	3.5	13.90	13.50	0.40	0.40	20.4	0.991	8.5E-05
11/17	----	92.0	87.2	86.8	3.5	13.50	13.70	---	---	---	---	---
11/17	34	92.0	87.2	86.8	3.5	13.90	13.30	0.40	0.40	20.4	0.991	8.0E-05
11/17	----	92.0	87.2	86.8	3.5	13.50	13.70	---	---	---	---	---
11/17	32	92.0	87.2	86.8	3.5	13.90	13.30	0.40	0.40	20.4	0.991	8.5E-05
11/17	----	92.0	87.2	86.8	3.5	13.30	13.60	---	---	---	---	---
11/17	33	92.0	87.2	86.8	3.5	13.70	13.20	0.40	0.40	20.4	0.991	8.2E-05

PERMEABILITY AT 20° C: 8.3 x 10⁻⁵ cm/sec (@ 5 psi effective stress)



Client:	Navarro Research & Engineering, Inc.		
Project Name:	Soil Property Testing from NASA White Sands Test Facility		
Project Location:	Las Cruces, NM		
GTX #:	305503		
Start Date:	11/15/2016	Tested By:	jcw
End Date:	11/21/2016	Checked By:	emm
Boring #:	---		
Sample #:	400-SB-3		
Depth:	35-40 ft		
Visual Description:	Moist, pale brown clayey gravel with sand		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084 Constant Gradient

Sample Type:	Remolded	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	3/23

Sample Preparation: Target Compaction: 113-122 pcf at the as-received moisture content (1.7%). Values specified by client. Material >3/8-inch screened out of sample prior to testing (50%). Trimmings moisture content = 1.5%

Measured Specific Gravity: 2.64

Parameter	Initial	Final
Height, in	3.06	3.06
Diameter, in	2.86	2.86
Area, in ²	6.42	6.42
Volume, in ³	19.7	19.7
Mass, g	617.4	695.8
Bulk Density, pcf	119.4	134.5
Moisture Content, %	1.9	14.8
Dry Density, pcf	117.2	117.2
Degree of Saturation, %	12	96

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	89.98	Increased Cell Pressure, psi:	95.44	Cell Pressure Increment, ps	5.46
Sample Pressure, psi:	84.96	Corresponding Sample Pressure, psi:	90.12	Sample Pressure Increment	5.16
				B Coefficient:	0.95

FLOW DATA

Date	Time, sec	Pressure, psi			Gradient	Flow Volume, cc				Temp, °C	R _t	Permeability K @ 20 °C, cm/sec
		Cell	Inlet	Outlet		In	Out	Δ In	Δ Out			
11/18	---	90.0	85.5	84.5	9.0	13.20	14.30	---	---	---	---	---
11/18	122	90.0	85.5	84.5	9.0	13.50	14.00	0.30	0.30	19.9	1.003	6.6E-06
11/18	----	90.0	85.5	84.5	9.0	13.50	13.90	---	---	---	---	---
11/18	87	90.0	85.5	84.5	9.0	13.70	13.70	0.20	0.20	19.9	1.003	6.1E-06
11/18	----	90.0	85.5	84.5	9.0	13.70	14.20	---	---	---	---	---
11/18	90	90.0	85.5	84.5	9.0	13.90	14.00	0.20	0.20	19.9	1.003	5.9E-06
11/18	----	90.0	85.5	84.5	9.0	13.60	14.00	---	---	---	---	---
11/18	85	90.0	85.5	84.5	9.0	13.80	13.80	0.20	0.20	19.9	1.003	6.3E-06

PERMEABILITY AT 20° C: 6.2 x 10⁻⁶ cm/sec (@ 5 psi effective stress)



Client:	Navarro Research & Engineering, Inc.		
Project Name:	Soil Property Testing from NASA White Sands Test Facility		
Project Location:	Las Cruces, NM		
GTX #:	305503		
Start Date:	11/14/2016	Tested By:	jcw
End Date:	11/21/2016	Checked By:	emm
Boring #:	---		
Sample #:	400-SB-04		
Depth:	90-93 ft		
Visual Description:	Moist, brown clayey gravel with sand		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084 Constant Gradient

Sample Type:	Remolded	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	15/13

Sample Preparation: Target Compaction: 113-122 pcf at the as-received moisture content (3.5%). Values specified by client. Material >3/8-inch screened out of sample prior to testing (27%). Trimmings moisture content = 3.9%

Measured Specific Gravity: 2.67

Parameter	Initial	Final
Height, in	3.30	3.20
Diameter, in	2.86	2.84
Area, in ²	6.42	6.33
Volume, in ³	21.2	20.3
Mass, g	628.2	704.0
Bulk Density, pcf	112.6	132.0
Moisture Content, %	4.9	17.5
Dry Density, pcf	107.4	112.3
Degree of Saturation, %	24	97

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	89.96	Increased Cell Pressure, psi:	94.23	Cell Pressure Increment, ps	4.27
Sample Pressure, psi:	84.95	Corresponding Sample Pressure, psi:	89.00	Sample Pressure Increment	4.05
				B Coefficient:	0.95

FLOW DATA

Date	Time, sec	Pressure, psi			Gradient	Flow Volume, cc				Temp, °C	R _t	Permeability K @ 20 °C, cm/sec
		Cell	Inlet	Outlet		In	Out	Δ In	Δ Out			
11/18	---	90.0	85.1	84.9	1.7	13.50	14.60	---	---	---	---	---
11/18	33	90.0	85.1	84.9	1.7	14.40	13.70	0.90	0.90	19.9	1.003	3.9E-04
11/18	----	90.0	85.1	84.9	1.7	13.00	13.90	---	---	---	---	---
11/18	31	90.0	85.1	84.9	1.7	13.90	13.00	0.90	0.90	19.9	1.003	4.1E-04
11/18	----	90.0	85.1	84.9	1.7	13.30	14.30	---	---	---	---	---
11/18	32	90.0	85.1	84.9	1.7	14.20	13.40	0.90	0.90	19.9	1.003	4.0E-04
11/18	----	90.0	85.1	84.9	1.7	13.30	13.60	---	---	---	---	---
11/18	32	90.0	85.1	84.9	1.7	14.20	12.70	0.90	0.90	19.9	1.003	4.0E-04

PERMEABILITY AT 20° C: 4.0 x 10⁻⁴ cm/sec (@ 5 psi effective stress)



Client:	Navarro Research & Engineering, Inc.		
Project Name:	Soil Property Testing from NASA White Sands Test Facility		
Project Location:	Las Cruces, NM		
GTX #:	305503		
Start Date:	2/13/2017	Tested By:	jcw
End Date:	2/15/2017	Checked By:	emm
Boring #:	---		
Sample #:	400-SB-05		
Depth:	0-10 ft		
Visual Description:	Moist, light reddish brown clayey sand with gravel		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084 Constant Gradient

Sample Type:	Remolded	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	6/7

Sample Preparation: Target Compaction: 113-122 pcf at the as-received moisture content (8.0%). Values specified by client. Material >3/8-inch screened out of sample prior to testing (21%). Trimmings moisture content = 7.8%

Measured Specific Gravity: 2.70

Parameter	Initial	Final
Height, in	3.02	3.00
Diameter, in	2.86	2.90
Area, in ²	6.42	6.61
Volume, in ³	19.4	19.8
Mass, g	619.5	681.2
Bulk Density, pcf	121.4	130.7
Moisture Content, %	8.0	18.8
Dry Density, pcf	112.4	110.0
Degree of Saturation, %	43	95

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	92.02	Increased Cell Pressure, psi:	97.19	Cell Pressure Increment, ps	5.17
Sample Pressure, psi:	87.00	Corresponding Sample Pressure, psi:	90.74	Sample Pressure Increment	3.74
				B Coefficient:	0.72

FLOW DATA
*B value did not increase with increase in pressure.
Final degree of saturation >95%.

Date	Time, sec	Pressure, psi			Gradient	Flow Volume, cc				Temp, °C	R _t	Permeability K @ 20 °C, cm/sec
		Cell	Inlet	Outlet		In	Out	Δ In	Δ Out			
2/14	---	92.0	87.2	86.8	3.7	13.20	14.00	---	---	---	---	---
2/14	52	92.0	87.2	86.8	3.7	13.70	13.50	0.50	0.50	19.7	1.008	6.2E-05
2/14	----	92.0	87.2	86.8	3.7	13.20	14.10	---	---	---	---	---
2/14	33	92.0	87.2	86.8	3.7	13.50	13.80	0.30	0.30	19.7	1.008	5.8E-05
2/14	----	92.0	87.2	86.8	3.7	13.50	14.00	---	---	---	---	---
2/14	32	92.0	87.2	86.8	3.7	13.80	13.70	0.30	0.30	19.7	1.008	6.0E-05
2/14	----	92.0	87.2	86.8	3.7	13.70	14.10	---	---	---	---	---
2/14	33	92.0	87.2	86.8	3.7	14.00	13.80	0.30	0.30	19.7	1.008	5.8E-05

PERMEABILITY AT 20° C: 6.0 x 10⁻⁵ cm/sec (@ 5 psi effective stress)



Client:	Navarro Research & Engineering, Inc.		
Project Name:	Soil Property Testing from NASA White Sands Test Facility		
Project Location:	Las Cruces, NM		
GTX #:	305503		
Start Date:	2/13/2017	Tested By:	jcw
End Date:	2/15/2017	Checked By:	emm
Boring #:	---		
Sample #:	400-SB-06		
Depth:	20-24 ft		
Visual Description:	Moist, light reddish brown gravel with silty clay and sand		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084 Constant Gradient

Sample Type:	Remolded	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	1/5

Sample Preparation: Target Compaction: 113-122 pcf at the as-received moisture content (2.2%). Values specified by client. Material >3/8-inch screened out of sample prior to testing (46%). Trimmings moisture content = 2.3%

Measured Specific Gravity: 2.70

Parameter	Initial	Final
Height, in	3.00	2.73
Diameter, in	2.86	2.88
Area, in ²	6.42	6.51
Volume, in ³	19.3	17.8
Mass, g	588.0	650.6
Bulk Density, pcf	116.0	139.1
Moisture Content, %	2.1	13.0
Dry Density, pcf	113.6	123.1
Degree of Saturation, %	12	95

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	91.95	Increased Cell Pressure, psi:	96.93	Cell Pressure Increment, ps	4.98
Sample Pressure, psi:	86.99	Corresponding Sample Pressure, psi:	91.53	Sample Pressure Increment	4.54
				B Coefficient:	0.91

FLOW DATA
*B value did not increase with increase in pressure.
Final degree of saturation >95%.

Date	Time, sec	Pressure, psi			Gradient	Flow Volume, cc				Temp, °C	R _t	Permeability K @ 20 °C, cm/sec
		Cell	Inlet	Outlet		In	Out	Δ In	Δ Out			
2/14	---	92.0	87.1	86.9	2.0	12.60	13.00	---	---	---	---	---
2/14	31	92.0	87.1	86.9	2.0	13.00	12.60	0.40	0.40	19.7	1.008	1.5E-04
2/14	----	92.0	87.1	86.9	2.0	12.60	12.90	---	---	---	---	---
2/14	35	92.0	87.1	86.9	2.0	13.10	12.40	0.50	0.50	19.7	1.008	1.7E-04
2/14	----	92.0	87.1	86.9	2.0	12.50	13.30	---	---	---	---	---
2/14	32	92.0	87.1	86.9	2.0	12.90	12.90	0.40	0.40	19.7	1.008	1.5E-04
2/14	----	92.0	87.1	86.9	2.0	12.60	13.00	---	---	---	---	---
2/14	30	92.0	87.1	86.9	2.0	13.00	12.60	0.40	0.40	19.7	1.008	1.6E-04

PERMEABILITY AT 20° C: 1.6 x 10⁻⁴ cm/sec (@ 5 psi effective stress)



Client:	Navarro Research & Engineering, Inc.		
Project Name:	Soil Property Testing from NASA White Sands Test Facility		
Project Location:	Las Cruces, NM		
GTX #:	305503		
Start Date:	2/13/2017	Tested By:	jcw
End Date:	2/15/2017	Checked By:	emm
Boring #:	---		
Sample #:	400-SB-06		
Depth:	25-30 ft		
Visual Description:	Moist, light reddish brown gravel with silty clay and sand		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084 Constant Gradient

Sample Type:	Remolded	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	15/13

Sample Preparation: Target Compaction: 113-122 pcf at the as-received moisture content (2.2%). Values specified by client. Material >3/8-inch screened out of sample prior to testing (51%). Trimmings moisture content = 2.1%

Measured Specific Gravity: 2.70

Parameter	Initial	Final
Height, in	3.00	2.71
Diameter, in	2.86	2.90
Area, in ²	6.42	6.61
Volume, in ³	19.3	17.9
Mass, g	591.0	655.2
Bulk Density, pcf	116.6	139.2
Moisture Content, %	2.2	13.3
Dry Density, pcf	114.1	122.8
Degree of Saturation, %	12	96

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	92.02	Increased Cell Pressure, psi:	97.96	Cell Pressure Increment, ps	5.94
Sample Pressure, psi:	86.95	Corresponding Sample Pressure, psi:	92.39	Sample Pressure Increment	5.44
				B Coefficient:	0.92

FLOW DATA

*B value did not increase with increase in pressure.
Final degree of saturation >95%.

Date	Time, sec	Pressure, psi			Gradient	Flow Volume, cc				Temp, °C	R _t	Permeability K @ 20 °C, cm/sec
		Cell	Inlet	Outlet		In	Out	Δ In	Δ Out			
2/14	---	92.0	87.2	86.8	4.1	12.90	13.80	---	---	---	---	---
2/14	43	92.0	87.2	86.8	4.1	13.20	13.50	0.30	0.30	19.7	1.008	4.0E-05
2/14	----	92.0	87.2	86.8	4.1	13.20	14.00	---	---	---	---	---
2/14	46	92.0	87.2	86.8	4.1	13.50	13.70	0.30	0.30	19.7	1.008	3.8E-05
2/14	----	92.0	87.2	86.8	4.1	13.60	14.00	---	---	---	---	---
2/14	46	92.0	87.2	86.8	4.1	13.90	13.70	0.30	0.30	19.7	1.008	3.8E-05
2/14	----	92.0	87.2	86.8	4.1	13.50	14.10	---	---	---	---	---
2/14	44	92.0	87.2	86.8	4.1	13.80	13.80	0.30	0.30	19.7	1.008	3.9E-05

PERMEABILITY AT 20° C: 3.9 x 10⁻⁵ cm/sec (@ 5 psi effective stress)



Client:	Navarro Research & Engineering, Inc.		
Project Name:	Soil Property Testing from NASA White Sands Test Facility		
Project Location:	Las Cruces, NM		
GTX #:	305503		
Start Date:	12/15/2016	Tested By:	jcw
End Date:	12/19/2016	Checked By:	emm
Boring #:	---		
Sample #:	400-SB-8		
Depth:	5-10 ft		
Visual Description:	Moist, light brown clayey sand with gravel		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084 Constant Gradient

Sample Type:	Remolded	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	9/15
Sample Preparation:	Target Compaction: 113-122 pcf at the as-received moisture content (9.1%). Values specified by client. Material >3/8-inch screened out of sample prior to testing (14% of sample). Trimmings moisture content = 7.2%		
Measured Specific Gravity:	2.68		

Parameter	Initial	Final
Height, in	2.97	2.96
Diameter, in	2.98	3.05
Area, in ²	6.97	7.31
Volume, in ³	20.7	21.6
Mass, g	664.6	740.5
Bulk Density, pcf	122.0	130.2
Moisture Content, %	7.9	20.2
Dry Density, pcf	113.1	108.3
Degree of Saturation, %	44	99

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	92.02	Increased Cell Pressure, psi:	96.88	Cell Pressure Increment, ps	4.86
Sample Pressure, psi:	86.95	Corresponding Sample Pressure, psi:	91.41	Sample Pressure Increment	4.46
				B Coefficient:	0.92

FLOW DATA
 *B value did not increase with increase in pressure.
 Final degree of saturation >95%.

Date	Time, sec	Pressure, psi			Gradient	Flow Volume, cc				Temp, °C	R _t	Permeability K @ 20 °C, cm/sec
		Cell	Inlet	Outlet		In	Out	Δ In	Δ Out			
12/16	---	92.0	87.1	86.9	1.9	13.80	14.50	---	---	---	---	---
12/16	30	92.0	87.1	86.9	1.9	14.20	14.10	0.40	0.40	19.5	1.013	1.5E-04
12/16	----	92.0	87.1	86.9	1.9	13.80	14.50	---	---	---	---	---
12/16	30	92.0	87.1	86.9	1.9	14.20	14.10	0.40	0.40	19.5	1.013	1.5E-04
12/16	----	92.0	87.1	86.9	1.9	13.70	14.50	---	---	---	---	---
12/16	30	92.0	87.1	86.9	1.9	14.10	14.10	0.40	0.40	19.5	1.013	1.5E-04
12/16	----	92.0	87.1	86.9	1.9	13.90	14.40	---	---	---	---	---
12/16	30	92.0	87.1	86.9	1.9	14.30	14.00	0.40	0.40	19.5	1.013	1.5E-04

PERMEABILITY AT 20° C: 1.5 x 10⁻⁴ cm/sec (@ 5 psi effective stress)



Client:	Navarro Research & Engineering, Inc.		
Project Name:	Soil Property Testing from NASA White Sands Test Facility		
Project Location:	Las Cruces, NM		
GTX #:	305503		
Start Date:	12/15/2016	Tested By:	jcw
End Date:	12/19/2016	Checked By:	emm
Boring #:	---		
Sample #:	400-SB-8		
Depth:	10-15 ft		
Visual Description:	Moist, light brown gravel with silt and sand		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084 Constant Gradient

Sample Type:	Remolded	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	4/5
Sample Preparation:	Target Compaction: 113-122 pcf at the as-received moisture content (3.3%). Values specified by client. Material >3/8-inch screened out of sample prior to testing (58% of sample). Trimmings moisture content = 2.9%		
Measured Specific Gravity:	2.69		

Parameter	Initial	Final
Height, in	3.01	2.73
Diameter, in	2.96	3.06
Area, in ²	6.88	7.35
Volume, in ³	20.7	20.1
Mass, g	639.6	712.5
Bulk Density, pcf	117.4	134.9
Moisture Content, %	3.6	15.4
Dry Density, pcf	113.3	116.9
Degree of Saturation, %	20	95

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	92.01	Increased Cell Pressure, psi:	96.95	Cell Pressure Increment, ps	4.94
Sample Pressure, psi:	86.97	Corresponding Sample Pressure, psi:	91.50	Sample Pressure Increment	4.53
				B Coefficient:	0.92

FLOW DATA
 *B value did not increase with increase in pressure.
 Final degree of saturation >95%.

Date	Time, sec	Pressure, psi			Gradient	Flow Volume, cc				Temp, °C	R _t	Permeability K @ 20 °C, cm/sec
		Cell	Inlet	Outlet		In	Out	Δ In	Δ Out			
12/16	---	92.0	87.1	86.9	2.0	13.00	14.40	---	---	---	---	---
12/16	32	92.0	87.1	86.9	2.0	13.50	13.90	0.50	0.50	19.5	1.013	1.6E-04
12/16	----	92.0	87.1	86.9	2.0	13.10	14.10	---	---	---	---	---
12/16	33	92.0	87.1	86.9	2.0	13.60	13.60	0.50	0.50	19.5	1.013	1.6E-04
12/16	----	92.0	87.1	86.9	2.0	13.30	14.00	---	---	---	---	---
12/16	33	92.0	87.1	86.9	2.0	13.80	13.50	0.50	0.50	19.5	1.013	1.6E-04
12/16	----	92.0	87.1	86.9	2.0	13.40	14.10	---	---	---	---	---
12/16	33	92.0	87.1	86.9	2.0	13.90	13.60	0.50	0.50	19.5	1.013	1.6E-04

PERMEABILITY AT 20° C: 1.6 x 10⁻⁴ cm/sec (@ 5 psi effective stress)



Client:	Navarro Research & Engineering, Inc.		
Project Name:	Soil Property Testing from NASA White Sands Test Facility		
Project Location:	Las Cruces, NM		
GTX #:	305503		
Start Date:	12/14/2016	Tested By:	jcw
End Date:	12/19/2016	Checked By:	emm
Boring #:	---		
Sample #:	400-SB-09		
Depth:	12.5-15 ft		
Visual Description:	Moist, light brown gravel with clay and sand		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084 Constant Gradient

Sample Type:	Remolded	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	7/3
Sample Preparation:	Target Compaction: 113-122 pcf at the as-received moisture content (1.4%). Values specified by client. Material >3/8-inch screened out of sample prior to testing (51% of sample). Trimmings moisture content = 2.6%		
Measured Specific Gravity:	2.64		

Parameter	Initial	Final
Height, in	2.98	2.80
Diameter, in	2.95	3.00
Area, in ²	6.83	7.07
Volume, in ³	20.4	19.8
Mass, g	622.9	698.5
Bulk Density, pcf	116.3	134.2
Moisture Content, %	2.3	14.7
Dry Density, pcf	113.6	116.9
Degree of Saturation, %	14	95

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	91.97	Increased Cell Pressure, psi:	96.90	Cell Pressure Increment, ps	4.93
Sample Pressure, psi:	86.98	Corresponding Sample Pressure, psi:	91.48	Sample Pressure Increment	4.50
				B Coefficient:	0.91
				*B value did not increase with increase in pressure. Final degree of saturation >95%.	

FLOW DATA

Date	Time, sec	Pressure, psi			Gradient	Flow Volume, cc				Temp, °C	R _t	Permeability K @ 20 °C, cm/sec
		Cell	Inlet	Outlet		In	Out	Δ In	Δ Out			
12/15	---	92.0	87.1	86.9	2.0	14.20	14.80	---	---	---	---	---
12/15	33	92.0	87.1	86.9	2.0	14.60	14.40	0.40	0.40	19.5	1.013	1.4E-04
12/15	----	92.0	87.1	86.9	2.0	14.50	14.90	---	---	---	---	---
12/15	32	92.0	87.1	86.9	2.0	14.90	14.50	0.40	0.40	19.5	1.013	1.4E-04
12/15	----	92.0	87.1	86.9	2.0	14.70	15.20	---	---	---	---	---
12/15	32	92.0	87.1	86.9	2.0	15.10	14.80	0.40	0.40	19.5	1.013	1.4E-04
12/15	----	92.0	87.1	86.9	2.0	15.00	15.60	---	---	---	---	---
12/15	33	92.0	87.1	86.9	2.0	15.40	15.20	0.40	0.40	19.5	1.013	1.4E-04

PERMEABILITY AT 20° C: 1.4 x 10⁻⁴ cm/sec (@ 5 psi effective stress)



Client:	Navarro Research & Engineering, Inc.		
Project Name:	Soil Property Testing from NASA White Sands Test Facility		
Project Location:	Las Cruces, NM		
GTX #:	305503		
Start Date:	12/15/2016	Tested By:	jcw
End Date:	12/19/2016	Checked By:	emm
Boring #:	---		
Sample #:	400-SB-9		
Depth:	20-25 ft		
Visual Description:	Moist, light brown gravel with clay and sand		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084 Constant Gradient

Sample Type:	Remolded	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	3/23

Sample Preparation: Target Compaction: 113-122 pcf at the as-recieved moisture content (1%). Values specified by client. Material >3/8-inch screened out of sample prior to testing (49%). Trimmings moisture content = 1.7%

Measured Specific Gravity: 2.63

Parameter	Initial	Final
Height, in	2.98	2.72
Diameter, in	2.89	2.94
Area, in ²	6.56	6.79
Volume, in ³	19.5	18.5
Mass, g	632.3	686.1
Bulk Density, pcf	123.0	141.2
Moisture Content, %	2.0	10.7
Dry Density, pcf	120.5	127.6
Degree of Saturation, %	15	98

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	90.02	Increased Cell Pressure, psi:	94.98	Cell Pressure Increment, ps	4.96
Sample Pressure, psi:	84.97	Corresponding Sample Pressure, psi:	89.59	Sample Pressure Increment	4.62
				B Coefficient:	0.93

FLOW DATA

*B value did not increase with increase in pressure.
Final degree of saturation >95%.

Date	Time, sec	Pressure, psi			Gradient	Flow Volume, cc				Temp, °C	R _t	Permeability K @ 20 °C, cm/sec
		Cell	Inlet	Outlet		In	Out	Δ In	Δ Out			
12/15	---	90.0	85.2	84.8	4.1	10.20	12.50	---	---	---	---	---
12/15	40	90.0	85.2	84.8	4.1	10.50	12.20	0.30	0.30	19.5	1.013	4.3E-05
12/15	----	90.0	85.2	84.8	4.1	11.00	12.70	---	---	---	---	---
12/15	35	90.0	85.2	84.8	4.1	11.30	12.40	0.30	0.30	19.5	1.013	4.9E-05
12/15	----	90.0	85.2	84.8	4.1	11.90	12.90	---	---	---	---	---
12/15	34	90.0	85.2	84.8	4.1	12.20	12.60	0.30	0.30	19.5	1.013	5.0E-05
12/15	----	90.0	85.2	84.8	4.1	12.30	13.20	---	---	---	---	---
12/15	37	90.0	85.2	84.8	4.1	12.60	12.90	0.30	0.30	19.5	1.013	4.6E-05

PERMEABILITY AT 20° C: 4.7 x 10⁻⁵ cm/sec (@ 5 psi effective stress)



Client:	Navarro Research & Engineering, Inc.		
Project Name:	Soil Property Testing from NASA White Sands Test Facility		
Project Location:	Las Cruces, NM		
GTX #:	305503		
Start Date:	11/14/2016	Tested By:	jcw
End Date:	11/21/2016	Checked By:	emm
Boring #:	---		
Sample #:	400-SB-10		
Depth:	15-20 ft		
Visual Description:	Moist, reddish brown silty gravel with sand		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084 Constant Gradient

Sample Type:	Remolded	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	4/5

Sample Preparation: Target Compaction: 113-122 pcf at the as-received moisture content (1.9%). Values specified by client. Material >3/8-inch screened out of sample prior to testing (39%). Trimmings moisture content = 2.2%

Measured Specific Gravity: 2.69

Parameter	Initial	Final
Height, in	3.00	2.99
Diameter, in	2.86	2.84
Area, in ²	6.42	6.33
Volume, in ³	19.3	18.9
Mass, g	618.6	685.0
Bulk Density, pcf	122.0	137.5
Moisture Content, %	2.8	13.8
Dry Density, pcf	118.7	120.8
Degree of Saturation, %	18	95

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	91.95	Increased Cell Pressure, psi:	97.07	Cell Pressure Increment, ps	5.12
Sample Pressure, psi:	86.96	Corresponding Sample Pressure, psi:	91.66	Sample Pressure Increment	4.70
				B Coefficient:	0.92

FLOW DATA

*B value did not increase with increase in pressure.
Final degree of saturation >95%.

Date	Time, sec	Pressure, psi			Gradient	Flow Volume, cc				Temp, °C	R _t	Permeability K @ 20 °C, cm/sec
		Cell	Inlet	Outlet		In	Out	Δ In	Δ Out			
11/18	---	92.0	87.2	86.7	4.6	14.20	14.90	---	---	---	---	---
11/18	44	92.0	87.2	86.7	4.6	14.50	14.60	0.30	0.30	19.9	1.003	3.6E-05
11/18	----	92.0	87.2	86.7	4.6	14.70	14.80	---	---	---	---	---
11/18	40	92.0	87.2	86.7	4.6	15.00	14.50	0.30	0.30	19.9	1.003	4.0E-05
11/18	----	92.0	87.2	86.7	4.6	14.00	14.90	---	---	---	---	---
11/18	43	92.0	87.2	86.7	4.6	14.30	14.60	0.30	0.30	19.9	1.003	3.7E-05
11/18	----	92.0	87.2	86.7	4.6	14.20	14.80	---	---	---	---	---
11/18	42	92.0	87.2	86.7	4.6	14.50	14.50	0.30	0.30	19.9	1.003	3.8E-05

PERMEABILITY AT 20° C: 3.8 x 10⁻⁵ cm/sec (@ 5 psi effective stress)



Client:	Navarro Research & Engineering, Inc.		
Project Name:	Soil Property Testing from NASA White Sands Test Facility		
Project Location:	Las Cruces, NM		
GTX #:	305503		
Start Date:	11/14/2016	Tested By:	jcw
End Date:	11/21/2016	Checked By:	emm
Boring #:	---		
Sample #:	400-SB-10		
Depth:	20-25 ft		
Visual Description:	Moist, reddish brown silty, clayey gravel with sand		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084 Constant Gradient

Sample Type:	Remolded	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	5/16

Sample Preparation: Target Compaction: 113-122 pcf at the as-received moisture content (1.5%). Values specified by client. Material >3/8-inch screened out of sample prior to testing (41%). Trimmings moisture content = 1.5%

Measured Specific Gravity: 2.69

Parameter	Initial	Final
Height, in	3.00	2.97
Diameter, in	2.86	2.86
Area, in ²	6.42	6.42
Volume, in ³	19.3	19.1
Mass, g	616.2	690.9
Bulk Density, pcf	121.5	137.7
Moisture Content, %	1.4	13.7
Dry Density, pcf	119.9	121.1
Degree of Saturation, %	9	95

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	92.00	Increased Cell Pressure, psi:	96.98	Cell Pressure Increment, ps	4.98
Sample Pressure, psi:	86.97	Corresponding Sample Pressure, psi:	91.62	Sample Pressure Increment	4.65
				B Coefficient:	0.93

FLOW DATA

*B value did not increase with increase in pressure.
Final degree of saturation >95%.

Date	Time, sec	Pressure, psi			Gradient	Flow Volume, cc				Temp, °C	R _t	Permeability K @ 20 °C, cm/sec
		Cell	Inlet	Outlet		In	Out	Δ In	Δ Out			
11/18	---	92.0	87.5	86.5	9.3	13.50	13.90	---	---	---	---	---
11/18	223	92.0	87.5	86.5	9.3	13.75	13.65	0.25	0.25	19.9	1.003	2.9E-06
11/18	----	92.0	87.5	86.5	9.3	13.40	14.20	---	---	---	---	---
11/18	220	92.0	87.5	86.5	9.3	13.65	13.95	0.25	0.25	19.9	1.003	2.9E-06
11/18	----	92.0	87.5	86.5	9.3	13.60	13.90	---	---	---	---	---
11/18	171	92.0	87.5	86.5	9.3	13.80	13.70	0.20	0.20	19.9	1.003	3.0E-06
11/18	----	92.0	87.5	86.5	9.3	13.50	14.00	---	---	---	---	---
11/18	177	92.0	87.5	86.5	9.3	13.70	13.80	0.20	0.20	19.9	1.003	2.9E-06

PERMEABILITY AT 20° C: 3.0 x 10⁻⁶ cm/sec (@ 5 psi effective stress)



Client:	Navarro Research & Engineering, Inc.		
Project Name:	Soil Property Testing from NASA White Sands Test Facility		
Project Location:	Las Cruces, NM		
GTX #:	305503		
Start Date:	2/13/2017	Tested By:	jcw
End Date:	2/15/2017	Checked By:	emm
Boring #:	---		
Sample #:	400-SB-11		
Depth:	15-20 ft		
Visual Description:	Moist, light reddish brown gravel with silt and sand		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084 Constant Gradient

Sample Type:	Remolded	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	9/1

Sample Preparation: Target Compaction: 113-122 pcf at the as-received moisture content (.9%). Values specified by client. Material >3/8-inch screened out of sample prior to testing (44%). Trimmings moisture content = .8%

Measured Specific Gravity: 2.68

Parameter	Initial	Final
Height, in	2.97	2.91
Diameter, in	2.86	2.86
Area, in ²	6.42	6.42
Volume, in ³	19.1	18.7
Mass, g	618.0	685.8
Bulk Density, pcf	123.1	139.5
Moisture Content, %	1.5	12.6
Dry Density, pcf	121.3	123.8
Degree of Saturation, %	11	96

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	91.99	Increased Cell Pressure, psi:	96.95	Cell Pressure Increment, ps	4.96
Sample Pressure, psi:	86.97	Corresponding Sample Pressure, psi:	91.49	Sample Pressure Increment	4.52
				B Coefficient:	0.91

FLOW DATA

*B value did not increase with increase in pressure.
Final degree of saturation >95%.

Date	Time, sec	Pressure, psi			Gradient	Flow Volume, cc				Temp, °C	R _t	Permeability K @ 20 °C, cm/sec
		Cell	Inlet	Outlet		In	Out	Δ In	Δ Out			
2/14	---	92.0	87.1	86.9	1.9	11.30	13.00	---	---	---	---	---
2/14	33	92.0	87.1	86.9	1.9	12.50	11.80	1.20	1.20	19.7	1.008	4.6E-04
2/14	----	92.0	87.1	86.9	1.9	11.90	13.00	---	---	---	---	---
2/14	31	92.0	87.1	86.9	1.9	13.10	11.80	1.20	1.20	19.7	1.008	4.9E-04
2/14	----	92.0	87.1	86.9	1.9	11.60	12.70	---	---	---	---	---
2/14	31	92.0	87.1	86.9	1.9	12.70	11.60	1.10	1.10	19.7	1.008	4.5E-04
2/14	----	92.0	87.1	86.9	1.9	11.40	13.10	---	---	---	---	---
2/14	30	92.0	87.1	86.9	1.9	12.50	12.00	1.10	1.10	19.7	1.008	4.7E-04

PERMEABILITY AT 20° C: 4.7×10^{-4} cm/sec (@ 5 psi effective stress)



Client:	Navarro Research & Engineering, Inc.		
Project Name:	Soil Property Testing from NASA White Sands Test Facility		
Project Location:	Las Cruces, NM		
GTX #:	305503		
Start Date:	2/13/2017	Tested By:	jcw
End Date:	2/15/2017	Checked By:	emm
Boring #:	---		
Sample #:	400-SB-11		
Depth:	20-25 ft		
Visual Description:	Moist, light reddish brown gravel with clay and sand		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084 Constant Volume

Sample Type:	Remolded	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	8/1
Sample Preparation:	Target Compaction: 113-122 pcf at the as-received moisture content (1.5%). Values specified by client. Material >3/8-inch screened out of sample prior to testing 61%. Trimmings moisture content = 1.7%		
Measured Specific Gravity:	2.70		

Parameter	Initial	Final
Height, in	3.00	2.99
Diameter, in	2.86	2.85
Area, in ²	6.42	6.38
Volume, in ³	19.3	19.1
Mass, g	615	687
Bulk Density, pcf	121	137
Moisture Content, %	2.2	14.2
Dry Density, pcf	118.7	120.0
Degree of Saturation, %	14	95

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	89.96	Increased Cell Pressure, psi:	94.92	Cell Pressure Increment, psi:	4.96
Sample Pressure, psi:	85.01	Corresponding Sample Pressure, psi:	89.70	Sample Pressure Increment, psi:	4.69
				B Coefficient:	0.95

FLOW DATA

Date	Trial #	Pressure, psi		Manometer Readings			Elapsed Time, sec	Gradient	Permeability K, cm/sec	Temp, °C	R _t	Permeability K @ 20 °C, cm/sec
		Cell	Sample	Z ₁	Z ₂	Z ₁ -Z ₂						
2/14	1	90.0	85.0	4.5	2.8	1.7	31	7.5	7.1E-06	19.7	1.008	7.2E-06
2/14	2	90.0	85.0	4.5	2.8	1.7	32	7.5	6.9E-06	19.7	1.008	7.0E-06
2/14	3	90.0	85.0	4.5	2.8	1.7	33	7.5	6.7E-06	19.7	1.008	6.7E-06
2/14	4	90.0	85.0	4.5	2.8	1.7	33	7.5	6.7E-06	19.7	1.008	6.7E-06

PERMEABILITY AT 20° C: 6.9 x 10⁻⁶ cm/sec (@ 5 psi effective stress)



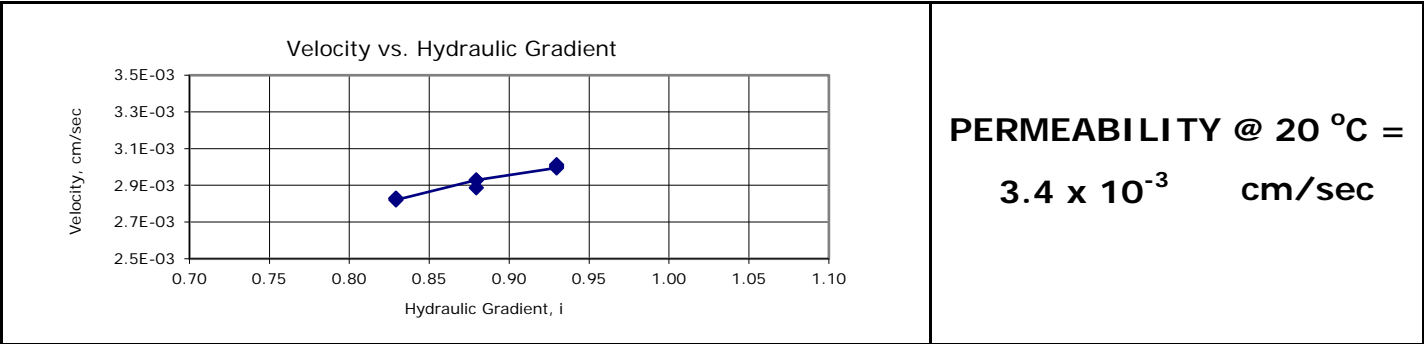
Client:	Navarro Research & Engineering, Inc.		
Project Name:	Soil Property Testing from NASA White Sands Test Facility		
Project Location:	Las Cruces, NM		
GTX #:	305503		
Start Date:	11/10/16	Tested By:	jcw
End Date:	11/15/16	Checked By:	emm
Boring #:	---		
Sample #:	400-SB-12		
Depth:	40-45 ft		
Visual Description:	Moist, reddish brown gravel with silt and sand		

Permeability of Granular Soils (Constant Head) by ASTM D2434

Sample Type:	Remolded		
Sample Information:	Maximum Dry Density:	---	pcf
	Optimum Moisture Content:	---	%
	Compaction Test Method:	---	
	Classification (ASTM D2487):	---	
	Assumed Specific Gravity:	2.65	
Sample Preparation / Test Setup:	Target Compaction: 113-122 pcf at air-dried moisture content. Values specified by client. Material >3/8-inch screened out of sample prior to testing (42%).		

Parameter	Initial	Final
Height, in	4.03	3.98
Diameter, in	3.98	3.98
Area, in ²	12.4	12.4
Volume, in ³	50.1	49.5
Mass, g	1552	1773
Bulk Density, pcf	117.9	136.4
Moisture Content, %	1.3	14.8
Dry Density, pcf	116.4	118.8
Degree of Saturation, %	---	100.0
Void Ratio, e	---	0.39

Date	Reading #	Volume of Flow, cc	Time of Flow, sec	Flow Rate, cc/sec	Gradient	Permeability, cm/sec	Temp., °C	Correction Factor	Permeability @ 20 °C, cm/sec
11/10	1	3.4	15	0.23	0.83	3.4E-03	19.3	1.018	3.5E-03
11/10	2	3.4	15	0.23	0.83	3.4E-03	19.3	1.018	3.5E-03
11/10	3	3.4	15	0.23	0.83	3.4E-03	19.3	1.018	3.5E-03
11/10	4	3.5	15	0.24	0.88	3.3E-03	19.3	1.018	3.4E-03
11/10	5	3.5	15	0.23	0.88	3.3E-03	19.3	1.018	3.3E-03
11/10	6	3.5	15	0.24	0.88	3.3E-03	19.3	1.018	3.4E-03
11/10	7	3.6	15	0.24	0.93	3.2E-03	19.3	1.018	3.3E-03
11/10	8	3.6	15	0.24	0.93	3.2E-03	19.3	1.018	3.3E-03
11/10	9	3.6	15	0.24	0.93	3.2E-03	19.3	1.018	3.3E-03



Note: This standard has been withdrawn by ASTM with no replacement.



Client:	Navarro Research & Engineering, Inc.		
Project Name:	Soil Property Testing from NASA White Sands Test Facility		
Project Location:	Las Cruces, NM		
GTX #:	305503		
Start Date:	11/14/2016	Tested By:	jcw
End Date:	11/21/2016	Checked By:	emm
Boring #:	---		
Sample #:	400-SB-12		
Depth:	45-50 ft		
Visual Description:	Moist, light brown gravel with silt and sand		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084 Constant Gradient

Sample Type:	Remolded	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	2/4

Sample Preparation: Target Compaction: 113-122 pcf at the as-received moisture content (1.7%). Values specified by client. Material >3/8-inch screened out of sample prior to testing (47%). Trimmings moisture content = 1.8%

Assumed Specific Gravity: 2.66

Parameter	Initial	Final
Height, in	3.03	3.03
Diameter, in	2.86	2.86
Area, in ²	6.42	6.42
Volume, in ³	19.5	19.5
Mass, g	617.4	696.6
Bulk Density, pcf	120.6	136.1
Moisture Content, %	2.1	15.2
Dry Density, pcf	118.1	118.1
Degree of Saturation, %	14	100

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	89.96	Increased Cell Pressure, psi:	95.41	Cell Pressure Increment, ps	5.45
Sample Pressure, psi:	85.04	Corresponding Sample Pressure, psi:	90.20	Sample Pressure Increment	5.16
				B Coefficient:	0.95

FLOW DATA

Date	Time, sec	Pressure, psi			Gradient	Flow Volume, cc				Temp, °C	R _t	Permeability K @ 20 °C, cm/sec
		Cell	Inlet	Outlet		In	Out	Δ In	Δ Out			
11/18	---	90.0	85.1	84.9	1.8	13.50	14.00	---	---	---	---	---
11/18	31	90.0	85.1	84.9	1.8	13.80	13.70	0.30	0.30	19.9	1.003	1.3E-04
11/18	----	90.0	85.1	84.9	1.8	13.60	14.20	---	---	---	---	---
11/18	31	90.0	85.1	84.9	1.8	13.90	13.90	0.30	0.30	19.9	1.003	1.3E-04
11/18	----	90.0	85.1	84.9	1.8	13.70	14.10	---	---	---	---	---
11/18	32	90.0	85.1	84.9	1.8	14.00	13.80	0.30	0.30	19.9	1.003	1.2E-04
11/18	----	90.0	85.1	84.9	1.8	13.50	13.90	---	---	---	---	---
11/18	31	90.0	85.1	84.9	1.8	13.80	13.60	0.30	0.30	19.9	1.003	1.3E-04

PERMEABILITY AT 20° C: 1.3 x 10⁻⁴ cm/sec (@ 5 psi effective stress)



Client:	Navarro Research & Engineering, Inc.		
Project Name:	Soil Property Testing from NASA White Sands Test Facility		
Project Location:	Las Cruces, NM		
GTX #:	305503		
Start Date:	12/15/2016	Tested By:	jcw
End Date:	12/19/2016	Checked By:	emm
Boring #:	---		
Sample #:	400-SB-13		
Depth:	60-65 ft		
Visual Description:	Moist, light brown gravel with clay and sand		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084 Constant Gradient

Sample Type:	Remolded	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	1/5
Sample Preparation:	Target Compaction: 113-122 pcf at the as-received moisture content (2.4%). Values specified by client. Material >3/8-inch screened out of sample prior to testing (51% of sample). Trimmings moisture content = 2.1%		
Measured Specific Gravity:	2.69		

Parameter	Initial	Final
Height, in	2.97	2.77
Diameter, in	2.96	2.98
Area, in ²	6.88	6.97
Volume, in ³	20.4	19.3
Mass, g	627.3	698.4
Bulk Density, pcf	116.7	137.4
Moisture Content, %	2.2	13.7
Dry Density, pcf	114.2	120.8
Degree of Saturation, %	12	95

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	92.03	Increased Cell Pressure, psi:	97.11	Cell Pressure Increment, ps	5.08
Sample Pressure, psi:	86.99	Corresponding Sample Pressure, psi:	91.67	Sample Pressure Increment	4.68
				B Coefficient:	0.92

FLOW DATA
 *B value did not increase with increase in pressure.
 Final degree of saturation >95%.

