NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA

SITE INSPECTION FOR MISCELLANEOUS SITES AT WALLOPS FLIGHT FACILITY

VOLUME II
Preliminary Reports Prepared Under DO 14, Phases I-II, Field Surveys

March 27, 1996

Environmental A/E Services
Contract NAS5-35042
Delivery Order 14

Submitted to:

National Aeronautics and Space Administration
Wallops Flight Facility
Wallops Island, Virginia

Metcalf & Eddy
An Air & Water Technologies Company

SITE INSPECTIONS FOR MISCELLANEOUS SITES AT WALLOPS FLIGHT FACILITY

VOLUME II,
PRELIMINARY REPORTS PREPARED UNDER DO 14, PHASES I-II, FIELD SURVEYS

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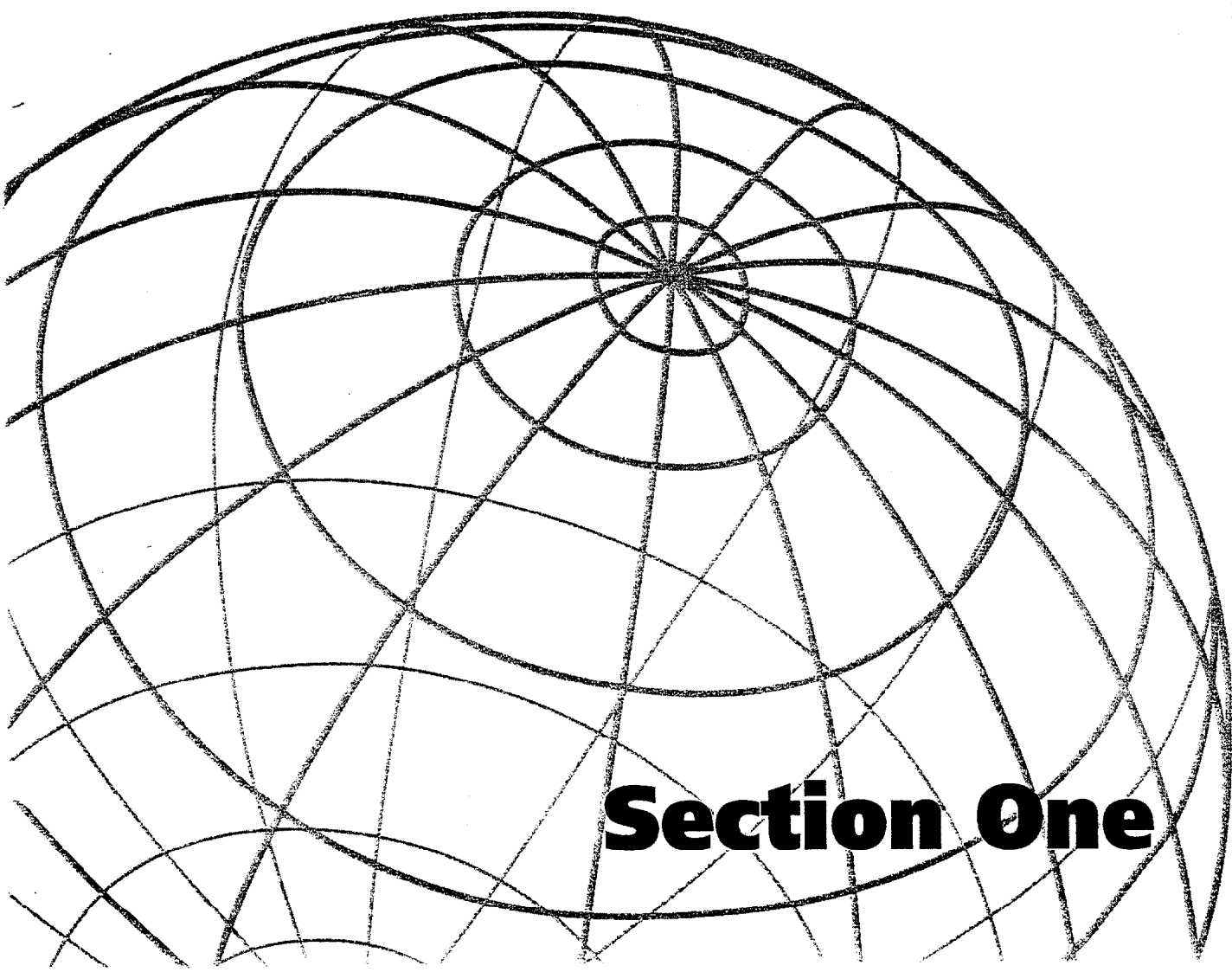

Section One

Submitted to:
National Aeronautics and Space Administration
Wallops Flight Facility
Wallops Island, Virginia

Environmental A/E Services
Contract NAS5-35042
Delivery Order: 14

NASA WALLOPS FLIGHT FACILITY SITE INSPECTION PRELIMINARY REPORT #1 UNEXPLODED ORDNANCE/MAGNETOMETER SURVEY RESULTS

REVISED

July 23, 1993

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NASA WALLOPS FLIGHT FACILITY SITE INSPECTION
PRELIMINARY REPORT #1
UNEXPLODED ORDNANCE/MAGNETOMETER SURVEY RESULTS

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CHAPTER 1.0

INTRODUCTION

1.1 PURPOSE

This preliminary report is being prepared for the National Aeronautics and Space Administration (NASA), Goddard Space Flight Center (GSFC), Wallops Flight Facility (WFF), Wallops Island, Virginia. The report is being prepared under contract NAS5-35042, Delivery Order 14: Wallops Flight Facility Site Inspection. The Site Inspection (SI) project includes investigation of fifteen separate sites identified in 1990 during an Environmental Site Survey as being potentially affected by past activities. The Environmental Site Survey (NASA, 1990c) is being used in the place of a Preliminary Assessment (PA) for the sites and will be referred to as such throughout this report.

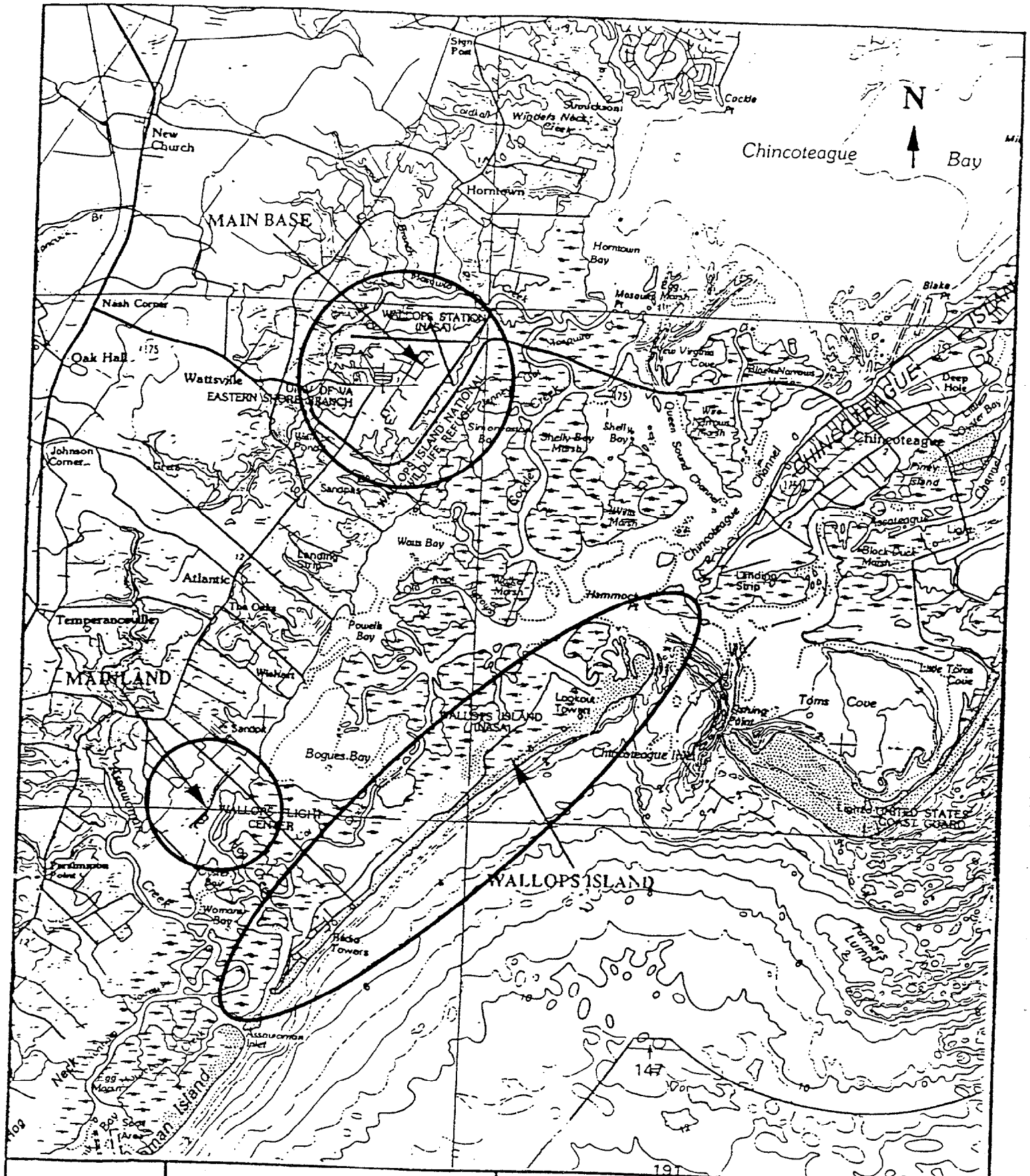
The SI is being conducted in phases due to the magnitude of the task. Preliminary preparation for the SI included collection of background data and a walk-through site survey. Phase I of the field investigations consisted of unexploded ordnance (UXO) and magnetometer surveys at nine of the fifteen sites. The purpose of this document is to present the preliminary findings of the UXO and magnetometer surveys which were performed between March 1 - March 11, 1993 and the excavation performed between June 29 - July 1, 1993. Field methodologies are briefly described, and preliminary conclusions and recommendations for each site are also provided. A similar document will be prepared for the additional field activities which are being conducted in other phases of the SI, as described in the "NASA Wallops Flight Facility Site Inspection Work Plan", prepared by Metcalf & Eddy in March 1993. A Final Site Inspection Report will be prepared at the conclusion of the field investigations, and will include results and discussion of each of the individual field efforts.

1.2 SITE LOCATIONS

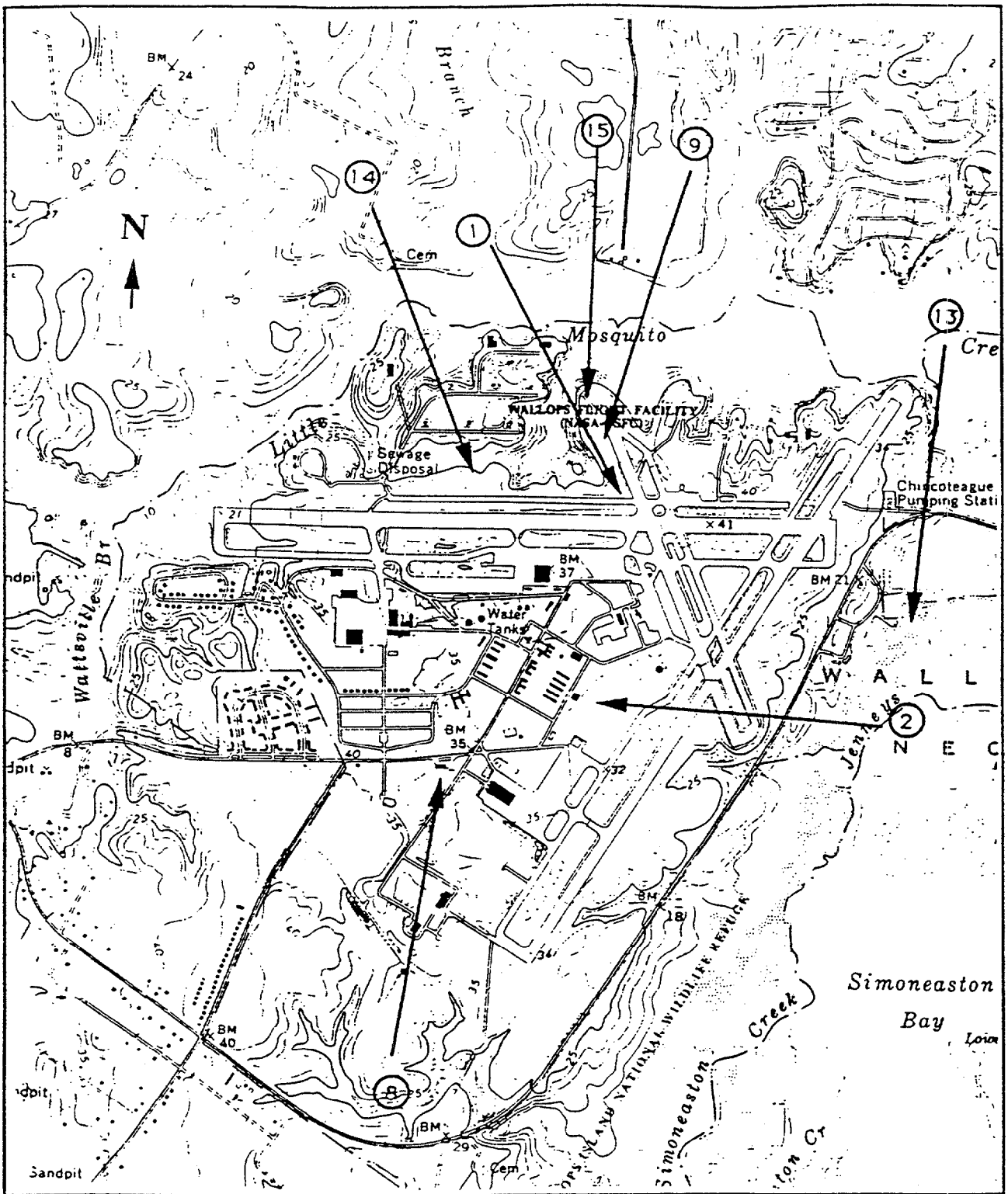
WFF is composed of three separate specific areas in close proximity to each other--the Main Base, the Mainland, and Wallops Island (Figure 1-1). WFF is located in the temperate zone at approximately 37° 56' north latitude and 75° 27' west longitude. WFF is within the political boundaries of Accomack County on the Eastern Shore of the Commonwealth of Virginia. WFF is approximately 40 miles southeast of Salisbury, Maryland, and 90 miles north by northeast of the Tidewater Regional area. Chincoteague Island is approximately five miles to the northeast of the Main Base.

UXO/magnetometer surveys were performed at nine of the fifteen areas of concern identified in the 1990 PA. The nine areas are listed below, and a description of each site is provided in Section 1.3. The location of each area is illustrated on Figures 1-2 and 1-3, and individual maps for each site are included in Chapter 2.0.

SITE NAME	LOCATION
Site 1 - Old Wastewater Treatment Plant	Main Base
Site 2 - Maintenance Facility	Main Base - Building E-52
Site 4 - Debris Pile	Wallops Island - North End
Site 6 - Former Island Fueling System	Wallops Island - Building X-5 and X-10



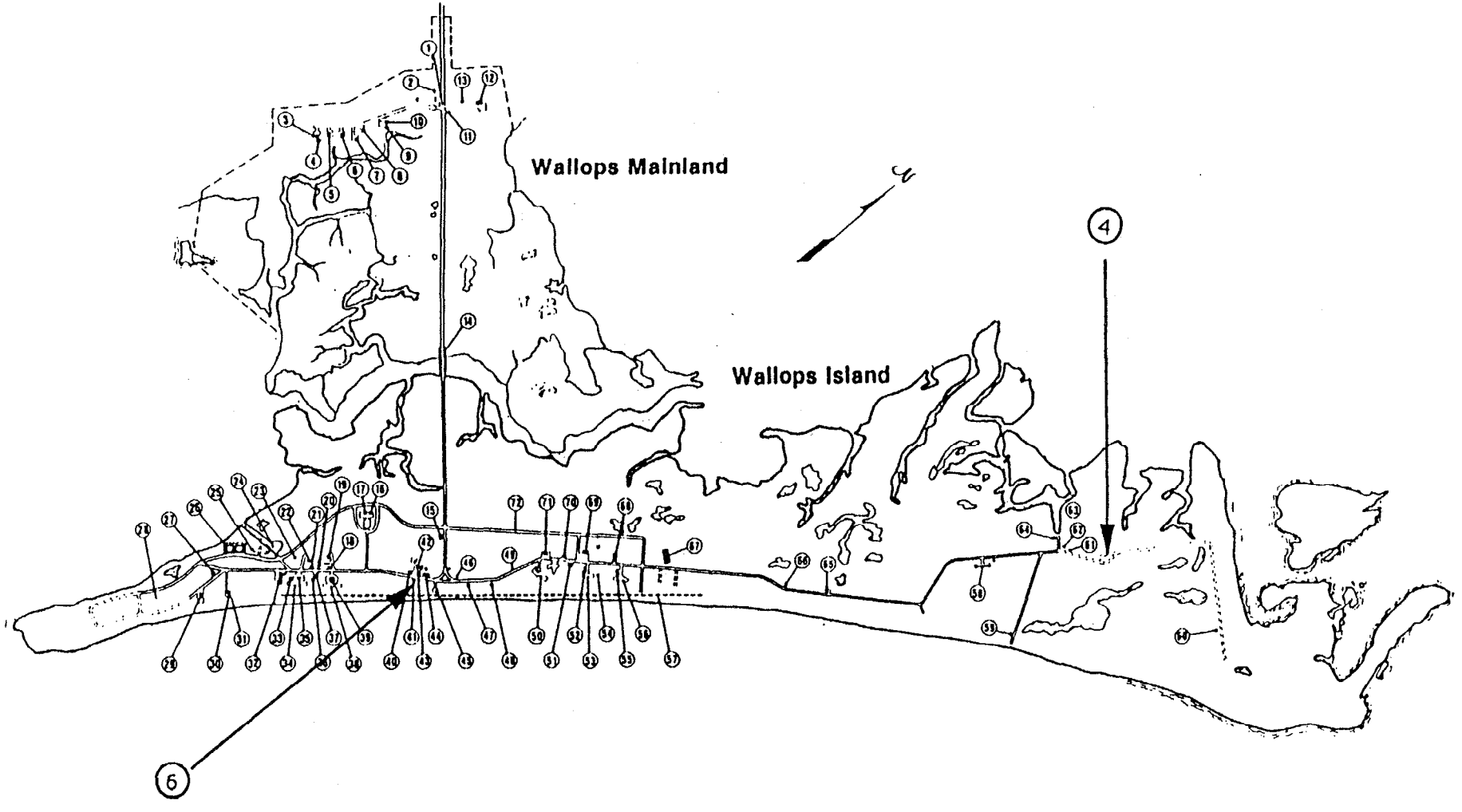
M&E Metcalf & Eddy	FIGURE 1-1 SCALE - 1:100,000	WFF VICINITY MAP SOURCE: USGS NATIONAL OCEAN SURVEY



SCALE - 1=24,000

Metcalf & Eddy	FIGURE 1-2	MAIN BASE SITES SOURCE: USGS

7/23/93



Metcalf & Eddy

FIGURE 1-3

WALLOPS ISLAND SITES

SOURCE: NASA

APPROX. SCALE - 1"= 4000'

SITE NAME	LOCATION
Site 8 - Former Main Base Fueling System	Main Base - Building N-134
Site 9 - Abandoned Drum Field	Main Base - Along Runway 17-35
Site 13 - Ordnance Disposal Area	Main Base - Boat Basin/Visitor Center
Site 14 - Debris Pile	Main Base - Along Runway 10-28
Site 15 - Debris Pile	Main Base - Along Runway 17-35

1.3 SITE DESCRIPTIONS

Site 1 - Old Wastewater Treatment Plant. The old wastewater treatment plant was constructed by the Navy, and was abandoned in 1957 when NASA took over the facility and constructed the current wastewater treatment plant. Structures and items noted during the initial site visit included: a plant control building, concrete process tanks and associated piping, sludge drying beds, a pump/valve building, a trickling filter, three transformers (possibly PCB), and two compressed gas cylinders (possibly chlorine). A NASA (NASA, 1988a) memo addressed to the Corps of Engineers indicated that a drainage swale located near the old plant was potentially used as an ordnance disposal site, but no evidence of ordnance was noted during the initial site survey.

Site 2 - Maintenance Facility, Building E-52. The facility is located adjacent to the former Aviation Fuel Tank Farm area, and was used by the Navy as a Motor Pool and more recently by NASA, as a landscaping facility. A soil gas survey (NASA, 1990b) of the area detected xylene isomers along the border between the tank farm and E-52, and a soil gas survey (NASA, 1992) detected perchloroethene in the same approximate area. Subsurface soil samples collected during the Supplemental Site Characterization (NASA, 1991) for the tank farm indicated fuel related chemicals and trichloroethene downgradient of E-52. Review of aerial photographs taken in the 1960's showed the presence of drum storage areas and at least one above ground tank. A 1990 survey of the facility indicated that petroleum products were stored in open containers around the perimeter of the building at that time (NASA, 1990a). Additionally, the annual safety and health survey conducted in 1988 (NASA, 1988b) indicated that excessive numbers of batteries were stored around the area, and that two 500 gallon fuel tanks were present at that time with no secondary containment. Extensive soil staining was noted around the building during the 1993 site walk-through. In addition, four protective bollards (posts) were noted near the building, which may have previously protected a fuel pump.

Site 4 - Debris Pile, North End of Wallops Island. Debris, metal, and telephone poles were disposed at the north end of the island. No further information is available.

Site 6 - Former Island Fueling System, Building X-10 and Building X-5. Building X-10 was the Former Island Fueling System. Drawings of the facility (NASA, 1948) indicate that there were two 30,000 above ground tanks, and five partially buried storage tanks of unknown size. Drawings and aerial photographs from the 1960's indicate that the tanks were surrounded by a concrete dike, and a concrete pad was located next to the underground tanks.

The above ground tanks were removed in 1981 (NASA, 1993) but the saddles may still remain. The concrete pad is still present. Recent soil gas and soil data indicate that soil contamination is present in the vicinity of the former fueling station.

Building X-5 was used as a support facility (NASA, 1993). Drawings for the facility indicate the presence of a hydraulic system, a 500 gallon underground waste oil tank, an oil/water separator, and a drain field. The hydraulic system consisted of two 30 gallon above ground tanks inside the building. These tanks have been removed (Traynor, 1993). Additionally, a 250 gallon above ground fuel oil storage tank was located behind the building. Recently, the interior floor drains were flushed out, which caused oily material to overflow from an exterior standpipe located at the oil/water separator (Traynor, 1993). Extensive soil staining was noted around this standpipe during the 1993 site survey.

Site 8 - Former Main Base Fueling System, Building N-134. An underground storage tank fueling system was previously located at Building N-134 (Navy, 1956). The tanks were removed in the mid-seventies, but piping to the fuel pumps may not have been removed. Samples were not collected at the time of tank removal to determine levels of contamination, if any. In addition, a 550 gallon waste oil tank was once located at the facility (Navy, 1956).

Site 9 - Abandoned Drum Field, Along Runway 17-35. During a NASA walk-through survey of stormwater discharges, abandoned drums were discovered within the tree line along runway 17-35. This site is located north of Site 1, the old Wastewater Treatment Plant. There were several deteriorated drums protruding from the ground with visible petroleum residuals (i.e., tar-like) in/on the drums.

Site 13 - Ordnance Disposal Area. The WFF Master Plan indicates that Navy disposed of ordnance at the pyrotechnics dump site located adjacent to the boat basin at the Visitor Information Center (VIC). No further information is available.

Site 14 - Debris Pile, North of Runway 10-28. Metal, wood, and other objects have been disposed along the taxiway north of Runway 10-28. No further information is available.

Site 15 - Debris Pile, Along Runway 17-35. During a NASA walk-through survey of stormwater discharges, concrete filled drums and other debris were discovered within the tree line along runway 17-35. This site is located north of Site 9 at the 17 end of Runway 17-35. There were several deteriorated drums protruding from the ground with visible petroleum residuals (i.e., tar-like) in/on the drums. A preliminary radiation survey was performed on the concrete drums. No radiation levels were detected above background (NASA, 1993).

CHAPTER 2.0

UNEXPLODED ORDNANCE/MAGNETOMETER SURVEY METHODOLOGY

The first phase of the site investigations consisted of UXO/magnetometer surveys at nine of the fifteen sites. These surveys were performed by the UXO certified subcontractor, UXB International. Visual surface searches and electronic subsurface searches were conducted to locate the items of interest at each of the eight sites. Passive (ferrous) and active (all metals) magnetometers were used, and were set at the maximum sensitivities allowable by prevailing site conditions.

The Foerster Ferex Ordnance Locator and the White's commercial metal detector were both used to conduct the subsurface geophysical surveys. The following are descriptions of these two electronic detectors:

a. FOERSTER FEREX ELECTROMAGNETIC DETECTOR - The Foerster Ferex Ordnance Locator is the most recent military approved locator and is in use by the U.S. Military EOD forces. It is designated the MK 26 Ordnance Locator and is used for detecting subsurface ferrous ordnance items. The locator is a hand-held unit and uses 2 fluxgate magnetometers, aligned and mounted a fixed distance apart to detect changes in the earth's ambient magnetic field caused by ferrous metal or disturbances caused by soil conditions. Both an audio and metered signal are provided to the operator. The metered signal indicates whether the disturbance is geodetic or metal-related. The detection capability of the Foerster Ferex is dependent on the size of the item versus its depth. The Foerster Ferex is capable of ordnance location to the following depths:

ITEM	DEPTH
Small Arms Round	1 ft
Hand Grenade	2 ft
Anti-Personnel Mine	3 ft
Anti-Tank Mine	4.5 ft
Medium Projectile	10 ft
Small Bomb	15 ft
Large Bomb	19 ft

Although the Foerster Ferex Ordnance Locator will detect disturbances caused by changes in soil conditions, its ability to detect metallic items is not affected by local soil conditions because it is nulled to accept local soil conditions as normal background readings on-site.

b. WHITE'S EAGLE II METAL DETECTOR - The White's Eagle II Metal Detector is a portable, microprocessor-controlled metal detector with a Liquid Crystal Display and a keypad user interface. This metal detector operates on the induction principle whereby a transmitter coil induces eddy currents within buried metal and these induced eddy currents are received

by a receiver unit. The advantage of this detector is that it can detect both ferrous and non-ferrous metals.

The instruments detailed above were used during the investigation to locate subsurface metallic objects. They were effective in locating specific objects in areas where there was sparse metallic contamination and, conversely, of limited usefulness in areas that were heavily saturated with miscellaneous metallic debris and slag. In areas of heavy metallic debris (e.g., the disposal areas), the instruments were used to delineate the edges of the disposal area.

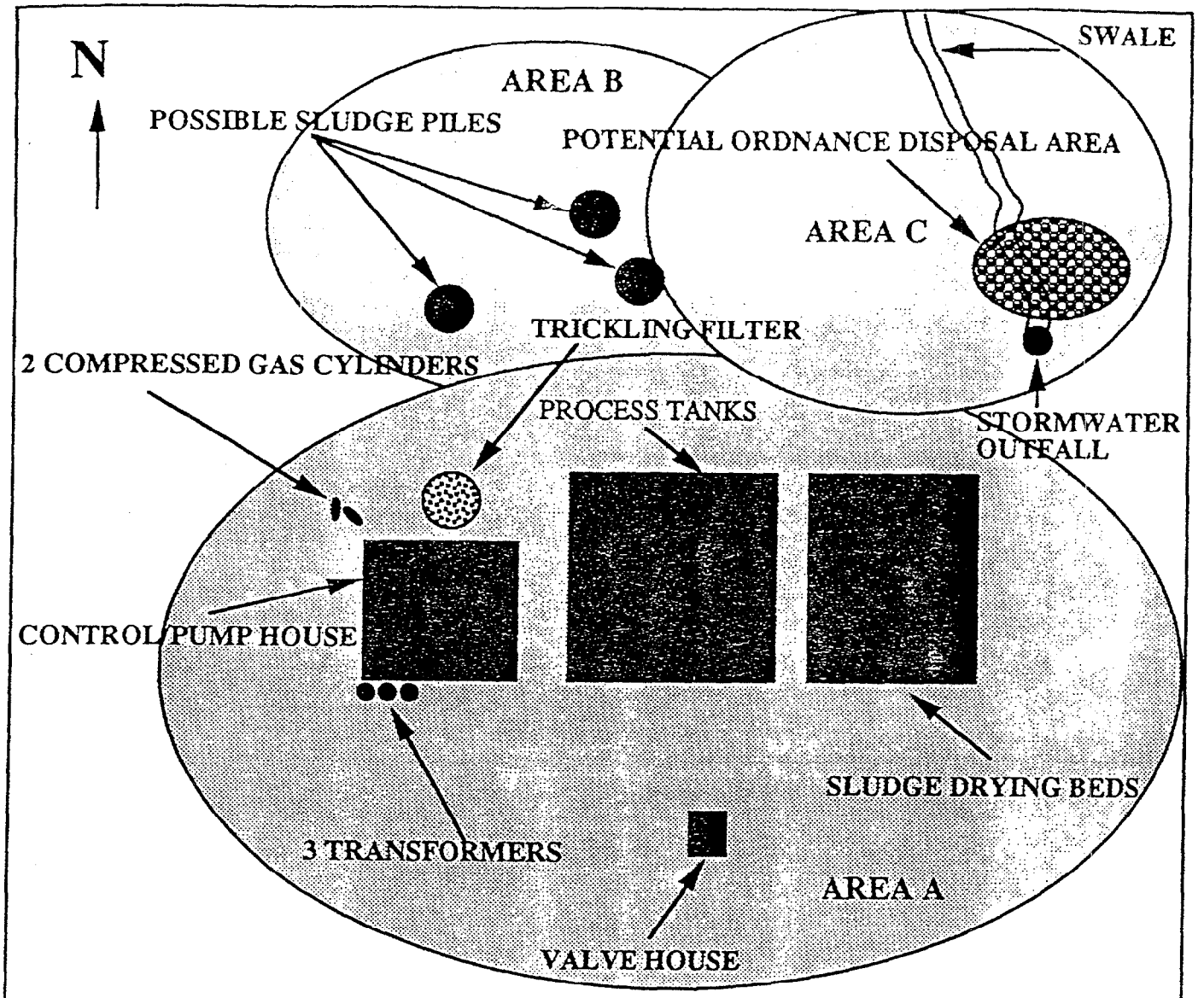
Prior to conducting the geophysical survey, the area to be surveyed was marked with wooden stakes based on aerial photos, maps, existing landmarks and/or other information provided by NASA. An M&E field operations representative assisted the UXB Project Leader in locating the correct survey areas.

The geophysical survey team consisted of two UXB UXO-certified technicians. The team searched the survey areas and marked all contacts of interest with orange pin flags or spray paint to facilitate avoidance by the soil gas survey crew. A visual survey was conducted simultaneously with the geophysical survey. During the surveys, photographic and written logbooks were maintained to document the site conditions and inspection activities.

The UXO/Magnetometer survey crew searched for the following items of interest at each of the nine sites (Figures 2-1 through 2-9):

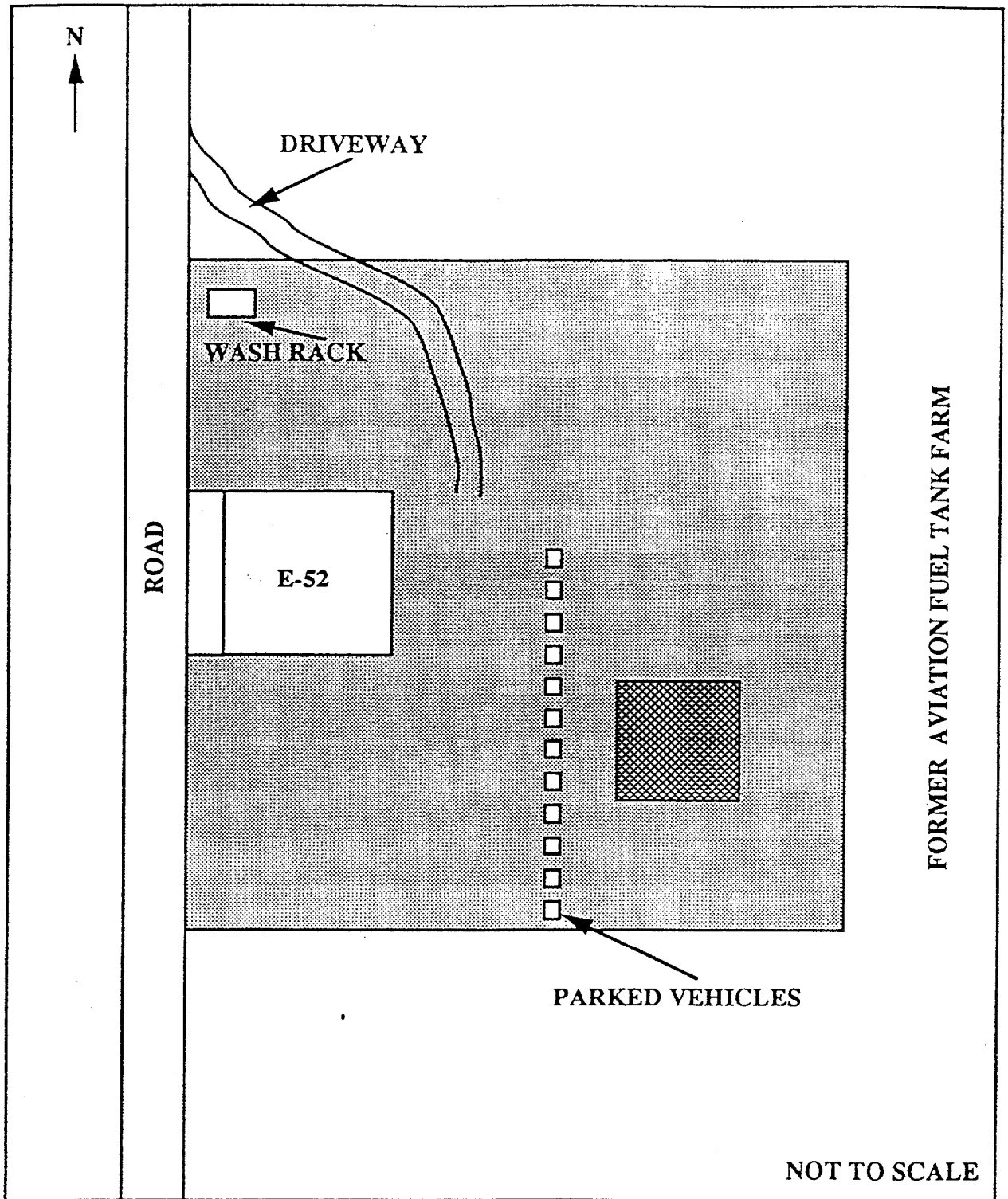
SITE	ITEM OF INTEREST
Site 1 - Old Wastewater Treatment Plant	USTs, Pipes, UXO
Site 2 - Maintenance Facility, Building E-52	USTs, Pipes, Drums
Site 4 - Debris Pile, North End of Wallops Island	Edge of Debris Pile
Site 6 - Former Island Fueling System, Buildings X5 and X10	USTs, Pipes, Tank Saddles
Site 8 - Former Main Base Fueling System, Buildings N-134	UST, Pipes, Tank Saddles
Site 9 - Abandoned Drum Field, Along Runway 17-35	Drums
Site 13 - Ordnance Disposal Area	UXO
Site 14 - Debris Pile, North of Runway 10-28	Edge of Debris Pile
Site 15 - Debris Pile, Along Runway 17-35	Edge of Debris Pile

The excavation conducted at Site 2 - Maintenance Facility, Building E-52, was conducted by the NASA Plant Operations and Maintenance Branch (POMB). POMB personnel used a NASA backhoe to excavate and backfill approximately 50,000 cubic feet of soil (L:100 feet, W:100 feet, D:5 feet).

