

Appendix H

Soil Vapour Data Validation Reports

Appendix H – Quality Assurance and Quality Control - Soil Vapour Round 1

1 Data Quality Objectives

BlueSphere has adopted quality assurance and quality control procedures consistent with guidance from the following sources:

- NEPC 1999. National Environmental Protection (Assessment of Site Contamination) Measure 1999, National Environment Protection Council as amended 15 May 2013, Comlaw No. F2013C00288
- Standards Australia AS/NZ, Australian/New Zealand Standard 2005, AS4482.1:2005 Guide to the Sampling and Investigation of Potentially Contaminated Soil – Non-Volatile and Semi-Volatile Compounds.
- Standards Australia AS/NZ, Australian/New Zealand Standard 1998, AS 5667.1:1998 Water Quality – Sampling Part 1: Guidance on the Design of Sampling Programs, Sampling Techniques and the Preservation and Handling of Samples.
- USEPA 2006, Guidance on Systematic Planning Using the Data Quality Objective Process (EPA QA/G-4), EPA/240/B-06, February 2006.
- USEPA 2008, Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8), EPA/240/R-02/004, published November 2007, re-issued 7 January 2008.
- USEPA – Contract Laboratory Program <http://www.epa.gov/superfund/programs/clp/index.htm>

2 Field Procedures

A summary of the field quality assurance and quality control procedures conducted as part of the investigation is summarised below in **Table 1**.

Table 1 Summary of Field Procedures

Data Quality Objectives		Acceptability Limits	Reference	Pass	Comments
Field Calibration	All instruments to be calibrated correctly prior to use in field	Field instrumentation calibrated prior to use. Calibration certificates and records documented	AS4482.1-2005 NEPM (2013) Schedule B 2	Y	All instruments were calibrated correctly prior to use in the field. Calibration certificates for soil vapour sampling equipment are provided in Appendix D .
Sample Preservation and Storage	Samples preserved, stored and transported in such a manner such that sample integrity is maintained	Summa canisters received at laboratory with negative pressure similar to the recorded post-sampling pressure.	AS4482.1-2005	Y	All primary canisters were reported as having negative pressures on receipt by the laboratory similar to the post-sampling pressures. A full list of all canister pressures is presented in Table 2 and Table 3 below.

Table 1 Summary of Field Procedures

Data Quality Objectives		Acceptability Limits	Reference	Pass	Comments
Frequency of Quality Control Samples	Field blanks, field duplicates and triplicates are above minimum requirements	Field duplicate samples at one per 20 samples collected.	AS4482.1-2005	Y	Four intra-laboratory duplicate samples were collected and analysed as required. A summary of quality control samples is presented in Table H1 .
Frequency of Quality Control Samples	Field blanks, field duplicates and triplicates are above minimum requirements	Field triplicate samples at one per 20 samples collected.	AS4482.1-2005 ASC NEPM (Schedule B3)	Y	Four inter-laboratory triplicate samples were collected and analysed as required. A summary of quality control samples is presented in Table H1 .
Field Duplicates	Relative percentage difference (RPD) between parent sample and duplicate sample within acceptable range	Results >10 x LOR = RPD between 0 – 30% (Where results <10 x LOR = no RPD range was applied in recognition of the low absolute differences at these concentrations).	US EPA Contract Laboratory Program	Y	All RPDs fell within the acceptable range. A comparison of primary and duplicate samples is provided in Table H2 .
Field Triplicates	Relative percentage difference (RPD) between parent sample and duplicate sample within acceptable range	Results >10 x LOR = RPD between 0 – 30% (Where results <10 x LOR = no RPD range was applied in recognition of the low absolute differences at these concentrations).	US EPA Contract Laboratory Program	N	One RPD exceedance was reported between the primary and triplicate sample. Further comment is provided in Section 2.2 below. A comparison of primary and triplicate samples is provided in Table H2 .



2.1 Sample Preservation and Storage

All practicable measures were undertaken by BlueSphere field personnel to ensure samples were stored and transported correctly. Vacuum or pressure was recorded at the end of air sampling and upon receipt at the laboratories.

Canisters should be received by the laboratory with negative internal pressure as this indicates that leakage of ambient air into the cylinders is limited. Some variation between pressure at completion of sampling and receipt by the laboratory is to be expected; however, large pressure differences (>5" Hg) and pressures close to atmospheric pressure (<1"Hg) upon receipt by the laboratory may indicate that a significant volume of ambient air has leaked into the cylinder potentially biasing the reported analyte concentrations low.

