Toxicological Assessment of ISS Air Quality: September 2012 – October 2012 with Formaldehyde Supplement from May-October 2012

A summary of the analytical results from 6 grab sample containers (GSCs) and 12 pairs of formaldehyde badges collected on ISS and returned aboard 29S or 31S is shown in Table 1. The average recoveries of the 3 surrogate standards from the GSCs were as follows: ^{13}C-acetone, 128%; fluorobenzene, 114%; and chlorobenzene, 78%. Recoveries of two lab-control formaldehyde badges averaged 95%.

Table 1. Analytical Summary of ISS results

Sample Location	Sample Date	NMVOCs[a] (mg/m^3)	Freon 218 (mg/m^3)	CO_2 (mg/m^3)	Alcohols (mg/m^3)	T Value[b] (units)	Formaldehyde ($\mu g/m^3$)
Lab	4/25/12	--	--	--	--	--	34
SM	4/25/12	--	--	--	--	--	19
Lab	6/30/12	--	--	--	--	--	43
SM	6/30/12	--	--	--	--	--	20
Lab	7/18/12	--	--	--	--	--	37
SM	7/18/12	--	--	--	--	--	24
Lab	8/22/12	--	--	--	--	--	31
SM	8/22/12	--	--	--	--	--	29
Lab	9/15/12	10	22	5200	5.9	0.55	29
SM	9/15/12	8	19	7300	5.5	0.42	32
JPM	9/15/12	9	22	5900	5.4	0.44	--
Lab	10/22/12	9	23	4300	6.9	0.35	31
SM	10/22/12	11	23	4300	8.5	0.36	23
Columbus	10/22/12	10	19	5100	6.7	0.42	--
Guideline		*<25*	---	*<9300*	*<5*	*<1*	*<120*

[a] Non-methane volatile organic hydrocarbons, excluding Freon 218
[b] Based on 180-d SMACs and calculated excluding CO_2

Toxicological Evaluation of ISS Air Quality: Despite the limited number of samples, the "snap shots" compiled in the table above reflect a stable period in which the air easily meets requirements for human respiration. Formaldehyde concentrations, except for the pair taken on 8/22/12, continue to show less formaldehyde in the SM than in the Lab; however, all concentrations are far below the spacecraft maximum allowable concentration of 120 $\mu g/m^3$. The uniformity of Freon 218 concentrations show relatively uniform mixing of this compound, with low concentrations suggesting that no leak has occurred for some time. Alcohol concentrations slightly exceed the target value of 5 mg/m selected to minimize alcohols in the water recovery system.

John T. James, Ph.D., DABT
NASA Chief Toxicologist

1-28-13
Date

Enclosures Table 1: Analytical concentrations of compounds found in the 31S GSCs
Table 2: T-values corresponding to analytical concentrations in Table 1.