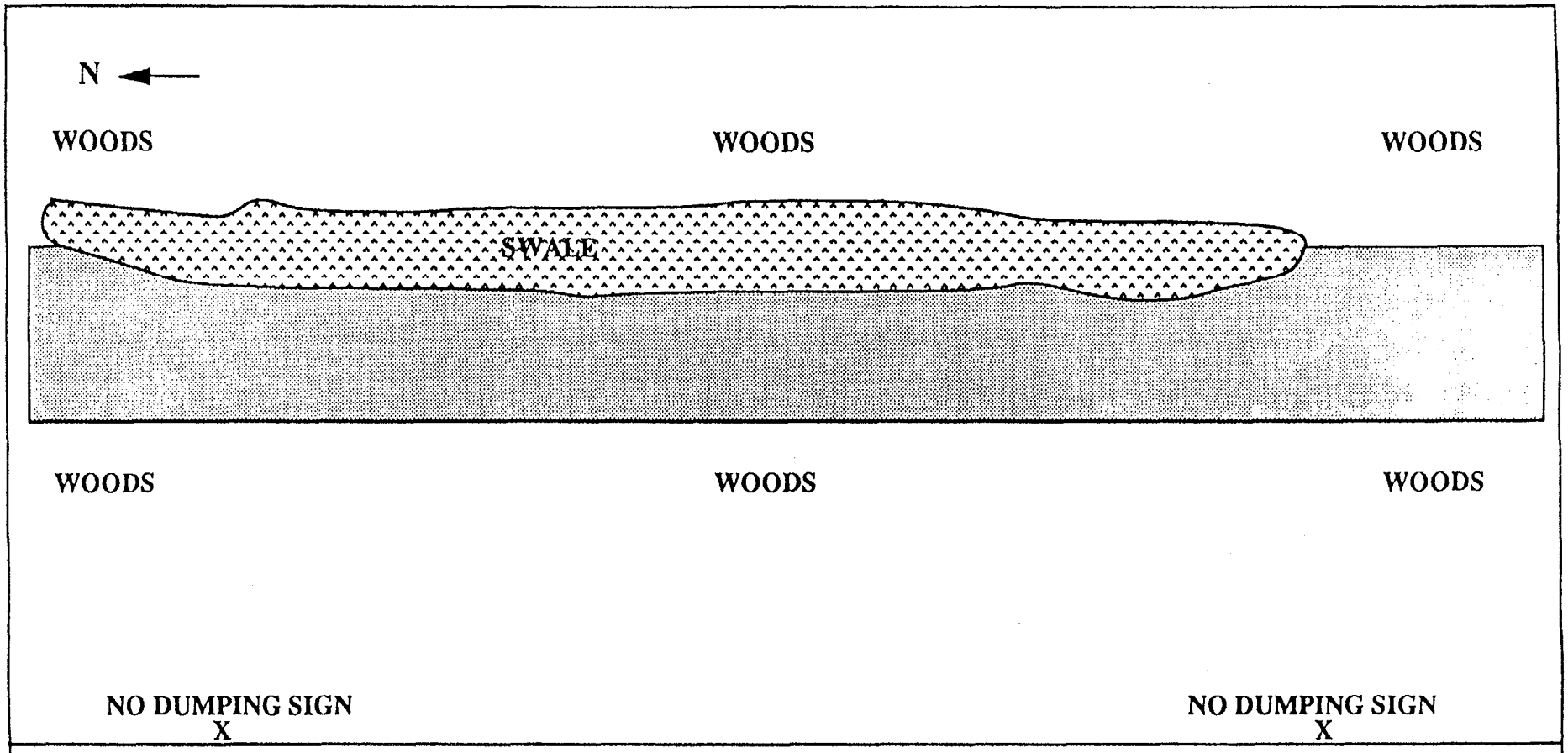


APPROXIMATE UXO/MAGNETOMETER SURVEY AREA NOT TO SCALE

Metcalf & Eddy	FIGURE 2-1	SITE 1 - OLD WASTEWATER TREATMENT PLANT UXO/MAGNETOMETER SURVEY AREA



Metcalf & Eddy	FIGURE 2-2	SITE 2 - MAINTENANCE FACILITY, BUILDING E-52 UXO/MAGNETOMETER SURVEY AREA

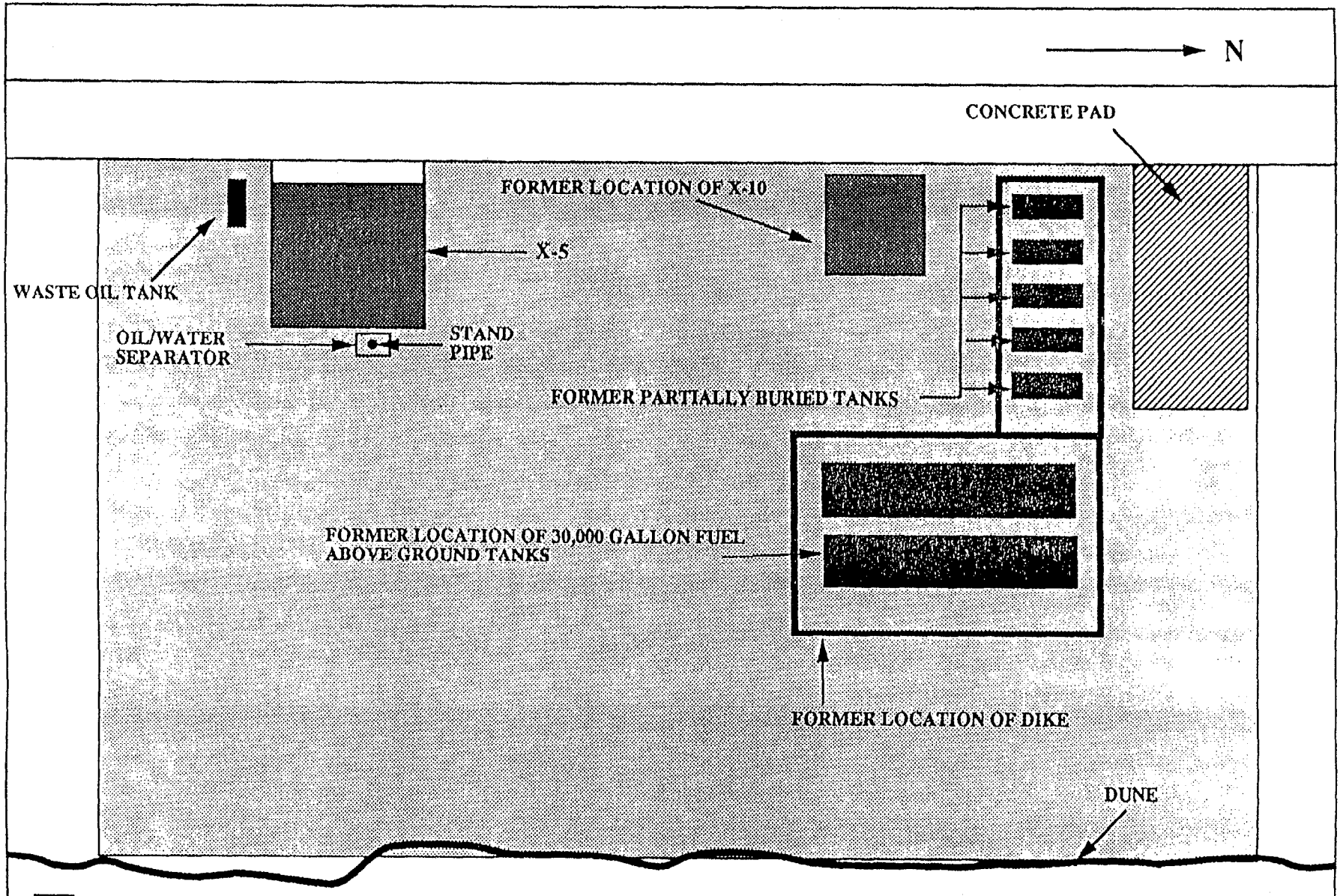


Metcalf & Eddy

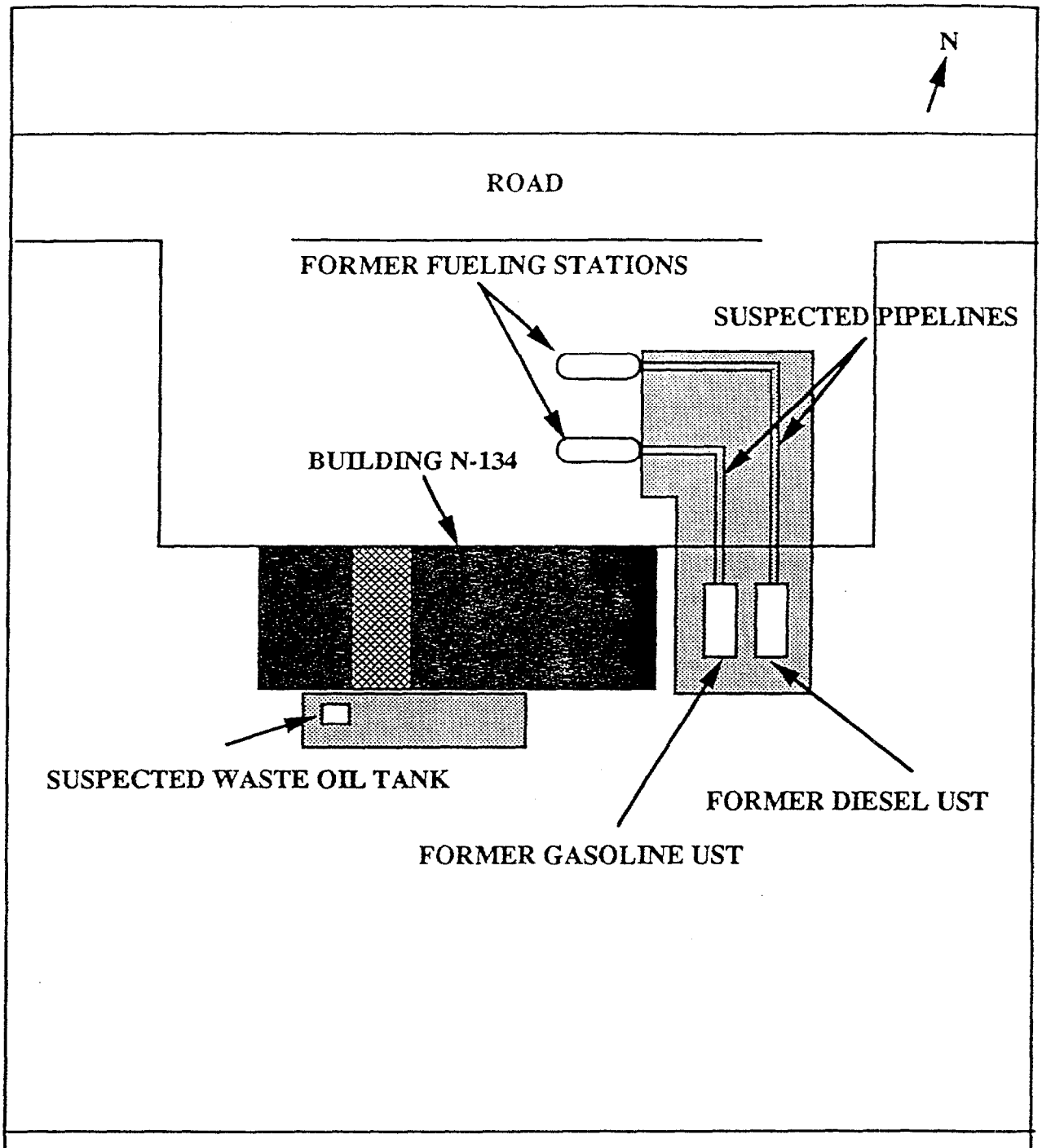
FIGURE 2-3

SITE 4 - DEBRIS PILE, NORTH END OF WALLOPS ISLAND

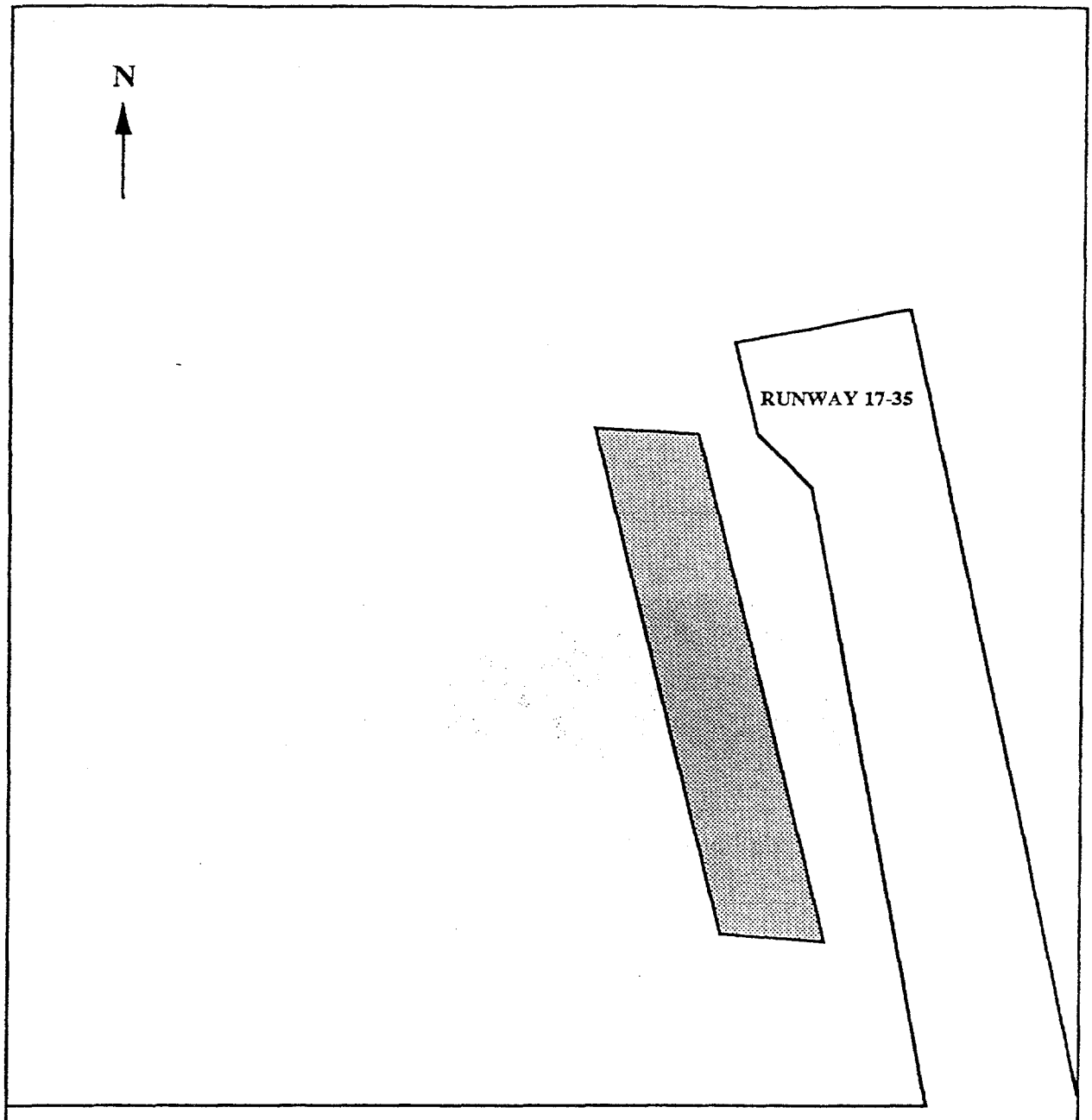
UXO/MAGNETOMETER SURVEY AREA



Metcalf & Eddy	FIGURE 2-4	SITE 6 - FORMER ISLAND FUELING SYSTEM, BUILDINGS X-5 AND X-10 UXO/MAGNETOMETER SURVEY AREA



Metcalf & Eddy	FIGURE 2-5	SITE 8 - FORMER MAIN BASE FUELING SYSTEM, BUILDING N-134 UXO/MAGNETOMETER SURVEY AREA



UXO/MAGNETOMETER SURVEY AREA

NOT TO SCALE

Metcalf & Eddy

FIGURE 2-6

SITE 9 - ABANDONED DRUM FIELD, ALONG RUNWAY 17-35

UXO/MAGNETOMETER SURVEY AREA

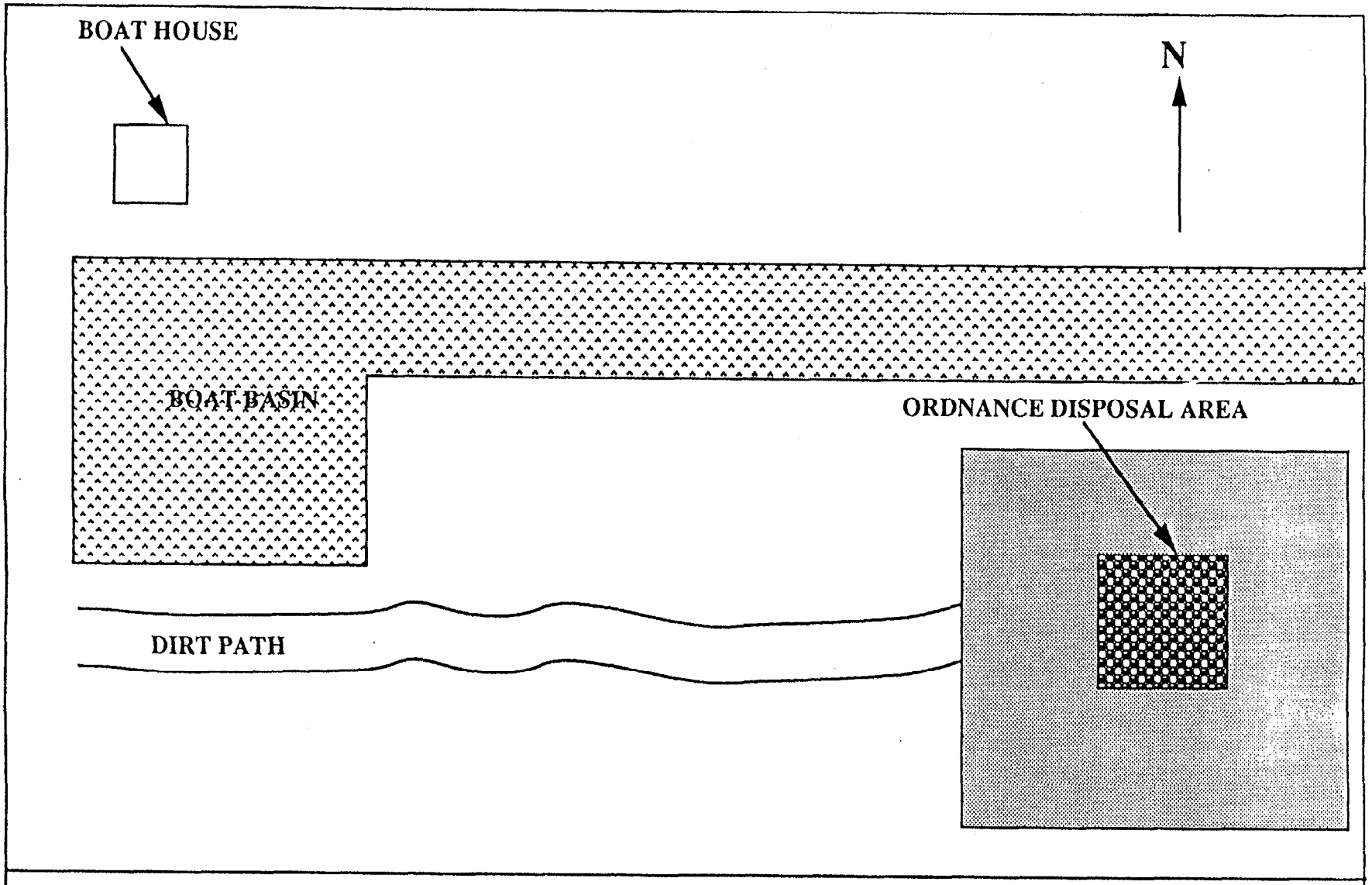


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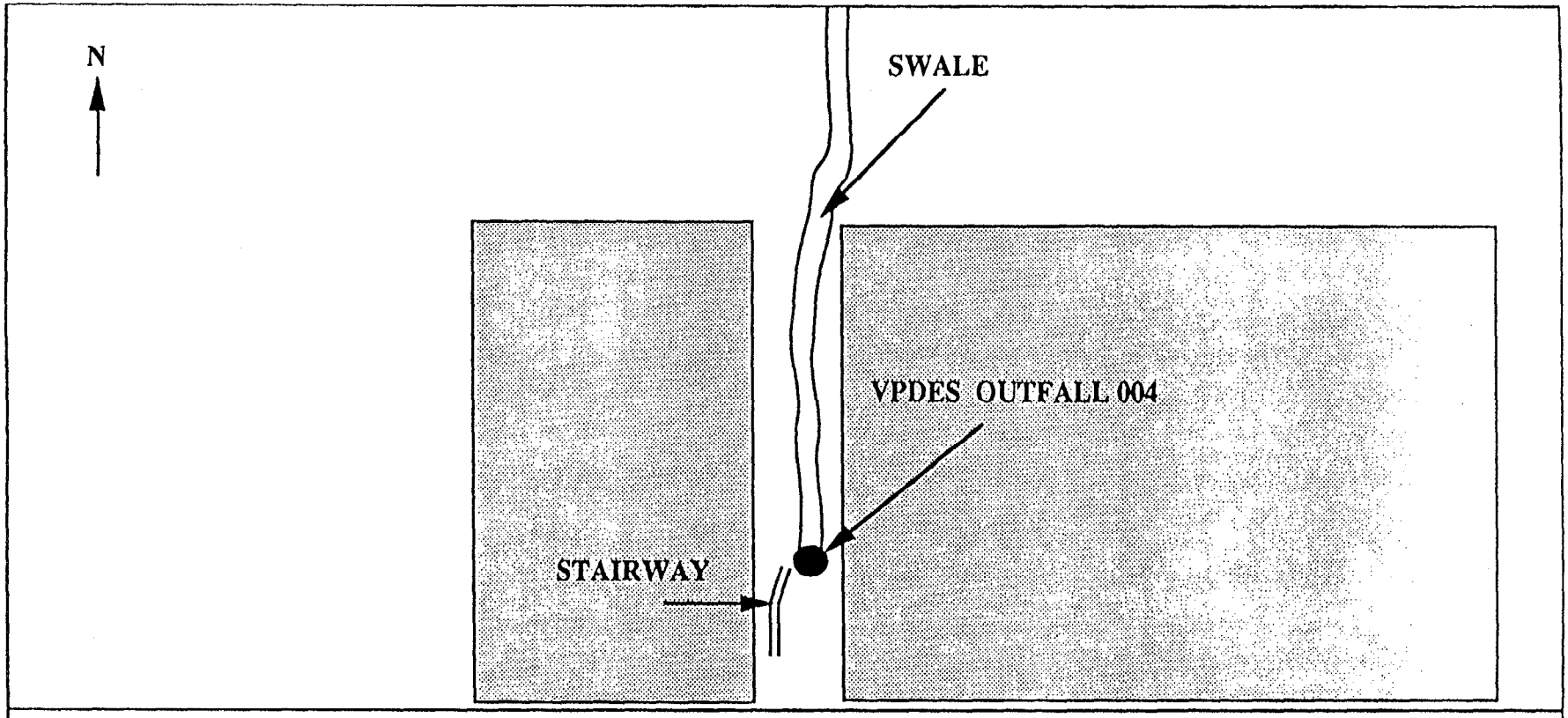
FIGURE 2-7

SITE 13 - ORDINANCE DISPOSAL AREA

UXO/MAGNETOMETER SURVEY AREA



ACCESS ROAD

RUNWAY 10-28

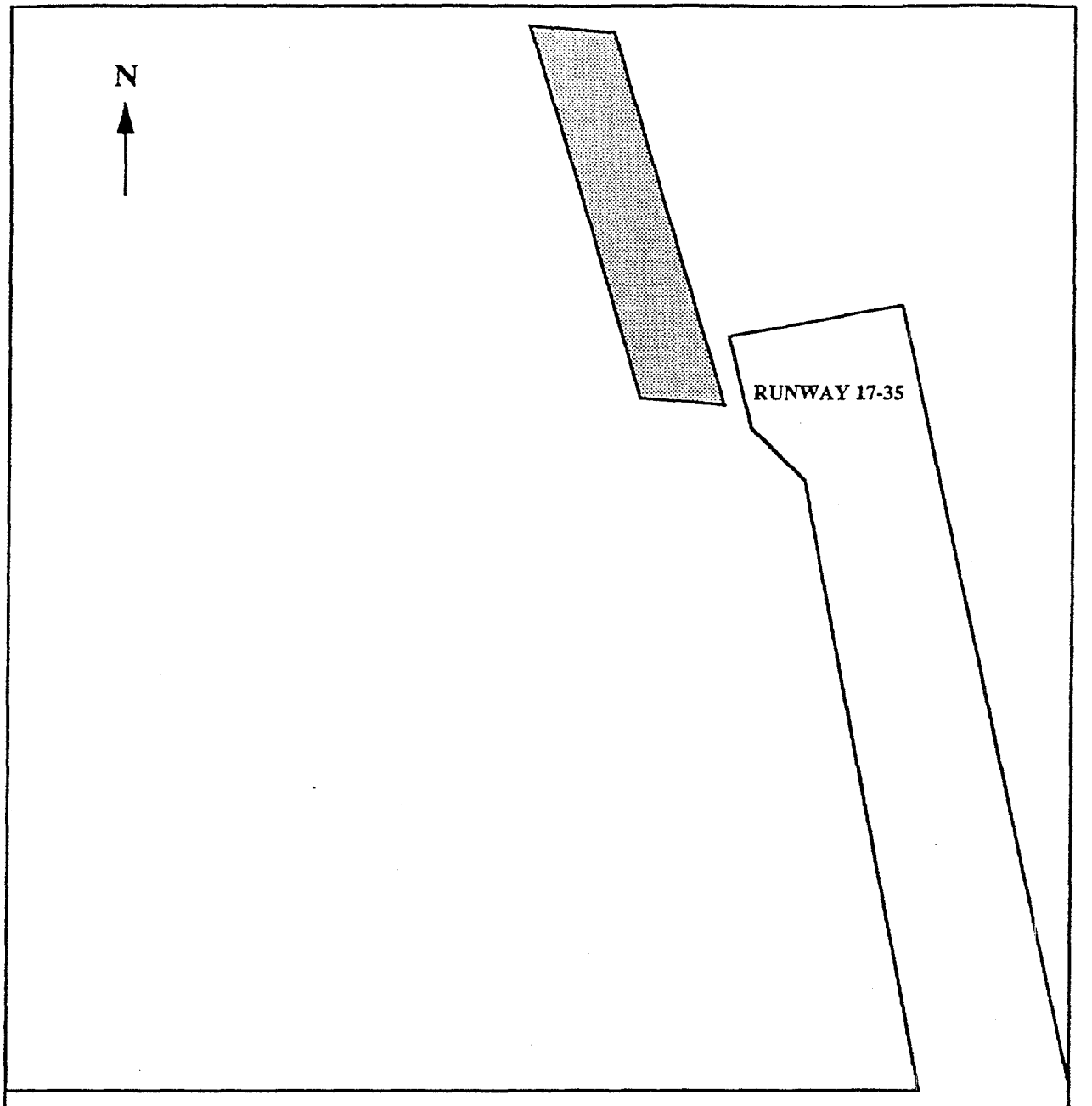
UXO/MAGNETOMETER SURVEY AREA

NOT TO SCALE

Metcalf & Eddy

FIGURE 2-8

SITE 14 - DEBRIS PILE, NORTH OF RUNWAY 10-28
UXO/MAGNETOMETER SURVEY AREA



UXO/MAGNETOMETER SURVEY AREA

NOT TO SCALE

Metcalf & Eddy

FIGURE 2-9

SITE 15 - DEBRIS PILE, ALONG RUNWAY 17-35
UXO/MAGNETOMETER SURVEY AREA

CHAPTER 3.0

RESULTS AND CONCLUSIONS

Site 1 - Old Wastewater Treatment Plant. The area surrounding the Old Wastewater Treatment Plant (WWTP) was investigated to determine the presence of buried tanks, process piping, and UXO. Three separate areas (Figure 3-1) were investigated at this site: immediate area surrounding the Old WWTP (Area A), possible sludge disposal area (Area B), and possible ordnance disposal area (Area C).

Area A - Immediate Area Surrounding the Old WWTP - Approximately 10 subsurface contacts were located in this area and were marked with orange pin flags. Based upon the sizes (i.e., less than 2 feet in diameter) and orientations (i.e. not forming a line) of the contacts, UXB concluded they were not USTs or part of the WWTP process piping.

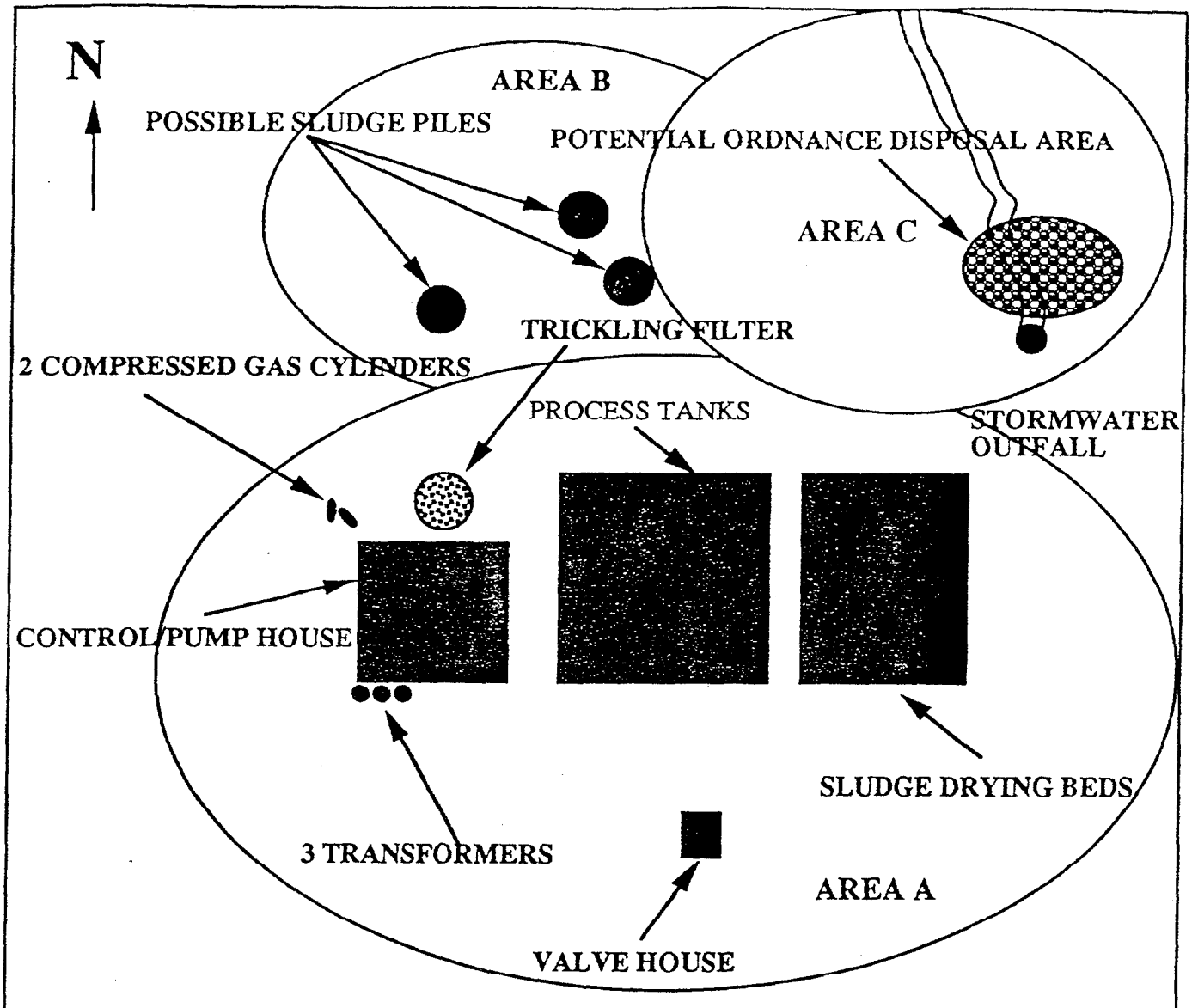
Area B - Possible Sludge Disposal Area - Approximately 30 subsurface contacts were located in this area and were marked with orange pin flags. Based upon the sizes (i.e., less than 2 feet in diameter) and orientations (i.e., not forming a line) of these contacts, UXB concluded they were not USTs or part of the WWTP process piping.

Area C - Possible Ordnance Disposal Area- After a debris (brush, fallen trees, concrete pieces, fence posts) clearing operation by NASA personnel at this portion of the site, approximately 50 subsurface contacts (less than 2 feet in diameter) were located and marked with orange pin flags. UXB detected no subsurface contacts in this area which were large enough to indicate a sizable ordnance disposal area. However, the identities of the 50 subsurface contacts were not determined.

Site 2 - Maintenance Facility, Building E-52. The area surrounding Building E-52 was investigated to determine the presence of buried tanks, pipes, and drums (Figure 3-2). Marston matting (steel sheeting commonly used by the military for temporary roads, parking lots, air strips, etc.) was observed on the surface, and based upon magnetometer readings, is buried to the north, east, and south of Building E-52. The marston matting caused interference with the magnetometers, therefore, it is not known whether additional buried objects are located beneath the marston matting in this area.

At the conclusion of the magnetometer survey conducted in the field to the east of Building E-52 and west of the former Aviation Fuel Tank Farm, UXB located and marked with fluorescent orange spray paint 88 subsurface contacts. These contacts range from minor contacts (i.e. less than two feet in diameter) to a large contact approximately 50 feet by 50 feet. Additionally, UXB suspected underground piping in this area. UXB marked the minor contacts with the symbol "O", larger contacts with the symbol "F", and suspected piping with dotted lines.

The area where the large contact was located was excavated. Minor debris was located such as: broken concrete pieces approximately 1 foot in diameter, and section of rebar approximately 1 foot in length, one section of I-beam approximately two feet in length, and one piece of wire approximately 5 feet in length.



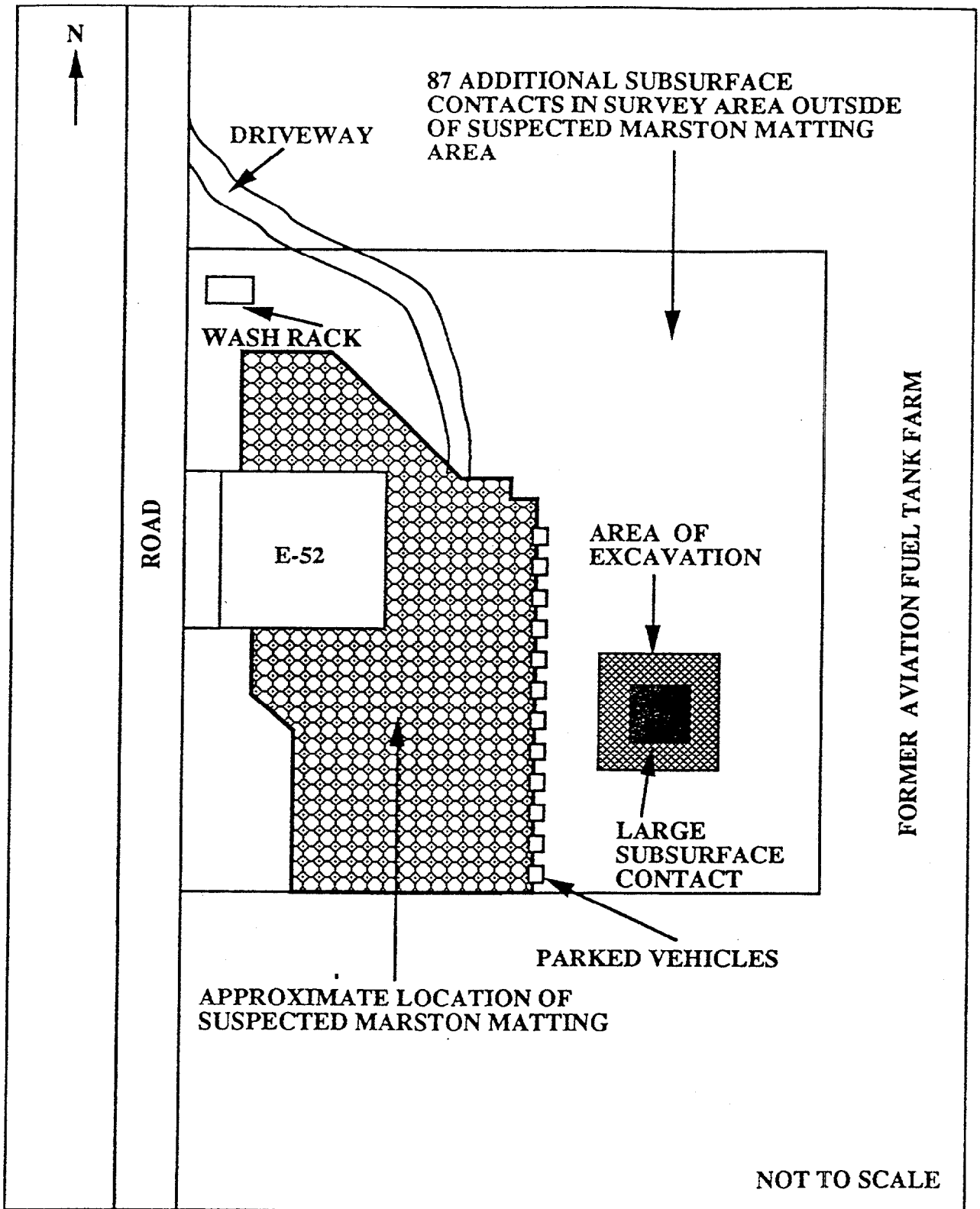
AREA A - APPROXIMATELY 10 SMALL SUBSURFACE CONTACTS, NO INDICATION OF USTs OR OR BURIED PROCESS PIPING.

AREA B - APPROXIMATELY 30 SMALL SUBSURFACE CONTACTS, NO INDICATION OF USTs OR OR BURIED PROCESS PIPING.

AREA C- APPROXIMATELY 50 SMALL SUBSURFACE CONTACTS, NO INDICATION OF A SIZABLE ORDNANCE DISPOSAL AREA.

NOT TO SCALE

M&E Metcalf & Eddy	FIGURE 3-1	SITE 1 - OLD WASTE WATER TREATMENT PLANT UXO/MAGNETOMETER SURVEY RESULTS



Metcalf & Eddy

FIGURE 3-2

SITE 2 - MAINTENANCE FACILITY, BUILDING E-52
UXO/MAGNETOMETER SURVEY RESULTS

Site 4 - Debris Pile, North End of Wallops Island. The survey area at the north end of Wallops Island was investigated to determine the edges of the debris pile. The debris pile was located and is approximately 400 feet long with a width ranging from approximately 10 feet to 40 feet (Figure 3-3). The edges of the debris pile were marked with red flagging tape tied to trees or wooden stakes. Items noted in the debris pile include: marston matting, oil switch, drums, insulation, bottles, cans, and vehicle parts. NOTE: Oil switches are used to control transformer and often contain PCB contaminated oil.

Site 6 - Former Island Fueling System, Building X-5 and X-10. The area surrounding the Former Island Fueling System was investigated to determine the presence of buried tanks, pipes, and tank saddles (Figure 3-4). Approximately 85 subsurface contacts greater than 2 feet in diameter and various suspected pipe lines were located and marked with orange pin flags. Approximately 80 additional smaller subsurface contacts were located, however, these contacts were not marked.

All located piping was confirmed to be to be either a compressed air or water line by NASA personnel. Pin flags marking utility lines were removed and NASA utility crews marked the lines with spray paint.

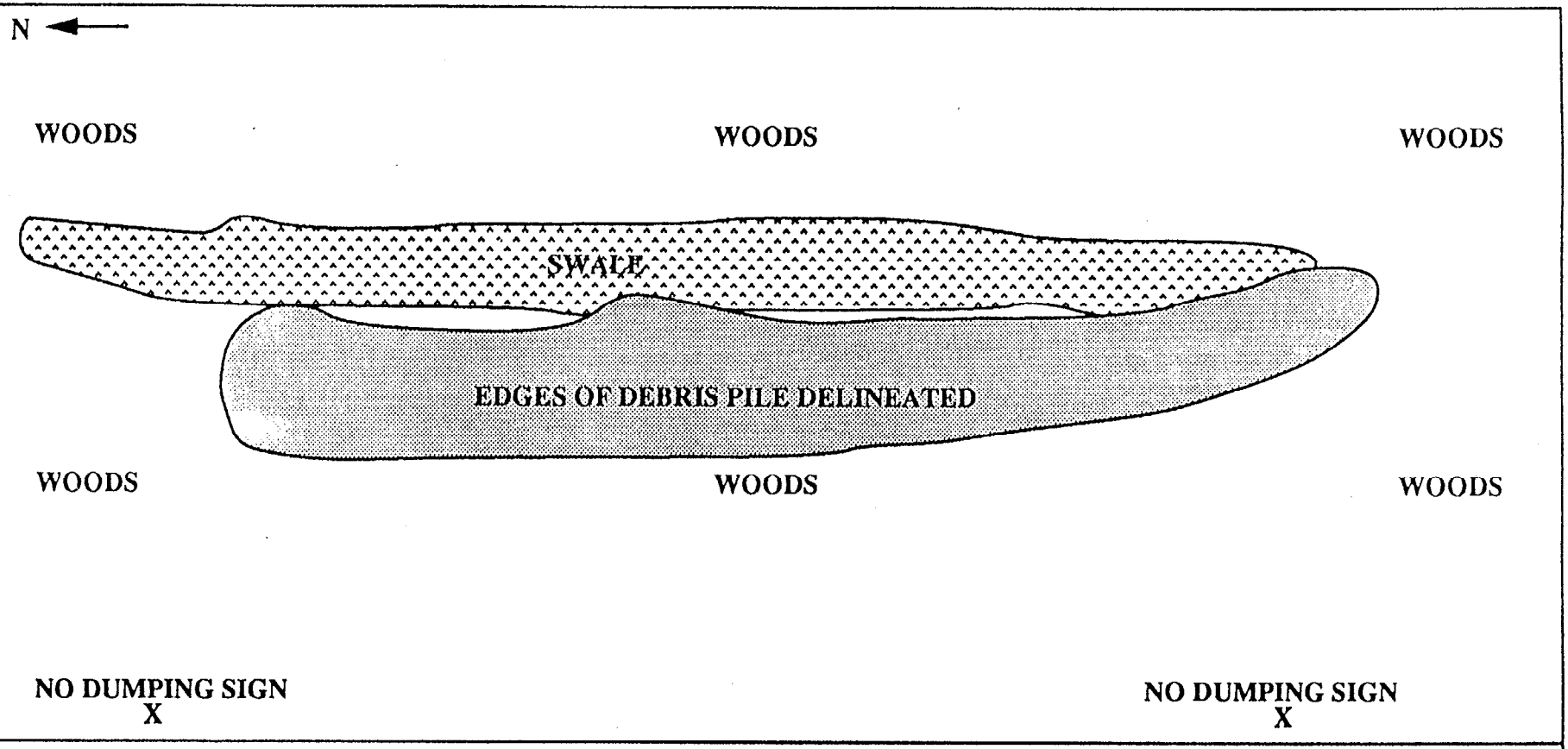
Based upon the results of this survey it is concluded that the UST's and associated piping previously located at this site have been removed. Additionally, no subsurface contact was located to indicate the presence of the tank saddles, however, it is suspected that many of the subsurface contacts are portions of broken concrete which may have been part of the saddles.

Site 8 - Former Main Base Fueling System, Building N-134. The area surrounding the former Main Base Fueling System was investigated to determine the presence of a buried waste oil tank behind the building and the piping associated with the former fueling system (Figure 3-5). The waste oil tank was not located. The pipes running from the tanks were located and the ends were marked with orange pin flags.

Site 9 - Abandoned Drum Field, Along Runway 17-35. The area along runway 17-35 investigated to determine the possible presence of buried drums. The abandoned drum field is approximately 600 feet long and ranges in width from 20 to 200 feet. Twenty subsurface contacts of approximately 55 gallon drum size were located and marked with orange pin flags.

Site 13 - Ordnance Disposal Area. The area in and around the ordnance disposal site was investigated to determine the presence of possible UXO. The magnetometer survey was conducted inside the fenced area and approximately 50 feet out from the fenced area (Figure 3-7). A large number of small subsurface contacts were located inside the fenced area. Additionally, the remains of flares were observed on the surface inside the fenced area. Thirteen subsurface contacts were located outside the fenced area and marked with orange pin flags.

Site 14 - Debris Piles North of Runway 10-28. The survey area along Runway 10-28 was investigated to determine the edges of the debris piles on either side of VPDES outfall 004 (Figure 3-8). The edges of the debris piles were located and marked with red flagging tape tied to wooden stakes. The debris pile to the west of outfall 004 is approximately 90 feet by



Metcalf & Eddy

FIGURE 3-3

SITE 4 - DEBRIS PILE, NORTH END OF WALLOPS ISLAND

UXO/MAGNETOMETER SURVEY RESULTS

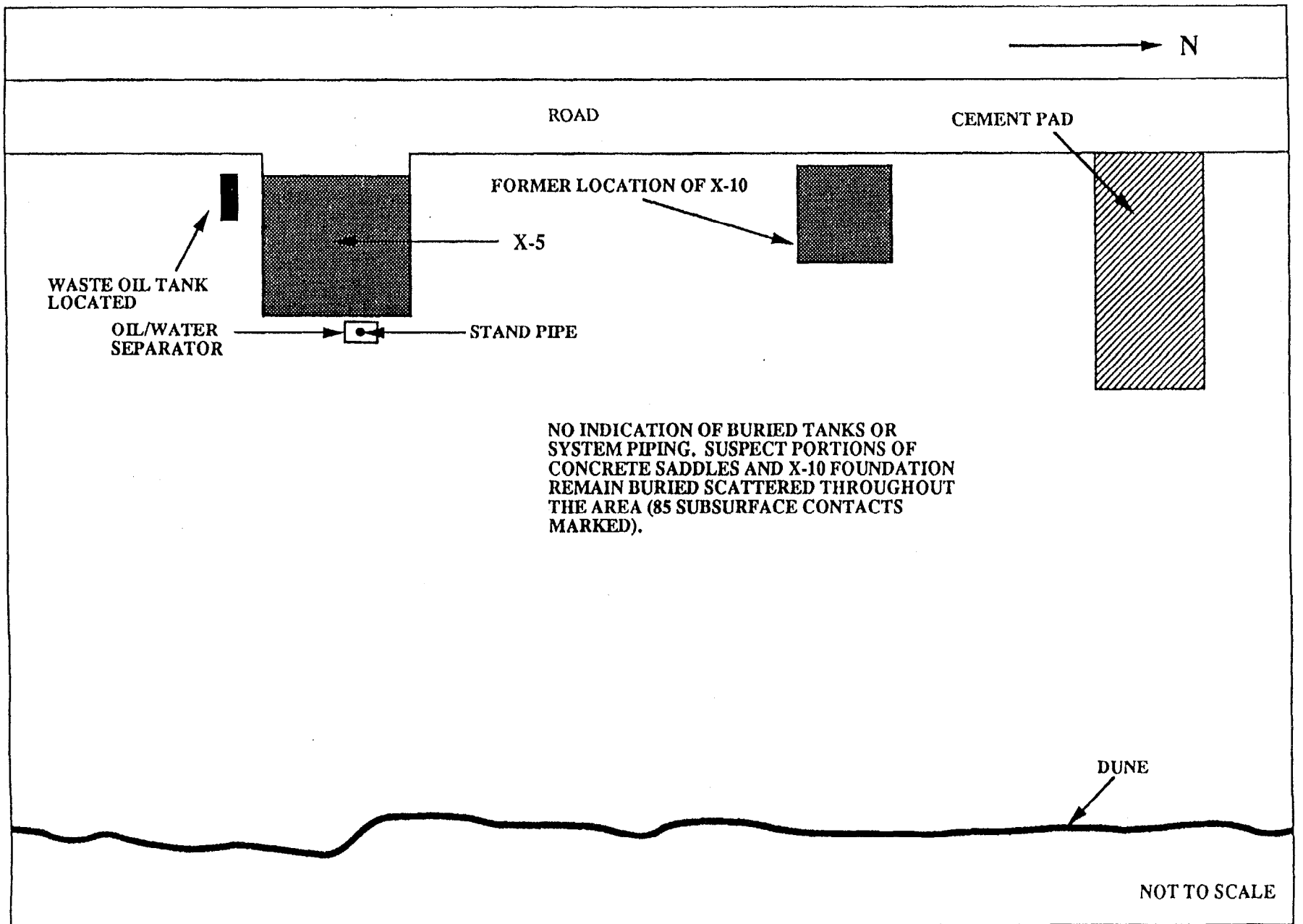
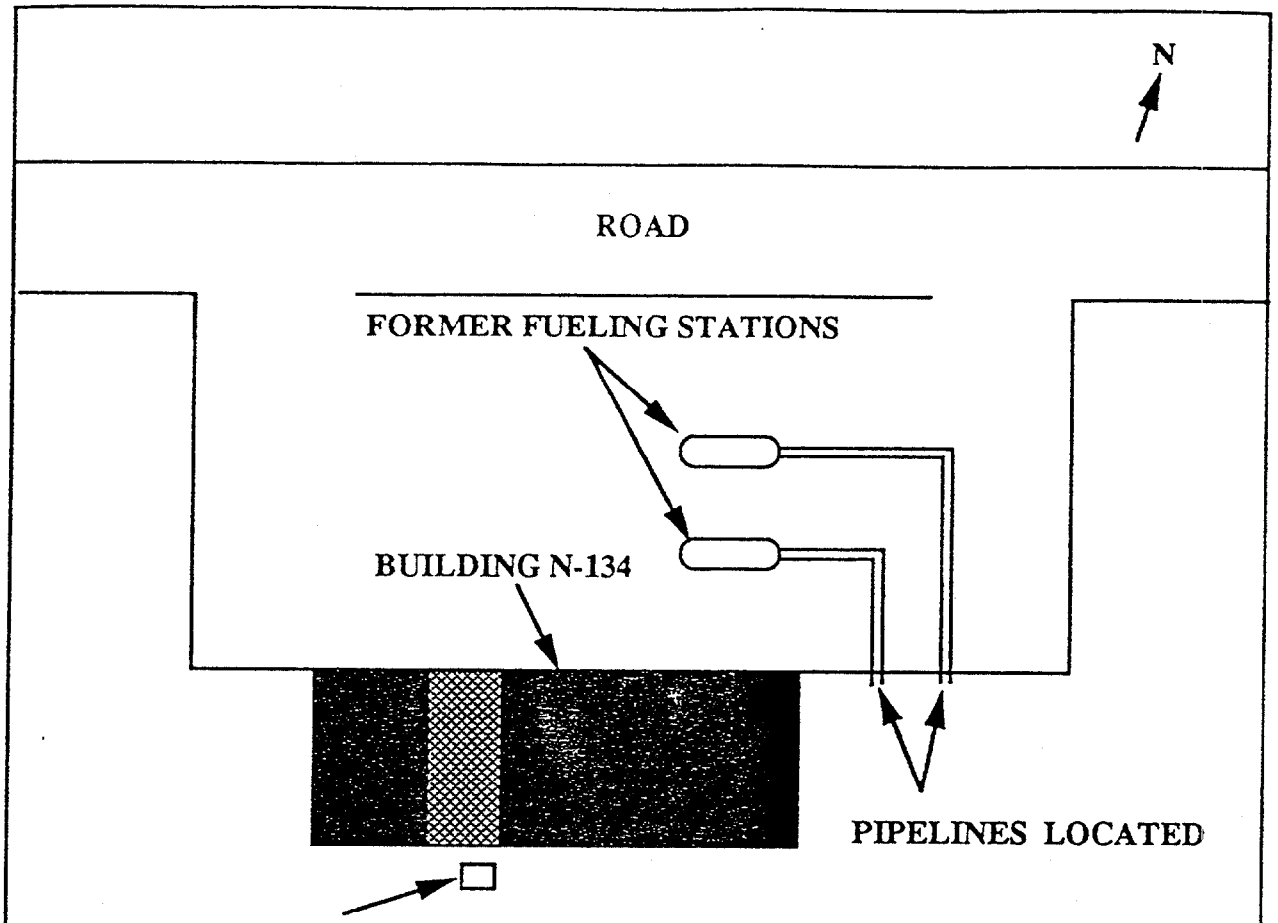


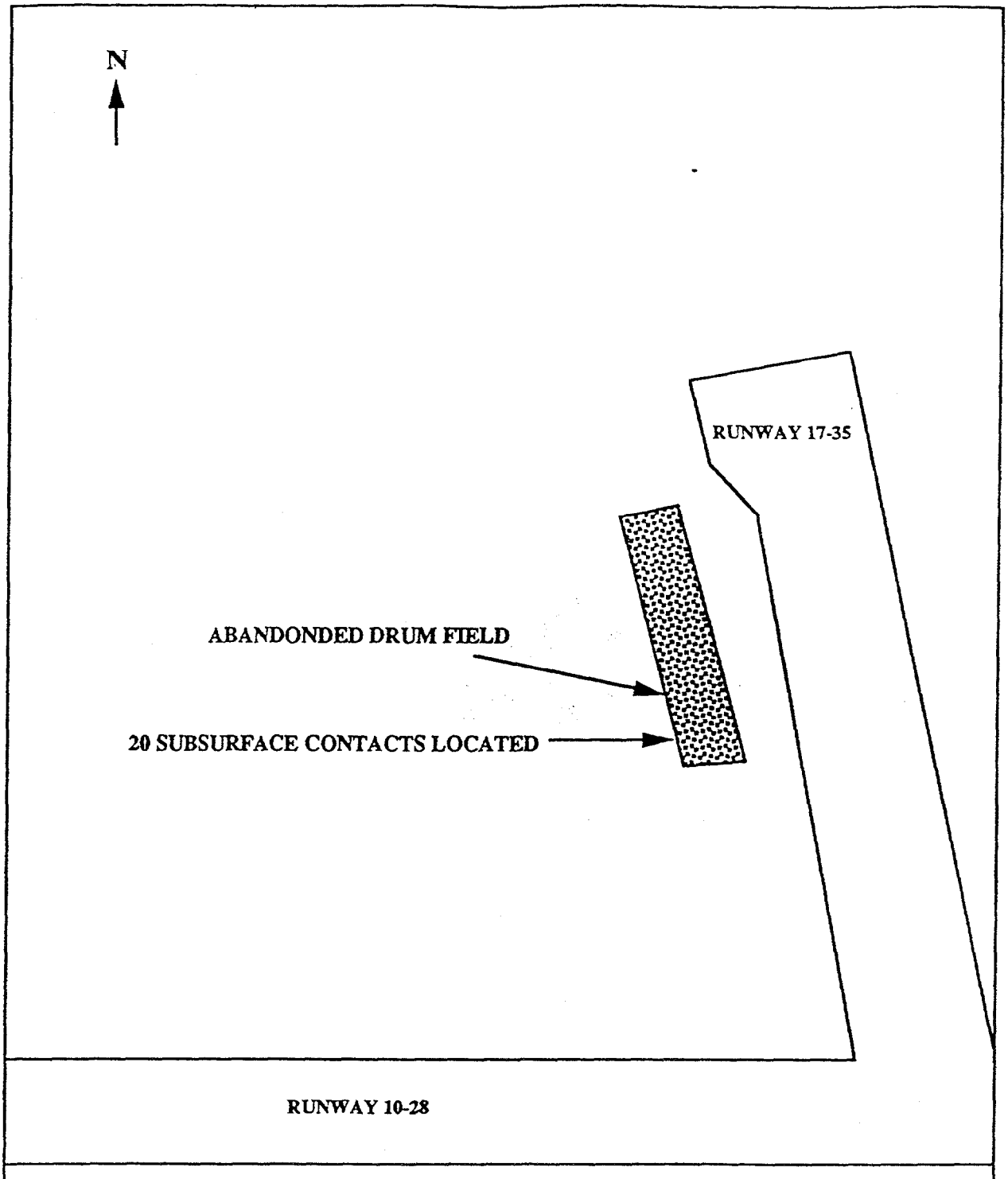
FIGURE 3-4

SITE 6 - FORMER ISLAND FUELING SYSTEM, BUILDINGS X-5 AND X-10
UXO/MAGNETOMETER SURVEY RESULTS



NOT TO SCALE

Metcalf & Eddy	FIGURE 3-5	SITE 8 - FORMER MAIN BASE FUELING SYSTEM, BUILDING N-134 UXO/MAGNETOMETER SURVEY RESULTS



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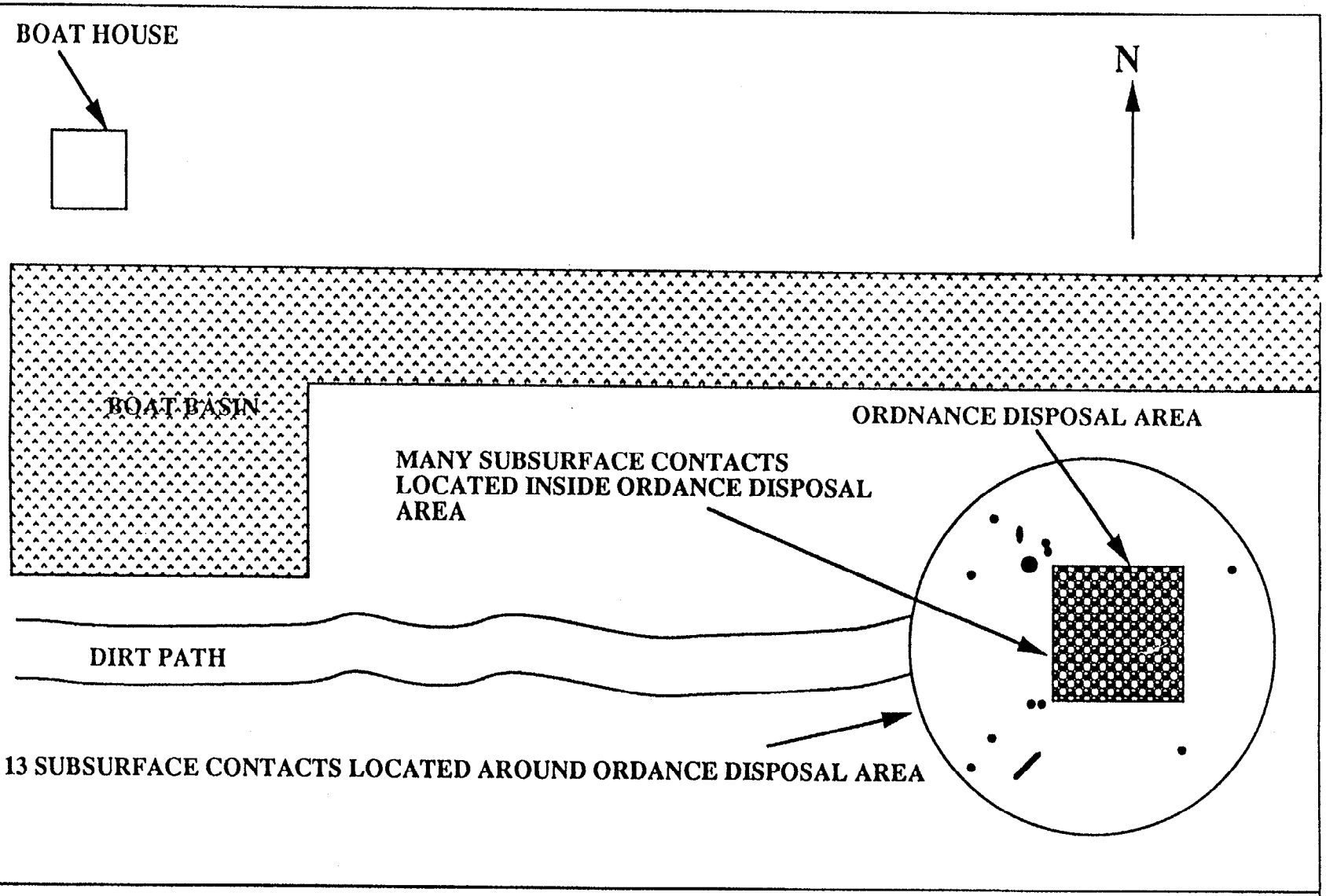
Metcalf & Eddy	FIGURE 3-6	SITE 9 - ABANDONED DRUM FIELD, ALONG RUNWAY 17-35 UXO/MAGNETOMETER SURVEY RESULTS

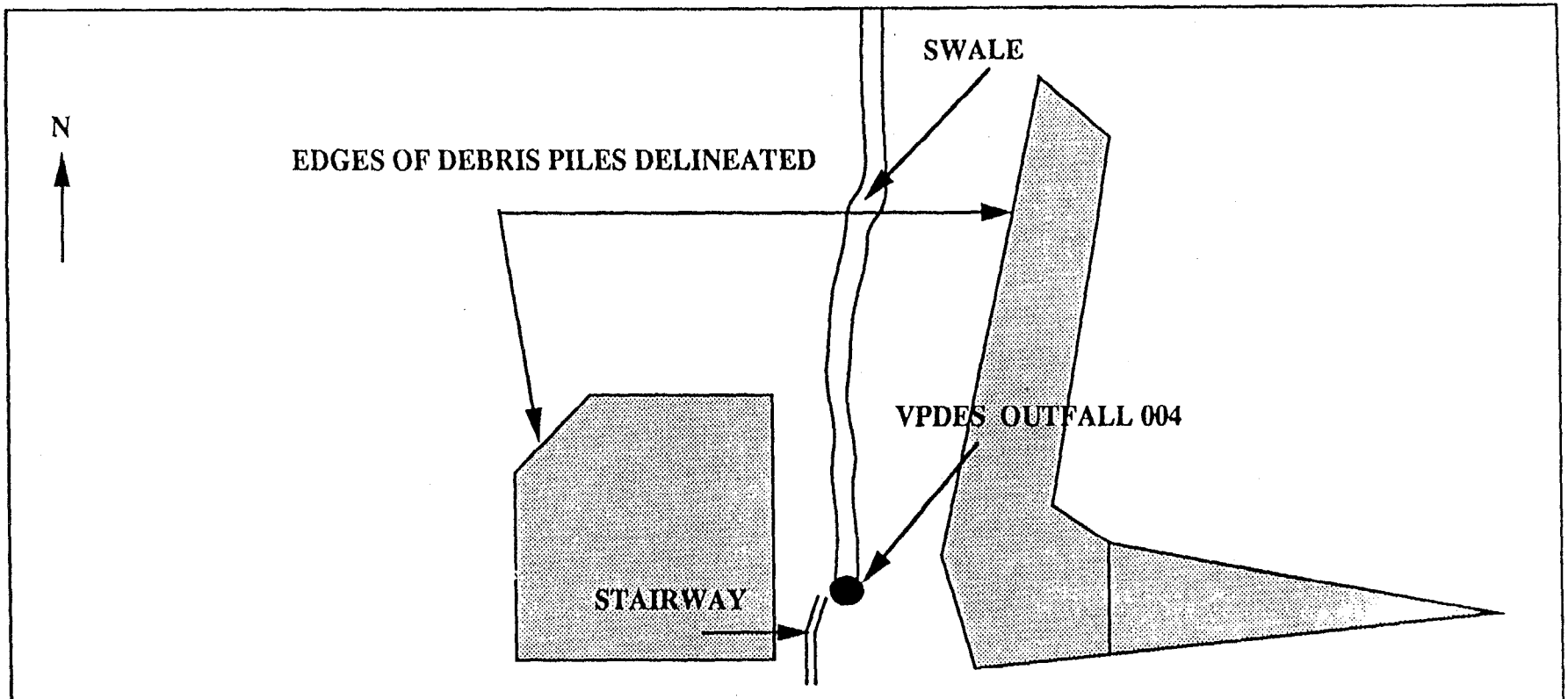


Metcalf & Eddy

FIGURE 3-7

SITE 13 - ORDINANCE DISPOSAL AREA

UXO/MAGNETOMETER SURVEY RESULTS



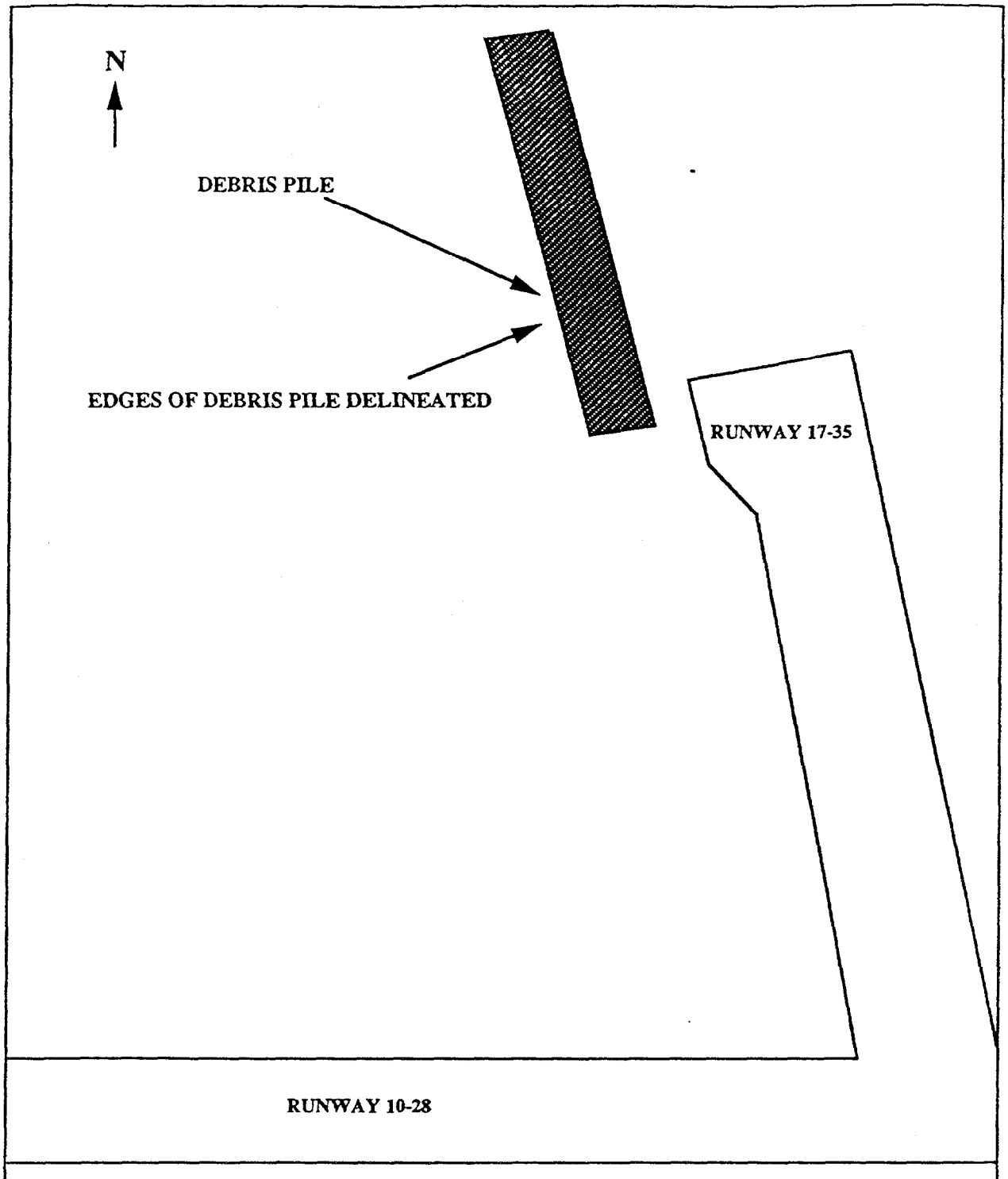
Metcalf & Eddy	FIGURE 3-8	SITE 14 - DEBRIS PILE, NORTH OF RUNWAY 10-28 UXO/MAGNETOMETER SURVEY RESULTS

150 feet. Items noted in this debris pile include: brick, tile, pipe, ductwork, concrete block, wood, metal sheeting, and insulation.