The 52 canisters submitted to the primary laboratory (ALS) and the four inter-laboratory triplicate samples all reported satisfactory canister pressures upon receipt, indicating that minimal leakage had occurred during transit. A summary of the post-sampling and laboratory receipt pressures is shown in **Table 2** and **Table 3** below.

Table 2 Summary of Canister Pressures – On Site

Sample ID	Sample Date	Canister ID No.	Regulator ID No.	Post-sampling pressure (Hg")	Pressure on receipt by lab (Hg")
BSE_SV02A	20/11/2017	998	037	-6.0	-5.43
BSE_SV02B	20/11/2017	839	024	-5.0	-4.0
BSE_SV02C	20/11/2017	727	044	-6.0	-5.52
BSE_SV01A	21/11/2017	835	070	-7.0	-6.79
BSE_SV01B	21/11/2017	5389	079	-6.0	-5.34
BSE_SV01C	21/11/2017	700	066	-4.0	-3.93
BSE_SV03A	21/11/2017	1085	061	-4.0	-4.75
BSE_SV03B	21/11/2017	995	022	-10.0	-9.80
BSE_SV03C	21/11/2017	5455	118	-6.0	-5.70
BSE_SV04A	21/11/2017	5390	5248	-4.0	-5.11
BSE_SV04B	21/11/2017	3026	5246	-10.0	-10.7
BSE_SV04C	21/11/2017	2914	5238	-12.0	-12.2
BSE_SV05A	22/11/2017	3020	071	-4.0	-2.83
BSE_SV05B	22/11/2017	5447	5247	-5.0	-4.19
BSE_SV05C	22/11/2017	5494	027	-7.0	-6.14
SV06	22/11/2017	1322	5231	-5.0	-5.20
SV_EPA62A	22/11/2017	3022	5221	-5.0	-4.81
SV02	22/11/2017	840	5228	-6.0	-5.55
SV04	23/11/2017	737	5243	-5.0	-3.51
SV13_1M	23/11/2017	1021	5237	-4.0	-2.18
SV13_2M	23/11/2017	1292	5234	-4.0	-2.63
SV13_4M	23/11/2017	3021	5245	-4.0	-3.04
SV13_6M	23/11/2017	5061	5203	-6.0	-4.19
SV_EPA66	23/11/2017	5450	5208	-6.0	-4.72



Table 2 Summary of Canister Pressures – On Site

Sample ID	Sample Date	Canister ID No.	Regulator ID No.	Post-sampling pressure (Hg ^{''})	Pressure on receipt by lab (Hg ^{''})
SV01	24/11/2017	5497	5223	-5.0	-4.52
SV_EPA64	24/11/2017	823	5200	-4.0	-2.89
SV_31	24/11/2017	991	5218	-7.0	-6.85
SVEPA60A	27/11/2017	809	038	-5.0	-4.52
SV07	27/11/2017	741	035	-5.0	-5.28
QC01A	21/11/2017	5451	099	-6.0	-5.40
QC02A	21/11/2017	2460	099	-4.0	-4.0
QC03A	22/11/2017	5053	071	-4.0	-2.80
QC04A	22/11/2017	1881	071	-4.0	-3.0

Table 3 Summary of Canister Pressures – Off Site

Sample ID	Sample Date	Canister ID No.	Regulator ID No.	Post-sampling pressure (Hg ^{''})	Pressure on receipt by lab (Hg ^{''})
SV_EPA76A	27/11/2017	711	110	-8.0	-7.29
SV_EPA76B	27/11/2017	1299	004	-3.0	-3.13
SV_EPA42	06/11/2017	872	141	-5.0	-3.31
SV_EPA57A	06/11/2017	714	045	-6.0	-5.20
SV_EPA80	06/11/2017	748	049	-6.0	-4.96
SV_EPA40A	06/11/2017	703	054	-6.0	-4.16
SV_EPA40B	06/11/2017	719	078	-5.0	-3.48
SV_EPA49	07/11/2017	1301	140	-6.0	-3.42
SV_EPA78A	07/11/2017	1118	073	-5.0	-2.78
SV_EPA78B	07/11/2017	2917	059	-5.0	-2.45
SV_EPA77	07/11/2017	838	075	-6.0	-3.84
SV_EPA30	07/11/2017	713	013	-5.0	-3.10
SV_EPA33B	08/11/2017	704	046	-8.0	-6.79
SV_EPA33A	08/11/2017	1088	110	-5.0	3.46
SV_EPA27	08/11/2017	836	080	-6.0	4.70
SV_EPA52	09/11/2017	5046	124	-5.0	3.69
SV_EPA54A	09/11/2017	1283	114	-4.0	3.42
SV_EPA51	09/11/2017	2913	051	-7.0	6.97
SV_EPA35B	09/11/2017	869	109	-4.0	3.69
SV_EPA35A	09/11/2017	730	129	-5.0	4.75
SV_EPA34B	10/11/2017	2984	026	-6.0	-5.58