Date	Time, sec	Pressure, psi			Gradient	Flow Volume, cc				Temp, °C	R _t	Permeability K @ 20 °C, cm/sec
		Cell	Inlet	Outlet		In	Out	Δ In	Δ Out			
12/16	---	92.0	87.1	86.9	2.0	13.80	14.20	---	---	---	---	---
12/16	48	92.0	87.1	86.9	2.0	14.20	13.80	0.40	0.40	19.5	1.013	9.4E-05
12/16	---	92.0	87.1	86.9	2.0	13.60	14.20	---	---	---	---	---
12/16	39	92.0	87.1	86.9	2.0	14.00	13.80	0.40	0.40	19.5	1.013	1.2E-04
12/16	---	92.0	87.1	86.9	2.0	13.40	14.10	---	---	---	---	---
12/16	40	92.0	87.1	86.9	2.0	13.80	13.70	0.40	0.40	19.5	1.013	1.1E-04
12/16	---	92.0	87.1	86.9	2.0	13.60	14.10	---	---	---	---	---
12/16	43	92.0	87.1	86.9	2.0	14.00	13.70	0.40	0.40	19.5	1.013	1.0E-04

PERMEABILITY AT 20° C: 1.1 x 10⁻⁴ cm/sec (@ 5 psi effective stress)



Client:	Navarro Research & Engineering, Inc.		
Project Name:	Soil Property Testing from NASA White Sands Test Facility		
Project Location:	Las Cruces, NM		
GTX #:	305503		
Start Date:	12/12/2016	Tested By:	jcw
End Date:	12/14/2016	Checked By:	emm
Boring #:	---		
Sample #:	400-SB-14		
Depth:	65-70 ft		
Visual Description:	Moist, reddish brown gravel with silt and sand		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084 Constant Gradient

Sample Type:	Remolded	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	1/5
Sample Preparation:	Target Compaction: 113-122 pcf at the as-received moisture content (7.2%). Values specified by client. Material >3/8-inch screened out of sample prior to testing (60% of sample). Trimmings moisture content = 7.2%		
Measured Specific Gravity:	2.70		

Parameter	Initial	Final
Height, in	3.00	2.84
Diameter, in	2.91	2.93
Area, in ²	6.65	6.74
Volume, in ³	20.0	19.1
Mass, g	646.2	689.1
Bulk Density, pcf	123.1	136.8
Moisture Content, %	7.2	14.3
Dry Density, pcf	114.8	119.6
Degree of Saturation, %	42	95

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	92.04	Increased Cell Pressure, psi:	96.90	Cell Pressure Increment, ps	4.86
Sample Pressure, psi:	86.97	Corresponding Sample Pressure, psi:	91.37	Sample Pressure Increment	4.40
				B Coefficient:	0.91

FLOW DATA
 *B value did not increase with increase in pressure.
 Final degree of saturation >95%.

Date	Time, sec	Pressure, psi			Gradient	Flow Volume, cc				Temp, °C	R _t	Permeability K @ 20 °C, cm/sec
		Cell	Inlet	Outlet		In	Out	Δ In	Δ Out			
12/13	---	92.0	87.1	86.9	1.9	13.00	13.40	---	---	---	---	---
12/13	31	92.0	87.1	86.9	1.9	13.30	13.10	0.30	0.30	19.7	1.008	1.2E-04
12/13	----	92.0	87.1	86.9	1.9	13.10	13.50	---	---	---	---	---
12/13	32	92.0	87.1	86.9	1.9	13.40	13.20	0.30	0.30	19.7	1.008	1.1E-04
12/13	----	92.0	87.1	86.9	1.9	13.10	13.50	---	---	---	---	---
12/13	32	92.0	87.1	86.9	1.9	13.40	13.20	0.30	0.30	19.7	1.008	1.1E-04
12/13	----	92.0	87.1	86.9	1.9	13.20	13.40	---	---	---	---	---
12/13	32	92.0	87.1	86.9	1.9	13.50	13.10	0.30	0.30	19.7	1.008	1.1E-04

PERMEABILITY AT 20° C: 1.1 x 10⁻⁴ cm/sec (@ 5 psi effective stress)



Client:	Navarro Research & Engineering, Inc.		
Project Name:	Soil Property Testing from NASA White Sands Test Facility		
Project Location:	Las Cruces, NM		
GTX #:	305503		
Start Date:	12/14/2016	Tested By:	jcw
End Date:	12/19/2016	Checked By:	emm
Boring #:	---		
Sample #:	400-SB-14		
Depth:	70-75 ft		
Visual Description:	Moist, light brown clayey gravel with sand		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084 Constant Gradient

Sample Type:	Remolded	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	16/14

Sample Preparation: Target Compaction: 113-122 pcf at the as-received moisture content (7.0%). Values specified by client. Material >3/8-inch screened out of sample prior to testing (52%). Trimmings moisture content = 7.0%

Measured Specific Gravity: 2.69

Parameter	Initial	Final
Height, in	2.97	2.74
Diameter, in	2.96	3.03
Area, in ²	6.88	7.21
Volume, in ³	20.4	19.8
Mass, g	649.8	704.8
Bulk Density, pcf	120.9	135.6
Moisture Content, %	7.1	16.1
Dry Density, pcf	112.9	116.8
Degree of Saturation, %	39	99

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	90.01	Increased Cell Pressure, psi:	94.97	Cell Pressure Increment, ps	4.96
Sample Pressure, psi:	84.98	Corresponding Sample Pressure, psi:	89.67	Sample Pressure Increment	4.69
				B Coefficient:	0.95

FLOW DATA

Date	Time, sec	Pressure, psi			Gradient	Flow Volume, cc				Temp, °C	R _t	Permeability K @ 20 °C, cm/sec
		Cell	Inlet	Outlet		In	Out	Δ In	Δ Out			
12/16	---	90.0	85.1	84.9	2.0	11.60	12.70	---	---	---	---	---
12/16	35	90.0	85.1	84.9	2.0	12.20	12.10	0.60	0.60	19.5	1.013	1.8E-04
12/16	----	90.0	85.1	84.9	2.0	12.00	12.60	---	---	---	---	---
12/16	35	90.0	85.1	84.9	2.0	12.60	12.00	0.60	0.60	19.5	1.013	1.8E-04
12/16	----	90.0	85.1	84.9	2.0	11.80	12.50	---	---	---	---	---
12/16	36	90.0	85.1	84.9	2.0	12.40	11.90	0.60	0.60	19.5	1.013	1.8E-04
12/16	----	90.0	85.1	84.9	2.0	12.00	12.70	---	---	---	---	---
12/16	36	90.0	85.1	84.9	2.0	12.60	12.10	0.60	0.60	19.5	1.013	1.8E-04

PERMEABILITY AT 20° C: 1.8 x 10⁻⁴ cm/sec (@ 5 psi effective stress)



Client:	Navarro Research & Engineering, Inc.		
Project Name:	Soil Property Testing from NASA White Sands Test Facility		
Project Location:	Las Cruces, NM		
GTX #:	305503		
Start Date:	11/11/2016	Tested By:	jcw
End Date:	11/18/2016	Checked By:	emm
Boring #:	---		
Sample #:	400-SB-15		
Depth:	15-20 ft		
Visual Description:	Moist, light brown gravel with silt and sand		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084 Constant Gradient

Sample Type:	Remolded	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	14/11

Sample Preparation: Target Compaction: 113-122 pcf at the as-received moisture content (1.2%). Values specified by client. Material >3/8-inch screened out of sample prior to testing (59%). Trimmings moisture content = 1.2%

Measured Specific Gravity: 2.68

Parameter	Initial	Final
Height, in	3.00	2.89
Diameter, in	2.86	2.91
Area, in ²	6.42	6.65
Volume, in ³	19.3	19.2
Mass, g	618.6	695.5
Bulk Density, pcf	122.0	137.6
Moisture Content, %	1.4	14.1
Dry Density, pcf	120.3	120.6
Degree of Saturation, %	10	97

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	92.01	Increased Cell Pressure, psi:	97.17	Cell Pressure Increment, ps	5.16
Sample Pressure, psi:	87.00	Corresponding Sample Pressure, psi:	91.32	Sample Pressure Increment	4.32
				B Coefficient:	0.84

FLOW DATA
*B value did not increase with increase in pressure.
Final degree of saturation >95%.

Date	Time, sec	Pressure, psi			Gradient	Flow Volume, cc				Temp, °C	R _t	Permeability K @ 20 °C, cm/sec
		Cell	Inlet	Outlet		In	Out	Δ In	Δ Out			
11/17	---	92.0	87.1	86.9	1.9	13.60	14.00	---	---	---	---	---
11/17	41	92.0	87.1	86.9	1.9	13.90	13.70	0.30	0.30	19.7	1.008	9.0E-05
11/17	----	92.0	87.1	86.9	1.9	13.60	13.80	---	---	---	---	---
11/17	41	92.0	87.1	86.9	1.9	13.90	13.50	0.30	0.30	19.7	1.008	9.0E-05
11/17	----	92.0	87.1	86.9	1.9	13.50	14.00	---	---	---	---	---
11/17	41	92.0	87.1	86.9	1.9	13.80	13.70	0.30	0.30	19.7	1.008	9.0E-05
11/17	----	92.0	87.1	86.9	1.9	13.80	14.00	---	---	---	---	---
11/17	41	92.0	87.1	86.9	1.9	14.10	13.70	0.30	0.30	19.7	1.008	9.0E-05

PERMEABILITY AT 20° C: 9.0 x 10⁻⁵ cm/sec (@ 5 psi effective stress)



Client:	Navarro Research & Engineering, Inc.		
Project Name:	Soil Property Testing from NASA White Sands Test Facility		
Project Location:	Las Cruces, NM		
GTX #:	305503		
Start Date:	11/14/2016	Tested By:	jcw
End Date:	11/21/2016	Checked By:	emm
Boring #:	---		
Sample #:	400-SB-15 #2		
Depth:	15-20 ft #2		
Visual Description:	Moist, light brown gravel with silt and sand		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084 Constant Gradient

Sample Type:	Remolded	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	7/3

Sample Preparation: Target Compaction: 113-122 pcf at the as-received moisture content (1.7%). Values specified by client. Material >3/8-inch screened out of sample prior to testing (47%). Trimmings moisture content = 1.7%

Measured Specific Gravity: 2.70

Parameter	Initial	Final
Height, in	3.00	3.00
Diameter, in	2.86	2.86
Area, in ²	6.42	6.42
Volume, in ³	19.3	19.3
Mass, g	618.0	692.3
Bulk Density, pcf	121.9	136.6
Moisture Content, %	2.2	14.4
Dry Density, pcf	119.3	119.3
Degree of Saturation, %	14	95

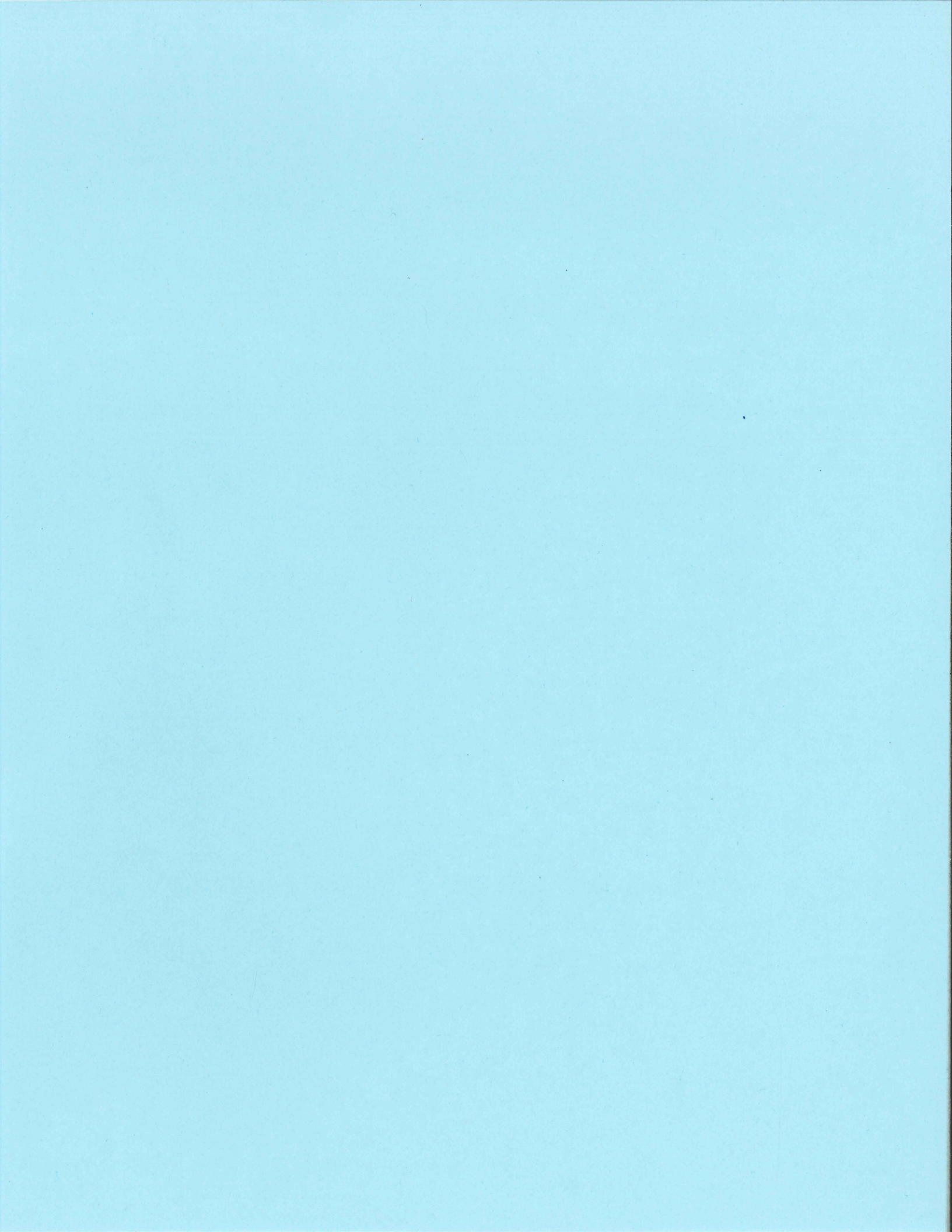
B COEFFICIENT DETERMINATION

Cell Pressure, psi:	89.99	Increased Cell Pressure, psi:	94.94	Cell Pressure Increment, ps	4.95
Sample Pressure, psi:	84.97	Corresponding Sample Pressure, psi:	89.66	Sample Pressure Increment	4.69
				B Coefficient:	0.95

FLOW DATA

Date	Time, sec	Pressure, psi			Gradient	Flow Volume, cc				Temp, °C	R _t	Permeability K @ 20 °C, cm/sec
		Cell	Inlet	Outlet		In	Out	Δ In	Δ Out			
11/18	---	90.0	85.2	84.7	4.6	13.60	14.50	---	---	---	---	---
11/18	31	90.0	85.2	84.7	4.6	14.00	14.10	0.40	0.40	19.9	1.003	6.8E-05
11/18	----	90.0	85.2	84.7	4.6	13.80	14.40	---	---	---	---	---
11/18	31	90.0	85.2	84.7	4.6	14.20	14.00	0.40	0.40	19.9	1.003	6.8E-05
11/18	----	90.0	85.2	84.7	4.6	13.90	14.30	---	---	---	---	---
11/18	30	90.0	85.2	84.7	4.6	14.30	13.90	0.40	0.40	19.9	1.003	7.0E-05
11/18	----	90.0	85.2	84.7	4.6	13.70	14.20	---	---	---	---	---
11/18	31	90.0	85.2	84.7	4.6	14.10	13.80	0.40	0.40	19.9	1.003	6.8E-05

PERMEABILITY AT 20° C: 6.8×10^{-5} cm/sec (@ 5 psi effective stress)





Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Tested By:	jm
Checked By:	
Date:	4/5/2017
Sample No.:	400-SB-02
Sample Depth:	0-10
Sample Description:	Moist, light reddish brown silty sand with gravel

Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge by ASTM D6836

Saturation Liquid:	Distilled, De-aired Water	Method:	C
Saturation Method:	Tray	Porous Material:	Membrane
Temperature of Soil:	20 °C		

Initial Specimen:

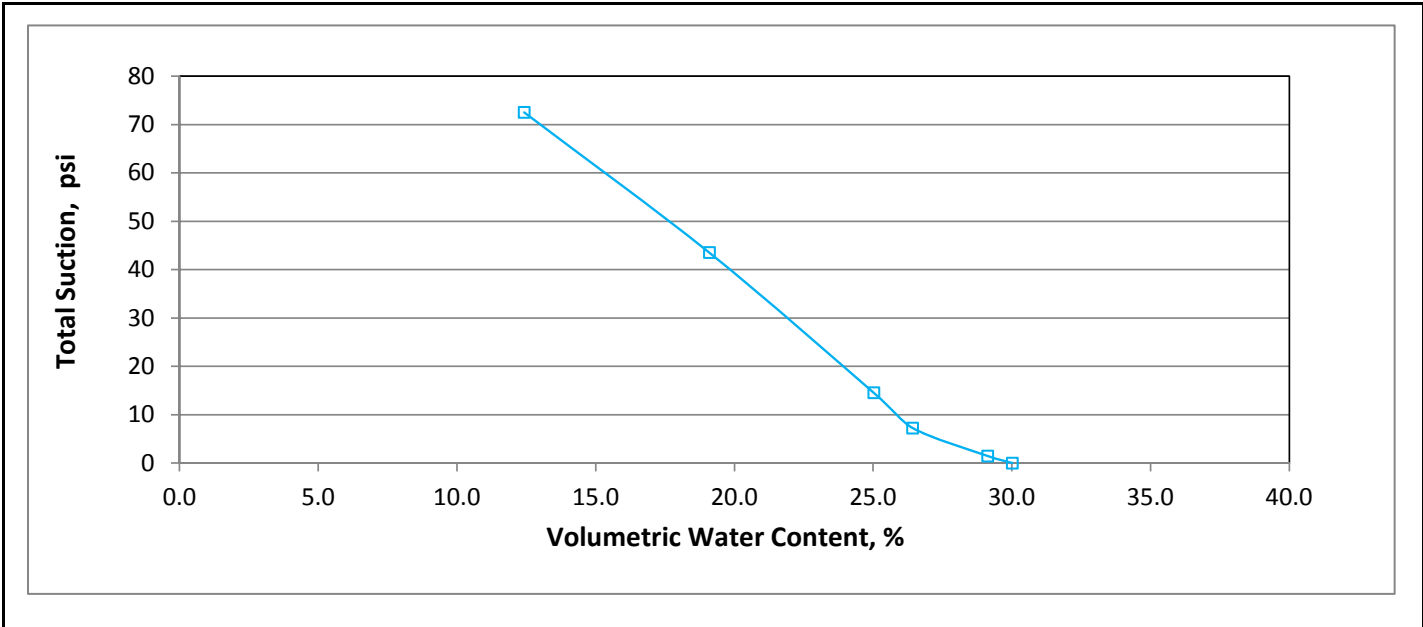
Initial Moisture, %/Vol:	30.9
Dry Unit Weight (pcf):	113.3

Applied Suction:

Point	1	2	3	4	5	6
psi	0	1.45	7.25	14.5	43.5	72.5
kpa	0	10	50	100	300	500

Volumetric Water Content:

Point	1	2	3	4	5	6
%	30.0	29.1	26.4	25.0	19.1	12.4





Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Tested By:	jm
Checked By:	mcm
Date:	2/21/2017
Sample No.:	400-SB-03
Sample Depth:	30-35
Sample Description:	Moist, pale brown clayey gravel with sand

Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge by ASTM D6836

Saturation Liquid:	Distilled, De-aired Water	Method:	C
Saturation Method:	Tray	Porous Material:	Membrane
Temperature of Soil:	20 °C		

Initial Specimen:

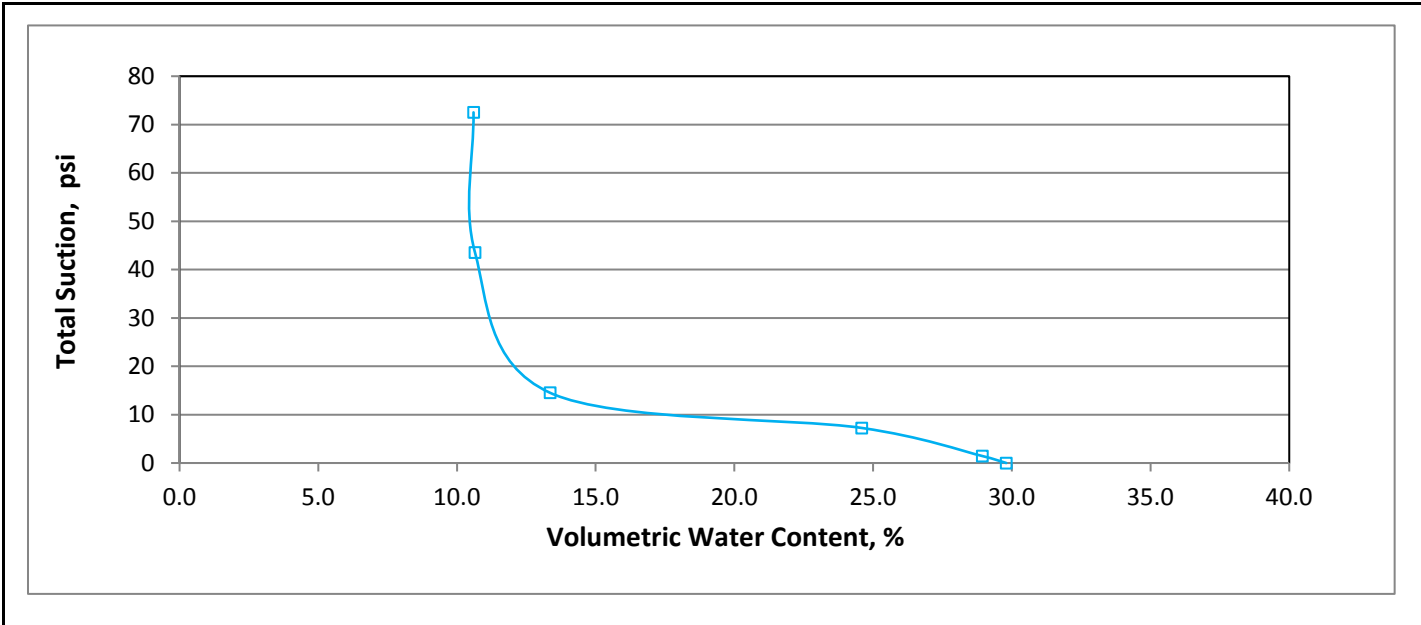
Initial Moisture, %/Vol:	30.1
Dry Unit Weight (pcf):	114.0

Applied Suction:

Point	1	2	3	4	5	6
psi	0	1.45	7.25	14.5	43.5	72.5
kpa	0	10	50	100	300	500

Volumetric Water Content:

Point	1	2	3	4	5	6
%	29.8	28.9	24.6	13.4	10.7	10.6





Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Tested By:	jm
Checked By:	
Date:	2/21/2017
Sample No.:	400-SB-03
Sample Depth:	35-40
Sample Description:	Moist, pale brown clayey gravel with sand

Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge by ASTM D6836

Saturation Liquid:	Distilled, De-aired Water	Method:	C
Saturation Method:	Tray	Porous Material:	Membrane
Temperature of Soil:	20 °C		

Initial Specimen:

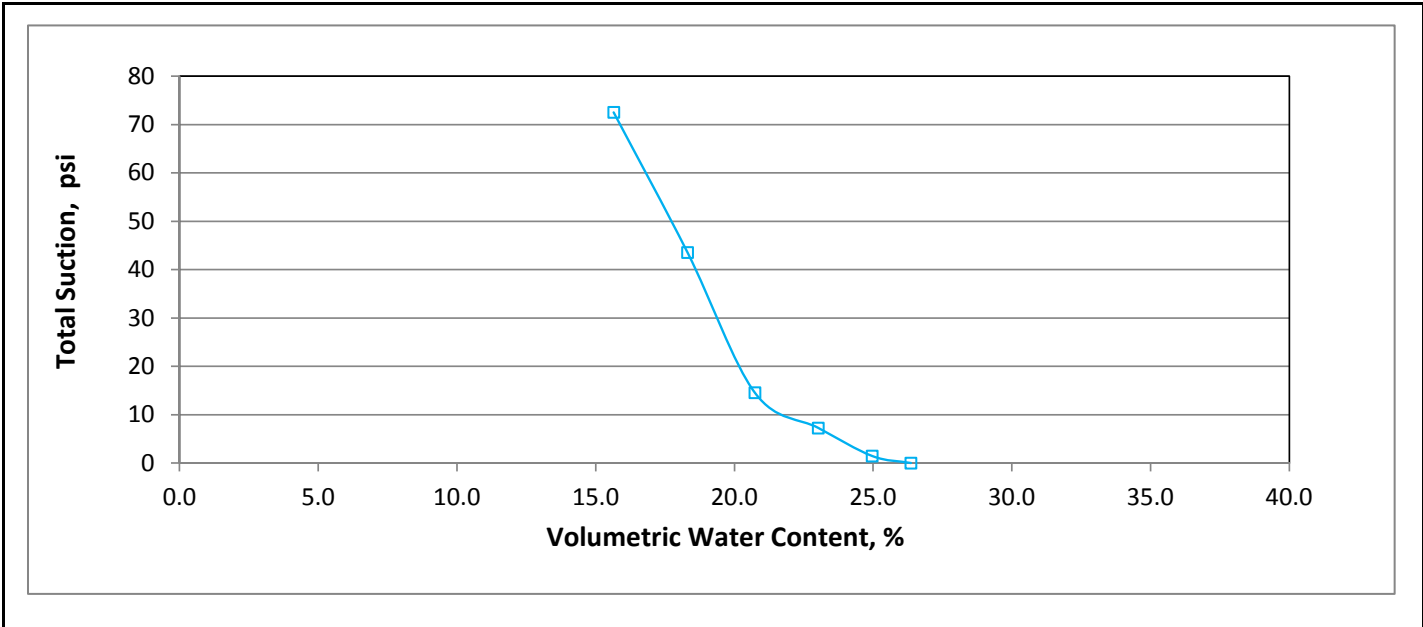
Initial Moisture, %/Vol:	27.3
Dry Unit Weight (pcf):	117.4

Applied Suction:

Point	1	2	3	4	5	6
psi	0	1.45	7.25	14.5	43.5	72.5
kpa	0	10	50	100	300	500

Volumetric Water Content:

Point	1	2	3	4	5	6
%	26.4	25.0	23.0	20.7	18.3	15.6





Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Tested By:	jm
Checked By:	
Date:	2/21/2017
Sample No.:	400-SB-04
Sample Depth:	90-93
Sample Description:	Moist, pale brown clayey gravel with sand

Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge by ASTM D6836

Saturation Liquid:	Distilled, De-aired Water	Method:	C
Saturation Method:	Tray	Porous Material:	Membrane
Temperature of Soil:	20 °C		

Initial Specimen:

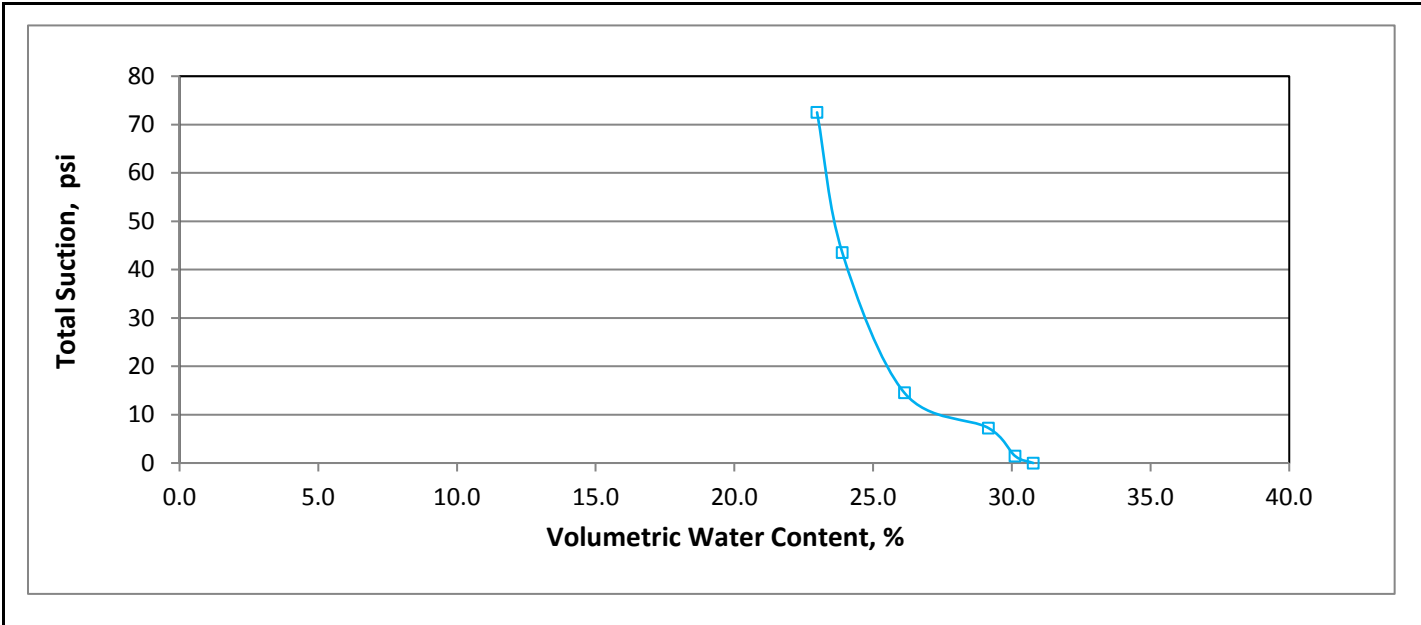
Initial Moisture, %/Vol:	30.0
Dry Unit Weight (pcf):	114.5

Applied Suction:

Point	1	2	3	4	5	6
psi	0	1.45	7.25	14.5	43.5	72.5
kpa	0	10	50	100	300	500

Volumetric Water Content:

Point	1	2	3	4	5	6
%	30.8	30.1	29.2	26.1	23.9	23.0





Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Tested By:	jm
Checked By:	
Date:	4/5/2017
Sample No.:	400-SB-05
Sample Depth:	0-10
Sample Description:	Moist, light reddish brown clayey sand with gravel

Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge by ASTM D6836

Saturation Liquid:	Distilled, De-aired Water	Method:	C
Saturation Method:	Tray	Porous Material:	Membrane
Temperature of Soil:	20 °C		

Initial Specimen:

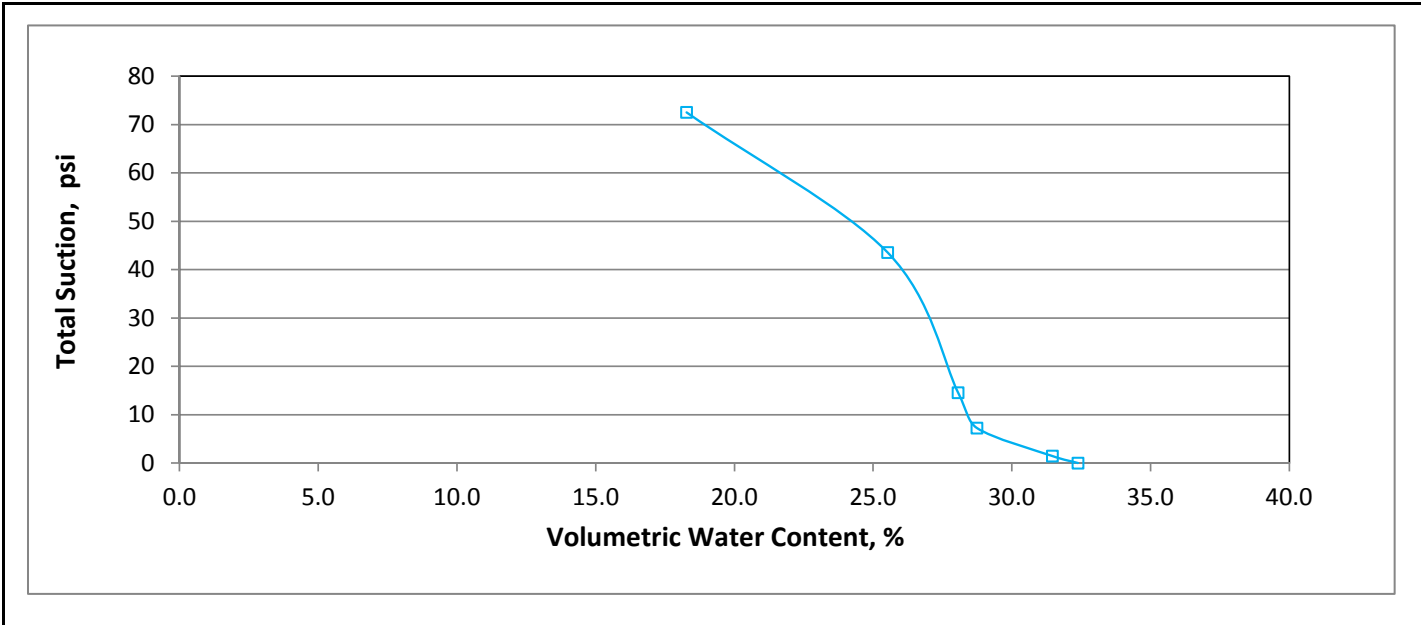
Initial Moisture, %/Vol:	32.4
Dry Unit Weight (pcf):	110.5

Applied Suction:

Point	1	2	3	4	5	6
psi	0	1.45	7.25	14.5	43.5	72.5
kpa	0	10	50	100	300	500

Volumetric Water Content:

Point	1	2	3	4	5	6
%	32.4	31.5	28.7	28.1	25.5	18.3





Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Tested By:	jm
Checked By:	
Date:	4/5/2017
Sample No.:	400-SB-06
Sample Depth:	20-24
Sample Description:	Moist, light reddish brown gravel with silty clay and sand

Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge by ASTM D6836

Saturation Liquid:	Distilled, De-aired Water	Method:	C
Saturation Method:	Tray	Porous Material:	Membrane
Temperature of Soil:	20 °C		

Initial Specimen:

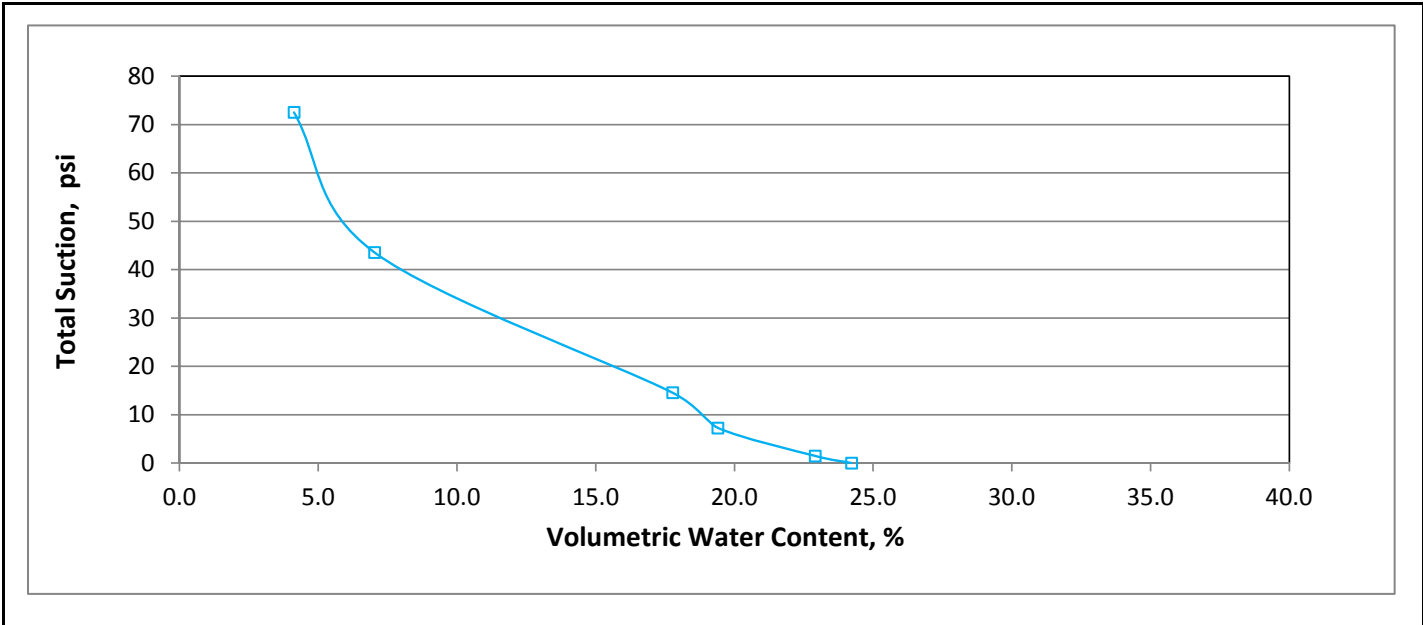
Initial Moisture, %/Vol:	24.9
Dry Unit Weight (pcf):	123.4

Applied Suction:

Point	1	2	3	4	5	6
psi	0	1.45	7.25	14.5	43.5	72.5
kpa	0	10	50	100	300	500

Volumetric Water Content:

Point	1	2	3	4	5	6
%	24.2	22.9	19.4	17.8	7.0	4.1





Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Tested By:	jm
Checked By:	
Date:	4/5/2017
Sample No.:	400-SB-06
Sample Depth:	25-30
Sample Description:	Moist, light reddish brown gravel with silty clay and sand

Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge by ASTM D6836

Saturation Liquid:	Distilled, De-aired Water	Method:	C
Saturation Method:	Tray	Porous Material:	Membrane
Temperature of Soil:	20 °C		

Initial Specimen:

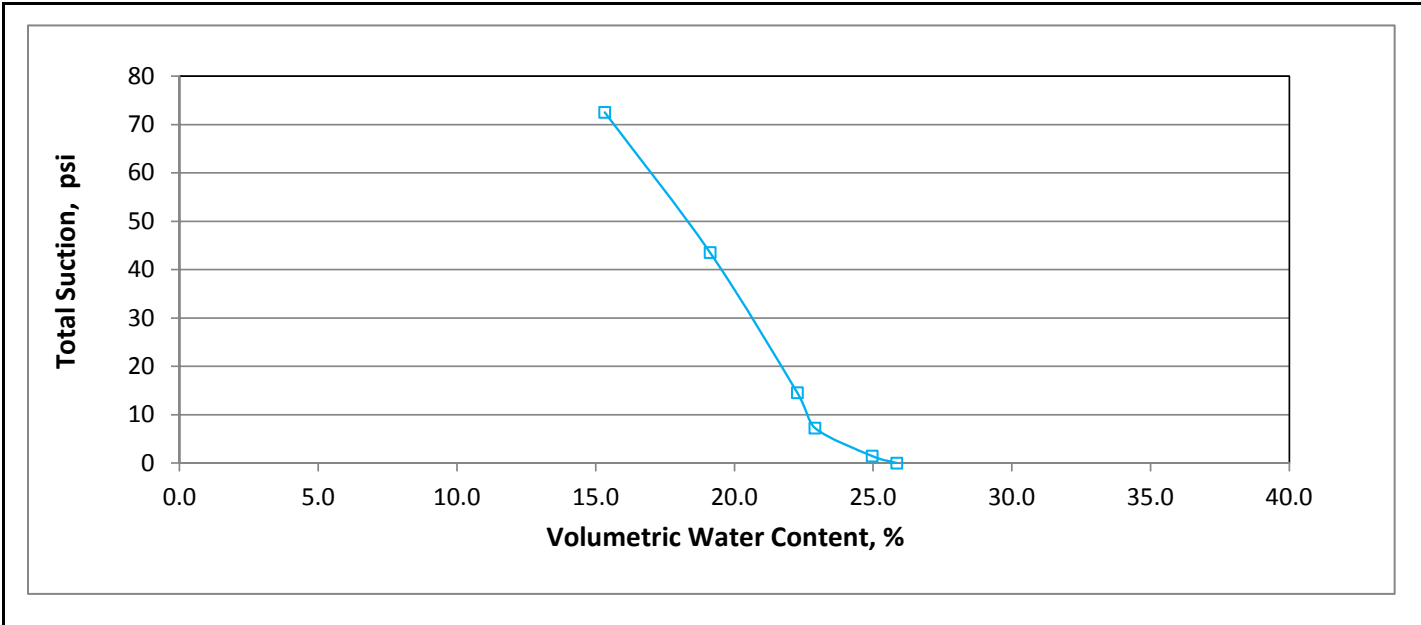
Initial Moisture, %/Vol:	25.8
Dry Unit Weight (pcf):	122.9

Applied Suction:

Point	1	2	3	4	5	6
psi	0	1.45	7.25	14.5	43.5	72.5
kpa	0	10	50	100	300	500

Volumetric Water Content:

Point	1	2	3	4	5	6
%	25.8	25.0	22.9	22.3	19.1	15.3





Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Tested By:	jm
Checked By:	
Date:	3/17/2017
Sample No.:	400-SB-08
Sample Depth:	5-10
Sample Description:	Moist, light brown clayey sand with gravel

Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge by ASTM D6836

Saturation Liquid:	Distilled, De-aired Water	Method:	C
Saturation Method:	Tray	Porous Material:	Membrane
Temperature of Soil:	20 °C		

Initial Specimen:

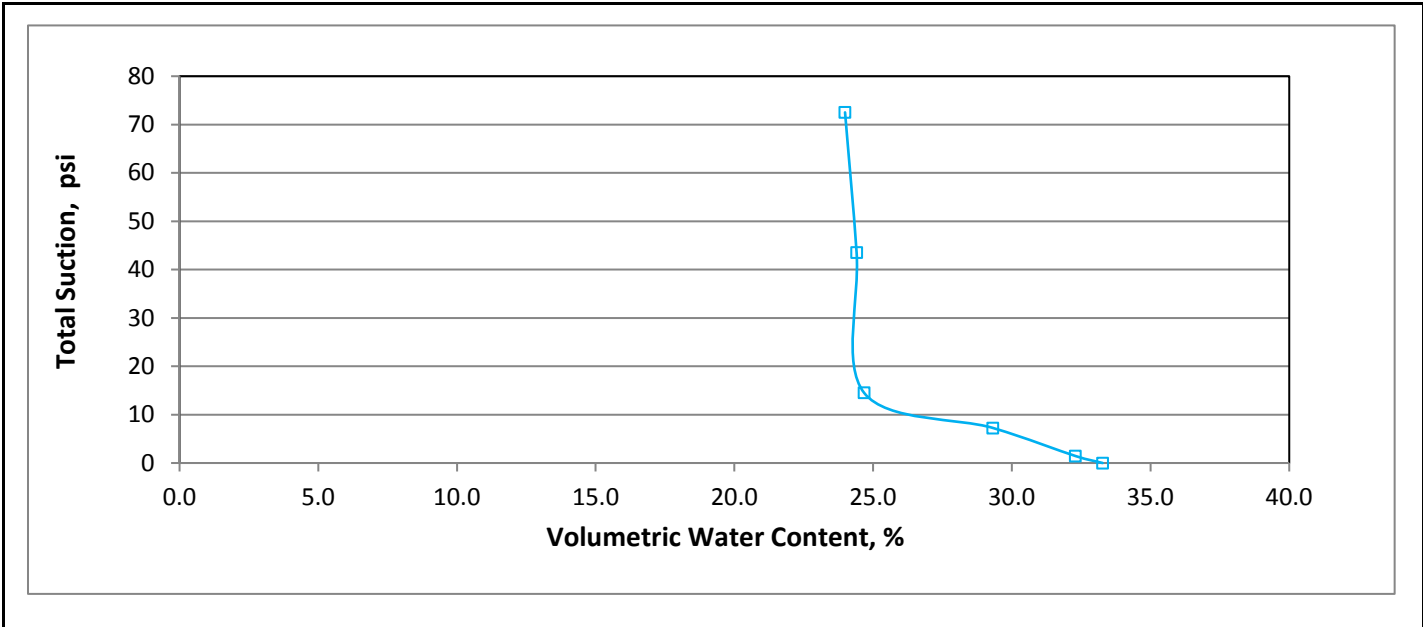
Initial Moisture, %/Vol:	32.0
Dry Unit Weight (pcf):	110.4

Applied Suction:

Point	1	2	3	4	5	6
psi	0	1.45	7.25	14.5	43.5	72.5
kpa	0	10	50	100	300	500

Volumetric Water Content:

Point	1	2	3	4	5	6
%	33.3	32.3	29.3	24.7	24.4	24.0





Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Tested By:	jm
Checked By:	
Date:	3/17/2017
Sample No.:	400-SB-08
Sample Depth:	10-15
Sample Description:	Moist, light brown gravel with silt and sand

Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge by ASTM D6836

Saturation Liquid:	Distilled, De-aired Water	Method:	C
Saturation Method:	Tray	Porous Material:	Membrane
Temperature of Soil:	20 °C		

Initial Specimen:

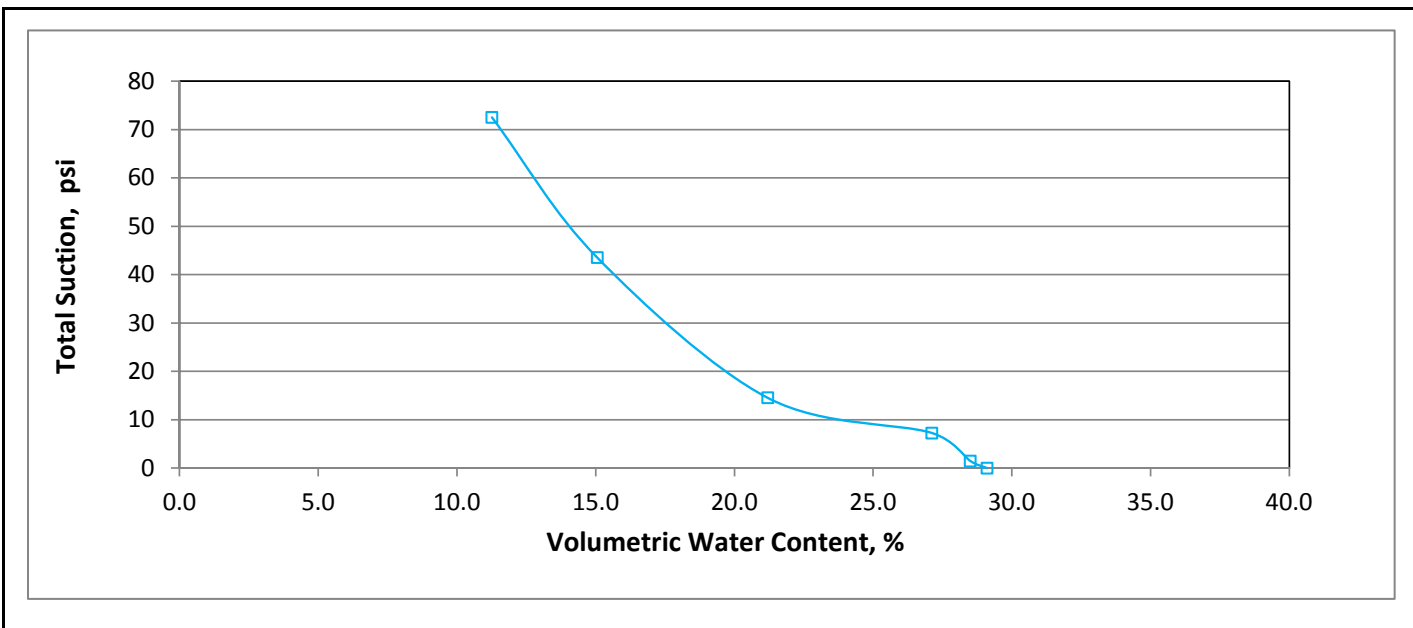
Initial Moisture, %/Vol:	28.2
Dry Unit Weight (pcf):	117.2

Applied Suction:

Point	1	2	3	4	5	6
psi	0	1.45	7.25	14.5	43.5	72.5
kpa	0	10	50	100	300	500

Volumetric Water Content:

Point	1	2	3	4	5	6
%	29.1	28.5	27.1	21.2	15.1	11.3





Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Tested By:	jm
Checked By:	
Date:	3/17/2017
Sample No.:	400-SB-09
Sample Depth:	12.5-15
Sample Description:	Moist, light brown gravel with clay and sand

Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge by ASTM D6836

Saturation Liquid:	Distilled, De-aired Water	Method:	C
Saturation Method:	Tray	Porous Material:	Membrane
Temperature of Soil:	20 °C		

Initial Specimen:

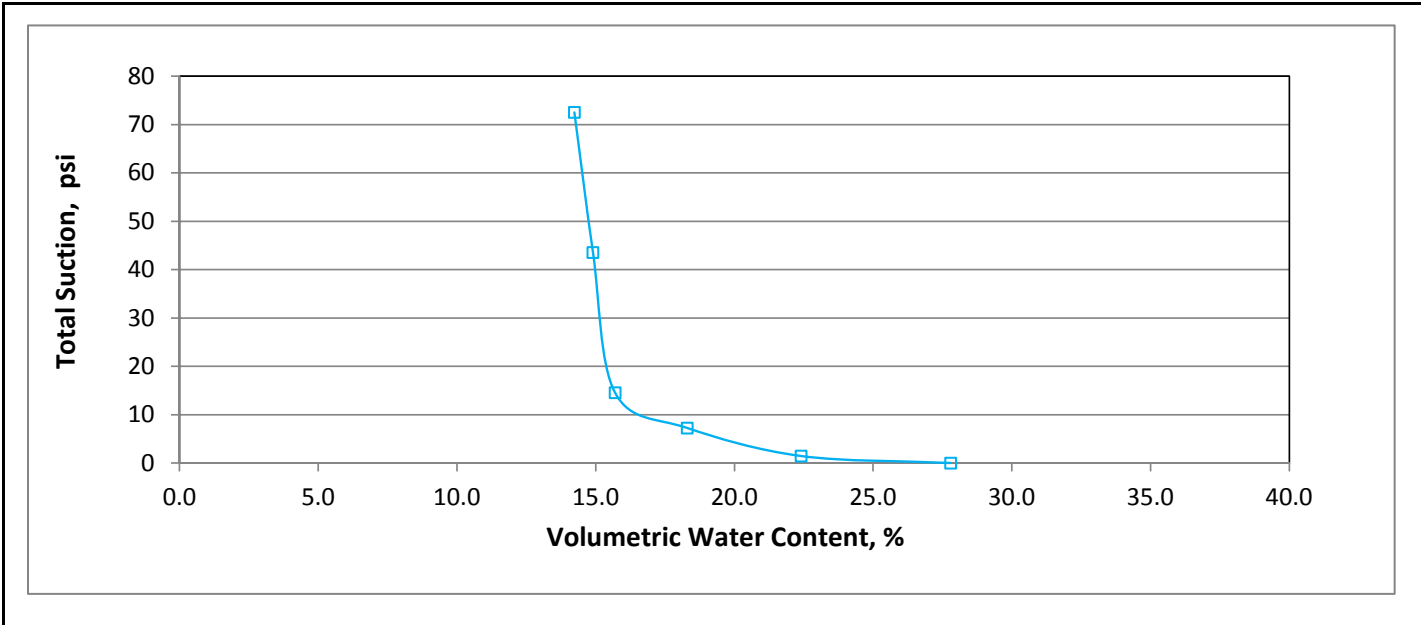
Initial Moisture, %/Vol:	26.3
Dry Unit Weight (pcf):	119.6

Applied Suction:

Point	1	2	3	4	5	6
psi	0	1.45	7.25	14.5	43.5	72.5
kpa	0	10	50	100	300	500

Volumetric Water Content:

Point	1	2	3	4	5	6
%	27.8	22.4	18.3	15.7	14.9	14.2





Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Tested By:	jm
Checked By:	
Date:	3/17/2017
Sample No.:	400-SB-09
Sample Depth:	20-25 ft
Sample Description:	Moist, light brown gravel with clay and sand

Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge by ASTM D6836

Saturation Liquid:	Distilled, De-aired Water	Method:	C
Saturation Method:	Tray	Porous Material:	Membrane
Temperature of Soil:	20 °C		

Initial Specimen:

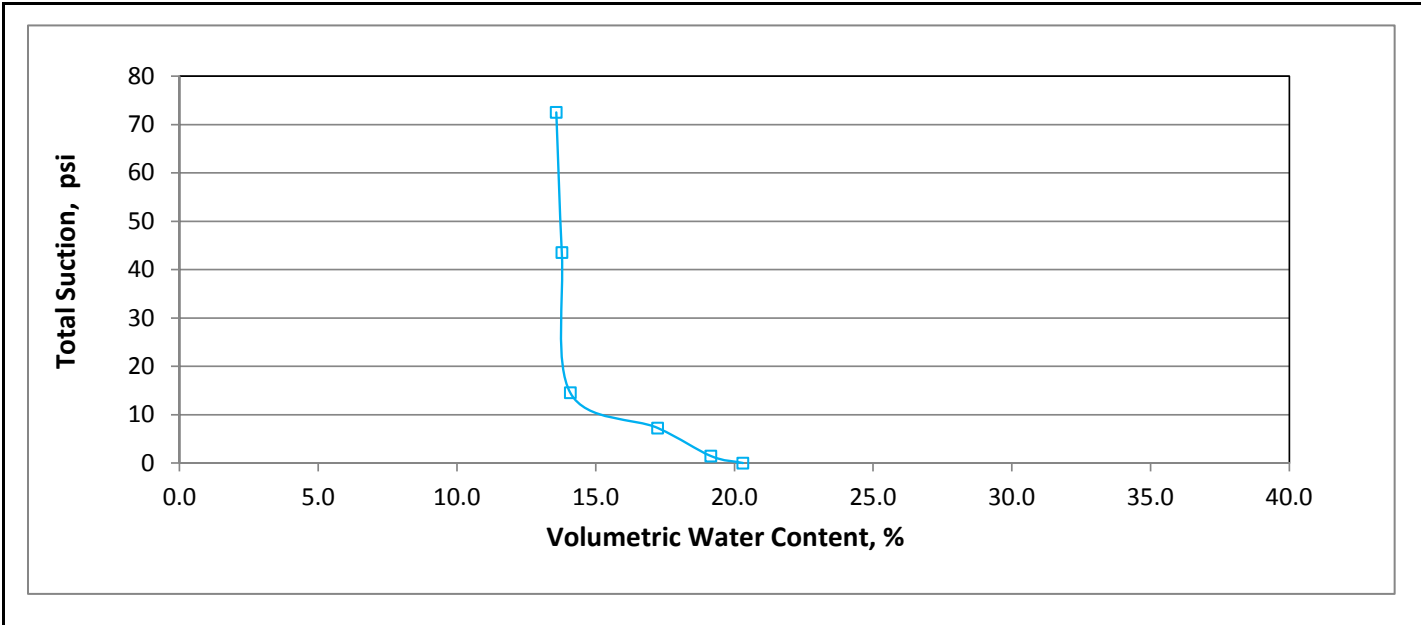
Initial Moisture, %/Vol:	21.2
Dry Unit Weight (pcf):	127.7

Applied Suction:

Point	1	2	3	4	5	6
psi	0	1.45	7.25	14.5	43.5	72.5
kpa	0	10	50	100	300	500

Volumetric Water Content:

Point	1	2	3	4	5	6
%	20.3	19.1	17.2	14.1	13.8	13.6





Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Tested By:	jm
Checked By:	
Date:	2/21/2017
Sample No.:	400-SB-10
Sample Depth:	15-20
Sample Description:	Moist, pale brown clayey gravel with sand

Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge by ASTM D6836

Saturation Liquid:	Distilled, De-aired Water	Method:	C
Saturation Method:	Tray	Porous Material:	Membrane
Temperature of Soil:	20 °C		

Initial Specimen:

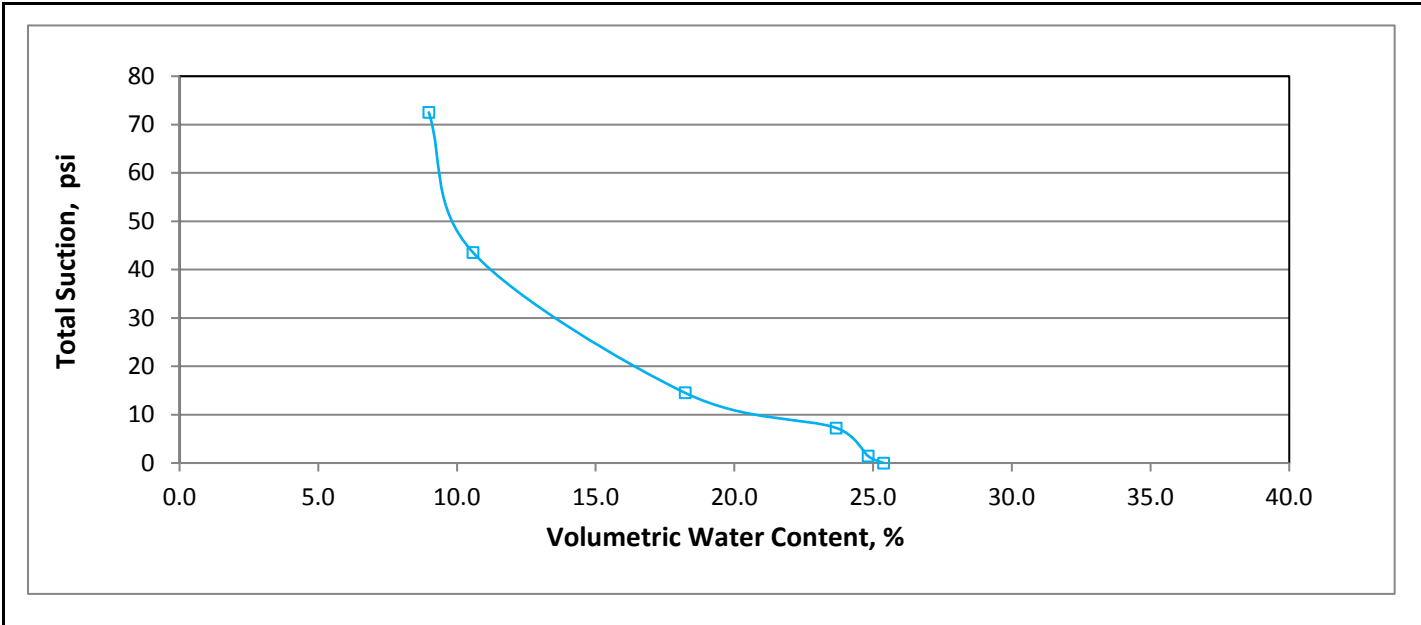
Initial Moisture, %/Vol:	26.9
Dry Unit Weight (pcf):	121.7

Applied Suction:

Point	1	2	3	4	5	6
psi	0	1.45	7.25	14.5	43.5	72.5
kpa	0	10	50	100	300	500

Volumetric Water Content:

Point	1	2	3	4	5	6
%	25.4	24.8	23.7	18.2	10.6	9.0





Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Tested By:	jm
Checked By:	
Date:	2/21/2017
Sample No.:	400-SB-10
Sample Depth:	20-25
Sample Description:	Moist, pale brown clayey gravel with sand

Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge by ASTM D6836

Saturation Liquid:	Distilled, De-aired Water	Method:	C
Saturation Method:	Tray	Porous Material:	Membrane
Temperature of Soil:	20 °C		

Initial Specimen:

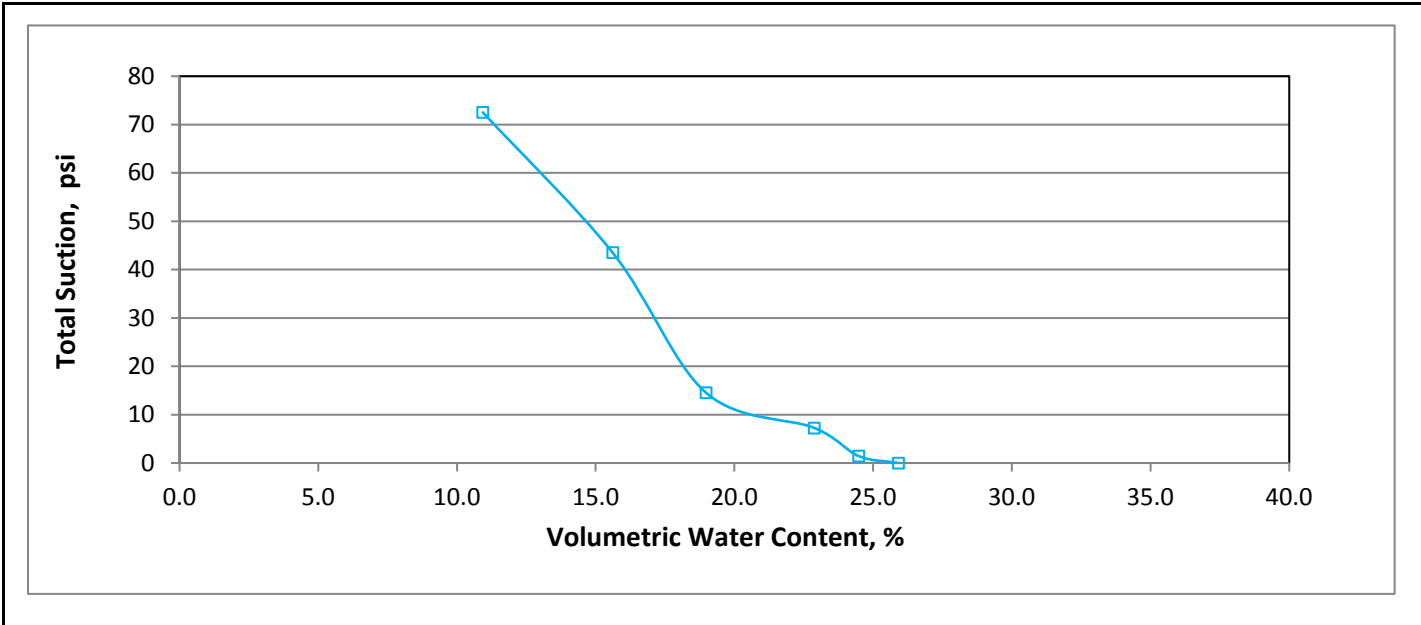
Initial Moisture, %/Vol:	26.2
Dry Unit Weight (pcf):	120.8

Applied Suction:

Point	1	2	3	4	5	6
psi	0	1.45	7.25	14.5	43.5	72.5
kpa	0	10	50	100	300	500

Volumetric Water Content:

Point	1	2	3	4	5	6
%	25.9	24.5	22.9	19.0	15.6	10.9





Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Tested By:	jm
Checked By:	
Date:	4/5/2017
Sample No.:	400-SB-11
Sample Depth:	15-20
Sample Description:	Moist, reddish brown silty gravel with sand

Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge by ASTM D6836

Saturation Liquid:	Distilled, De-aired Water	Method:	C
Saturation Method:	Tray	Porous Material:	Membrane
Temperature of Soil:	20 °C		

Initial Specimen:

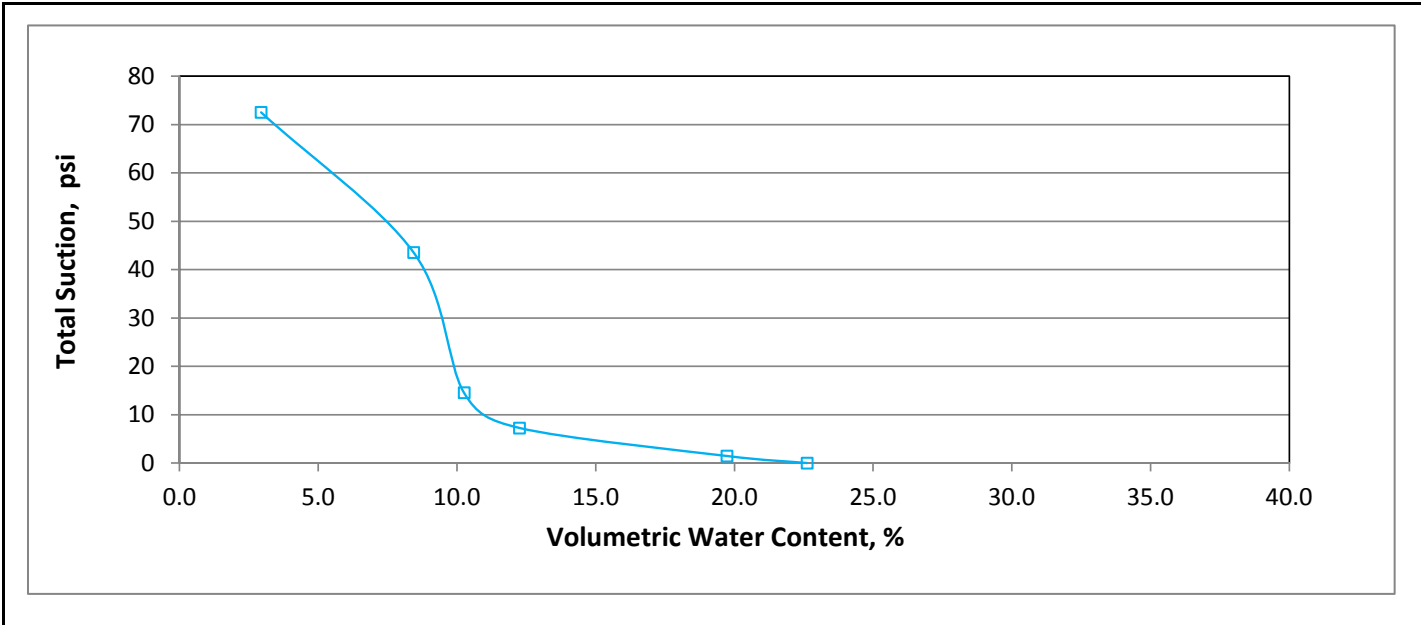
Initial Moisture, %/Vol:	26.1
Dry Unit Weight (pcf):	121.7

Applied Suction:

Point	1	2	3	4	5	6
psi	0	1.45	7.25	14.5	43.5	72.5
kpa	0	10	50	100	300	500

Volumetric Water Content:

Point	1	2	3	4	5	6
%	22.6	19.7	12.3	10.3	8.4	2.9





Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Tested By:	jm
Checked By:	
Date:	4/5/2017
Sample No.:	400-SB-11
Sample Depth:	20-25
Sample Description:	Moist, reddish brown silty, clayey gravel with sand

Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge by ASTM D6836

Saturation Liquid:	Distilled, De-aired Water	Method:	C
Saturation Method:	Tray	Porous Material:	Membrane
Temperature of Soil:	20 °C		

Initial Specimen:

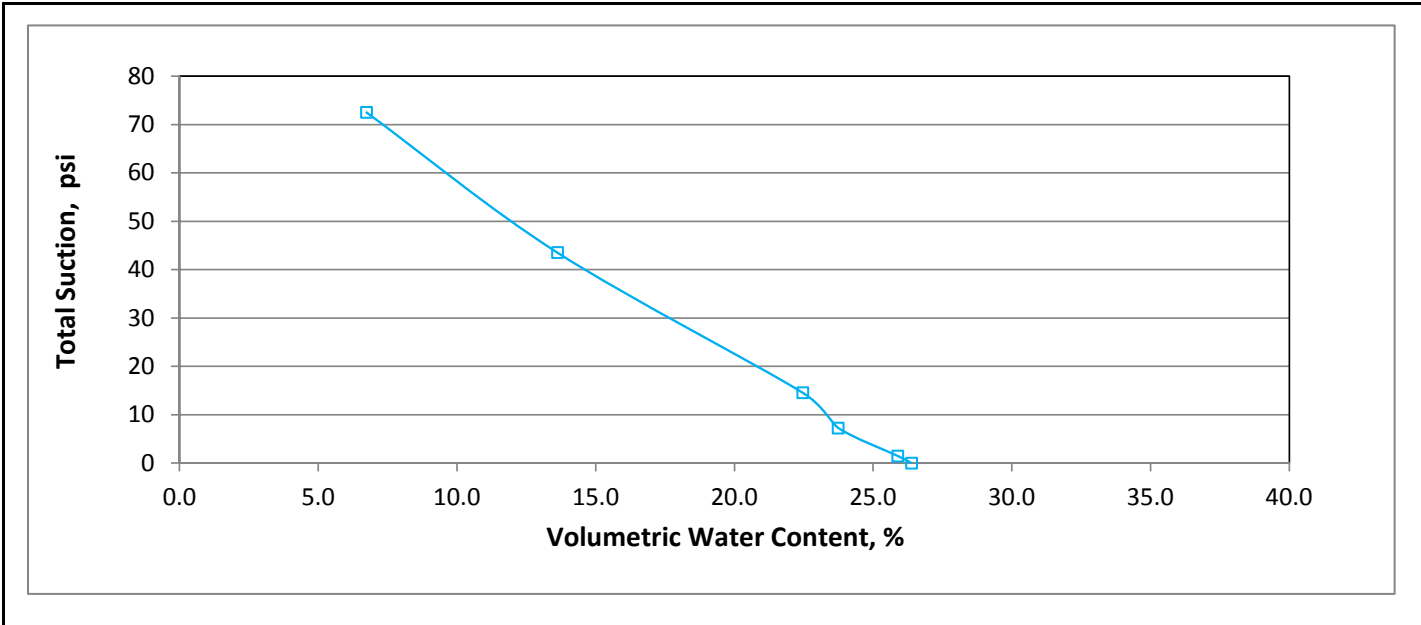
Initial Moisture, %/Vol:	26.7
Dry Unit Weight (pcf):	120.4

Applied Suction:

Point	1	2	3	4	5	6
psi	0	1.45	7.25	14.5	43.5	72.5
kpa	0	10	50	100	300	500

Volumetric Water Content:

Point	1	2	3	4	5	6
%	26.4	25.9	23.7	22.5	13.6	6.7





Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Tested By:	jm
Checked By:	
Date:	2/21/2017
Sample No.:	400-SB-12
Sample Depth:	40-45
Sample Description:	Moist, pale brown clayey gravel with sand

Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge by ASTM D6836

Saturation Liquid:	Distilled, De-aired Water	Method:	C
Saturation Method:	Tray	Porous Material:	Membrane
Temperature of Soil:	20 °C		

Initial Specimen:

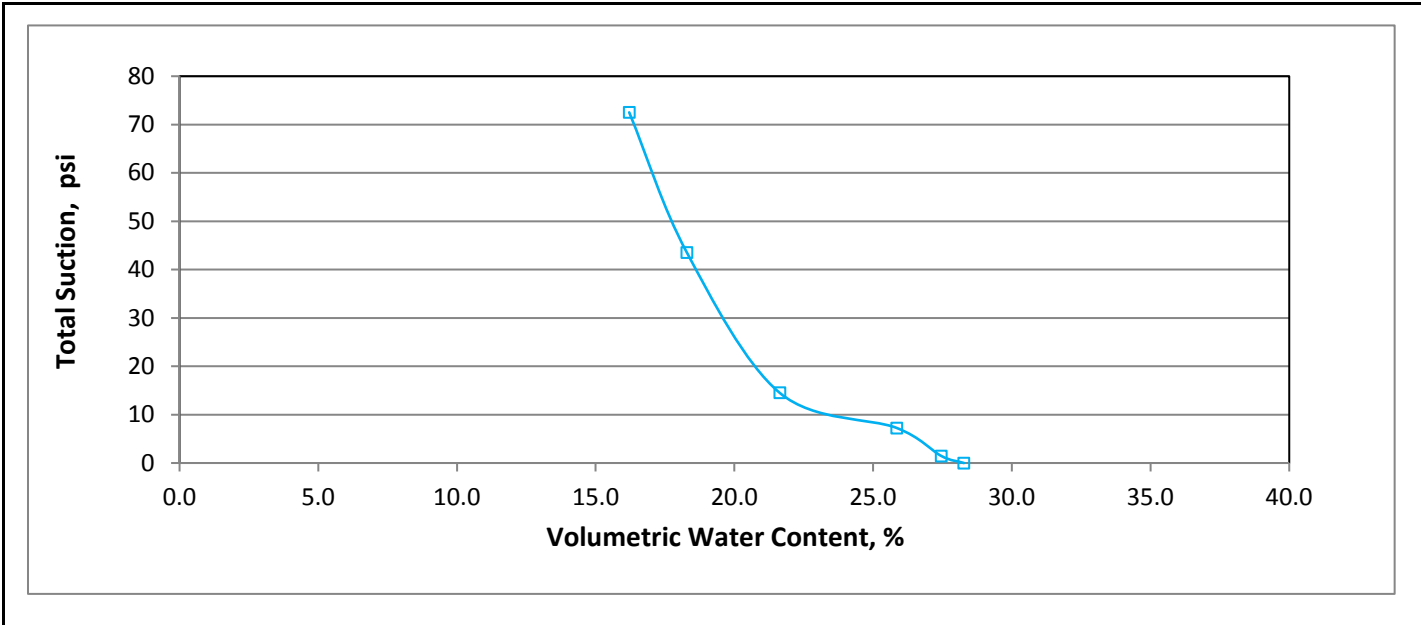
Initial Moisture, %/Vol:	28.2
Dry Unit Weight (pcf):	118.7

Applied Suction:

Point	1	2	3	4	5	6
psi	0	1.45	7.25	14.5	43.5	72.5
kpa	0	10	50	100	300	500

Volumetric Water Content:

Point	1	2	3	4	5	6
%	28.3	27.5	25.9	21.6	18.3	16.2





Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Tested By:	jm
Checked By:	
Date:	2/21/2017
Sample No.:	400-SB-12
Sample Depth:	45-50
Sample Description:	Moist, pale brown clayey gravel with sand

Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge by ASTM D6836

Saturation Liquid:	Distilled, De-aired Water	Method:	C
Saturation Method:	Tray	Porous Material:	Membrane
Temperature of Soil:	20 °C		

Initial Specimen:

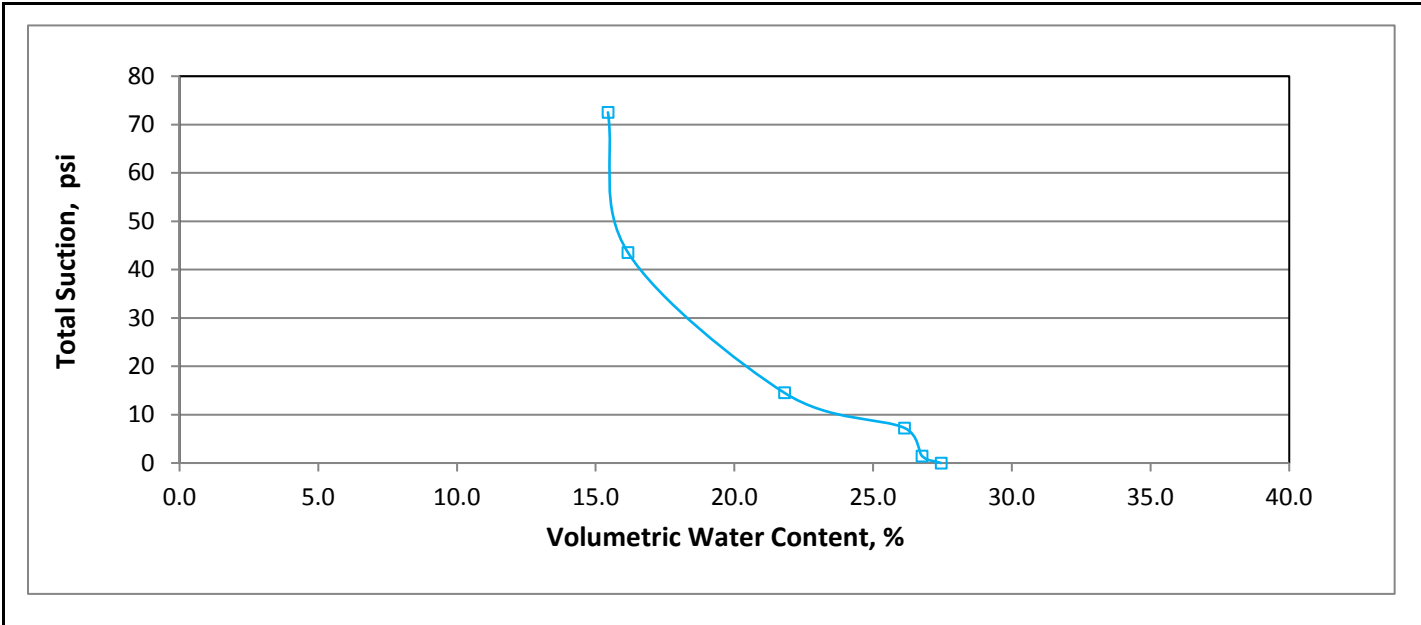
Initial Moisture, %/Vol:	27.5
Dry Unit Weight (pcf):	119.7

Applied Suction:

Point	1	2	3	4	5	6
psi	0	1.45	7.25	14.5	43.5	72.5
kpa	0	10	50	100	300	500

Volumetric Water Content:

Point	1	2	3	4	5	6
%	27.4	26.8	26.1	21.8	16.2	15.4





Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Tested By:	jm
Checked By:	
Date:	3/17/2017
Sample No.:	400-SB-13
Sample Depth:	60-65
Sample Description:	Moist, light brown gravel with clay and sand

Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge by ASTM D6836

Saturation Liquid:	Distilled, De-aired Water	Method:	C
Saturation Method:	Tray	Porous Material:	Membrane
Temperature of Soil:	20 °C		

Initial Specimen:

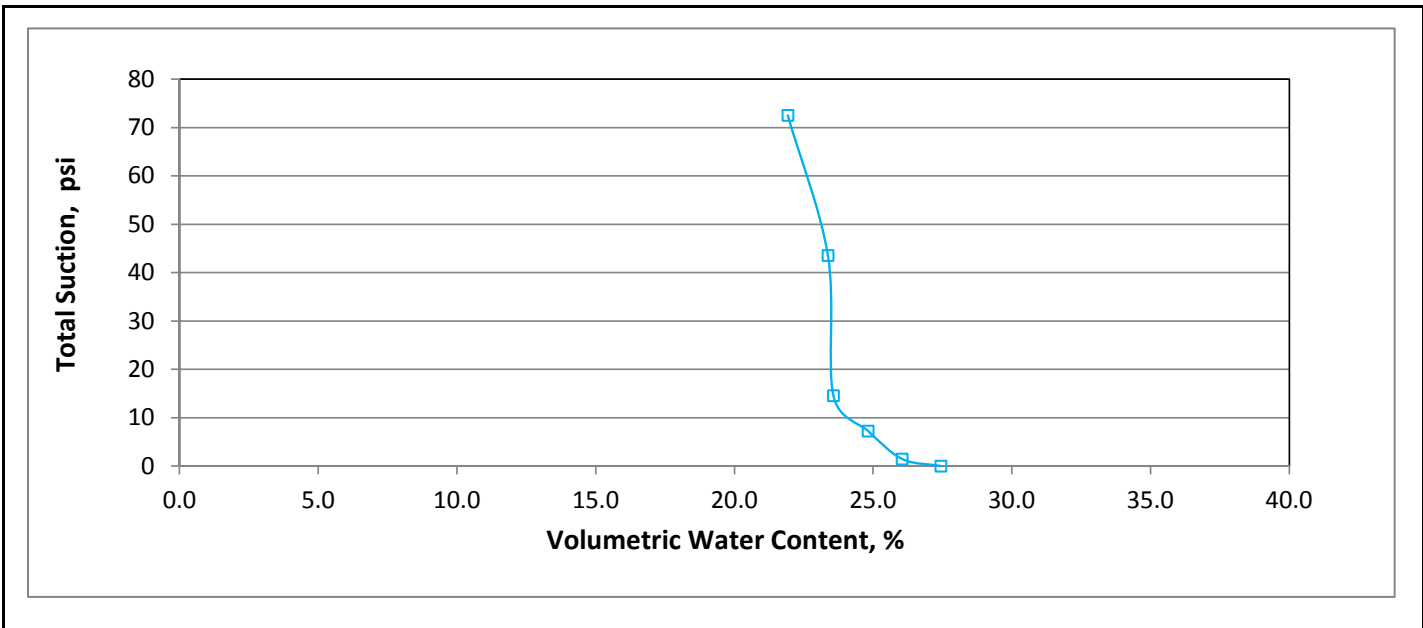
Initial Moisture, %/Vol:	24.2
Dry Unit Weight (pcf):	122.5

Applied Suction:

Point	1	2	3	4	5	6
psi	0	1.45	7.25	14.5	43.5	72.5
kpa	0	10	50	100	300	500

Volumetric Water Content:

Point	1	2	3	4	5	6
%	27.4	26.0	24.8	23.6	23.4	21.9





Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Tested By:	jm
Checked By:	
Date:	3/17/2017
Sample No.:	400-SB-14
Sample Depth:	65-70
Sample Description:	Moist, pale brown clayey gravel with sand

Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge by ASTM D6836

Saturation Liquid:	Distilled, De-aired Water	Method:	C
Saturation Method:	Tray	Porous Material:	Membrane
Temperature of Soil:	20 °C		

Initial Specimen:

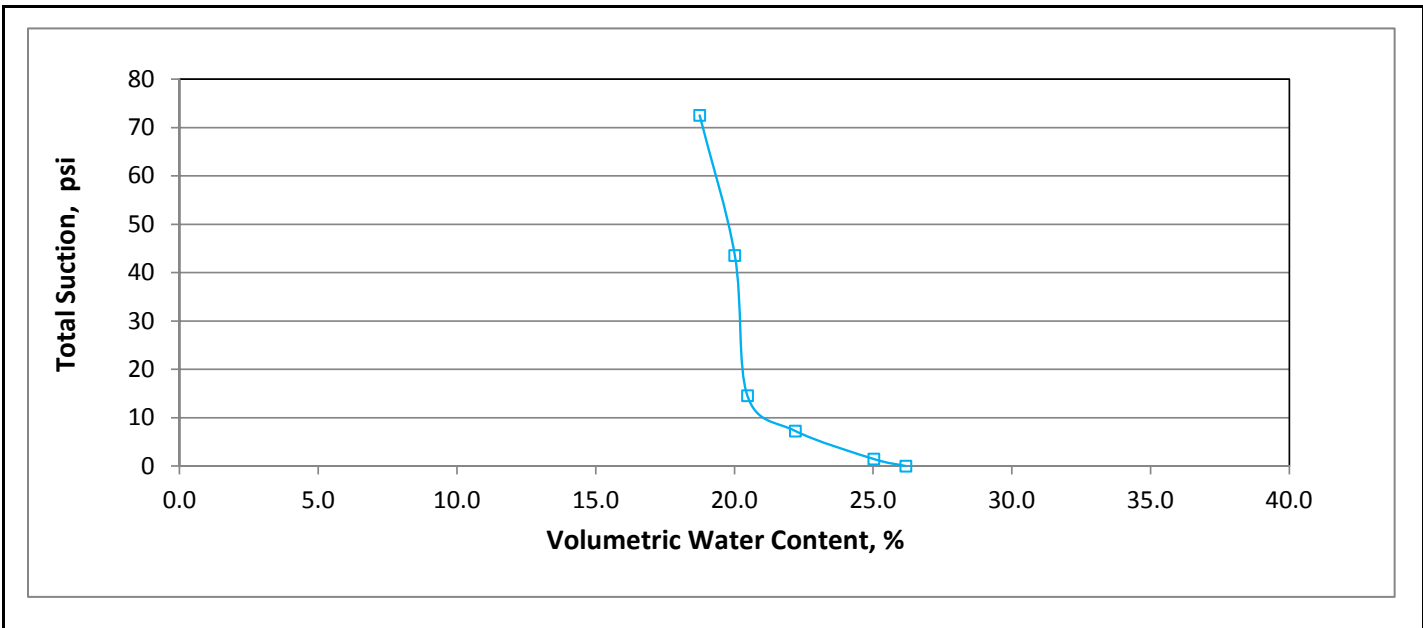
Initial Moisture, %/Vol:	23.2
Dry Unit Weight (pcf):	122.3

Applied Suction:

Point	1	2	3	4	5	6
psi	0	1.45	7.25	14.5	43.5	72.5
kpa	0	10	50	100	300	500

Volumetric Water Content:

Point	1	2	3	4	5	6
%	26.2	25.0	22.2	20.5	20.0	18.7





Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Tested By:	jm
Checked By:	
Date:	3/17/2017
Sample No.:	400-SB-14
Sample Depth:	70-75
Sample Description:	Moist, light brown clayey gravel with sand

Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge by ASTM D6836

Saturation Liquid:	Distilled, De-aired Water	Method:	C
Saturation Method:	Tray	Porous Material:	Membrane
Temperature of Soil:	20 °C		

Initial Specimen:

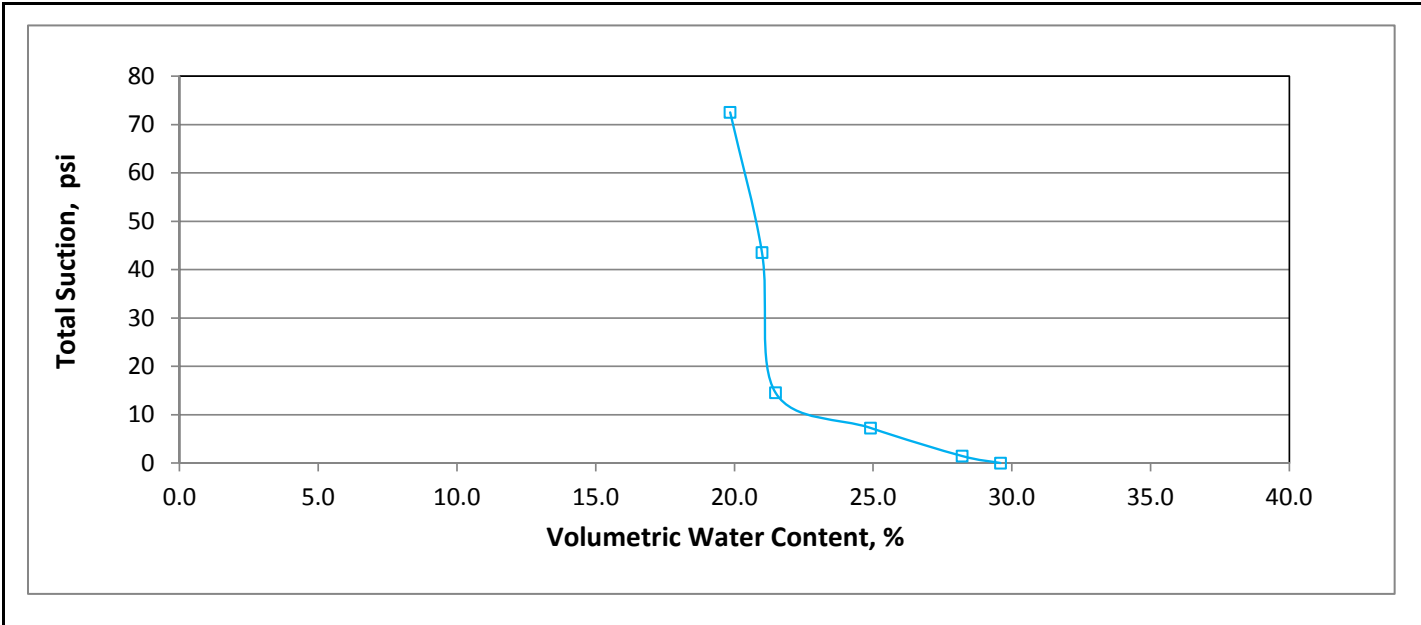
Initial Moisture, %/Vol:	31.3
Dry Unit Weight (pcf):	116.5

Applied Suction:

Point	1	2	3	4	5	6
psi	0	1.45	7.25	14.5	43.5	72.5
kpa	0	10	50	100	300	500

Volumetric Water Content:

Point	1	2	3	4	5	6
%	29.6	28.2	24.9	21.5	21.0	19.8





Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Tested By:	jm
Checked By:	
Date:	2/21/2017
Sample No.:	400-SB-15
Sample Depth:	15-20
Sample Description:	Moist, pale brown clayey gravel with sand

Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge by ASTM D6836

Saturation Liquid:	Distilled, De-aired Water	Method:	C
Saturation Method:	Tray	Porous Material:	Membrane
Temperature of Soil:	20 °C		

Initial Specimen:

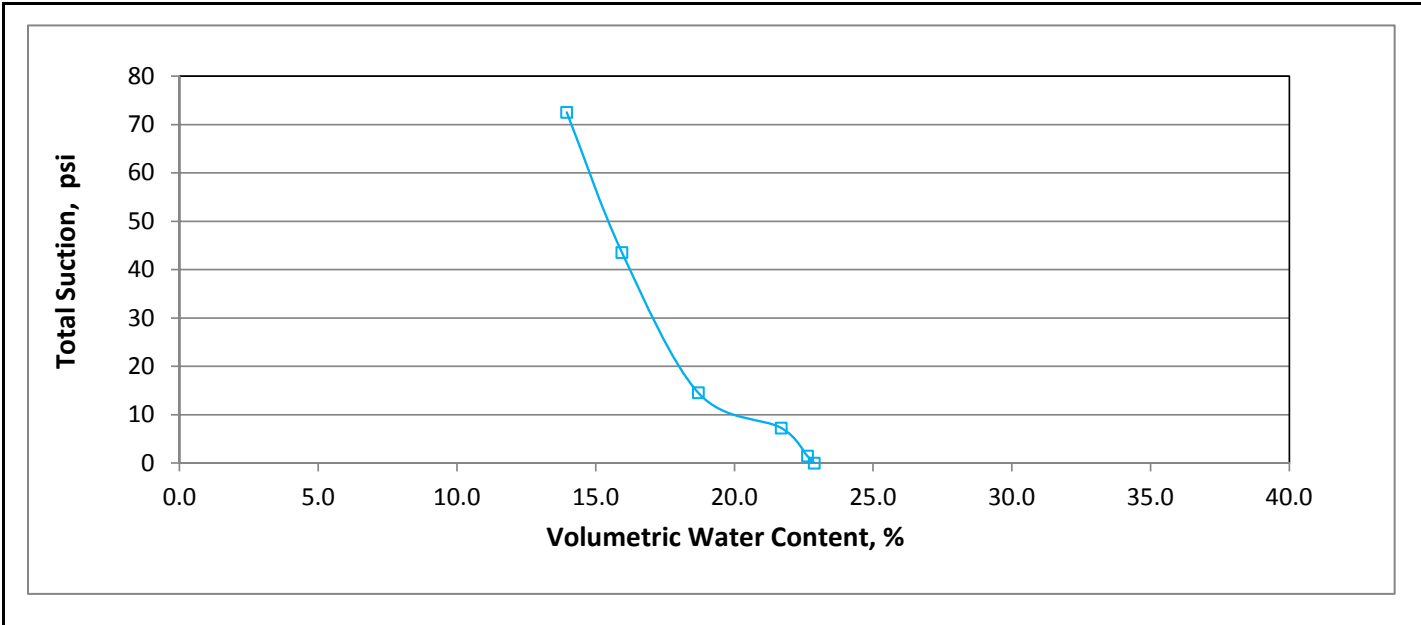
Initial Moisture, %/Vol:	24.7
Dry Unit Weight (pcf):	120.5