TABLE 1
ANALYTICAL RESULTS OF
SOYUZ 31S RETURN GSC AIR SAMPLES

CHEMICAL CONTAMINANT	CONCENTRATION (mg/m3)					
	AA05411 S/N 2109 SM 9/15/12 @ 09:00 GMT	AA05412 S/N 2113 LAB 9/15/12 @ 09:00 GMT	AA05413 S/N 2112 JPM 9/15/12 @ 09:01 GMT	AA05414 S/N 2005 COL 10/22/12 @ 10:50 GMT	AA05415 S/N 2108 LAB 10/22/12 @ 10:53 GMT	AA05416 S/N 2115 SM 10/22/12 @ 10:56 GMT
TARGET COMPOUNDS (TO-14/POLAR)						
FREON12	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
CHLOROMETHANE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
FREON114	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
METHANOL	0.82	0.57	0.65	0.34	0.40	0.45
ACETALDEHYDE	0.15	0.15	0.15	0.15	0.14	0.16
VINYLCHLORIDE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
BROMOMETHANE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
ETHANOL *	**3.8**	**3.9**	**3.9**	**5.5**	**5.8**	**6.7**
CHLOROETHANE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
ACETONITRILE	<0.050	TRACE	<0.050	<0.050	<0.050	<0.050
PROPENAL	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
ACETONE	0.33	0.27	0.28	0.27	0.26	0.27
PROPANAL	TRACE	TRACE	TRACE	TRACE	TRACE	TRACE
ISOPROPANOL	0.29	0.87	0.51	0.36	0.27	0.49
FREON11	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
FURAN	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
ACRYLONITRILE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
PENTANE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
2-METHYL-2-PROPANOL	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
METHYLACETATE	TRACE	TRACE	TRACE	TRACE	TRACE	TRACE
1,1-DICHLOROETHENE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
DICHLOROMETHANE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
3-CHLOROPROPENE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
FREON113	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
N-PROPANOL	0.069	0.22	TRACE	0.083	0.14	0.48
1,1-DICHLOROETHANE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
BUTANAL	TRACE	<0.050	<0.050	<0.050	<0.050	<0.050
2-BUTANONE	TRACE	TRACE	TRACE	TRACE	<0.050	<0.050
CIS-1,2-DICHLOROETHENE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
2-METHYLFURAN	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
ETHYLACETATE	0.055	TRACE	0.053	TRACE	TRACE	TRACE
HEXANE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
CHLOROFORM	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
2-BUTENAL	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,2-DICHLOROETHANE	TRACE	TRACE	TRACE	TRACE	TRACE	TRACE
1,1,1-TRICHLOROETHANE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
N-BUTANOL	0.13	0.087	0.11	0.088	0.073	0.089
BENZENE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
CARBONTETRACHLORIDE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
2-PENTANONE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
2-METHYLHEXANE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
2,3-DIMETHYLPENTANE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
PENTANAL	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
3-METHYLHEXANE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,2-DICHLOROPROPANE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,4-DIOXANE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
TRICHLOROETHENE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
2,5-DIMETHYLFURAN	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
N-HEPTANE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
4-METHYL2-PENTANONE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
CIS-1,3-DICHLOROPROPENE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
2-PENTENAL	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
TRANS-1,3-DICHLOROPROPENE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1,2-TRICHLOROETHANE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
TOLUENE	TRACE	TRACE	TRACE	TRACE	TRACE	TRACE
HEXANAL	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
MESITYLOXIDE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,2-DIBROMOETHANE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
BUTYLACETATE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
OCTANE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
TETRACHLOROETHENE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
CHLOROBENZENE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
ETHYLBENZENE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
M/P-XYLENES	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
2-HEPTANONE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
CYCLOHEXANONE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
HEPTANAL	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
STYRENE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1,2,2-TETRACHLOROETHANE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
O-XYLENE	0.093	0.066	0.081	0.053	TRACE	0.052
NONANE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,3,5-TRIMETHYLBENZENE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,2,4-TRIMETHYLBENZENE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,3-DICHLOROBENZENE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,4-DICHLOROBENZENE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,2-DICHLOROBENZENE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,2,4-TRICHLOROBENZENE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
HEXACHLORO-1,3-BUTADIENE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050