Table 3 Summary of Canister Pressures – Off Site

Sample ID	Sample Date	Canister ID No.	Regulator ID No.	Post-sampling pressure (Hg ^{''})	Pressure on receipt by lab (Hg ^{''})
SV_EPA34A	10/11/2017	5049	106	-7.0	-5.91
SV_EPA56	10/11/2017	1289	006	-7.0	-6.85
QC01B	08/11/2017	724	110	-5.0	3.46
QC02B	08/11/2017	1866	110	-6.0	-4.0
QC03B	09/11/2017	1308	051	-7.0	-7.0
QC04B	09/11/2017	2257	051	-6.0	-4.0

2.2 Field Triplicate

There was one elevated RPD exceedance reported between the primary and triplicate samples summarised in **Table 4** below.

Table 4 Field Triplicate Elevated RPD

Analyte	Parent Sample I.D.	Triplicate Sample I.D.	Parent Sample Result (µg/m ³)	Triplicate Sample Result (µg/m ³)	RPD (%)
Trichloroethene	BSE_SV05B	QC04A	838	510	49

This single discrepancy between the primary and triplicate result is not considered to be significant noting that the primary sample (which is used for interpretative purposes) reported higher concentrations than the triplicate sample. The RPD discrepancy is not anticipated to effect the overall interpretation of the results.

3 Laboratory Procedures

The nominated NATA accredited laboratory was Australian Laboratory Services Pty Ltd (ALS). A summary and evaluation of the laboratory quality assurance and quality control procedures conducted as part of the investigation are summarised in **Table 5** below.

Table 5 Summary and Evaluation of Laboratory Procedures

Data Quality Objective		Acceptability Limits	Comment	Reference
Verification of supplied sampling equipment	Summa canisters and flow controllers to be verified by providing laboratory as 'fit for purpose'	Target compounds reported below verification goal	Summa canisters and flow controllers supplied by ALS and were verified as 'fit for purpose'.	USEPA method TO15
Sample Holding Times	Samples received and extracted by the laboratory within recommended holding times.	As specified by a NATA accredited laboratory.	There were no reported exceedances of analyte holding times.	AS4482.1-2005
Sample	Samples analysed for chemicals as required on	Samples analysed by a NATA accredited	All samples were analysed as required on the COC via	



Table 5 Summary and Evaluation of Laboratory Procedures

Data Quality Objective		Acceptability Limits	Comment	Reference
Analysis	COC via appropriate laboratory techniques.	laboratory.	appropriate laboratory techniques.	
Limits of Reporting	Laboratory reporting limits to be below relevant screening criteria.	LOR < lowest applicable screening/assessment criteria.	Laboratory LORs were below adopted assessment criteria	AS4482.1-2005
Laboratory Method Blank	Analytes reported at concentrations below the laboratory limit or reporting.	<LOR	No method blank outliers occurred.	US EPA Contract Laboratory Program
Laboratory Duplicates	RPD between duplicate samples within an acceptable range.	Results <10 x the LOR = no RPD range. Results between 10 and 20 x the LOR = RPD between 0 – 50%. Results >20 x the LOR = RPD between 0 – 20%.	There were no reported laboratory duplicate values exceeding the acceptable RPD range.	NATA laboratory practice
Matrix Spike Recoveries	Recoveries within adopted acceptability range.	As specified in laboratory QC report, if applicable. If not specified 70 – 130% is adopted	No Matrix Spike or Matrix Spike duplicate results were required to be reported.	NATA laboratory practice
Laboratory Control Spike (LCS) Recoveries	Recoveries within adopted acceptability range.	Specific to chemicals analysed.	No Laboratory Control Spike (LCS) Recovery exceedences were reported.	Dynamic recovery limits for individual compounds
Surrogate Spike Recoveries	Recoveries within adopted acceptability range.	As specified in laboratory QC report, if applicable. If not specified 70 – 130% is adopted.	Spike recoveries within adopted acceptability range.	NATA laboratory practice.