Applied Suction:

Point	1	2	3	4	5	6
psi	0	1.45	7.25	14.5	43.5	72.5
kpa	0	10	50	100	300	500

Volumetric Water Content:

Point	1	2	3	4	5	6
%	22.9	22.6	21.7	18.7	15.9	14.0





Client:	Navarro Research & Engineering, Inc.		
Project:	Soil Property Testing from NASA White Sands Test Facility		
Location:	Las Cruces, NM		
GTX No.:	305503		
Tested By:	jm		
Checked By:			
Date:	2/21/2017		
Sample No.:	400-SB-15 #2		
Sample Depth:	15-20		
Sample Description:	Moist, pale brown clayey gravel with sand		

Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge by ASTM D6836

Saturation Liquid:	Distilled, De-aired Water	Method:	C
Saturation Method:	Tray	Porous Material:	Membrane
Temperature of Soil:	20 °C		

Initial Specimen:

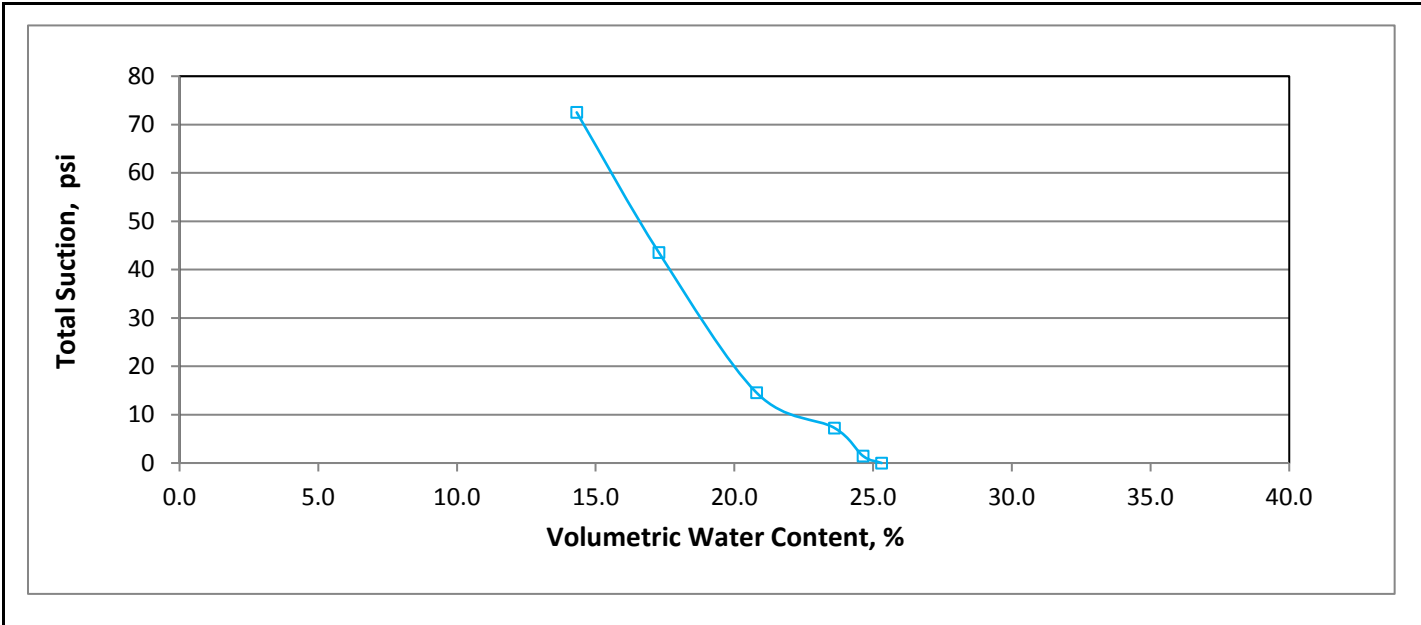
Initial Moisture, %/Vol:	27.2
Dry Unit Weight (pcf):	119.5

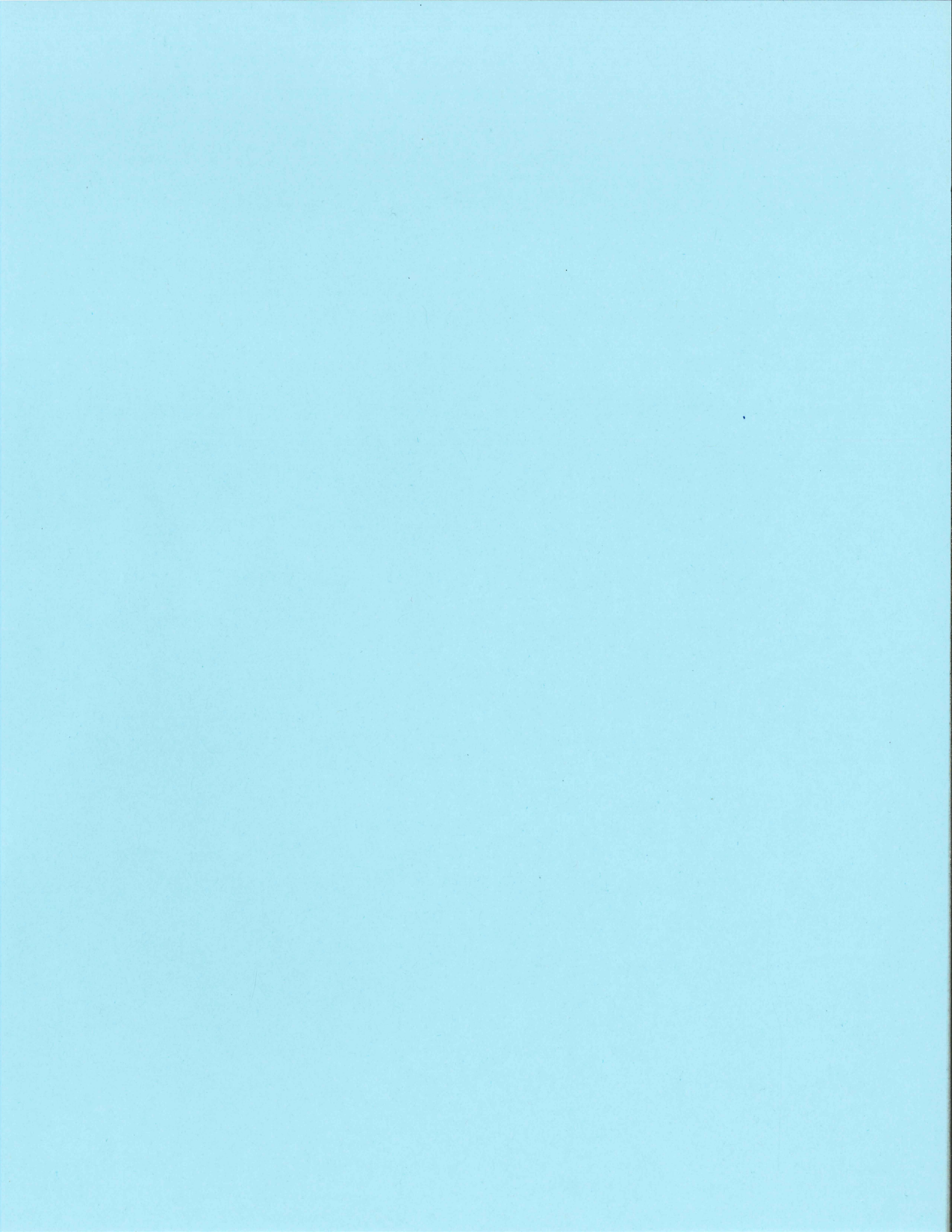
Applied Suction:

Point	1	2	3	4	5	6
psi	0	1.45	7.25	14.5	43.5	72.5
kpa	0	10	50	100	300	500

Volumetric Water Content:

Point	1	2	3	4	5	6
%	25.3	24.6	23.6	20.8	17.3	14.3

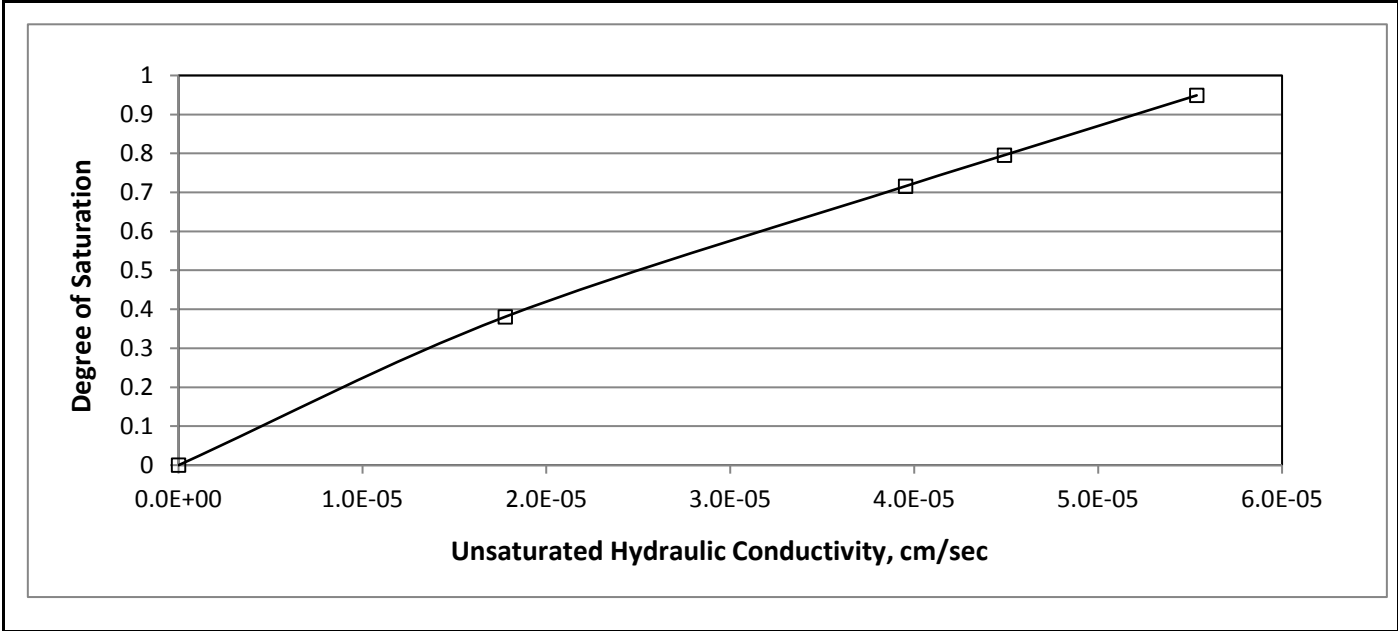






Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Date:	2/21/2017
Sample No.:	400-SB-02
Sample Depth, ft:	0-10
Sample Description:	Moist, light reddish brown silty sand with gravel

Unsaturated Hydraulic Conductivity vs Degree of Saturation



Sample Properties

Particle Size Distribution:	Moisture Content, %:	3.7
Gravel, %: 32.4	Specific Gravity:	2.69
Sand, %: 43.8	Porosity:	0.36
Fines, %: 23.8	Saturated Hydraulic Conductivity, cm/sec:	5.2E-05
*Material >3/8-inch Removed from Test Specimen, %:	25.0	

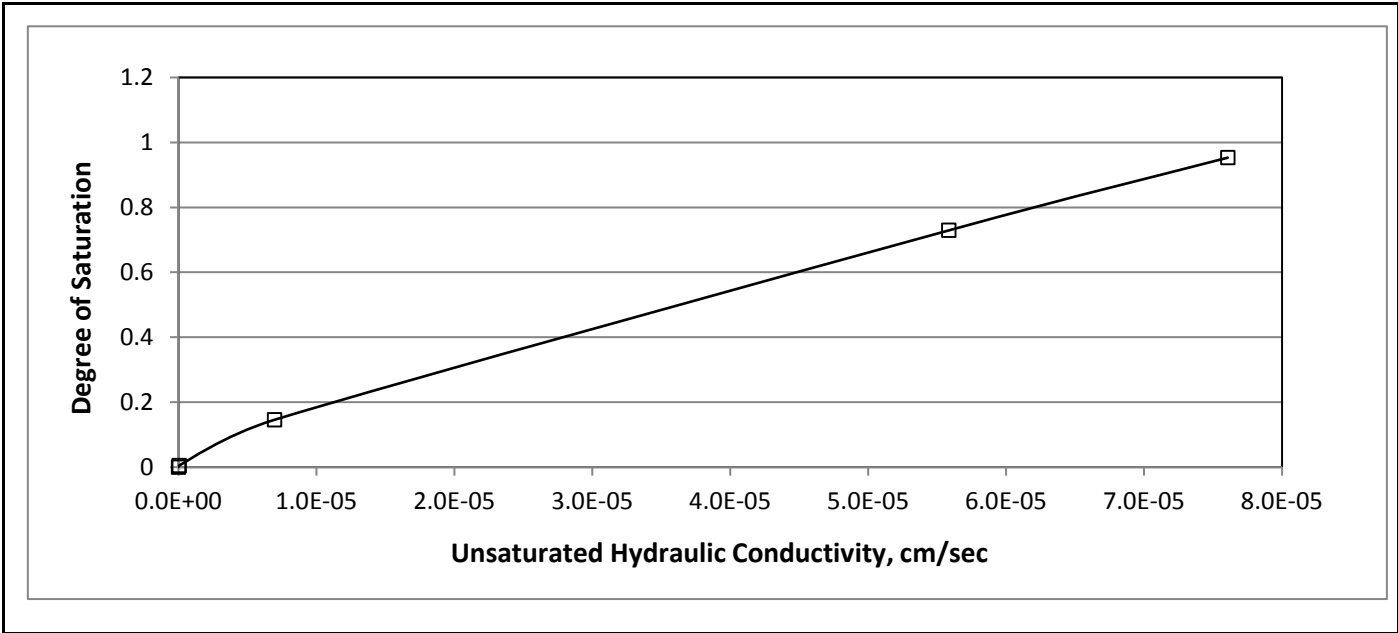
Notes: Calculations based on the Mualem's (1976) model for Predicting the Hydraulic Conductivity of Unsaturated Porous Media

*Only material passing a 3/8-inch sieve used for testing



Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Date:	2/21/2017
Sample No.:	400-SB-03
Sample Depth, ft:	30-35
Sample Description:	Moist, reddish brown gravel with clay and sand

Unsaturated Hydraulic Conductivity vs Degree of Saturation



Sample Properties

Particle Size Distribution:	Moisture Content, %:	1.2
Gravel, %:	Specific Gravity:	2.68
Sand, %:	Porosity:	0.28
Fines, %:	Saturated Hydraulic Conductivity, cm/sec:	8.3E-05
*Material > 3/8-inch Removed from Test Specimen, %:		50.0

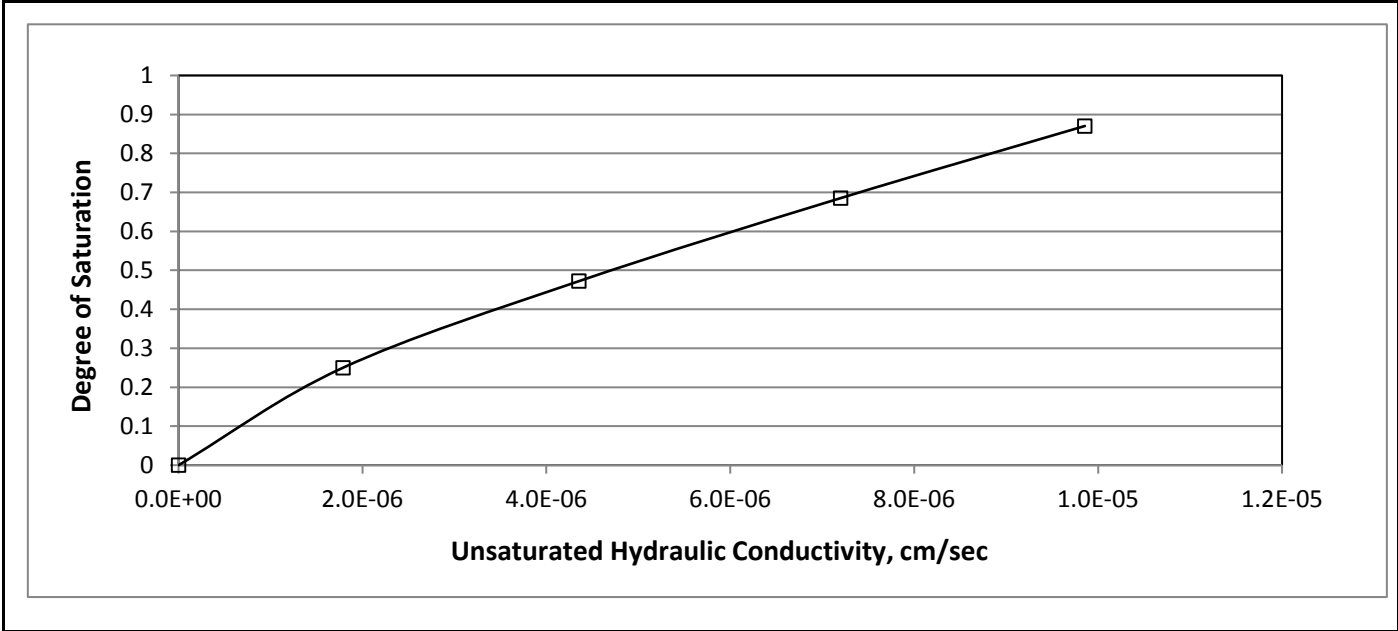
Notes: Calculations based on the Mualem's (1976) model for Predicting the Hydraulic Conductivity of Unsaturated Porous Media

*Only material passing a 3/8-inch sieve used for testing



Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Date:	2/21/2017
Sample No.:	400-SB-03
Sample Depth, ft:	35-40
Sample Description:	Moist, pale brown clayey gravel with sand

Unsaturated Hydraulic Conductivity vs Degree of Saturation



Sample Properties

Particle Size Distribution:	Moisture Content, %:	1.7
Gravel, %: 58.8	Specific Gravity:	2.64
Sand, %: 25.3	Porosity:	0.27
Fines, %: 15.9	Saturated Hydraulic Conductivity, cm/sec:	6.2E-06
*Material >3/8-inch Removed from Test Specimen, %:	50.0	

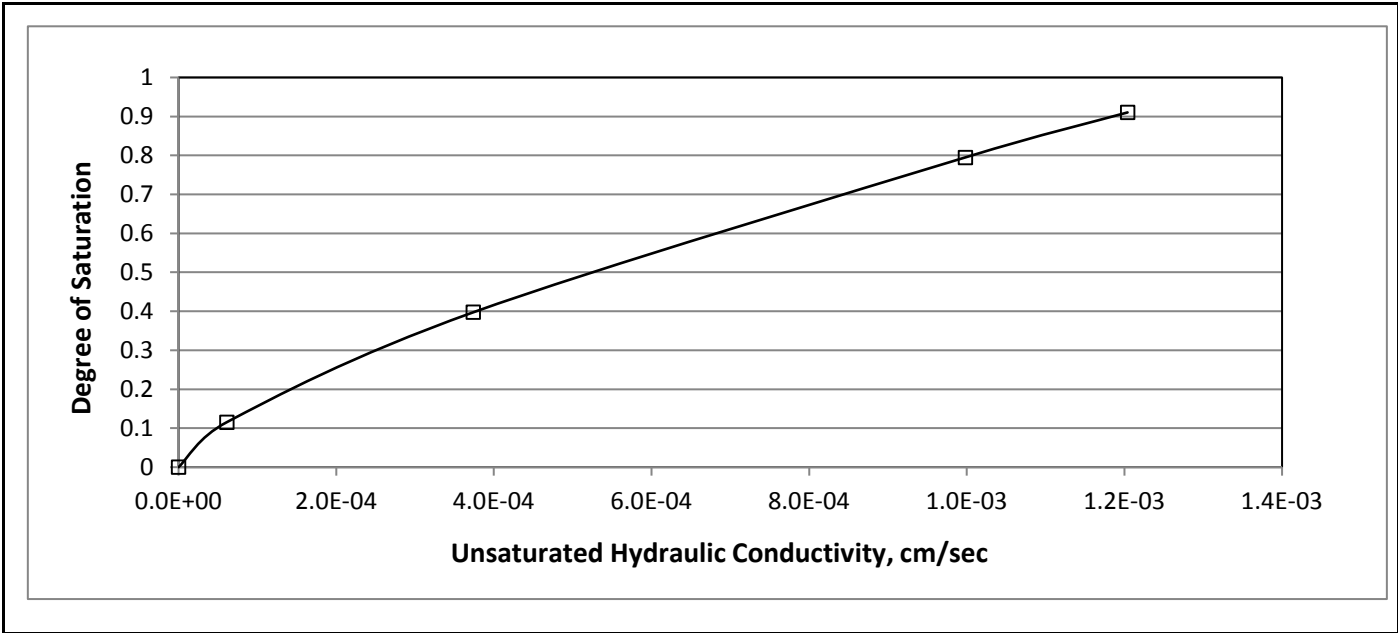
Notes: Calculations based on the Mualem's (1976) model for Predicting the Hydraulic Conductivity of Unsaturated Porous Media

*Only material passing a 3/8-inch sieve used for testing



Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Date:	2/21/2017
Sample No.:	400-SB-04
Sample Depth, ft:	90-93
Sample Description:	Moist, brown clayey gravel with sand

Unsaturated Hydraulic Conductivity vs Degree of Saturation



Sample Properties

Particle Size Distribution:	Moisture Content, %:	3.5
Gravel, %: 43.9	Specific Gravity:	2.67
Sand, %: 42.8	Porosity:	0.33
Fines, %: 13.3	Saturated Hydraulic Conductivity, cm/sec:	4.0E-04
*Material > 3/8-inch Removed from Test Specimen, %:		27.0

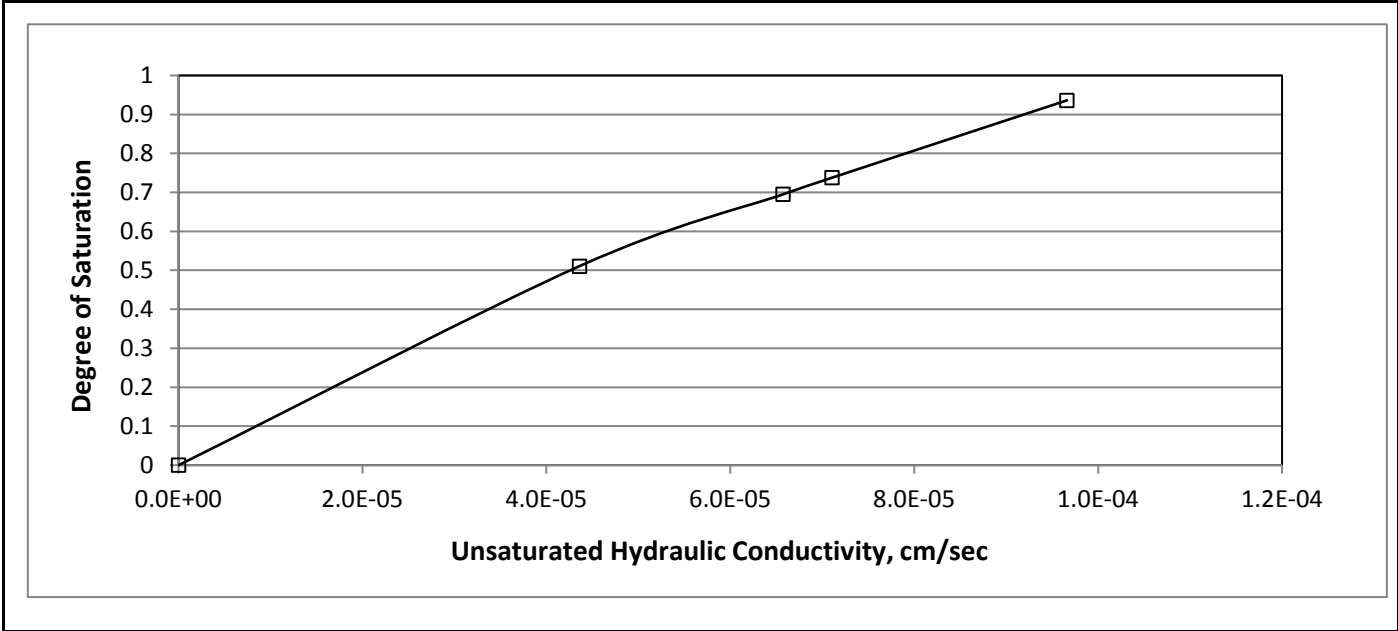
Notes: Calculations based on the Mualem's (1976) model for Predicting the Hydraulic Conductivity of Unsaturated Porous Media

*Only material passing a 3/8-inch sieve used for testing



Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Date:	2/21/2017
Sample No.:	400-SB-05
Sample Depth, ft:	0-10
Sample Description:	Moist, light reddish brown clayey sand with gravel

Unsaturated Hydraulic Conductivity vs Degree of Saturation



Sample Properties

Particle Size Distribution:	Moisture Content, %:	8.0
Gravel, %: 32.0	Specific Gravity:	2.70
Sand, %: 41.2	Porosity:	0.42
Fines, %: 26.8	Saturated Hydraulic Conductivity, cm/sec:	6.0E-05
*Material > 3/8-inch Removed from Test Specimen, %:		21.0

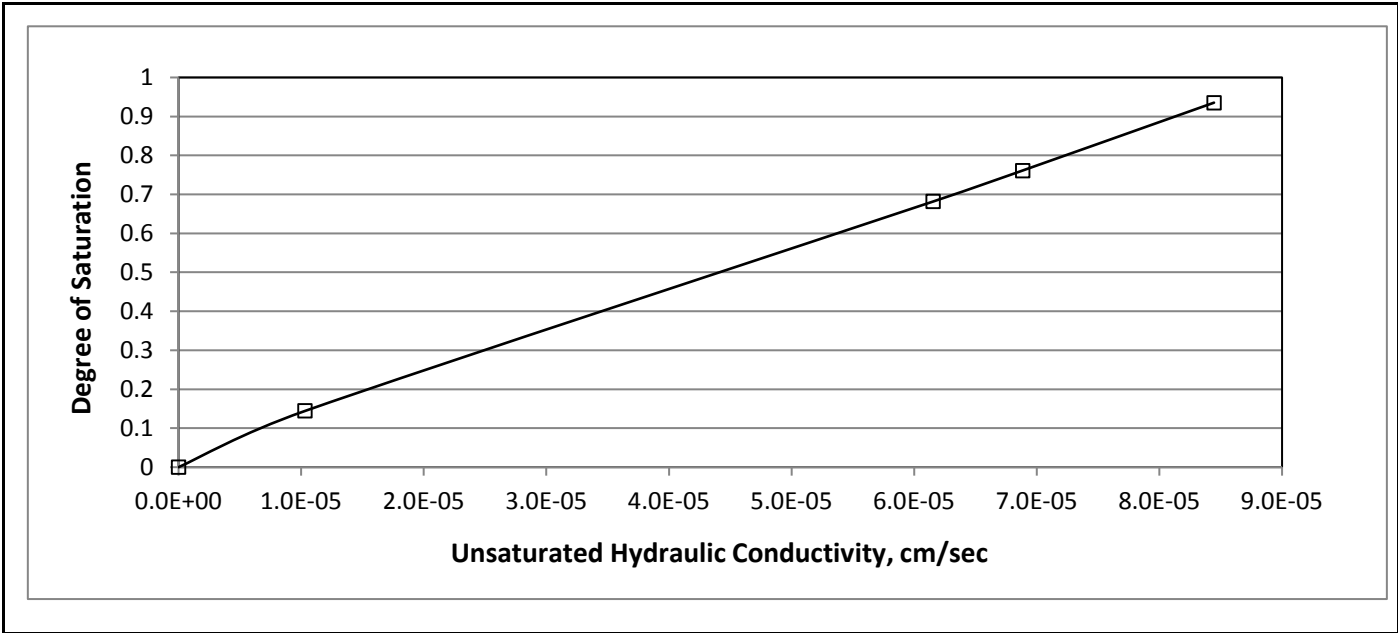
Notes: Calculations based on the Mualem's (1976) model for Predicting the Hydraulic Conductivity of Unsaturated Porous Media

*Only material passing a 3/8-inch sieve used for testing



Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Date:	2/21/2017
Sample No.:	400-SB-06
Sample Depth, ft:	20-24
Sample Description:	Moist, light reddish brown gravel with silty clay and sand

Unsaturated Hydraulic Conductivity vs Degree of Saturation



Sample Properties

Particle Size Distribution:	Moisture Content, %:	2.2
Gravel, %: 56.5	Specific Gravity:	2.70
Sand, %: 33.7	Porosity:	0.32
Fines, %: 9.8	Saturated Hydraulic Conductivity, cm/sec:	1.6E-04
*Material >3/8-inch Removed from Test Specimen, %:	46.0	

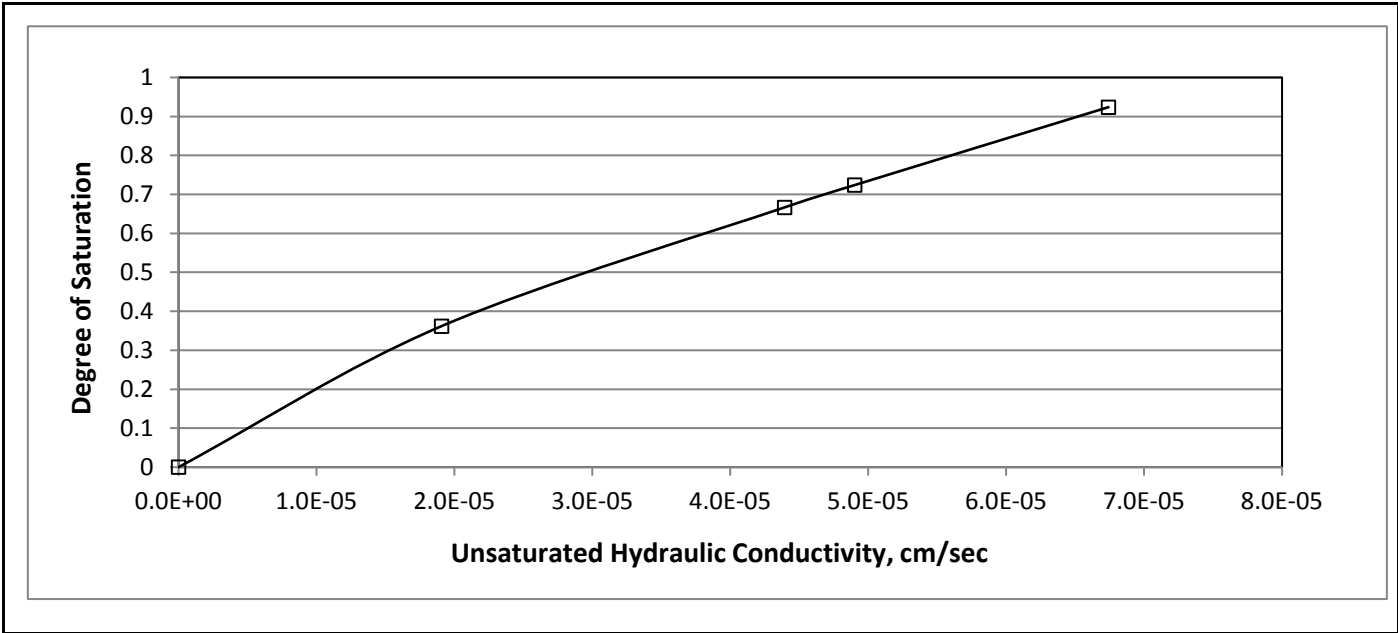
Notes: Calculations based on the Mualem's (1976) model for Predicting the Hydraulic Conductivity of Unsaturated Porous Media

*Only material passing a 3/8-inch sieve used for testing



Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Date:	2/21/2017
Sample No.:	400-SB-06
Sample Depth, ft:	25-30
Sample Description:	Moist, light reddish brown gravel with silty clay and sand

Unsaturated Hydraulic Conductivity vs Degree of Saturation



Sample Properties

Particle Size Distribution:	Moisture Content, %:	2.2
Gravel, %:	Specific Gravity:	2.70
Sand, %:	Porosity:	0.32
Fines, %:	Saturated Hydraulic Conductivity, cm/sec:	3.9E-05
60.4		
31.1		
8.5		
*Material >3/8-inch Removed from Test Specimen, %:		51.0

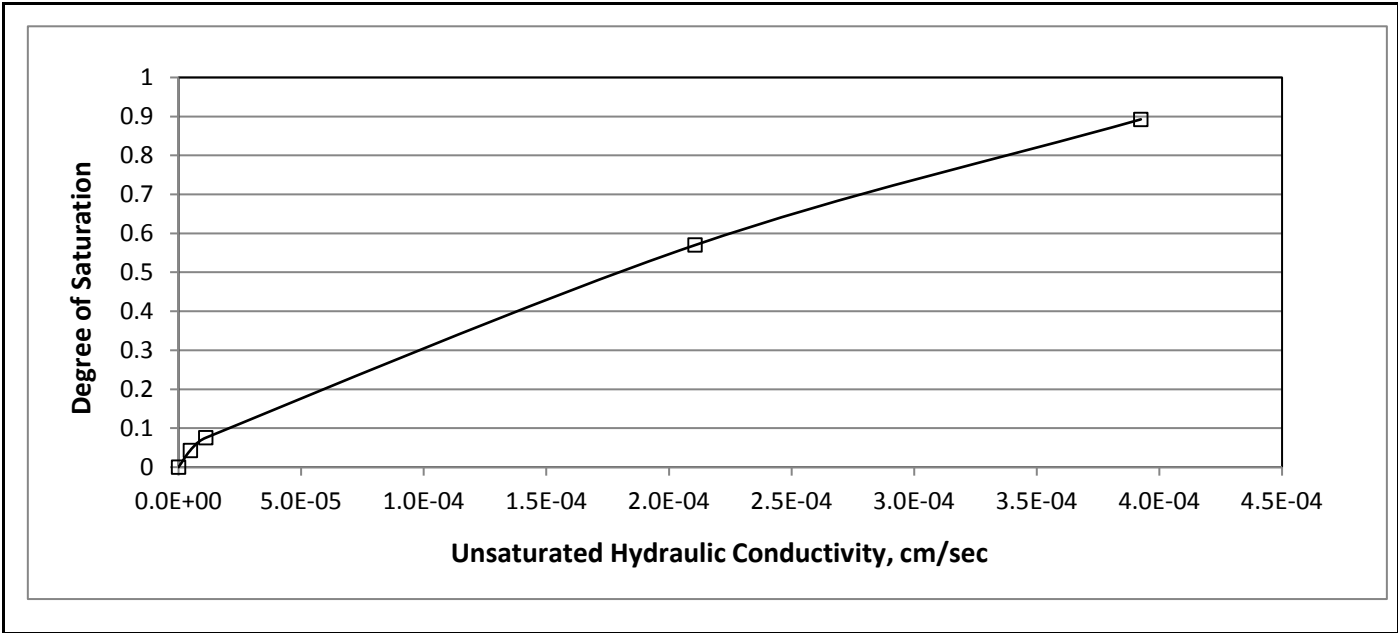
Notes: Calculations based on the Mualem's (1976) model for Predicting the Hydraulic Conductivity of Unsaturated Porous Media

*Only material passing a 3/8-inch sieve used for testing



Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Date:	2/21/2017
Sample No.:	400-SB-08
Sample Depth, ft:	5-10
Sample Description:	Moist, light brown clayey sand with gravel

Unsaturated Hydraulic Conductivity vs Degree of Saturation



Sample Properties

Particle Size Distribution:	Moisture Content, %:	9.1
Gravel, %: 22.0	Specific Gravity:	2.68
Sand, %: 46.9	Porosity:	0.28
Fines, %: 31.1	Saturated Hydraulic Conductivity, cm/sec:	1.5E-04
*Material >3/8-inch Removed from Test Specimen, %:		14.0

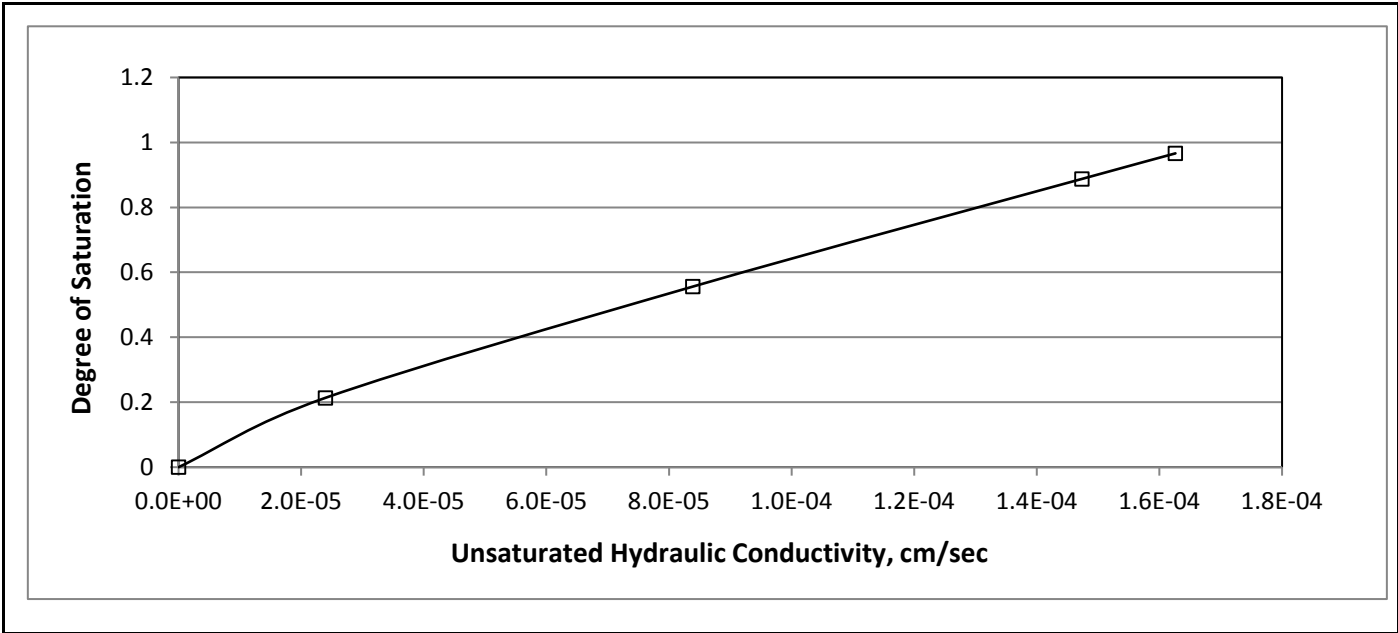
Notes: Calculations based on the Mualem's (1976) model for Predicting the Hydraulic Conductivity of Unsaturated Porous Media

*Only material passing a 3/8-inch sieve used for testing



Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Date:	2/21/2017
Sample No.:	400-SB-08
Sample Depth, ft:	10-15
Sample Description:	Moist, light brown gravel with silt and sand

Unsaturated Hydraulic Conductivity vs Degree of Saturation



Sample Properties

Particle Size Distribution:	Moisture Content, %:	3.3	
Gravel, %:	39.3	Specific Gravity:	2.69
Sand, %:	26.2	Porosity:	0.43
Fines, %:	7.8	Saturated Hydraulic Conductivity, cm/sec:	1.6E-04
*Material >3/8-inch Removed from Test Specimen, %:		58.0	

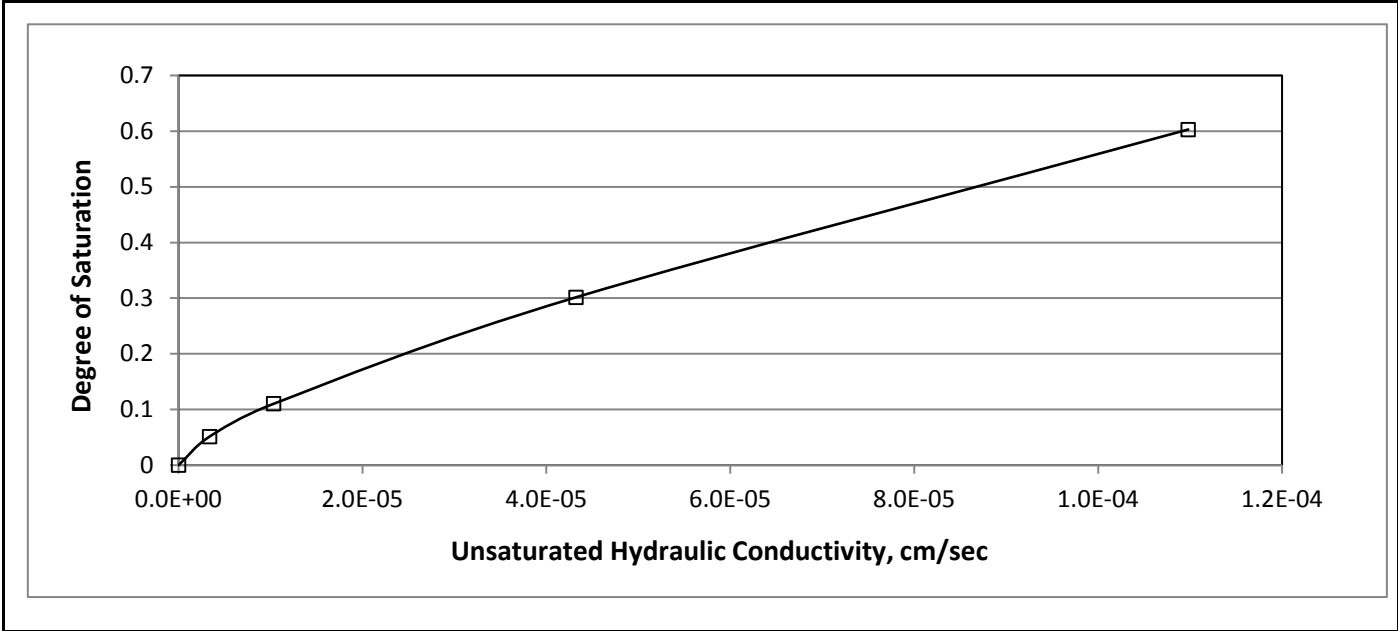
Notes: Calculations based on the Mualem's (1976) model for Predicting the Hydraulic Conductivity of Unsaturated Porous Media

*Only material passing a 3/8-inch sieve used for testing



Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Date:	2/21/2017
Sample No.:	400-SB-09
Sample Depth, ft:	12.5-15
Sample Description:	Moist, light brown gravel with clay and sand

Unsaturated Hydraulic Conductivity vs Degree of Saturation



Sample Properties

Particle Size Distribution:	Moisture Content, %:	1.4
Gravel, %:	Specific Gravity:	2.64
Sand, %:	Porosity:	0.37
Fines, %:	Saturated Hydraulic Conductivity, cm/sec:	1.4E-04
*Material >3/8-inch Removed from Test Specimen, %:		51.0

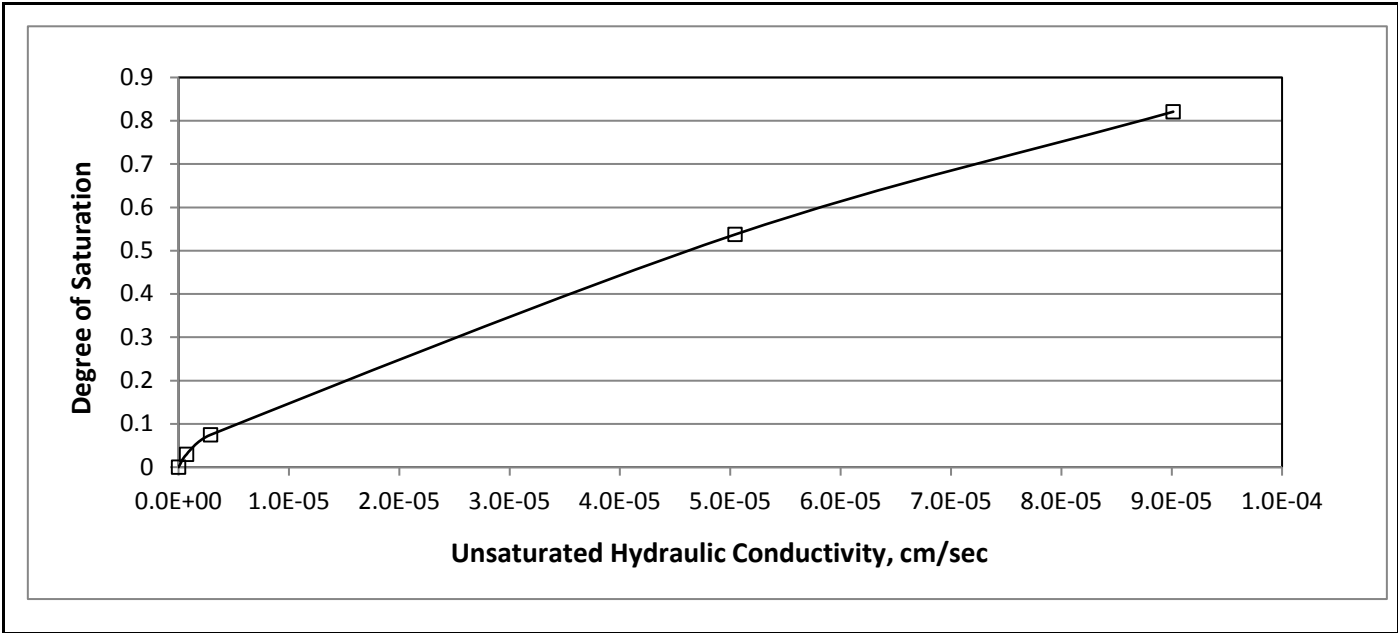
Notes: Calculations based on the Mualem's (1976) model for Predicting the Hydraulic Conductivity of Unsaturated Porous Media