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CHEMICAL CONTAMINANT	CONCENTRATION (mg/m3)					
	AA05411 S/N 2109 SM 9/15/12 @ 09:00 GMT	AA05412 S/N 2113 LAB 9/15/12 @ 09:00 GMT	AA05413 S/N 2112 JPM 9/15/12 @ 09:01 GMT	AA05414 S/N 2005 COL 10/22/12 @ 10:50 GMT	AA05415 S/N 2108 LAB 10/22/12 @ 10:53 GMT	AA05416 S/N 2115 SM 10/22/12 @ 10:56 GMT
SPECIAL INTEREST COMPOUNDS **						
1,3-BUTADIENE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
ETHYLENE OXIDE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
2-METHYL-2-PROPENAL	TRACE	TRACE	<0.050	TRACE	TRACE	<0.050
3-BUTEN-2-ONE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
2-ETHOXYETHANOL	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
DIMETHYL DISULFIDE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
OCTAFLUOROPROPANE &	19	22	22	19	23	23
PERFLUORO-2-METHYLPENTANE &	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
CARBONYL SULFIDE &	<0.050	<0.050	<0.050	TRACE	<0.050	<0.050
ISOBUTANE &	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
2-METHYL-1-PROPENE &	TRACE	TRACE	TRACE	TRACE	TRACE	TRACE
DIMETHYL SULFIDE &	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
CARBON DISULFIDE &	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
TRIMETHYLSILANOL &	0.15	0.16	0.21	0.19	0.16	0.15
OCTAMETHYLCYCLOTETRASILOXANE &	0.093	0.18	0.099	0.079	<0.050	0.076
DECAMETHYLCYCLOPENTASILOXANE &	0.45	0.51	0.43	0.25	0.16	0.13
HEXAMETHYLCYCLOTRISILOXANE %	1.4	2.6	1.8	1.8	1.4	1.5
NON-TARGET COMPOUNDS **						
SULFUR HEXAFLUORIDE	<0.050	0.11	TRACE	0.12	0.14	0.15
1,1,1,2-TETRAFLUOROETHANE	0.16	0.15	0.15	0.12	0.12	0.12
PROPENE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
CHLORODIFLUOROMETHANE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
C9-ALKANE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
LIMONENE	0.060	TRACE	0.056	<0.050	<0.050	<0.050
TOTAL ALCOHOLS PLUS ACETONE	**5.5**	**5.9**	**5.4**	**6.7**	**6.9**	**8.5**
TARGET COMPOUNDS (GC)						
CARBON MONOXIDE	1.1	0.90	0.89	0.89	0.88	0.87
METHANE	11	11	11	3.9	3.9	4.1
HYDROGEN	4.0	3.6	3.6	2.4	2.5	2.5
CARBON DIOXIDE	7300	5200	5900	5100	4300	4300
TOTAL CONCENTRATION (NON-METHANE HYDROCARBONS)	**28**	**32**	**31**	**29**	**32**	**34**
TOTAL CONCENTRATION - OFP (NON-METHANE HYDROCARBONS)	**8.3**	**10**	**8.7**	**9.7**	**9.2**	**11**

* GC/FID data results are in bold
** Quantified using "B" response factor except where noted
& Quantified using a multi-level calibration
% Response factor generated from an internal study
< : Value is less than the laboratory report detection limit.
TRACE: Amount detected is sufficient for compound identification only.
OFP: Octafluoropropane