The debris pile to the east of the outfall, which runs along the drainage ditch, is approximately 60 feet by 240 feet. Items noted in this debris pile included: broken concrete, pieces of concrete pipe, runway lights, and empty 5 gallon buckets which used to contain foam for firefighting.

The debris pile to the east of the outfall, which runs along the runway, is triangular shaped with a base of approximately 75 feet and height of 180 feet. Items noted in the debris pile included: cement block, metal sheeting, and broken concrete.

Site 15 - Debris Pile, Along Runway 17-35. The debris pile is approximately 720 feet long and ranges in width from 25 to 100 feet (Figure 3-6). The edge of the debris pile is outlined with red flagging tape tied to wooden stakes or trees. Items noted in the debris pile include: marston matting, concrete filled 55 gallon drums, empty 55 gallon drums, concrete block, broken pieces of concrete, pipe, brick, fence posts, bottles, cans, tires, toilets, asphalt, lumber, and steel cable. Additionally, two samples of suspected asbestos board were collected for NASA to have analyzed for asbestos content.



NOT TO SCALE

Metcalf & Eddy	FIGURE 3-9	SITE 15 - DEBRIS PILE, ALONG RUNWAY 17-35 UXO/MAGNETOMETER SURVEY RESULTS

CHAPTER 4.0

RECOMMENDATIONS

Based on the results of the UXO/magnetometer survey, recommendations are being made to survey the areas where significant contacts were recorded during Phase II of the SI. The flagging and painted areas were not intended to be permanent markers and are subject to environmental and human destruction.

Site 1 - Old Wastewater Treatment Plant.

Area A - No recommendation.

Area B - No recommendation.

Area C should be recorded as a possible ordnance disposal area on the Facilities Master Plan. Additional subsurface investigations (UXO survey) should be conducted prior to any intrusive activity at this site. This site will be forwarded to the Corps of Engineers for further evaluation.

Site 2 - Maintenance Facility, Building E-52. Due to the previously detected contamination in the proximity of this site, the marston matting surrounding the building should be removed to allow investigation of the subsurface.

Site 4 - Debris Pile, North End of Wallops Island. The edge of the debris pile should be surveyed during Phase III of the SI to insure a record of its location.

Site 6 - Former Island Fueling System, Building - X-5 and X-10
No recommendation.

Site 8 - Former Main Base Fueling System, Building N-134.
No recommendation.

Site 9 - Abandoned Drum Field, Along Runway 17-35. The 20 subsurface contacts in the abandoned drum field should be surveyed during Phase III of the SI to ensure a record of their locations.

Site 13 - Ordnance Disposal Area. The thirteen subsurface contacts located outside the fenced area should be surveyed during Phase III of the SI to ensure a record of their locations. This site will be forwarded to the Corps of Engineers for further evaluation.

Site 14 - Debris Pile, North of Runway 10-28. The edges of the debris piles should be surveyed during Phase III of the SI to ensure a record of their locations.

Site 15 - Debris Pile, Along Runway 17-35. The edge of the debris pile should be surveyed during Phase III of the SI to ensure a record of its location.

CHAPTER 5.0

REFERENCES

NASA, 1948. Drawings for former Wallops Island Fueling System - Drawing #LD-30120, pages 1-20, July 22, 1948.

NASA, 1988(a). Memo to Mr. Graham J. Ellixson, Jr., Corps of Engineers, from Mr. Billie J. McGarvey, Assistant Associate Administrator for Facilities Management. September 26, 1988.

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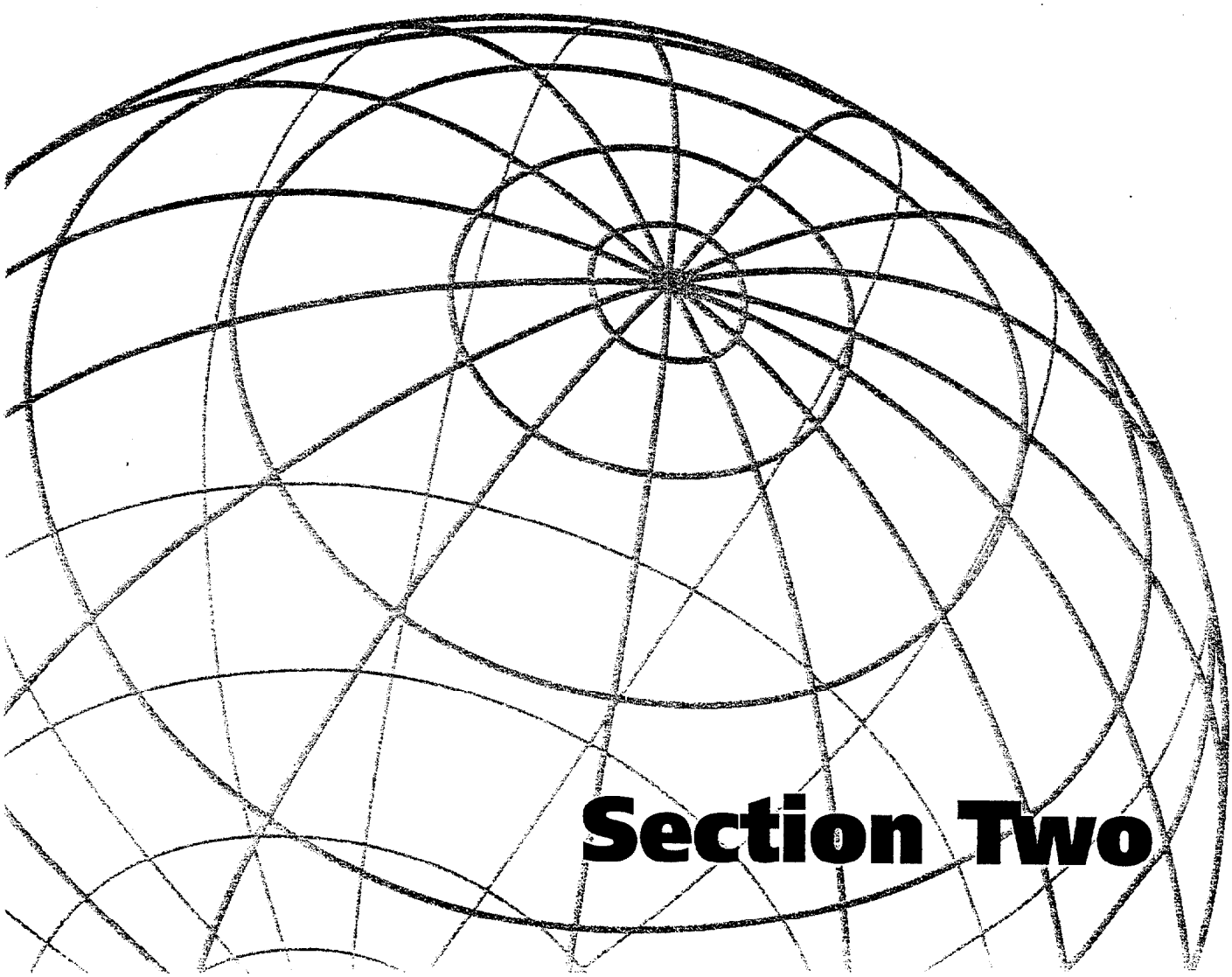

Section Two

Submitted to:
National Aeronautics and Space Administration
Wallops Flight Facility
Wallops Island, Virginia

Environmental A/E Services
Contract NAS5-35042
Delivery Order: 14

NASA WALLOPS FLIGHT FACILITY SITE INSPECTION PRELIMINARY REPORT #2 SOIL GAS SURVEY RESULTS

April 28, 1993

Submitted by:
Metcalf & Eddy, Inc.
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Laurel, Maryland 20708

NASA WALLOPS FLIGHT FACILITY SITE INSPECTION
PRELIMINARY REPORT #2
SOIL GAS SURVEY RESULTS

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CHAPTER 1.0

INTRODUCTION

1.1 PURPOSE

This preliminary report is being prepared for the National Aeronautics and Space Administration (NASA), Goddard Space Flight Center (GSFC), Wallops Flight Facility (WFF), Wallops Island, Virginia. The report is being prepared under contract NAS5-35042, Delivery Order 14: Wallops Flight Facility Site Inspection. The Site Inspection (SI) project includes investigation of fourteen separate sites identified in 1990 during an Environmental Site Survey (NASA, 1990c) as being potentially affected by past activities. The Environmental Site Survey is being used in the place of a Preliminary Assessment (PA) for the sites and will be referred to as such throughout this report.

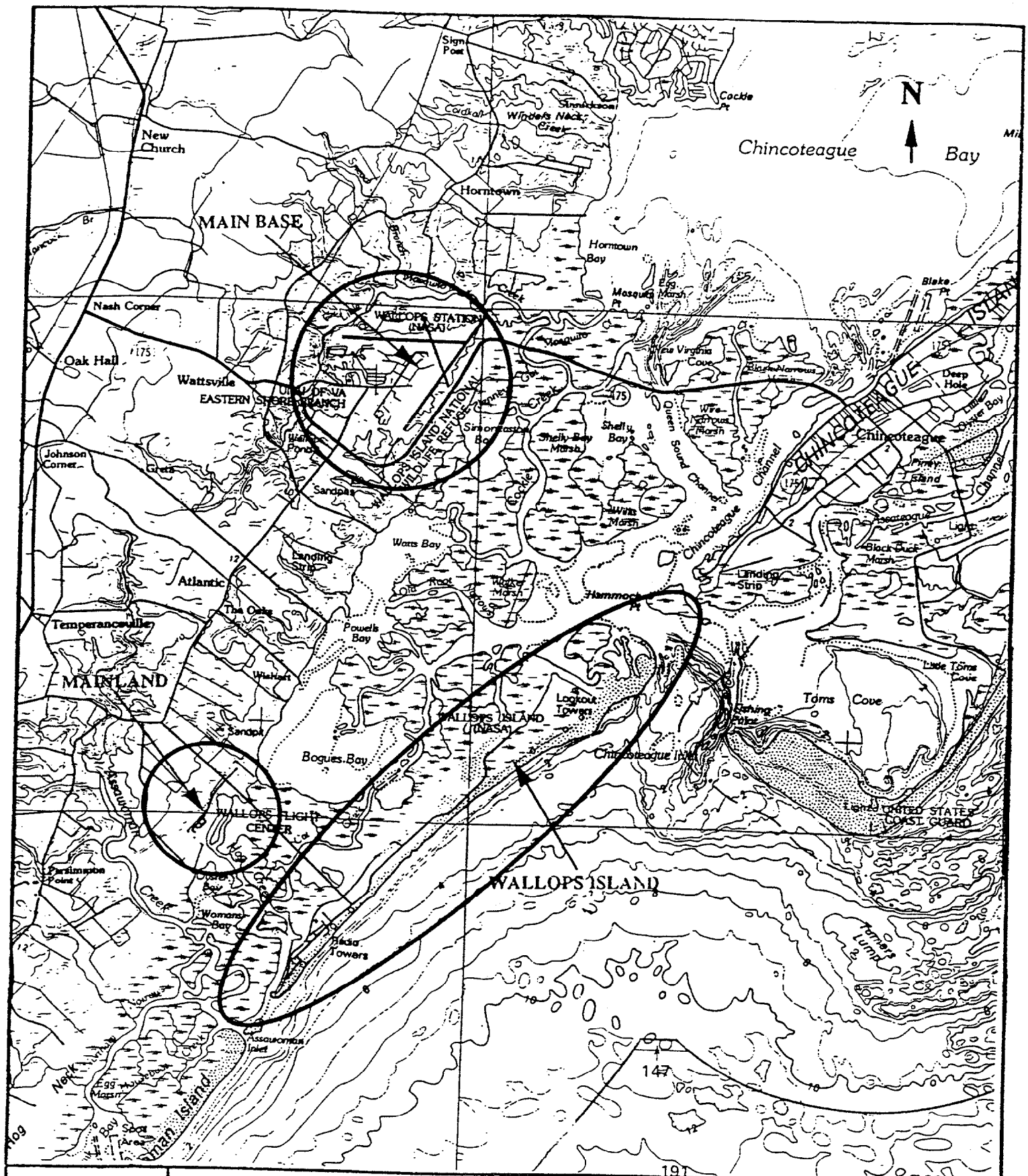
The SI is being conducted in phases due to the magnitude of the task. Preliminary preparation for the SI included collection of background data and a walk-through site survey. Phase I of the field investigations consisted of an unexploded ordnance (UXO) and magnetometer survey at eight of the fourteen sites. Phase II consisted of soil gas surveys at ten of the fourteen sites. The purpose of this document is to present the preliminary findings of the soil gas surveys, which were performed between March 8 - March 22, 1993. Field methodologies are briefly described, and preliminary conclusions and recommendations for each site are also provided. A similar document will be prepared for each of the other field activities which are being conducted in other phases of the SI, as described in the "NASA Wallops Flight Facility Site Inspection Work Plan", prepared by Metcalf & Eddy in March 1993. A Final Site Inspection Report will be prepared at the conclusion of the field investigations, and will include results and discussion of each of the individual field efforts.

1.2 SITE LOCATIONS

WFF is composed of three separate specific areas in close proximity to each other--the Main Base, the Mainland, and Wallops Island (Figure 1-1). WFF is located in the temperate zone at approximately 37° 56' north latitude and 75° 27' west longitude. WFF is within the political boundaries of Accomack County on the Eastern Shore of the Commonwealth of Virginia. WFF is approximately 40 miles southeast of Salisbury, Maryland, and 90 miles north by northeast of the Tidewater Regional area. Chincoteague Island is approximately five miles to the northeast of the Main Base.

Soil gas surveys were performed at ten of the fourteen areas of concern identified in the 1990 PA. The ten areas are listed below, and a description of each site is provided in Section 1.3. The locations of each area are illustrated on Figures 1-2 and 1-3, and individual maps for each site are included in Chapter 2.0.

SITE NAME	LOCATION
Site 1 - Old Wastewater Treatment Plant	Main Base
Site 2 - Maintenance Facility	Main Base - Building E-52
Site 3 - Two 600,000 Gallon Fuel Tanks	Main Base - Buildings A-46A, A-46B



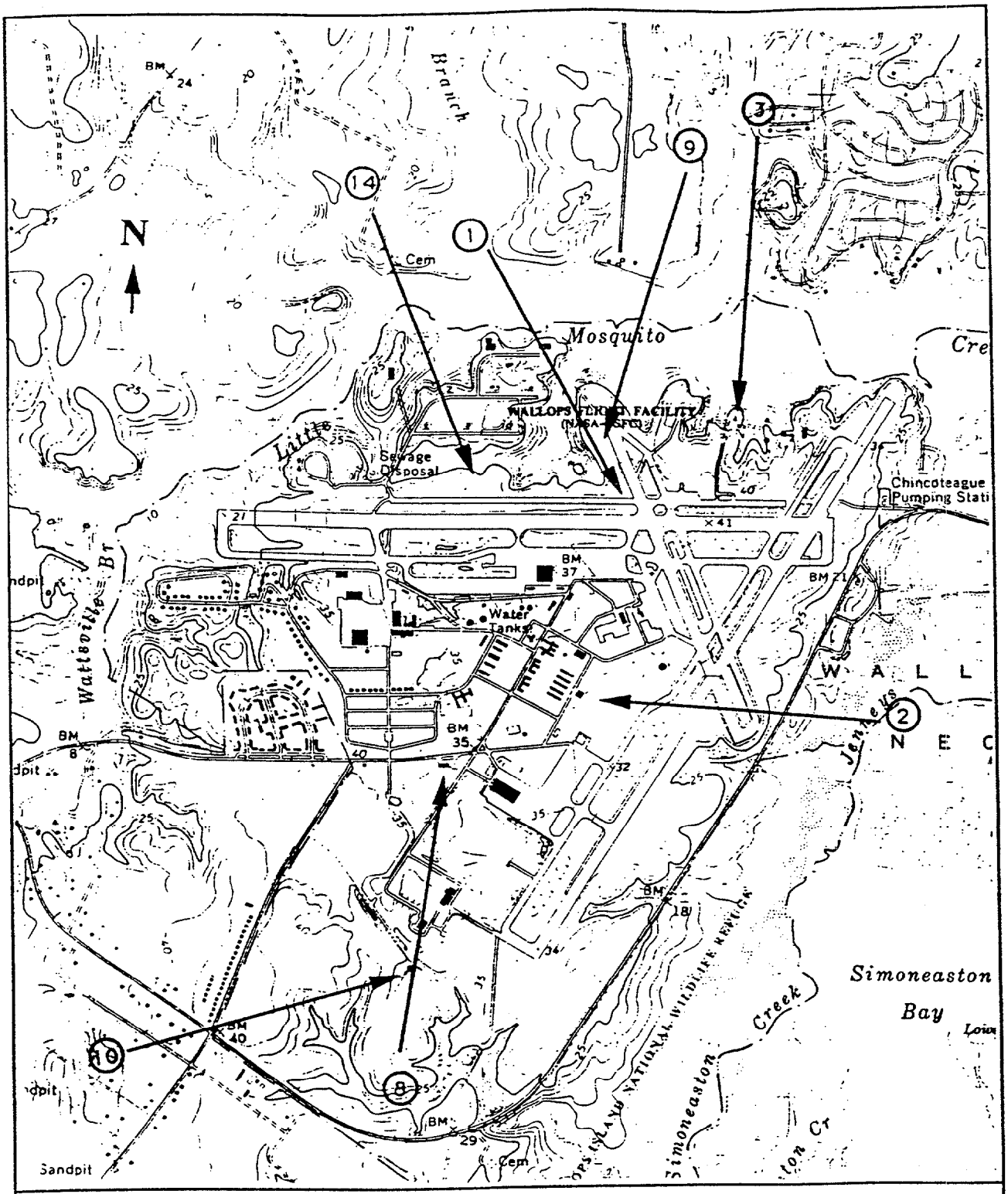
Metcalf & Eddy

FIGURE 1-1

SCALE - 1:100,000

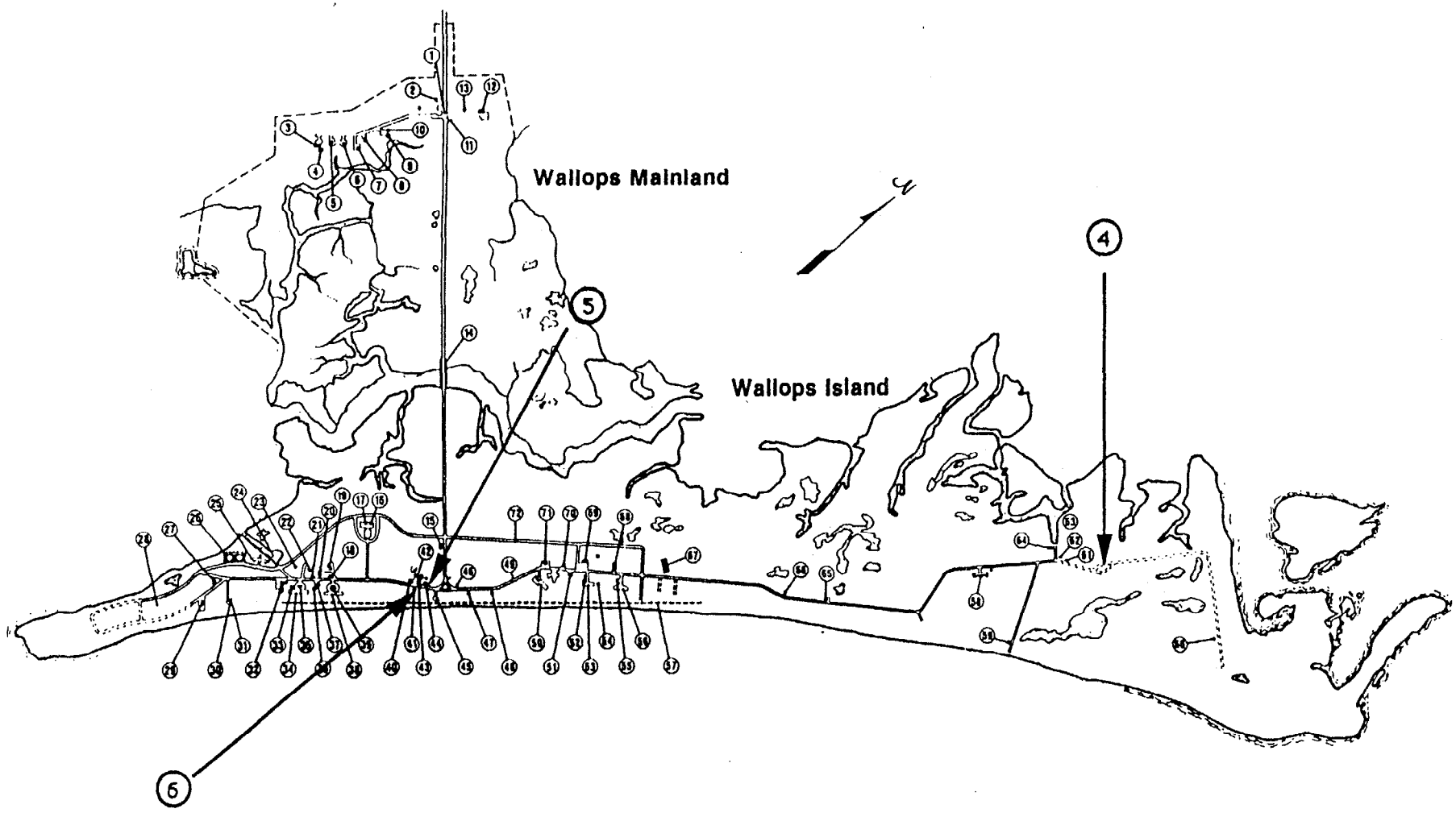
WFF VICINITY MAP

SOURCE: USGS NATIONAL OCEAN SURVEY



SCALE - 1=24,000

Metcalf & Eddy	FIGURE 1-2	MAIN BASE SITES SOURCE: USGS



Metcalf & Eddy

FIGURE 1-3

WALLOPS ISLAND SITES

SOURCE: NASA

APPROX. SCALE - 1"= 4000'

SITE NAME	LOCATION
Site 4 - Debris Pile	Wallops Island - North End
Site 5 - Paint Stain	Wallops Island - Building X-30
Site 6 - Former Island Fueling System	Wallops Island - Building X-5 and X-10
Site 8 - Former Main Base Fueling System	Main Base - Building N-134
Site 9 - Abandoned Drum Field/Debris Pile	Main Base - Along Runway 17-35
Site 10 - Advanced Data Acquisition Support Facility (ADAS)	Main Base - Building N-168
Site 14 - Debris Pile	Main Base - Along Runway 10-28

1.3 SITE DESCRIPTIONS

Site 1 - Old Wastewater Treatment Plant. The old wastewater treatment plant was constructed by the Navy, and was abandoned in 1957 when NASA took over the facility and constructed the current wastewater treatment plant. Structures and items noted during the initial site visit included: a plant control building, concrete process tanks and associated piping, sludge drying beds, a pump/valve building, a trickling filter, three transformers (possibly PCB), and two compressed gas cylinders (possibly chlorine). A 1988 NASA (NASA, 1988a) memo addressed to the Corps of Engineers indicated that a drainage swale located near the old plant was potentially used as an ordnance disposal site, but no evidence of ordnance was noted during the initial site survey.

Site 2 - Maintenance Facility, Building E-52. The facility is located adjacent to the former Aviation Fuel Tank Farm, and was used by the Navy as a Motor Pool and more recently by NASA as a landscaping facility. A 1989 soil gas survey (NASA, 1990b) of the area detected xylene isomers along the border between the tank farm and E-52, and a 1990 soil gas survey (NASA, 1992) detected perchloroethene in the same approximate area. Subsurface soil samples collected during the Supplemental Site Characterization (NASA, 1991) for the tank farm indicated fuel related chemicals and trichloroethene downgradient of E-52. Review of aerial photographs taken in the 1960's showed the presence of drum storage areas and at least one above ground tank. A 1990 survey of the facility indicated that petroleum products were stored in open containers around the perimeter of the building at that time (NASA, 1990a). Additionally, the annual safety and health survey conducted in 1988 (NASA, 1988b) indicated that excessive numbers of batteries were stored around the area, and that two 500 gallon fuel tanks were present at that time with no secondary containment. Extensive soil staining was noted around the building during the 1993 site walk-through. In addition, four protective bollards (posts) were noted near the building, which may have previously protected a fuel pump.

Site 3 - Two 600,000 Gallon Fuel Tanks, Building A-46A and A-46B. The two tanks, designated A-46A and A-46B, and the pump house are located north of taxiway 10-28. The tanks were used by the Navy for storage of JP-4 fuel. Interviews with personnel revealed that the tanks were emptied and filled with salt water. The tanks were never used by NASA

(NASA, 1993). Petroleum by-products were recently detected in one groundwater sample in monitoring well MW-41 in this area. A petroleum odor was noted near A-46A during the 1993 site survey. There is an abandoned pipeline which originally connected these tanks to building E-77, in the old aviation fuel tank farm. During the 1991 excavation of the old aviation fuel tank farm, this pipeline contained product. This line was allowed to drain and then it was capped, however, it is not known whether the line was completely emptied.

Site 4 - Debris Pile, North End of Wallops Island. Debris, metal, and telephone poles were disposed at the north end of the island. No further information is available.

Site 5 - Paint Stain, Building X-30. The exhaust fan from the spray paint booth has been expelling paint particles which have left a stained area behind the facility. Although a filter has been ordered for the system, it has not been installed, and investigation of the surface gravel and soil is necessary to characterize the paint content. Paint, paint thinner, and lacquer was currently used in this building. Additionally, an area in front of the building is used for sandblasting activities.

Site 6 - Former Island Fueling System, Building X-10 and Building X-5. Building X-10 was the former Island Fueling System. Drawings of the facility (NASA, 1948) indicate that there were two 30,000 above ground tanks, and five partially buried storage tanks of unknown size. Drawings and aerial photographs from the 1960's indicate that the tanks were surrounded by a concrete dike, and a concrete pad was located next to the underground tanks. The above ground tanks were removed in 1981 (NASA, 1993) but the saddles may still remain. The concrete pad is still present. Recent soil gas and soil data indicate that soil contamination is present in the vicinity of the former fueling station.

Building X-5 was used as a support facility (NASA, 1993). Drawings for the facility indicate the presence of a hydraulic system, a 500 gallon underground waste oil tank, an oil/water separator, and a drain field. The hydraulic system consisted of two 30 gallon above ground tanks inside the building. These tanks have been removed (Traynor, 1993). Additionally, a 250 gallon above ground fuel oil storage tank was located behind the building (Traynor, 1993). Recently, the interior floor drains were flushed out, which caused oily material to overflow from an exterior standpipe located at the oil/water separator (Traynor, 1993). Extensive soil staining was noted around this standpipe during the 1993 site survey.

Site 8 - Former Main Base Fueling System, Building N-134. An underground storage tank fueling system was previously located at Building N-134 (NAVY, 1956). The tanks were removed in the mid-seventies, but piping to the fuel pumps may not have been removed. Samples were not collected at the time of tank removal to determine levels of contamination, if any. In addition, a 550 gallon waste oil tank was once located at the facility (NAVY, 1956).

Site 9 - Abandoned Drum Field, Along Runway 17-35. During a NASA walk-through survey of stormwater discharges, abandoned drums were discovered within the tree line along runway 17-35. The site is divided into two areas - Site 9 North, which contains concrete-filled and some empty drums, and Site 9 South, which contains empty drums and is located north of Site 1, the old Wastewater Treatment Plant. There were several deteriorated drums protruding from the ground with visible petroleum residuals (i.e., tar-like) in/on the drums at

both sites. A preliminary radiation survey was performed on the concrete drums. No radiation levels were detected above background (NASA, 1993).

Site 10 - ADAS, Building N-168. ADAS contains a hydraulic system that holds approximately 1000 gallons of hydraulic fluid. During the past several years, there have been discharges of the hydraulic fluid from the system (NASA, 1993). Three drum storage areas have been used for storing new and used oil. There is visible staining around ADAS and at two of the drum-storage areas. Additionally, solvents were previously used in maintenance activities, and it is possible that surface contamination may have occurred.

Site 14 - Debris Pile, North of Runway 10-28. Metal, wood, and other objects have been disposed along the taxiway north of Runway 10-28. No further information is available.

CHAPTER 2.0

FIELD METHODOLOGIES

2.1 SOIL GAS SAMPLING PROCEDURES

Steel soil gas probes were used to collect soil gas samples at the ten sites. The depths for sample collection were variable and were field determined based on the nature of the suspected contamination and site characteristics. After the probe was driven to the appropriate sample depth, a length of Teflon tubing was inserted into the top of the probe. The tubing was then connected to a vacuum box, and all connections were sealed. The box was used to purge atmospheric air from the probe, and then to fill a Tedlar bag with soil gas. The soil gas sample bag was connected to the analyzer and a sample extracted into the detector via the instrument's internal vacuum pump.

A MicroTip photoionization detector (PID) was originally planned for analysis of the soil gas samples. A Foxboro organic vapor analyzer (OVA) was also used for confirmation of PID results. Soil gas sample results obtained from both the PID and OVA are presented in Chapter 3.0. Both detectors were calibrated at least twice daily. The OVA measures organic vapor levels including methane and ethane, whereas the PID will not detect methane or ethane. Therefore, positive results obtained by the OVA were checked with a carbon scrubber, which filters out VOCs, but allows methane and ethane to pass through. Any OVA results obtained with the carbon scrubber in place were considered to be potentially methane, an anaerobic degradation product commonly found in soil when carbonaceous material is present, and the results were confirmed by using the PID.

2.2 SAMPLE IDENTIFICATION AND COLLECTION

Soil gas surveys were conducted at sites 1, 2, 3, 4, 5, 6, 8, 9, 10 and 14. Soil gas probes were driven by hand or with an electric rotary hammer, powered by a small, portable generator. Soil gas sample locations are shown on Figures 2-1 through 2-10 on pages 2-4 through 2-13. Sample identifications, collection dates, and depths are listed in Table 2-1 at the end of the chapter.

Soil gas surveys were performed at the following ten sites:

Site 1 - Old Wastewater Treatment Plant. Six soil gas samples were collected (Figure 2-1) around the old wastewater treatment plant at depths from 2.5 to 5 feet. The purpose of the soil gas survey at this site was to locate subsurface volatile contamination in the vicinity of the plant, if any. There were no specific suspect areas. Sample locations and depths were chosen to provide data representative of conditions around the plant. Therefore, locations were chosen to surround the plant, and variable depths were used. Soil gas sampling was not performed in areas of suspected UXO due to the danger of explosion.

Site 2 - Maintenance Facility, Building E-52. Fourteen soil gas samples were (Figure 2-2) collected around Building E-52 at various depths ranging from 2.5 to 8 feet. Sample locations were chosen in areas of soil staining, areas where volatile contamination was previously detected, and other suspect areas such as previous drum storage and above ground tank locations. Variable depths were chosen to provide representative data.

Site 3 - Two 600,000 Gallon Fuel Tanks, Building A-46A and A-46B. Thirteen soil gas samples were collected (Figure 2-3) at variable depths ranging from 4 to 6 feet around the two tanks at Buildings A-46A and A-46B to locate possible subsurface volatile fuel contamination due to leaks in the tanks or valve pits. Sample locations were chosen to surround the tanks at the bottoms of the tank mounds and to trace the abandoned pipeline which extended to the former Aviation Fuel Tank Farm area. Sample depths around the mounds were intended to be the approximate level of the tank bottoms, and samples were collected along the pipeline at the approximate depth of the pipeline.

Site 4 - Debris Pile, North End of Wallops Island. Five soil gas samples were collected (Figure 2-4) in and around the debris piles at shallow depths (1 to 2 feet). The sample locations were selected based on visible signs of potential contamination and the results of the UXO/magnetometer survey. Shallow depths were chosen due to the presence of a shallow groundwater table.

Site 5 - Paint Stain, Building X-30. Five soil gas samples were collected (Figure 2-5) at 2 foot depths in and around the area of visible staining from the spray paint booth exhaust. The purpose of the sampling was to determine whether volatile organic contamination was present in the stained area, and to roughly estimate the depth and aerial extent of contamination. Shallow depths were chosen due to the presence of surface contamination.

Site 6 - Former Island Fueling System, Building X-5 and Building X-10. Fourteen soil gas samples were collected (Figure 2-6) around Buildings X-5 and X-10 at depths ranging from 3 to 5 feet, just above groundwater. Sample locations and depths were chosen to determine whether contamination previously detected by NASA (Bunting, 1993) was migrating downward or toward the ocean.

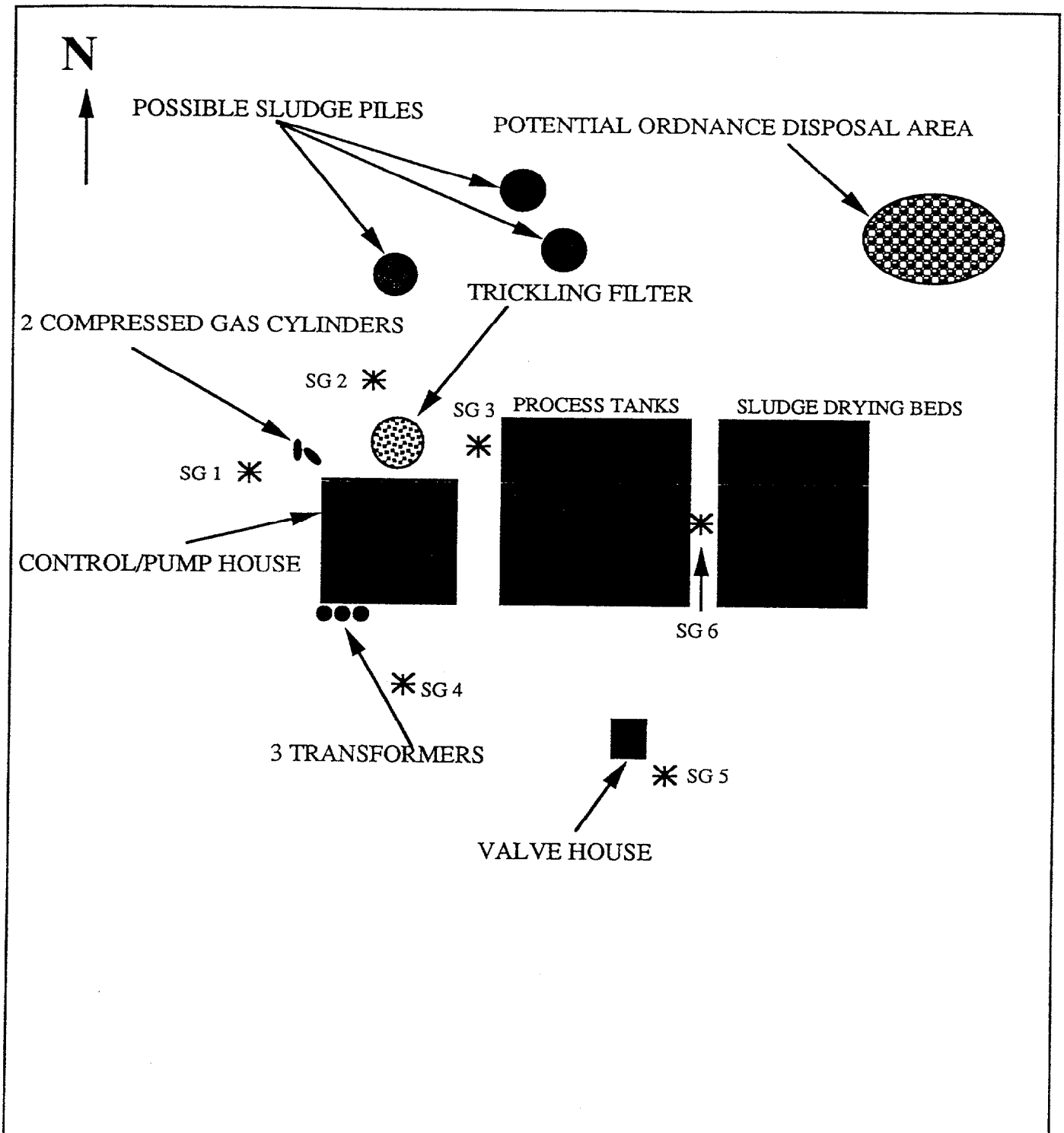
Site 8 - Former Main Base Fueling System, Building N-134. Eleven soil gas samples were collected (Figure 2-7) in the area of the previous UST fueling system at depths of 3 to 6.5 feet. The purpose of the sampling was to determine the depth and aerial extent of volatile fuel contamination in that area. Sample locations and depths were chosen based upon facility maps (NAVY, 1956) indicating where the underground storage tanks were previously located.

Site 9 - Abandoned Drum Field, Along Runway 17-35. Nineteen soil gas samples were collected (Figure 2-8) at variable depths (2 to 8 feet) in and around two abandoned drum fields. The sample locations were selected based on visible signs of potential contamination and the results of the UXO/magnetometer survey. Depths were chosen based on the presence of shallow groundwater, or the estimated depths of buried drums and debris.

Site 10. - ADAS, Building N-168. Eight soil gas samples were collected (Figure 2-9) at shallow depths (1 to 2 feet) around the ADAS facility. Three areas around the facility are currently or were formerly used as drum staging areas. Two samples were collected in each of these areas to determine whether solvent or other volatile organic contamination is present in any of these areas. In addition, oil staining is present near the heat exchange unit and around the base of the ADAS tower. One sample was collected in the heat exchange area and one sample was collected near a drain hole at the base of the ADAS tower to determine whether solvent or petroleum related volatile organic contamination is present at these areas.

Shallow depths were chosen to determine whether volatile contamination was present below the visible surface staining.

Site 14 - Debris Pile, North of Runway 10-28. Ten soil gas samples were collected (Figure 2-10) at variable depths from 1.5 to 8 feet around the debris piles to determine whether VOCs were migrating away from sources within the piles. The sample locations were selected based on visible signs of potential contamination (i.e. drums, cans, etc.) and the results of the UXO/magnetometer survey. Depths were chosen based on the presence of shallow groundwater, or the estimated depths of buried drums and debris.



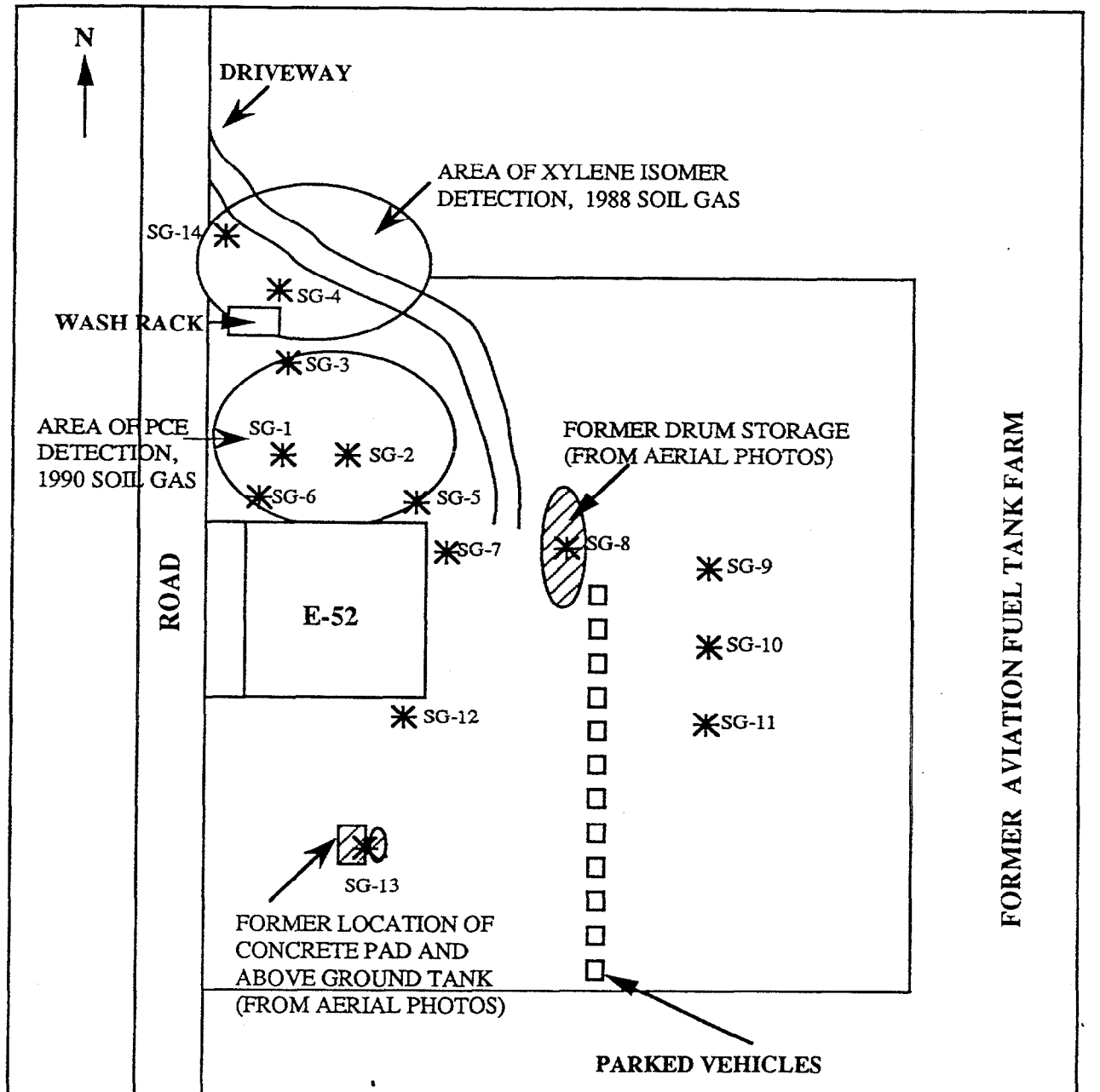
✳ SOIL GAS SAMPLE LOCATION

APPROX. SCALE - 1 " = 100'