4 Anomalous Results

No anomalous results were observed.

5 Data Quality Assessment

Based on the sampling procedures assessed against the data quality objectives, including non-conformances, the analytical data obtained for this report is deemed to be acceptable for interpretative use.



Table H2 - Round 1 Soil Vapour Field Duplicates and Triplicates



Sample ID	Date	QC Type	Sampling Method	Matrix	Parent Sample	Analysis	Lab
On-Site							
QC01A	21/11/2017	Duplicate	Summa Canister	Air	BSE_SV01B	VOCs, TRH/BTEX	ALS
QC02A	21/11/2017	Triplicate	Summa Canister	Air	BSE_SV03A	VOCs, TRH/BTEX	Envirolab
QC03A	22/11/2017	Duplicate	Summa Canister	Air	BSE_SV05A	VOCs	ALS
QC04A	22/11/2017	Triplicate	Summa Canister	Air	BSE_SV05B	VOCs	Envirolab
Off-Site							
QC01B	8/11/2017	Duplicate	Summa Canister	Air	SV_EPA33A	VOCs	ALS
QC02B	9/11/2017	Triplicate	Summa Canister	Air	SV_EPA52	VOCs	Envirolab
QC03B	9/11/2017	Duplicate	Summa Canister	Air	SV_EPA51	VOCs	ALS
QC04B	9/11/2017	Triplicate	Summa Canister	Air	SV_EPA35B	VOCs	Envirolab

Table H2 - Round 1 Soil Vapour Field Duplicates and Triplicates



ChemName	Units	EQL	Sample Type	Parent	Duplicate	RPD	Parent	Duplicate	RPD	Parent	Duplicate	RPD	Parent	Duplicate	RPD
			Lab SDG	EN1704871	EN1704871		EN1704871	EN1704871		EN1704672	EN1704672		EN1704672	EN1704672	
			Field ID	BSE_SV01B	QC01A		BSE_SV05A	QC03A		SV_EPA33A	QC01B		SV_EPA51	QC03B	
			Date Sampled	21/11/2017	21/11/2017		22/11/2017	22/11/2017		8/11/2017	8/11/2017		9/11/2017	9/11/2017	
Canister Sampling - Field Data															
Temperature as Received	°C	0.1		22.0	22.0	0	22.0	22.0	0	21.0	21.0	0	21.0	21.0	0
Vacuum - As received	Inchs Hg	0.03		5.34	5.4	1	2.83	2.8	1	3.46	3.46	0	6.97	7.0	0
Pressure - As received	kPaa	0.1		83.4	83.1	0	91.8	91.9	0	90.3	90.3	0	78.4	78.3	0
Pressure - Laboratory Atmosphere	kPaa	0.1		101.0	101.0	0	101.0	101.0	0	102.0	102.0	0	102.0	102.0	0
PAHs															
Naphthalene	µg/m3	100 (Primary): 2.6 (Interlab)		<100.0	<100.0	0									
Chlorinated Hydrocarbons															
1,1,1-trichloroethane	µg/m3	270 (Primary): 2.7 (Interlab)		<270.0	<270.0	0	<270.0	<270.0	0	<270.0	<270.0	0	<270.0	<270.0	0
1,1,2-trichloroethane	µg/m3	270 (Primary): 2.7 (Interlab)		<270.0	<270.0	0	<270.0	<270.0	0	<270.0	<270.0	0	<270.0	<270.0	0
1,1-dichloroethane	µg/m3	200 (Primary): 2 (Interlab)		<200.0	<200.0	0	<200.0	<200.0	0	<200.0	<200.0	0	<200.0	<200.0	0
1,1-dichloroethene	µg/m3	200 (Primary): 2 (Interlab)		<200.0	<200.0	0	<200.0	<200.0	0	<200.0	<200.0	0	<200.0	<200.0	0
1,2-dichloroethane	µg/m3	200 (Primary): 2 (Interlab)		<200.0	<200.0	0	<200.0	<200.0	0	<200.0	<200.0	0	<200.0	<200.0	0
Chloroethane	µg/m3	130 (Primary): 1 (Interlab)		<130.0	<130.0	0	<130.0	<130.0	0	<130.0	<130.0	0	<130.0	<130.0	0
cis-1,2-dichloroethene	µg/m3	20 (Primary): 2 (Interlab)		<20.0	<20.0	0	<20.0	<20.0	0	<20.0	<20.0	0	<20.0	<20.0	0
Trichloroethene	µg/m3	5.4 (Primary): 2.7 (Interlab)		<5.4	<5.4	0	13.4	13.4	0	1200.0	1280.0	6	<5.4	<5.4	0
Tetrachloroethene	µg/m3	340 (Primary): 3 (Interlab)		<340.0	<340.0	0	<340.0	<340.0	0	<340.0	<340.0	0	<340.0	<340.0	0
trans-1,2-dichloroethene	µg/m3	200 (Primary): 2 (Interlab)		<200.0	<200.0	0	<200.0	<200.0	0	<200.0	<200.0	0	<200.0	<200.0	0
Vinyl chloride	µg/m3	5.1 (Primary): 1 (Interlab)		<5.1	<5.1	0	<5.1	<5.1	0	<5.1	<5.1	0	<5.1	<5.1	0
BTEX															
Benzene	µg/m3	100 (Primary): 1.6 (Interlab)		<100.0	<100.0	0									
Ethylbenzene	µg/m3	220 (Primary): 2 (Interlab)		<220.0	<220.0	0									
Toluene	µg/m3	190 (Primary): 1.9 (Interlab)		<190.0	<190.0	0									
Xylene (m & p)	µg/m3	430 (Primary): 4 (Interlab)		<430.0	<430.0	0									
Xylene (o)	µg/m3	220 (Primary): 2 (Interlab)		<220.0	<220.0	0									
TRH															
C10-C16	ug/m3	40000		<40000.0	<40000.0	0									
F2-NAPHTHALENE	ug/m3	40000		<40000.0	<40000.0	0									
C6-C10 less BTEX (F1)	mg/m3	20		<20.0	<20.0	0									
C6-C10	mg/m3	20		<20.0	<20.0	0									
TPH															
C6 - C9	µg/m3	20000		<20000.0	<20000.0	0									
C10 - C14	µg/m3	35000		<35000.0	<35000.0	0									