TABLE 2
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CHEMICAL CONTAMINANT	T-VALUE (180-d SMAC)					
	AA05411 S/N 2109 SM 9/15/12 @ 09:00 GMT	AA05412 S/N 2113 LAB 9/15/12 @ 09:00 GMT	AA05413 S/N 2112 JPM 9/15/12 @ 09:01 GMT	AA05414 S/N 2005 COL 10/22/12 @ 10:50 GMT	AA05415 S/N 2108 LAB 10/22/12 @ 10:53 GMT	AA05416 S/N 2115 SM 10/22/12 @ 10:56 GMT
TARGET COMPOUNDS (TO-14/POLAR)						
FREON12	ND	ND	ND	ND	ND	ND
CHLOROMETHANE	ND	ND	ND	ND	ND	ND
FREON114	ND	ND	ND	ND	ND	ND
METHANOL	0.00912	0.00638	0.00722	0.00373	0.00447	0.00497
ACETALDEHYDE	0.04343	0.03823	0.03632	0.03697	0.03577	0.04084
VINYLCHLORIDE	ND	ND	ND	ND	ND	ND
BROMOMETHANE	ND	ND	ND	ND	ND	ND
ETHANOL	0.00192	0.00193	0.00193	0.00277	0.00288	0.00337
CHLOROETHANE	ND	ND	ND	ND	ND	ND
ACETONITRILE	ND	0.00373	ND	ND	ND	ND
PROPENAL	ND	ND	ND	ND	ND	ND
ACETONE	0.00629	0.00518	0.00537	0.00526	0.00499	0.00526
PROPANAL	0.00227	0.00227	0.00227	0.00227	0.00227	0.00227
ISOPROPANOL	0.00194	0.00577	0.00343	0.00239	0.00180	0.00327
FREON11	ND	ND	ND	ND	ND	ND
FURAN	ND	ND	ND	ND	ND	ND
ACRYLONITRILE	ND	ND	ND	ND	ND	ND
PENTANE	ND	ND	ND	ND	ND	ND
2-METHYL-2-PROPANOL	ND	ND	ND	ND	ND	ND
METHYLACETATE	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021
1,1-DICHLOROETHENE	ND	ND	ND	ND	ND	ND
DICHLOROMETHANE	ND	ND	ND	ND	ND	ND
3-CHLOROPROPENE	ND	ND	ND	ND	ND	ND
FREON113	ND	ND	ND	ND	ND	ND
N-PROPANOL	0.00070	0.00229	0.00026	0.00084	0.00139	0.00494
1,1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND
BUTANAL	0.00192	ND	ND	ND	ND	ND
2-BUTANONE	0.00083	0.00083	0.00083	0.00083	ND	ND
CIS-1,2-DICHLOROETHENE	ND	ND	ND	ND	ND	ND
2-METHYLFURAN	ND	ND	ND	ND	ND	ND
ETHYLACETATE	0.00031	0.00014	0.00029	0.00014	0.00014	0.00014
HEXANE	ND	ND	ND	ND	ND	ND
CHLOROFORM	ND	ND	ND	ND	ND	ND
2-BUTENAL	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	0.01563	0.01563	0.01563	0.01563	0.01563	0.01563
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
N-BUTANOL	0.00328	0.00218	0.00286	0.00219	0.00183	0.00222
BENZENE	ND	ND	ND	ND	ND	ND
CARBONTETRACHLORIDE	ND	ND	ND	ND	ND	ND
2-PENTANONE	ND	ND	ND	ND	ND	ND
2-METHYLHEXANE	ND	ND	ND	ND	ND	ND
2,3-DIMETHYLPENTANE	ND	ND	ND	ND	ND	ND
PENTANAL	ND	ND	ND	ND	ND	ND
3-METHYLHEXANE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND
1,4-DIOXANE	ND	ND	ND	ND	ND	ND
TRICHLOROETHENE	ND	ND	ND	ND	ND	ND
2,5-DIMETHYLFURAN	ND	ND	ND	ND	ND	ND
N-HEPTANE	ND	ND	ND	ND	ND	ND
4-METHYL2-PENTANONE	ND	ND	ND	ND	ND	ND
CIS-1,3-DICHLOROPROPENE	ND	ND	ND	ND	ND	ND
2-PENTENAL	ND	ND	ND	ND	ND	ND
TRANS-1,3-DICHLOROPROPENE	ND	ND	ND	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND
TOLUENE	0.00167	0.00167	0.00167	0.00167	0.00167	0.00167
HEXANAL	ND	ND	ND	ND	ND	ND
MESITYLOXIDE	ND	ND	ND	ND	ND	ND
1,2-DIBROMOETHANE	ND	ND	ND	ND	ND	ND
BUTYLACETATE	ND	ND	ND	ND	ND	ND
OCTANE	ND	ND	ND	ND	ND	ND
TETRACHLOROETHENE	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND
ETHYLBENZENE	ND	ND	ND	ND	ND	ND
M/P-XYLENES	ND	ND	ND	ND	ND	ND
2-HEPTANONE	ND	ND	ND	ND	ND	ND
CYCLOHEXANONE	ND	ND	ND	ND	ND	ND
HEPTANAL	ND	ND	ND	ND	ND	ND
STYRENE	ND	ND	ND	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND
O-XYLENE	0.00251	0.00178	0.00219	0.00145	0.00068	0.00141
NONANE	ND	ND	ND	ND	ND	ND
1,3,5-TRIMETHYLBENZENE	ND	ND	ND	ND	ND	ND
1,2,4-TRIMETHYLBENZENE	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND
1,2,4-TRICHLOROBENZENE	ND	ND	ND	ND	ND	ND
HEXACHLORO-1,3-BUTADIENE	ND	ND	ND	ND	ND	ND