Metcalf & Eddy

FIGURE 2-1
SOIL GAS SAMPLE LOCATIONS

SITE 1 - OLD WASTEWATER TREATMENT PLANT



Metcalf & Eddy

FIGURE 2-2 SITE 2 - MAINTENANCE FACILITY, BUILDING E-52 SOIL GAS SAMPLE LOCATIONS

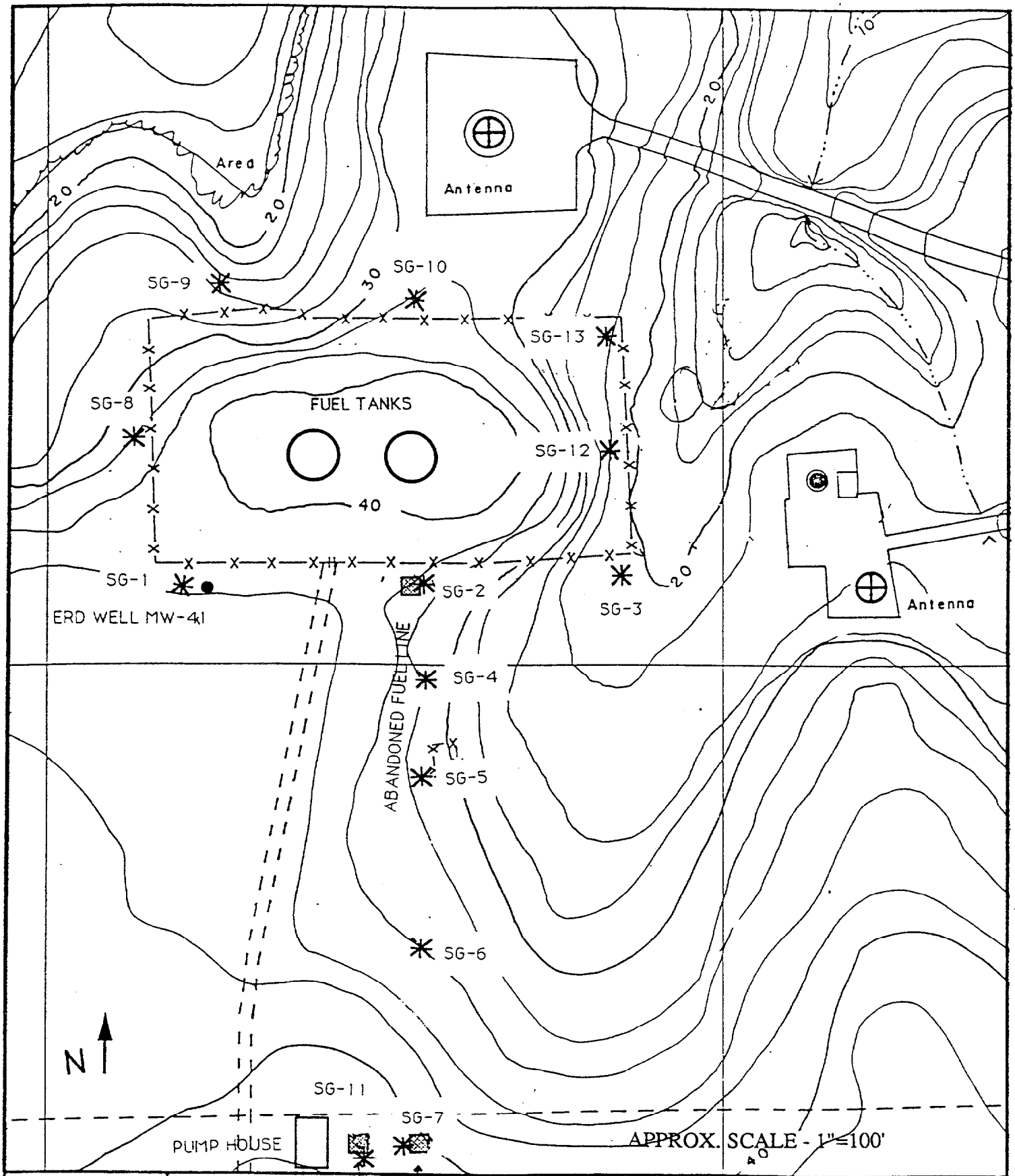
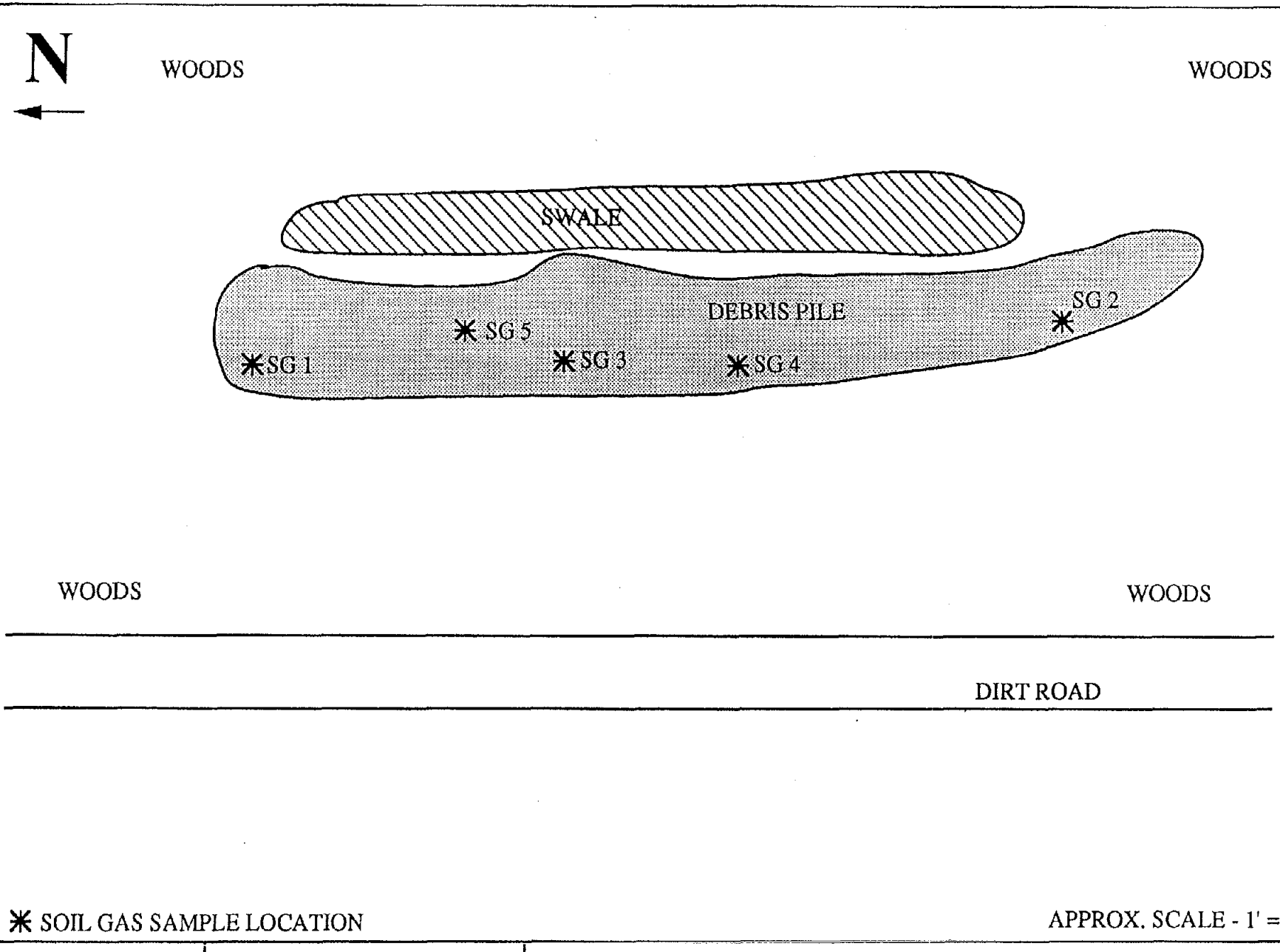


FIGURE 2-3
SOIL GAS SAMPLE LOCATIONS

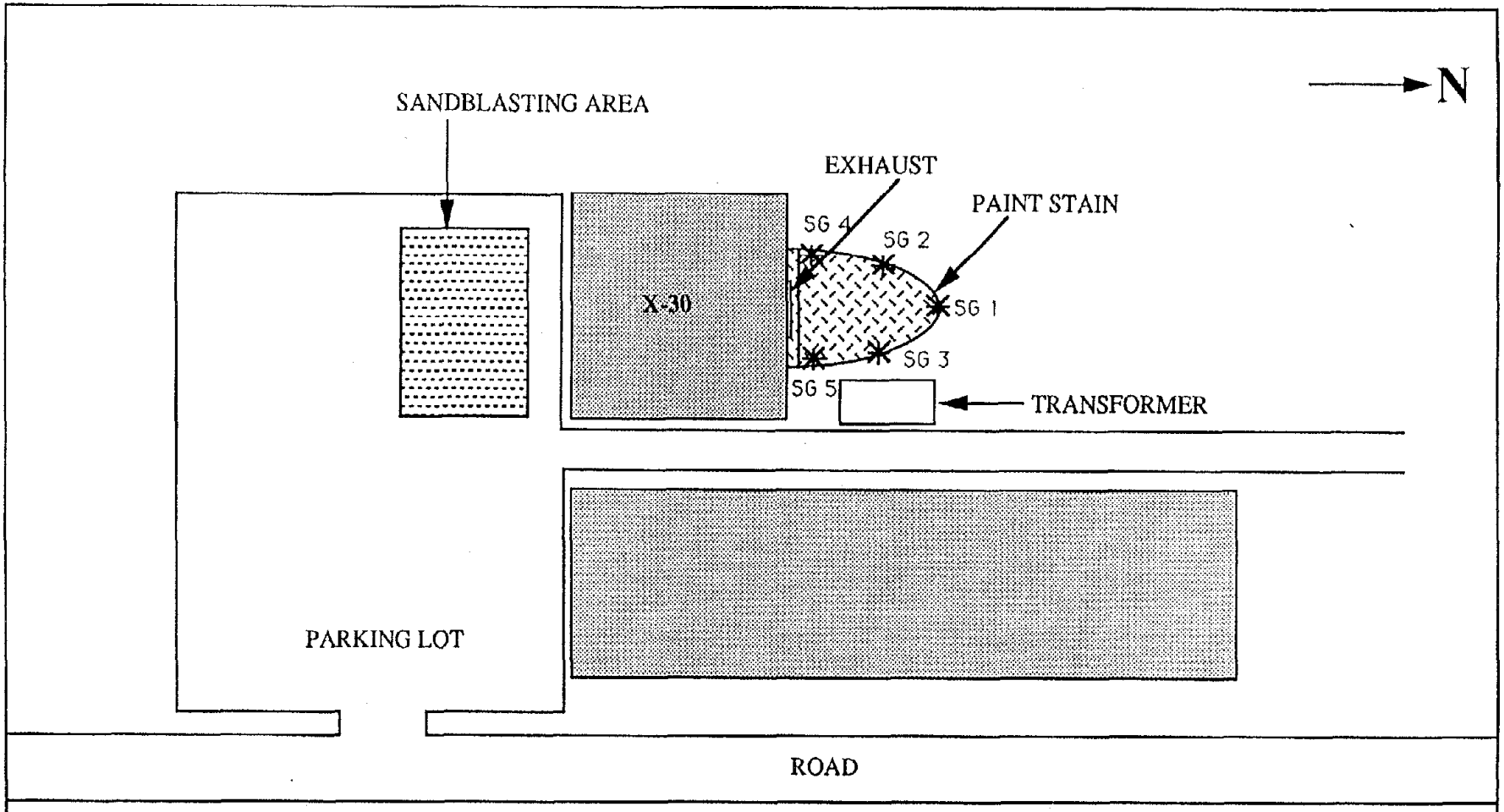
SITE 3 - TWO 600,000 GALLON FUEL TANKS, BUILDINGS A-46A AND A-46B

SOURCE: Stephen A. Estrin, Inc., 1977

✳ SOIL GAS SAMPLE LOCATION



Metcalf & Eddy	**FIGURE 2-4** **SOIL GAS SAMPLE LOCATIONS**	**SITE 4 - DEBRIS PILE, NORTH END OF WALLOPS ISLAND**



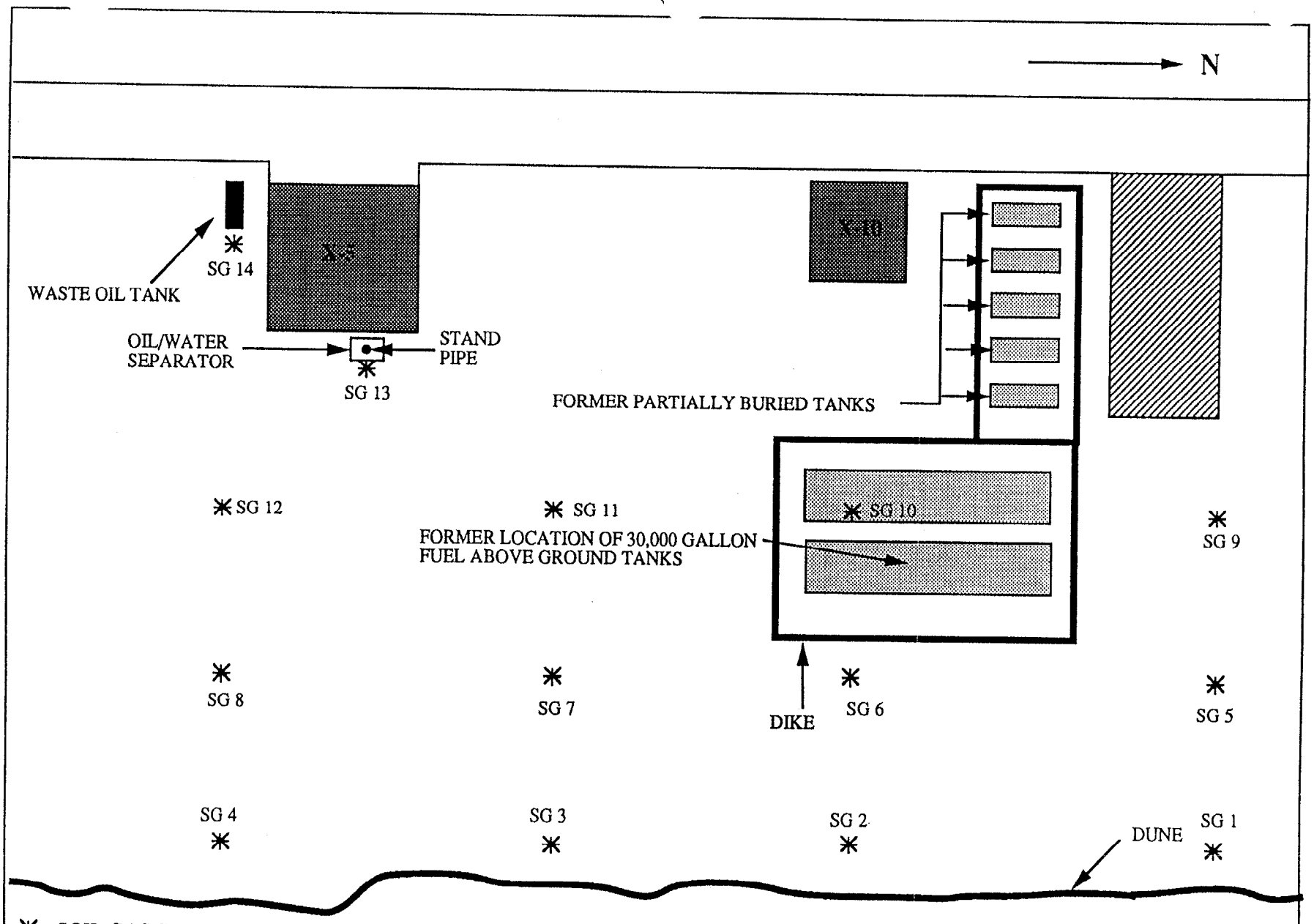
* SOIL GAS SAMPLE LOCATION

APPROX. SCALE - 1"=20'

Metcalf & Eddy

FIGURE 2-5
SOIL GAS SAMPLE LOCATIONS

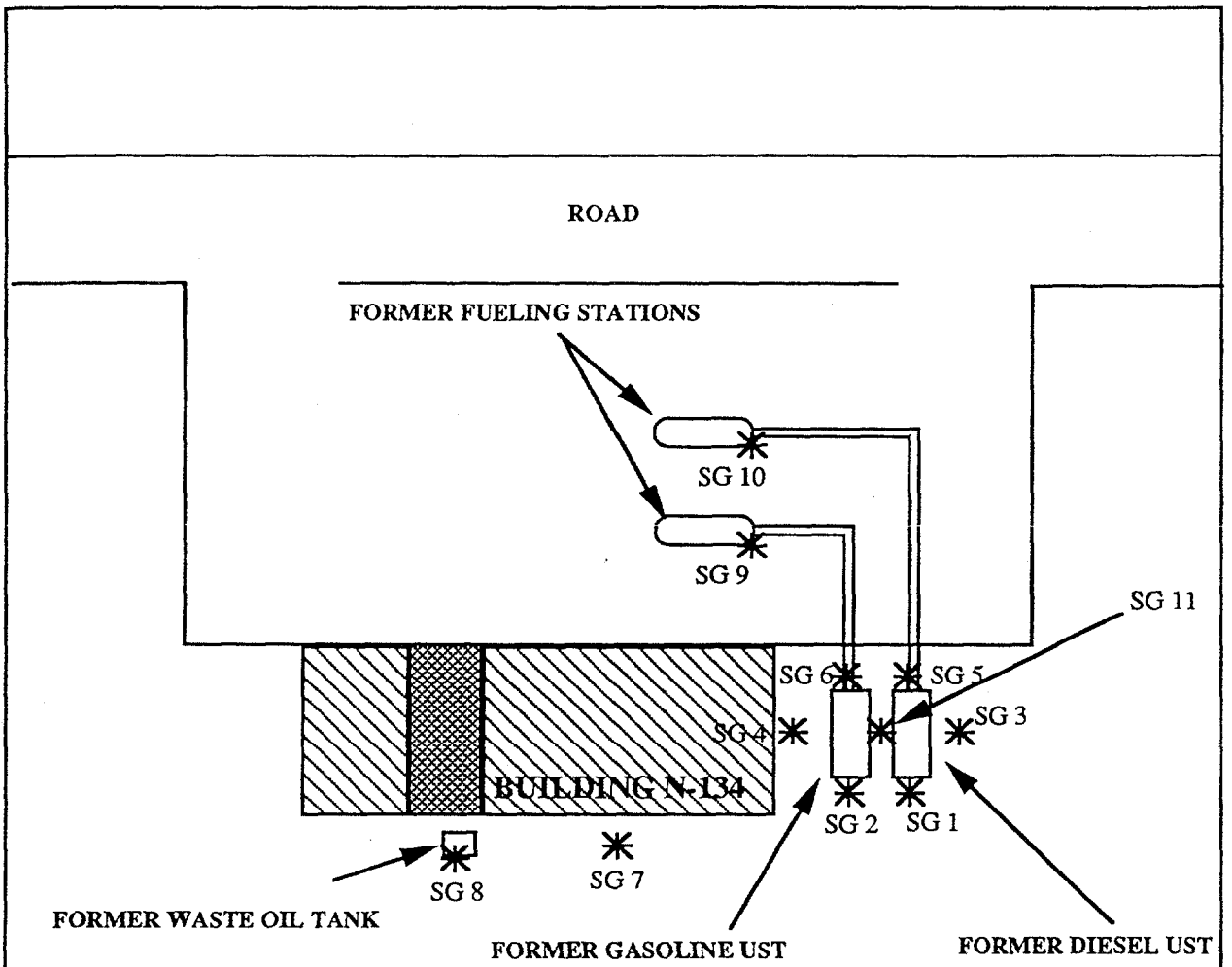
SITE 5 - PAINT STAIN, BUILDING X-30
SOURCE: GSFC Facilities Master Plan, Volume 3, June 1988



Metcalf & Eddy

FIGURE 2-6
SOIL GAS SAMPLE LOCATIONS

SITE 6 - FORMER ISLAND FUELING SYSTEM, BUILDINGS X-5 AND X-10



✳ SOIL GAS SAMPLE LOCATION

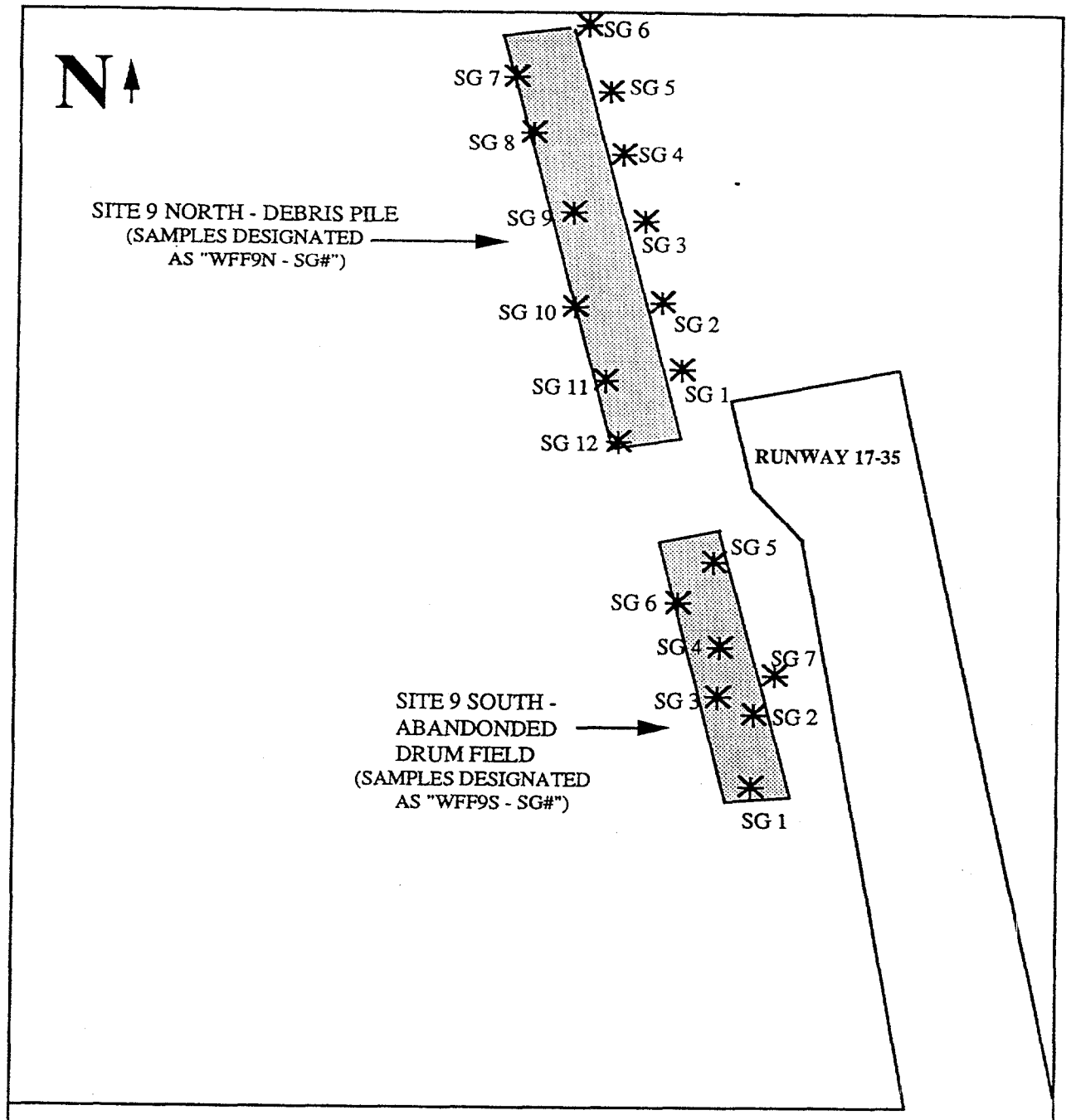
N

APPROX. SCALE - 1"=50'

Metcalf & Eddy

FIGURE 2-7
SOIL GAS SAMPLE LOCATIONS

SITE 8 - FORMER MAIN BASE FUELING SYSTEM, BUILDING N-134



✳ SOIL GAS SAMPLE LOCATION

APPROX. SCALE - 1"=120'

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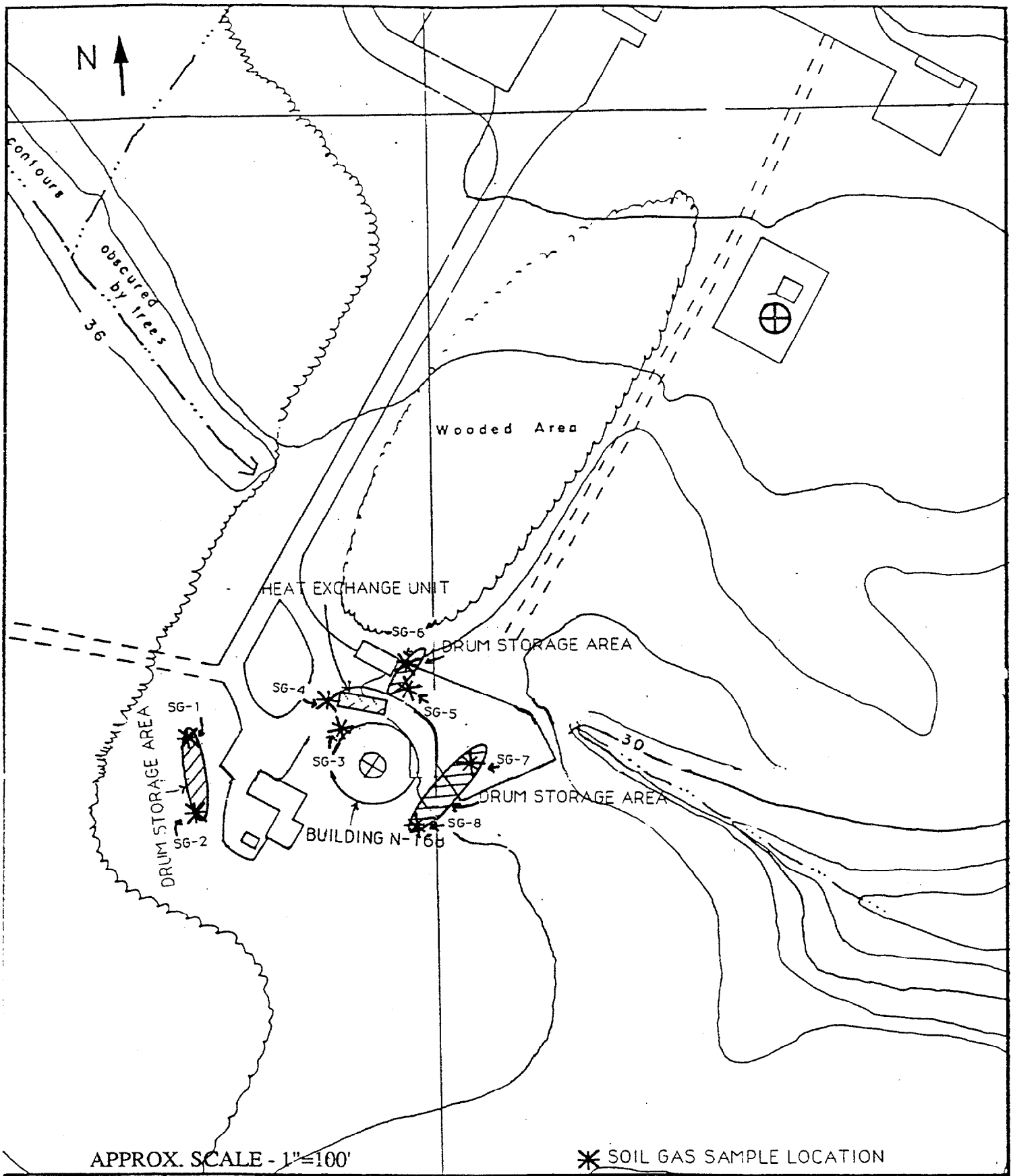
FIGURE 2-8
SOIL GAS SAMPLE LOCATIONS

SITE 9 - ABANDONED DRUM FIELD, ALONG RUNWAY 17-35

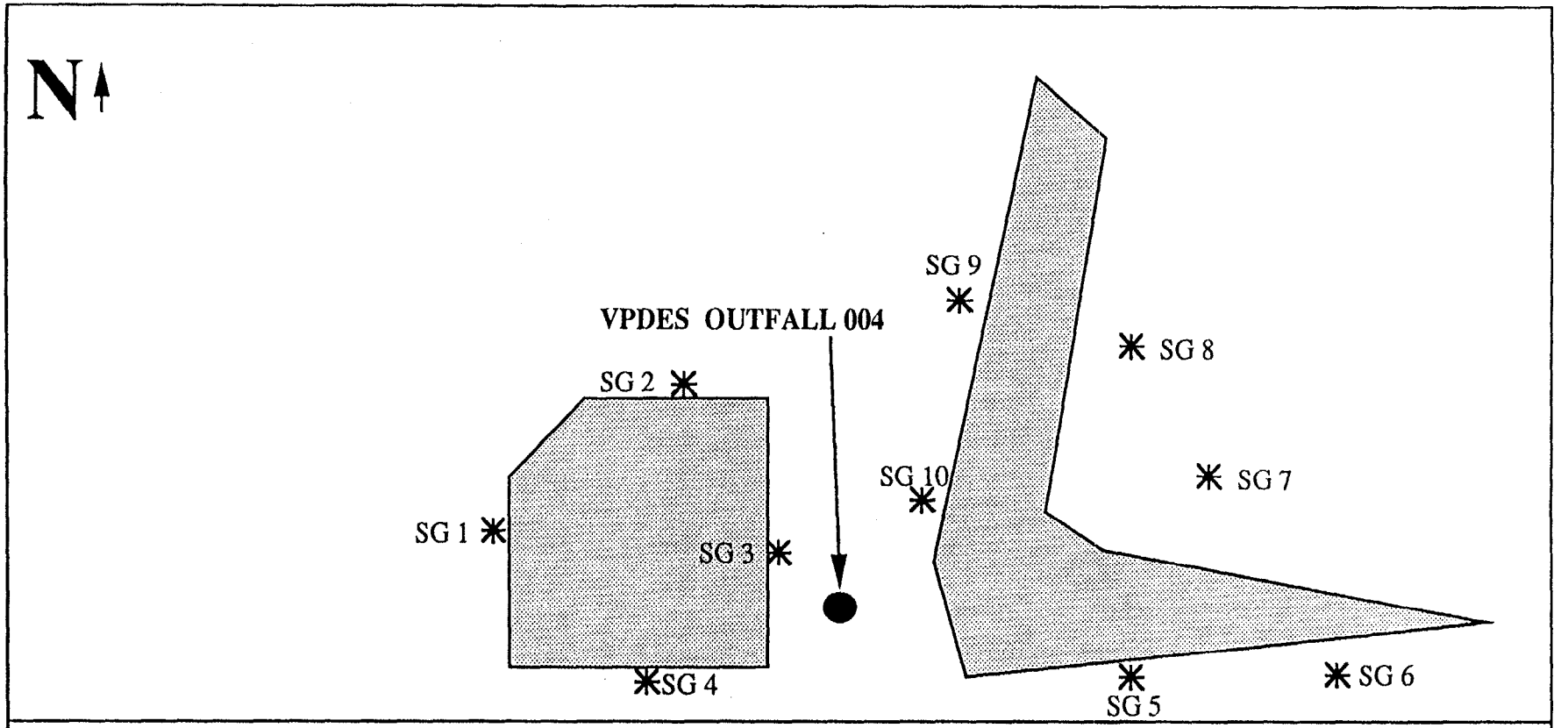


Metcalf & Eddy

FIGURE 2-9
SOIL GAS SAMPLE LOCATIONS

SITE 10 - ADAS, BUILDING N-168

SOURCE: Stephen A. Estrin, Inc., 1977



Metcalf & Eddy	**FIGURE 2-10** **SOIL GAS SAMPLE LOCATIONS**	**SITE 14 - DEBRIS PILE, NORTH OF RUNWAY 10-28**

TABLE 2-1 SOIL GAS SAMPLE IDENTIFICATION

SAMPLE ID	DATE COLLECTED	DEPTH (FT)
Site 1 - Old Wastewater Treatment Plant		
WFF1-SG1	3/11/93	5
WFF1-SG2	3/11/93	3
WFF1-SG3	3/11/93	5
WFF1-SG4	3/11/93	4
WFF1-SG5	3/11/93	2.5
WFF1-SG6	3/11/93	5
Site 2 - Building E-52		
WFF2-SG1	3/22/93	4
WFF2-SG2	3/22/93	4
WFF2-SG3	3/22/93	5
WFF2-SG4	3/22/93	6
WFF2-SG5	3/22/93	8
WFF2-SG6	3/22/93	2
WFF2-SG7	3/22/93	2.5
WFF2-SG8	3/22/93	4
WFF2-SG9	3/22/93	8
WFF2-SG10	3/22/93	8
WFF2-SG11	3/22/93	8
WFF2-SG12	3/22/93	2.5
WFF2-SG13	3/22/93	7
WFF2-SG14	3/22/93	7

TABLE 2-1 SOIL GAS SAMPLE IDENTIFICATION (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)
Site 3 - Buildings A-46A and A-46B		
WFF3-SG1	3/20/93	6
WFF3-SG2	3/20/93	5
WFF3-SG3	3/20/93	6
WFF3-SG4	3/20/93	5
WFF3-SG5	3/20/93	6
WFF3-SG6	3/20/93	5
WFF3-SG7	3/20/93	6
WFF3-SG8	3/21/93	4
WFF3-SG9	3/21/93	5
WFF3-SG10	3/21/93	4
WFF3-SG11	3/21/93	4
WFF3-SG12	3/22/93	4
WFF3-SG13	3/22/93	5
Site 4 - Wallops Island Debris Pile		
WFF4-SG1	3/11/93	2
WFF4-SG2	3/11/93	1.5
WFF4-SG3	3/11/93	1
WFF4-SG4	3/11/93	1.5
WFF4-SG5	3/11/93	2
Site 5 - Paint Stain, Building X-30		
WFF5-SG1	3/9/932	2

TABLE 2-1 SOIL GAS SAMPLE IDENTIFICATION (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)
Site 5 - Continued		
WFF5-SG2	3/9/93	2
WFF5-SG3	3/9/93	2
WFF5-SG4	3/9/93	2
WFF5-SG5	3/9/93	2
Site 6 - Former Wallops Island Fueling System		
WFF6-SG1	3/19/93	3
WFF6-SG2	3/19/93	3
WFF6-SG3	3/19/93	3
WFF6-SG4	3/19/93	3
WFF6-SG5	3/19/93	4
WFF6-SG6	3/19/93	4
WFF6-SG7	3/19/93	4
WFF6-SG8	3/19/93	4
WFF6-SG9	3/19/93	5
WFF6-SG10	3/19/93	5
WFF6-SG11	3/19/93	4
WFF6-SG12	3/19/93	4
WFF6-SG13	3/19/93	4
WFF6-SG14	3/19/93	4
Site 8 - Former Main Base Fueling System		
WFF8-SG1	3/17/93	5

TABLE 2-1 SOIL GAS SAMPLE IDENTIFICATION (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)
Site 8 - Continued		
WFF8-SG2	3/17/93	5
WFF8-SG3	3/17/93	5
WFF8-SG4	3/18/93	3
WFF8-SG5	3/17/93	5
WFF8-SG6	3/18/93	5
WFF8-SG7	3/18/93	3.5
WFF8-SG8	3/18/93	3
WFF8-SG9	3/20/93	5
WFF8-SG10	3/20/93	5
WFF8-SG11	3/20/93	6.5
Site 9N - Abandoned Drum Field/Debris Pile, North Section		
WFF9N-SG1	3/16/93	8
WFF9N-SG2	3/16/93	5
WFF9N-SG3	3/16/93	5
WFF9N-SG4	3/16/93	8
WFF9N-SG5	3/16/93	5
WFF9N-SG6	3/16/93	2.5
WFF9N-SG7	3/16.93	2.5
WFF9N-SG8	3/16/93	2
WFF9N-SG9	3/16/93	1.5

TABLE 2-1 SOIL GAS SAMPLE IDENTIFICATION (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)
Site 9N - Continued		
WFF9N-SG10	3/16/93	2.5
WFF9N-SG11	3/16/93	2
WFF9N-SG12	3/16/93	2
Site 9S - Abandoned Drum Field, South Section		
WFF9S-SG1	3/21/93	2.5
WFF9S-SG2	3/21/93	2.5
WFF9S-SG3	3/21/93	2.5
WFF9S-SG4	3/21/93	2.5
WFF9S-SG5	3/21/93	2.5
WFF9S-SG6	3/21/93	2.5
WFF9S-SG7	3/21/93	4
Site 10 - ADAS, Building 168		
WFF10-SG1	3/18/93	2
WFF10-SG2	3/18/93	1.5
WFF10-SG3	3/18/93	2
WFF10-SG4	3/18/93	2
WFF10-SG5	3/18/93	2
WFF10-SG6	3/18/93	2
WFF10-SG7	3/18/93	1
WFF10-SG8	3/18/93	1

TABLE 2-1 SOIL GAS SAMPLE IDENTIFICATION (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)
Site 14 - Debris Pile North of Runway 10-28		
WFF14-SG1	3/9/93	3.5
WFF14-SG2	3/9/93	2.5
WFF14-SG3	3/17/93	2
WFF14-SG4	3/17/93	8
WFF14-SG5	3/17/93	5
WFF14-SG6	3/17/93	5
WFF14-SG7	3/17/93	8
WFF14-SG8	3/17/93	1.5
WFF14-SG9	3/17/93	1.5
WFF14-SG10	3/17/93	1.5

CHAPTER 3.0

SOIL GAS SURVEY RESULTS AND CONCLUSIONS

Soil gas samples were analyzed with both photoionization (PID) and flame ionization (OVA) detectors. Analytical results for each site are presented in Table 3-1 at the end of the chapter. PID and OVA detector responses may differ for some compounds due to differences in the instruments' relative response factors for various compounds. In addition, the detectors perform differently under different environmental conditions (i.e., cold temperatures and moisture). For example, the PID may give a false positive result if a sample has a high moisture content, but this data will not be confirmed by the OVA. Therefore, some variation is seen in the data from the two instruments. However, qualitative conclusions can be drawn from the comparison of the two data sets.

Site 1 - Old Wastewater Treatment Plant. Positive PID readings of 7 ppm and 200 ppm were obtained from samples WFF1-SG1 and WFF1-SG6, respectively (Figure 3-1). WFF1-SG1 was collected to the west of the control house, near a subsurface contact identified by the magnetometer survey. WFF1-SG6 was collected between the process tanks and the sludge beds. The OVA detected no VOCs in either of these samples. This discrepancy is most likely explained by the presence of moisture in the samples. This could be confirmed by collecting soil samples at those locations.

The OVA had a detection greater than the instrument's maximum detection limit (i.e., > 1,000 ppm) from sample WFF1-SG3. This positive response was checked with a carbon scrubber, described in Chapter 2.0. The same value was obtained with the scrubber, therefore it is assumed that WFF1-SG3 contained greater than 1000 ppm of methane, which is a common anaerobic degradation product. This result could be indicative of buried debris and/or wastewater sludge at that location or nearby. WFF1-SG2 is located north/northwest of the trickling filter.

Site 2 - Building E-52. Detector readings of < 10 ppm (Figure 3-2 and Table 3-1) were obtained at various locations around Building E-52 (WFF2-SG1, WFF2-SG2, WFF2-SG4, WFF2-SG6, WFF2-SG7, WFF2-SG9, and WFF2-SG12-14). Sample results are both illustrated on Figure 3-2 and presented in Table 3-1. A strong odor was detected in WFF2-SG13, and soil staining was noted at approximately 6-8 feet. The PID detected 0.5 ppm, and the OVA detected 1.0 ppm for this sample. This sample was collected in the approximate location of a former above ground storage tank noted in aerial photographs from the 1960's. The strong odor and low-level detection indicate that this contamination may be a heavy petroleum product such as diesel fuel.

Methane was detected in samples WFF2-SG1 (3.2 ppm), WFF2-SG2 (> 1000 ppm), WFF2-SG5 (0.6 ppm) and WFF2-SG14 (1.0 ppm). This may be indicative of degradation of some type of subsurface carbonaceous material. The low level detections obtained in areas of soil staining (WFF2-SG6, WFF2-SG7, and WFF2-SG12) indicate that this staining may be due to a nonvolatile substance, or that the VOCs have volatilized.

Site 3 - Two 600,000 Gallon Fuel Tanks, Buildings A-46A and A-46B. Detector readings of < 5 ppm (Figure 3-3 and Table 3-1) were obtained in eleven of the thirteen samples

collected around these tanks and associated pipelines. The OVA detected 37.4 ppm in sample WFF3-SG1, which is located near monitoring well MW-41. This result, combined with a previous petroleum detection in the monitoring well, indicates that a leak may be occurring from the tanks or associated piping in this area.

Methane (< 2 ppm) was detected in samples WFF3-SG1, WFF3-SG3, WFF3-SG8, and WFF3-SG10. Low levels of petroleum contamination throughout the area (as indicated in eleven of the thirteen samples) may be contributing to subsurface levels of methane, which is released during anaerobic decomposition of carbonaceous compounds. If this is the case, the heavier-end petroleum hydrocarbons may be present in the subsurface in higher levels than the light end VOCs measured by soil gas.

Site 4 - Debris Pile, North End of Wallops Island. The PID detected 6.7 ppm in WFF4-SG1 and the OVA detected 1 ppm in that sample. These data (Figure 3-4 and Table 3-1) indicate that low-level VOC contamination may be present in the vicinity of this sample. Samples WFF4-SG2 and WFF4-SG5 contained 37.5 and 1.3 ppm, respectively, as analyzed by the PID, but the OVA did not detect VOCs in those samples. Therefore, the PID detections in those samples may have been moisture-related. The OVA detected 1 ppm of methane in WFF2-SG2. This may be indicative of degradation of a carbonaceous material.

Site 5 - Paint Stain, Building X-30. No volatile organics were detected at Site 5 (Table 3-1). No figure is presented in this Chapter for this Site, but sample locations are illustrated on Figure 2-5.

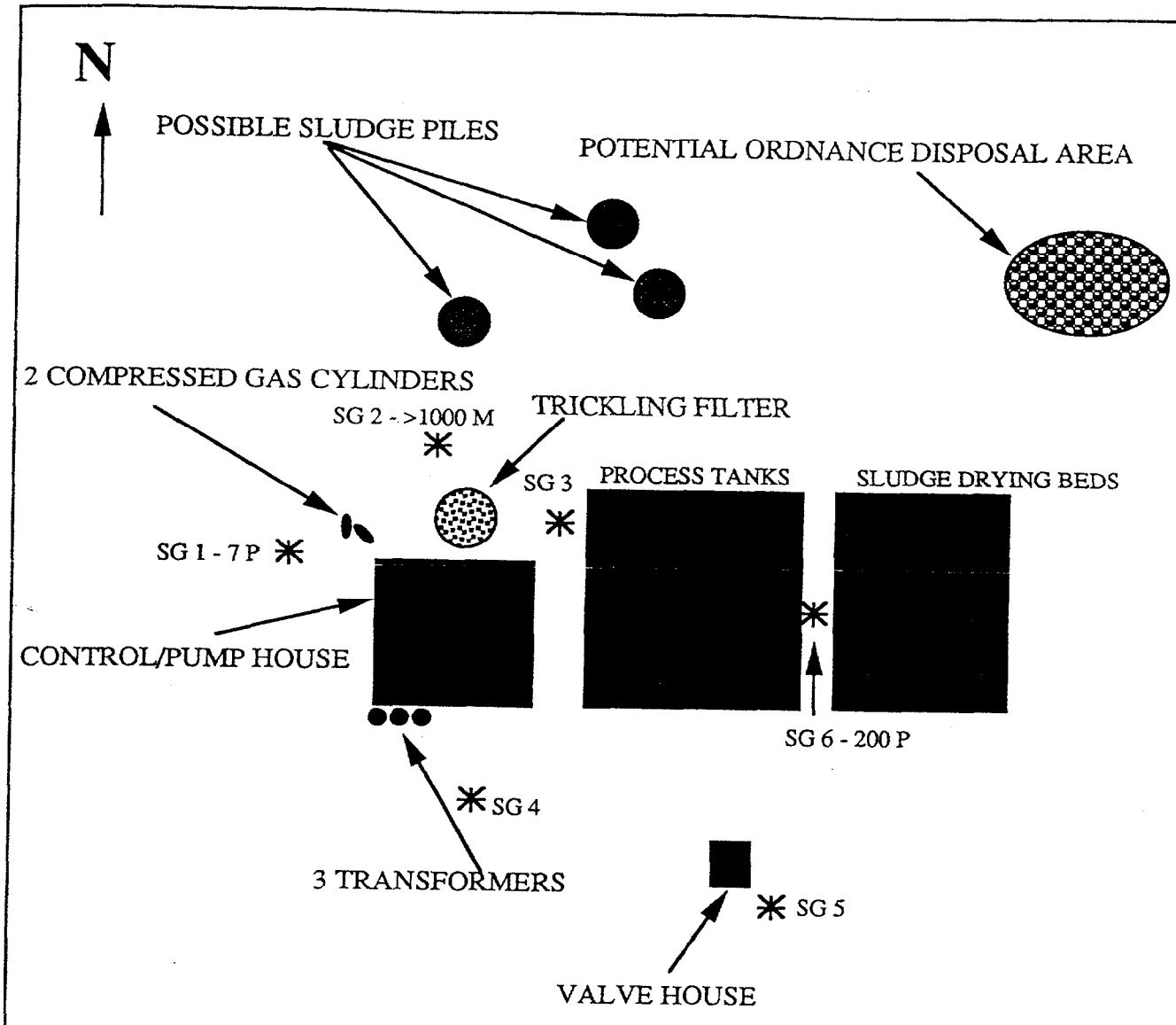
Site 6 - Former Wallops Island Fueling Station. Detections of < 1 ppm were obtained detected by the PID in samples WFF5-SG11 through WFF6-SG14 (Figure 3-5 and Table 3-1). Positive detections were not obtained near the former tank locations, or toward the dunes (i.e., sample locations WFF6-SG1 through WFF6-SG10). Therefore, it appears that VOCs may not be present in these areas. This can be confirmed by soil sample collection. The OVA detected a methane level of 4.0 ppm in WFF6-SG3, and detected methane levels of < 1 ppm in WFF5-SG7, WFF6-SG10, WFF-SG11, and WFF-SG12. These data indicate that partially-degraded petroleum contamination may be present in these areas. Heavier-end petroleum components may be more prevalent than the light volatile organics detectable by soil gas due to the age of the contamination.

Site 8 - Former Main Base Fueling Station. Contamination was detected (Figure 3-6 and Table 3-1) by the PID in all eleven of the samples collected at Site 8. The lowest response was 0.2 ppm (WFF8-SG7), and the highest was 45.7 ppm (WFF8-SG9). The OVA detected 90 ppm in WFF8-SG9, in addition to 110 ppm of methane. Historical records show that this location (WFF8-SG9) was formerly a gasoline pump. Petroleum odors were noted in both WFF8-SG9 and WFF8-SG10. PID and OVA results for WFF8-SG10 were 3.5 and 3.8 ppm, respectively. Historical records show that this location (WFF8-SG10) was formerly a diesel pump. The magnetometer survey in this area indicated that the pipelines from these islands to the former tanks have not been removed. The data indicate that gasoline and diesel lines have leaked near the fueling islands, and that petroleum contamination is present at the depths sampled in the former tank area which was previously excavated.

Site 9 - Abandoned Drum Field, Along Runway 17-35. There are two distinct areas containing abandoned drums along Runway 17-35 (Figure 3-7 and Table 3-1). An area containing concrete-filled drums and other debris is located in the northern part of the site, and is designated as Site 9 North, Debris Pile. Another area containing empty drums is located in the northern part of the site and is designated as Site 9 South, Abandoned Drum Field. The only positive detection in Site 9 South was 0.2 ppm in WFF9S-SG2 as measured by the OVA. This sample was located near a mound of partially-buried drums. A number of positive detections were obtained at Site 9 North with both detectors. These readings ranged from 0.5 to 46 ppm. The highest readings were obtained in a flat grassy area along the runway. Other lower readings were found scattered throughout the area. The positive results may be due to volatile organic contamination from drum contents.

Site 10 - ADAS, Building N-168. Contamination was detected in all eight samples collected at this site (Figure 3-8 and Table 3-1). Samples were collected at shallow depths due to the possible presence of surface contamination. Detections of <2 ppm were found with the PID in the former drum storage area located to the west of ADAS, and in the oil-stained areas near the heat exchanger. Significant levels of VOCs (7 to 57.5 ppm) were detected by both detectors in the drum storage area to the north of ADAS. Levels ranging from ND to 19.5 ppm were detected by both detectors in the drum storage area located to the southeast of ADAS. Methane (1.0 to 69 ppm) was detected in samples WFF10-SG3 through WFF10-SG6. This could be indicative of subsurface degradation of heavy semi-volatile contaminants, such as compounds present in hydraulic oil.

Site 14 - Debris Pile, North of Runway 10-28. Detections of <3 ppm were obtained with the PID in seven of the ten samples collected (Figure 3-9 and Table 3-1). Significant contamination was detected in samples WFF14-SG3 (35-40.8 ppm) and WFF14-SG9 (30-88.9 ppm). This indicates that sources of VOC contamination may be present at this site.