*Only material passing a 3/8-inch sieve used for testing



Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Date:	2/21/2017
Sample No.:	400-SB-09
Sample Depth, ft:	20-25
Sample Description:	Moist, light brown gravel with clay and sand

Unsaturated Hydraulic Conductivity vs Degree of Saturation



Sample Properties

Particle Size Distribution:	Moisture Content, %:	1.0
Gravel, %:	Specific Gravity:	2.63
Sand, %:	Porosity:	0.32
Fines, %:	Saturated Hydraulic Conductivity, cm/sec:	4.7E-05
*Material >3/8-inch Removed from Test Specimen, %:		49.0

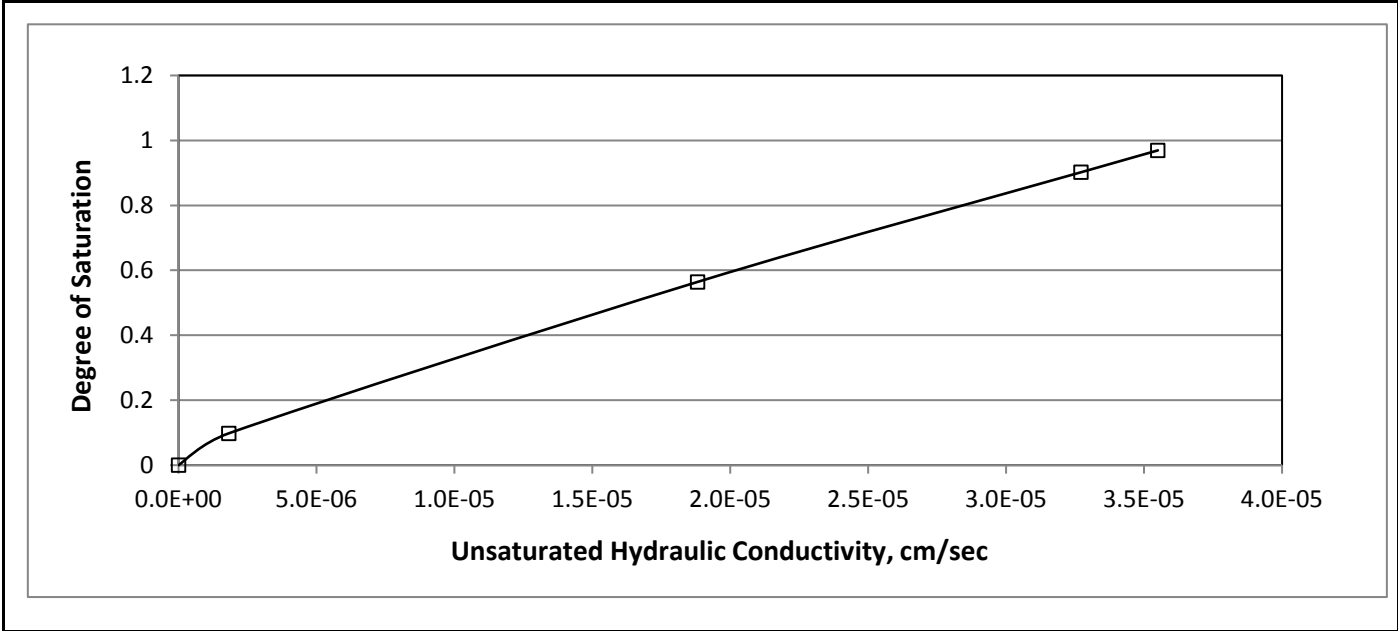
Notes: Calculations based on the Mualem's (1976) model for Predicting the Hydraulic Conductivity of Unsaturated Porous Media

*Only material passing a 3/8-inch sieve used for testing



Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Date:	2/21/2017
Sample No.:	400-SB-10
Sample Depth, ft:	15-20
Sample Description:	Moist, reddish brown silty gravel with sand

Unsaturated Hydraulic Conductivity vs Degree of Saturation



Sample Properties

Particle Size Distribution:	Moisture Content, %:	1.9
Gravel, %:	Specific Gravity:	2.69
Sand, %:	Porosity:	0.27
Fines, %:	Saturated Hydraulic Conductivity, cm/sec:	3.8E-05
*Material > 3/8-inch Removed from Test Specimen, %:		39.0

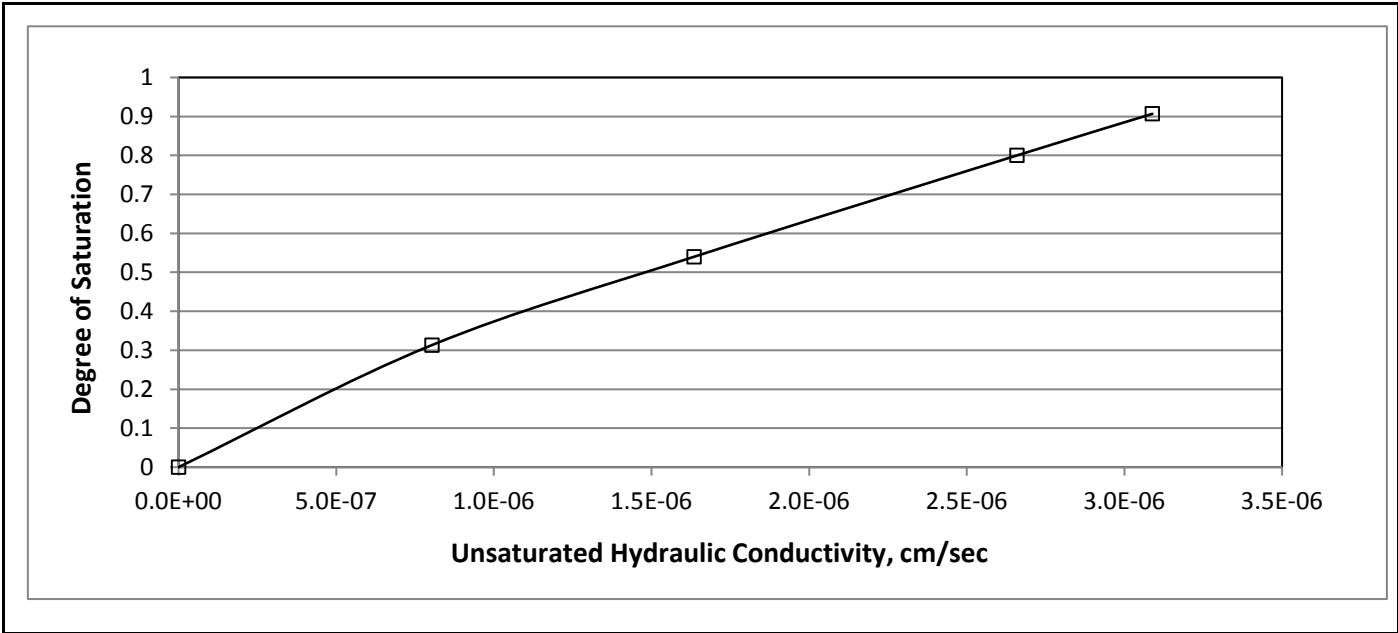
Notes: Calculations based on the Mualem's (1976) model for Predicting the Hydraulic Conductivity of Unsaturated Porous Media

*Only material passing a 3/8-inch sieve used for testing



Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Date:	2/21/2017
Sample No.:	400- SB-10
Sample Depth, ft:	20-25
Sample Description:	Moist, reddish brown silty clayey gravel with sand

Unsaturated Hydraulic Conductivity vs Degree of Saturation



Sample Properties

Particle Size Distribution:	Moisture Content, %:	1.5
Gravel, %:	Specific Gravity:	2.69
Sand, %:	Porosity:	0.28
Fines, %:	Saturated Hydraulic Conductivity, cm/sec:	3.0E-06
*Material >3/8-inch Removed from Test Specimen, %:		41.0

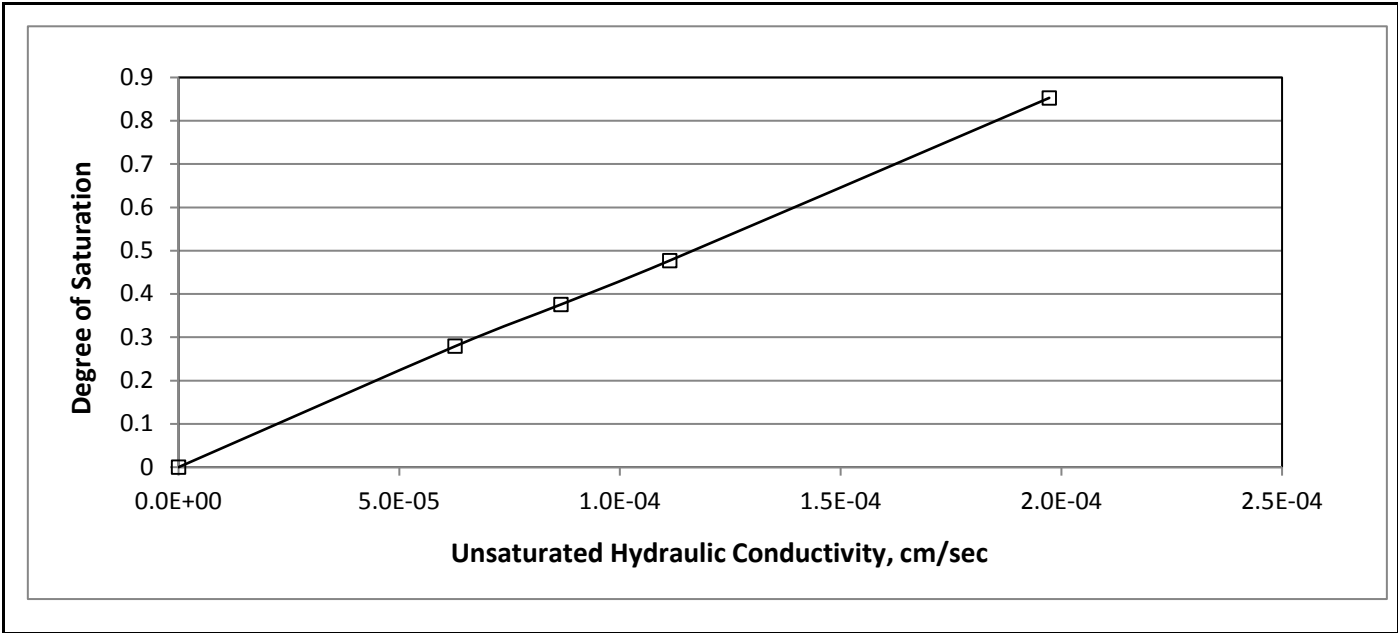
Notes: Calculations based on the Mualem's (1976) model for Predicting the Hydraulic Conductivity of Unsaturated Porous Media

*Only material passing a 3/8-inch sieve used for testing



Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Date:	2/21/2017
Sample No.:	400-SB-11
Sample Depth, ft:	15-20
Sample Description:	Moist, light reddish brown gravel with silt and sand

Unsaturated Hydraulic Conductivity vs Degree of Saturation



Sample Properties

Particle Size Distribution:	Moisture Content, %:	0.9
Gravel, %: 53.8	Specific Gravity:	2.68
Sand, %: 39.8	Porosity:	0.26
Fines, %: 6.4	Saturated Hydraulic Conductivity, cm/sec:	4.7E-04
*Material > 3/8-inch Removed from Test Specimen, %:		44.0

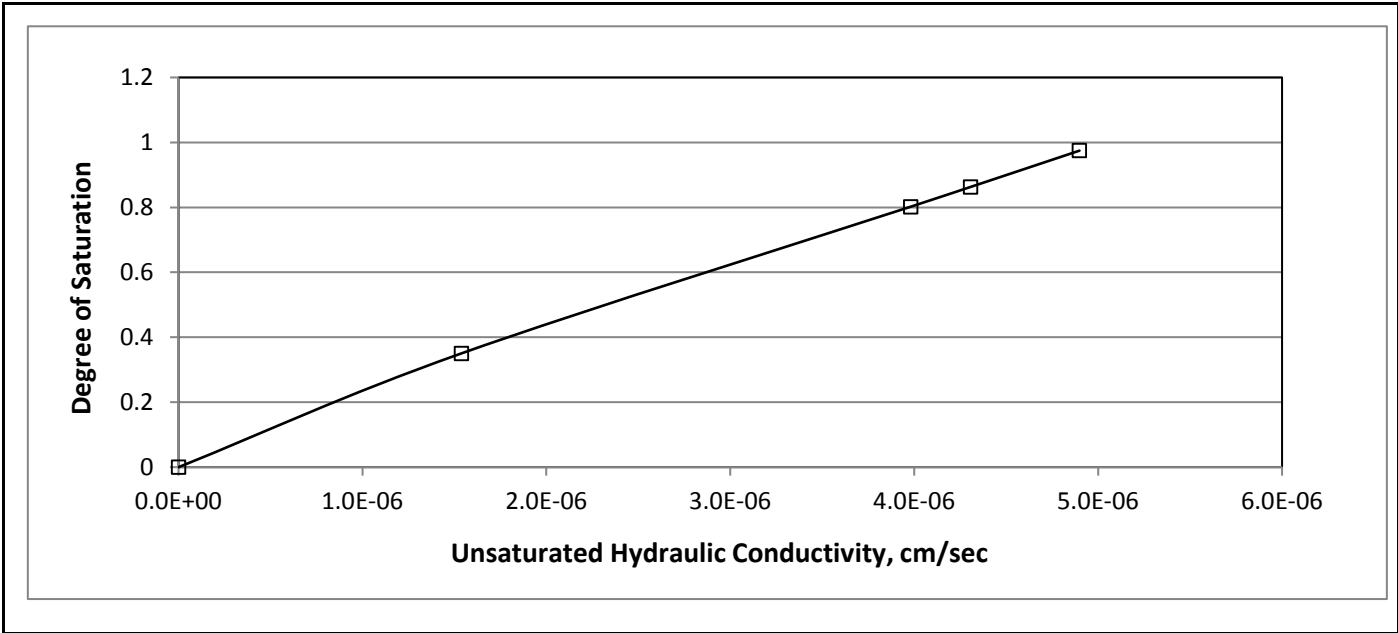
Notes: Calculations based on the Mualem's (1976) model for Predicting the Hydraulic Conductivity of Unsaturated Porous Media

*Only material passing a 3/8-inch sieve used for testing



Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Date:	2/21/2017
Sample No.:	400-SB-11
Sample Depth, ft:	20-25
Sample Description:	Moist, light reddish brown gravel with clay and sand

Unsaturated Hydraulic Conductivity vs Degree of Saturation



Sample Properties

Particle Size Distribution:	Moisture Content, %:	1.5
Gravel, %:	Specific Gravity:	2.70
Sand, %:	Porosity:	0.36
Fines, %:	Saturated Hydraulic Conductivity, cm/sec:	6.9E-06
*Material > 3/8-inch Removed from Test Specimen, %:		61.0

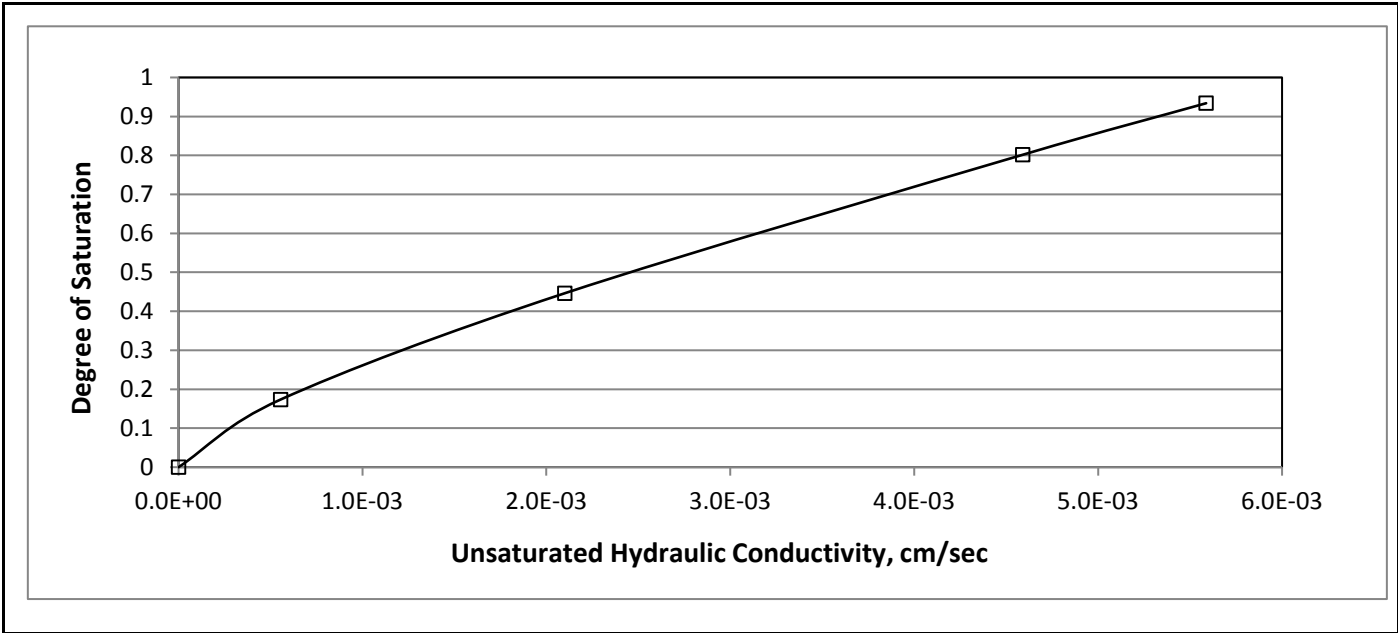
Notes: Calculations based on the Mualem's (1976) model for Predicting the Hydraulic Conductivity of Unsaturated Porous Media

*Only material passing a 3/8-inch sieve used for testing



Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Date:	2/21/2017
Sample No.:	400- SB-12
Sample Depth, ft:	40-45
Sample Description:	Moist, reddish brown gravel with silt and sand

Unsaturated Hydraulic Conductivity vs Degree of Saturation



Sample Properties

Particle Size Distribution:	Moisture Content, %:	1.5
Gravel, %: 51.8	Specific Gravity:	2.72
Sand, %: 41.8	Porosity:	0.28
Fines, %: 6.4	Saturated Hydraulic Conductivity, cm/sec:	3.4E-03
*Material >3/8-inch Removed from Test Specimen, %:	40.0	

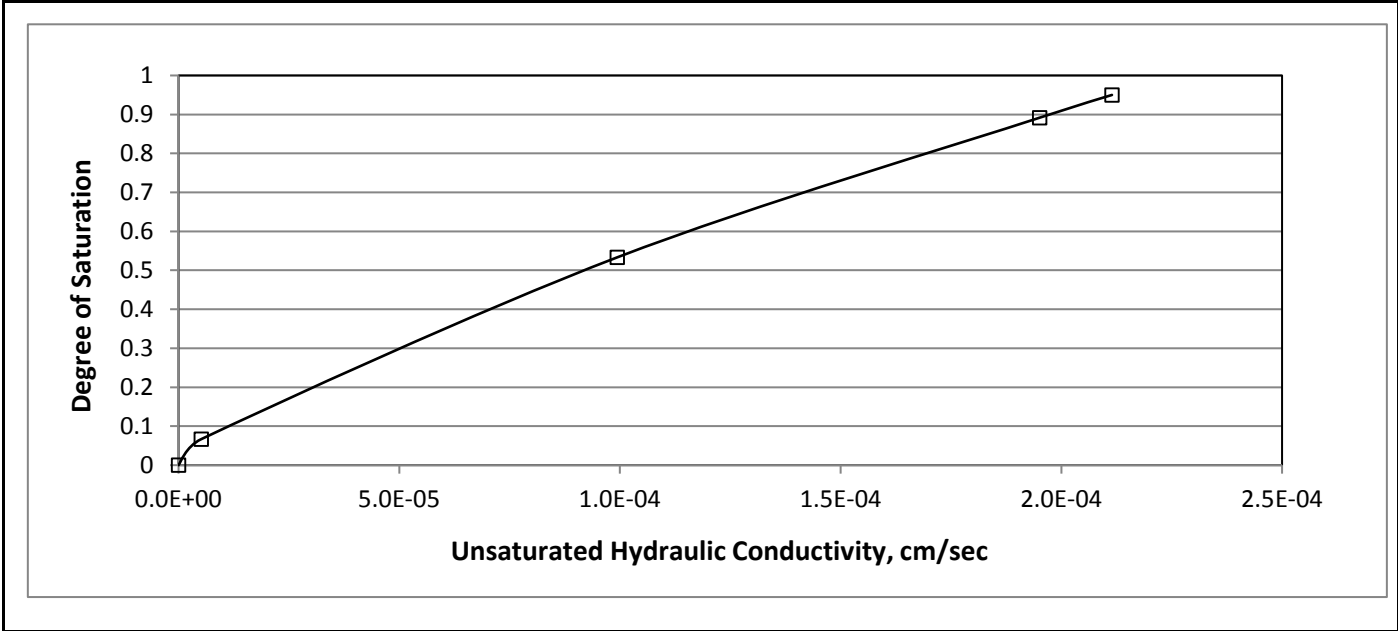
Notes: Calculations based on the Mualem's (1976) model for Predicting the Hydraulic Conductivity of Unsaturated Porous Media

*Only material passing a 3/8-inch sieve used for testing



Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Date:	2/21/2017
Sample No.:	400- SB-12
Sample Depth, ft:	45-50
Sample Description:	Moist, light brown gravel with silt and sand

Unsaturated Hydraulic Conductivity vs Degree of Saturation



Sample Properties

Particle Size Distribution:	Moisture Content, %:	1.7	
Gravel, %:	59.9	Specific Gravity:	2.66
Sand, %:	32.3	Porosity:	0.27
Fines, %:	7.8	Saturated Hydraulic Conductivity, cm/sec:	1.3E-04
*Material >3/8-inch Removed from Test Specimen, %:		47.0	

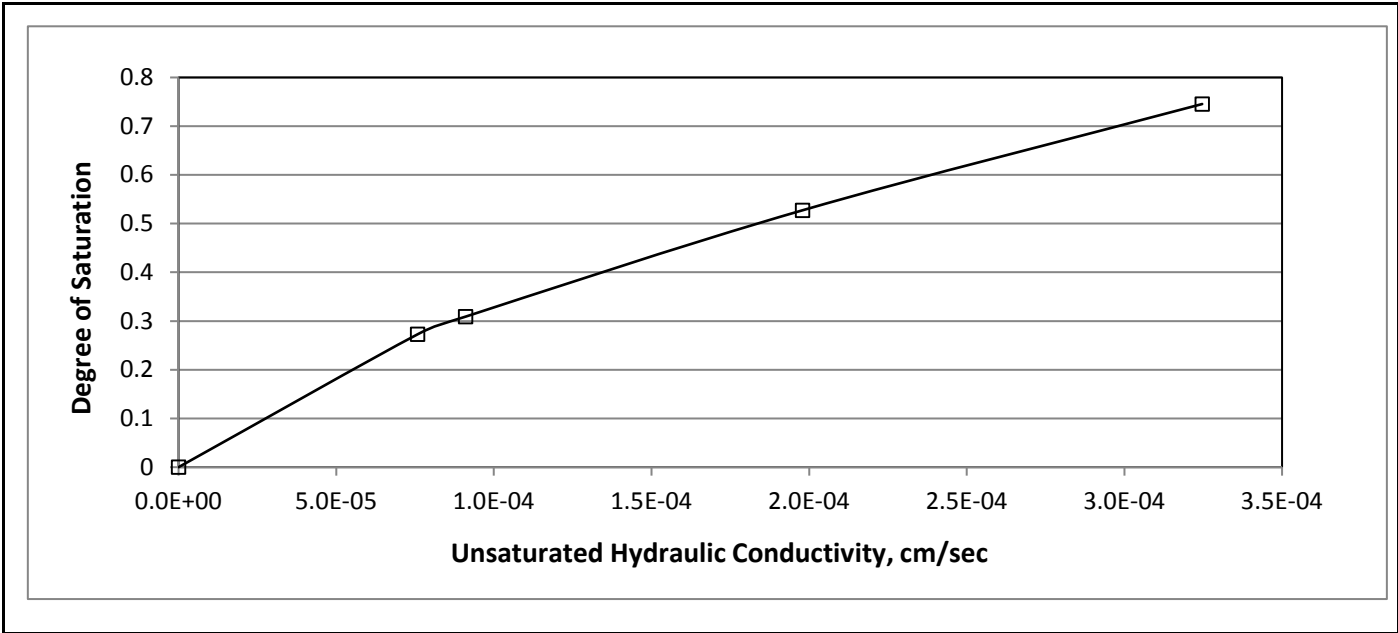
Notes: Calculations based on the Mualem's (1976) model for Predicting the Hydraulic Conductivity of Unsaturated Porous Media

*Only material passing a 3/8-inch sieve used for testing



Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Date:	2/21/2017
Sample No.:	400-SB-13
Sample Depth, ft:	60-65
Sample Description:	Moist, light brown gravel with clay and sand

Unsaturated Hydraulic Conductivity vs Degree of Saturation



Sample Properties

Particle Size Distribution:	Moisture Content, %:	2.4	
Gravel, %:	59.2	Specific Gravity:	2.69
Sand, %:	29.2	Porosity:	0.29
Fines, %:	11.6	Saturated Hydraulic Conductivity, cm/sec:	1.1E-04
*Material >3/8-inch Removed from Test Specimen, %:		51.0	

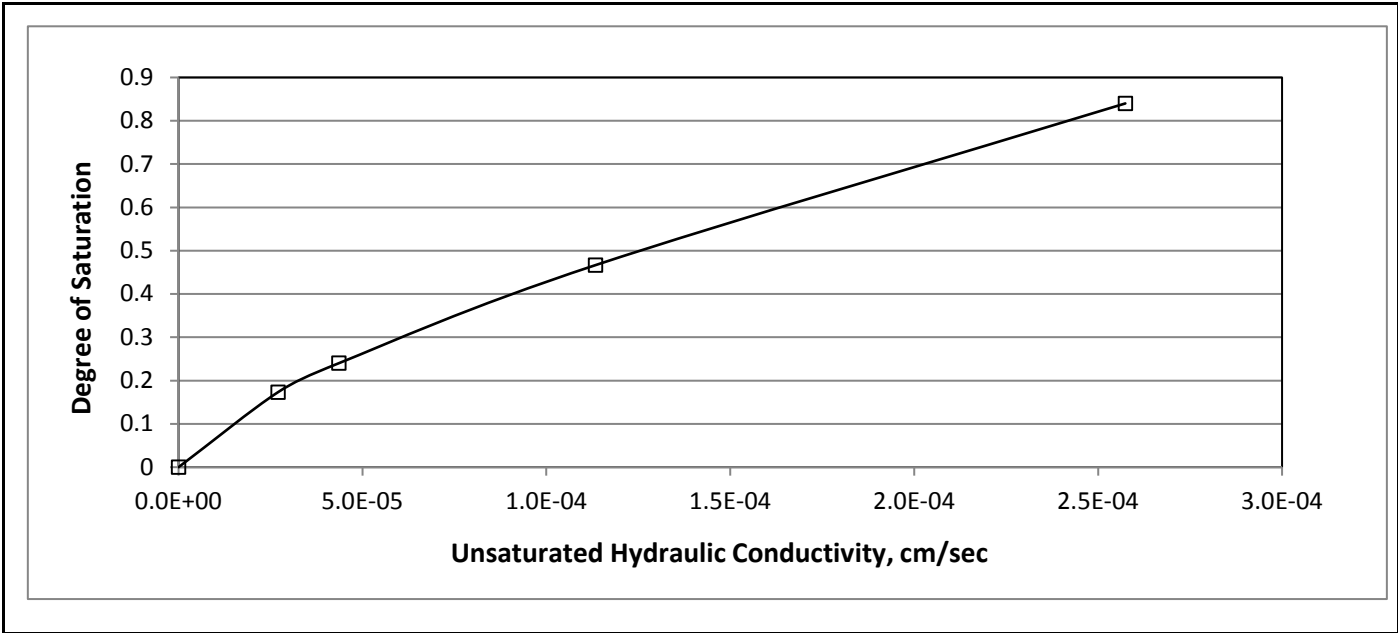
Notes: Calculations based on the Mualem's (1976) model for Predicting the Hydraulic Conductivity of Unsaturated Porous Media

*Only material passing a 3/8-inch sieve used for testing



Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Date:	2/21/2017
Sample No.:	400-SB-14
Sample Depth, ft:	65-70
Sample Description:	Moist, reddish brown gravel with silt and sand

Unsaturated Hydraulic Conductivity vs Degree of Saturation



Sample Properties

Particle Size Distribution:	Moisture Content, %:	7.2	
Gravel, %:	67.8	Specific Gravity:	2.70
Sand, %:	22.6	Porosity:	0.31
Fines, %:	9.6	Saturated Hydraulic Conductivity, cm/sec:	1.1E-04
*Material >3/8-inch Removed from Test Specimen, %:		60.0	

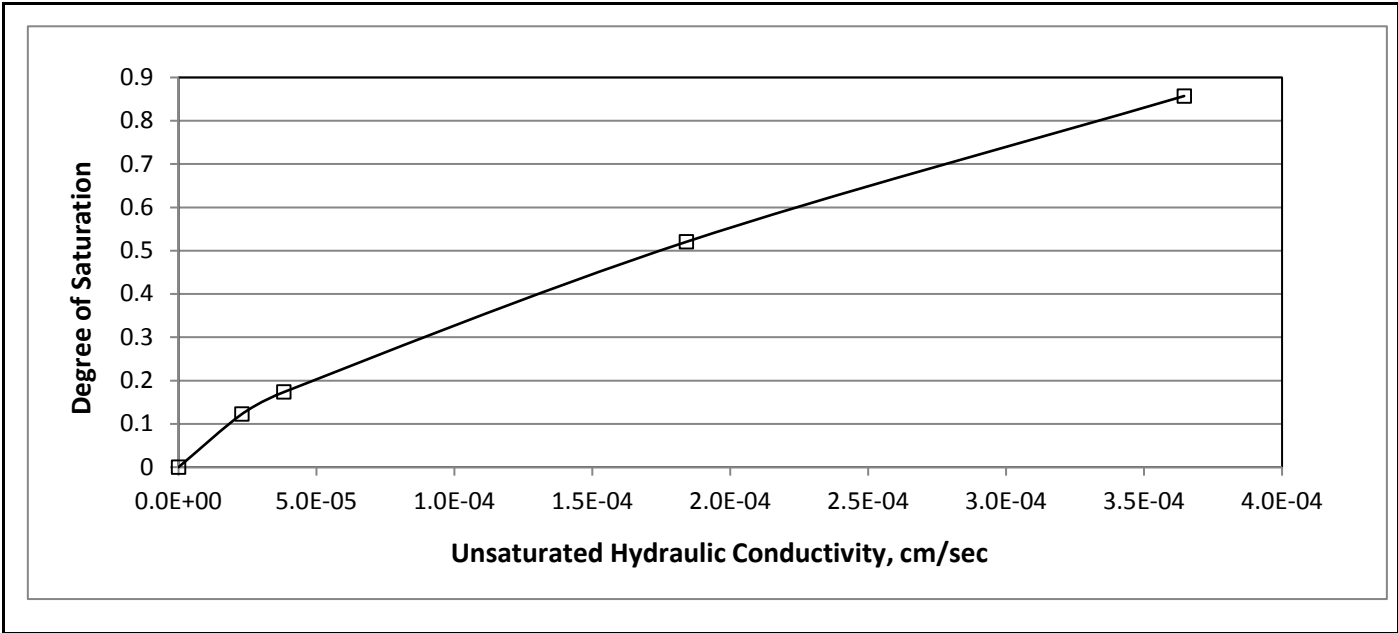
Notes: Calculations based on the Mualem's (1976) model for Predicting the Hydraulic Conductivity of Unsaturated Porous Media

*Only material passing a 3/8-inch sieve used for testing



Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Date:	2/21/2017
Sample No.:	400-SB-14
Sample Depth, ft:	70-75
Sample Description:	Moist, light brown clayey gravel with sand

Unsaturated Hydraulic Conductivity vs Degree of Saturation



Sample Properties

Particle Size Distribution:	Moisture Content, %:	3.7	
Gravel, %:	60.8	Specific Gravity:	2.69
Sand, %:	24.7	Porosity:	0.37
Fines, %:	14.5	Saturated Hydraulic Conductivity, cm/sec:	1.8E-04
*Material >3/8-inch Removed from Test Specimen, %:		52.0	

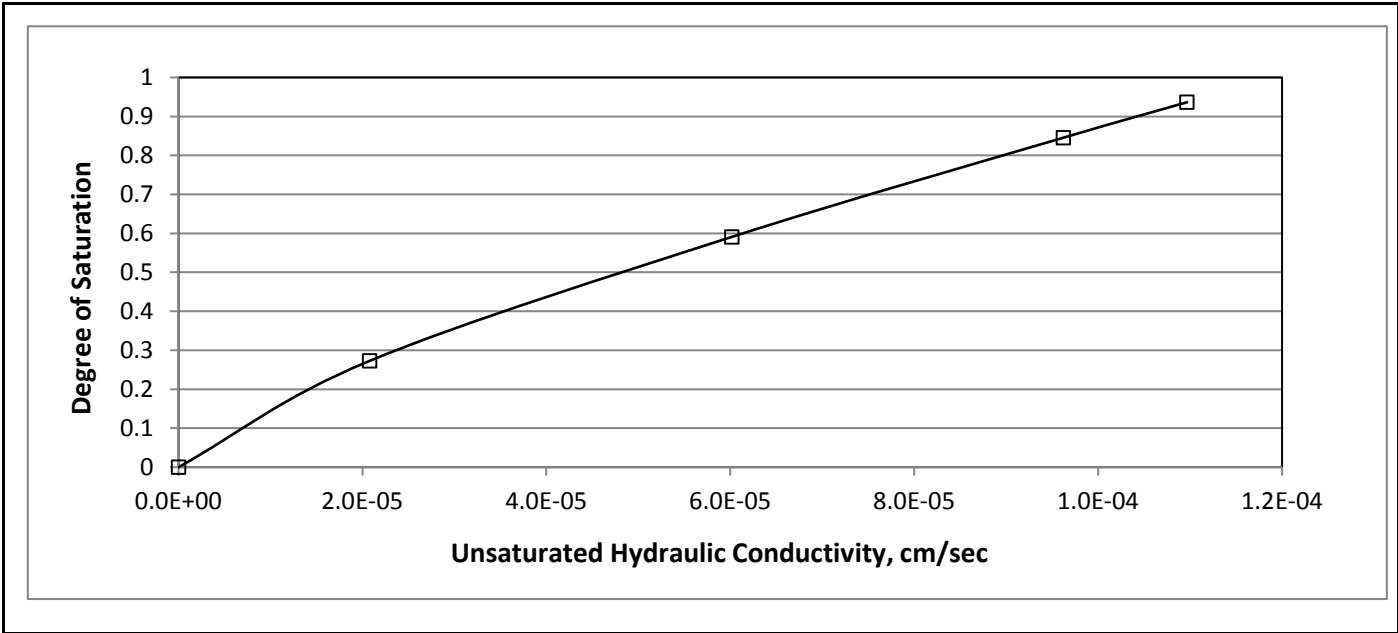
Notes: Calculations based on the Mualem's (1976) model for Predicting the Hydraulic Conductivity of Unsaturated Porous Media

*Only material passing a 3/8-inch sieve used for testing



Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Date:	2/21/2017
Sample No.:	400-SB-15 #2
Sample Depth, ft:	15-20 #2
Sample Description:	Moist, light brown gravel with silt and sand

Unsaturated Hydraulic Conductivity vs Degree of Saturation



Sample Properties

Particle Size Distribution:	Moisture Content, %:	1.8
Gravel, %: 60.2	Specific Gravity:	2.70
Sand, %: 30.9	Porosity:	0.31
Fines, %: 8.9	Saturated Hydraulic Conductivity, cm/sec:	6.8E-05
*Material >3/8-inch Removed from Test Specimen, %:		47.0

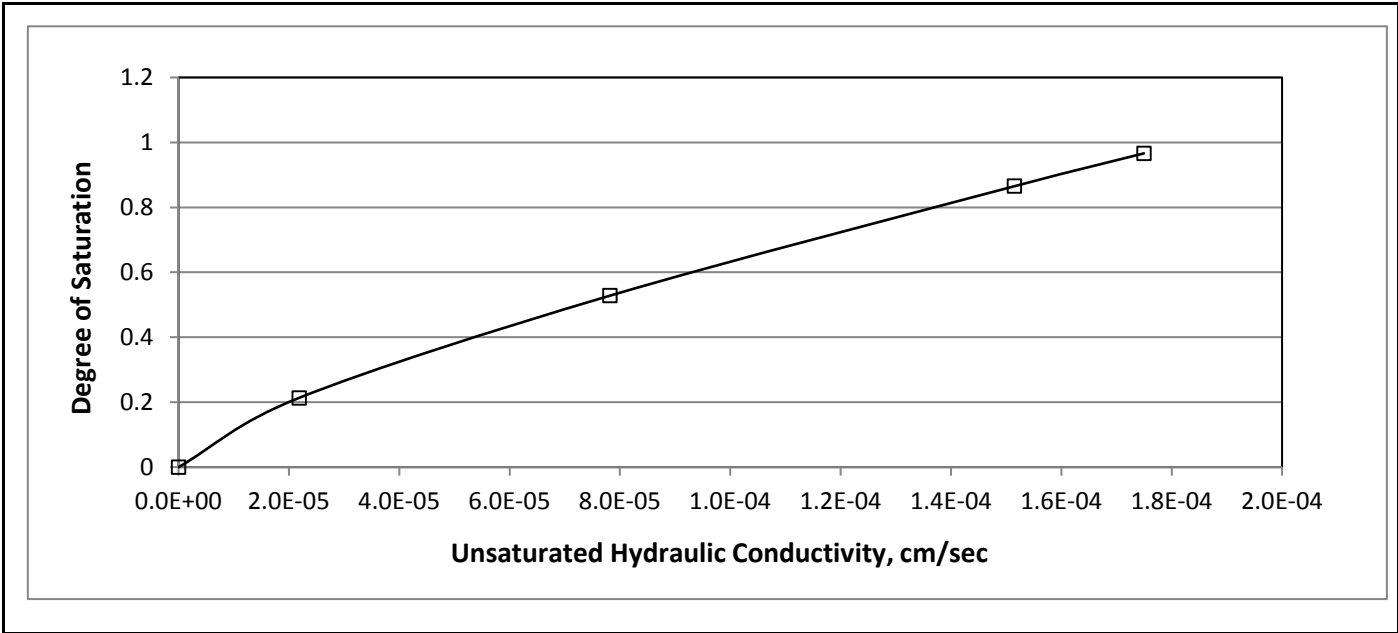
Notes: Calculations based on the Mualem's (1976) model for Predicting the Hydraulic Conductivity of Unsaturated Porous Media

*Only material passing a 3/8-inch sieve used for testing



Client:	Navarro Research & Engineering, Inc.
Project:	Soil Property Testing from NASA White Sands Test Facility
Location:	Las Cruces, NM
GTX No.:	305503
Date:	2/21/2017
Sample No.:	400-SB-15
Sample Depth, ft:	15-20
Sample Description:	Moist, light brown gravel with silt and sand

Unsaturated Hydraulic Conductivity vs Degree of Saturation



Sample Properties

Particle Size Distribution:	Moisture Content, %:	1.2
Gravel, %:	Specific Gravity:	2.68
Sand, %:	Porosity:	0.28
Fines, %:	Saturated Hydraulic Conductivity, cm/sec:	9.0E-05
6.6		
*Material >3/8-inch Removed from Test Specimen, %:		59.0

Notes: Calculations based on the Mualem's (1976) model for Predicting the Hydraulic Conductivity of Unsaturated Porous Media

*Only material passing a 3/8-inch sieve used for testing

WARRANTY and LIABILITY

GeoTesting Express (GTX) warrants that all tests it performs are run in general accordance with the specified test procedures and accepted industry practice. GTX will correct or repeat any test that does not comply with this warranty. GTX has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

GTX may report engineering parameters that require us to interpret the test data. Such parameters are determined using accepted engineering procedures. However, GTX does not warrant that these parameters accurately reflect the true engineering properties of the *in situ* material. Responsibility for interpretation and use of the test data and these parameters for engineering and/or construction purposes rests solely with the user and not with GTX or any of its employees.

GTX's liability will be limited to correcting or repeating a test which fails our warranty. GTX's liability for damages to the Purchaser of testing services for any cause whatsoever shall be limited to the amount GTX received for the testing services. GTX will not be liable for any damages, or for any lost benefits or other consequential damages resulting from the use of these test results, even if GTX has been advised of the possibility of such damages. GTX will not be responsible for any liability of the Purchaser to any third party.

Commonly Used Symbols

A	pore pressure parameter for $\Delta\sigma_1 - \Delta\sigma_3$	S_r	Post cyclic undrained shear strength
B	pore pressure parameter for $\Delta\sigma_3$	T	temperature
CAI	CERCHAR Abrasiveness Index	t	time
CIU	isotropically consolidated undrained triaxial shear test	U, UC	unconfined compression test
CR	compression ratio for one dimensional consolidation	UU, Q	unconsolidated undrained triaxial test
CSR	cyclic stress ratio	u_a	pore gas pressure
C_c	coefficient of curvature, $(D_{30})^2 / (D_{10} \times D_{60})$	u_e	excess pore water pressure
C_u	coefficient of uniformity, D_{60}/D_{10}	u, u_w	pore water pressure
C_c	compression index for one dimensional consolidation	V	total volume
C_α	coefficient of secondary compression	V_g	volume of gas
c_v	coefficient of consolidation	V_s	volume of solids
c	cohesion intercept for total stresses	V_s	shear wave velocity
c'	cohesion intercept for effective stresses	V_v	volume of voids
D	diameter of specimen	V_w	volume of water
D	damping ratio	V_o	initial volume
D_{10}	diameter at which 10% of soil is finer	v	velocity
D_{15}	diameter at which 15% of soil is finer	W	total weight
D_{30}	diameter at which 30% of soil is finer	W_s	weight of solids
D_{50}	diameter at which 50% of soil is finer	W_w	weight of water
D_{60}	diameter at which 60% of soil is finer	w	water content
D_{85}	diameter at which 85% of soil is finer	w_c	water content at consolidation
d_{50}	displacement for 50% consolidation	w_f	final water content
d_{90}	displacement for 90% consolidation	w_l	liquid limit
d_{100}	displacement for 100% consolidation	w_n	natural water content
E	Young's modulus	w_p	plastic limit
e	void ratio	w_s	shrinkage limit
e_c	void ratio after consolidation	w_o, w_i	initial water content
e_o	initial void ratio	α	slope of q_f versus p_f
G	shear modulus	α'	slope of q_f versus p_f'
G_s	specific gravity of soil particles	γ_t	total unit weight
H	height of specimen	γ_d	dry unit weight
H_R	Rebound Hardness number	γ_s	unit weight of solids
i	gradient	γ_w	unit weight of water
I_S	Uncorrected point load strength	ϵ	strain
$I_{S(50)}$	Size corrected point load strength index	ϵ_{vol}	volume strain
H_A	Modified Taber Abrasion	ϵ_h, ϵ_v	horizontal strain, vertical strain
H_T	Total hardness	μ	Poisson's ratio, also viscosity
K_o	lateral stress ratio for one dimensional strain	σ	normal stress
k	permeability	σ'	effective normal stress
LI	Liquidity Index	σ_c, σ'_c	consolidation stress in isotropic stress system
m_v	coefficient of volume change	σ_h, σ'_h	horizontal normal stress
n	porosity	σ_v, σ'_v	vertical normal stress
PI	plasticity index	σ'_{vc}	Effective vertical consolidation stress
P_c	preconsolidation pressure	σ_1	major principal stress
p	$(\sigma_1 + \sigma_3) / 2, (\sigma_v + \sigma_h) / 2$	σ_2	intermediate principal stress
p'	$(\sigma'_1 + \sigma'_3) / 2, (\sigma'_v + \sigma'_h) / 2$	σ_3	minor principal stress
p'_c	p' at consolidation	τ	shear stress
Q	quantity of flow	ϕ	friction angle based on total stresses
q	$(\sigma_1 - \sigma_3) / 2$	ϕ'	friction angle based on effective stresses
q_f	q at failure	ϕ'_r	residual friction angle
q_o, q_i	initial q	ϕ_{ult}	ϕ for ultimate strength
q_c	q at consolidation		

Appendix E
Well Completion Diagrams



Well Completion Diagram 400-EV-131



Coordinates (amsl): 554,883.91 N; 1,530,620.93 E
Brass Cap: 4,832.08'
Borehole Diameter (Depth): Cored 6.1" (0-153');
 reamed 7.5" (to 154.5'); 9.5" (to 144');
Drilling Method: Sonic coring with casing advance
Temporary Casing: Drive casing 9.5" to 144'

Construction Start Date: 9/29/16 **Time:** 1000
Construction End Date: 10/4/16 **Time:** 1000
Development Start Date: 12/7/16 **Time:** 1406
Development End Date: 12/16/16 **Time:** 0939
Development Method: Surge/Bail/Add Water/Pump
Total Purge Volume: 143 gallons
Final Turbidity (NTU): 3.95

Soil Vapor Zones: 7.5'-12.5' port at 10'
 44.8'-50.5' port at 50'
 97.3'-102.6' port at 100'
 127.4'-154.5' port at 130'
Groundwater Zone: 127.4'-154.5'
Screen: 131'-146'
Comments: Was soil boring 400-SB-04

Notes:

- Diagram not to scale.
- All depths are below ground surface (bgs).
- Stainless Steel hose clamp was used to secure tubing to guide lines every 5'.
- A guide line was used for each soil vapor port.