Table H2 - Round 1 Soil Vapour Field Duplicates and Triplicates



ChemName	Units	EQL	Sample Type		RPD	Parent		RPD	TriPLICATE		RPD	Parent		RPD	TriPLICATE	
			Lab SDG	Parent		TriPLICATE	EN1704871		181011	EN1704672		179803				
			Field ID	BSE_SV03A		QC02A	BSE_SV05B		QC04A	SV_EPA52		QC02B	EN1704672		179803	
			Date Sampled	21/11/2017		21/11/2017	22/11/2017		22/11/2017	9/11/2017		9/11/2017	SV_EPA35E		QC04B	
Canister Sampling - Field Data																
Temperature as Received	°C	0.1														
Vacuum - As received	Inchs Hg	0.03														
Pressure - As received	kPaa	0.1														
Pressure - Laboratory Atmosphere	kPaa	0.1														
PAHs																
Naphthalene	µg/m3	100 (Primary): 2.6 (Interlab)	<100.0	<7.8	0											
Chlorinated Hydrocarbons																
1,1,1-trichloroethane	µg/m3	270 (Primary): 2.7 (Interlab)	<270.0	<2.7	0	<270.0	<2.7	0	<270.0	<2.7	0	<270.0	10.0	0		
1,1,2-trichloroethane	µg/m3	270 (Primary): 2.7 (Interlab)	<270.0	<2.7	0	<270.0	<2.7	0	<270.0	<2.7	0	<270.0	<2.7	0		
1,1-dichloroethane	µg/m3	200 (Primary): 2 (Interlab)	<200.0	<2.0	0	<200.0	<2.0	0	<200.0	<2.0	0	<200.0	<2.0	0		
1,1-dichloroethene	µg/m3	200 (Primary): 2 (Interlab)	<200.0	<2.0	0	<200.0	<2.0	0	<200.0	48.0	0	527.0	610.0	15		
1,2-dichloroethane	µg/m3	200 (Primary): 2 (Interlab)	<200.0	<2.0	0	<200.0	<2.0	0	<200.0	<2.0	0	<200.0	<2.0	0		
Chloroethane	µg/m3	130 (Primary): 1 (Interlab)	<130.0	<1.0	0	<130.0	<1.0	0	<130.0	<1.0	0	<130.0	<1.0	0		
cis-1,2-dichloroethene	µg/m3	20 (Primary): 2 (Interlab)	<20.0	<2.0	0	<20.0	10.0	0	<20.0	<2.0	0	<20.0	<2.0	0		
Trichloroethene	µg/m3	5.4 (Primary): 2.7 (Interlab)	<5.4	<2.7	0	838.0	510.0	49	<5.4	<2.7	0	27.9	27.0	3		
Tetrachloroethene	µg/m3	340 (Primary): 3 (Interlab)	<340.0	<3.0	0	<340.0	42.0	0	<340.0	<3.0	0	<340.0	<3.0	0		
trans-1,2-dichloroethene	µg/m3	200 (Primary): 2 (Interlab)	<200.0	<2.0	0	<200.0	<2.0	0	<200.0	<2.0	0	<200.0	<2.0	0		
Vinyl chloride	µg/m3	5.1 (Primary): 1 (Interlab)	<5.1	<1.0	0	<5.1	<1.0	0	<5.1	<1.0	0	<5.1	<1.0	0		
BTEX																
Benzene	µg/m3	100 (Primary): 1.6 (Interlab)	<100.0	20.0	0											
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Toluene	µg/m3	190 (Primary): 1.9 (Interlab)	<190.0	25.0	0											
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TRH																
C10-C16	ug/m3	40000														
F2-NAPHTHALENE	ug/m3	40000														
C6-C10 less BTEX (F1)	mg/m3	20														
C6-C10	mg/m3	20														
TPH																
C6 - C9	µg/m3	20000														
C10 - C14	µg/m3	35000														