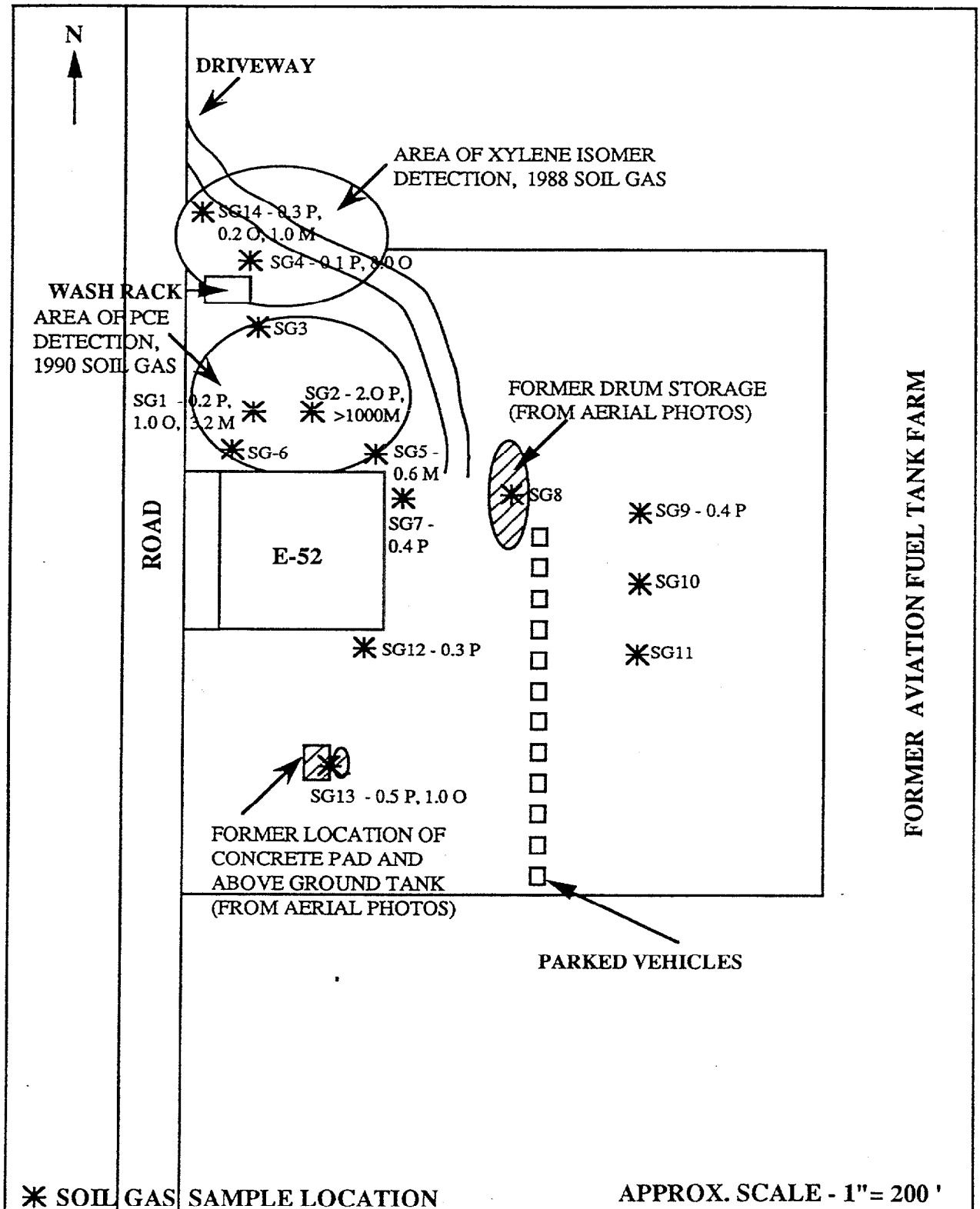


LEGEND:
P = PID VOC (ppm)
O = OVA VOC (ppm)
M = METHANE (ppm)

✳ SOIL GAS SAMPLE LOCATION

APPROX. SCALE - 1"=100'

Metcalf & Eddy	**FIGURE 3-1** **POSITIVE SOIL GAS RESULTS**	**SITE 1 - OLD WASTEWATER TREATMENT PLANT**



Metcalf & Eddy

FIGURE 3-2 | SITE 2 - MAINTENANCE FACILITY, BUILDING E-52 SOIL GAS SURVEY RESULTS

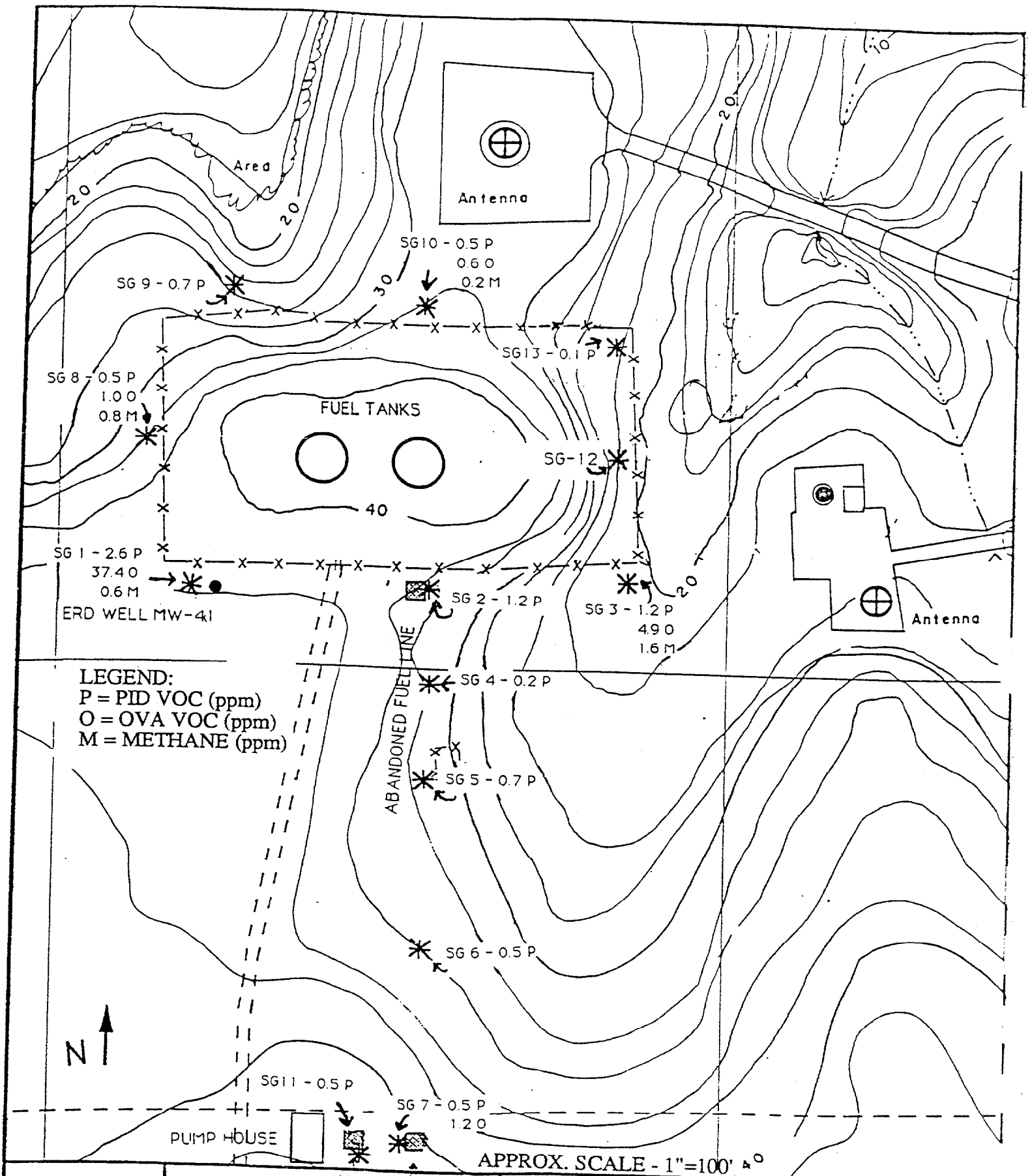
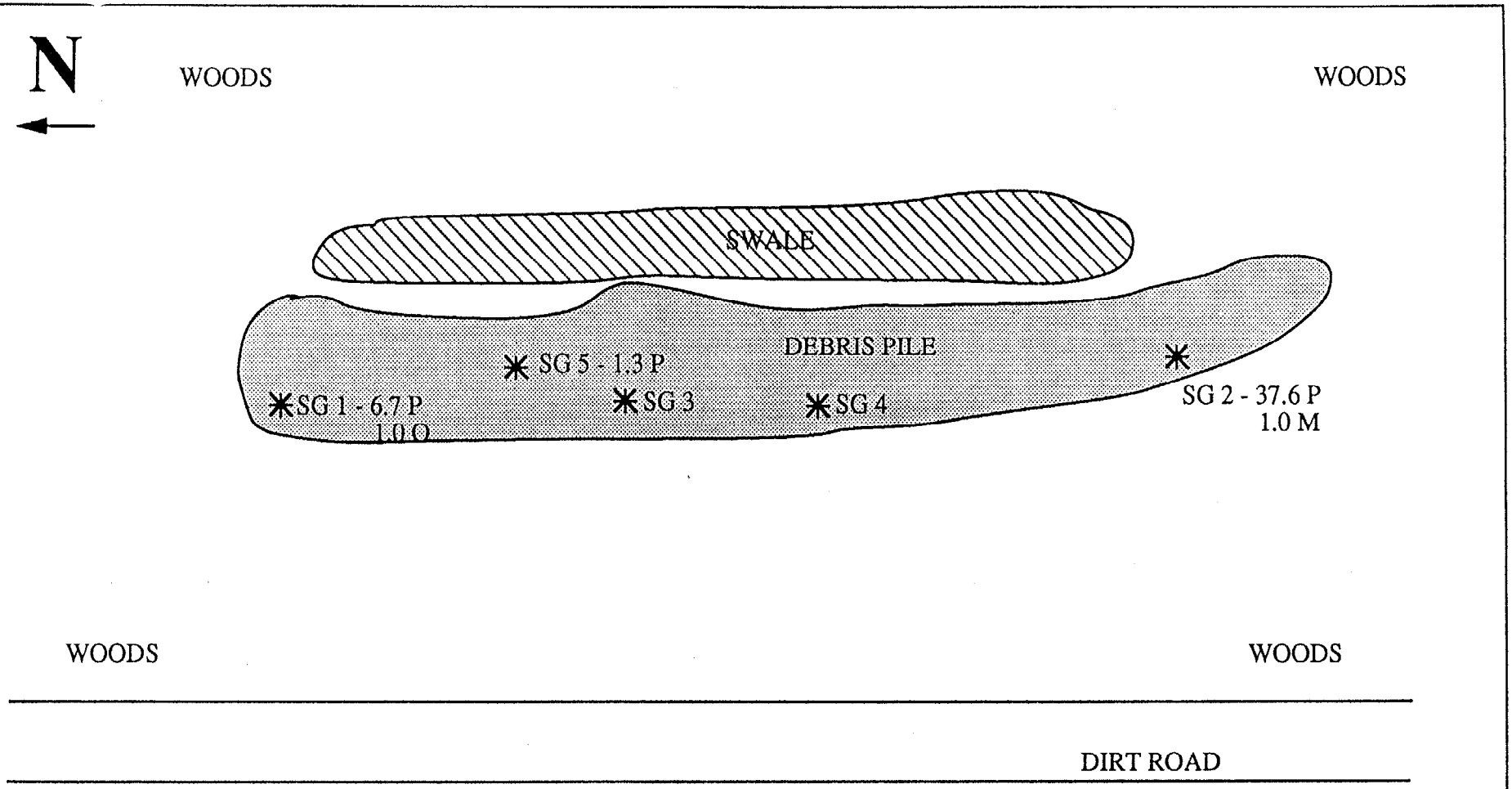


FIGURE 3-3
POSITIVE SOIL GAS RESULTS

SITE 3 - TWO 600,000 GALLON FUEL TANKS, BUILDINGS A-46A AND A-46B

SOURCE: Stephen A. Estrin, Inc., 1977

✳ SOIL GAS SAMPLE LOCATION



Metcalf & Eddy	**FIGURE 3-4** **POSITIVE SOIL GAS RESULTS**	**SITE 4 - DEBRIS PILE, NORTH END OF WALLOPS ISLAND**

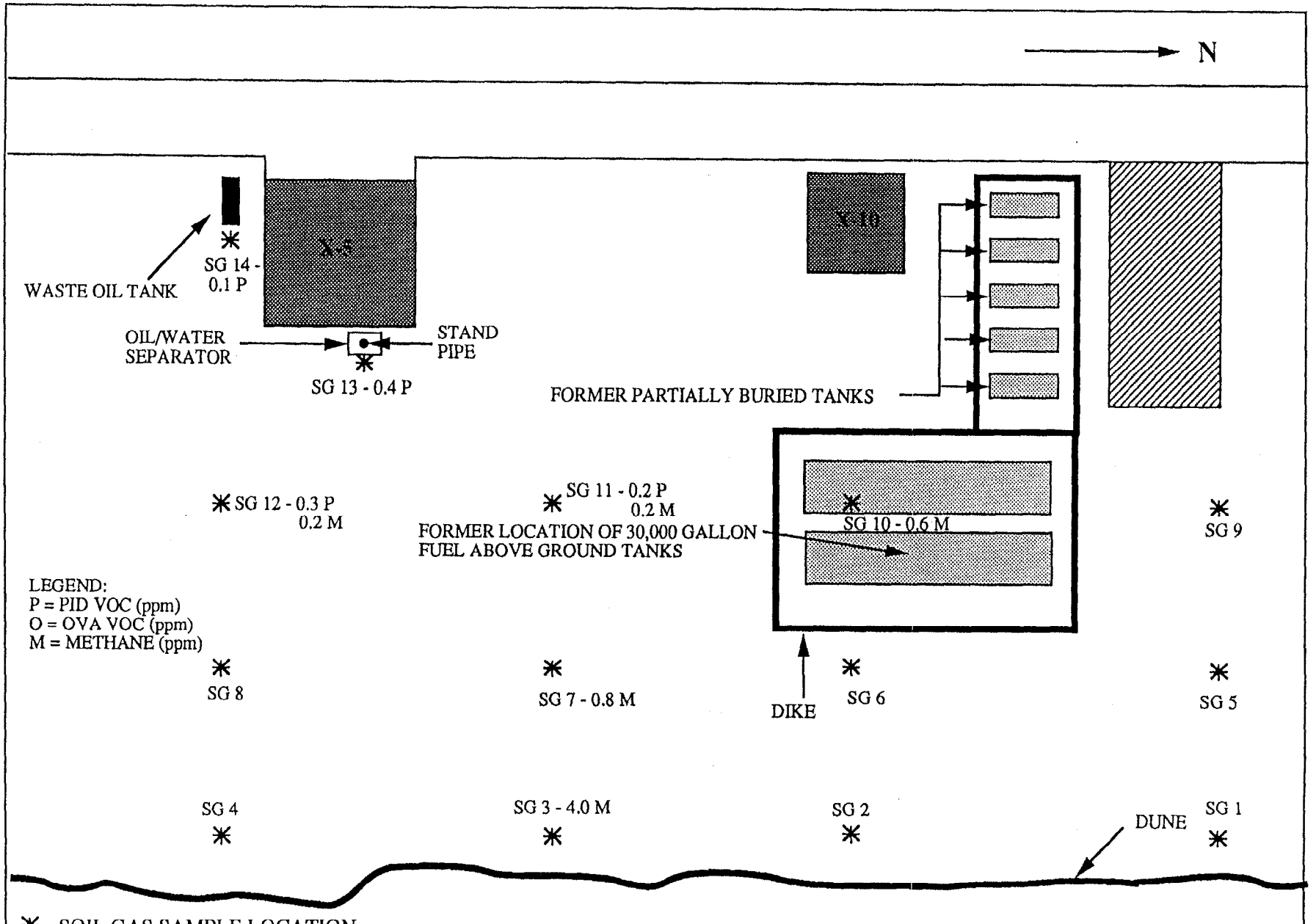


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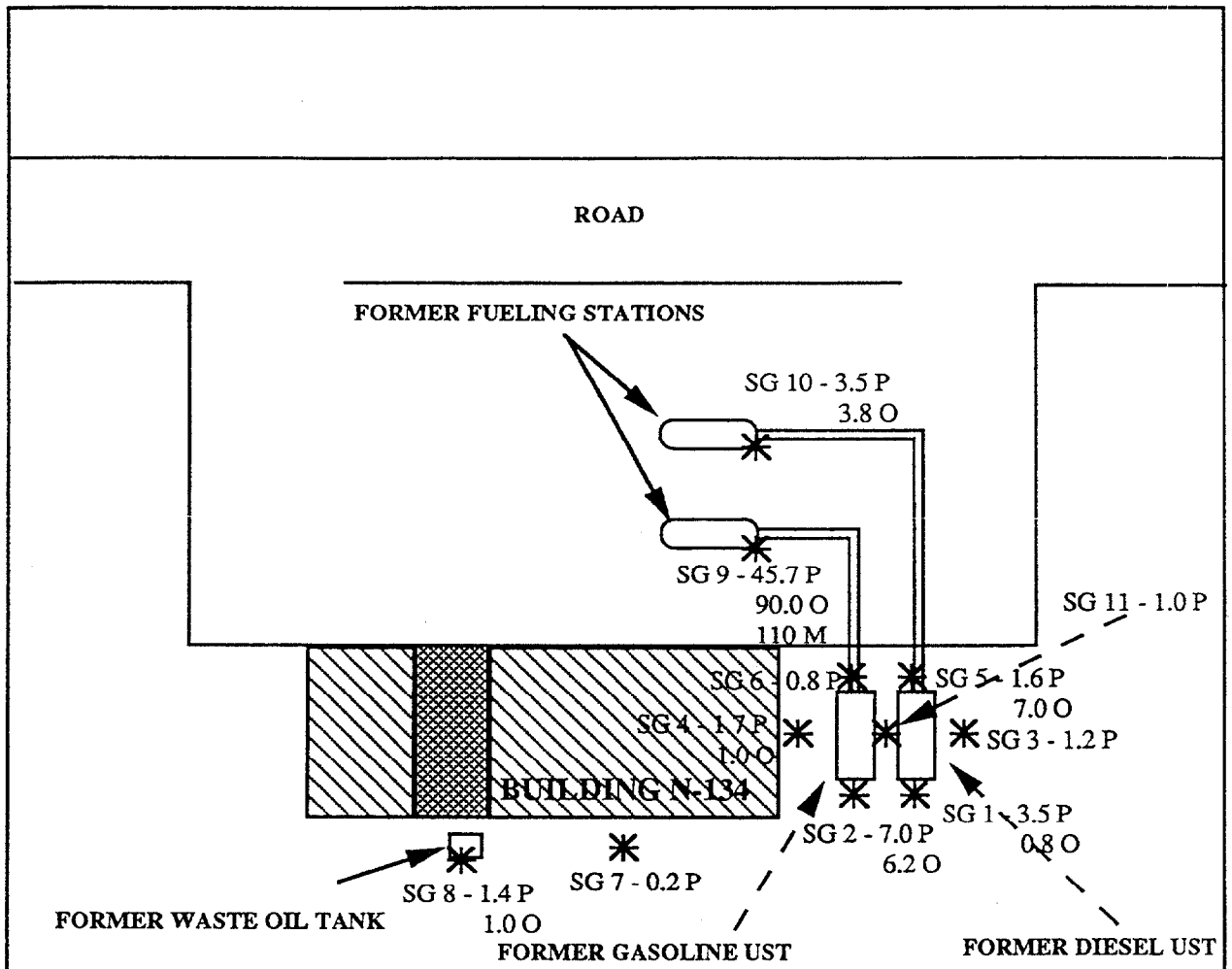
FIGURE 3-5
POSITIVE SOIL GAS RESULTS

SITE 6 - FORMER ISLAND FUELING SYSTEM, BUILDINGS X-5 AND X-10



LEGEND:
P = PID VOC (ppm)
O = OVA VOC (ppm)
M = METHANE (ppm)

✳ SOIL GAS SAMPLE LOCATION

N

APPROX. SCALE - 1"=50'

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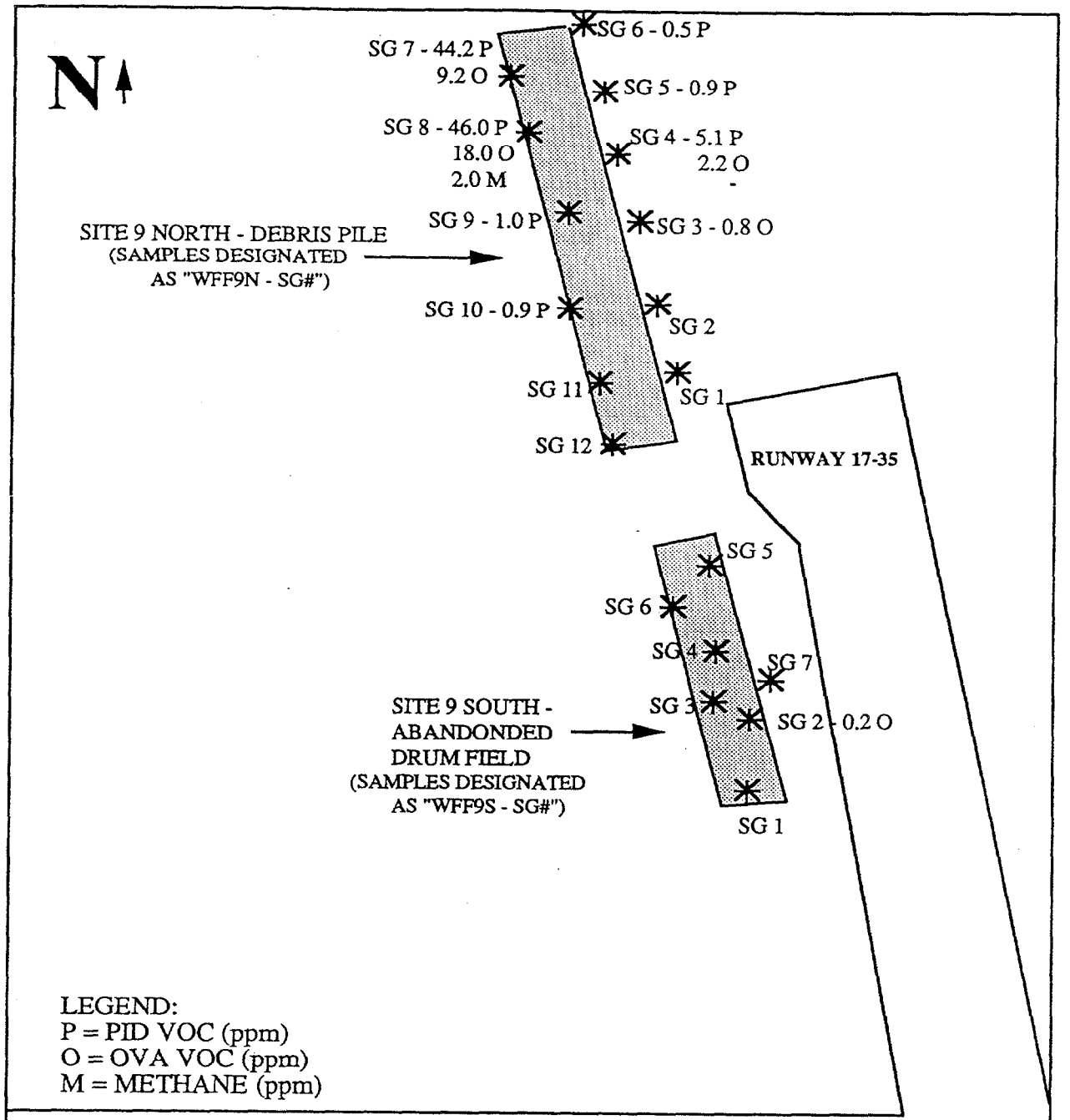
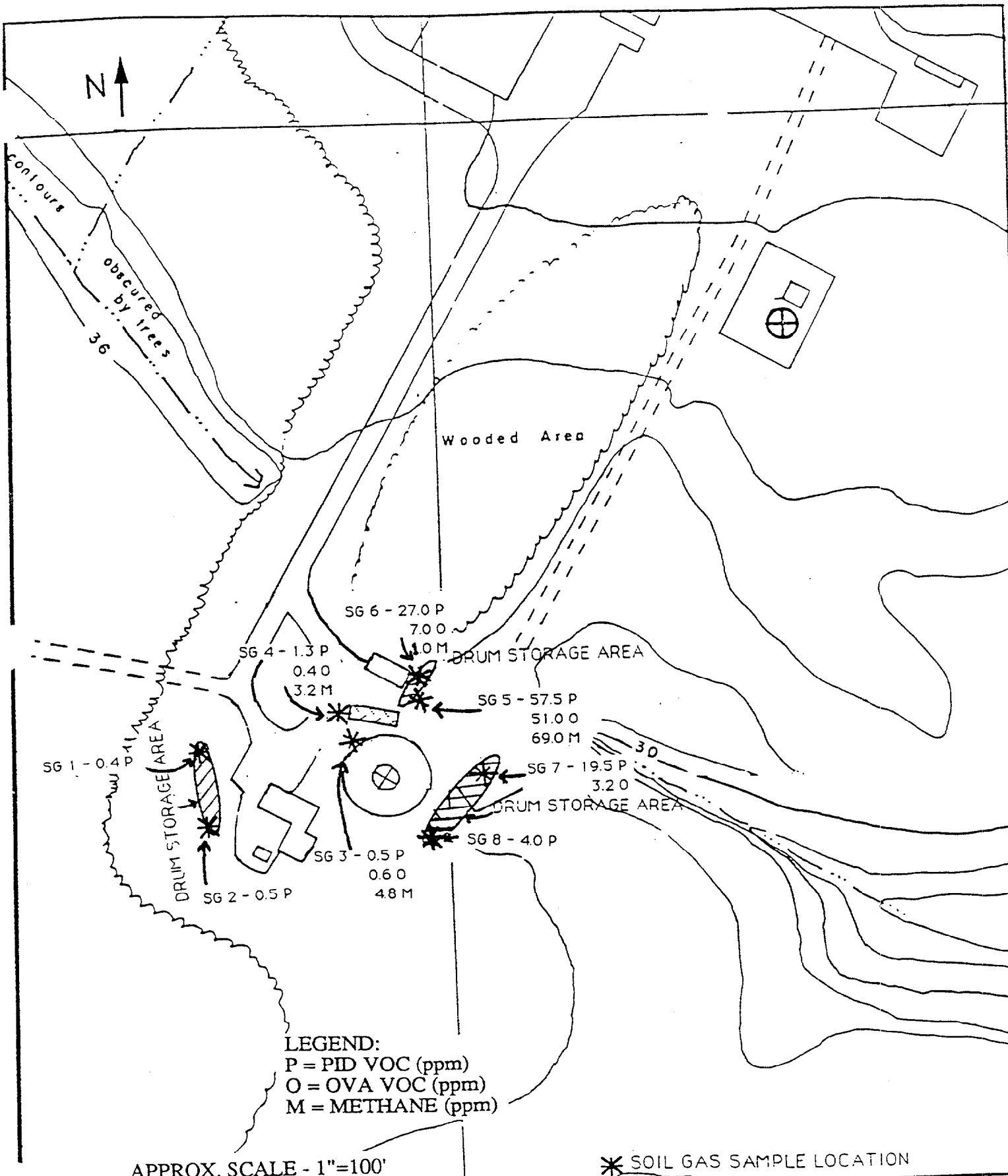
FIGURE 3-6

POSITIVE SOIL GAS RESULTS

SITE 8 - FORMER MAIN BASE FUELING SYSTEM, BUILDING N-134



Metcalf & Eddy	**FIGURE 3-7** **POSITIVE SOIL GAS RESULTS**	**SITE 9 - ABANDONED DRUM FIELD, ALONG RUNWAY 17-35**

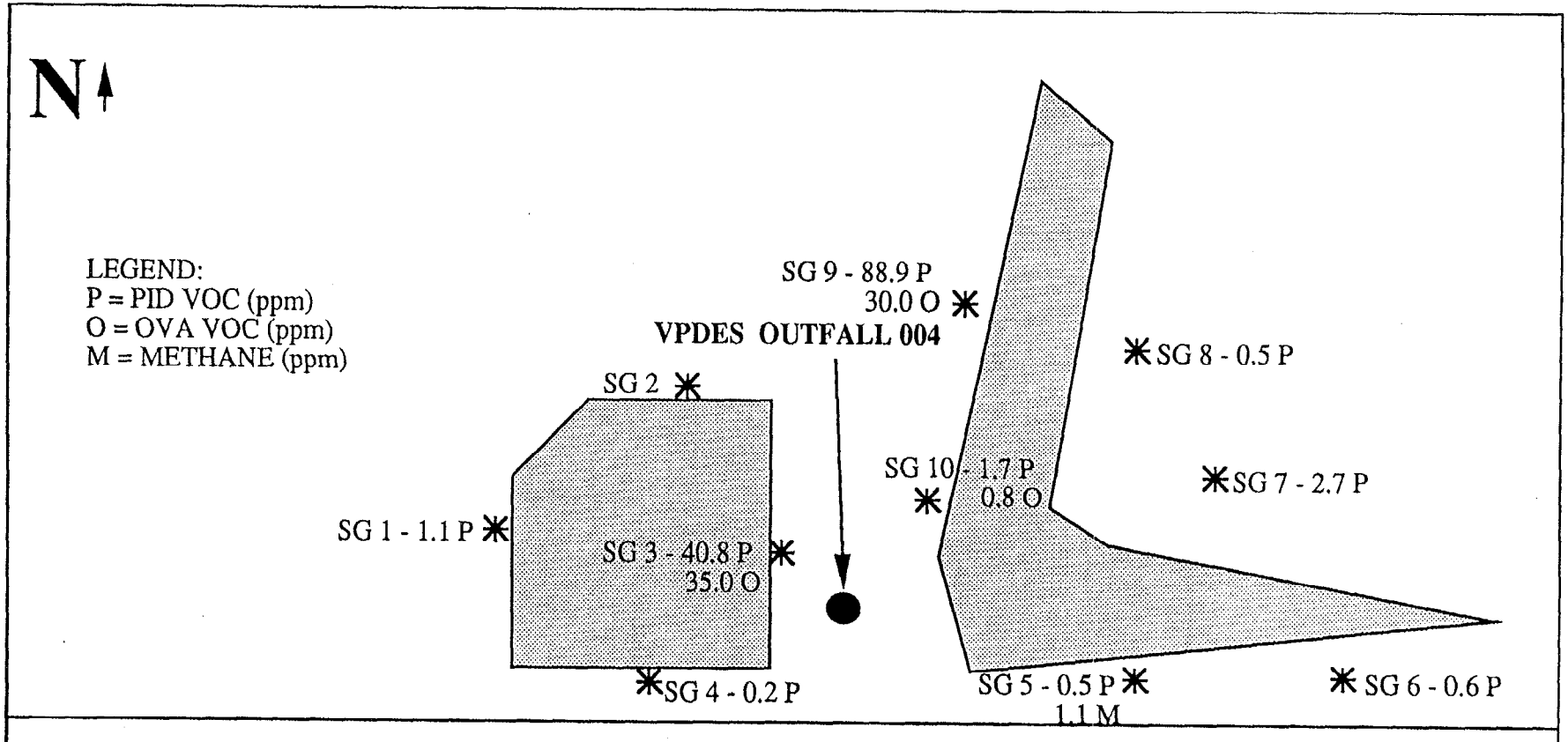


Metcalf & Eddy

FIGURE 3-8
POSITIVE SOIL GAS RESULTS

SITE 10 - ADAS, BUILDING N-168

SOURCE: Stephen A. Estrin, Inc., 1977



Metcalf & Eddy	**FIGURE 3-9** **POSITIVE SOIL GAS RESULTS**	**SITE 14 - DEBRIS PILE, NORTH OF RUNWAY 10-28**

TABLE 3-1 SOIL GAS SURVEY RESULTS

SAMPLE ID	DATE COLLECTED	DEPTH (FT)	VOC RESULTS (PPM) PID	OVA (minus methane)	NOTES
Site 1 - Old Wastewater Treatment Plant					
WFF1-SG1	3/11/93	5	7	ND	-
WFF1-SG2	3/11/93	3	ND	ND	> 1000 ppm methane detected
WFF1-SG3	3/11/93	5	ND	ND	-
WFF1-SG4	3/11/93	4	ND	ND	-
WFF1-SG5	3/11/93	2.5	ND	ND	-
WFF1-SG6	3/11/93	5	200	ND	-
Site 2 - Building E-52					
WFF2-SG1	3/22/93	4	0.2	1.0	3.2 ppm methane detected
WFF2-SG2	3/22/93	4	2.0	ND	> 1000 ppm methane detected
WFF2-SG3	3/22/93	5	ND	ND	-
WFF2-SG4	3/22/93	6	0.1	8.0	-
WFF2-SG5	3/22/93	8	ND	ND	0.6 ppm methane detected
WFF2-SG6	3/22/93	2	0.1	NR	-
WFF2-SG7	3/22/93	2.5	0.4	ND	-
WFF2-SG8	3/22/93	4	ND	NR	-
WFF2-SG9	3/22/93	8	0.4	ND	-
WFF2-SG10	3/22/93	8	ND	ND	-
WFF2-SG11	3/22/93	8	ND	ND	-

TABLE 3-1 SOIL GAS SURVEY RESULTS (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)	RESULTS (PPM) PID	OVA	NOTES
Site 2 - Continued					
WFF2-SG12	3/22/93	2.5	0.3	NR	-
WFF2-SG13	3/22/93	7	0.5	1.0	Strong odor, stained soil 6-8 ft.
WFF2-SG14	3/22/93	7	0.3	0.2	1.0 ppm methane detected
Site 3 - Buildings A-46A and A-46B					
WFF3-SG1	3/20/93	6	2.6	37.4	0.6 ppm methane detected
WFF3-SG2	3/20/93	5	1.2	ND	-
WFF3-SG3	3/20/93	6	1.2	4.9	1.5 ppm methane detected
WFF3-SG4	3/20/93	5	0.2	ND	-
WFF3-SG5	3/20/93	6	0.7	ND	-
WFF3-SG6	3/20/93	5	0.5	ND	-
WFF3-SG7	3/20/93	6	0.5	1.2	-
WFF3-SG8	3/21/93	4	0.5	1.0	0.8 ppm methane detected
WFF3-SG9	3/21/93	5	0.7	ND	-
WFF3-SG10	3/21/93	4	0.5	0.6	0.2 ppm methane detected
WFF3-SG11	3/21/93	4	0.5	ND	-
WFF3-SG12	3/22/93	4	ND	ND	-
WFF3-SG13	3/22/93	5	0.1	ND	-

TABLE 3-1 SOIL GAS SURVEY RESULTS (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)	RESULTS (PPM) PID	OVA	NOTES
Site 4 - Wallops Island Debris Pile					
WFF4-SG1	3/11/93	2	6.7	1.0	-
WFF4-SG2	3/11/93	1.5	37.6	ND	1 ppm methane detected
WFF4-SG3	3/11/93	1	ND	ND	-
WFF4-SG4	3/11/93	1.5	ND	ND	-
WFF4-SG5	3/11/93	2	1.3	ND	-
Site 5 - Paint Stain					
WFF5-SG1	3/9/93	2	ND	ND	-
WFF5-SG2	3/9/93	2	ND	ND	-
WFF5-SG3	3/9/93	2	ND	ND	-
WFF5-SG4	3/9/93	2	ND	ND	-
WFF5-SG5	3/9/93	2	ND	ND	-
Site 6 - Former Wallops Island Fueling Station					
WFF6-SG1	3/19/93	3	ND	ND	-
WFF6-SG2	3/19/93	3	ND	ND	-
WFF6-SG3	3/19/93	3	ND	ND	4.0 ppm methane detected
WFF6-SG4	3/19/93	3	ND	ND	-
WFF6-SG5	3/19/93	4	ND	ND	-
WFF6-SG6	3/19/93	4	ND	ND	-
WFF6-SG7	3/19/93	4	ND	ND	0.8 ppm methane detected

TABLE 3-1 SOIL GAS SURVEY RESULTS (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)	RESULTS (PPM) PID	OVA	NOTES
Site 6 - Continued					
WFF6-SG8	3/19/93	4	ND	ND	-
WFF6-SG9	3/19/93	5	ND	ND	-
WFF6-SG10	3/19/93	5	ND	ND	0.6 ppm methane detected
WFF6-SG11	3/19/93	4	0.2	ND	0.2 ppm methane detected
WFF6-SG12	3/19/93	4	0.3	ND	0.2 ppm methane detected
WFF6-SG13	3/19/93	4	0.4	ND	-
WFF6-SG14	3/19/93	4	0.1	ND	-
Site 8 - Former Main Base Fueling Station					
WFF8-SG1	3/17/93	5	3.5	0.8	-
WFF8-SG2	3/17/93	5	7.0	6.2	-
WFF8-SG3	3/17/93	5	1.2	ND	-
WFF8-SG4	3/18/93	3	1.7	1.0	-
WFF8-SG5	3/17/93	5	1.6	7.0	-
WFF8-SG6	3/18/93	5	0.8	ND	-
WFF8-SG7	3/18/93	3.5	0.2	ND	-
WFF8-SG8	3/18/93	3	1.4	1.0	-
WFF8-SG9	3/20/93	5	45.7	90.0	110 ppm methane detected

TABLE 3-1 SOIL GAS SURVEY RESULTS (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)	RESULTS (PPM) PID	OVA	NOTES
Site 8 - Continued					
WFF8-SG10	3/20/93	5	3.5	3.8	Strong odor, possibly diesel.
WFF8-SG11	3/20/93	6.5	1.0	ND	-
Site 9N - Abandoned Drum Field/Debris Pile, North Section					
WFF9N-SG1	3/16/93	8	ND	ND	-
WFF9N-SG2	3/16/93	5	ND	ND	-
WFF9N-SG3	3/16/93	5	ND	0.8	-
WFF9N-SG4	3/16/93	8	5.1	2.2	-
WFF9N-SG5	3/16/93	5	0.9	ND	-
WFF9N-SG6	3/16/93	2.5	0.5	ND	-
WFF9N-SG7	3/16.93	2.5	44.2	9.2	-
WFF9N-SG8	3/16/93	2	46.0	18.0	2 ppm methane detected
WFF9N-SG9	3/16/93	1.5	1.0	ND	-
WFF9N-SG10	3/16/93	2.5	0.9	ND	-
WFF9N-SG11	3/16/93	2	ND	ND	-
WFF9N-SG12	3/16/93	2	ND	ND	-
Site 9S - Abandoned Drum Field, South Section					
WFF9S-SG1	3/21/93	2.5	ND	ND	-
WFF9S-SG2	3/21/93	2.5	ND	0.2	-
WFF9S-SG3	3/21/93	2.5	ND	ND	-

TABLE 3-1 SOIL GAS SURVEY RESULTS (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)	RESULTS (PPM) PID	OVA	NOTES
Site 9S - Continued					
WFF9S-SG4	3/21/93	2.5	ND	ND	-
WFF9S-SG5	3/21/93	2.5	ND	ND	-
WFF9S-SG6	3/21/93	2.5	ND	ND	-
WFF9S-SG7	3/21/93	4	ND	ND	-
Site 10 - ADAS, Building 168					
WFF10-SG1	3/18/93	2	0.4	ND	-
WFF10-SG2	3/18/93	1.5	0.5	ND	-
WFF10-SG3	3/18/93	2	0.5	0.6	4.8 ppm methane detected
WFF10-SG4	3/18/93	2	1.3	0.4	3.2 ppm methane detected
WFF10-SG5	3/18/93	2	57.5	51.0	69.0 ppm methane detected
WFF10-SG6	3/18/93	2	27.0	7.0	1.0 ppm methane detected
WFF10-SG7	3/18/93	1	19.5	3.2	-
WFF10-SG8	3/18/93	1	4.0	ND	-
Site 14 - Debris Pile North of Runway 10-28					
WFF14-SG1	3/9/93	3.5	1.1	ND	-
WFF14-SG2	3/9/93	2.5	ND	ND	-
WFF14-SG3	3/17/93	2	40.8	35	-
WFF14-SG4	3/17/93	8	0.2	ND	-

TABLE 3-1 SOIL GAS SURVEY RESULTS (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)	RESULTS (PPM) PID	OVA	NOTES
Site 14 - Continued					
WFF14-SG5	3/17/93	5	0.5	ND	1.1 ppm methane detected
WFF14-SG6	3/17/93	5	0.6	ND	-
WFF14-SG7	3/17/93	8	2.7	ND	-
WFF14-SG8	3/17/93	1.5	0.5	ND	-
WFF14-SG9	3/17/93	1.5	88.9	30	-
WFF14-SG10	3/17/93	1.5	1.7	0.8	-

Notes: ND = No detection
NR = No results due to insufficient sample volume

CHAPTER 4.0

RECOMMENDATIONS

Site 1 - Old Wastewater Treatment Plant. M&E recommends collection of subsurface soil samples at three locations: soil gas sample location WFF1-SG2, the sludge piles located north of WFF1-SG2, and soil gas sample location WFF1-SG6. One soil sample at WFF1-SG2 should be collected at a depth of 3 feet to determine what is causing the high level of methane in that area. The methane may be due to the presence of decaying debris, such as wood, or due to the presence of another carbonaceous material, such as sewage sludge. It is recommended that this sample be analyzed for the organic compounds on the target compound list (TCL), the target analyte list (TAL), and for fecal coliforms. A positive detection of fecal coliforms may indicate that sewage sludge is present, and could be causing the methane levels. The TCL is a list of 125 organic compounds, including 34 volatiles, 65 semivolatiles, and 26 pesticides/PCBs. The TAL is a list of 23 metals, plus cyanide. One sample should be collected in the sludge drying beds, and one to three samples should be collected in the potential sludge piles to the north of WFF1-SG2 for the same reason, and analyzed for the same parameters. One soil sample at WFF1-SG6 should be collected at a depth of 5 feet to determine whether organic or metal contamination is present at this location. This sample should be analyzed for TCL and TAL. This site will be forwarded to the Corps of Engineers for further evaluation.

Site 2 - Maintenance Facility, Building E-52. M&E recommends conducting an expanded soil gas survey at Building E-52. This survey should consist of a grid pattern in the areas surrounding the building. The purpose of the survey would be to locate and delineate the source(s) of contamination which was identified in previous soil gas surveys, and to locate additional sources which have not yet been discovered, if any. After completion of the expanded soil gas survey, M&E recommends selection of several soil sampling locations based on the results obtained from soil gas.

In addition to sample locations based on soil gas results, M&E recommends collection of the following samples:

Sample #	Location	Depth	Analysis	Rational
1	WFF2-SG6, stained area	0-6 inches	TCL, TAL, TPH	identify source of soil staining
2	Stained area South of bollards	0-6 inches	TCL, TAL, TPH	identify source of soil staining
3	WFF2-SG7, stained area	0-6 inches	TCL, TAL, TPH	identify source of soil staining
4	WFF2-SG12, stained area	0-6 inches	TCL, TAL, TPH	identify source of soil staining
5	Stained area SW corner of E-52	0-6 inches	TCL, TAL, TPH	identify source of soil staining

Note*: TPH - Total Petroleum Hydrocarbons

Site 3 - Two 600,000 Gallon Fuel Tanks, Buildings A46-A and A46-B. M&E recommends collection of eight deep soil samples around the former tanks and pipelines. Sample depths should be field determined, and should be based on visual examination, PID/OVA readings, depth of groundwater table, and/or maximum feasible augering depth. One sample should be collected at WFF3-SG1 due to the high soil gas reading and the previous petroleum detection in the nearby well. In addition one sample should be collected on each of the sides of the tanks, at soil gas locations WFF3-SG2, WFF3-SG3, WFF3-SG8, and WFF3-SG10. One sample should be collected along the pipeline, at WFF3-SG5, and two samples should be collected at the valve pits near runway 10-28. All samples should be analyzed for TPH, benzene, toluene, ethyl benzene, xylenes (BTEX), and lead. This site will be forwarded to the Corps of Engineers for further evaluation.

Site 4 - Debris Pile, North End of Wallops Island. M&E recommends collection of shallow (i.e., at or above the groundwater table) subsurface soil samples at each of the three soil gas locations where soil gas OVA levels were detected: WFF4-SG1, WFF4-SG2 and WFF4-SG5. These locations are well-spaced throughout the debris pile and were chosen due to the presence of suspect objects such as drums. In addition, M&E recommends collection of four water and sediment samples from the swale to the east side of the pile. These samples should provide data on compounds which may be leaching from the pile. All of the above samples should be analyzed for the full TCL/TAL parameters, and TPH with fingerprinting. Two background soil, two sediment and two surface water samples should also be collected outside the perimeter of the site on the north end of Wallops Island. Background samples should be analyzed for TAL to determine naturally occurring metal levels at Wallops Island. In addition, one surface soil sample should be collected for analysis of PCBs near the abandoned oil switch identified in Preliminary Report 1 - UXO/Magnetometer Survey, and one sample should be collected for PCB analysis at each of the abandoned transformers which were located by NASA personnel (Traynor, 1993) during Phase I.

Site 5 - Paint Stain, Building X-30. M&E recommends collection of one surface soil sample and one sample at a 1 foot depth in the center of the paint stain. These samples should be analyzed for the TCL/TAL, with the exception of TCL pesticides/PCBs.

Surface and subsurface (1 foot) soil samples should also be collected to the south and west of the sandblasting pad. These samples should also be analyzed for TCL/TAL, with the exception of TCL pesticides/PCBs. One background surface soil sample and one background subsurface soil sample should be collected for analysis of TAL.

Site 6 - Former Island Fueling System, Buildings X-5 and X-10. M&E recommends collection of ten soil samples. Five should be in the area of the former above ground tanks, with one in the center and four around the outside of the tank locations. Two should be in the area of the former underground tanks. Depths should be field determined, and should be based on visual examination and PID/OVA readings. These samples should be analyzed for TPH with fingerprinting, BTEX and lead. Two samples should be collected near the standpipe, which has visible soil staining around it. One of these should be a surface soil sample, and one should be at the depth of the bottom of the oil/water separator. The tenth sample should be collected near the waste oil tank. The depth should be field determined, at approximately the bottom of the tank. These samples should be analyzed for TPH with fingerprinting, TCL and TAL.

Site 8 - Former Main Base Fueling System, Building N-134. M&E recommends collection of eight soil samples. Five samples should be collected in the area of the former tanks. The center sample should be collected below the backfill from the previous excavation. One sample each should be collected near the former waste oil tank. One sample each should be collected below the pavement at WFF8-SG9 and WFF8-SG10. All depths should be field determined based on visual examination and PID/OVA readings. All samples should be analyzed for TPH with fingerprinting, BTEX, and lead, with the exception of the sample from the waste oil tank, which should be analyzed for TPH, all TCL volatiles and PCBs, and all TAL metals.

Site 9 - Abandoned Drum Field, Along Runway 17-35. M&E recommends splitting Sites 9 North and South into two sites. Site 9 North should be renamed as Site 15 - Debris pile, and Site 9 South alone should be referred to as Site 9 - Abandoned Drum Field. M&E recommends collections of one sample of the petroleum residue (i.e., tar-like) from the abandoned drums in Site 9, as described in Chapter 3. This sample should be analyzed for TCL, TAL and TPH. In addition, M&E recommends collection of ten surface water and sediment samples in the swale behind Sites 9 and 15 to be analyzed for TCL/TAL and TPH.

Site 10 - ADAS, Building N-168. M&E recommends collection of six surface soil samples and six subsurface soil samples in the stained areas near locations WFF10-SG3 through WFF10-SG8. These samples should all be analyzed for TCL, TPH, and TAL.

Site 14 - Debris Pile, North of Runway 10-28. M&E recommends performing an expanded soil gas survey at this site to locate source(s) of contamination and to delineate the edges. This sampling should be performed prior to collection of soil samples. Based on the results of the expanded soil gas survey, soil sample locations should be chosen for identification and quantification of contaminants. In addition, M&E recommends collection of five surface water and sediment samples in this area to be analyzed for TCL/TAL and TPH.

Site 15 - Debris Pile, Along Runway 17-35. M&E recommends performing an expanded soil gas survey at this site to locate source(s) of contamination and to delineate the edges. Soil sampling locations should be chosen based on the results of the soil gas survey.

CHAPTER 5.0

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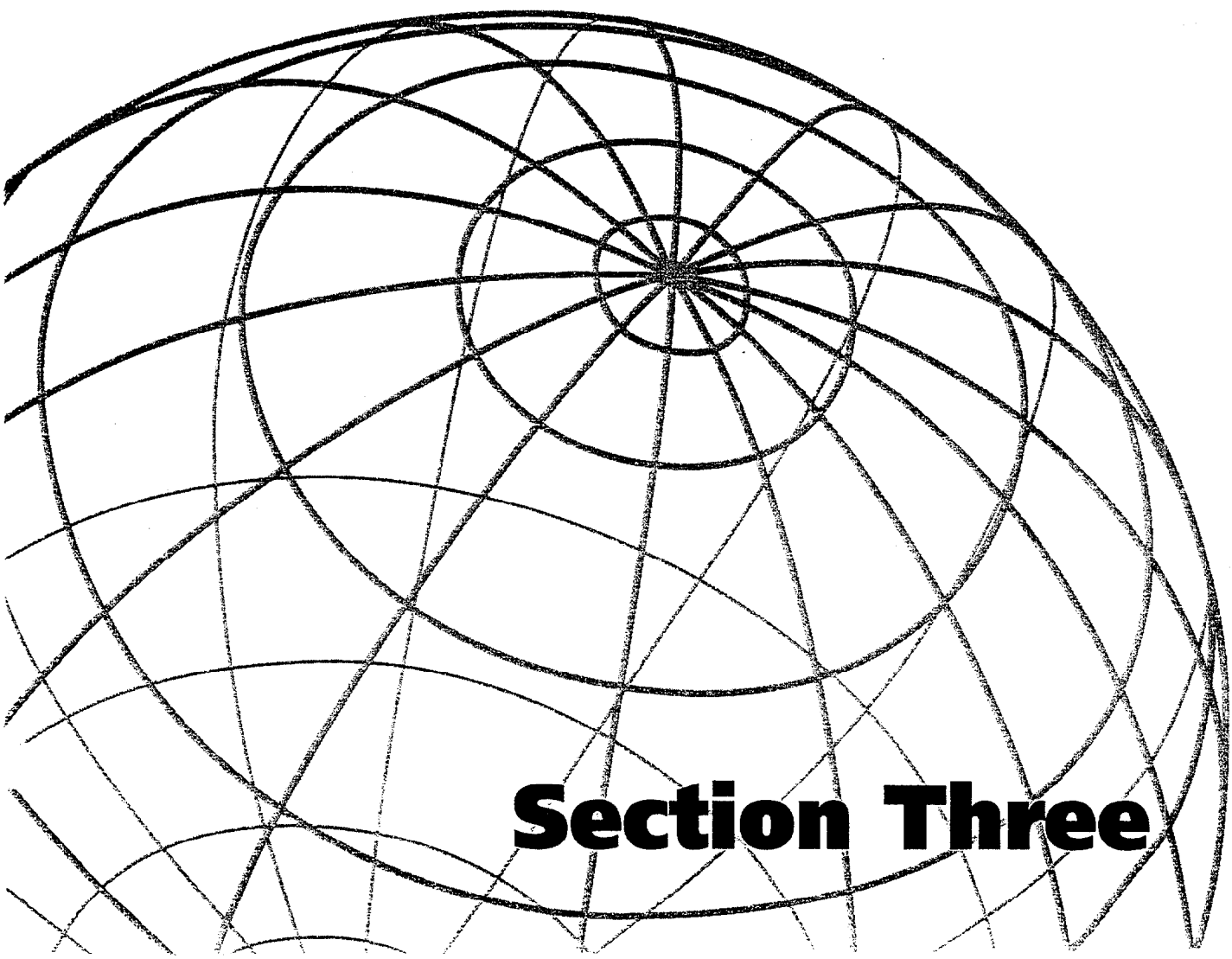

Section Three

Submitted to:
National Aeronautics and Space Administration
Wallops Flight Facility
Wallops Island, Virginia

Environmental A/E Services
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NASA WALLOPS FLIGHT FACILITY SITE INSPECTION PRELIMINARY REPORT #2 SOIL GAS SURVEY RESULTS

REVISED

July 23, 1993

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NASA WALLOPS FLIGHT FACILITY SITE INSPECTION
PRELIMINARY REPORT #2
SOIL GAS SURVEY RESULTS
REVISED
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CHAPTER 1.0

INTRODUCTION

1.1 PURPOSE

This preliminary report is being prepared for the National Aeronautics and Space Administration (NASA), Goddard Space Flight Center (GSFC), Wallops Flight Facility (WFF), Wallops Island, Virginia. The report is being prepared under contract NAS5-35042, Delivery Order 14: Wallops Flight Facility Site Inspection. The Site Inspection (SI) project includes investigation of fifteen separate sites identified in 1990 during an Environmental Site Survey (NASA, 1990c) as being potentially affected by past activities. The Environmental Site Survey is being used in the place of a Preliminary Assessment (PA) for the sites and will be referred to as such throughout this report.

The SI is being conducted in phases due to the magnitude of the task. Preliminary preparation for the SI included collection of background data and a walk-through site survey. Phase I of the field investigations consisted of an unexploded ordnance (UXO) and magnetometer survey at nine of the fifteen sites. Phase II consisted of soil gas surveys at eleven of the fifteen sites between March 8 - March 22, 1993, and expanded soil gas surveys at three of the eleven sites between June 7 - June 14, 1993. The purpose of this document is to present the results of the soil gas surveys. Field methodologies are briefly described, and preliminary conclusions and recommendations for each site are also provided. A similar document will be prepared for each of the other field activities which are being conducted in other phases of the SI, as described in the "NASA Wallops Flight Facility Site Inspection Work Plan", prepared by Metcalf & Eddy in March 1993. A Final Site Inspection Report will be prepared at the conclusion of the field investigations, and will include results and discussion of each of the individual field efforts.