TABLE 2
T-VALUES for SOYUZ 31S RETURN GSC AIR SAMPLES

CHEMICAL CONTAMINANT	T-VALUE (180-d SMAC)					
	AA05411 S/N 2109 SM 9/15/12 @ 09:00 GMT	AA05412 S/N 2113 LAB 9/15/12 @ 09:00 GMT	AA05413 S/N 2112 JPM 9/15/12 @ 09:01 GMT	AA05414 S/N 2005 COL 10/22/12 @ 10:50 GMT	AA05415 S/N 2108 LAB 10/22/12 @ 10:53 GMT	AA05416 S/N 2115 SM 10/22/12 @ 10:56 GMT
SPECIAL INTEREST COMPOUNDS						
1,3-BUTADIENE	ND	ND	ND	ND	ND	ND
ETHYLENE OXIDE	ND	ND	ND	ND	ND	ND
2-METHYL-2-PROPENAL	0.01471	0.01471	ND	0.01471	0.01471	ND
3-BUTEN-2-ONE	ND	ND	ND	ND	ND	ND
2-ETHOXYETHANOL	ND	ND	ND	ND	ND	ND
DIMETHYL DISULFIDE	ND	ND	ND	ND	ND	ND
OCTAFLUOROPROPANE	0.00023	0.00025	0.00026	0.00022	0.00027	0.00027
PERFLUORO-2-METHYLPENTANE	ND	ND	ND	ND	ND	ND
CARBONYL SULFIDE	ND	ND	ND	0.00208	ND	ND
ISOBUTANE	ND	ND	ND	ND	ND	ND
2-METHYL-1-PROPENE	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002
DIMETHYL SULFIDE	ND	ND	ND	ND	ND	ND
CARBON DISULFIDE	ND	ND	ND	ND	ND	ND
TRIMETHYLSILANOL	0.03663	0.04032	0.05135	0.04644	0.04100	0.03684
OCTAMETHYLCYCLOTETRASILOXANE	0.00774	0.01469	0.00828	0.00662	ND	0.00636
DECAMETHYLCYCLOPENTASILOXANE	0.02989	0.03425	0.02853	0.01664	0.01035	0.00843
HEXAMETHYLCYCLOTRISILOXANE	0.15384	0.29104	0.20135	0.20199	0.15088	0.16540
NON-TARGET COMPOUNDS						
SULFUR HEXAFLUORIDE	ND	0.00009	0.00002	0.00010	0.00011	0.00012
1,1,1,2-TETRAFLUOROETHANE	0.00155	0.00141	0.00146	0.00113	0.00113	0.00119
PROPENE	ND	ND	ND	ND	ND	ND
CHLORODIFLUOROMETHANE	ND	ND	ND	ND	ND	ND
C9-ALKANE	ND	ND	ND	ND	ND	ND
LIMONENE	0.00052	0.00022	0.00048	ND	ND	ND
TARGET COMPOUNDS (GC)						
CARBON MONOXIDE	0.06179	0.05281	0.05221	0.05245	0.05177	0.05100
METHANE	0.00319	0.00315	0.00318	0.00113	0.00112	0.00117
HYDROGEN	0.01183	0.01058	0.01047	0.00711	0.00731	0.00734
CARBON DIOXIDE	0.56256	0.40140	0.45392	0.39573	0.33103	0.33209
TOTAL T-VALUE	**0.97653**	**0.95316**	**0.89200**	**0.82272**	**0.68343**	**0.69643**
TOTAL T-VALUE - CO2	**0.41397**	**0.55176**	**0.43808**	**0.42699**	**0.35240**	**0.36434**

ND : Value is less than the laboratory report detection limit.
Note: Number of decimal places in T-Values do not represent significant figures of measurements.