Appendix H – Quality Assurance and Quality Control - Soil Vapour Round 2

1 Data Quality Objectives

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Frequency of Quality Control Samples	Field blanks, field duplicates and triplicates are above minimum requirements	Field duplicate samples at one per 20 samples collected.	AS4482.1-2005	Y	Four intra-laboratory duplicate samples were collected and analysed as required. A summary of quality control samples is presented in Table H3 .
Frequency of Quality Control Samples	Field blanks, field duplicates and triplicates are above minimum requirements	Field triplicate samples at one per 20 samples collected.	AS4482.1-2005	Y	Four inter-laboratory triplicate samples were collected and analysed as required. A summary of quality control samples is presented in Table H3 .
Field Duplicates	Relative percentage difference (RPD) between parent sample and duplicate sample within acceptable range	Results >10 x LOR = RPD between 0 – 30% (Where results <10 x LOR = no RPD range was applied in recognition of the low absolute differences at these concentrations).	US EPA Contract Laboratory Program	N	One RPD exceedance was reported between the primary and duplicate sample. Further comment is provided in Section 2.2 below. A comparison of primary and duplicate samples is provided in Table H4 .
Field Triplicates	Relative percentage difference (RPD) between parent sample and duplicate sample within acceptable range	Results >10 x LOR = RPD between 0 – 30% (Where results <10 x LOR = no RPD range was applied in recognition of the low absolute differences at these concentrations).	US EPA Contract Laboratory Program	N	Five RPD exceedances were reported between the primary and triplicate samples. Further comment is provided in Section 2.3 below. A comparison of primary and triplicate samples is provided in Table H4 .



2.1 Sample Preservation and Storage

All practicable measures were undertaken by BlueSphere field personnel to ensure samples were stored and transported correctly. Vacuum or pressure was recorded at the end of air sampling and upon receipt at the laboratories.

Canisters should be received by the laboratory with negative internal pressure as this indicates that leakage of ambient air into the cylinders is limited. Some variation between pressure at completion of sampling and receipt by the laboratory is to be expected; however, large pressure differences (>5" Hg) and pressures close to atmospheric pressure (<1"Hg) upon receipt by the laboratory may indicate that a significant volume of ambient air has leaked into the cylinder potentially biasing the reported analyte concentrations low.

The 46 canisters submitted to the MGT Eurofins (MGT) and the four inter-laboratory triplicate samples all reported satisfactory canister pressures upon receipt, indicating that minimal leakage had occurred during transit. A summary of the post-sampling and laboratory receipt pressures is shown in **Table 2** and **Table 3** below.