1.2 SITE LOCATIONS

WFF is composed of three separate specific areas in close proximity to each other--the Main Base, the Mainland, and Wallops Island (Figure 1-1). WFF is located in the temperate zone at approximately 37° 56' north latitude and 75° 27' west longitude. WFF is within the political boundaries of Accomack County on the Eastern Shore of the Commonwealth of Virginia. WFF is approximately 40 miles southeast of Salisbury, Maryland, and 90 miles north by northeast of the Tidewater Regional area. Chincoteague Island is approximately five miles to the northeast of the Main Base.

Soil gas surveys were performed at eleven of the fifteen areas of concern identified in the 1990 PA. The eleven areas are listed below, and a description of each site is provided in Section 1.3. The locations of each area are illustrated on Figures 1-2 and 1-3, and individual maps for each site are included in Chapter 2.0.

SITE NAME	LOCATION
Site 1 - Old Wastewater Treatment Plant	Main Base
Site 2 - Maintenance Facility	Main Base - Building E-52

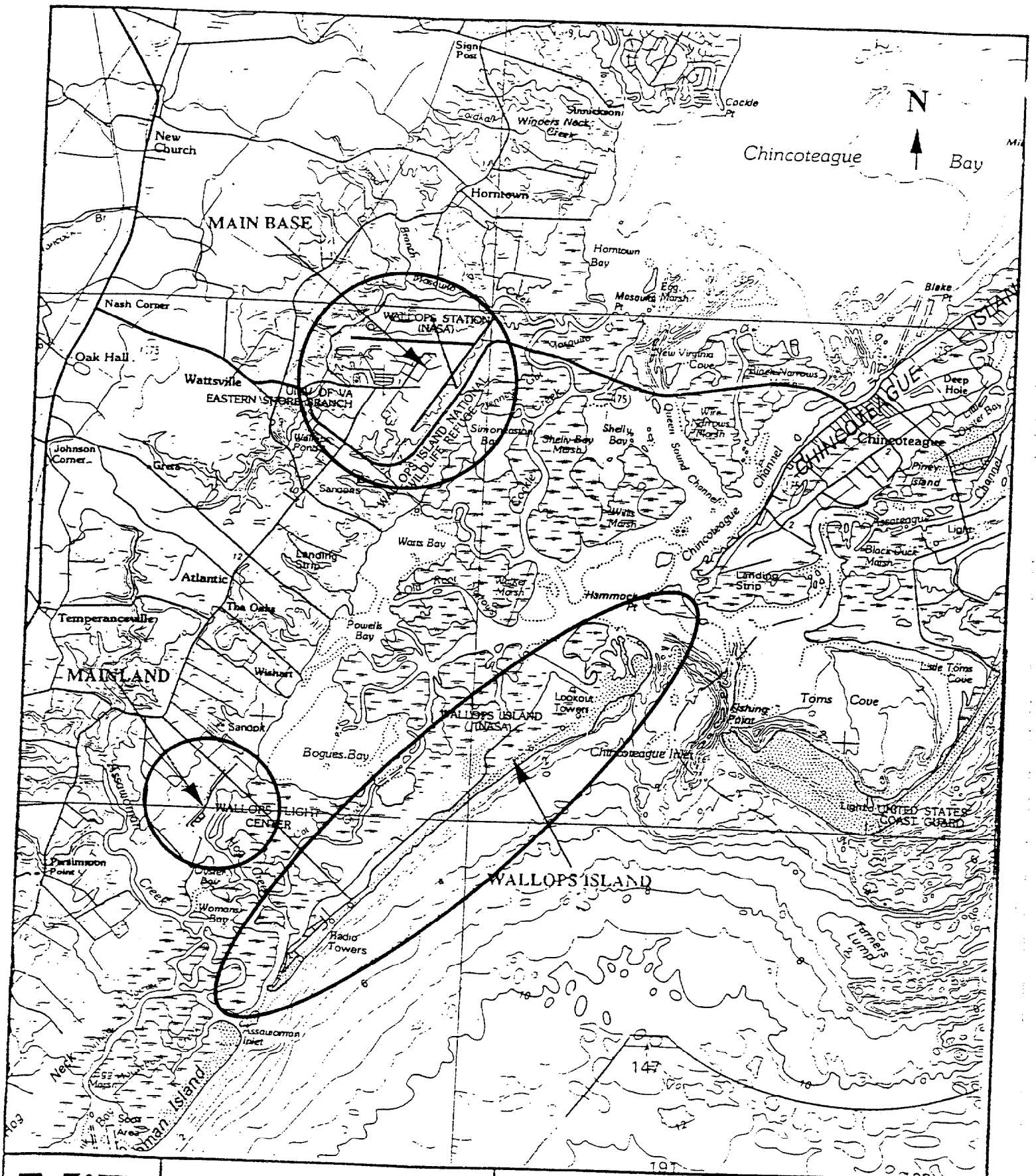

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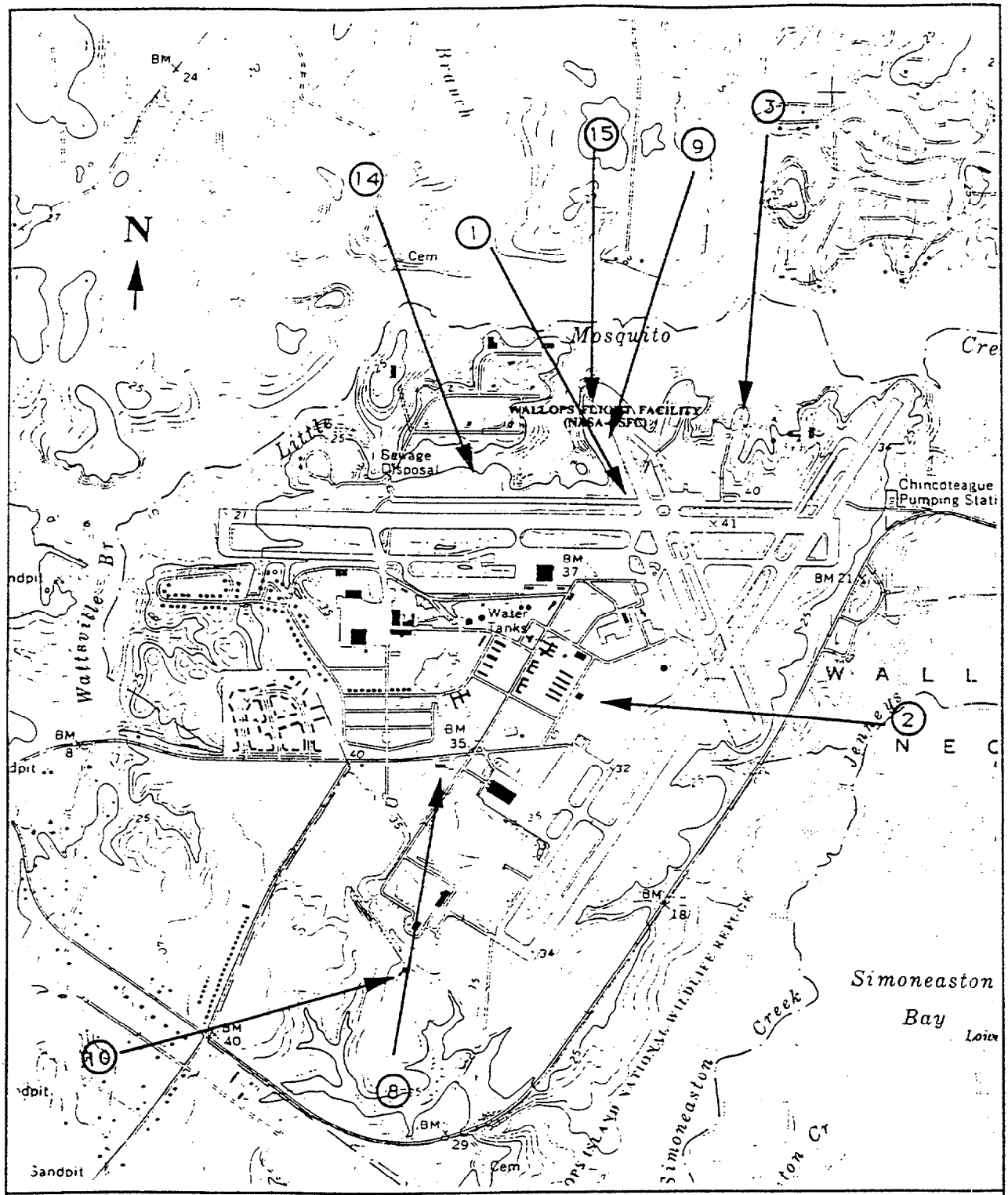
FIGURE 1-1

SCALE - 1:100,000

WFF VICINITY MAP

SOURCE: USGS NATIONAL OCEAN SURVEY



SCALE - 1=24,000

Metcalf & Eddy	FIGURE 1-2	MAIN BASE SITES SOURCE: USGS

7/23/93

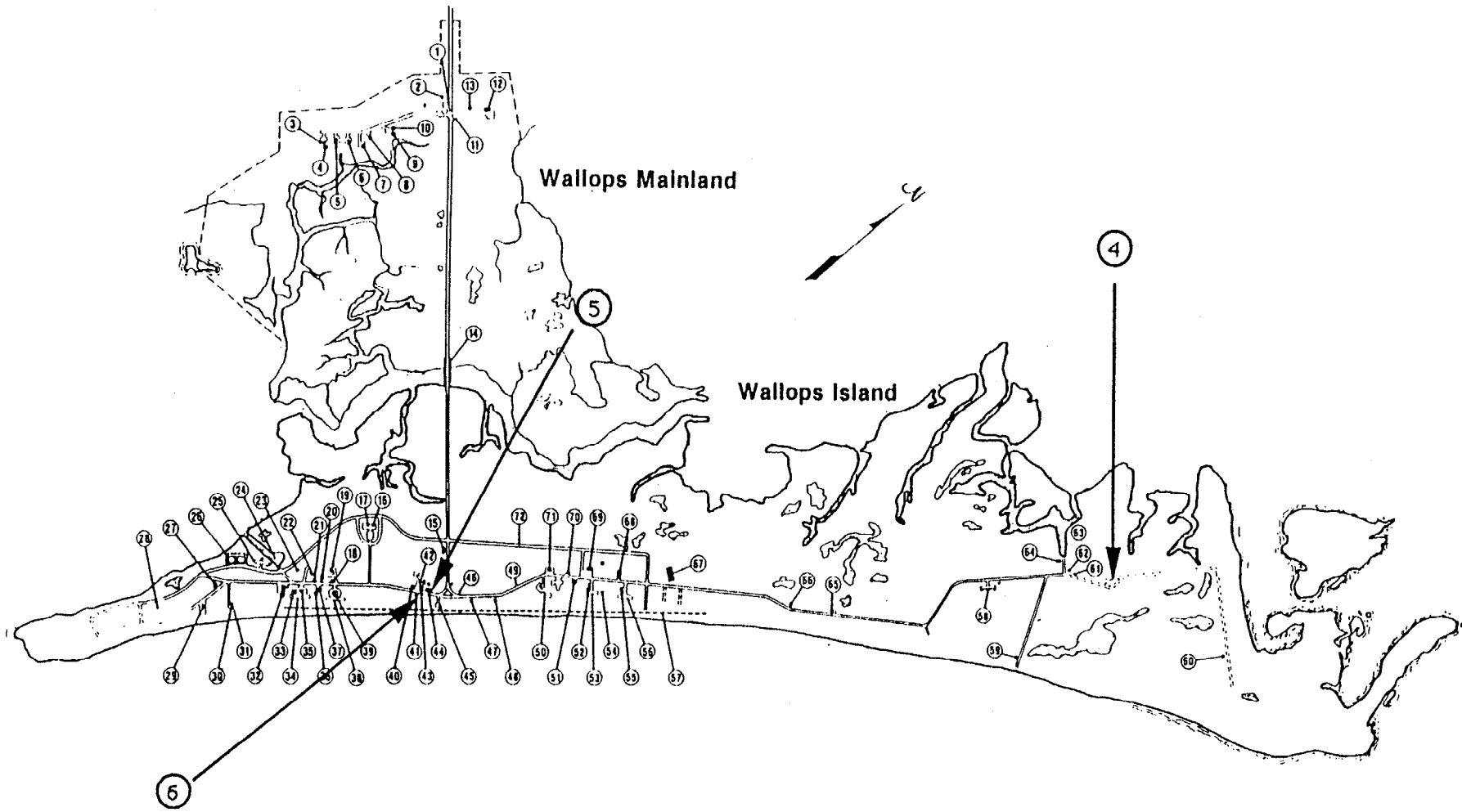


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FIGURE 1-3

WALLOPS ISLAND SITES

SOURCE: NASA

APPROX. SCALE - 1"= 4000'

SITE NAME	LOCATION
Site 3 - Two 600,000 Gallon Fuel Tanks	Main Base - Buildings A-46A, A-46B
Site 4 - Debris Pile	Wallops Island - North End
Site 5 - Paint Stain	Wallops Island - Building X-30
Site 6 - Former Island Fueling System	Wallops Island - Building X-5 and X-10
Site 8 - Former Main Base Fueling System	Main Base - Building N-134
Site 9 - Abandoned Drum Field	Main Base - Along Runway 17-35
Site 10 - Advanced Data Acquisition Support Facility (ADAS)	Main Base - Building N-168
Site 14 - Debris Pile	Main Base - Along Runway 10-28
Site 15 - Debris Pile	Main Base - Along Runway 17-35

1.3 SITE DESCRIPTIONS

Site 1 - Old Wastewater Treatment Plant. The old wastewater treatment plant was constructed by the Navy, and was abandoned in 1957 when NASA took over the facility and constructed the current wastewater treatment plant. Structures and items noted during the initial site visit included: a plant control building, concrete process tanks and associated piping, sludge drying beds, a pump/valve building, a trickling filter, three transformers (possibly PCB), and two compressed gas cylinders (possibly chlorine). A 1988 NASA (NASA, 1988a) memo addressed to the Corps of Engineers indicated that a drainage swale located near the old plant was potentially used as an ordnance disposal site, but no evidence of ordnance was noted during the initial site survey.

Site 2 - Maintenance Facility, Building E-52. The facility is located adjacent to the former Aviation Fuel Tank Farm, and was used by the Navy as a Motor Pool and more recently by NASA as a landscaping facility. A 1989 soil gas survey (NASA, 1990b) of the area detected xylene isomers along the border between the tank farm and E-52, and a 1990 soil gas survey (NASA, 1992) detected perchloroethene in the same approximate area. Subsurface soil samples collected during the Supplemental Site Characterization (NASA, 1991) for the tank farm indicated fuel related chemicals and trichloroethene downgradient of E-52. Review of aerial photographs taken in the 1960's showed the presence of drum storage areas and at least one above ground tank. A 1990 survey of the facility indicated that petroleum products were stored in open containers around the perimeter of the building at that time (NASA, 1990a). Additionally, the annual safety and health survey conducted in 1988 (NASA, 1988b) indicated that excessive numbers of batteries were stored around the area, and that two 500 gallon fuel tanks were present at that time with no secondary containment. Extensive soil staining was noted around the building during the 1993 site walk-through. In addition, four protective bollards (posts) were noted near the building, which may have previously protected a fuel pump.

Site 3 - Two 600,000 Gallon Fuel Tanks, Building A-46A and A-46B. The two tanks, designated A-46A and A-46B, and the pump house are located north of taxiway 10-28. The tanks were used by the Navy for storage of JP-4 fuel. Interviews with personnel revealed that the tanks were emptied and filled with salt water. The tanks were never used by NASA (NASA, 1993). Petroleum by-products were recently detected in one groundwater sample in monitoring well MW-41 in this area. A petroleum odor was noted near A-46A during the 1993 site survey. There is an abandoned pipeline which originally connected these tanks to building E-77, in the old aviation fuel tank farm. During the 1991 excavation of the old aviation fuel tank farm, this pipeline contained product. This line was allowed to drain and then it was capped, however, it is not known whether the line was completely emptied.

Site 4 - Debris Pile, North End of Wallops Island. Debris, metal, and telephone poles were disposed at the north end of the island. No further information is available.

Site 5 - Paint Stain, Building X-30. The exhaust fan from the spray paint booth has been expelling paint particles which have left a stained area behind the facility. Although a filter has been ordered for the system, it has not been installed, and investigation of the surface gravel and soil is necessary to characterize the paint content. Paint, paint thinner, and lacquer was currently used in this building. Additionally, an area in front of the building is used for sandblasting activities.

Site 6 - Former Island Fueling System, Building X-10 and Building X-5. Building X-10 was the former Island Fueling System. Drawings of the facility (NASA, 1948) indicate that there were two 30,000 above ground tanks, and five partially buried storage tanks of unknown size. Drawings and aerial photographs from the 1960's indicate that the tanks were surrounded by a concrete dike, and a concrete pad was located next to the underground tanks. The above ground tanks were removed in 1981 (NASA, 1993) but the saddles may still remain. The concrete pad is still present. Recent soil gas and soil data indicate that soil contamination is present in the vicinity of the former fueling station.

Building X-5 was used as a support facility (NASA, 1993). Drawings for the facility indicate the presence of a hydraulic system, a 500 gallon underground waste oil tank, an oil/water separator, and a drain field. The hydraulic system consisted of two 30 gallon above ground tanks inside the building. These tanks have been removed (Traynor, 1993). Additionally, a 250 gallon above ground fuel oil storage tank was located behind the building (Traynor, 1993). Recently, the interior floor drains were flushed out, which caused oily material to overflow from an exterior standpipe located at the oil/water separator (Traynor, 1993). Extensive soil staining was noted around this standpipe during the 1993 site survey.

Site 8 - Former Main Base Fueling System, Building N-134. An underground storage tank fueling system was previously located at Building N-134 (NAVY, 1956). The tanks were removed in the mid-seventies, but piping to the fuel pumps may not have been removed. Samples were not collected at the time of tank removal to determine levels of contamination, if any. In addition, a 550 gallon waste oil tank was once located at the facility (NAVY, 1956).

Site 9 - Abandoned Drum Field, Along Runway 17-35 (formerly referred to as Site 9 South). During a NASA walk-through survey of stormwater discharges, abandoned drums were discovered within the tree line along Runway 17-35 north of Site 1, the old Wastewater Treatment Plant. There were several deteriorated drums protruding from the ground with visible petroleum residuals (i.e., tar-like) in/on the drums at the site.

Site 10 - ADAS, Building N-168. ADAS contains a hydraulic system that holds approximately 1000 gallons of hydraulic fluid. During the past several years, there have been discharges of the hydraulic fluid from the system (NASA, 1993). Three drum storage areas have been used for storing new and used oil. There is visible staining around ADAS and at two of the drum-storage areas. Additionally, solvents were previously used in maintenance activities, and it is possible that surface contamination may have occurred.

Site 14 - Debris Pile, North of Runway 10-28. Metal, wood, and other objects have been disposed along the taxiway north of Runway 10-28. No further information is available.

Site 15 - Debris Pile, Along Runway 17-35. During a NASA walk-through survey of stormwater discharges, concrete filled drums and other debris were discovered within the tree line along Runway 17-35. This site is located north of Site 9 at the 17 end of Runway 17-35. There were several deteriorated drums protruding from the ground with visible petroleum residuals (i.e., tar-like) in/on the drums. A preliminary radiation survey was performed on the concrete drums. No radiation levels were detected above background (NASA, 1993).

CHAPTER 2.0

FIELD METHODOLOGIES

2.1 SOIL GAS SAMPLING PROCEDURES

Steel soil gas probes were used to collect soil gas samples at the eleven sites. The depths for sample collection were variable and were field determined based on the nature of the suspected contamination and site characteristics. After the probe was driven to the appropriate sample depth, a length of Teflon tubing was inserted into the top of the probe. The tubing was then connected to a vacuum box, and all connections were sealed. The box was used to purge atmospheric air from the probe, and then to fill a Tedlar bag with soil gas. The soil gas sample bag was connected to the analyzer and a sample extracted into the detector via the instrument's internal vacuum pump.

A MicroTip photoionization detector (PID) was used for analysis of the soil gas samples and a Foxboro organic vapor analyzer (OVA) was used for confirmation of the PID results. Soil gas sample results obtained from both the PID and OVA are presented in Chapter 3.0. Both detectors were calibrated at least twice daily. The OVA measures organic vapor levels including methane and ethane, whereas the PID will not detect methane or ethane. Therefore, results obtained by the OVA indicating the presence of organic vapors were checked with a carbon scrubber, which filters out VOCs, but allows methane and ethane to pass through. Any OVA results obtained when using the carbon scrubber were considered to be potentially methane, an anaerobic degradation product commonly found in soil when carbonaceous material is present, and the results were confirmed by using the PID.

2.2 SAMPLE IDENTIFICATION AND COLLECTION

Soil gas surveys were conducted between March 8 - March 22, 1993 at sites 1, 2, 3, 4, 5, 6, 8, 9, 10, 14, and 15. Expanded soil gas surveys were conducted between June 7 - June 14, 1993 at sites 2, 14 and 15. Soil gas probes were driven by hand or with an electric rotary hammer, powered by a small, portable generator. Soil gas sample locations are shown on Figures 2-1 through 2-10 on pages 2-4 through 2-13. Sample identifications, collection dates, and depths are listed in Table 2-1 at the end of the chapter.

Soil gas surveys were performed at the following eleven sites:

Site 1 - Old Wastewater Treatment Plant. Six soil gas samples were collected (Figure 2-1) during the March 1993 soil gas survey around the old Wastewater Treatment Plant at depths from 2.5 to 5 feet. The purpose of the soil gas survey at this site was to locate subsurface volatile contamination in the vicinity of the plant, if any. There were no specific suspect areas. Sample locations and depths were chosen to provide data representative of conditions around the plant. Therefore, locations were chosen to surround the plant, and variable depths were used. Soil gas sampling was not performed in areas of suspected UXO due to the danger of explosion.

Site 2 - Maintenance Facility, Building E-52. Fourteen soil gas samples were collected around Building E-52 during the March soil gas survey at various depths ranging from 2.5 to 8 feet. Thirty additional samples (Figure 2-2) were collected during the expanded soil gas survey in June at depths ranging from 2-1/2 to 15 feet. Sample locations were chosen in areas of soil staining, areas where volatile contamination was previously detected, and other suspect areas such as previous drum storage and above ground tank locations. Variable depths were chosen to provide representative data.

Site 3 - Two 600,000 Gallon Fuel Tanks, Building A-46A and A-46B. Thirteen soil gas samples were collected during the March 1993 Soil Gas Survey (Figure 2-3) at variable depths ranging from 4 to 6 feet around the two tanks at Buildings A-46A and A-46B to locate possible subsurface volatile fuel contamination due to leaks in the tanks or valve pits. Sample locations were chosen to surround the tanks at the bottoms of the tank mounds and to trace the abandoned pipeline which extended to the former Aviation Fuel Tank Farm area. Sample depths around the mounds were intended to be the approximate level of the tank bottoms, and samples were collected along the pipeline at the approximate depth of the pipeline.

Site 4 - Debris Pile, North End of Wallops Island. Five soil gas samples were collected during the March 1993 soil gas survey (Figure 2-4) in and around the debris piles at shallow depths (1 to 2 feet). The sample locations were selected based on visible signs of potential contamination and the results of the UXO/magnetometer survey. Shallow depths were chosen due to the presence of a shallow groundwater table.

Site 5 - Paint Stain, Building X-30. Five soil gas samples were collected during the March soil gas survey at 2 foot depths in and around the area of visible staining from the spray paint booth exhaust. One additional sample was collected in the center of the stained area in June 1993 at the request of NASA. The purpose of the sampling was to determine whether volatile organic contamination was present in the stained area, and to roughly estimate the depth and aerial extent of contamination. Shallow depths were chosen due to the presence of surface contamination.

Site 6 - Former Island Fueling System, Building X-5 and Building X-10. Fourteen soil gas samples were collected during the March 1993 soil gas survey (Figure 2-6) around Buildings X-5 and X-10 at depths ranging from 3 to 5 feet, just above groundwater. Sample locations and depths were chosen to determine whether contamination previously detected by NASA (Bunting, 1993) was migrating downward or toward the ocean.

Site 8 - Former Main Base Fueling System, Building N-134. Eleven soil gas samples were collected during the March 1993 soil gas survey (Figure 2-7) in the area of the previous UST fueling system at depths of 3 to 6.5 feet. The purpose of the sampling was to determine the depth and aerial extent of volatile fuel contamination in that area. Sample locations and depths were chosen based upon facility maps (NAVY, 1956) indicating where the underground storage tanks were previously located.

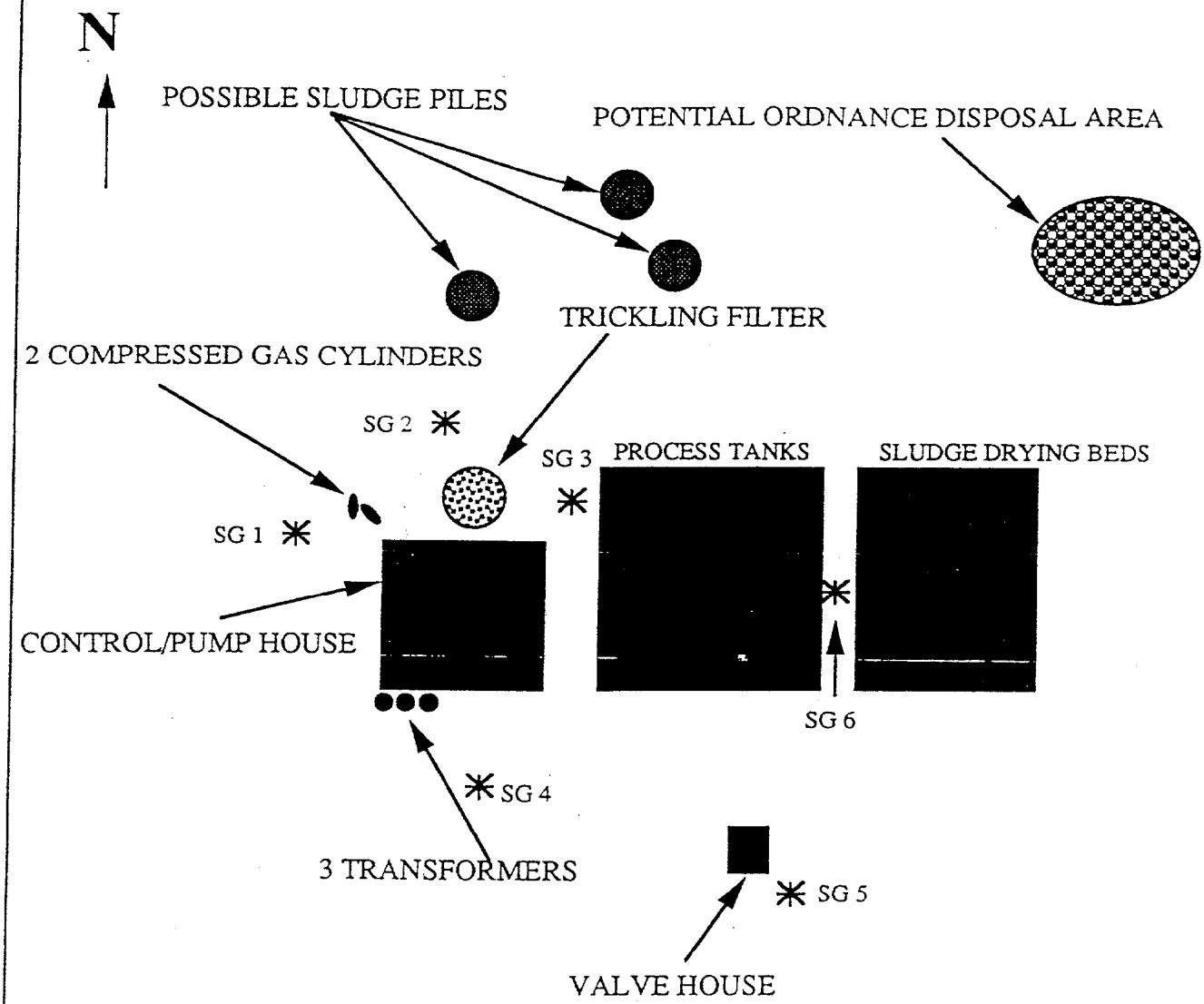
Site 9 - Abandoned Drum Field, Along Runway 17-35. Seven soil gas samples were collected during the March 1993 soil gas survey at variable depths (2 to 8 feet) in and around the abandoned drum field. The sample locations were selected based on visible signs of potential contamination and the results of the UXO/magnetometer survey. Depths were

chosen based on the presence of shallow groundwater, or the estimated depths of buried drums and debris.

Site 10. - ADAS, Building N-168. Eight soil gas samples were collected during the March 1993 soil gas survey (Figure 2-9) at shallow depths (1 to 2 feet) around the ADAS facility. Three areas around the facility are currently or were formerly used as drum staging areas. Two samples were collected in each of these areas to determine whether solvent or other volatile organic contamination is present in any of these areas. In addition, oil staining is present near the heat exchange unit and around the base of the ADAS tower. One sample was collected in the heat exchange area and one sample was collected near a drain hole at the base of the ADAS tower to determine whether solvent or petroleum related volatile organic contamination is present at these areas. Shallow depths were chosen to determine whether volatile contamination was present below the visible surface staining.

Site 14 - Debris Pile, North of Runway 10-28. Ten soil gas samples were collected during the March 1993 soil gas survey at variable depths from 1.5 to 8 feet around the debris piles to determine whether VOCs were migrating away from sources within the piles. Twenty-nine additional samples (Figure 2-10) were collected during the June 1993 survey at depths from 1 to 12 feet. The sample locations were selected based on visible signs of potential contamination (i.e. drums, cans, etc.) and the results of the UXO/magnetometer survey. Depths were chosen based on the presence of shallow groundwater, or the estimated depths of buried drums and debris.

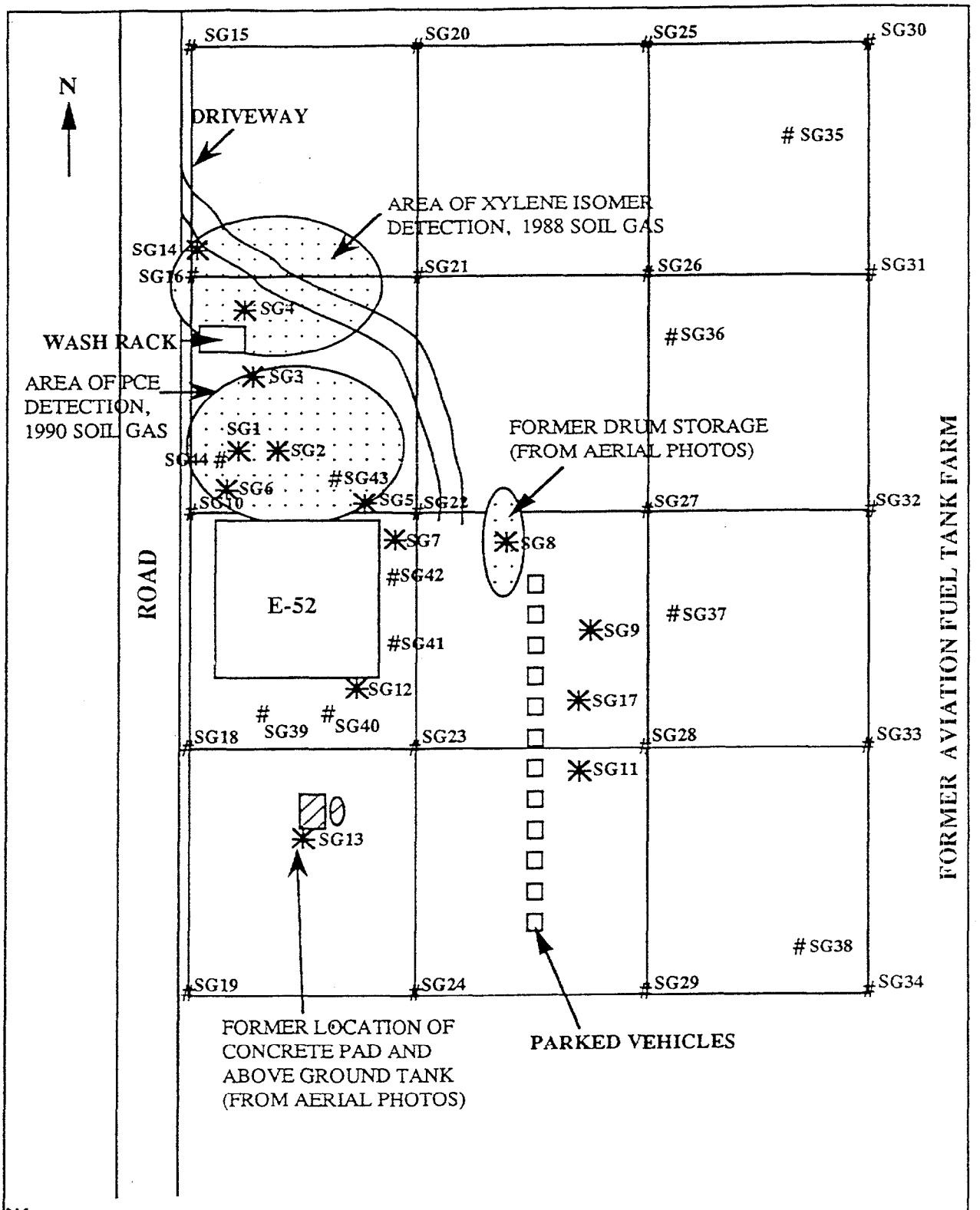
Site 15 - Debris Pile, Along Runway 17-35. Twelve soil gas samples were collected during the March 1993 soil gas survey at variable depths from 1.5 to eight feet in and around the debris pile. An additional eighteen samples were collected during the June 1993 (Figure 2-11) survey at depths from 1 to 5.5 feet. The sample locations were selected based on visible signs of potential contamination and the results of the UXO/magnetometer survey. Depths were chosen based on the presence of shallow groundwater, or the estimated depths of buried drums and debris.



✳ SOIL GAS SAMPLE LOCATION

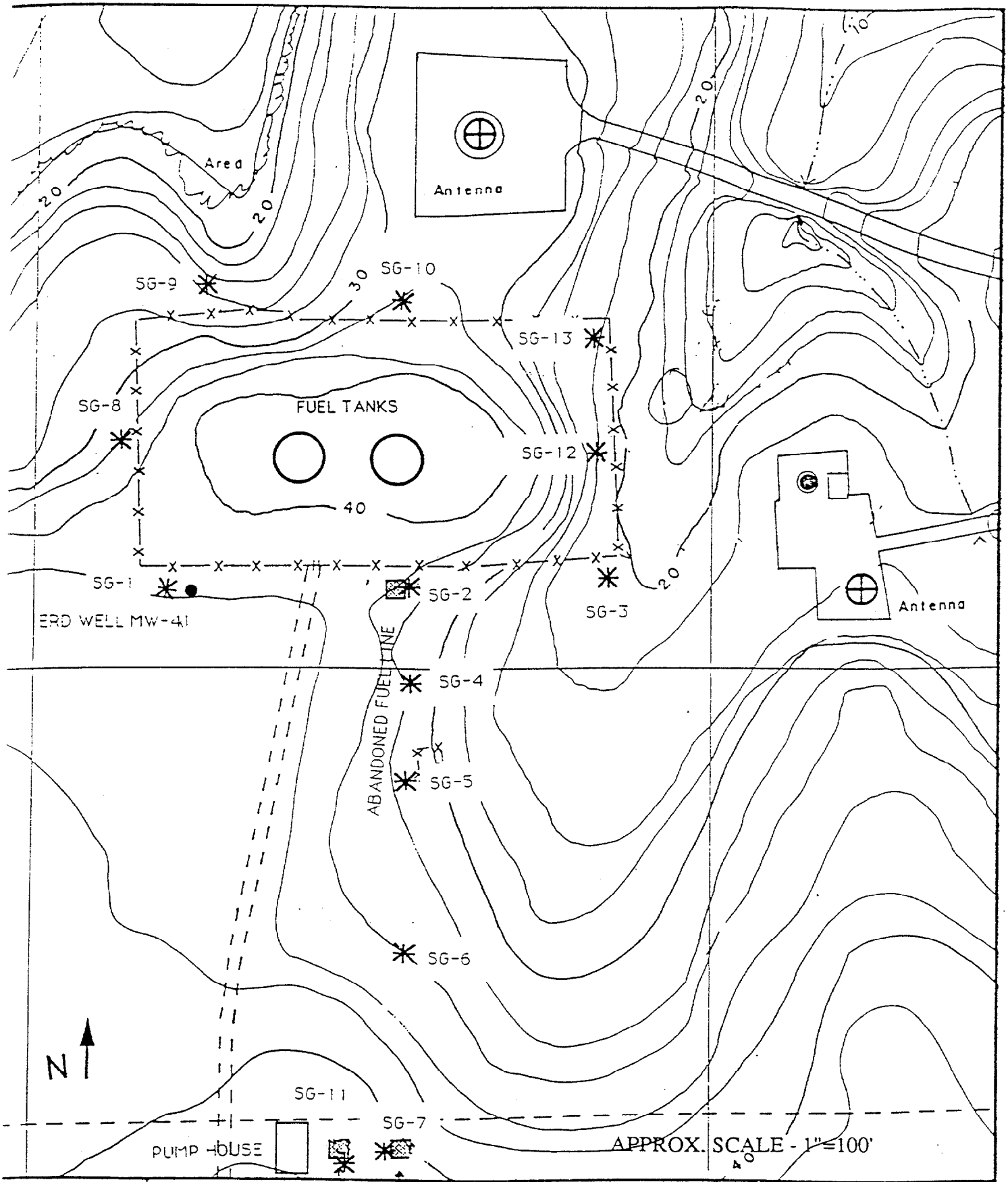
APPROX. SCALE - 1 " = 100'

M&E Metcalf & Eddy	FIGURE 2-1 SOIL GAS SAMPLE LOCATIONS	SITE 1 - OLD WASTEWATER TREATMENT PLANT



✳INITIAL SOIL GAS SAMPLE LOCATION
EXPANDED SOIL GAS SAMPLE LOCATION

Metcalf & Eddy	FIGURE 2-2	SITE 2 - MAINTENANCE FACILITY, BUILDING E-52 APPROX. SCALE - 1"= 100 '



Metcalf & Eddy

FIGURE 2-3
SOIL GAS SAMPLE LOCATIONS

SITE 3 - TWO 600,000 GALLON FUEL TANKS, BUILDINGS A-46A AND A-46B

SOURCE: Stephen A. Estrin, Inc., 1977

✳ SOIL GAS SAMPLE LOCATION

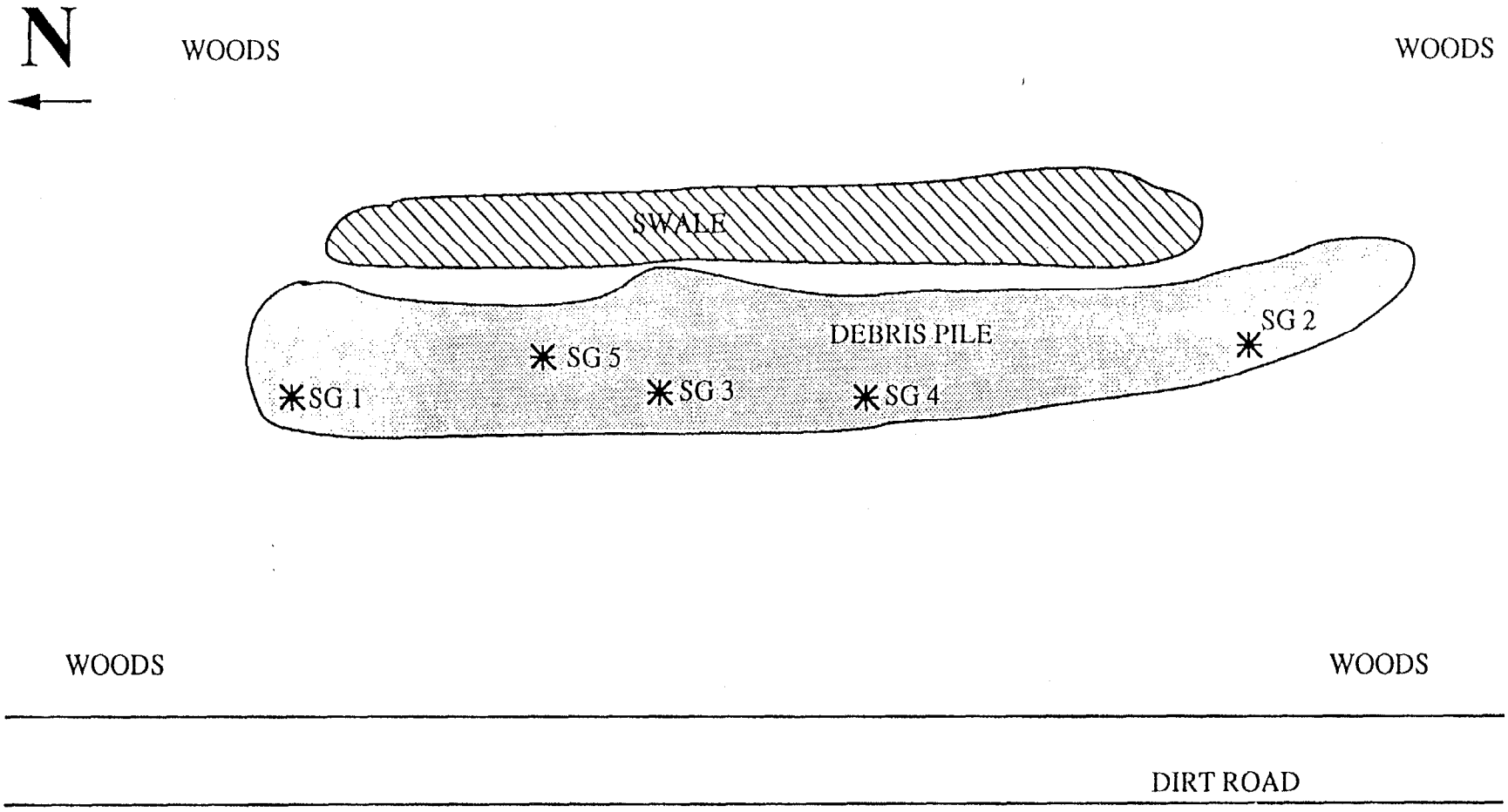
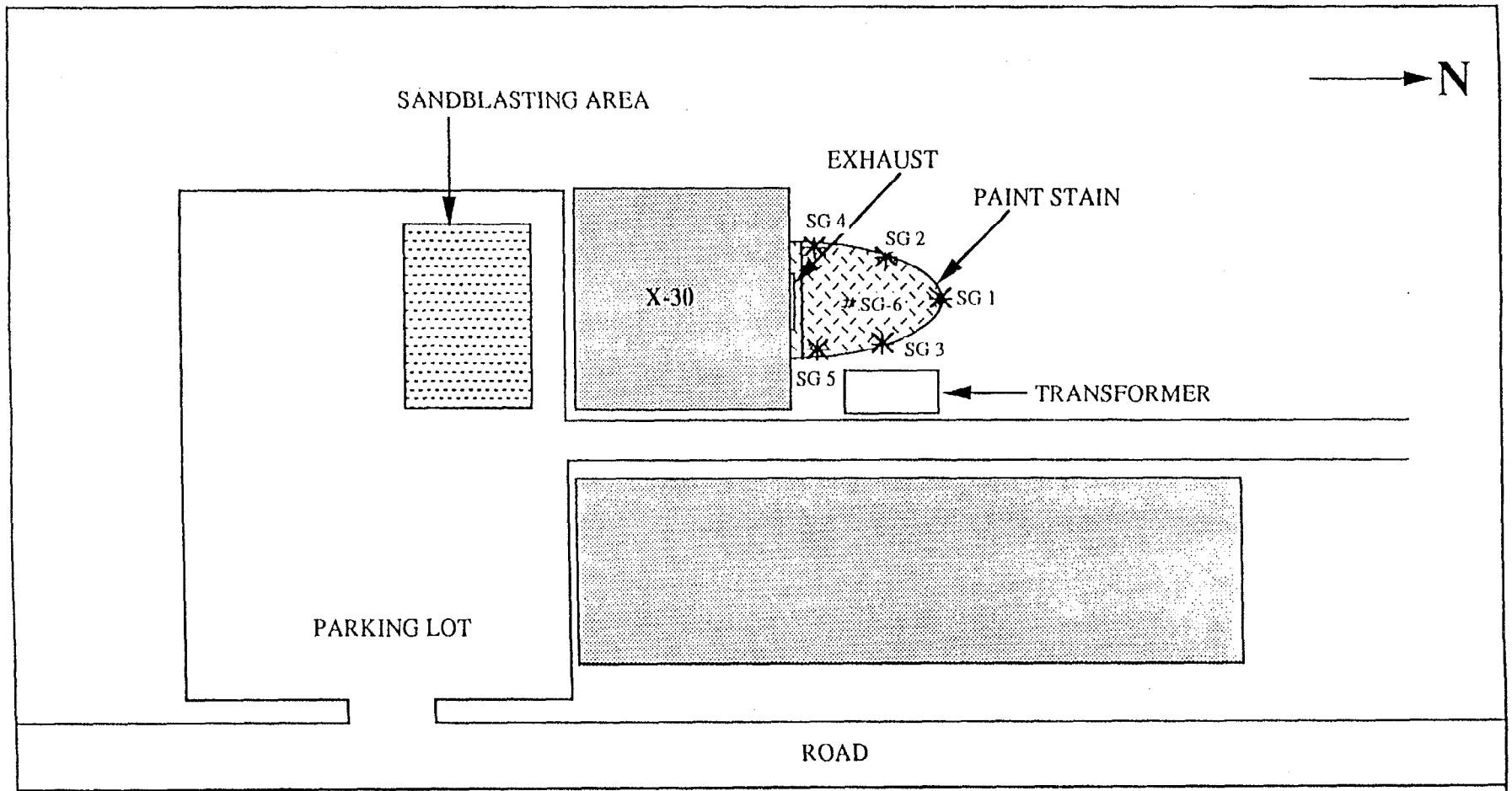


FIGURE 2-4
SOIL GAS SAMPLE LOCATIONS

SITE 4 - DEBRIS PILE, NORTH END OF WALLOPS ISLAND

Metcalf & Eddy



EXPANDED SOIL GAS SAMPLE LOCATION

✳ SOIL GAS SAMPLE LOCATION

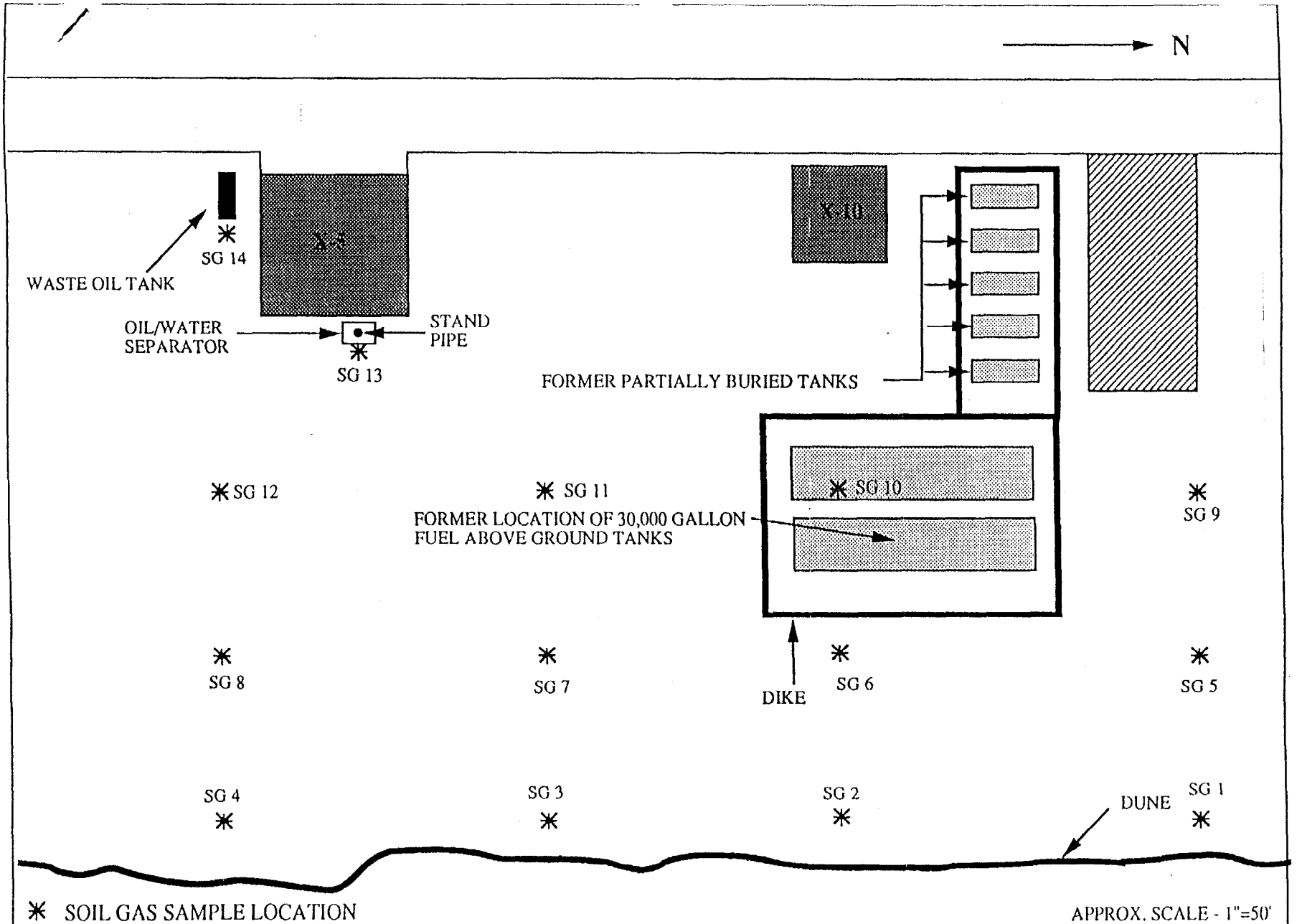
APPROX. SCALE - 1"=20'