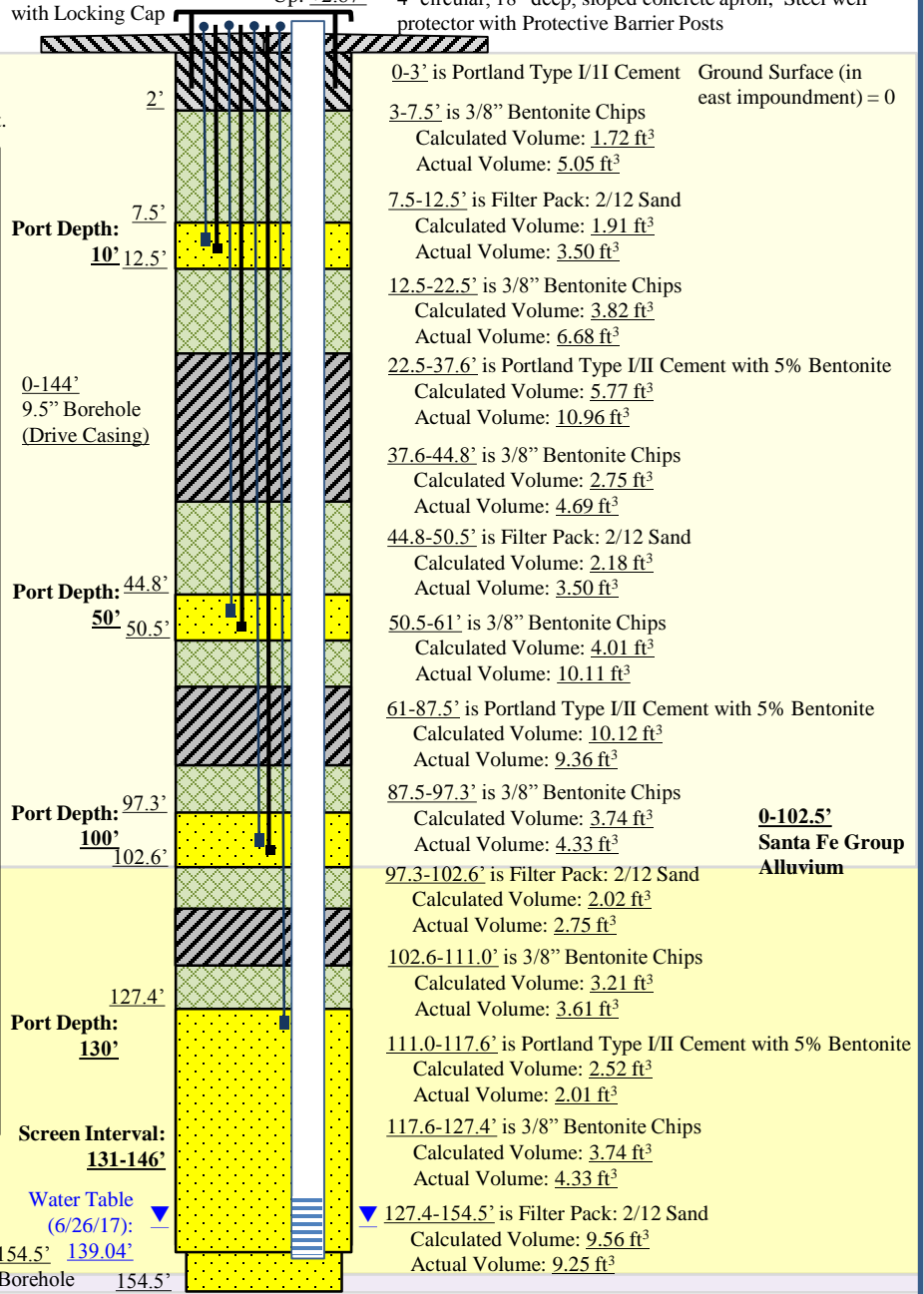
- 1/4" diameter type 304/304L stainless steel tubing.
- 1/2" x 12" L-H thread soil vapor implant filter cylindrical screens, 0.011 Twill, type 304 stainless steel, 60 x 60, Item #SVPT99 with 300 series machined ends.
- 1/4" Swagelok® fitting #QC4-SS-D-L-1/4 for attachment of sampling equipment. Each soil vapor port installed with a depth label at surface.
- 3/8" stainless steel guide line (with stainless steel weight below each port).
- 3/4" x 1.5" steel weight attached to the bottom of stainless steel guide line.
- 4" ID (4.5" OD) type 316/316L schedule 10 stainless steel casing, flush threaded joints.
- 4" ID (4.5" OD) type 316 stainless steel screen (0.010" slot).
- Water table
- Type I/II Portland Cement
- Type I/II Portland Cement with 5% Bentonite
- 3/8" Bentonite Chips (hydrated)
- 2/12 Colorado Silica Sand
- Santa Fe Group Alluvium
- Cemented Santa Fe Group Alluvium
- Andesite Bedrock

102.5-152'
Cemented Santa Fe Group Alluvium (Bedrock)

152-154.5'
Andesite Bedrock

8" Steel Well Protector with Locking Cap
 Well Casing Stick-Up: +2.87'

Well Apron Design & Construction:
 4' circular, 18" deep, sloped concrete apron, Steel well protector with Protective Barrier Posts



Total Well Depth: 146'
 Total Borehole Depth: 154.5'



Well Completion Diagram 400-FV-131



Coordinates (amsl): 554,783.24 N; 1,530,181.02 E
Brass Cap: 4.815.43'
Borehole Diameter/Depth: Cored 6.1" (0-108.5');
 reamed 7.5" (to 62'), 8.3" (to 109'); 8.5" (109-153.5')
Drilling Method: Sonic coring to bedrock /
 Air rotary in bedrock (109-153.5')
Temporary Casing: Drive Casing 9.5" to 19.5'

Construction Start Date: 11/09/16 **Time:** 0922
Construction End Date: 11/10/16 **Time:** 1145
Development Start Date: 12/6/16 **Time:** 0800
Development End Date: 1/26/17 **Time:** 0845
Development Method: Surge/Bail/Pump
Total Purge Volume: 165 gallons
Turbidity (NTU): 4.87

Soil Vapor Zones: 12.4'-17.5' port at 15'
 60.4'-65.3' port at 63'
 101.4'-106.5' port at 104'
 127.1'-153' port at 130'
Groundwater Zone: 127.1'-153'
Screen: 130.5'-145.5'
Comments: Was soil boring 400-SB-14

Notes:

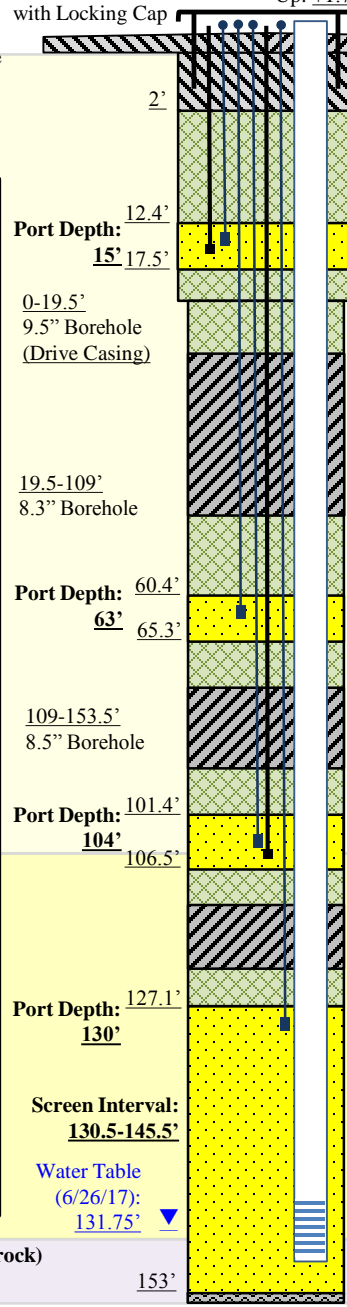
- Diagram not to scale.
- All depths are below ground surface (bgs).
- Stainless Steel hose clamp was used to secure tubing to guide lines every 5'.
- Deepest port attached to well casing. Middle two ports attached on one guide line. Shallow port attached to separate guide line.

- 1/4" diameter type 304/304L stainless steel tubing.
- 1/2" x 12" L-H thread soil vapor implant filter cylindrical screens, 0.011 Twill, type 304 stainless steel, 60 x 60, Item #SVPT99 with 300 series machined ends.
- 1/4" Swagelok® fitting #QC4-SS-D-L-1/4 for attachment of sampling equipment. Each soil vapor port installed with a depth label at surface.
- 3/8" stainless steel guide line (with stainless steel weight below each port).
- 3/4" x 1.5" steel weight attached to the bottom of stainless steel guide line.
- 4" ID (4.5" OD) type 316/316L schedule 10 stainless steel casing, flush threaded joints.
- 4" ID (4.5" OD) type 316 stainless steel screen (0.010" slot).
- Water table
- Type I/II Portland Cement
- Type I/II Portland Cement with 5% Bentonite
- 3/8" Bentonite Chips (hydrated)
- 2/12 Colorado Silica Sand
- Slough
- Santa Fe Group Alluvium
- Cemented Santa Fe Group Alluvium
- Andesite Bedrock

8" Steel Well Protector with Locking Cap
 Well Casing Stick-Up: +1.77'

Well Apron Design & Construction:

4' diameter circular sloped concrete apron, Steel well protector with Protective Barrier Posts



0-2' is Portland Type I/II Cement Ground Surface = 0

2-12.4' is 3/8" Bentonite Chips
 Calculated Volume: 2.95 ft³
 Actual Volume: 5.42 ft³

12.4-17.5' is Filter Pack: 2/12 Sand
 Calculated Volume: 1.45 ft³
 Actual Volume: 2.00 ft³

17.5-32' is 3/8" Bentonite Chips
 Calculated Volume: 4.31 ft³
 Actual Volume: 5.42 ft³

32-50.5' is Portland Type I/II Cement with 5% Bentonite
 Calculated Volume: 5.25 ft³
 Actual Volume: 6.68 ft³

50.5-60.4' is 3/8" Bentonite Chips
 Calculated Volume: 2.81 ft³
 Actual Volume: 3.61 ft³

60.4-65.3' is Filter Pack: 2/12 Sand
 Calculated Volume: 1.39 ft³
 Actual Volume: 1.75 ft³

65.3-75.5' is 3/8" Bentonite Chips
 Calculated Volume: 2.90 ft³
 Actual Volume: 2.53 ft³

75.5-91.3' is Portland Type I/II Cement with 5% Bentonite
 Calculated Volume: 4.49 ft³
 Actual Volume: 4.28 ft³

91.3-101.4' is 3/8" Bentonite Chips
 Calculated Volume: 2.87 ft³
 Actual Volume: 2.89 ft³

0-104.3'
 Santa Fe Group Alluvium

101.4-106.5' is Filter Pack: 2/12 Sand
 Calculated Volume: 1.33 ft³
 Actual Volume: 1.38 ft³

106.5-111.9' is 3/8" Bentonite Chips
 Calculated Volume: 1.41 ft³
 Actual Volume: 1.26 ft³

111.9-118.7' is Portland Type I/II Cement with 5% Bentonite
 Calculated Volume: 1.77 ft³
 Actual Volume: 1.34 ft³

118.7-127.1' is 3/8" Bentonite Chips
 Calculated Volume: 2.19 ft³
 Actual Volume: 2.17 ft³

127.1-153' is Filter Pack: 2/12 Sand
 Calculated Volume: 7.55 ft³
 Actual Volume: 7.00 ft³

104.3-136'

Cemented Santa Fe Group Alluvium (Bedrock)

136-153.5'

Andesite Bedrock

Total Well Depth: 145.5'

Total Borehole Depth: 153.5'



Well Completion Diagram 400-GV-125



Coordinates (amsl): 554,838.22 N; 1,530,296.59 E
Brass Cap: 4,818.86'
Borehole Diameter/Depth: Cored 6.1" (0-107.5');
 reamed 8.3" (to 167.5'); 9.5" (to 41')
Drilling Method: Sonic coring to bedrock /
 Air rotary in bedrock (107.5-167.5')
Temporary Casing: Drive Casing 9.5" to 41'

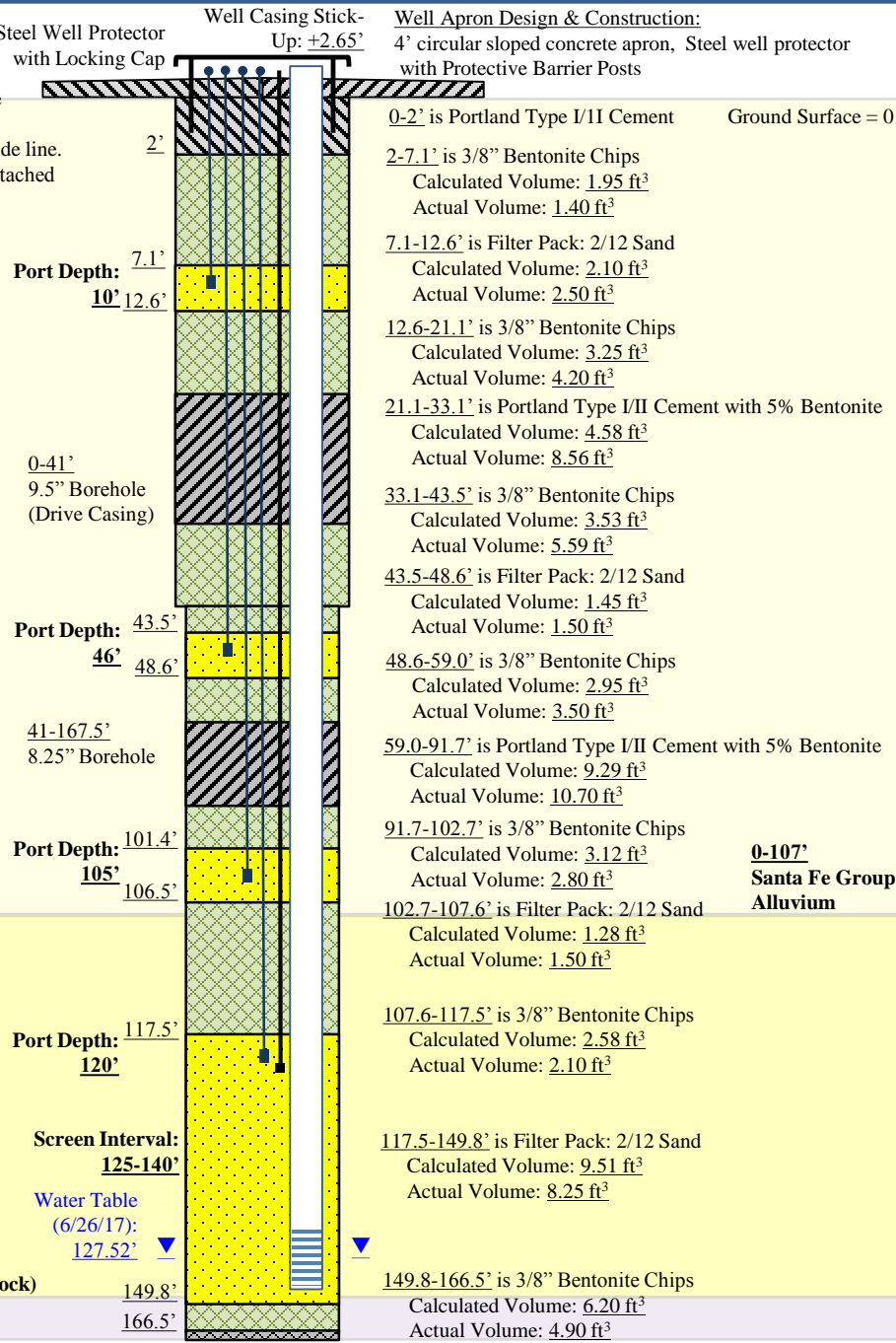
Construction Start Date: 12/1/16 **Time:** 1225
Construction End Date: 12/02/16 **Time:** 1639
Development Start Date: 12/6/16 **Time:** 1125
Development End Date: 12/16/16 **Time:** 1445
Development Method: Surge/Bail/Pump
Total Purge Volume: 127 gallons
Turbidity (NTU): 3.45

Soil Vapor Zones: 7.1'-12.6' port at 10'
 43.5'-48.6' port at 46'
 102.7'-107.6' port at 105'
 117.5'-149.8' port at 120'
Groundwater Zone: 117.5'-149.8'
Screen: 125'-140'
Comments: Was soil boring 400-SB-13

Notes:

- Diagram not to scale.
- All depths are below ground surface (bgs).
- Stainless Steel hose clamp was used to secure tubing to guide line every 5'.
- Deepest 2 soil vapor ports attached to one guide line.
- Soil vapor ports at 10' and 46' have weight attached to port tubing; no guide line.

- 1/4" diameter type 304/304L stainless steel tubing.
- 1/2" x 12" L-H thread soil vapor implant filter cylindrical screens, 0.011 Twill, type 304 stainless steel, 60 x 60, Item #SVPT99 with 300 series machined ends.
- 1/4" Swagelok® fitting #QC4-SS-D-L-1/4 for attachment of sampling equipment. Each soil vapor port installed with a depth label at surface.
- 3/8" stainless steel guide line (with stainless steel weight below each port).
- 3/4" x 1.5" steel weight attached to the bottom of stainless steel guideline.
- 4" ID (4.5" OD) type 316/316L schedule 10 stainless steel casing, flush threaded joints.
- 4" ID (4.5" OD) type 316 stainless steel screen (0.010" slot).
- Water table
- Type I/II Portland Cement
- Type I/II Portland Cement with 5% Bentonite
- 3/8" Bentonite Chips (hydrated)
- 2/12 Colorado Silica Sand
- Slough
- Santa Fe Group Alluvium
- Cemented Santa Fe Group Alluvium
- Andesite Bedrock



107-148.5'
Cemented Santa Fe Group Alluvium (Bedrock) 149.8'
148.5-167.5'
Andesite Bedrock 166.5'

Total Well Depth: 140'
 Total Borehole Depth: 167.5'



Well Completion Diagram 400-HV-147



Coordinates (amsl): 554,813.50 N; 1,530,474.81 E **Construction Start Date:** 12/06/16 **Time:** 1035
Brass Cap: 4,829.26' **Construction End Date:** 12/07/16 **Time:** 1147
Borehole Diameter/Depth: Cored 6.1" (0-110'); **Development Start Date:** 12/10/16 **Time:** 0852
reamed 8.3" (to 109.5'); 8.5" (to 172.9'); 9.5" (to 37') **Development End Date:** 3/22/17 **Time:** 0750
Drilling Method: Sonic coring to bedrock / **Development Method:** Surge/Bail/Pump
Air rotary in bedrock (110-172.9') **Total Purge Volume:** 103 gallons
Temporary Casing: Drive casing 9.5" to 37' **Turbidity (NTU):** 1.44
Soil Vapor Zones: 9.5'-14.5' port at 12'
41.1'-47.3' port at 45'
92.3'-97.5' port at 95'
123.5'-172.6' port at 130'
Groundwater Zone: 123.5'-172.6'
Screen: 147'-162'
Comments: Was soil boring 400-SB-08

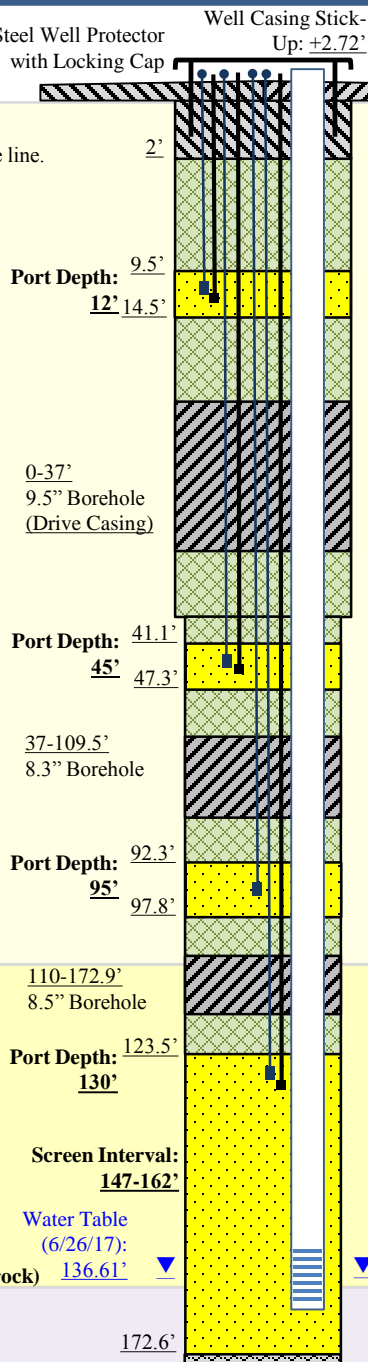
Notes:

- Diagram not to scale.
- All depths are below ground surface (bgs).
- Stainless Steel hose clamp was used to secure tubings to guide line every 5'.
- Vapor ports at 95° and 130° are on same guide line. Other ports on separate guide lines.

- 1/4" diameter type 304/304L stainless steel tubing.
- 1/2" x 12" L-H thread soil vapor implant filter cylindrical screens, 0.011 Twill, type 304 stainless steel, 60 x 60, Item #SVPT99 with 300 series machined ends.
- 1/4" Swagelok® fitting #QC4-SS-D-L-1/4 for attachment of sampling equipment. Each soil vapor port installed with a depth label at surface.
- 3/8" stainless steel guide line (with stainless steel weight below each port).
- 3/4" x 1.5" steel weight attached to the bottom of stainless steel guide line.
- 4" ID (4.5" OD) type 316/316L schedule 10 stainless steel casing, flush threaded joints.
- 4" ID (4.5" OD) type 316 stainless steel screen (0.010" slot).
- Water table
- Type I/II Portland Cement
- Type I/II Portland Cement with 5% Bentonite
- 3/8" Bentonite Chips (hydrated)
- 2/12 Colorado Silica Sand
- Slough
- Santa Fe Group Alluvium
- Cemented Santa Fe Group Alluvium
- Andesite Bedrock

109-157'
Cemented Santa Fe Group Alluvium (Bedrock) 136.61' ▼

157-172.9'
Andesite Bedrock 172.6'



Well Apron Design & Construction:
4' diameter circular sloped concrete apron, Steel well protector with Protective Barrier Posts

0-2' is Portland Type I/II Cement Ground Surface = 0

2-9.5' is 3/8" Bentonite Chips
Calculated Volume: 2.87 ft³
Actual Volume: 2.80 ft³

9.5-14.5' is Filter Pack: 12/20 Sand
Calculated Volume: 1.91 ft³
Actual Volume: 2.00 ft³

14.5-24' is 3/8" Bentonite Chips
Calculated Volume: 3.09 ft³
Actual Volume: 1.93 ft³

24-32.5' is Portland Type I/II Cement with 5% Bentonite
Calculated Volume: 2.41 ft³
Actual Volume: 2.67 ft³

32.5-41.1' is 3/8" Bentonite Chips
Calculated Volume: 2.44 ft³
Actual Volume: 1.75 ft³

41.1-47.3' is Filter Pack: 12/20 Sand
Calculated Volume: 1.76 ft³
Actual Volume: 1.50 ft³

47.3-58.6' is 3/8" Bentonite Chips
Calculated Volume: 3.21 ft³
Actual Volume: 3.85 ft³

58.6-82.4' is Portland Type I/II Cement with 5% Bentonite
Calculated Volume: 6.76 ft³
Actual Volume: 6.95 ft³

82.4-92.3' is 3/8" Bentonite Chips
Calculated Volume: 2.81 ft³
Actual Volume: 2.80 ft³

0-109' Santa Fe Group Alluvium

92.3-97.8' is Filter Pack: 12/20 Sand
Calculated Volume: 1.56 ft³
Actual Volume: 2.00 ft³

97.8-107.7' is 3/8" Bentonite Chips
Calculated Volume: 2.81 ft³
Actual Volume: 1.75 ft³

107.7-117' is Portland Type I/II Cement with 5% Bentonite
Calculated Volume: 2.43 ft³
Actual Volume: 2.14 ft³

117-123.5' is 3/8" Bentonite Chips
Calculated Volume: 1.70 ft³
Actual Volume: 1.05 ft³

123.5-172.6' is Filter Pack: 12/20 Sand
Calculated Volume: 13.95 ft³
Actual Volume: 12.00 ft³

Total Well Depth: 162'
Total Borehole Depth: 172.9'



Well Completion Diagram 400-IV-123



Coordinates (amsl): 554,995.63 N; 1,531,966.75 E
Brass Cap: 4,864.22'
Borehole Diameter/Depth: Cored 6.1" (0-85'); reamed 7.5" (to 83'); 8.3" (to 81'); 8.5" (to 155'); 9.5" to 40'
Drilling Method: Sonic coring to bedrock / Air rotary in bedrock (83-155')
Temporary Casing: Drive casing 9.5" to 40'

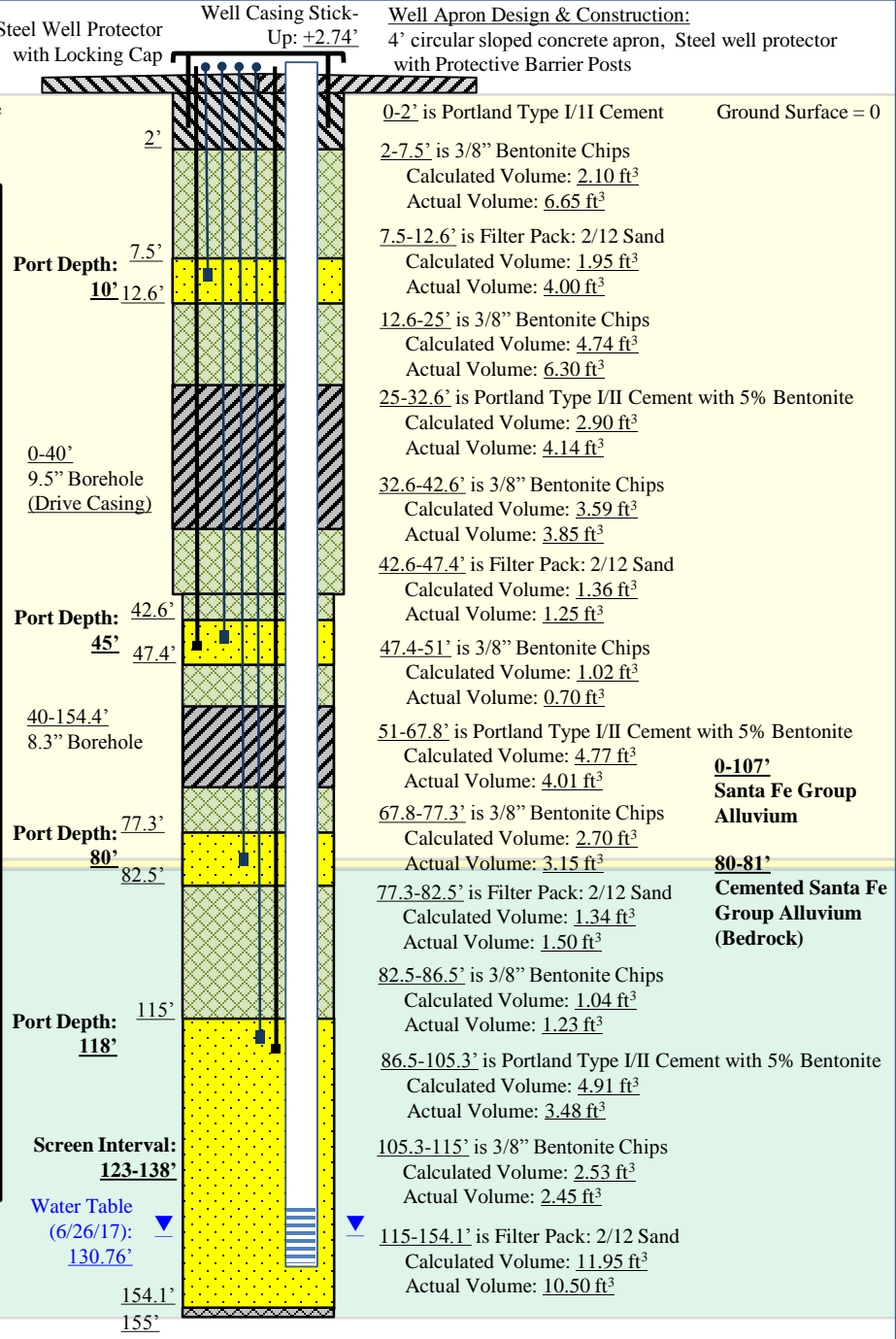
Construction Start Date: 10/22/16 **Time:** 1629
Construction End Date: 10/24/16 **Time:** 0858
Development Start Date: 12/5/16 **Time:** 1050
Development End Date: 1/25/17 **Time:** 1237
Development Method: Surge/Bail/Pump
Total Purge Volume: 221.5 gallons
Turbidity (NTU): 2.7

Soil Vapor Zones: 7.5'-12.6' port at 10'
 42.6'-47.4' port at 45'
 77.3'-82.5' port at 80'
 115'-154.1' port at 118'
Groundwater Zone: 115'-154.1'
Screen: 123'-138'
Comments: Was soil boring 400-SB-12

Notes:

- Diagram not to scale.
- All depths are below ground surface (bgs).
- Stainless Steel hose clamp was used to secure tubing to guide lines every 5'.
- Two vapor ports installed per guide line.

- 1/4" diameter type 304/304L stainless steel tubing.
- 1/2" x 12" L-H thread soil vapor implant filter cylindrical screens, 0.011 Twill, type 304 stainless steel, 60 x 60, Item #SVPT99 with 300 series machined ends.
- 1/4" Swagelok® fitting #QC4-SS-D-L-1/4 for attachment of sampling equipment. Each soil vapor port installed with a depth label at surface.
- 3/8" stainless steel guide line (with stainless steel weight below each port).
- 3/4" x 1.5" steel weight attached to the bottom of stainless steel guide line.
- 4" ID (4.5" OD) type 316/316L schedule 10 stainless steel casing, flush threaded joints.
- 4" ID (4.5" OD) type 316 stainless steel screen (0.010" slot).
- Water table
- Type I/II Portland Cement
- Type I/II Portland Cement with 5% Bentonite
- 3/8" Bentonite Chips (hydrated)
- 2/12 Colorado Silica Sand
- Slough
- Santa Fe Group Alluvium
- Cemented Santa Fe Group Alluvium
- Hornfels Bedrock



81-154.4'
Hornfels Bedrock

Total Well Depth: 138'
 Total Borehole Depth: 155'



Well Completion Diagram 400-JV-150



Coordinates (amsl): 554,745.84 N; 1,530,515.12 E
Brass Cap: 4.835.71'
Borehole Diameter/Depth: Cored to 6.1" (0-175);
 reamed 7.5" (to 97.5'); 9.5" (to 18.5');
Drilling Method: Sonic Coring
Temporary Casing: Drive Casing 9.5" to 18.5'

Construction Start Date: 12/21/16 **Time:** 1301
Construction End Date: 12/22/16 **Time:** 0958
Development Start Date: 1/26/17 **Time:** 1410
Development End Date: 3/17/17 **Time:** 1315
Development Method: Surge/Bail/Pump
Total Purge Volume: 64.75 gallons
Turbidity (NTU): 4.62

Soil Vapor Zones: 10'-15' port at 12.5'
 47.5'-52.5' port at 50'
 97.5'-102.5' port at 100'
 141.9'-175' port at 145'
Groundwater Zone: 141.9' - 175'
Screen: 150' - 165'
Comments: Was soil boring 400-SB-11

Notes:

- Diagram not to scale.
- All depths are below ground surface (bgs).
- Stainless Steel hose clamp was used to secure tubing to guide line every 5'.
- All ports on separate guide lines.

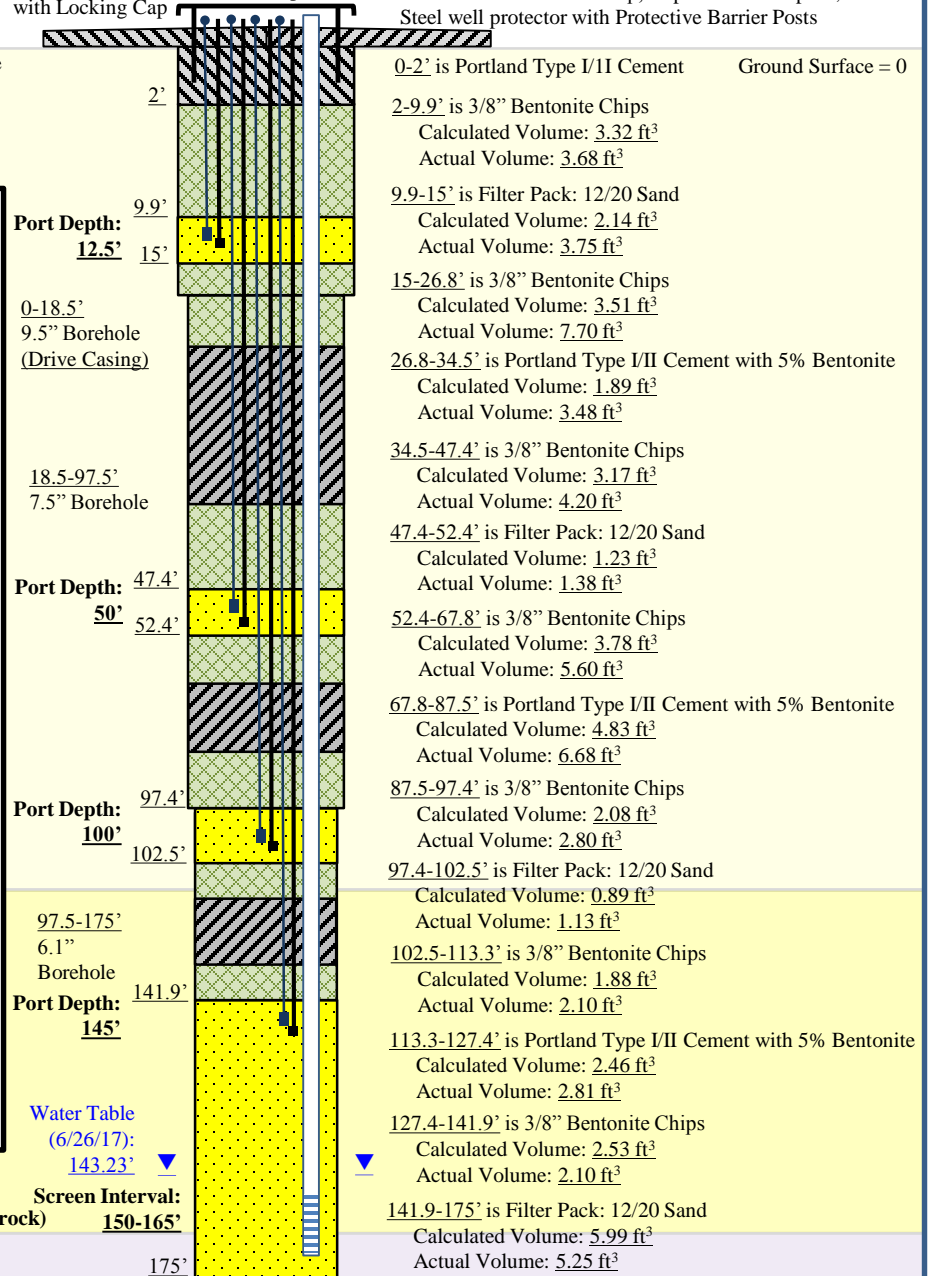
0-113' Santa Fe Group Alluvium

- 1/4" diameter type 304/304L stainless steel tubing.
- 1/2" x 12" L-H thread soil vapor implant filter cylindrical screens, 0.011 Twill, type 304 stainless steel, 60 x 60, Item #SVPT99 with 300 series machined ends.
- 1/4" Swagelok® fitting #QC4-SS-D-L-1/4 for attachment of sampling equipment. Each soil vapor port installed with a depth label at surface.
- 3/8" stainless steel guide line (with stainless steel weight below each port).
- 3/4" x 1.5' steel weight attached to the bottom of stainless steel guide line
- 1 1/2" ID (2" OD) CertainTeed™ Schedule 40 PVC Casing.
- 1 1/2" ID (2" OD) Schedule 40 PVC screen (0.020" slot).
- Water table
- Type I/II Portland Cement
- Type I/II Portland Cement with 5% Bentonite
- 3/8" Bentonite Chips (hydrated)
- 12/20 Colorado Silica Sand
- Santa Fe Group Alluvium
- Cemented Santa Fe Group Alluvium
- Andesite Bedrock

8" Steel Well Protector with Locking Cap
 Well Casing Stick-Up: +2.69'

Well Apron Design & Construction:

4' diameter circular 4" deep, sloped concrete apron, Steel well protector with Protective Barrier Posts



113-162'
Cemented Santa Fe Group Alluvium (Bedrock) 150-165'
162-175'
Andesite Bedrock 175'

Total Well Depth: 165'
 Total Borehole Depth: 175'



Well Completion Diagram 400-KV-142

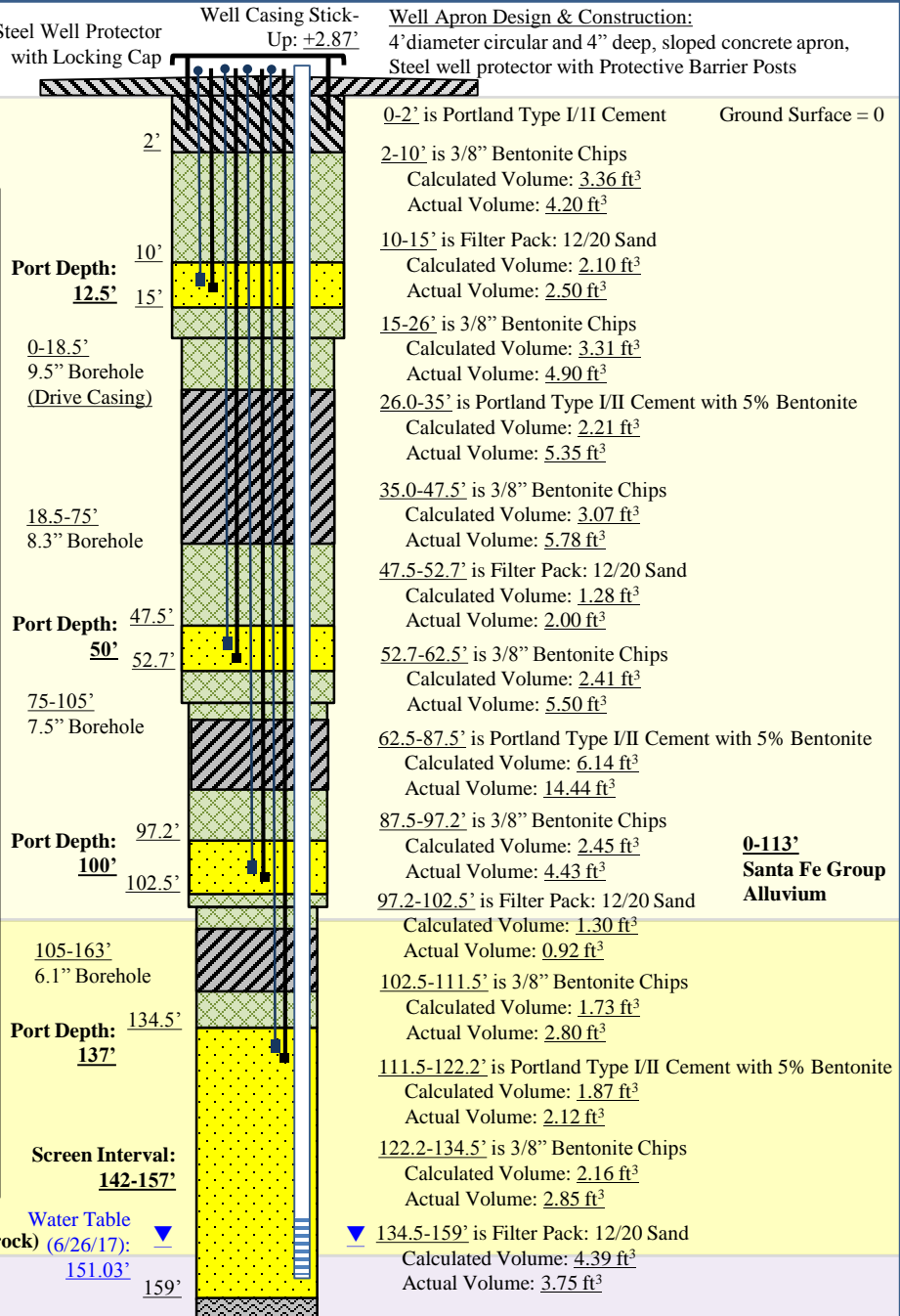


Coordinates (amsl): 554,831.80 N; 1,530,686.14 E **Construction Start Date:** 1/6/17 **Time:** 1125 **Soil Vapor Zones:** 10' - 15' port at 12.5'
Brass Cap: 4.839.53' **Construction End Date:** 1/7/17 **Time:** 1100 **Development Start Date:** 1/27/17 **Time:** 0942 **Development End Date:** 4/17/17 **Time:** 0840 **Groundwater Zone:** 134.5' - 159'
Borehole Diameter/Depth: Cored 6.1" (0-163'); reamed 7.5" (75-105') 8.3" (to 75'); 9.5" (to 18.5') **Development Method:** Surge/Bail/Added Water/Pump **Screen:** 142' - 157'
Drilling Method: Sonic Coring **Total Purge Volume:** 31.5 gallons **Turbidity (NTU):** 1.23 **Comments:** Was soil boring 400-SB-06
Temporary Casing: Drive Casing 9.5" to 18.5'

Notes:

- Diagram not to scale.
- All depths are below ground surface (bgs).
- Stainless Steel hose clamp was used to secure tubings to guide line every 5'.
- Soil ports installed on separate guide lines.

- 1/4" diameter type 304/304L stainless steel tubing.
- 1/2" x 12" Swagelok® L-H thread soil vapor implant filter cylindrical screens, 0.011 Twill, type 304 stainless steel, 60 x 60, Item #SVPT99 with 300 series machined ends.
- 1/4" Swagelok fitting #QC4-SS-D-L-1/4 for attachment of sampling equipment. Each soil vapor port installed with a depth label at surface.
- 3/8" stainless steel guide line (with stainless steel weight below each port).
- 3/4" x 1.5" steel weight attached to the bottom of stainless steel guide line.
- 1 1/2" ID (2" OD) CertainTeed™ Schedule 40 PVC Casing.
- 1 1/2" ID (2" OD) Schedule 40 PVC screen (0.020" slot).
- Water table
- Type I/II Portland Cement
- Type I/II Portland Cement with 5% Bentonite
- 3/8" Bentonite Chips (hydrated)
- 12/20 Colorado Silica Sand
- Slough
- Santa Fe Group Alluvium
- Cemented Santa Fe Group Alluvium
- Andesite Bedrock



Total Well Depth: 157'
 Total Borehole Depth: 163'



Well Completion Diagram 400-LV-125



Coordinates (amsl): 554,893.87 N; 1,530,873.50 E
Brass Cap: 4,838.68'
Borehole Diameter/Depth: Cored 6.1" (0-156');
 reamed 7.5" (to 95'); 9.5" (to 18.5')
Drilling Method: Sonic Coring
Temporary Casing: Drive Casing 9.5" to 18.5'

Construction Start Date : 1/12/17 **Time:** ~0950
Construction End Date : 01/13/17 **Time:** 1105
Development Start Date: Dry Well; Screen was
 Set above the level of final static water.