Table 2 Summary of Canister Pressures – On Site

Sample ID	Sample Date	Canister ID No.	Regulator ID No.	Post-sampling pressure (Hg")	Pressure on receipt by lab (Hg")
SV_BSE02B	26/03/2018	1L0159	111	-5.0	-2.8
SV_BSE01A	27/03/2018	1L0164	076	-7.0	-4.5
SV_BSE01B	27/03/2018	1L0071	146	-3.5	-7.3
SV_BSE01C	27/03/2018	1L0187	047	-4.0	-1.6
SV_BSE02C	27/03/2018	1L0104	1720	-5.0	-3.0
SV_BSE64A	28/03/2018	1L0156	003	-5.0	-4.2
SV_BSE64B	28/03/2018	1L0230	142	-4.5	-4.8
SV_BSE64C	28/03/2018	1L0135	029	-4.5	-5.4
SV01	28/03/2018	1L0239	006	-4.0	-5.0
SV_EPA66	28/03/2018	1L0118	036	-5.0	-4.2
SV_BSE05C	28/03/2018	1L0190	1703	-7.0	-5.4
SV_BSE05A	28/03/2018	1L0099	046	-4.5	-2.5
SV_BSE05B	28/03/2018	1L0082	083	-4.5	-4.0
SV_BSE03B	28/03/2018	1L0129	177	-7.0	-6.4
SV_BSE03C	28/03/2018	1L0123	1652	-6.0	-4.4
SV_BSE03A	29/03/2018	1L0068	162	-5.5	-2.1
SV13_1M	29/03/2018	1L0244	117	-4.0	-4.1
SV13_4M	29/03/2018	1L0034	1720	-4.0	-4.4
SV13_2M	29/03/2018	1L0052	148	-6.0	-4.3
SV13_6M	29/03/2018	1L0065	043	-5.5	-3.7
SV_EPA62A	29/03/2018	1L0181	135	-4.0	-4.7
SV_BSE04B	29/03/2018	1L0198	1720	-6.0	-6.0
SV_EPA04C	29/03/2018	1L0133	149	-6.0	-4.7
SV_BSE04A	29/03/2018	1L0107	1652	-5.0	-6.1



Table 2 Summary of Canister Pressures – On Site

Sample ID	Sample Date	Canister ID No.	Regulator ID No.	Post-sampling pressure (Hg ^{''})	Pressure on receipt by lab (Hg ^{''})
QC01	28/03/2018	1L0124	003	-4.5	-4.4
QC02	28/03/2018	1L0136	083	-4.5	-4.2
QC03	29/03/2018	1691	1752	-5.0	-5.0
QC04	29/03/2018	1877	1748	-3.0	-2.0

Table 3 Summary of Canister Pressures – Off Site

Sample ID	Sample Date	Canister ID No.	Regulator ID No.	Post-sampling pressure (Hg ^{''})	Pressure on receipt by lab (Hg ^{''})
SV_EPA33A	26/03/2018	1L0166	1720	-5.0	-4.8
SV_EPA33B	26/03/2018	1L0019	1652	-5.0	-4.2
SV_EPA78A	27/03/2018	1L0117	085	-5.0	-4.9
SV_EPA78B	27/03/2018	1L0174	1709	-5.0	-4.8
SV_EPA35A	27/03/2018	1L0222	1652	-5.0	-4.8
SV_EPA35B	27/03/2018	1L0171	171	-5.0	-5.2
SV_EPA30	27/03/2018	1L0138	144	-5.0	-2.9
SV_EPA34B	27/03/2018	1L0081	1652	-6.5	-6.6
SV_EPA34A	27/03/2018	1L0147	1708	-5.0	-3.1
SV_EPA27	27/03/2018	1L0144	123	-5.0	-3.8
SV_EPA80	27/03/2018	1L0084	1707	-5.0	-7.6
SV_EPA49	27/03/2018	1L0249	1652	-5.0	-5.8
SV_EPA52	28/03/2018	1L0116	121	-5.0	-3.0
SV_EPA54A	28/03/2018	1L0194	1720	-5.0	-5.1
SV_EPA56	28/03/2018	1L0241	1708	-5.0	-3.3
SV_EPA51	28/03/2018	1L0002	1708	-5.0	-5.6
SV_EPA26	28/03/2018	1L0245	009	-5.0	-3.5
SV_EPA40A	28/03/2018	1L0039	059	-5.0	-2.4
SV_EPA40B	28/03/2018	1L0196	128	-5.0	-3.4
SV_EPA32	28/03/2018	1L0131	123	-5.0	-3.8
SV_EPA42	29/03/2018	1L0098	008	-4.5	-4.4
SV_EPA57A	29/03/2019	1L0149	148	-6.0	-3.2
QC01A	28/03/2018	1L0205	1720	-5.0	-5.7
QC02A	28/03/2018	1L0193	1708	-5.0	-5.4
QC03A	29/03/2018	2240	1749	-4.0	-1.0