Metcalf & Eddy

FIGURE 2-5
SOIL GAS SAMPLE LOCATIONS

SITE 5 - PAINT STAIN, BUILDING X-30

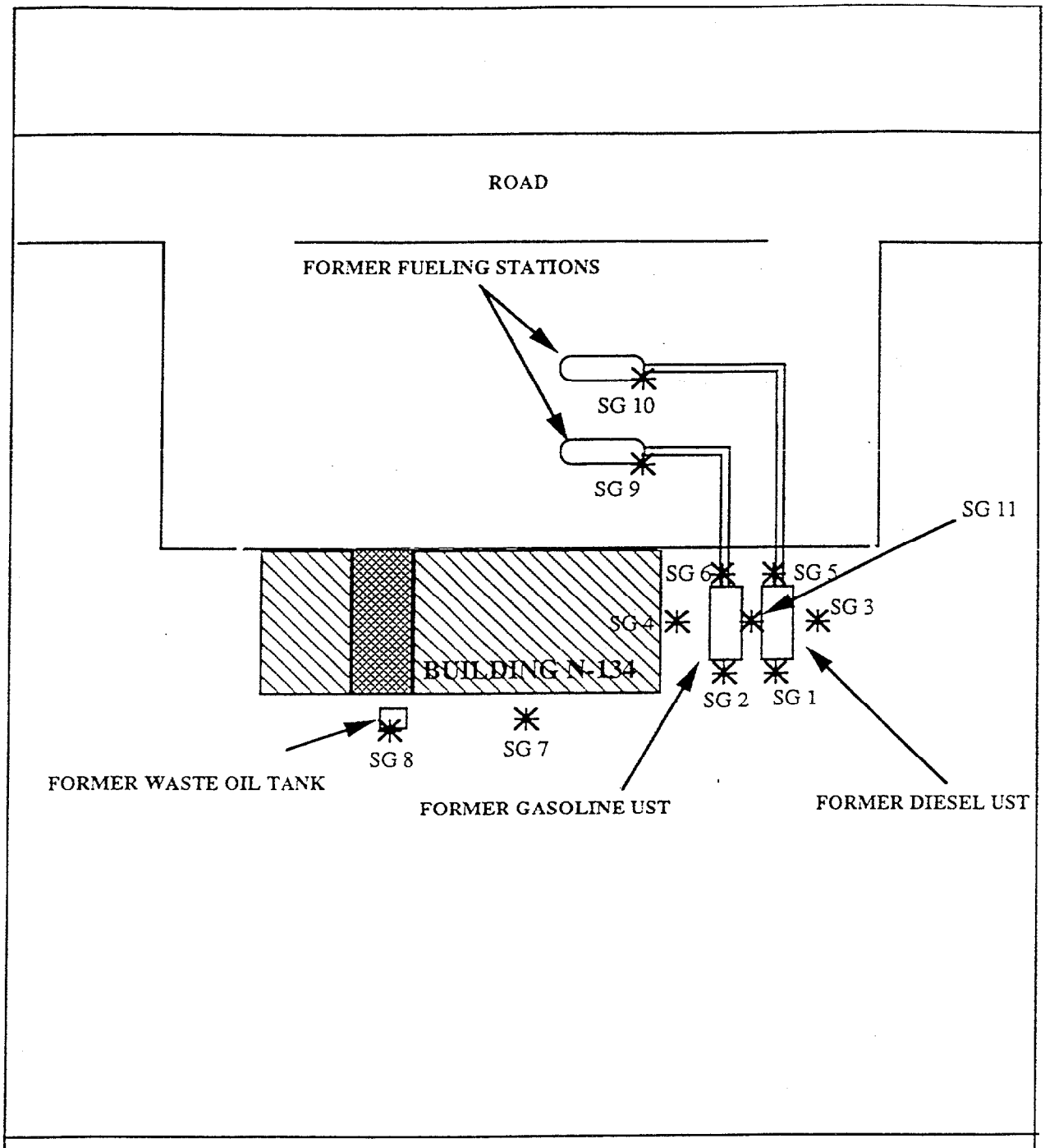
7/23/93



Metcalf & Eddy

FIGURE 2-6
SOIL GAS SAMPLE LOCATIONS

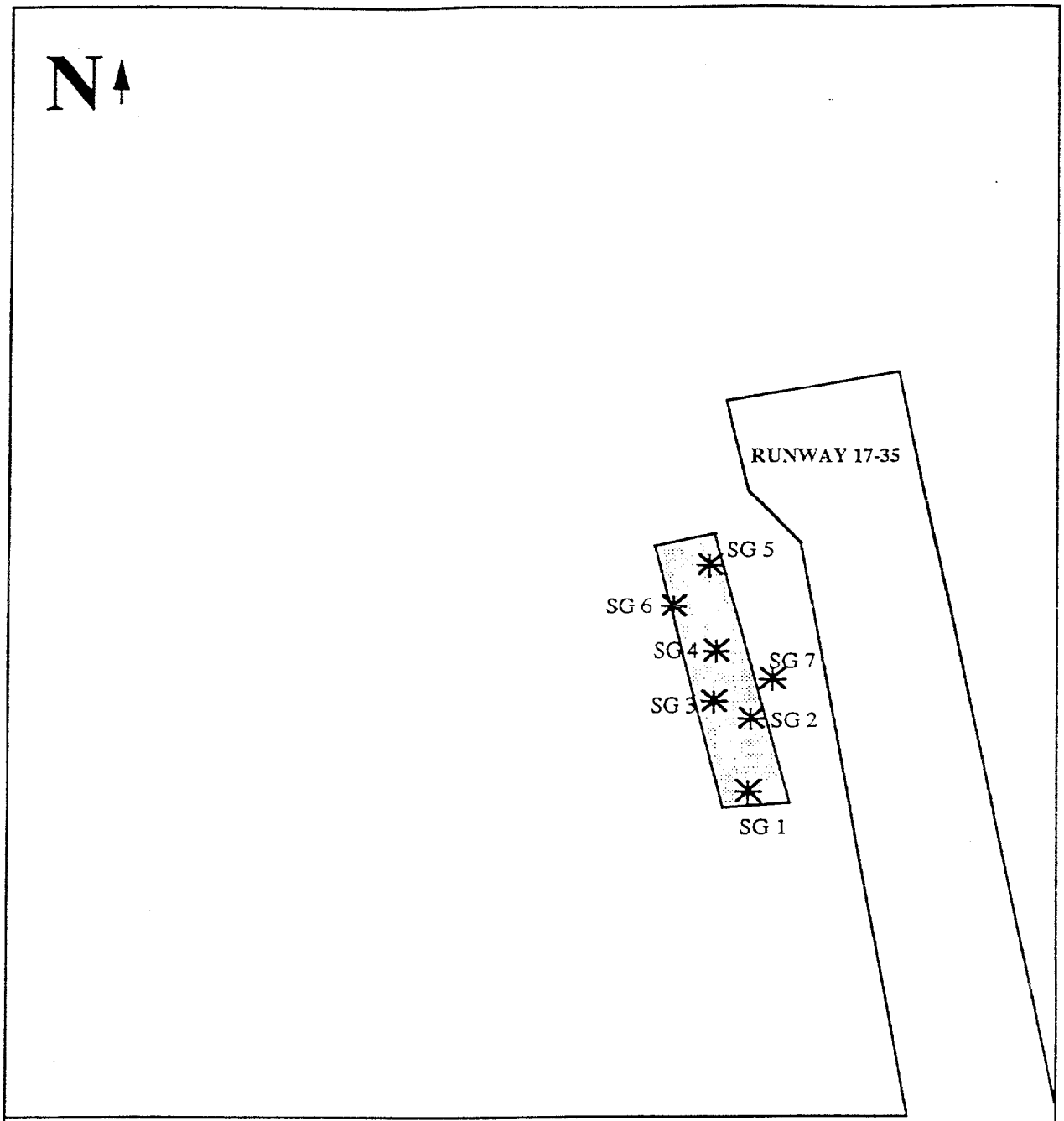
SITE 6 - FORMER ISLAND FUELING SYSTEM, BUILDINGS X-5 AND X-10



Metcalf & Eddy

FIGURE 2-7
SOIL GAS SAMPLE LOCATIONS

SITE 8 - FORMER MAIN BASE FUELING SYSTEM, BUILDING N-134



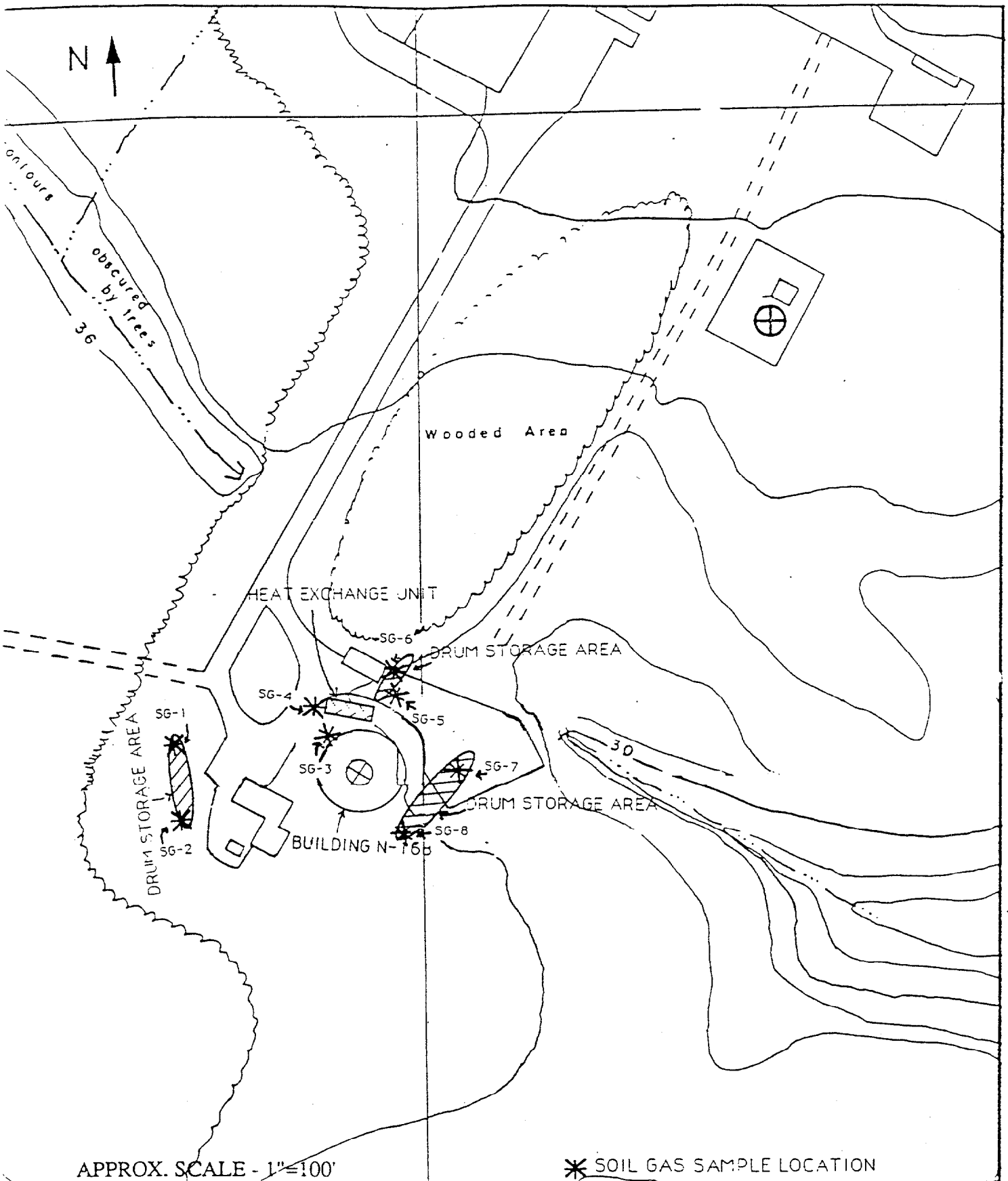
✳ SOIL GAS SAMPLE LOCATION

APPROX. SCALE - 1"=120'

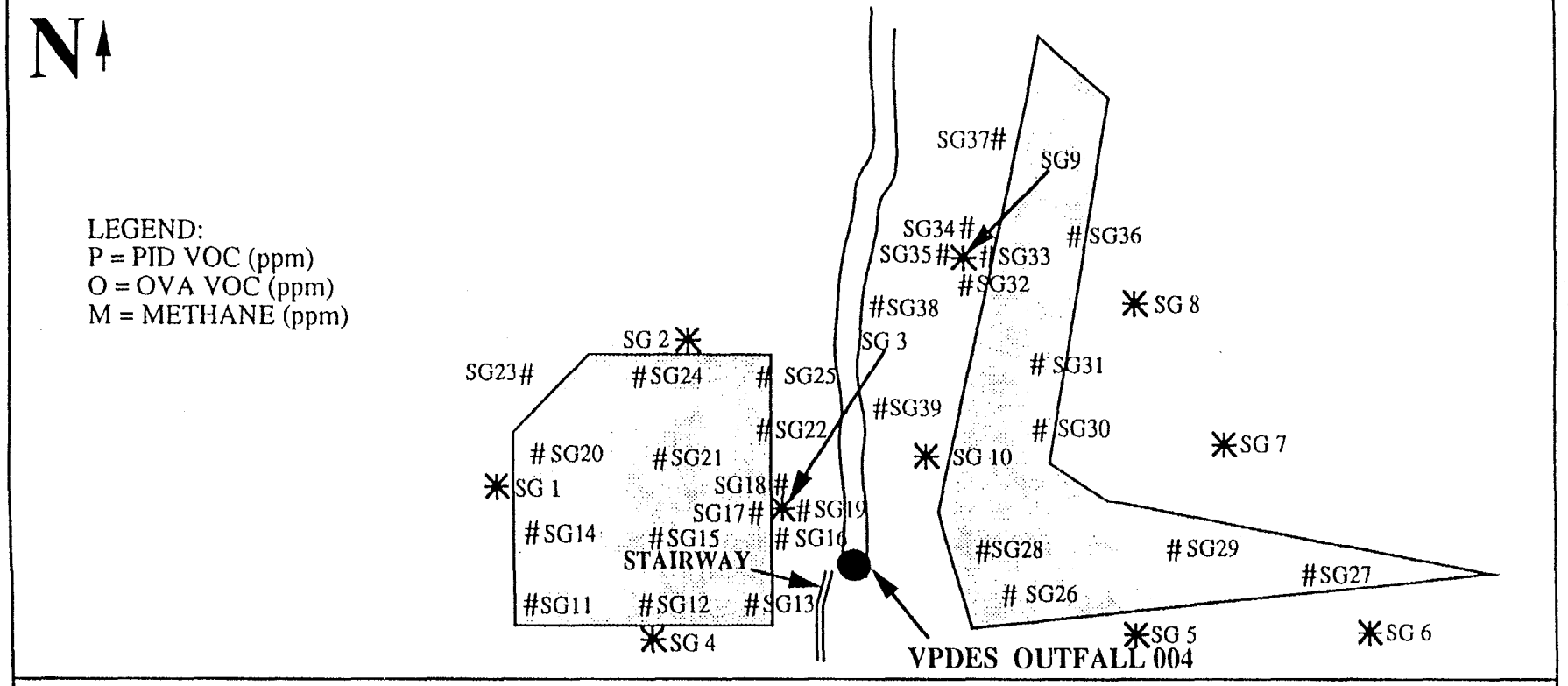
Metcalf & Eddy

FIGURE 2-8
SOIL GAS SAMPLE LOCATIONS

SITE 9 - ABANDONED DRUM FIELD, ALONG RUNWAY 17-35



M&E Metcalf & Eddy	**FIGURE 2-9** **SOIL GAS SAMPLE LOCATIONS**	SITE 10 - ADAS, BUILDING N-168 SOURCE: Stephen A. Estrin, Inc., 1977

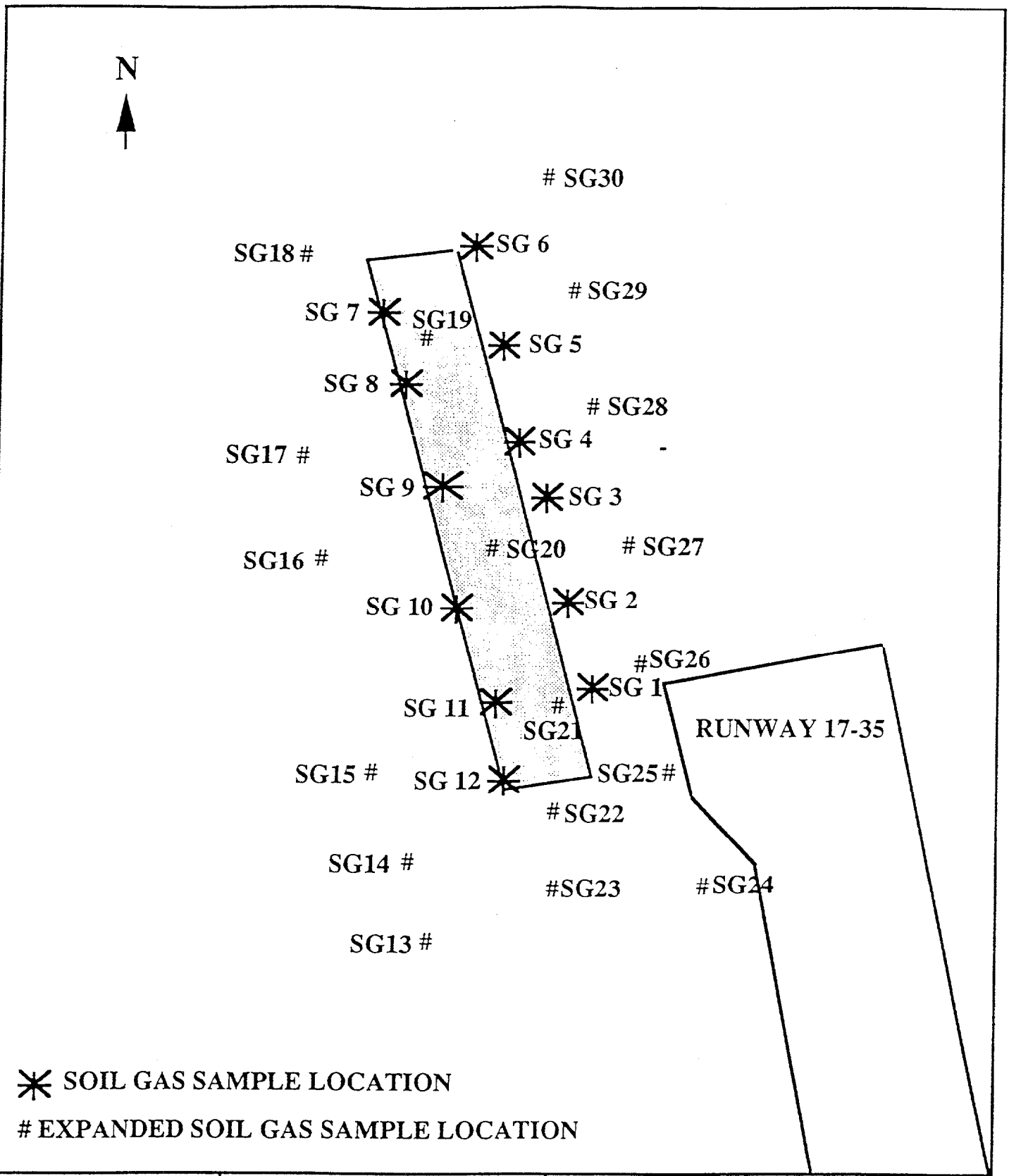


Metcalf & Eddy

FIGURE 2-10
POSITIVE SOIL GAS RESULTS

SITE 14 - DEBRIS PILE, NORTH OF RUNWAY 10-28

7/23/93



Metcalf & Eddy	FIGURE 2-8 SOIL GAS SAMPLE LOCATIONS	SITE 15 - ABANDONED DRUM FIELD, ALONG RUNWAY 17-35 APPROX. SCALE - 1"=120'

TABLE 2-1 SOIL GAS SAMPLE IDENTIFICATION

SAMPLE ID	DATE COLLECTED	DEPTH (FT)
Site 1 - Old Wastewater Treatment Plant		
WFF1-SG1	3/11/93	5
WFF1-SG2	3/11/93	3
WFF1-SG3	3/11/93	5
WFF1-SG4	3/11/93	4
WFF1-SG5	3/11/93	2.5
WFF1-SG6	3/11/93	5
Site 2 - Building E-52		
WFF2-SG1	3/22/93	4
WFF2-SG2	3/22/93	4
WFF2-SG3	3/22/93	5
WFF2-SG4	3/22/93	6
WFF2-SG5	3/22/93	8
WFF2-SG6	3/22/93	2
WFF2-SG7	3/22/93	2.5
WFF2-SG8	3/22/93	4
WFF2-SG9	3/22/93	8
WFF2-SG10	3/22/93	8
WFF2-SG11	3/22/93	8
WFF2-SG12	3/22/93	2.5
WFF2-SG13	3/22/93	7
WFF2-SG14	3/22/93	7

TABLE 2-1 SOIL GAS SAMPLE IDENTIFICATION (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)
Site 2 - Continued		
WFF2-SG15	6/9/93	4
WFF2-SG16	6/9/93	5
WFF2-SG17	6/10/93	5
WFF2-SG18	6/10/93	5
WFF2-SG19	6/10/93	3
WFF2-SG20	6/9/93	8
WFF2-SG21	6/9/93	5
WFF2-SG22	6/10/93	8
WFF2-SG23	6/10/93	5
WFF2-SG24	6/10/93	15
WFF2-SG25	6/9/93	15
WFF2-SG26	6/9/93	3
WFF2-SG27	6/10/93	5
WFF2-SG28	6/10/93	9
WFF2-SG29	6/10/93	5
WFF2-SG30	6/9/93	8
WFF2-SG31	6/9/93	13
WFF2-SG32	6/10/93	9
WFF2-SG33	6/10/93	5
WFF2-SG34	6/10/93	12
WFF2-SG35	6/11/93	5

TABLE 2-1 SOIL GAS SAMPLE IDENTIFICATION (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)
Site 2 - Continued		
WFF2-SG36	6/11/93	5
WFF2-SG37	6/11/93	5
WFF2-SG38	6/11/93	5
WFF2-SG39	6/11/93	5
WFF2-SG40	6/11/93	5
WFF2-SG41	6/11/93	5
WFF2-SG42	6/11/93	5
WFF2-SG43	6/11/93	5
WFF2-SG44	6/11/93	5
Site 3 - Buildings A-46A and A-46B		
WFF3-SG1	3/20/93	6
WFF3-SG2	3/20/93	5
WFF3-SG3	3/20/93	6
WFF3-SG4	3/20/93	5
WFF3-SG5	3/20/93	6
WFF3-SG6	3/20/93	5
WFF3-SG7	3/20/93	6
WFF3-SG8	3/21/93	4
WFF3-SG9	3/21/93	5
WFF3-SG10	3/21/93	4
WFF3-SG11	3/21/93	4

TABLE 2-1 SOIL GAS SAMPLE IDENTIFICATION (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)
Site 3 - Continued		
WFF3-SG12	3/22/93	4
WFF3-SG13	3/22/93	5
Site 4 - Wallops Island Debris Pile		
WFF4-SG1	3/11/93	2
WFF4-SG2	3/11/93	1.5
WFF4-SG3	3/11/93	1
WFF4-SG4	3/11/93	1.5
WFF4-SG5	3/11/93	2
Site 5 - Paint Stain, Building X-30		
WFF5-SG1	3/9/932	2
WFF5-SG2	3/9/93	2
WFF5-SG3	3/9/93	2
WFF5-SG4	3/9/93	2
WFF5-SG5	3/9/93	2
WFF5-SG6	6/14/93	2
Site 6 - Former Wallops Island Fueling System		
WFF6-SG1	3/19/93	3
WFF6-SG2	3/19/93	3
WFF6-SG3	3/19/93	3
WFF6-SG4	3/19/93	3
WFF6-SG5	3/19/93	4

TABLE 2-1 SOIL GAS SAMPLE IDENTIFICATION (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)
Site 6 - Continued		
WFF6-SG6	3/19/93	4
WFF6-SG7	3/19/93	4
WFF6-SG8	3/19/93	4
WFF6-SG9	3/19/93	5
WFF6-SG10	3/19/93	5
WFF6-SG11	3/19/93	4
WFF6-SG12	3/19/93	4
WFF6-SG13	3/19/93	4
WFF6-SG14	3/19/93	4
Site 8 - Former Main Base Fueling System		
WFF8-SG1	3/17/93	5
WFF8-SG2	3/17/93	5
WFF8-SG3	3/17/93	5
WFF8-SG4	3/18/93	3
WFF8-SG5	3/17/93	5
WFF8-SG6	3/18/93	5
WFF8-SG7	3/18/93	3.5
WFF8-SG8	3/18/93	3
WFF8-SG9	3/20/93	5
WFF8-SG10	3/20/93	5
WFF8-SG11	3/20/93	6.5

TABLE 2-1 SOIL GAS SAMPLE IDENTIFICATION (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)
Site 9 - Abandoned Drum Field, Along Runway 17-35		
WFF9-SG1	3/21/93	2.5
WFF9-SG2	3/21/93	2.5
WFF9-SG3	3/21/93	2.5
WFF9-SG4	3/21/93	2.5
WFF9-SG5	3/21/93	2.5
WFF9-SG6	3/21/93	2.5
WFF9-SG7	3/21/93	4
Site 10 - ADAS, Building N-168		
WFF10-SG1	3/18/93	2
WFF10-SG2	3/18/93	1.5
WFF10-SG3	3/18/93	2
WFF10-SG4	3/18/93	2
WFF10-SG5	3/18/93	2
WFF10-SG6	3/18/93	2
WFF10-SG7	3/18/93	1
WFF10-SG8	3/18/93	1
Site 14 - Debris Pile North of Runway 10-28		
WFF14-SG1	3/9/93	3.5
WFF14-SG2	3/9/93	2.5
WFF14-SG3	3/17/93	2
WFF14-SG4	3/17/93	8

TABLE 2-1 SOIL GAS SAMPLE IDENTIFICATION (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)
Site 14 - Continued		
WFF14-SG5	3/17/93	5
WFF14-SG6	3/17/93	5
WFF14-SG7	3/17/93	8
WFF14-SG8	3/17/93	1.5
WFF14-SG9	3/17/93	1.5
WFF14-SG10	3/17/93	1.5
WFF14-SG11	6/11/93	5
WFF14-SG12	6/11/93	9
WFF14-SG13	6/11/93	5
WFF14-SG14	6/11/93	10
WFF14-SG15	6/11/93	9
WFF14-SG16	6/11/93	1.5
WFF14-SG17	6/11/93	2.5
WFF14-SG18	6/11/93	2
WFF14-SG19	6/11/93	1
WFF14-SG20	6/11/93	9
WFF14-SG21	6/11/93	12
WFF14-SG22	6/11/93	2
WFF14-SG23	6/11/93	5
WFF14-SG24	6/11/93	8
WFF14-SG25	6/11/93	2

TABLE 2-1 SOIL GAS SAMPLE IDENTIFICATION (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)
Site 14 - Continued		
WFF14-SG26	6/14/93	12
WFF14-SG27	6/14/93	5
WFF14-SG28	6/14/93	9
WFF14-SG29	6/14/93	2.5
WFF14-SG30	6/14/93	7
WFF14-SG31	6/14/93	2.5
WFF14-SG32	6/14/93	2
WFF14-SG33	6/14/93	2
WFF14-SG34	6/14/93	2
WFF14-SG35	6/14/93	1.5
WFF14-SG36	6/14/93	9
WFF14-SG37	6/14/93	2
WFF14-SG38	6/14/93	2
WFF14-SG39	6/14/93	2
Site 15 - Debris Pile, Along Runway 17-35		
WFF15-SG1	3/16/93	8
WFF15-SG2	3/16/93	5
WFF15-SG3	3/16/93	5
WFF15-SG4	3/16/93	8
WFF15-SG5	3/16/93	5
WFF15-SG6	3/16/93	2.5

TABLE 2-1 SOIL GAS SAMPLE IDENTIFICATION (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)
Site 15 - Continued		
WFF15-SG7	3/16.93	2.5
WFF15-SG8	3/16/93	2
WFF15-SG9	3/16/93	1.5
WFF15-SG10	3/16/93	2.5
WFF15-SG11	3/16/93	2
WFF15-SG12	3/16/93	2
WFF15-SG13	6/7/93	2
WFF15-SG14	6/7/93	1
WFF15-SG15	6/7/93	1
WFF15-SG16	6/7/93	1
WFF15-SG17	6/7/93	1
WFF15-SG18	6/7/93	1
WFF15-SG19	6/7/93	3
WFF15-SG20	6/7/93	3
WFF15-SG21	6/7/93	1
WFF15-SG22	6/7/93	3
WFF15-SG23	6/7/93	3
WFF15-SG24	6/7/93	5
WFF15-SG25	6/7/93	5
WFF15-SG26	6/7/93	5
WFF15-SG27	6/7/93	5

TABLE 2-1 SOIL GAS SAMPLE IDENTIFICATION (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)
Site 15 - Continued		
WFF15-SG28	6/9/93	5
WFF15-SG29	6/9/93	5.5
WFF15-SG30	6/9/93	5.5

CHAPTER 3.0

SOIL GAS SURVEY RESULTS AND CONCLUSIONS

Soil gas samples were analyzed with both photoionization (detection range 0.1 - 999 parts per million (ppm)) and flame ionization (detection limit 0.2-1000 ppm) detectors. Analytical results for each site are presented in Table 3-1 at the end of the chapter. PID and OVA detector responses may differ for some compounds due to differences in the instruments' relative response factors for various compounds. In addition, the detectors perform differently under different environmental conditions (i.e., cold temperatures and moisture). For example, the PID may give a false reading if a sample has a high moisture content, but this data will not be confirmed by the OVA. Therefore, some variation is seen in the data from the two instruments. However, qualitative conclusions can be drawn from the comparison of the two data sets.

Site 1 - Old Wastewater Treatment Plant. PID readings of 7 ppm and 200 ppm were obtained from samples WFF1-SG1 and WFF1-SG6, respectively (Figure 3-1). WFF1-SG1 was collected to the west of the control house, near a subsurface contact identified by the magnetometer survey. WFF1-SG6 was collected between the process tanks and the sludge beds. The OVA detected no VOCs in either of these samples. This discrepancy is most likely explained by the presence of moisture in the samples.

The OVA had one analytical level greater than the instrument's maximum detection limit (i.e., $>1{,}000$ ppm) from sample WFF1-SG3. This reading was checked with a carbon scrubber, described in Chapter 2.0. The same value was obtained with the scrubber, therefore, it is assumed that WFF1-SG3 contained greater than 1000 ppm of methane, which is a common anaerobic degradation product. This may be indicative of degradation of some type of subsurface carbonaceous material. WFF1-SG2 is located north/northwest of the trickling filter.

Site 2 - Building E-52. Detector readings ranging from non-detect to 289 ppm were obtained at various locations around Building E-52. Sample results are both illustrated on Figure 3-2 and presented in Table 3-1. A strong odor was detected in WFF2-SG13, and soil staining was noted at approximately 6-8 feet. This sample was collected in the approximate location of a former above ground storage tank noted in aerial photographs from the 1960's.

Methane was detected in samples WFF2-SG1 (3.2 ppm), WFF2-SG2 (>1000 ppm), WFF2-SG5 (0.6 ppm), WFF2-SG14 (1.0 ppm), WFF2-SG21 (390 ppm), WFF2-SG27 (450 ppm), WFF2-SG36 (>1000 ppm), and WFF2-SG43 (>1000 ppm). This may be indicative of degradation of some type of subsurface carbonaceous material. The low level detections obtained in areas of soil staining (WFF2-SG6, WFF2-SG7, and WFF2-SG12) indicate that this staining may be due to a nonvolatile substance, or that the VOCs have volatilized.

Site 3 - Two 600,000 Gallon Fuel Tanks, Buildings A-46A and A-46B. Detector readings of <5 ppm (Figure 3-3 and Table 3-1) were obtained in eleven of the thirteen samples collected around these tanks and associated pipelines. The OVA detected 37.4 ppm in sample WFF3-SG1, which is located near monitoring well MW-41. This result, combined with a

previous petroleum detection in the monitoring well, indicates that a leak may be occurring from the tanks or associated piping in this area.

Methane (< 2 ppm) was detected in samples WFF3-SG1, WFF3-SG3, WFF3-SG8, and WFF3-SG10. Low levels of petroleum contamination throughout the area (as indicated in eleven of the thirteen samples) may be contributing to subsurface levels of methane, which is released during anaerobic decomposition of carbonaceous compounds. If this is the case, the heavier-end petroleum hydrocarbons may be present in the subsurface in higher levels than the light end VOCs measured by soil gas.

Site 4 - Debris Pile, North End of Wallops Island. The PID detected 6.7 ppm in WFF4-SG1 and the OVA detected 1 ppm in that sample. These data (Figure 3-4 and Table 3-1) indicate that low-level VOC contamination may be present in the vicinity of this sample. Samples WFF4-SG2 and WFF4-SG5 contained 37.5 and 1.3 ppm, respectively, as analyzed by the PID, but the OVA did not detect VOCs in those samples. Therefore, the PID detections in those samples may have been moisture-related. The OVA detected 1 ppm of methane in WFF2-SG2. This may be indicative of degradation of a carbonaceous material.

Site 5 - Paint Stain, Building X-30. No volatile organics were detected at Site 5 (Table 3-1). No figure is presented in this Chapter for this Site, but sample locations are illustrated on Figure 2-5.

Site 6 - Former Wallops Island Fueling Station. Detections of < 1 ppm were detected by the PID in samples WFF5-SG11 through WFF6-SG14 (Figure 3-5 and Table 3-1). Detectable levels were not obtained near the former tank locations, or toward the dunes (i.e., sample locations WFF6-SG1 through WFF6-SG10). Therefore, it appears that VOCs in the ppm range may not be present in the areas sampled. The OVA detected a methane level of 4.0 ppm in WFF6-SG3, and detected methane levels of < 1 ppm in WFF5-SG7, WFF6-SG10, WFF-SG11, and WFF-SG12. Heavier-end petroleum components may be more prevalent than the light volatile organics detectable by soil gas due to the age of the contamination.

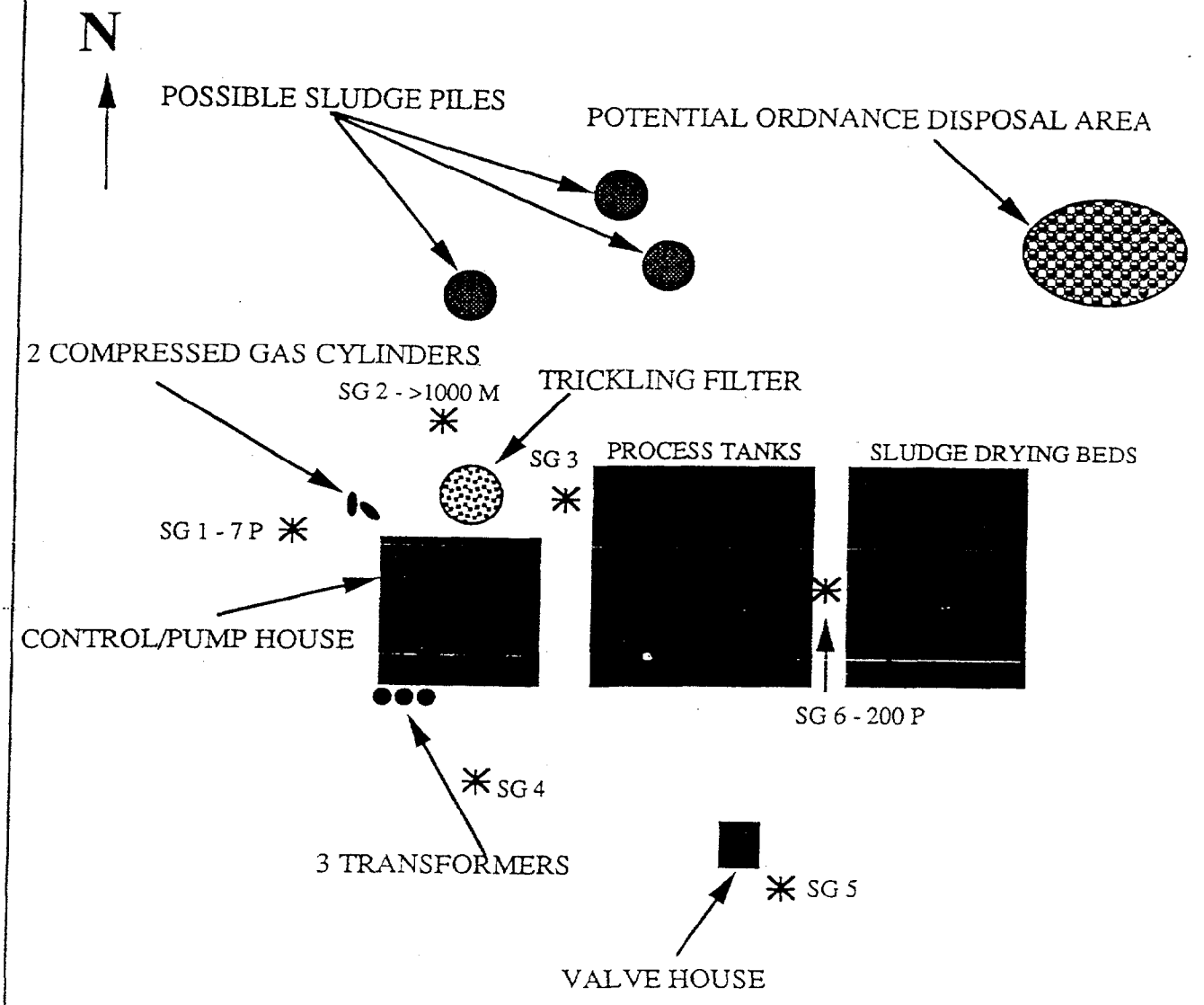
Site 8 - Former Main Base Fueling Station. Contamination was detected (Figure 3-6 and Table 3-1) by the PID in all eleven of the samples collected at Site 8. The lowest PID response was 0.2 ppm (WFF8-SG7), and the highest was 45.7 ppm (WFF8-SG9). The OVA detected 90 ppm in WFF8-SG9, in addition to 110 ppm of methane. Historical records show that this location (WFF8-SG9) was formerly a gasoline pump. Petroleum odors were noted in both WFF8-SG9 and WFF8-SG10. PID and OVA results for WFF8-SG10 were 3.5 and 3.8 ppm, respectively. Historical records show that this location (WFF8-SG10) was formerly a diesel pump. The magnetometer survey in this area indicated that the pipelines from these islands to the former tanks have not been removed. The data indicate that gasoline and diesel lines have leaked near the fueling islands, and that petroleum contamination may be present at the depths sampled in the former tank area which was previously excavated.

Site 9 - Abandoned Drum Field, Along Runway 17-35. The only detection in Site 9 was 0.2 ppm in WFF9S-SG2 as measured by the OVA. This sample was located near a mound of partially-buried drums.

Site 10 - ADAS, Building N-168. Volatile organic compounds were detected in all eight samples collected at this site (Figure 3-8 and Table 3-1). Samples were collected at shallow depths due to the possible presence of surface contamination. Detections of <2 ppm were found with the PID in the former drum storage area located to the west of ADAS, and in the oil-stained areas near the heat exchanger. Significant levels of VOCs (7 to 57.5 ppm) were detected by both detectors in the drum storage area to the north of ADAS. Levels ranging from non-detect to 19.5 ppm were detected by both instruments in the drum storage area located to the southeast of ADAS. Methane (1.0 to 69 ppm) was detected in samples WFF10-SG3 through WFF10-SG6. This could be indicative of subsurface degradation of heavy semi-volatile contaminants, such as compounds present in hydraulic oil.

Site 14 - Debris Pile, North of Runway 10-28. Detectable levels of volatile organics were obtained with the PID in 33 of the 39 samples collected (Figure 3-9 and Table 3-1). Nine of these detections were confirmed with the OVA, and methane was detected in ten of the 39 samples. Sources of VOC contamination may be present at this site.

Site 15 - Debris Pile, Along Runway 17-35. Readings ranging from 0.2 to 46 ppm were detected at Site 15 with both instruments (Figure 3-10 and Table 3-1). The highest readings were obtained in a flat grassy area along the runway. Other lower readings were found scattered throughout the area. The results may be due to volatile organic contamination buried in the debris pile.

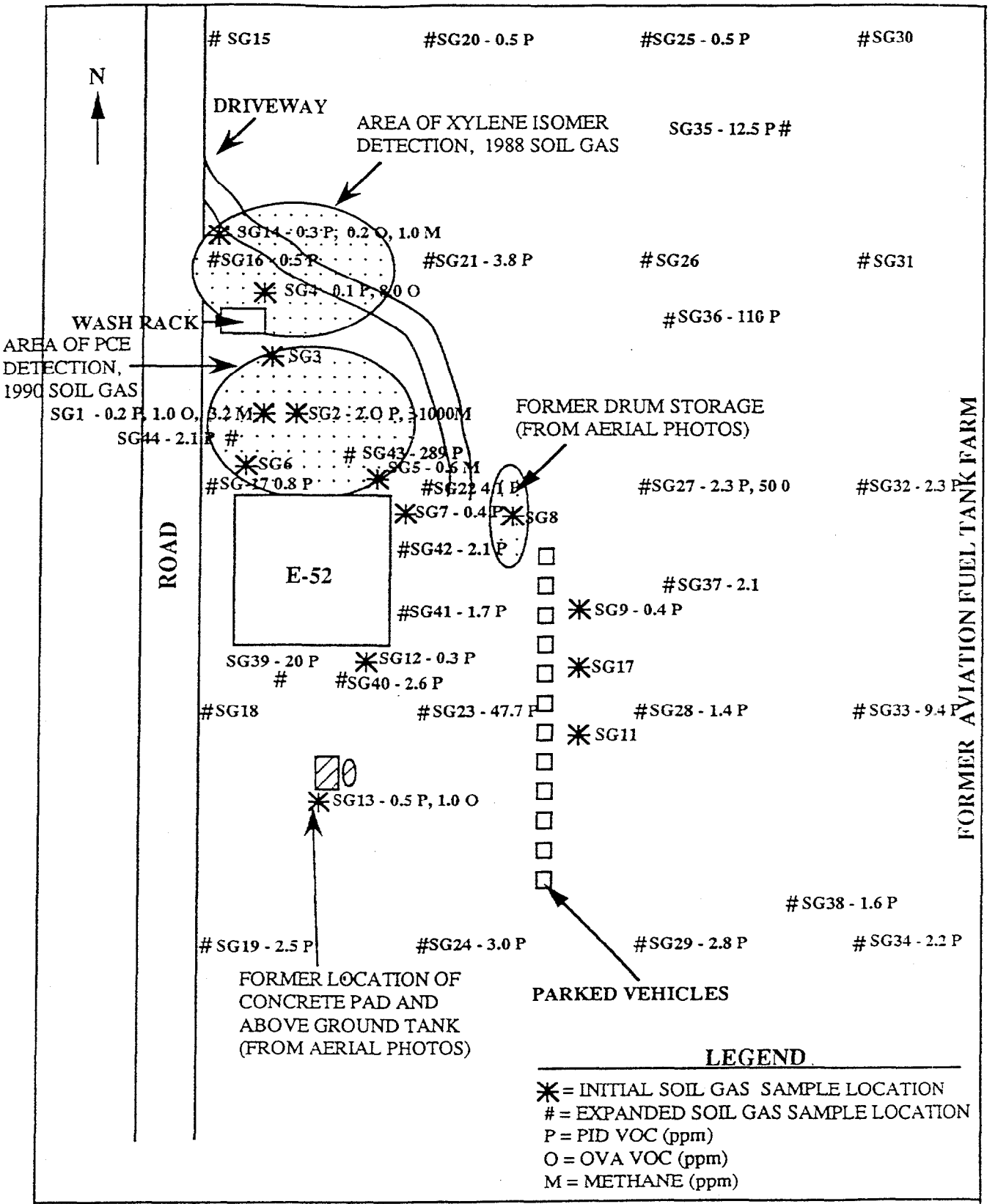


LEGEND:
P = PID VOC (ppm)
O = OVA VOC (ppm)
M = METHANE (ppm)

✳ SOIL GAS SAMPLE LOCATION

APPROX. SCALE - 1"=100'

M&E Metcalf & Eddy	**FIGURE 3-1** **POSITIVE SOIL GAS RESULTS**	**SITE 1 - OLD WASTEWATER TREATMENT PLANT**



Metcalf & Eddy

FIGURE 3-2

SITE 2 - MAINTENANCE FACILITY, BUILDING E-52

APPROX. SCALE - 1"= 200 '

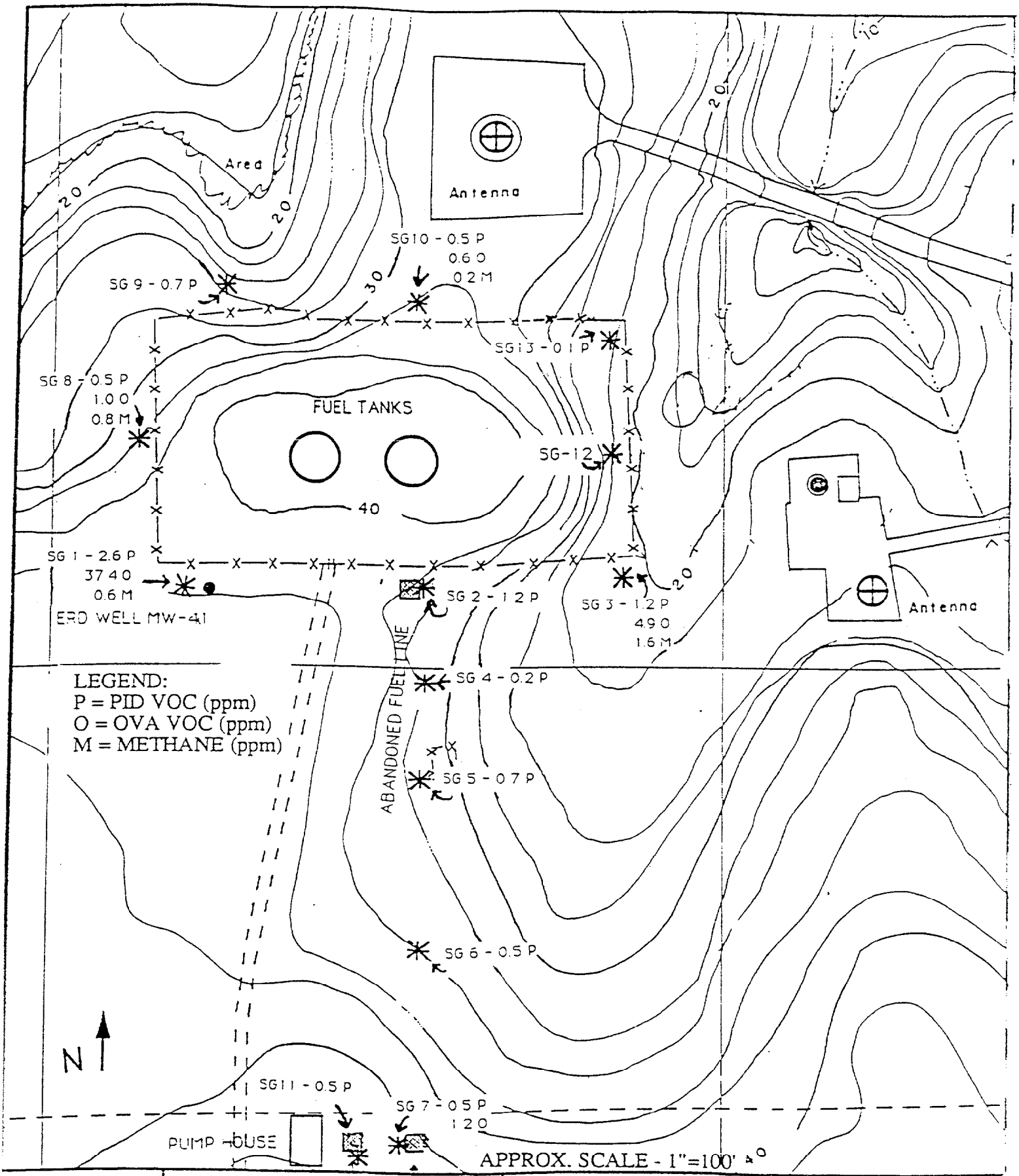
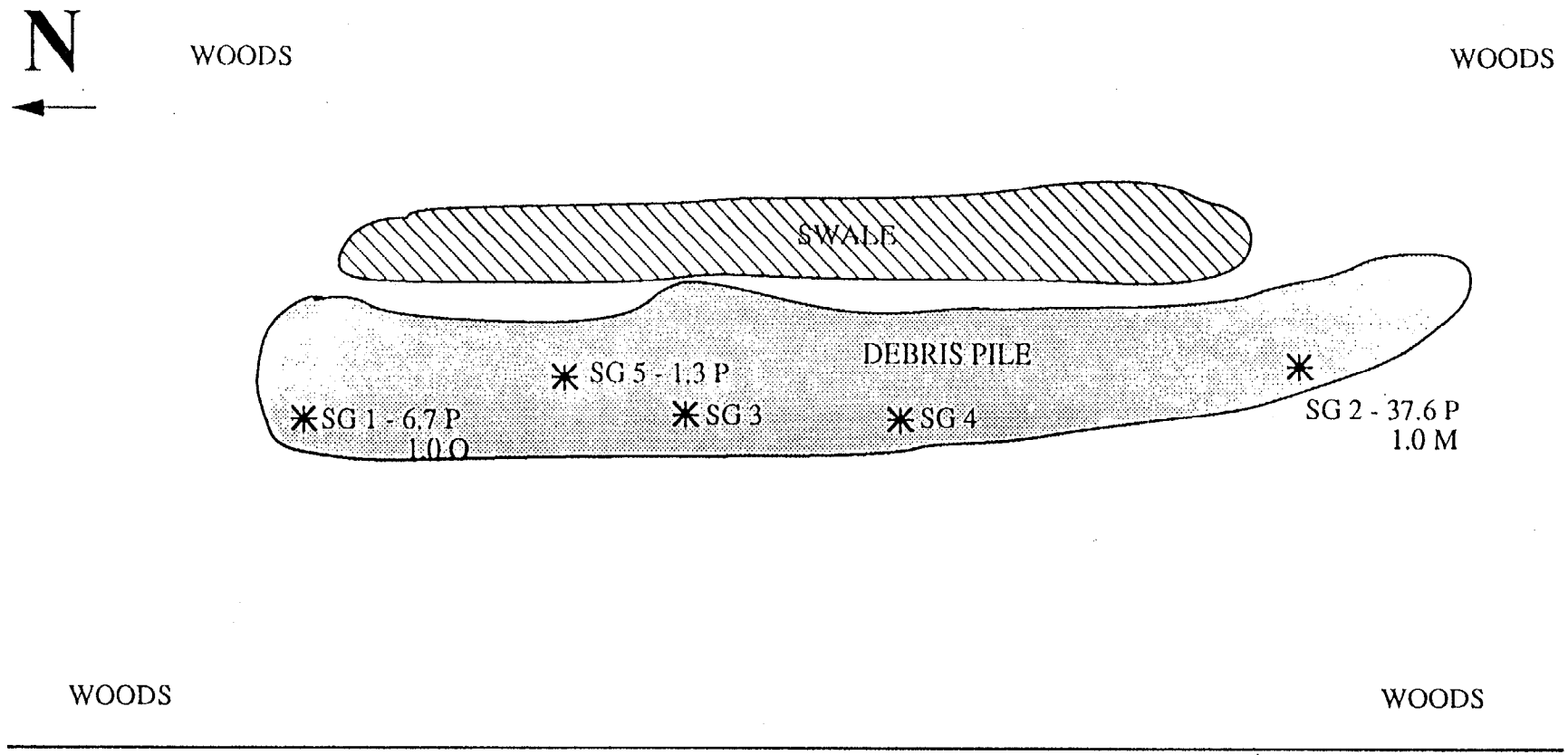