Soil Vapor Zones: 7.5'-12.6' port at 10'
 47.5'-52.5' port at 50'
 92.5'-97.5' port at 95'
 117.5'-154.2' port at 122'
Groundwater Zone: 117.5'-154.2'
Screen: 125' - 140'
Comments: Was soil boring 400-SB-01

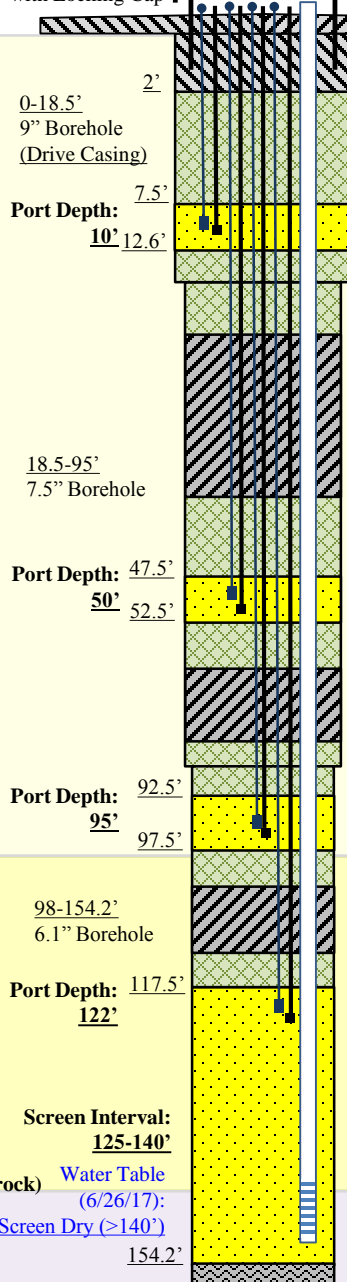
Notes:

- Diagram not to scale.
- All depths are below ground surface (bgs).
- Stainless Steel hose clamp was used to secure tubing to guideline every 5'.

- 1/4" diameter type 304/304L stainless steel tubing.
- 1/2" x 12" L-H thread soil vapor implant filter cylindrical screens, 0.011 Twill, type 304 stainless steel, 60 x 60, Item #SVPT99 with 300 series machined ends.
- 1/4" Swagelok® fitting #QC4-SS-D-L-1/4 for attachment of sampling equipment. Each soil vapor port installed with a depth label at surface.
- 3/8" stainless steel guide line (with stainless steel weight below each port).
- 3/4" x 1.5" steel weight attached to the bottom of stainless steel guide line.
- 1 1/2" ID (2" OD) CertainTeed™ Schedule 40 PVC Casing.
- 1 1/2" ID (2" OD) Schedule 40 PVC screen (0.020" slot).
- Water table
- Type I/II Portland Cement
- Type I/II Portland Cement with 5% Bentonite
- 3/8" Bentonite Chips (hydrated)
- 12/20 Colorado Silica Sand
- Slough
- Santa Fe Group Alluvium
- Cemented Santa Fe Group Alluvium
- Andesite Bedrock

98-127'
Cemented Santa Fe Group Alluvium (Bedrock)
127-156'
Andesite Bedrock

8" Steel Well Protector with Locking Cap
 Well Casing Stick-Up: +2.66'



Well Apron Design & Construction:
 4' diameter circular and 12" deep, sloped concrete apron, Steel well protector with Protective Barrier Posts

0-2' is Portland Type I/II Cement Ground Surface (in concrete flume to east impoundment) = 0
 2-7.5' is 3/8" Bentonite Chips
 Calculated Volume: 2.31 ft³
 Actual Volume: 2.22 ft³
 7.5-12.6' is Filter Pack: 12/20 Sand
 Calculated Volume: 2.14 ft³
 Actual Volume: 3.25 ft³
 12.6-25' is 3/8" Bentonite Chips
 Calculated Volume: 3991 ft³
 Actual Volume: 4.43 ft³
 25-37.5' is Portland Type I/II Cement with 5% Bentonite
 Calculated Volume: 3.07 ft³
 Actual Volume: 6.28 ft³
 37.5-47.5' is 3/8" Bentonite Chips
 Calculated Volume: 2.45 ft³
 Actual Volume: 2.85 ft³
 47.5-52.5' is Filter Pack: 12/20 Sand
 Calculated Volume: 1.23 ft³
 Actual Volume: 1.67 ft³
 52.5-62.5' is 3/8" Bentonite Chips
 Calculated Volume: 2.45 ft³
 Actual Volume: 2.98 ft³
 62.5-82' is Portland Type I/II Cement with 5% Bentonite
 Calculated Volume: 4.79 ft³
 Actual Volume: 9.23 ft³
 82-92.5' is 3/8" Bentonite Chips
 Calculated Volume: 2.58 ft³
 Actual Volume: 3.68 ft³
 92.5-97.5' is Filter Pack: 12/20 Sand
 Calculated Volume: 1.23 ft³
 Actual Volume: 2.25 ft³
 97.5-100.5' is 3/8" Bentonite Chips
 Calculated Volume: 0.56 ft³
 Actual Volume: 0.70 ft³
 100.5-110' is Portland Type I/II Cement with 5% Bentonite
 Calculated Volume: 1.66 ft³
 Actual Volume: 1.34 ft³
 110-117.5' is 3/8" Bentonite Chips
 Calculated Volume: 1.31 ft³
 Actual Volume: 1.40 ft³
 117.5-154.2' is Filter Pack: 12/20 Sand
 Calculated Volume: 6.40 ft³
 Actual Volume: 7.00 ft³

0-98'
Santa Fe Group Alluvium

Total Well Depth: 140'
 Total Borehole Depth: 156'



Well Completion Diagram 400-SV-02



Coordinates (amsl): 554,895.09 N; 1,530,796.47 E

Brass Cap: 4,836.95'

Borehole Diameter/Depth: Cored 6.1" (0-105'); reamed 7.5" (to 105'); 9.5" (to 38')

Drilling Method: Sonic Coring (with casing advance)

Temporary Casing: Drive Casing 9.5" to 38'

Construction Start Date: 1/13/17 **Time:** 1330

Construction End Data: 1/15/17 **Time:** ~1700

Soil Vapor Zones: 7.5'-12.5' port at 10'
47.5'-52.5' port at 50'
97.5'-104' port at 100'

Comments: Was soil boring 400-SB-02

Notes:

-Diagram not to scale.

-All depths are below ground surface (bgs).

-Stainless Steel hose clamp was used to secure tubing to guide line every 5'.

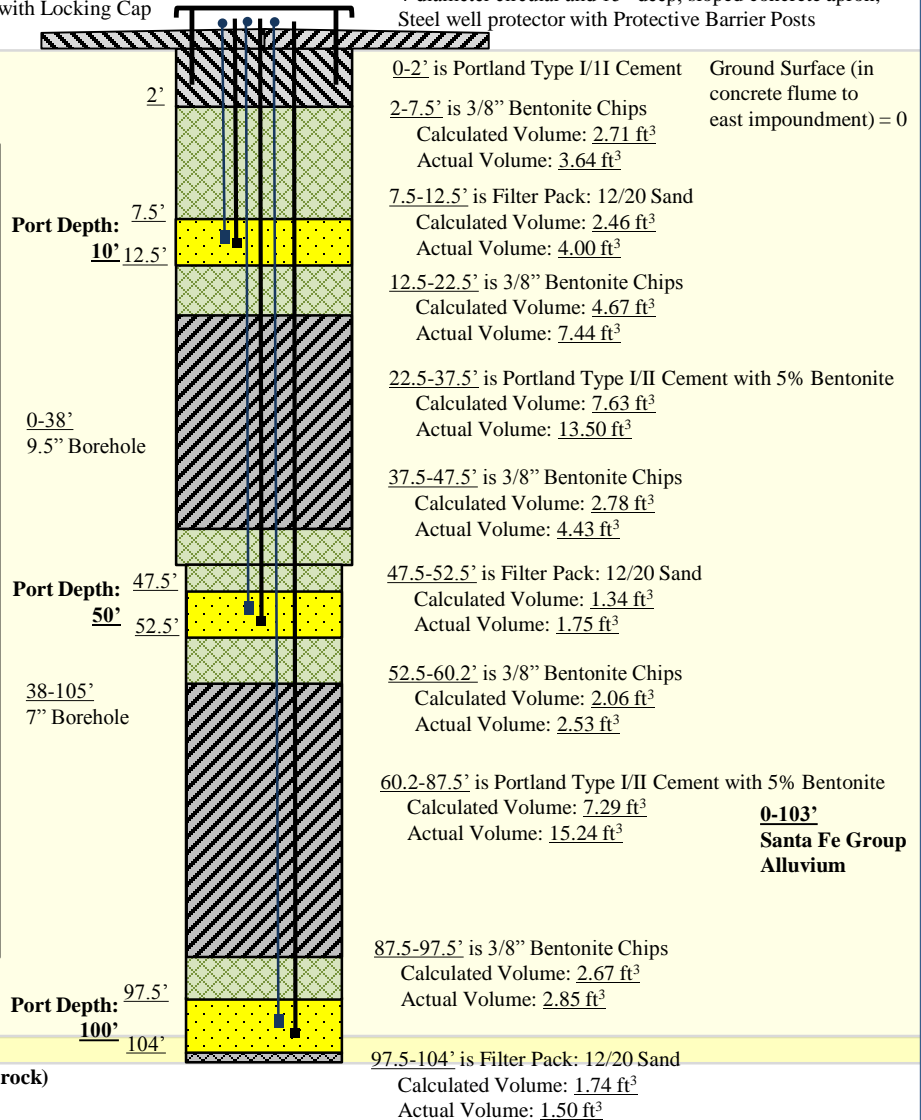
-Vapor ports installed on separate guide lines.

- | ¼" diameter type 304/304L stainless steel tubing.
 - ½" x 12" L-H thread soil vapor implant filter cylindrical screens, 0.011 Twill, type 304 stainless steel, 60 x 60, Item #SVPT99 with 300 series machined ends.
 - ¼" Swagelok® fitting #QC4-SS-D-L-¼ for attachment of sampling equipment. Each soil vapor port installed with a depth label at surface.
 - | ⅜" stainless steel guide line (with stainless steel weight below each port).
 - ¾" x 1.5" steel weight attached to the bottom of stainless steel guide line.
- ▨ Type I/II Portland Cement
 - ▨ Type I/II Portland Cement with 5% Bentonite
 - ▨ 3/8" Bentonite Chips (hydrated)
 - ▨ 2/12 Colorado Silica Sand
 - ▨ Slough
 - ▨ Santa Fe Group Alluvium
 - ▨ Cemented Santa Fe Group Alluvium

8" Steel Well Protector with Locking Cap

Well Apron Design & Construction:

4' diameter circular and 15" deep, sloped concrete apron, Steel well protector with Protective Barrier Posts



103-105'

Cemented Santa Fe Group Alluvium (Bedrock)

Total Borehole Depth: 105'



Well Completion Diagram 400-SV-03



Coordinates (amsl): 554,896.16 N; 1,530,719.28 E

Brass Cap: 4,833.33'

Borehole Diameter/Depth: Cored 6.1" (0-108'); reamed 7.5" (to 95'); 9.5" (to 37')

Drilling Method: Sonic coring (with casing advance)

Temporary Casing: Drive Casing 9.5" to 37'

Construction Start Date: 10/12/16 **Time:** 0854

Construction End Date: 10/13/16 **Time:** 1020

Soil Vapor Zones: 7.5'-12.7' port at 10'

47.3'-53' port at 50'

89.1'-108' port at 92'

Comments: Was soil boring 400-SB-03

Notes:

-Diagram not to scale.

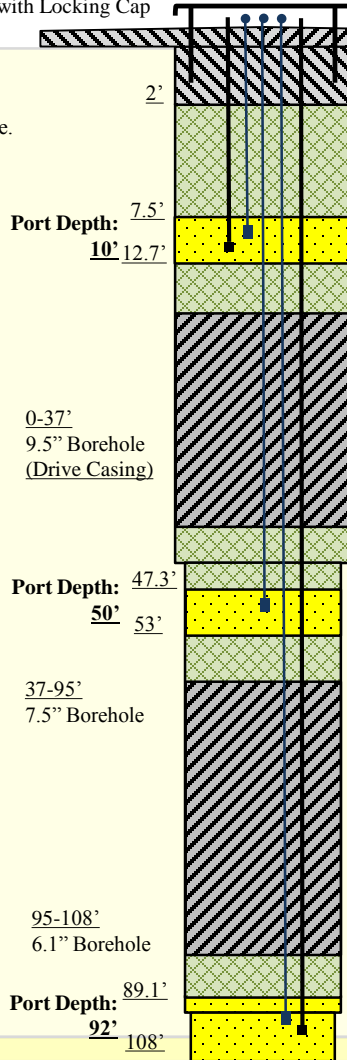
-All depths are below ground surface (bgs).

-Stainless Steel hose clamp was used to secure tubing to guide lines every 5'.

-Port at 10' attached to one guide line; ports at 50' and 92' are attached to a separate guide line.

- | ¼" diameter type 304/304L stainless steel tubing.
 - ½" x 12" L-H thread soil vapor implant filter cylindrical screens, 0.011 Twill, type 304 stainless steel, 60 x 60, Item #SVPT99 with 300 series machined ends.
 - ¼" Swagelok® fitting #QC4-SS-D-L-¼ for attachment of sampling equipment. Each soil vapor port installed with a depth label at surface.
 - | ⅜" stainless steel guide line (with stainless steel weight below each port).
 - ¾" x 1.5" steel weight attached to the bottom of stainless steel guide line.
- Type I/II Portland Cement
 - Type I/II Portland Cement with 5% Bentonite
 - 3/8" Bentonite Chips (hydrated)
 - 2/12 Colorado Silica Sand
 - Santa Fe Group Alluvium
 - Cemented Santa Fe Group Alluvium
 - Andesite Bedrock

8" Steel Well Protector with Locking Cap



Well Apron Design & Construction:

4' diameter circular and 15" deep, sloped concrete apron, Steel well protector with Protective Barrier Posts

0-2' is Portland Type I/II Cement Ground Surface (in east impoundment) = 0

2-7.5' is 3/8" Bentonite Chips
Calculated Volume: 2.71 ft³
Actual Volume: 4.33 ft³

7.5-12.7' is Filter Pack: 2/12 Sand
Calculated Volume: 2.56 ft³
Actual Volume: 6.50 ft³

12.7-24.5' is 3/8" Bentonite Chips
Calculated Volume: 5.81 ft³
Actual Volume: 9.39 ft³

24.5-37.1' is Portland Type I/II Cement with 5% Bentonite
Calculated Volume: 7.18 ft³
Actual Volume: 12.00 ft³

37.1-47.3' is 3/8" Bentonite Chips
Calculated Volume: 2.72 ft³
Actual Volume: 4.33 ft³

47.3-53' is Filter Pack: 2/12 Sand
Calculated Volume: 1.352 ft³
Actual Volume: 3.25 ft³

53-61.1' is 3/8" Bentonite Chips
Calculated Volume: 2.06 ft³
Actual Volume: 2.53 ft³

61.1-79.2' is Portland Type I/II Cement with 5% Bentonite
Calculated Volume: 4.83 ft³
Actual Volume: 8.96 ft³

0-105'
Santa Fe Group Alluvium

79.2-89.1' is 3/8" Bentonite Chips
Calculated Volume: 2.64 ft³
Actual Volume: 3.97 ft³

89.1-108' is Filter Pack: 2/12 Sand
Calculated Volume: 5.05 ft³
Actual Volume: 4.75 ft³

105-108'

Cemented Santa Fe Group Alluvium (Bedrock)

Total Borehole Depth: 108'



Well Completion Diagram 400-SV-05



Coordinates (amsl): 554,884.41 N; 1,530,808.73 E

Brass Cap: 4,839.33'

Borehole Diameter/Depth: Cored 6.1" (0-110'); reamed 7.5" (to 90'); 9.5" (to 18')

Drilling Method: Sonic oring (with casing advance)

Temporary Casing: Drive Casing 9.5" to 18'

Construction Start Date: 1/16/17 **Time:** 0830

Construction End Data: 1/16/17 **Time:** 1435

Soil Vapor Zones: 7.5'-12.7' port at 10'
47.5'-52.3' port at 50'
97.5'-109' port at 100'

Comments: Was soil boring 400-SB-05

Notes:

-Diagram not to scale.

-All depths are below ground surface (bgs).

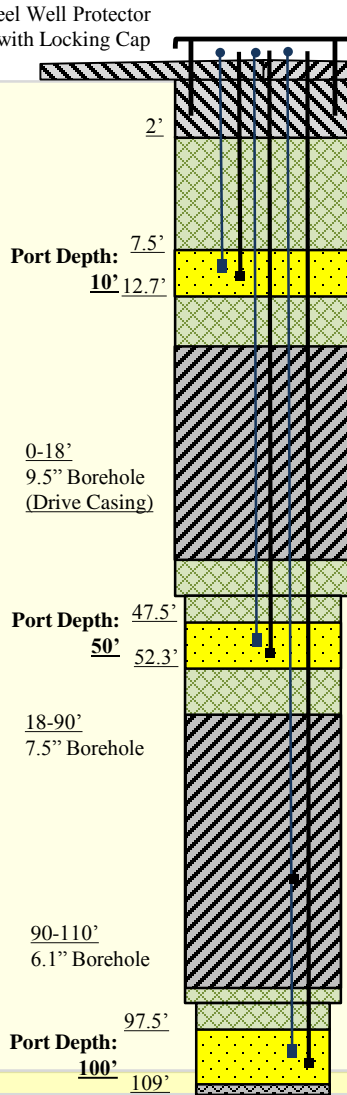
-Stainless Steel hose clamp was used to secure tubing to guide line every 5'.

-Vapor ports installed on separate guide lines.

Well Apron Design & Construction:

4' diameter circular, 4" deep, sloped concrete apron, Steel well protector with Protective Barrier Posts

- ▬ ¼" diameter type 304/304L stainless steel tubing.
 - ½" x 12" L-H thread soil vapor implant filter cylindrical screens, 0.011 Twill, type 304 stainless steel, 60 x 60, Item #SVPT99 with 300 series machined ends.
 - ¼" Swagelok® fitting #QC4-SS-D-L-¼ for attachment of sampling equipment. Each soil vapor port installed with a depth label at surface.
 - ▬ ⅜" stainless steel guide line (with stainless steel weight below each port).
 - ¾" x 1.5" steel weight attached to the bottom of stainless steel guide line.
- Type I/II Portland Cement
 - Type I/II Portland Cement with 5% Bentonite
 - 3/8" Bentonite Chips (hydrated)
 - 2/12 Colorado Silica Sand
 - Slough
 - Santa Fe Group Alluvium
 - Cemented Santa Fe Group Alluvium



0-2' is Portland Type I/II Cement
Ground Surface (in ramp to east impoundment) = 0

2-7.5' is 3/8" Bentonite Chips
Calculated Volume: 2.431 ft³
Actual Volume: 2.53 ft³

7.5-12.7' is Filter Pack: 12/20 Sand
Calculated Volume: 2.30 ft³
Actual Volume: 3.75 ft³

12.7-22' is 3/8" Bentonite Chips
Calculated Volume: 3.41 ft³
Actual Volume: 4.12 ft³

22-37.5' is Portland Type I/II Cement with 5% Bentonite
Calculated Volume: 4.14 ft³
Actual Volume: 7.35 ft³

37.5-47.5' is 3/8" Bentonite Chips
Calculated Volume: 2.67 ft³
Actual Volume: 4.27 ft³

47.5-52.3' is Filter Pack: 12/20 Sand
Calculated Volume: 1.39 ft³
Actual Volume: 2.50 ft³

52.3-64' is 3/8" Bentonite Chips
Calculated Volume: 3.13 ft³
Actual Volume: 3.64 ft³

64-87.5' is Portland Type I/II Cement with 5% Bentonite
Calculated Volume: 6.28 ft³
Actual Volume: 10.29 ft³

0-106 Santa Fe Group Alluvium

87.5-97.5' is 3/8" Bentonite Chips
Calculated Volume: 2.14 ft³
Actual Volume: 2.53 ft³

97.5-109' is Filter Pack: 12/20 Sand
Calculated Volume: 2.26 ft³
Actual Volume: 2.75 ft³

106-110'
Cemented Santa Fe Group Alluvium (Bedrock)

Total Borehole Depth: 110'



Well Completion Diagram 400-SV-07



Coordinates (amsl): 554,818.66 N; 1,530,548.22 E

Brass Cap: 4,828.86'

Borehole Diameter/Depth: Cored 6.1" (0-109'); reamed 8.3" (to 95'); 9.5" (to 20')

Drilling Method: Sonic coring (with casing advance)

Temporary Casing: Drive Casing 9.5" to 20'

Construction Start Date: 12/15/16 **Time:** 1414

Construction End Date: 12/16/16 **Time:** 1140

Soil Vapor Zones: 7.5'-12.5' port at 10'
47.5'-52.5' port at 45'
97.5'-104' port at 100'

Comments: Was soil boring 400-SB-07

Notes:

-Diagram not to scale.

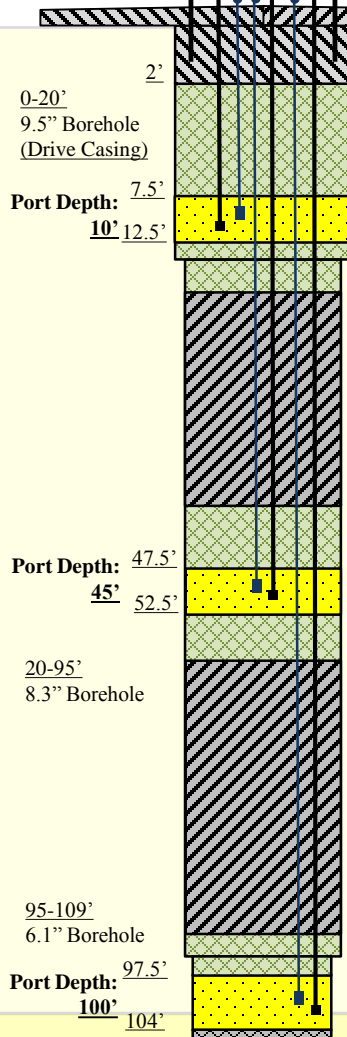
-All depths are below ground surface (bgs).

-Stainless Steel hose clamp was used to secure tubing to guide line every 5'.

-Ports installed on separate guide lines.

- ▮ ¼" diameter type 304/304L stainless steel tubing.
 - ▮ ½" x 12" L-H thread soil vapor implant filter cylindrical screens, 0.011 Twill, type 304 stainless steel, 60 x 60, Item #SVPT99 with 300 series machined ends.
 - ¼" Swagelok® fitting #QC4-SS-D-L-¼ for attachment of sampling equipment. Each soil vapor port installed with a depth label at surface.
 - ▮ ⅜" stainless steel guide line (with stainless steel weight below each port).
 - ▮ ¾" x 1.5" steel weight attached to the bottom of stainless steel guide line.
- Type I/II Portland Cement
 - Type I/II Portland Cement with 5% Bentonite
 - 3/8" Bentonite Chips (hydrated)
 - 2/12 Colorado Silica Sand
 - Slough
 - Santa Fe Group Alluvium
 - Cemented Santa Fe Group Alluvium

8" Steel Well Protector with Locking Cap



Well Apron Design & Construction:

4' diameter circular and 15" deep, sloped concrete apron, Steel well protector with Protective Barrier Posts

0-2' is Portland Type I/II Cement Ground Surface = 0

2-7.4' is 3/8" Bentonite Chips
Calculated Volume: 2.761 ft³
Actual Volume: 4.20 ft³

7.4-12.5' is Filter Pack: 12/20 Sand
Calculated Volume: 2.51 ft³
Actual Volume: 3.25 ft³

12.5-21' is 3/8" Bentonite Chips
Calculated Volume: 4.10 ft³
Actual Volume: 4.20 ft³

21-32.4' is Portland Type I/II Cement with 5% Bentonite
Calculated Volume: 4.29 ft³
Actual Volume: 4.01 ft³

32.4-42.3' is 3/8" Bentonite Chips
Calculated Volume: 3.72 ft³
Actual Volume: 4.20 ft³

42.3-47.5' is Filter Pack: 12/20 Sand
Calculated Volume: 1.96 ft³
Actual Volume: 2.63 ft³

47.5-61' is 3/8" Bentonite Chips
Calculated Volume: 5.08 ft³
Actual Volume: 6.12 ft³

61-87.5' is Portland Type I/II Cement with 5% Bentonite
Calculated Volume: 9.96 ft³
Actual Volume: 15.04 ft³

**0-108.5'
Santa Fe Group
Alluvium**

87.5-97.5' is 3/8" Bentonite Chips
Calculated Volume: 3.33 ft³
Actual Volume: 2.80 ft³

97.5-107.3' is Filter Pack: 12/20 Sand
Calculated Volume: 1.99 ft³
Actual Volume: 2.38 ft³

108.5-109'

Cemented Santa Fe Group Alluvium (Bedrock)

Total Borehole Depth: 109'



Well Completion Diagram 400-SV-09



Coordinates (amsl): 554,772.01 N; 1,530,363.39 E

Brass Cap: 4,824.09'

Borehole Diameter/Depth: Cored 6.1" (0-108.5'); reamed 8.3" (to 100')

Drilling Method: Sonic coring (with casing advance)

Temporary Casing: Drive Casing 9.5" to 20.5'

Construction Start Date: 11/29/16 **Time:** 1250

Construction End Date: 11/30/16 **Time:** 1722

Soil Vapor Zones: 7.5'-12.8' port at 10'

41'-47.8' port at 45'

100.1'-108.5' port at 104'

Comments: Was soil boring 400-SB-09

Notes:

-Diagram not to scale.

-All depths are below ground surface (bgs).

-Stainless Steel hose clamp was used to secure tubing to guideline every 5'.

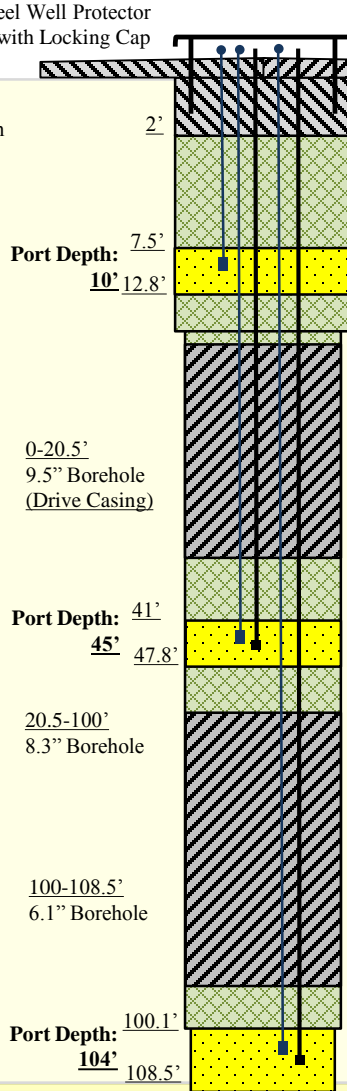
-No guide line used for 10' port. Other ports on Separate guide lines.

Well Apron Design & Construction:

4' diameter circular and 4" deep, sloped concrete apron,

Steel well protector with Protective Barrier Posts

- ▬ ¼" diameter type 304/304L stainless steel tubing.
 - ½" x 12" L-H thread soil vapor implant filter cylindrical screens, 0.011 Twill, type 304 stainless steel, 60 x 60, Item #SVPT99 with 300 series machined ends.
 - ¼" Swagelok® fitting #QC4-SS-D-L-¼ for attachment of sampling equipment. Each soil vapor port installed with a depth label at surface.
 - ▬ ⅜" stainless steel guide line (with stainless steel weight below each port).
 - ¾" x 1.5" steel weight attached to the bottom of stainless steel guide line.
- Type I/II Portland Cement
 - Type I/II Portland Cement with 5% Bentonite
 - 3/8" Bentonite Chips (hydrated)
 - 2/12 Colorado Silica Sand
 - Santa Fe Group Alluvium
 - Cemented Santa Fe Group Alluvium



0-2' is Portland Type I/II Cement Ground Surface = 0

2-7.5' is 3/8" Bentonite Chips

Calculated Volume: 2.71 ft³

Actual Volume: 2.80 ft³

7.5-12.8' is Filter Pack: 2/12 Sand

Calculated Volume: 2.61 ft³

Actual Volume: 2.50 ft³

12.8-23' is 3/8" Bentonite Chips

Calculated Volume: 4.78 ft³

Actual Volume: 6.30 ft³

23-32.5' is Portland Type I/II Cement with 5% Bentonite

Calculated Volume: 3.74 ft³

Actual Volume: 5.81 ft³

32.5-41' is 3/8" Bentonite Chips

Calculated Volume: 3.35 ft³

Actual Volume: 3.15 ft³

41-47.8' is Filter Pack: 2/12 Sand

Calculated Volume: 2.68 ft³

Actual Volume: 2.50 ft³

47.8-61' is 3/8" Bentonite Chips

Calculated Volume: 5.20 ft³

Actual Volume: 7.22 ft³

61-91.5' is Portland Type I/II Cement with 5% Bentonite

Calculated Volume: 12.02 ft³

Actual Volume: 23.40 ft³

0-108'
Santa Fe Group
Alluvium

91.5-100.1' is 3/8" Bentonite Chips

Calculated Volume: 3.23 ft³

Actual Volume: 3.25 ft³

100.1-108.5' is Filter Pack: 2/12 Sand

Calculated Volume: 1.50 ft³

Actual Volume: 1.50 ft³

108-108.5'

Cemented Santa Fe Group Alluvium (Bedrock)

Total Borehole Depth: 108.5'



Well Completion Diagram 400-SV-10



Coordinates (amsl): 554,854.24 N; 1,530,383.56 E

Brass Cap: 4,821.69'

Borehole Diameter/Depth: Cored 6.1" (0-109'); reamed 7.5" (to 100'), 8.3" (to 109'); 8.5" (to 173.5')

Drilling Method: Sonic coring to bedrock / Air rotary in bedrock (109-173.5')

Temporary Casing: Drive Casing 9.5" to 30'

Construction Start Date: 10/27/16 **Time:** 0949

Construction End Date: 11/01/16 **Time:** 1631

Soil Vapor Zones: 7.3'-12.6' port at 10'

47.5'-52.7' port at 50'

97.4'-102.5' port at 100'

122.2'-127.8' port at 125'

Comments: Was soil boring 400-SB-10

Notes:

-Diagram not to scale.

-All depths are below ground surface (bgs).

-Stainless Steel hose clamp was used to secure tubing to guideline every 5'.

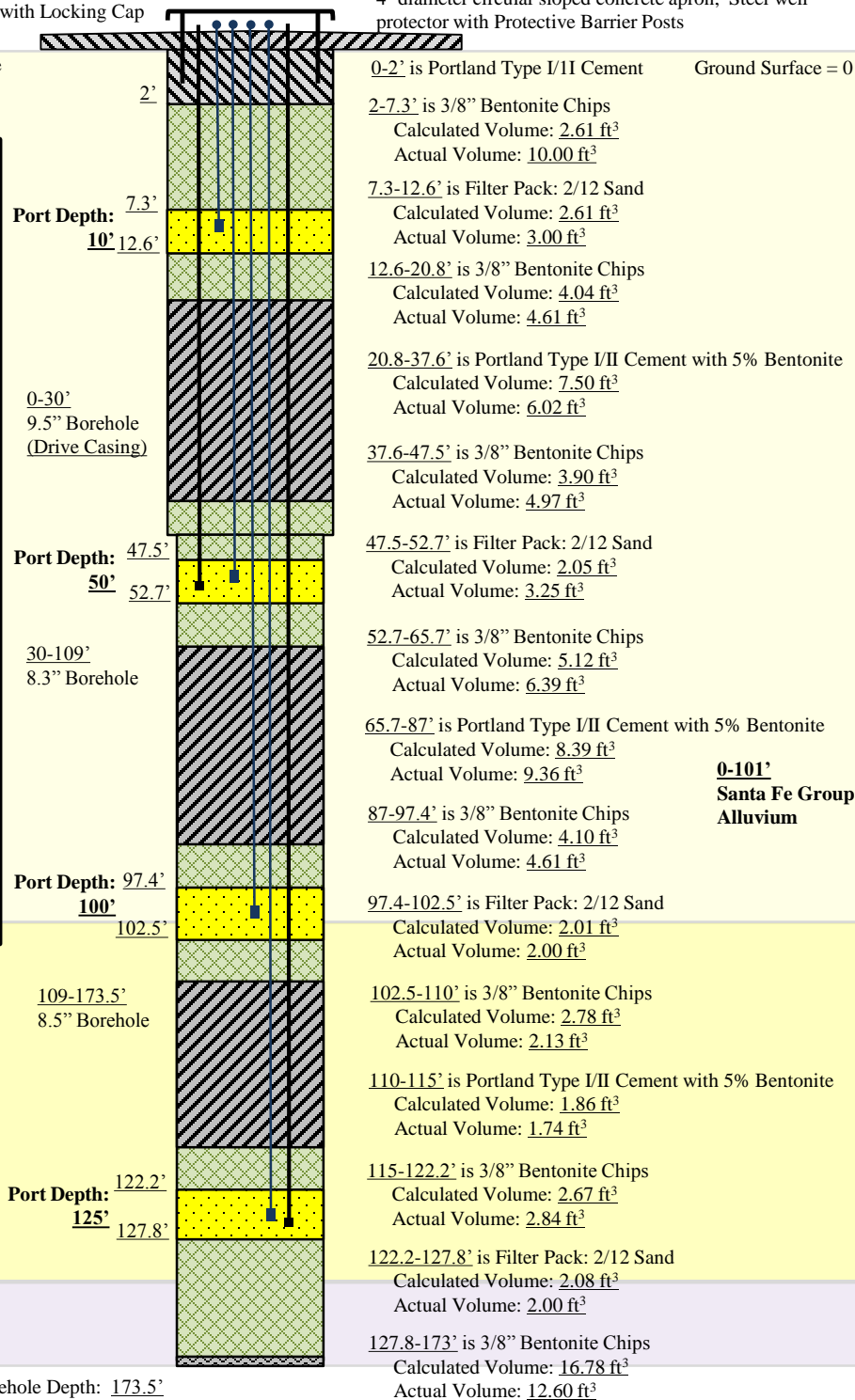
-Two vapor ports installed per guide line.

- ▬ ¼" diameter type 304/304L stainless steel tubing.
 - ½" x 12" L-H thread soil vapor implant filter cylindrical screens, 0.011 Twill, type 304 stainless steel, 60 x 60, Item #SVPT99 with 300 series machined ends.
 - ¼" Swagelok® fitting #QC4-SS-D-L-¼" for attachment of sampling equipment. Each soil vapor port installed with a depth label at surface.
 - ▬ ⅜" stainless steel guide line (with stainless steel weight below each port).
 - ¾" x 1.5" steel weight attached to the bottom of stainless steel guide line.
- Type I/II Portland Cement
 - Type I/II Portland Cement with 5% Bentonite
 - 3/8" Bentonite Chips (hydrated)
 - 2/12 Colorado Silica Sand
 - Slough
 - Santa Fe Group Alluvium
 - Cemented Santa Fe Group Alluvium
 - Andesite Bedrock

8" Steel Well Protector with Locking Cap

Well Apron Design & Construction:

4' diameter circular sloped concrete apron, Steel well protector with Protective Barrier Posts



Total Borehole Depth: 173.5'



Well Completion Diagram 400-SV-15



Coordinates (amsl): 555,033.95 N; 1,531,234.96 E

Brass Cap: 4,845.56'

Borehole Diameter/Depth: Cored 6.1" (0-95'); reamed 7.5" (to 94'); 9.5" (to 67')

Drilling Method: Sonic coring with casing advance

Temporary Casing: Drive casing 9.5" to 67'

Construction Start Date: 10/7/16 **Time:** 1450

Construction End Date: 10/8/16 **Time:** 0946

Soil Vapor Zones: 7.5'-12.7' port at 10'
47.5'-52.5' port at 50'
87.5'-93.6' port at 90'

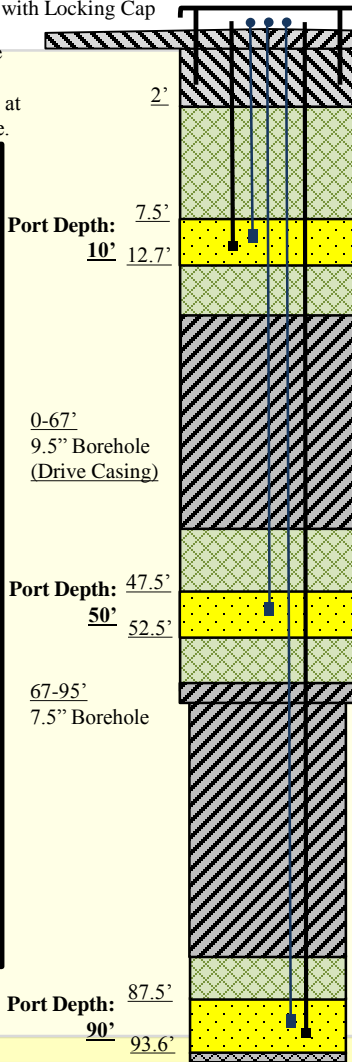
Comments: Was soil boring 400-SB-15

Notes:

- Diagram not to scale.
- All depths are below ground surface (bgs).
- Stainless Steel hose clamp was used to secure tubing to guide lines every 5'.
- Port at 10' is attached to one guide line; ports at 50 and 90' are attached to a separate guide line.

- ▬ ¼" diameter type 304/304L stainless steel tubing.
- ½" x 12" L-H thread soil vapor implant filter cylindrical screens, 0.011 Twill, type 304 stainless steel, 60 x 60, Item #SVPT99 with 300 series machined ends.
- ¼" Swagelok® fitting #QC4-SS-D-L-¼ for attachment of sampling equipment. Each soil vapor port installed with a depth label at surface.
- ▬ ⅜" stainless steel guide line (with stainless steel weight below each port).
- ¾" x 1.5" steel weight attached to the bottom of stainless steel guide line.
- ▨ Type I/II Portland Cement
- ▨ Type I/II Portland Cement with 5% Bentonite
- ▨ 3/8" Bentonite Chips (hydrated)
- ▨ 2/12 Colorado Silica Sand
- ▨ Slough
- ▨ Santa Fe Group Alluvium
- ▨ Cemented Santa Fe Group Alluvium

8" Steel Well Protector with Locking Cap



Well Apron Design & Construction:

4' diameter circular sloped concrete apron, Steel well protector with Protective Barrier Posts

0-2' is Portland Type I/II Cement Ground Surface = 0

2-7.5' is 3/8" Bentonite Chips
Calculated Volume: 2.71 ft³
Actual Volume: 4.33 ft³

7.5-12.7' is Filter Pack: 2/12 Sand
Calculated Volume: 2.56 ft³
Actual Volume: 3.50 ft³

12.7-25' is 3/8" Bentonite Chips
Calculated Volume: 6.05 ft³
Actual Volume: 11.07 ft³

25-37.6' is Portland Type I/II Cement with 5% Bentonite
Calculated Volume: 6.20 ft³
Actual Volume: 8.02 ft³

37.6-47.5' is 3/8" Bentonite Chips
Calculated Volume: 4.87 ft³
Actual Volume: 6.50 ft³

47.5-52.5' is Filter Pack: 2/12 Sand
Calculated Volume: 2.46 ft³
Actual Volume: 2.75 ft³

52.5-64' is 3/8" Bentonite Chips
Calculated Volume: 5.66 ft³
Actual Volume: 7.94 ft³

64-77.4' is Portland Type I/II Cement with 5% Bentonite
Calculated Volume: 4.39 ft³
Actual Volume: 6.02 ft³

0-92'
Santa Fe Group Alluvium

77.4-87.5' is 3/8" Bentonite Chips
Calculated Volume: 2.82 ft³
Actual Volume: 3.43 ft³

87.5-93.6' is Filter Pack: 2/12 Sand
Calculated Volume: 1.71 ft³
Actual Volume: 1.84 ft³

92-95'

Cemented Santa Fe Group Alluvium (Bedrock)

Total Borehole Depth: 95'

Appendix F
Well Development Reports



BOREHOLE / WELL DEVELOPMENT

400-SB-04 (Became 400-EV-131)

Site/Screen Name: Screen 131-146'
 Location: White Sands Test Facility
400 Area
 Lead Company: Navarro (N)
 Supporting Company: Cascade Drilling (C)

Project No.: 400 Area Investigation
 Field Personnel: Cody Stopka, Michael Narup (N); Danny Moore (C)
 Document Reviewer: Lela Hunnicutt-Mack
 Review Complete: 9/18/2017

FINAL DEVELOPMENT PARAMETERS

Borehole / Well Total Depth: 154.5 / 146 ft bgs
 Screened Interval: 131 ft bgs to 146 ft bgs
 Total Volume Withdrawn (Bailing/Pumping): 143 gals
 Total Volume Added: 44 gals

DEVELOPMENT TOOLS (Well Totals)

Tool: <u>Surge Tool</u>	Description: <u>10' long steel rod with rubber discs on ends size of casing ID</u>	Used from: <u>12/7/2016 1406</u>	to	<u>12/15/2016 1345</u>
Tool: <u>Bailer</u>	Description: <u>3" Inside Diameter, 5' long</u>	Used from: <u>12/7/2016 1508</u>	to	<u>12/15/2016 1457</u>
Tool: <u>Added water</u>	Description: <u>Added potable water to well to clear up sand and silt in water</u>	Used from: <u>12/8/2016 0750</u>	to	<u>12/8/2016 1406</u>
Tool: <u>Pump</u>	Description: <u>Submersible pump</u>	Used from: <u>12/15/2016 1515</u>	to	<u>12/16/2016 0939</u>

DEVELOPMENT DATA

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
12/7/2016	1406-1508	NA	NA	0	0	Surge	NR	NR	NR	NR	NR
"	1508-1604	NA	NA	14.5	14.5	Bail	NR	NR	NR	Brown	NR
12/8/2016	0720	NA	NA	NR	NR	Begin Bail	NR	NR	NR	Dark brown	NR
"	0750-1055	NA	NA	13 added	14.5	Added water	NA	NA	NA	NA	NA



BOREHOLE / WELL DEVELOPMENT

400-SB-04 (Became 400-EV-131) (Continued)

Site/Screen Name: Screen 135-146'

Project No.: 400 Area Investigation

Location: WSTF 400 Area

Field Personnel: Cody Stopka, Michael Narup (N) Richard Mallet (C)

DEVELOPMENT TOOLS (Daily)

Tool: <u>Bailer</u>	Description: <u>3" Inside Diameter; 5' long</u>	Used from: <u>12/8/2016 0935</u>	to: <u>12/8/2016 1338</u>
Tool: <u>Surge Tool</u>	Description: <u>10' long steel rod with rubber discs on ends size of casing ID</u>	Used from: <u>12/8/2016 1108</u>	to: <u>12/8/2016 1442</u>
Tool: <u>Added water</u>	Description: <u>To develop sand/silt from the well</u>	Used from: <u>12/8/2016 0750</u>	to: <u>12/8/2016 1406</u>

DEVELOPMENT DATA (Continued)

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
12/8/2016	0935	NA	NA	4.5	19	Bail	NR	NR	NR	NR	NR
"	1025	NA	NA	10	29	Bail End	NR	NR	NR	NR	149.35
"	1050	NA	NA	0	29	Recharge	NR	NR	NR	NR	146.60
"	1108-1123	NA	NA	0	29	Surge	NA	NA	NA	NA	NR
"	1123	NA	NA	NR	29	Bail	NR	NR	NR	NR	139.81
"	1224	NA	NA	24	53	Bail	NR	NR	NR	NR	NR
"	1226	NA	NA	15 added	53	Added water	NA	NA	NA	NA	NR
"	1226-1254	NA	NA	0	53	Surge	NA	NA	NA	NA	NR
"	1254-1338	NA	NA	20	73	Bail	NR	NR	NR	NR	141.05
"	1406	NA	NA	12 added 4 added	73	Added water	NA	NA	NA	NA	141.61



BOREHOLE / WELL DEVELOPMENT

400-SB-04 (Became 400-EV-131) (Continued)

Site/Screen Name: Screen 135-146'

Project No.: 400 Area Investigation

Location: WSTF 400 Area

Field Personnel: Cody Stopka, Michael Narup (N) Danny Moore,
Richard Mallet (C)

DEVELOPMENT TOOLS (Daily)

Tool: <u>Surge Tool</u>	Description: <u>10' long steel rod with rubber discs on ends size of casing ID</u>	Used from: <u>12/15/2016 1250</u>	to: <u>12/15/2016 1345</u>
Tool: <u>Bailer</u>	Description: <u>3" Inside Diameter; 5' long</u>	Used from: <u>12/15/2016 1442</u>	to: <u>12/15/2016 1457</u>
Tool: <u>Pump</u>	Description: <u>Submersible pump</u>	Used from: <u>12/15/2016 1515</u>	to: <u>12/15/2016 1622</u>