FIGURE 3-3
POSITIVE SOIL GAS RESULTS

SITE 3 - TWO 600,000 GALLON FUEL TANKS, BUILDINGS A-46A AND A-46B

SOURCE: Stephen A. Estrin, Inc., 1977

* SOIL GAS SAMPLE LOCATION



LEGEND:
P = PID VOC (ppm)
O = OVA VOC (ppm)
M = METHANE (ppm)

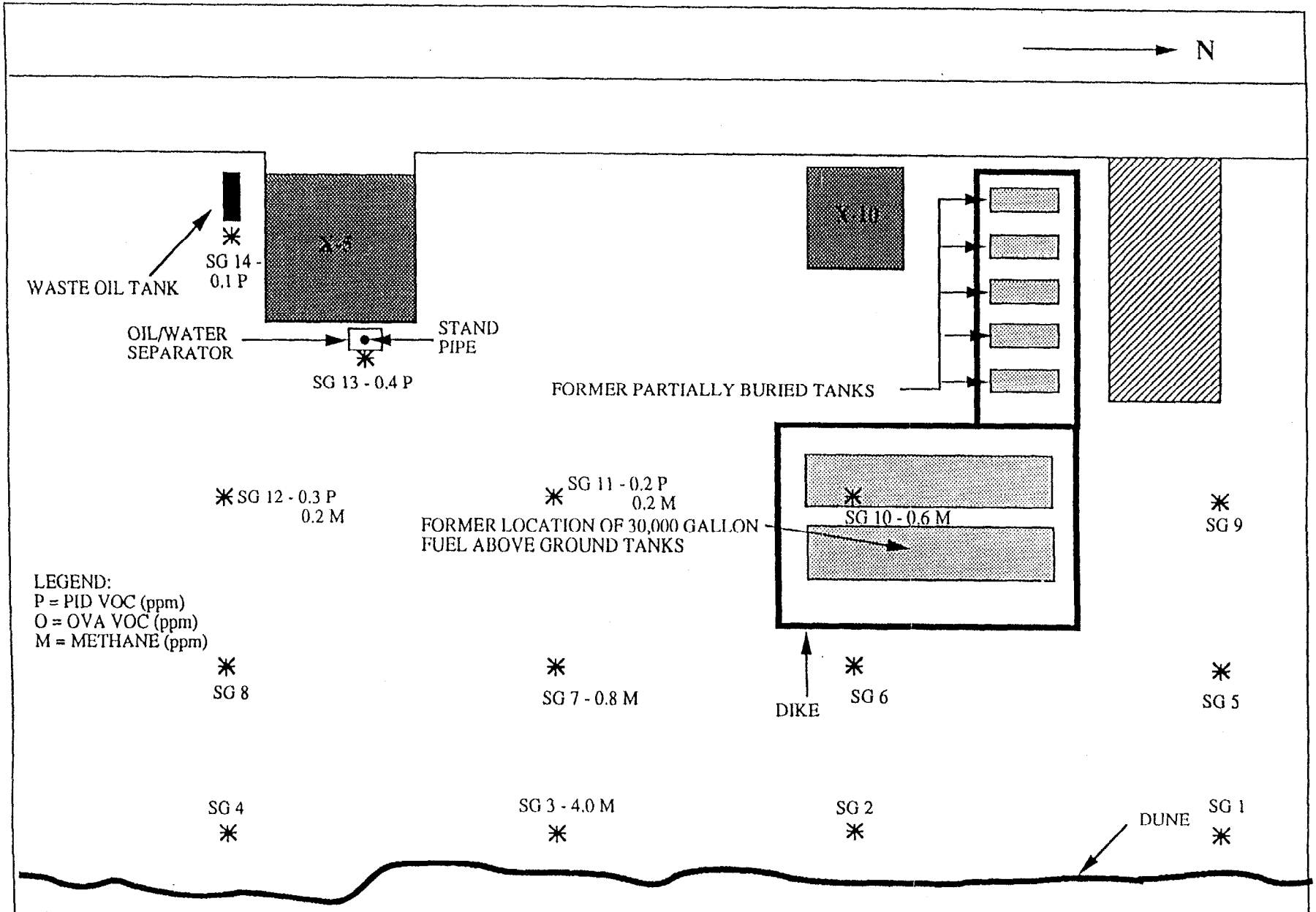
✳ SOIL GAS SAMPLE LOCATION

APPROX. SCALE - 1"=60'

Metcalf & Eddy

FIGURE 3-4
POSITIVE SOIL GAS RESULTS

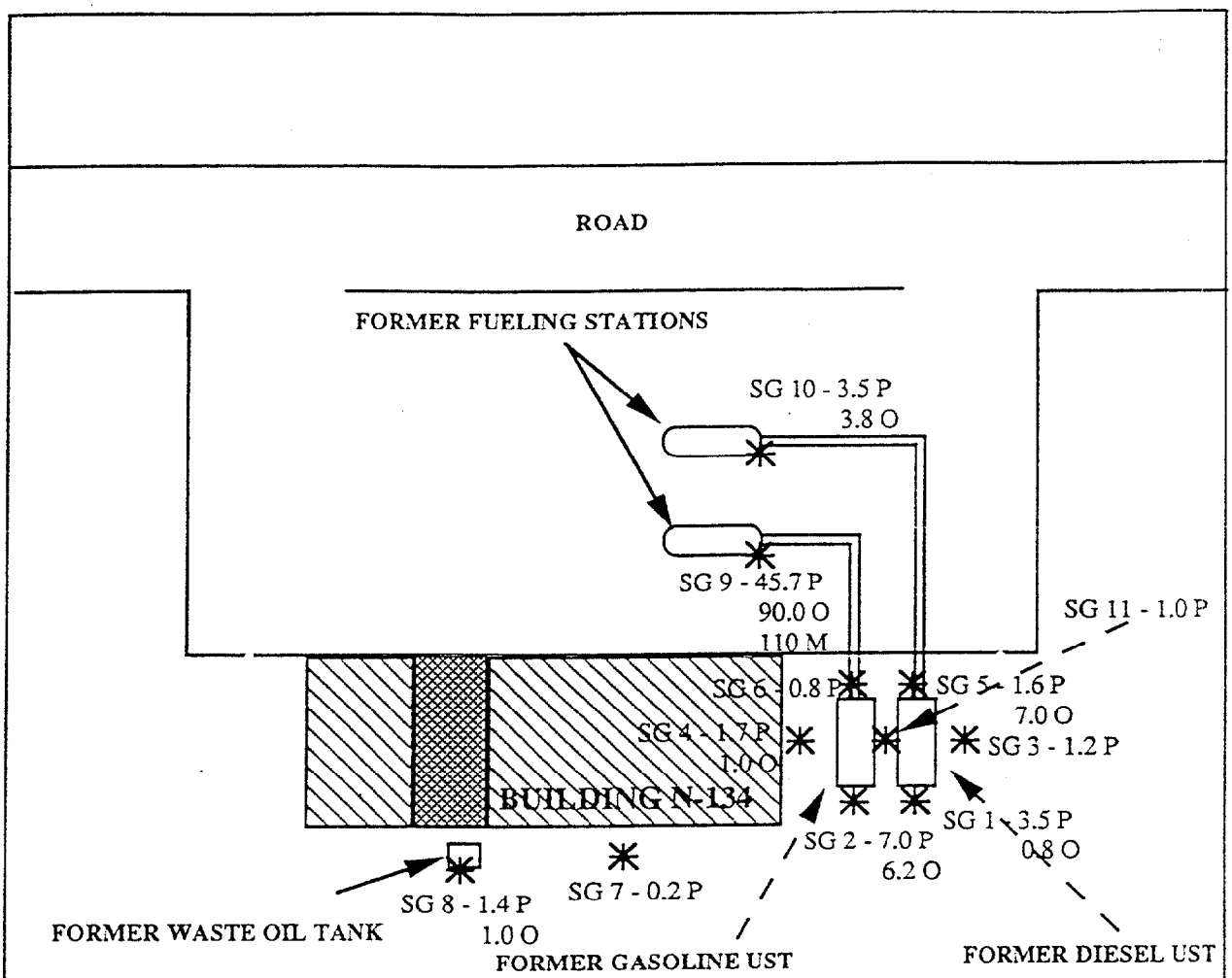
SITE 4 - DEBRIS PILE, NORTH END OF WALLOPS ISLAND



Metcalf & Eddy

FIGURE 3-5
POSITIVE SOIL GAS RESULTS

SITE 6 - FORMER ISLAND FUELING SYSTEM, BUILDINGS X-5 AND X-10



LEGEND:
P = PID VOC (ppm)
O = OVA VOC (ppm)
M = METHANE (ppm)

✳ SOIL GAS SAMPLE LOCATION

N

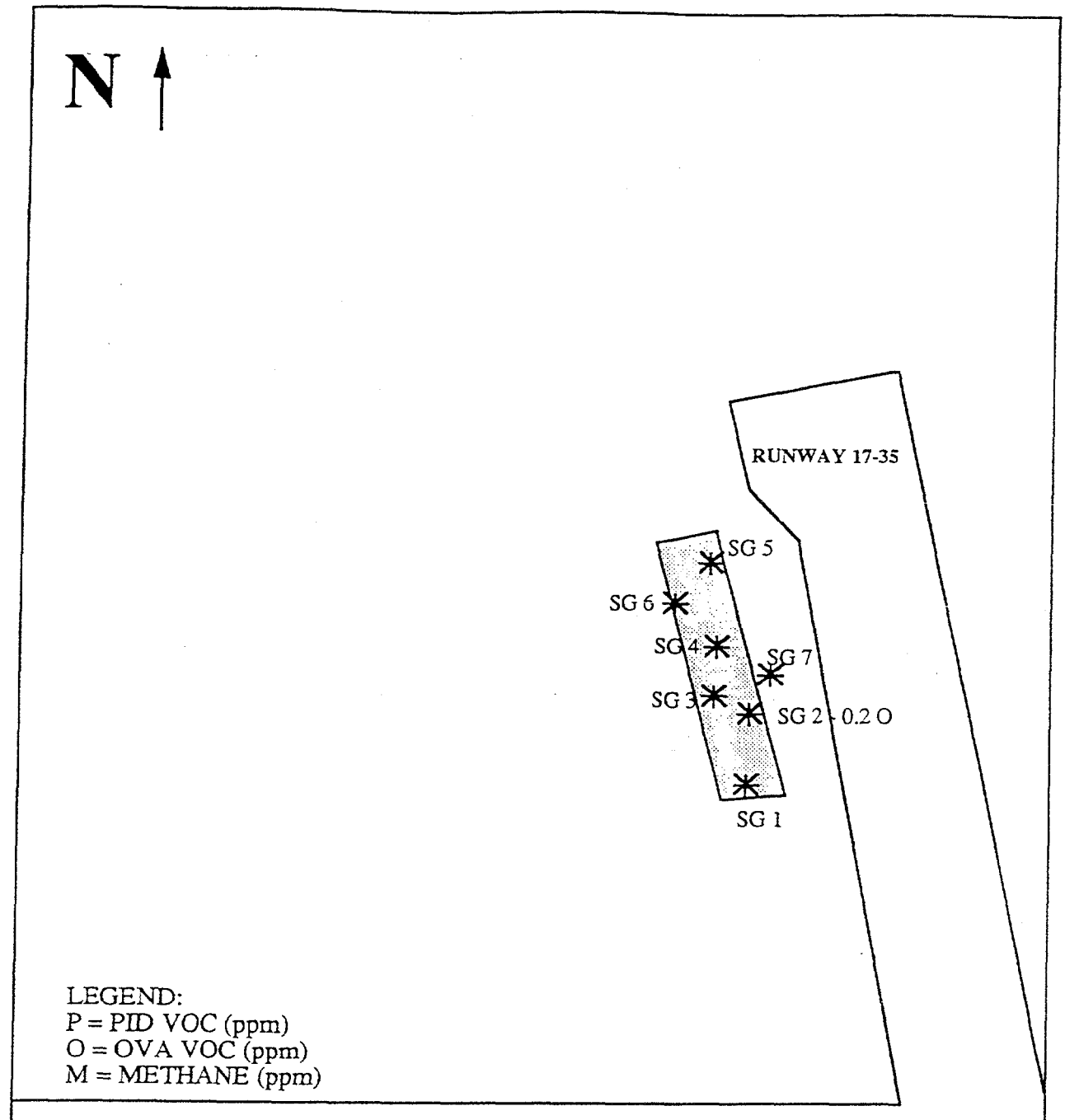
APPROX. SCALE - 1"=50'

Metcalf & Eddy

FIGURE 3-6

POSITIVE SOIL GAS RESULTS

SITE 8 - FORMER MAIN BASE FUELING SYSTEM, BUILDING N-134



✳ SOIL GAS SAMPLE LOCATION

APPROX. SCALE - 1"=120'

Metcalf & Eddy

FIGURE 3-7
POSITIVE SOIL GAS RESULTS

SITE 9 - ABANDONED DRUM FIELD, ALONG RUNWAY 17-35

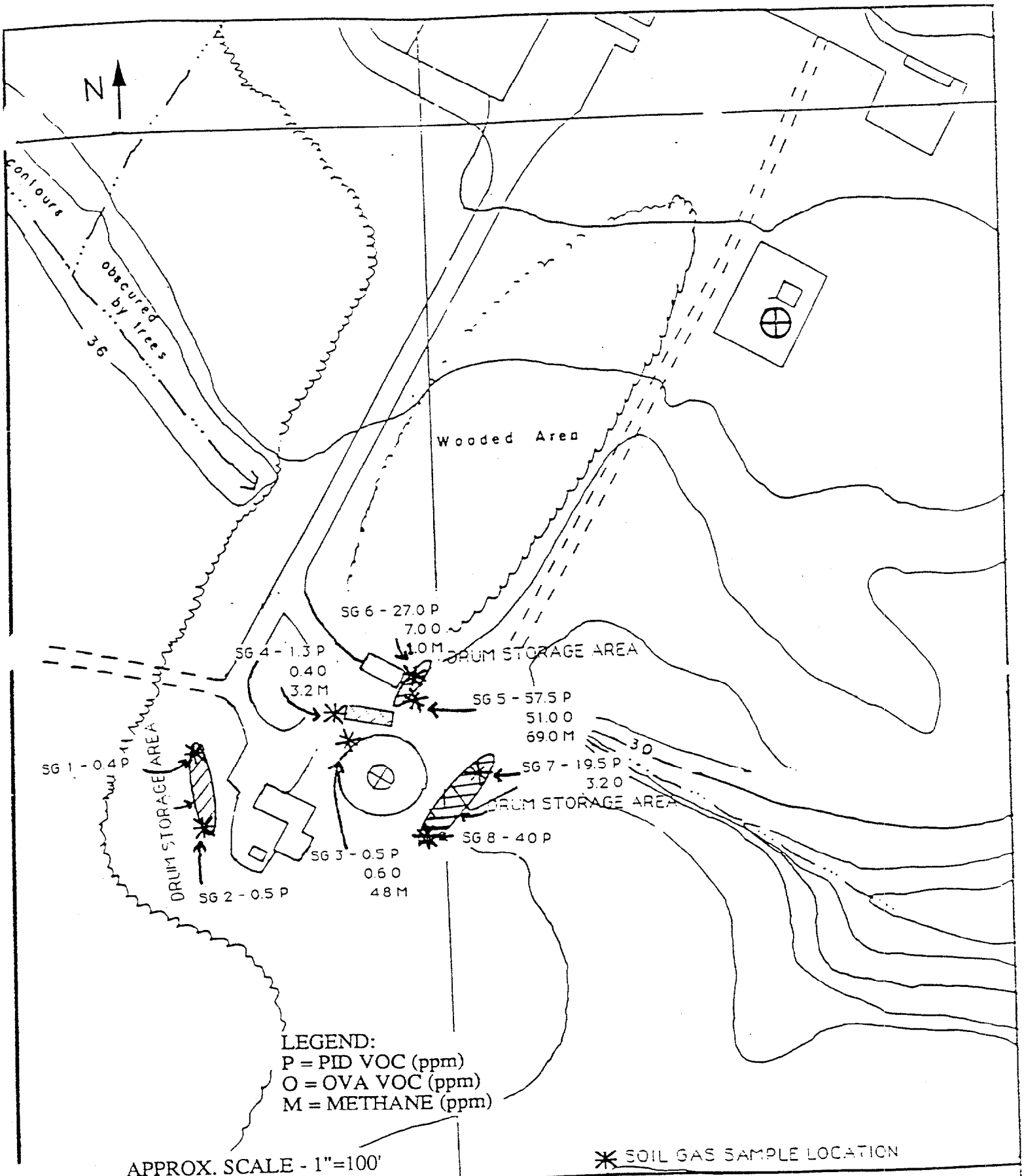
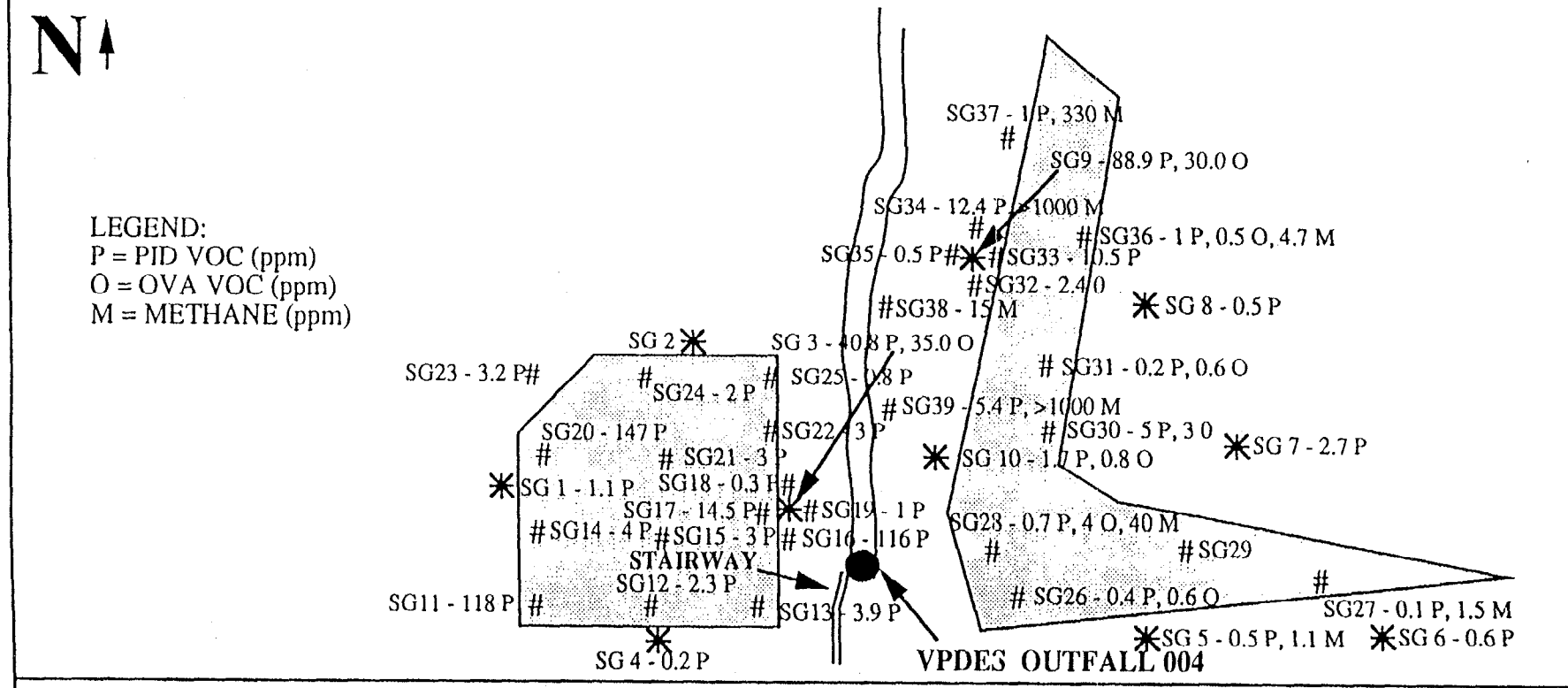


FIGURE 3-8
POSITIVE SOIL GAS RESULTS

SITE 10 - ADAS, BUILDING N-168

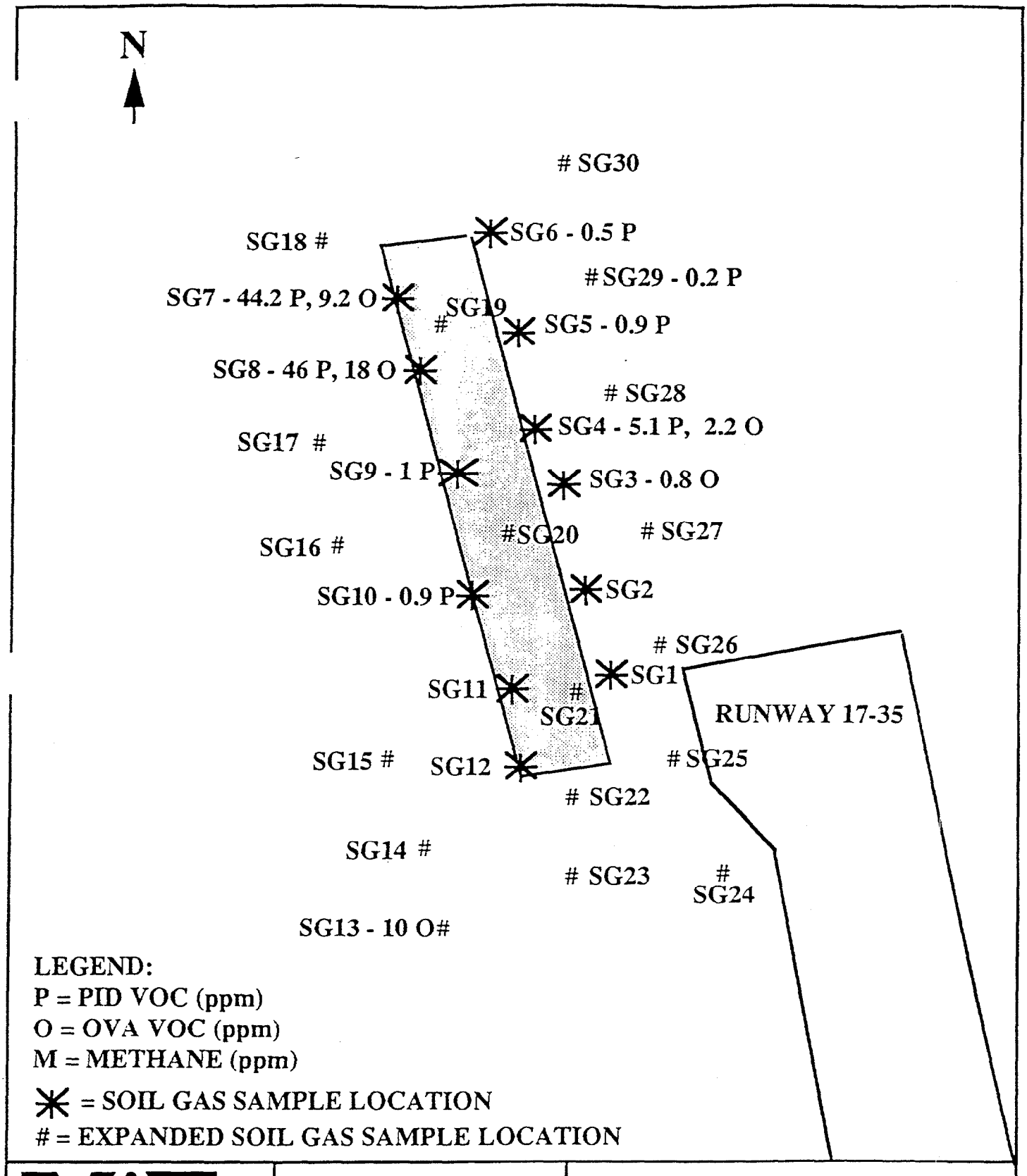
SOURCE: Stephen A. Estrin, Inc., 1977



Metcalf & Eddy

FIGURE 3-9
POSITIVE SOIL GAS RESULTS

SITE 14 - DEBRIS PILE, NORTH OF RUNWAY 10-28



Metcalf & Eddy	FIGURE 3-10 SOIL GAS SAMPLE LOCATIONS	SITE 9 - DEBRIS PILE, ALONG RUNWAY 17-35 APPROX. SCALE - 1"=120'

TABLE 3-1 SOIL GAS SURVEY RESULTS

SAMPLE ID	DATE COLLECTED	DEPTH (FT)	VOC RESULTS (PPM) PID	OVA (minus methane)	NOTES
Site 1 - Old Wastewater Treatment Plant					
WFF1-SG1	3/11/93	5	7	ND	-
WFF1-SG2	3/11/93	3	ND	ND	> 1000 ppm methane detected
WFF1-SG3	3/11/93	5	ND	ND	-
WFF1-SG4	3/11/93	4	ND	ND	-
WFF1-SG5	3/11/93	2.5	ND	ND	-
WFF1-SG6	3/11/93	5	200	ND	-
Site 2 - Building E-52					
WFF2-SG1	3/22/93	4	0.2	1.0	3.2 ppm methane detected
WFF2-SG2	3/22/93	4	2.0	ND	> 1000 ppm methane detected
WFF2-SG3	3/22/93	5	ND	ND	-
WFF2-SG4	3/22/93	6	0.1	8.0	-
WFF2-SG5	3/22/93	8	ND	ND	0.6 ppm methane detected
WFF2-SG6	3/22/93	2	0.1	NR	-
WFF2-SG7	3/22/93	2.5	0.4	ND	-
WFF2-SG8	3/22/93	4	ND	NR	-
WFF2-SG9	3/22/93	8	0.4	ND	-
WFF2-SG10	3/22/93	8	ND	ND	-
WFF2-SG11	3/22/93	8	ND	ND	-

TABLE 3-1 SOIL GAS SURVEY RESULTS (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)	VOC RESULTS (PPM) PID	OVA (minus methane)	NOTES
Site 2 - Continued					
WFF2-SG12	3/22/93	2.5	0.3	NR	-
WFF2-SG13	3/22/93	7	0.5	1.0	Strong odor, stained soil 6-8 ft.
WFF2-SG14	3/22/93	7	0.3	0.2	1.0 ppm methane detected
WFF2-SG15	6/9/93	4	ND	ND	-
WFF2-SG16	6/9/93	5	0.5	ND	-
WFF2-SG17	6/10/93	5	0.8	ND	-
WFF2-SG18	6/10/93	5	ND	ND	-
WFF2-SG19	6/10/93	3	2.5	ND	-
WFF2-SG20	6/9/93	8	0.5	ND	-
WFF2-SG21	6/9/93	5	3.8	ND	390 ppm methane detected
WFF2-SG22	6/10/93	8	4.1	ND	-
WFF2-SG23	6/10/93	5	47.7	ND	-
WFF2-SG24	6/10/93	15	3.0	ND	-
WFF2-SG25	6/9/93	15	0.5	ND	-
WFF2-SG26	6/9/93	3	ND	ND	-
WFF2-SG27	6/10/93	5	2.3	50	450 ppm methane detected
WFF2-SG28	6/10/93	9	1.4	ND	-
WFF2-SG29	6/10/93	5	2.8	ND	-

TABLE 3-1 SOIL GAS SURVEY RESULTS (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)	VOC RESULTS (PPM) PID	OVA (minus methane)	NOTES
Site 2 - Continued					
WFF2-SG30	6/9/93	8	ND	ND	-
WFF2-SG31	6/9/93	13	ND	ND	-
WFF2-SG32	6/10/93	9	2.3	ND	-
WFF2-SG33	6/10/93	5	9.4	ND	-
WFF2-SG34	6/10/93	12	2.2	ND	-
WFF2-SG35	6/11/93	5	12.5	ND	-
WFF2-SG36	6/11/93	5	110	ND	> 1000 ppm methane detected
WFF2-SG37	6/11/93	5	2.1	ND	-
WFF2-SG38	6/11/93	5	1.6	ND	-
WFF2-SG39	6/11/93	5	20	ND	-
WFF2-SG40	6/11/93	5	2.6	ND	-
WFF2-SG41	6/11/93	5	1.7	ND	-
WFF2-SG42	6/11/93	5	2.1	ND	-
WFF2-SG43	6/11/93	5	289	ND	> 1000 ppm methane detected
WFF2-SG44	6/11/93	5	2.1	ND	-
Site 3 - Buildings A-46A and A-46B					
WFF3-SG1	3/20/93	6	2.6	37.4	0.6 ppm methane detected
WFF3-SG2	3/20/93	5	1.2	ND	-

TABLE 3-1 SOIL GAS SURVEY RESULTS (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)	VOC RESULTS (PPM) PID	OVA (minus methane)	NOTES
Site 3 - Continued					
WFF3-SG3	3/20/93	6	1.2	4.9	1.5 ppm methane detected
WFF3-SG4	3/20/93	5	0.2	ND	-
WFF3-SG5	3/20/93	6	0.7	ND	-
WFF3-SG6	3/20/93	5	0.5	ND	-
WFF3-SG7	3/20/93	6	0.5	1.2	-
WFF3-SG8	3/21/93	4	0.5	1.0	0.8 ppm methane detected
WFF3-SG9	3/21/93	5	0.7	ND	-
WFF3-SG10	3/21/93	4	0.5	0.6	0.2 ppm methane detected
WFF3-SG11	3/21/93	4	0.5	ND	-
WFF3-SG12	3/22/93	4	ND	ND	-
WFF3-SG13	3/22/93	5	0.1	ND	-
Site 4 - Wallops Island Debris Pile					
WFF4-SG1	3/11/93	2	6.7	1.0	-
WFF4-SG2	3/11/93	1.5	37.6	ND	1 ppm methane detected
WFF4-SG3	3/11/93	1	ND	ND	-
WFF4-SG4	3/11/93	1.5	ND	ND	-
WFF4-SG5	3/11/93	2	1.3	ND	-

TABLE 3-1 SOIL GAS SURVEY RESULTS (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)	VOC RESULTS (PPM) PID	OVA (minus methane)	NOTES
Site 5 - Paint Stain					
WFF5-SG1	3/9/93	2	ND	ND	-
WFF5-SG2	3/9/93	2	ND	ND	-
WFF5-SG3	3/9/93	2	ND	ND	-
WFF5-SG4	3/9/93	2	ND	ND	-
WFF5-SG5	3/9/93	2	ND	ND	-
WFF5-SG6	6/14/93	2	ND	ND	-
Site 6 - Former Wallops Island Fueling Station					
WFF6-SG1	3/19/93	3	ND	ND	-
WFF6-SG2	3/19/93	3	ND	ND	-
WFF6-SG3	3/19/93	3	ND	ND	4.0 ppm methane detected
WFF6-SG4	3/19/93	3	ND	ND	-
WFF6-SG5	3/19/93	4	ND	ND	-
WFF6-SG6	3/19/93	4	ND	ND	-
WFF6-SG7	3/19/93	4	ND	ND	0.8 ppm methane detected
WFF6-SG8	3/19/93	4	ND	ND	-
WFF6-SG9	3/19/93	5	ND	ND	-
WFF6-SG10	3/19/93	5	ND	ND	0.6 ppm methane detected
WFF6-SG11	3/19/93	4	0.2	ND	0.2 ppm methane detected

TABLE 3-1 SOIL GAS SURVEY RESULTS (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)	VOC RESULTS (PPM) PID	OVA (minus methane)	NOTES
Site 6 - Continued					
WFF6-SG12	3/19/93	4	0.3	ND	0.2 ppm methane detected
WFF6-SG13	3/19/93	4	0.4	ND	-
WFF6-SG14	3/19/93	4	0.1	ND	-
Site 8 - Former Main Base Fueling Station					
WFF8-SG1	3/17/93	5	3.5	0.8	-
WFF8-SG2	3/17/93	5	7.0	6.2	-
WFF8-SG3	3/17/93	5	1.2	ND	-
WFF8-SG4	3/18/93	3	1.7	1.0	-
WFF8-SG5	3/17/93	5	1.6	7.0	-
WFF8-SG6	3/18/93	5	0.8	ND	-
WFF8-SG7	3/18/93	3.5	0.2	ND	-
WFF8-SG8	3/18/93	3	1.4	1.0	-
WFF8-SG9	3/20/93	5	45.7	90.0	110 ppm methane detected
WFF8-SG10	3/20/93	5	3.5	3.8	Strong fuel odor
WFF8-SG11	3/20/93	6.5	1.0	ND	-
Site 9 - Abandoned Drum Field					
WFF9-SG1	3/21/93	2.5	ND	ND	-
WFF9-SG2	3/21/93	2.5	ND	0.2	-

TABLE 3-1 SOIL GAS SURVEY RESULTS (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)	VOC RESULTS (PPM) PID	OVA (minus methane)	NOTES
Site 9 - Continued					
WFF9-SG2	3/21/93	2.5	ND	0.2	-
WFF9-SG3	3/21/93	2.5	ND	ND	-
WFF9-SG4	3/21/93	2.5	ND	ND	-
WFF9-SG5	3/21/93	2.5	ND	ND	-
WFF9-SG6	3/21/93	2.5	ND	ND	-
WFF9-SG7	3/21/93	4	ND	ND	-
Site 10 - ADAS, Building N-168					
WFF10-SG1	3/18/93	2	0.4	ND	-
WFF10-SG2	3/18/93	1.5	0.5	ND	-
WFF10-SG3	3/18/93	2	0.5	0.6	4.8 ppm methane detected
WFF10-SG4	3/18/93	2	1.3	0.4	3.2 ppm methane detected
WFF10-SG5	3/18/93	2	57.5	51.0	69.0 ppm methane detected
WFF10-SG6	3/18/93	2	27.0	7.0	1.0 ppm methane detected
WFF10-SG7	3/18/93	1	19.5	3.2	-
WFF10-SG8	3/18/93	1	4.0	ND	-
Site 14 - Debris Pile, North of Runway 10-28					
WFF14-SG1	3/9/93	3.5	1.1	ND	-
WFF14-SG2	3/9/93	2.5	ND	ND	-

TABLE 3-1 SOIL GAS SURVEY RESULTS (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)	VOC RESULTS (PPM) PID	OVA (minus methane)	NOTES
Site 14 - Continued					
WFF14-SG3	3/17/93	2	40.8	35	-
WFF14-SG4	3/17/93	8	0.2	ND	-
WFF14-SG5	3/17/93	5	0.5	ND	1.1 ppm methane detected
WFF14-SG6	3/17/93	5	0.6	ND	-
WFF14-SG7	3/17/93	8	2.7	ND	-
WFF14-SG8	3/17/93	1.5	0.5	ND	-
WFF14-SG9	3/17/93	1.5	88.9	30	-
WFF14-SG10	3/17/93	1.5	1.7	0.8	-
WFF14-SG11	6/11/93	5	118	ND	-
WFF14-SG12	6/11/93	9	2.3	ND	-
WFF14-SG13	6/11/93	5	3.9	ND	-
WFF14-SG14	6/11/93	10	4.0	ND	-
WFF14-SG15	6/11/93	9	3.0	ND	-
WFF14-SG16	6/11/93	1.5	116	ND	Shallow water table
WFF14-SG17	6/11/93	2.5	14.5	ND	Shallow water table
WFF14-SG18	6/11/93	2	0.3	ND	Shallow water table
WFF14-SG19	6/11/93	1	1.0	ND	Shallow water table
WFF14-SG20	6/11/93	9	147	ND	-
WFF14-SG21	6/11/93	12	3.0	ND	Encountered water at 15 feet

TABLE 3-1 SOIL GAS SURVEY RESULTS (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)	VOC RESULTS (PPM) PID	OVA (minus methane)	NOTES
Site 14 - Continued					
WFF14-SG22	6/11/93	2	3.0	ND	-
WFF14-SG23	6/11/93	5	3.2	ND	6.0 ppm methane detected
WFF14-SG24	6/11/93	8	2.0	ND	-
WFF14-SG25	6/11/93	2	0.8	ND	-
WFF14-SG26	6/14/93	12	0.4	0.6	-
WFF14-SG27	6/14/93	5	0.1	ND	1.5 ppm methane detected
WFF14-SG28	6/14/93	9	0.7	4	40 ppm methane detected
WFF14-SG29	6/14/93	2.5	ND	ND	Encountered obstruction repeatedly
WFF14-SG30	6/14/93	7	5.0	3.0	Encountered obstruction repeatedly
WFF14-SG31	6/14/93	2.5	0.2	0.6	Encountered obstruction repeatedly
WFF14-SG32	6/14/93	2	ND	2.4	Shallow water table
WFF14-SG33	6/14/93	2	10.5	ND	Shallow water table, 80 ppm methane detected
WFF14-SG34	6/14/93	2	12.4	ND	Shallow water table, > 1000 ppm methane detected

TABLE 3-1 SOIL GAS SURVEY RESULTS (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)	VOC RESULTS (PPM) PID	OVA (minus methane)	NOTES
Site 14 - Continued					
WFF14-SG35	6/14/93	1.5	0.5	ND	Shallow water table
WFF14-SG36	6/14/93	9	1.0	0.5	4.7 ppm methane detected
WFF14-SG37	6/14/93	2	1.0	ND	Shallow water table, 330 ppm methane detected
WFF14-SG38	6/14/93	2	ND	ND	Shallow water table, 15 ppm methane detected
WFF14-SG39	6/14/93	2	5.4	ND	Shallow water table, > 1000 ppm methane detected
Site 15 - Debris Pile, Along Runway 17-35					
WFF15-SG1	3/16/93	8	ND	ND	-
WFF15-SG2	3/16/93	5	ND	ND	-
WFF15-SG3	3/16/93	5	ND	0.8	-
WFF15-SG4	3/16/93	8	5.1	2.2	-
WFF15-SG5	3/16/93	5	0.9	ND	-
WFF15-SG6	3/16/93	2.5	0.5	ND	-
WFF15-SG7	3/16.93	2.5	44.2	9.2	-
WFF15-SG8	3/16/93	2	46.0	18.0	2 ppm methane detected
WFF15-SG9	3/16/93	1.5	1.0	ND	-
WFF15-SG10	3/16/93	2.5	0.9	ND	-

TABLE 3-1 SOIL GAS SURVEY RESULTS (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)	VOC RESULTS (PPM) PID	OVA (minus methane)	NOTES
Site 15 - Continued					
WFF15-SG11	3/16/93	2	ND	ND	-
WFF15-SG12	3/16/93	2	ND	ND	-
WFF15-SG13	6/7/93	2	ND	10	Shallow groundwater table
WFF15-SG14	6/7/93	1	ND	ND	Shallow groundwater table
WFF15-SG15	6/7/93	1	ND	ND	Shallow groundwater table
WFF15-SG16	6/7/93	1	ND	ND	Shallow groundwater table
WFF15-SG17	6/7/93	1	ND	ND	Shallow groundwater table
WFF15-SG18	6/7/93	1	ND	ND	Shallow groundwater table
WFF15-SG19	6/7/93	3	ND	ND	Shallow groundwater table
WFF15-SG20	6/7/93	3	ND	ND	Shallow groundwater table
WFF15-SG21	6/7/93	1	ND	ND	Encountered obstruction repeatedly
WFF15-SG22	6/7/93	3	ND	ND	-
WFF15-SG23	6/7/93	3	ND	ND	-
WFF15-SG24	6/7/93	5	ND	ND	-
WFF15-SG25	6/7/93	5	ND	ND	-

TABLE 3-1 SOIL GAS SURVEY RESULTS (Continued)

SAMPLE ID	DATE COLLECTED	DEPTH (FT)	VOC RESULTS (PPM) PID	OVA (minus methane)	NOTES
Site 15 - Continued					
WFF15-SG26	6/7/93	5	ND	ND	-
WFF15-SG27	6/7/93	5	ND	ND	-
WFF15-SG28	6/9/93	5	ND	ND	-
WFF15-SG29	6/9/93	5.5	0.2	ND	-
WFF15-SG30	6/9/93	5/5	ND	ND	-

Notes: ND = No detection
NR = No results due to insufficient sample volume

CHAPTER 4.0

RECOMMENDATIONS

Site 1 - Old Wastewater Treatment Plant. M&E recommends collection of subsurface soil samples at three locations: soil gas sample location WFF1-SG2, the sludge piles located north of WFF1-SG2, and soil gas sample location WFF1-SG6. One soil sample at WFF1-SG2 should be collected at a depth of 3 feet to determine what is causing the high level of methane in that area. The methane may be due to the presence of decaying debris, such as wood, or due to the presence of another carbonaceous material, such as sewage sludge. It is recommended that this sample be analyzed for the organic compounds on the target compound list (TCL), the target analyte list (TAL), and for fecal coliforms. A positive detection of fecal coliforms may indicate that sewage sludge is present, and could be causing the methane levels. The TCL is a list of 125 organic compounds, including 34 volatiles, 65 semivolatiles, and 26 pesticides/PCBs. The TAL is a list of 23 metals, plus cyanide. One sample should be collected in the sludge drying beds, and one to three samples should be collected in the potential sludge piles to the north of WFF1-SG2 for the same reason, and analyzed for the same parameters. One soil sample at WFF1-SG6 should be collected at a depth of 5 feet to determine whether organic or metal contamination is present at this location. This sample should be analyzed for TCL and TAL. This site will be forwarded to the Corps of Engineers for further evaluation.

Site 2 - Maintenance Facility, Building E-52. M&E recommends collection of soil samples at the following locations:

Sample #	Location	Depth	Analysis	Rational
1	WFF2-SG2	Field Determined	TCL, TAL, TPH	identify source of soil gas
2	WFF2-SG4	Field Determined	TCL, TAL, TPH	identify source of soil gas
3	WFF2-SG13	Field Determined	TCL, TAL, TPH	identify source of soil gas
4	WFF2-SG18	Field Determined	TCL, TAL, TPH	identify source of soil gas
5	WFF2-SG21	Field Determined	TCL, TAL, TPH	identify source of soil gas
6	WFF2-SG27	Field Determined	TCL, TAL, TPH	identify source of soil gas

Sample #	Location	Depth	Analysis	Rational
7	WFF2-SG35	Field Determined	TCL, TAL, TPH	identify source of soil gas
8	WFF2-SG36	Field Determined	TCL, TAL, TPH	identify source of soil gas
9	WFF2-SG37	Field Determined	TCL, TAL, TPH	identify source of soil gas
10	WFF2-SG43	Field Determined	TCL, TAL, TPH	identify source of soil gas
11	WFF2-SG6, stained area	0-6 inches	TCL, TAL, TPH	identify source of soil staining
12	Stained area South of bollards	0-6 inches	TCL, TAL, TPH	identify source of soil staining
13	WFF2-SG7, stained area	0-6 inches	TCL, TAL, TPH	identify source of soil staining
14	WFF2-SG12, stained area	0-6 inches	TCL, TAL, TPH	identify source of soil staining
15	Stained area SW corner of E-52	0-6 inches	TCL, TAL, TPH	identify source of soil staining

Note*: TPH - Total Petroleum Hydrocarbons

Site 3 - Two 600,000 Gallon Fuel Tanks, Buildings A46-A and A46-B. M&E recommends collection of eight deep soil samples around the former tanks and pipelines. Sample depths should be field determined, and should be based on visual examination, PID/OVA readings, depth of groundwater table, and/or maximum feasible augering depth. One sample should be collected at WFF3-SG1 due to the high soil gas reading and the previous petroleum detection in the nearby well. In addition one sample should be collected on each of the sides of the tanks, at soil gas locations WFF3-SG2, WFF3-SG3, WFF3-SG8, and WFF3-SG10. One sample should be collected along the pipeline, at WFF3-SG5, and two samples should be collected at the valve pits near runway 10-28. All samples should be analyzed for TPH, benzene, toluene, ethyl benzene, xylenes (BTEX), and lead. This site will be forwarded to the Corps of Engineers for further evaluation.

Site 4 - Debris Pile, North End of Wallops Island. M&E recommends collection of shallow (i.e., at or above the groundwater table) subsurface soil samples at each of the three soil gas locations where soil gas OVA levels were detected: WFF4-SG1, WFF4-SG2 and WFF4-SG5. These locations are well-spaced throughout the debris pile and were chosen due to the presence of suspect objects such as drums. In addition, M&E recommends collection of four water and sediment samples from the swale to the east side of the pile. These samples should provide data on compounds which may be leaching from the pile. All of the above samples should be analyzed for the full TCL/TAL parameters, and TPH with fingerprinting. Two background soil, two sediment and two surface water samples should also be collected outside the perimeter of the site on the north end of Wallops Island. Background samples should be

analyzed for TAL to determine naturally occurring metal levels at Wallops Island. In addition, one surface soil sample should be collected for analysis of PCBs near the abandoned oil switch identified in Preliminary Report 1 - UXO/Magnetometer Survey, and one sample should be collected for PCB analysis at each of the abandoned transformers which were located by NASA personnel (Traynor, 1993) during Phase I.

Site 5 - Paint Stain, Building X-30. M&E recommends collection of one surface soil sample and one sample at a 1 foot depth in the center of the paint stain. These samples should be analyzed for the TCL/TAL, with the exception of TCL pesticides/PCBs.

Surface and subsurface (1 foot) soil samples should also be collected to the south and west of the sandblasting pad. These samples should also be analyzed for TCL/TAL, with the exception of TCL pesticides/PCBs. One background surface soil sample and one background subsurface soil sample should be collected for analysis of TAL.

Site 6 - Former Island Fueling System, Buildings X-5 and X-10. M&E recommends collection of ten soil samples. Five should be in the area of the former above ground tanks, with one in the center and four around the outside of the tank locations. Two should be in the area of the former underground tanks. Depths should be field determined, and should be based on visual examination and PID/OVA readings. These samples should be analyzed for TPH with fingerprinting, BTEX and lead. Two samples should be collected near the standpipe, which has visible soil staining around it. One of these should be a surface soil sample, and one should be at the depth of the bottom of the oil/water separator. The tenth sample should be collected near the waste oil tank. The depth should be field determined, at approximately the bottom of the tank. These samples should be analyzed for TPH with fingerprinting, TCL and TAL.

Site 8 - Former Main Base Fueling System, Building N-134. M&E recommends collection of eight soil samples. Five samples should be collected in the area of the former tanks. The center sample should be collected below the backfill from the previous excavation. One sample each should be collected near the former waste oil tank. One sample each should be collected below the pavement at WFF8-SG9 and WFF8-SG10. All depths should be field determined based on visual examination and PID/OVA readings. All samples should be analyzed for TPH with fingerprinting, BTEX, and lead, with the exception of the sample from the waste oil tank, which should be analyzed for TPH, all TCL volatiles and PCBs, and all TAL metals.

Site 9 - Abandoned Drum Field, Along Runway 17-35. M&E recommends collection of five soil borings at Site 9, and ten surface water and sediment samples in the swale behind Sites 9 and 15 to be analyzed for TCL/TAL and TPH. M&E also recommends collection of one sample of the petroleum residue (i.e., tar-like) from the abandoned drums in Site 9, as described in Chapter 3. This sample should be analyzed for TCL, TAL and TPH.

Site 10 - ADAS, Building N-168. M&E recommends collection of six surface soil samples and six subsurface soil samples in the stained areas near locations WFF10-SG3 through WFF10-SG8. These samples should all be analyzed for TCL, TPH, and TAL.

Site 14 - Debris Pile, North of Runway 10-28. M&E recommends collection of ten soil boring samples and five surface water and sediment samples in this area to be analyzed for TCL, TAL and TPH.

Site 15 - Debris Pile, Along Runway 17-35. M&E recommends collection of ten soil boring samples in this area to be analyzed for TCL, TAL and TPH. In addition, M&E recommends collection of the surface water and sediment samples described in recommendations for Site 9.

CHAPTER 5.0

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