DEVELOPMENT DATA (Continued)

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
12/8/2016	1406-1442	NA	NA	0	73	Surge	NA	NA	NA	NA	NR
12/8/2016	1442-1535	NA	NA	25	98	Bail	NR	NR	NR	NR	NR
12/15/2016	1250-1345	NA	NA	0	98	Surge	NR	NR	NR	NR	NR
“	1345-1355	NA	NA	NR	98	Bail	NR	NR	NR	NR	NR
“	1445-1457	NA	NA	NR-5?	103	“	NR	NR	NR	NR	NR
“	1515	NA	NA	0	103	Pump on	NR	NR	NR	NR	NR
“	1551	NA	NA	11	114	Pump	6.72	23.0	1,337	193	NR
“	1557	NA	NA	NR	NR	“	6.80	22.0	1,341	52.4	NR
“	1602	NA	NA	NR	NR	“	6.79	22.1	1,341	31.2	NR
“	1610	NA	NA	NR	NR	“	6.81	21.7	1,321	19.1	NR
“	1617	NA	NA	NR	NR	“	6.79	21.7	1,313	11.4	NR



BOREHOLE / WELL DEVELOPMENT

400-SB-04 (Became 400-EV-131) (Continued)	
Site/Screen Name: <u>Screen 135-146'</u>	Project No.: <u>400 Area Investigation</u>
Location: <u>WSTF 400 Area</u>	Field Personnel: <u>Cody Stopka, Tom McCrory, Tim Kondy, Frank Gallegos (N) Richard Mallet (C)</u>

DEVELOPMENT TOOLS (Daily)			
Tool: <u>Pump</u>	Description: <u>Submersible pump</u>	Used from: <u>12/15/2016 1632</u>	to <u>12/16/2016 0939</u>

DEVELOPMENT DATA (Continued)

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
12/15/2016	1622	NA	NA	NR	NR	Pump	6.80	21.7	1,315	9.28	NR
12/15/2016	1632	NA	NA	9	123	Pump off	6.78	21.7	1,315	6.70	NR
12/16/2016	0905	NA	NA	NR	NR	Pump on	7.01	18.9	1,349	4.7	NR
“	0916	NA	NA	NR	NR	Pump	7.09	19.2	1,333	9.45	NR
“	0922	NA	NA	NR	NR	“	7.13	18.9	1,347	7.06	NR
“	0931	NA	NA	NR	NR	“	7.15	19.3	1,342	4.96	NR
“	0939	NA	NA	20	143	“	7.16	18.8	1,335	3.95	NR

Development Complete



BOREHOLE / WELL DEVELOPMENT

400-SB-14 (Became 400-FV-131)

Site/Screen Name: <u>Screen 130.5-145.5'</u>	Project No.: <u>400 Area Investigation</u>
Location: <u>White Sands Test Facility 400 Area</u>	Field Personnel: <u>Tom McCrory, Cody Stopka (N); Danny Moore (C)</u>
Lead Company: <u>Navarro (N)</u>	Document Reviewer: <u>Lela Hunnicutt-Mack</u>
Supporting Company: <u>Cascade Drilling</u>	Review Complete: <u>9/18/2017</u>

FINAL DEVELOPMENT PARAMETERS

Borehole / Well Total Depth: 145.5 / 153.5 ft bgs Screened Interval: 130.5 ft bgs to 145.5 ft bgs

Total Volume Withdrawn (Bailing/Pumping): 165 gals

DEVELOPMENT TOOLS (Well Totals)

Tool: <u>Surge Tool</u>	Description: <u>10' long steel rod with rubber discs on ends size of casing ID</u>	Used from: <u>12/6/2016 0800</u>	to	<u>12/10/2016 0717</u>
Tool: <u>Bailer</u>	Description: <u>3" Inside Diameter, 5' long</u>	Used from: <u>12/6/2016 0915</u>	to	<u>1/25/2017 1320</u>
Tool: <u>Pump</u>	Description: <u>Submersible pump</u>	Used from: <u>12/7/2016 0715</u>	to	<u>1/26/2017 0845</u>

DEVELOPMENT DATA

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
12/6/2016	0800-0900	NA	NA	0	0	Surge	NR	NR	NR	NR	NR
"	0915	NA	NA	0	0	Bailer	7.33	16.3	1,423	>999	125.63
"	0928	NA	NA	10	10	"	7.32	18.0	1,436	>999	NR
"	0938	NA	NA	11.5	21.5	"	6.81	18.0	1,451	>999	NR
12/7/2016	0715	NA	NA	0	21.5	Pump on	6.80	17.1	1,333	185	NR
"	0720	NA	NA	NR	21.5	"	NR	NR	NR	85	NR
"	0746	NA	NA	22 total	43.5	Pump off	NR	NR	NR	NR	NR



BOREHOLE / WELL DEVELOPMENT

400-SB-14 (Became 400-FV-131) (Continued)

Site/Screen Name: Screen 130.5-145.5'
White Sands Test Facility
 Location: 400 Area

Project No.: 400 Area Investigation
 Field Personnel: Cody Stopka, Michael Narup (N);
 Danny Moore (C)

DEVELOPMENT TOOLS (Daily)

Tool: <u>Pump</u>	Description: <u>Submersible pump</u>	Used from: <u>12/8/2016 1702</u>	to	<u>12/8/2016 1712</u>
Tool: <u>Surge Tool</u>	Description: <u>10' long steel rod with rubber discs on ends size of casing ID</u>	Used from: <u>12/9/2016 1400</u>	to	<u>12/9/2016 1555</u>
Tool: <u>Bailer</u>	Description: <u>3" Inside Diameter; 5' long</u>	Used from: <u>12/9/2016 1430</u>	to	<u>12/9/2016 1630</u>

DEVELOPMENT DATA

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
12/8/2016	1702-1712	NA	NA	NR-1.5?	45	Pump	NR	NR	NR	NR	128.55
12/9/2016	1400-1430	NA	NA	0	45	Surge	NA	NA	NA	NA	NR
“	1430-1535	NA	NA	22	67	Bail	NR	NR	NR	NR	NR
“	1535-1555	NA	NA	0	67	Surge	NA	NA	NA	NA	NR
“	1555	NA	NA	2 added	67	Added water	NA	NA	NA	NA	NR
“	1600	NA	NA	NR	67	Bail	NR	NR	NR	NR	NR
“	1610	NA	NA	10 added	67	Added water	NR	NR	NR	NR	NR
“	1630	NA	NA	12	79	Bail	NR	NR	NR	NR	NR



BOREHOLE / WELL DEVELOPMENT

400-SB-14 (Became 400-FV-131) (Continued)

Site/Screen Name: Screen 130.5-145.5'
 Location: White Sands Test Facility
400 Area

Project No.: 400 Area Investigation
 Field Personnel: Michael Narup, Tom McCrory (N);
Richard Mallet (C)

DEVELOPMENT TOOLS (Daily)

Tool: <u>Surge Tool</u>	Description: <u>10' long steel rod with rubber discs on ends size of casing ID</u>	Used from: <u>12/10/2016</u> <u>0700</u>	to	<u>12/10/2016</u> <u>0717</u>
Tool: <u>Bailer</u>	Description: <u>3" Inside Diameter; 5' long</u>	Used from: <u>12/10/2016</u> <u>0721</u>	to	<u>1/25/2017</u> <u>1320</u>
Tool: <u>Pump</u>	Description: <u>Submersible pump</u>	Used from: <u>12/25/2017</u> <u>1332</u>	to	<u>1/25/2017</u> <u>1429</u>

DEVELOPMENT DATA

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
12/10/2016	0700-0717	NA	NA	0	79	Surge	NR	NR	NR	NR	NR
"	0721-0756	NA	NA	20	99	Bail	NR	NR	NR	NR	148.60
1/18/2017	All day	NA	NA	25	124	"	NR	NR	NR	NR	NR
1/25/2017	1320	NA	NA	NR-1?	125	"	NR	NR	NR	Brown	128.32
"	1332	NA	NA	3	128	Pump on	NR	NR	NR	NR	132.35
"	1342	NA	NA	3	131	Pump	6.61	19.4	1,286	354	134.14
"	1356	NA	NA	3	134	"	NR	NR	NR	NR	136.0
"	1405	NA	NA	NR	134	"	NR	NR	NR	NR	137.14
"	1415	NA	NA	3	137	"	6.55	20.0	1,288	51.5	NR
"	1429	NA	NA	NR	137	"	NR	NR	NR	NR	139.30



BOREHOLE / WELL DEVELOPMENT

400-SB-14 (Became 400-FV-131) (Continued)

Site/Screen Name: Screen 130.5-145.5'
 White Sands Test Facility
 Location: 400 Area

Project No.: 400 Area Investigation
 Field Personnel: Michael Narup, Tom McCrory (N);
 Richard Mallet (C)

DEVELOPMENT TOOLS (Daily)

Tool: Pump Description: Submersible pump Used from: 1/25/2017 1431 to 1/26/2017 0845

DEVELOPMENT DATA

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
1/25/2017	1431	NA	NA	3	140	Pump	6.56	19.4	1,287	32.5	NR
"	1458	NA	NA	4	144	"	6.63	20.4	1289	16.0	142.0
1/25/2017	1530	NA	NA	6	150	Pump	6.65	19.5	1290	7.5	144.1
"	1556	NA	NA	3	153	"	6.72	19.3	1295	5.2	145.0
"	1605	NA	NA	NR-1?	154	Pump off	NR	NR	NR	NR	NR
1/26/2017	0750	NA	NA	1	155	Pump on	7.03	12.0	1,500	15.6	130.44
"	0810	NA	NA	3	158	"	6.94	12.1	1242	9.69	NR
"	0825	NA	NA	2	160	"	6.92	13.6	1232	7.18	136.93
"	0835	NA	NA	2	162	"	6.96	12.5	1233	4.95	NR
"	0845	NA	NA	3	165	"	6.87	13.6	1220	4.87	NR

Development Complete



BOREHOLE / WELL DEVELOPMENT

400-SB-13 (Became 400-GV-125)

Site/Screen Name: Screen 125-140'
 Location: White Sands Test Facility
400 Area
 Lead Company: Navarro (N)
 Supporting Company: Cascade Drilling (C)

Project No.: 400 Area Investigation
 Field Personnel: Tom McCrory, Cody Stopka (N); Danny Moore (C)
 Document Reviewer: Lela Hunnicutt-Mack
 Review Complete: 9/18/2017

FINAL DEVELOPMENT PARAMETERS

Borehole / Well Total Depth: 167.5 / 140 ft bgs
 Screened Interval: 125 ft bgs to 140 ft bgs
 Total Volume Withdrawn (Bailing/Pumping): 127 gals

DEVELOPMENT TOOLS (Well Totals)

Tool: <u>Surge Tool</u>	Description: <u>10' long steel rod with rubber discs at ends size of ID of well</u>	Used from: <u>12/6/2016 1125</u>	to	<u>12/6/2016 1225</u>
Tool: <u>Bailer</u>	Description: <u>3" Inside Diameter, 5' long</u>	Used from: <u>12/6/2016 1245</u>	to	<u>12/6/2016 1304</u>
Tool: <u>Pump</u>	Description: <u>Submersible pump</u>	Used from: <u>12/7/2016 0820</u>	to	<u>12/16/2016 1445</u>

DEVELOPMENT DATA

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
12/6/2016	1125-1225	NA	NA	0	0	Surge	NR	NR	NR	NR	129.62
"	1245	NA	NA	0	0	Bail	7.21	20.1	2,360	>999	NR
"	1252	NA	NA	8	8	"	7.16	19.8	2,346	>999	NR
"	1258	NA	NA	8	16	"	7.11	19.8	2,206	>999	NR
"	1304	NA	NA	1	17	"	NR	NR	NR	NR	NR
12/7/2016	0820	NA	NA	0	17	Pump on	NR	NR	NR	Brown	NR
"	0833	NA	NA	NR	17	Pump	NR	NR	NR	>999	NR



BOREHOLE / WELL DEVELOPMENT

400-SB-13 (Became 400-GV-125) (Continued)

Site/Screen Name: Screen 125-140'
 White Sands Test Facility
 Location: 400 Area

Project No.: 400 Area Investigation
 Field Personnel: Cody Stopka, Michael Narup (N); Danny Moore (C)

DEVELOPMENT TOOLS (Daily)

Tool: Pump Description: Submersible Pump Used from: 12/7/2016 0840 to 12/9/2016 0837

DEVELOPMENT DATA

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
12/7/2016	0840	NA	NA	13	30	Pump off	NR	NR	NR	NR	Pumps dry
"	0915	NA	NA	NA	30	Recharge	NR	NR	NR	NR	8' in 30 min
"	1225	NA	NA	0	30	Pump on	NR	NR	NR	NR	129.6
"	1230	NA	NA	NR	30	Pump	6.75	21.0	1,358	64.7	NR
"	1235	NA	NA	NR	30	"	NR	NR	NR	47.6	NR
"	1243	NA	NA	NR--~4?	34?	Pump off	NR	NR	NR	NR	NR
12/8/2016	1634	NA	NA	0	34	Pump on	NR	NR	NR	NR	129.70
"	1646	NA	NA	5	39	"	6.90	20.2	1,300	11.6	NR
"	1652	NA	NA	7	46	"	6.79	18.7	1,330	126	NR
"	1659	NA	NA	1	47	Pump off	NR	NR	NR	NR	NR
12/9/2016	0739	NA	NA	0	47	Pump fail	NR	NR	NR	NR	129.73
"	0830	NA	NA	0	47	Pump on	6.60	18.9	1,272	865	NR
"	0837	NA	NA	NR	47	Pump	6.73	19.6	1,298	90.0	NR



BOREHOLE / WELL DEVELOPMENT

400-SB-13 (Became 400-GV-125) (Continued)

Site/Screen Name: Screen 125-140'

Project No.: 400 Area Investigation

Location: White Sands Test Facility
400 Area

Field Personnel: Cody Stopka, Tom McCrory, Tim Kondy,
Frank Gallegos (N); Richard Mallet (C)

DEVELOPMENT TOOLS (Daily)

Tool: Pump Description: Submersible Pump Used from: 12/9/2016 0855 to 12/16/2016 1355

DEVELOPMENT DATA

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
12/9/2016	0855	NA	NA	NR	47	Pump	6.83	19.8	1,303	78.7	NR
“	0859	NA	NA	NR	47	“	6.79	20.3	1,301	42.7	NR
“	0902	NA	NA	NR	47	“	NR	NR	NR	37.4	NR
“	0915	NA	NA	25	72	Pump off	NR	NR	NR	NR	Pump dry
12/16/2016	1225	NA	NA	0	72	Pump on	7.27	22.0	1,311	41.3	NR
“	1234	NA	NA	NR	72	“	7.13	21.8	1,296	22.7	NR
“	1245	NA	NA	NR	72	“	7.10	22.2	1,296	12.8	NR
“	1256	NA	NA	NR	72	“	7.14	21.7	1,297	9.49	NR
“	1307	NA	NA	NR	72	“	7.11	21.2	1,281	7.53	NR
“	1315	NA	NA	NR	72	“	7.19	21.4	1,307	8.02	NR
“	1331	NA	NA	NR	72	“	7.31	21.4	1,304	10.06	NR
“	1343	NA	NA	NR	72	“	7.33	21.4	1,317	9.89	NR
“	1355	NA	NA	NR	72	“	7.21	22.1	1298	13.20	NR



BOREHOLE / WELL DEVELOPMENT

400-SB-13 (Became 400-GV-125) (Continued)

Site/Screen Name: Screen 125-140'
 Location: White Sands Test Facility
400 Area

Project No.: 400 Area Investigation
 Field Personnel: Tom McCrory, Tim Kondy, Frank Gallegos (N);
Richard Mallet (C)

DEVELOPMENT TOOLS (Daily)

Tool: Pump Description: Submersible Pump Used from: 12/16/2016 to 12/16/2016
1425 to 1445

DEVELOPMENT DATA

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
12/16/2016	1425	NA	NA	NR	72	Pump	7.31	21.9	1294	12.00	NR
“	1440	NA	NA	NR	72	“	7.18	21.8	1271	4.89	NR
“	1445	NA	NA	55	127	Pump off	7.13	22.8	1287	3.45	NR

Development Complete



BOREHOLE / WELL DEVELOPMENT

400-SB-08 (Became 400-HV-147)

Site/Screen Name: <u>Screen 147-162'</u>	Project No.: <u>400 Area Investigation</u>
Location: <u>White Sands Test Facility 400 Area</u>	Field Personnel: <u>Michael Narup, Troy Wiebe (N); Danny Moore; Richard Mallet (C)</u>
Lead Company: <u>Navarro (N)</u>	Document Reviewer: <u>Lela Hunnicutt-Mack</u>
Supporting Company: <u>Cascade Drilling (C)</u>	Review Complete: <u>9/18/2017</u>

FINAL DEVELOPMENT PARAMETERS

Borehole / Well Total Depth: 172.9/162 ft bgs Screened Interval: 147 ft bgs to 162 ft bgs

Total Volume Withdrawn (Bailing/Pumping): 103 gals

DEVELOPMENT TOOLS (Well Totals)

Tool: <u>Surge Tool</u>	Description: <u>10' long steel rod with rubber discs on ends size of casing ID</u>	Used from: <u>12/10/2016 0852</u>	to	<u>12/20/2016 0900</u>
Tool: <u>Bailer</u>	Description: <u>3" Inside Diameter, 5' long</u>	Used from: <u>12/10/2016 1010</u>	to	<u>1/26/2017 1100</u>
Tool: <u>Pump</u>	Description: <u>Submersible Pump/Bennett Pump</u>	Used from: <u>1/26/2017 1100</u>	to	<u>3/22/2017 0750</u>

DEVELOPMENT DATA

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
12/10/2016	0852-1010	NA	NA	0	0	Surge	NR	NR	NR	NR	133.90
"	1010-1029	NA	NA	15	15	Bail	NR	NR	NR	NR	NR
"	1036	NA	NA	15	30	"	NR	NR	NR	NR	NR
"	1051	NA	NA	10	40	"	NR	NR	NR	NR	NR
"	1109	NA	NA	12	52	"	NR	NR	NR	NR	164.98
12/20/2016	0815-0900	NA	NA	0	52	Surge	NR	NR	NR	NR	138.82



BOREHOLE / WELL DEVELOPMENT

400-SB-08 (Became 400-HV-147) (Continued)			
Site/Screen Name: <u>Screen 147-162'</u>	Project No.: <u>400 Area Investigation</u>		
Location: <u>White Sands Test Facility</u>	Field Personnel: <u>Michael Narup (N); Richard Mallet (C)</u>		
<u>400 Area</u>			

DEVELOPMENT TOOLS (Daily)				
Tool: <u>Bailer</u>	Description: <u>3" Inside Diameter, 5' long</u>	Used from: <u>12/20/2016</u> <u>0905</u>	to	<u>1/26/2017</u> <u>1100</u>
Tool: <u>Pump</u>	Description: <u>Submersible Pump</u>	Used from: <u>1/26/2017</u> <u>1100</u>	to	<u>1/27/2017</u> <u>1600</u>

DEVELOPMENT DATA

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Pump Intake (ft bgs)
12/20/2016	0905-0915	NA	NA	8	60	Bail	NR	NR	NR	NR	NR
1/26/2017	0915	NA	NA	0	60	Begin Bail	NR	NR	NR	NR	138.96
"	1015	NA	NA	6	66	"	NR	NR	NR	Brown	NR
"	1100	NA	NA	7	73	Bail End/ Pump	NR	NR	NR	Clearer	NR
"	1230	NA	NA	5	78	Pump	6.80	18.7	1600	431	NR
"	1255	NA	NA	1	79	Pump rate 0.04	6.95	16.2	1574	321	NR
"	1320	NA	NA	1?	80	Pump off	NR	NR	NR	NR	NR
1/27/2017	1530	NA	NA	0	80	Pump on	NR	NR	NR	NR	145.46
"	1550	NA	NA	1.5	81.5	Pump	7.80	12.3	1665	105	NR
"	1600	NA	NA	1.5	83	Pump rate 0.15	7.66	11.2	1569	35.2	NR



BOREHOLE / WELL DEVELOPMENT

400-SB-08 (Became 400-HV-147) (Continued)

Site/Screen Name: Screen 147-162'
White Sands Test Facility
 Location: 400 Area

Project No.: 400 Area Investigation
 Field Personnel: Michael Narup (N); Richard Mallet (C)

DEVELOPMENT TOOLS (Daily)

Tool: Pump Description: Submersible Pump Used from: 1/27/2017 1610 to 1/28/2017 1140

DEVELOPMENT DATA

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
1/27/2017	1610	NA	NA	1	84	Pump rate 0.1	7.62	11.3	1560	30.8	NR
“	1620	NA	NA	0.5	84.5	0.05	7.55	12.0	1605	58.9	NR
“	1630	NA	NA	1	85.5	0.1	7.60	10.6	1550	59.0	NR
“	1640	NA	NA	1	86.5	0.1	7.76	10.8	1616	38.9	NR
“	1650	NA	NA	1	87.5	0.1	7.69	11.0	1591	44.0	NR
“	1700	NA	NA	1	88.5	0.1	7.10	10.5	1663	36.2	NR
“	1710-1720	NA	NA	0.5	89	0.05 Pump off	7.45	7.5	1536	63.9	NR
01/28/2017	1110	NA	NA	1	90	Pump on	7.56	14.5	1595	8.58	NR
“	1120	NA	NA	0.5	90.5	0.05	7.40	13.8	1594	9.29	NR
“	1130	NA	NA	1	91.5	0.1	7.24	15.4	1599	8.53	NR
“	1140	NA	NA	0.5	92	0.05 Pump off	7.30	13.9	1592	7.08	NR



BOREHOLE / WELL DEVELOPMENT

400-SB-08 (Became 400-HV-147) (Continued)

Site/Screen Name: Screen 147-162'
White Sands Test Facility
 Location: 400 Area

Project No.: 400 Area Investigation
 Field Personnel: Tom McCrory, Tim Kondy, Al Montes

DEVELOPMENT TOOLS (Daily)

Tool: Bennett Pump (BP) Description: Nitrogen Operated Groundwater Pump Used from: 3/22/2017 0725 to 3/22/2017 0750

DEVELOPMENT DATA

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
3/15/2017	1355	NA	NA	0	92	Static	NA	NA	NA	NA	138.47
3/22/2017	0725	NA	NA	3	95	Pump (BP) Rate 0.4	8.15	14.8	1676	9.03	NR
“	0735	NA	NA	4	99	0.4	8.07	18.2	1652	2.66	NR
“	0750	NA	NA	4	103	0.25	7.71	18.5	1672	1.44	NR

Development Complete



BOREHOLE / WELL DEVELOPMENT

400-SB-12 (Became 400-IV-123)

Site/Screen Name: Screen 123-138' Project No.: 400 Area Investigation

Location: White Sands Test Facility
400 Area Field Personnel: Cody Stopka, Michael Narup (N); Danny Moore (C)

Lead Company: Navarro (N) Document Reviewer: Lela Hunnicutt-Mack

Supporting Company: Cascade Drilling (C) Review Complete: 9/18/2017

FINAL DEVELOPMENT PARAMETERS

Borehole / Well 155 / Screened
Total Depth: 138 ft bgs Interval: 123 ft bgs to 138 ft bgs

Total Volume Withdrawn
(Bailing/Pumping): 221.5 gals

DEVELOPMENT TOOLS (Well totals)

Tool: Surge Tool Description: 10' long steel rod with rubber discs on ends size of casing ID Used from: 12/5/2016 1050 to 1/25/2017 0905

Tool: Bailer Description: 3" Inside Diameter 5' long Used from: 12/5/2016 1050 to 1/25/2017 0950

Tool: Pump Description: Submersible pump Used from: 12/6/2016 1415 to 1/25/2017 1237

DEVELOPMENT DATA

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
12/5/2016	1050	NA	NA	NR	NR	Bail	8.20	19.6	520	>999	131
"	1050-1220	NA	0	NR	NR	Surge	NR	NR	NR	NR	NR
"	1220	NA	NA	NR	NR	Begin Bail	NR	NR	NR	NR	NR
"	1250	NA	NA	17	17	Bail	NR	NR	NR	Brown	NR
"	1330	NA	NA	NR	NR	"	7.87	20.8	1,341	>999	NR
"	1340	NA	NA	19	36	"	NR	NR	NR	NR	NR
"	1415	NA	NA	20	56	"	7.55	19.6	1,341	765	NR



BOREHOLE / WELL DEVELOPMENT

400-SB-12 (Became 400-IV-123) (Continued)	
Site/Screen Name: <u>Screen 123-138'</u>	Project No.: <u>400 Area Investigation</u>
Location: <u>WSTF 400 Area</u>	Field Personnel: <u>Tom McCrory, Cody Stopka, Michael Narup (N); Danny Moore (C)</u>

DEVELOPMENT TOOLS (Daily)			
Tool: <u>Bailer</u>	Description: <u>3" Inside Diameter, 5' long</u>	Used from: <u>12/5/2016 1500</u>	to <u>12/5/2016 1530</u>
Tool: <u>Pump</u>	Description: <u>Submersible pump</u>	Used from: <u>12/6/2016 1415</u>	to <u>12/6/2016 1529</u>

DEVELOPMENT DATA (Continued)

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Pump Intake (ft TOC)
12/5/2016	1500	NA	NA	NR	NR	Bail	7.42	20.2	1,321	371	NR
"	1530	NA	NA	NR	60	"	7.54	20.2	1,313	165	NR
12/6/2016	1415	NA	NA	0	60	Pump on	NR	NR	NR	NR	131.12
"	1423	NA	NA	NR	60	Pump	6.98	18.5	1,315	447	NR
"	1426	NA	NA	5	65	"	7.03	20.0	1,315	41.5	NR
"	1430	NA	NA	10	75	"	7.19	20.1	831	150	NR
"	1433	NA	NA	1	76	"	7.21	19.9	822	638	NR
"	1438	NA	NA	1	77	Pump off	NR	NR	NR	NR	NR
"	1459	NA	NA	0	77	Recharge	NR	NR	NR	NR	133
"	1502	NA	NA	2	79	Pump on	7.07	19.9	951	56.6	NR
"	1505	NA	NA	3	82	"	7.07	20.4	943	133	NR
"	1510	NA	NA	2	84	Pump off	NR	NR	NR	NR	NR
"	1529	NA	NA	2	86	Pump on	7.00	18.8	926	41.9	133



BOREHOLE / WELL DEVELOPMENT

400-SB-12 (Became 400-IV-123) (Continued)	
Site/Screen Name: <u>Screen 123-138'</u>	Project No.: <u>400 Area Investigation</u>
Location: <u>WSTF 400 Area</u>	Field Personnel: <u>Cody Stopka, Tom McCrory (N); Danny Moore (C)</u>

DEVELOPMENT TOOLS (Daily)			
Tool: <u>Pump</u>	Description: <u>Submersible pump</u>	Used from: <u>12/6/2016 1531</u>	to <u>12/9/2016 1009</u>

DEVELOPMENT DATA (Continued)

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Pump Intake (ft TOC)
12/6/2016	1531	NA	NA	2	88	Pump	7.03	20.4	929	53.2	NR
“	1534	NA	NA	2	90	“	6.96	20.7	921	85.5	NR
“	1538	NA	NA	3	93	“	7.03	20.8	915	140	NR
“	1620	NA	NA	12	105	Pump off	NR	NR	NR	NR	139.9
12/7/2016	0925	NA	NA	0	105	Pump on	NR	NR	NR	NR.3	NR
“	0930	NA	NA	NR	105	Pump	7.14	20.0	938	37.2	NR
“	0933	NA	NA	12.5	117.5	“	NR	NR	NR	22.6	NR
“	0945	NA	NA	0	117.5	Pump off	7.13	19.9	918	21.8	NR
“	1030	NA	NA	0	117.5	Pump on	NR	NR	NR	NR	NR
“	1040	NA	NA	10	127.5	Pump off	NR	NR	NR	NR	NR
“	1125	NA	NA	0	127.5	Pump on	7.13	19.9	918	21.8	NR
“	1128	NA	NA	1	128.5	Pump off	NR	NR	NR	NR	NR
12/9/2016	1005	NA	NA	0	128.5	Pump on	NR	NR	NR	NR	NR
“	1009	NA	NA	NR	128.5	“	7.23	19.1	938	136	NR



BOREHOLE / WELL DEVELOPMENT

400-SB-12 (Became 400-IV-123) (Continued)

Site/Screen Name: Screen 123-138'

Project No.: 400 Area Investigation

Location: WSTF 400 Area

Field Personnel: Cody Stopka (N); Danny Moore (C)

DEVELOPMENT TOOLS (Daily)

Tool: Pump Description: Submersible pump Used from: 12/6/2016 1013 to 12/9/2016 1210

DEVELOPMENT DATA (Continued)

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
12/9/2016	1013	NA	NA	NR	128.5	Pump	NR	NR	NR	98.5	NR
“	1020	NA	NA	NR	128.5	“	7.43	17.6	918	66.4	NR
“	1022	NA	NA	NR	128.5	“	NR	NR	NR	37.7	NR
“	1025	NA	NA	NR	128.5	“	7.20	18.8	927	20.5	NR
“	1030	NA	NA	NR	128.5	“	7.31	19.1	927	13.1	NR
“	1035	NA	NA	NR	128.5	“	7.34	18.9	938	11.8	NR
“	1040	NA	NA	5	133.5	“	7.29	19.0	935	9.12	NR
“	1050	NA	NA	3	136.5	“	7.23	19.5	934	9.69	NR
“	1100	NA	NA	NR	136.5	“	7.23	20.1	933	11.7	NR
“	1117	NA	NA	7	143.5	“	7.25	20.3	929	11.9	NR
“	1140	NA	NA	NR	143.5	“	7.13	21.2	927	10.0	NR
“	1150	NA	NA	NR	143.5	“	7.19	20.5	925	9.54	NR
“	1210	NA	NA	~8	151.5	Pump off	NR	NR	NR	NR	NR



BOREHOLE / WELL DEVELOPMENT

400-SB-12 (Became 400-IV-123) (Continued)			
Site/Screen Name: <u>Screen 123-138'</u>	Project No.: <u>400 Area Investigation</u>		
Location: <u>WSTF 400 Area</u>	Field Personnel: <u>Tom McCrory (N); Richard Mallet (C)</u>		

DEVELOPMENT TOOLS (Daily)				
Tool: <u>Surge Tool</u>	Description: <u>10' long steel rod with rubber discs on ends size of casing ID</u>	Used from: <u>1/25/2017 0820</u>	to	<u>1/25/2017 0905</u>
Tool: <u>Bailer</u>	Description: <u>3" Inside Diameter, 5' long</u>	Used from: <u>1/25/2017 0905</u>	to	<u>1/25/2017 1237</u>
Tool: <u>Pump</u>	Description: <u>Submersible pump</u>	Used from: <u>12/6/2016 1415</u>	to	<u>1/25/2017 1237</u>

DEVELOPMENT DATA (Continued)

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
1/25/2017	0820-0905	NA	NA	0	151.5	Surge	NR	NR	NR	NR	131.38
“	0905	NA	NA	0	151.5	Begin Bail	NR	NR	NR	NR	NR
“	0935	NA	NA	10	161.5	Bail	NR	NR	NR	NR	133.25
“	0945	NA	NA	4	165.5	Bail	7.65	18.5	539	>999	NR
“	0950	NA	NA	1	166.5	Bail End	NR	NR	NR	NR	NR
“	1009	NA	NA	3	169.5	Pump on	NR	NR	NR	NR	134.05
“	1016	NA	NA	1	170.5	Pump	7.40	17.8	607	630	NR
“	1025	NA	NA	2	172.5	“	NR	NR	NR	NR	133.48
“	1032	NA	NA	3	175.5	“	7.25	18.4	859	181	NR
“	1046	NA	NA	NR	175.5	“	NR	NR	NR	NR	132.74
“	1051	NA	NA	4	179.5	“	6.99	19.8	917	116	NR
“	1101	NA	NA	3	182.5	“	6.93	19.9	928	105	NR



BOREHOLE / WELL DEVELOPMENT

400-SB-12 (Became 400-IV-123) (Continued)

Site/Screen Name: Screen 123-138'

Project No.: 400 Area Investigation

Location: WSTF 400 Area

Field Personnel: Tom McCrory (N); Richard Mallet (C)

DEVELOPMENT TOOLS (Daily)

Tool: Pump Description: Submersible pump Used from: 1/25/2017 1116 to 1/25/2017 1237

DEVELOPMENT DATA (Continued)

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
1/25/2017	1116	NA	NA	6	188.5	Pump	6.89	20.4	946	63.2	NR
“	1124	NA	NA	3	191.5	“	NR	NR	NR	NR	135.16
“	1131	NA	NA	3	194.5	“	6.84	20.7	981	33.8	NR
“	1145	NA	NA	6	200.5	“	6.79	21.2	972	17.9	NR
“	1157	NA	NA	6	206.5	“	6.75	20.8	971	10.7	NR
“	1208	NA	NA	3	209.5	“	NR	NR	NR	NR	136.9
“	1213	NA	NA	3	212.5	“	6.72	20.8	971	8.6	NR
“	1215	NA	NA	NR	212.5	“	NR	NR	NR	NR	137.0
“	1229	NA	NA	6	218.5	“	6.72	21.1	1,001	3.0	NR
“	1237	NA	NA	3	221.5	“	6.66	21.3	1,005	2.7	NR

Development Complete



BOREHOLE / WELL DEVELOPMENT

400-SB-11 (Became 400-JV-150)

Site/Screen Name: <u>Screen 150-165'</u>	Project No.: <u>400 Area Investigation</u>
Location: <u>White Sands Test Facility 400 Area</u>	Field Personnel: <u>Michael Narup (N); Richard Mallet (C)</u>
Lead Company: <u>Navarro (N)</u>	Document Reviewer: <u>Lela Hunnicutt-Mack</u>
Supporting Company: <u>Cascade Drilling (C)</u>	Review Complete: <u>9/18/2017</u>

FINAL DEVELOPMENT PARAMETERS

Borehole / Well Total Depth: 175 / 165 ft bgs Screened Interval: 150 ft bgs to 165 ft bgs

Total Volume Withdrawn (Bailing/Pumping): 64.75 gals

DEVELOPMENT TOOLS (Well totals)

Tool: <u>Surge</u>	Description: <u>10' long steel rod with rubber discs on ends size casing ID</u>	Used from: <u>1/26/2017 1410</u>	to	<u>1/26/2017</u>
Tool: <u>Bailer</u>	Description: <u>5' long bailer</u>	Used from: <u>1/26/2017</u>	to	<u>1/28/2017 1350</u>
Tool: <u>Pump</u>	Description: <u>Submersible Pump/Bennett Pump</u>	Used from: <u>1/28/2017 1415</u>	to	<u>3/20/2017 1315</u>

DEVELOPMENT DATA

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
1/26/2017	1410	NA	NA	0	0	Surge	NR	NR	NR	NR	145.50
"	NR	NA	NA	2	2	Bail	NR	NR	NR	NR	NR
1/27/2017	0837	NA	NA	3	5	"	NR	NR	NR	NR	NR
"	0907	NA	NA	3	8	"	NR	NR	NR	NR	NR
"	0925	NA	NA	2	10	Bail End	NR	NR	NR	NR	NR
1/28/2017	1350	NA	NA	3	13	Bail	NR	NR	NR	NR	NR
"	1415	NA	NA	0	13	Pump on	NR	NR	NR	NR	145.5



BOREHOLE / WELL DEVELOPMENT

400-SB-11 (Became 400-JV-150) (Continued)			
Site/Screen Name:	<u>Screen 150-165'</u>	Project No.:	<u>400 Area Investigation</u>
	<u>White Sands Test Facility</u>	Field Personnel:	<u>Michael Narup, Tim Kondy, Al Montes (N); Richard Mallet (C)</u>
Location:	<u>400 Area</u>		

DEVELOPMENT TOOLS (Daily)					
Tool: <u>Pump</u>	Description: <u>Submersible Pump</u>	Used from:	<u>1/28/2017</u> <u>1500</u>	to	<u>1/29/2017</u> <u>1015</u>
Tool: <u>Bennett Pump (BP)</u>	Description: <u>Nitrogen Operated Groundwater Pump</u>	Used from:	<u>3/16/2017</u> <u>1350</u>	to	<u>3/16/2017</u> <u>1420</u>

DEVELOPMENT DATA

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
1/28/2017	1500	NA	NA	1	14	Pump off	NR	NR	NR	NR	NR
"	1605	NA	NA	5	19	Pump	NR	NR	NR	NR	NR
"	1625	NA	NA	2	21	"	NR	NR	NR	NR	NR
"	1645	NA	NA	0.5	21.5	Pump off	NR	NR	NR	NR	NR
1/29/2017	0830	NA	NA	0	21.5	Pump on	NR	NR	NR	NR	NR
"	0945	NA	NA	4	25.5	Pump	7.39	13.5	1714	380	NR
"	1000	NA	NA	2	27.5	Pump rate 0.13	7.30	16.0	1710	373	NR
"	1005	NA	NA	0.5	28	0.1	7.29	15.5	1680	290	NR
"	1015	NA	NA	0	28	Pump off	NR	NR	NR	NR	Pump dry
3/15/2017	1350	NA	NA	0	28	Static	NA	NA	NA	NA	145.07
3/16/2017	1350-1420	NA	NA	13.5	41.5	Pump (BP)	7.75	23.4	1690	155	NR



BOREHOLE / WELL DEVELOPMENT

400-SB-11 (Became 400-JV-150) (Continued)	
Site/Screen Name: <u>Screen 150-165'</u>	Project No.: <u>400 Area Investigation</u>
Location: <u>White Sands Test Facility</u>	Field Personnel: <u>Michael Narup, Tim Kondy,</u>
<u>400 Area</u>	<u>Frank Gallegos (N)</u>

DEVELOPMENT TOOLS (Daily)			
Tool: <u>Bennett Pump</u>	Description: <u>Nitrogen Operated Groundwater Pump</u>	Used from: <u>3/17/2017</u> <u>0805</u>	to <u>3/17/2017</u> <u>1303</u>

DEVELOPMENT DATA

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
3/17/2017	0805-0815	NA	NA	4	45.5	Pump (BP)	7.55	14.2	1665	85.5	NR
“	0820	NA	NA	1	46.5	“	7.54	17.3	1620	45.1	NR
“	0825	NA	NA	1	47.5	“	7.54	18.2	1617	106	NR
“	0830	NA	NA	2	49.5	“	7.44	18.4	1705	91.3	NR
“	0835	NA	NA	2	51.5	“	7.52	19.2	1659	107	NR
“	0840	NA	NA	1	52.5	“	7.58	20.0	1691	48.3	NR
“	0845	NA	NA	0.5	53	“	7.55	19.6	1694	37.0	NR
“	0850	NA	NA	0.25	53.25	“	7.68	19.4	1677	27.6	Pump dry
“	0945	NA	NA	0	53.25	Recharge	NR	NR	NR	NR	2' in 50 min
“	0950	NA	NA	1.25	54.5	Pump (BP)	7.55	23.4	1680	30.6	NR
“	1300	NA	NA	1	55.5	“	7.71	28.2	1681	20.4	NR
“	1303	NA	NA	1	56.5	“	7.71	28.0	1644	55.8	NR



BOREHOLE / WELL DEVELOPMENT

400-SB-11 (Became 400-JV-150) (Continued)

Site/Screen Name: Screen 150-165' Project No.: 400 Area Investigation
 Location: White Sands Test Facility Field Personnel: Michael Narup, Tim Kondy,
400 Area Frank Gallegos (N)

DEVELOPMENT TOOLS (Daily)

Tool: Bennett Pump Description: Nitrogen Operated Groundwater Pump Used from: 3/20/2017 to 3/20/2017
0937 1315

DEVELOPMENT DATA

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
3/17/2017	1305	NA	NA	1.5	58	Pump (BP)	7.66	30.1	1588	405	NR
3/20/2017	0937	NA	NA	1	59	0.25	7.81	19.7	NR	85.5	NR
“	0944	NA	NA	0.5	59.5	0.15	7.68	21.8	NR	166	NR
“	0954	NA	NA	1.5	61	0.25	7.64	23.2	NR	191	NR
“	1012	NA	NA	1	62	0.05	7.47	24.2	NR	35.1	NR
“	1021	NA	NA	0.25	62.25	0.025	7.41	25.0	NR	17.9	NR
“	1039	NA	NA	0.25	62.5	0.002	7.15	26.4	NR	16.9	NR
“	1055	NA	NA	0.15	62.65	0.0015	7.22	26.7	NR	12.6	NR
“	1300	NA	NA	2	64.65	0.0015	7.48	29.8	NR	3.84	NR
“	1315	NA	NA	0.10	64.75	0.0015	7.51	29.1	1655	4.62	NR

Development Complete



BOREHOLE / WELL DEVELOPMENT

400-SB-06 (Became 400-KV-142)	
Site/Screen Name: <u>Screen 142-157'</u>	Project No.: <u>400 Area Investigation</u>
Location: <u>White Sands Test Facility 400 Area</u>	Field Personnel: <u>Michael Narup (N); Richard Mallet (C)</u>
Lead Company: <u>Navarro (N)</u>	Document Reviewer: <u>Lela Hunnicutt-Mack</u>
Supporting Company: <u>Cascade Drilling (C)</u>	Review Complete: <u>9/18/2017</u>

FINAL DEVELOPMENT PARAMETERS			
Borehole / Well Total Depth:	<u>163 / 157</u> ft bgs	Screened Interval:	<u>142</u> ft bgs to <u>157</u> ft bgs
Total Volume Withdrawn (Bailing/Pumping):	<u>31.5</u> gals		

DEVELOPMENT TOOLS (Well totals)			
Tool: <u>Bailer</u>	Description: <u>5' long bailer</u>	Used from: <u>1/27/2017 0942</u>	to <u>1/28/2017 1330</u>
Tool: <u>Surge Tool</u>	Description: <u>10' long steel rod with rubber discs on ends size casing ID</u>	Used from: <u>1/28/2017 1150</u>	to <u>1/28/2017</u>
Tool: <u>Added Water</u>	Description: <u>Added potable water to help clear sediment from well</u>	Used from: <u>1/28/2017</u>	<u>1/28/2017</u>
Tool: <u>Pump</u>	Description: <u>Submersible pump/Bennett pump</u>	Used from: <u>1/29/2017 1045</u>	<u>4/17/2017 0840</u>

DEVELOPMENT DATA											
Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
1/27/2017	0942	NA	NA	0	0	Begin Bail	NR	NR	NR	NR	143.33
“	1020	NA	NA	8	8	Bail	NR	NR	NR	NR	Bail dry
“	1140	NA	NA	8	16	“	NR	NR	NR	Thick with sediment	“
1/28/2017	1150	NA	NA	0	16	Surge	NR	NR	NR	NR	NR



BOREHOLE / WELL DEVELOPMENT

400-SB-06 (Became 400-KV-142) (Continued)

Site/Screen Name: Screen 142-157'
 Location: White Sands Test Facility
400 Area

Project No.: 400 Area Investigation
 Field Personnel: Michael Narup, Tim Kondy, Al Montes (N);
Richard Mallet (C)

DEVELOPMENT TOOLS (Daily)

Tool: <u>Added Water</u>	Description: <u>Added potable water to help clear sediment from well</u>	Used from: <u>1/28/2017</u>	<u>1/28/2017</u>
Tool: <u>Pump</u>	Description: <u>Submersible Pump</u>	Used from: <u>1/29/2017</u> <u>1045</u>	to <u>1/29/2017</u> <u>1215</u>
Tool: <u>Bennett Pump (BP)</u>	Description: <u>Nitrogen Operated Groundwater Pump operated by Navarro</u>	Used from: <u>3/16/2017</u> <u>0800</u>	to <u>4/17/2017</u> <u>0750</u>

DEVELOPMENT DATA

Date	Time	Meter Type	Totalizer Reading	Volume Withdrawn (gal)	Cumulative Withdrawn (gal)	Pumping Rate (gpm)	pH	Temp (°C)	SC (µS/cm)	Turbidity (NTU)	Groundwater Depth (ft TOC)
1/28/2017	NR	NA	NA	15 added	16	Added water	NR	NR	NR	NR	NR
"	1150-1330	NA	NA	8	24	Bail	NR	NR	Brown	NR	NR
1/29/2017	1045	NA	NA	0	24	Pump on	NR	NR	NR	NR	NR
"	1200	NA	NA	4	28	Pump	NR	NR	NR	Brown	NR
"	1215	NA	NA	NR	28	Pump off	NR	NR	NR	NR	NR
3/15/2017	1345	NA	NA	0	28	Static	NA	NA	NA	NA	146.86
3/16/2017	0800	NA	NA	NR-2?	30	Pump (BP) on	NR	NR	NR	Very turbid	Pump dry
"	0900	NA	NA	0	30	Recharge	NR	NR	NR	NR	3.46' in 57 min 2 sec
4/17/2017	0840	NA	NA	1.5	31.5	Pump (BP)	NA	NA	NA	1.23	160