Table 3 Summary of Canister Pressures – Off Site

Sample ID	Sample Date	Canister ID No.	Regulator ID No.	Post-sampling pressure (Hg ^{''})	Pressure on receipt by lab (Hg ^{''})
QC04A	29/03/2018	1873	1747	-5.0	-1.0

2.2 Field Duplicate

There was one elevated RPD exceedance reported between the primary and duplicate sample summarised in **Table 4** below.

Table 4 Field Triplicate Elevated RPD

Analyte	Parent Sample I.D.	Triplicate Sample I.D.	Parent Sample Result (µg/m ³)	Duplicate Sample Result (µg/m ³)	RPD (%)
Trichloroethene	BSE_SV05B	QC02	1600	1100	37

This single discrepancy between the primary and triplicate result is not considered to be significant noting that the primary sample (which is used for interpretative purposes) reported higher concentrations than the triplicate sample. The RPD discrepancy is not anticipated to affect the overall interpretation of the results.

2.3 Field Triplicate

There was one elevated RPD exceedance reported between the primary and triplicate samples summarised in **Table 4** below.

Table 4 Field Triplicate Elevated RPD

Analyte	Parent Sample I.D.	Triplicate Sample I.D.	Parent Sample Result (µg/m ³)	Triplicate Sample Result (µg/m ³)	RPD (%)
Trichloroethene	BSE_SV03C	QC03	<13	28	73
Tetrachloroethene	BSE_SV03C	QC03	10,000	10	200
cis-1,2-dichloroethene	SV13_6M	QC04	7,600	14,000	59
Trichloroethene	SV13_6M	QC04	380,000	220,000	53
Trans-1,2-dichloroethene	SV13_6M	QC04	560	900	47

The discrepancy between the primary and triplicate results for trichloroethene, cis-1,2-dichloroethene and Trans-1,2-dichloroethene are not considered to be significant and may be attributed to differences arising from the sequential sampling of the primary and triplicate samples, or differences in analytical techniques the two laboratories. The interpretation of the results for these analytes are not considered to be affected by the RPD discrepancies reported as the primary results are consistent with historical data.



A large RFD has been reported for tetrachloroethene (PCE) for the sample collected from soil vapour bore BSE_SV03C, with the primary laboratory (MGT Eurofins) reporting a relatively high concentration of PCE that was not reflected in the Envirolab triplicate sample. The elevated PCE result was not consistent with the PCE concentrations reported at shallower depths at the same location, or with the reported concentrations of other VCH compounds from the same sample (all of which were <LOR).

A similar anomolous tetrachloroethene results was reported for soil bore BSE_SV1C. It is also noted that MGT Eurofins reported an elevated PCE concentration at SV_EPA32 which was noticeably inconsistent with previous data obtained from ALS for the same soil vapour bore. Consequently, it is considered that caution should be exercised in interpreting high PCE values reported by MGT Eurofins which are not reflective of historical data. It is noted, however, that PCE is not a primary risk driver for the site and the discrepancies noted are unlikely to affect the interpretation of the data.

3 Laboratory Procedures

The nominated NATA accredited laboratory was Australian Laboratory Services Pty Ltd (ALS). A summary and evaluation of the laboratory quality assurance and quality control procedures conducted as part of the investigation are summarised in **Table 5** below.

Table 5 Summary and Evaluation of Laboratory Procedures

Data Quality Objective		Acceptability Limits	Comment	Reference
Verification of supplied sampling equipment	Summa canisters and flow controllers to be verified by providing laboratory as 'fit for purpose'	Target compounds reported below verification goal	Summa canisters and flow controllers supplied by ALS and were verified as 'fit for purpose'.	USEPA method TO15
Sample Holding Times	Samples received and extracted by the laboratory within recommended holding times.	As specified by a NATA accredited laboratory.	There were no reported exceedances of analyte holding times.	AS4482.1-2005
Sample Analysis	Samples analysed for chemicals as required on COC via appropriate laboratory techniques.	Samples analysed by a NATA accredited laboratory.	All samples were analysed as required on the COC via appropriate laboratory techniques.	
Limits of Reporting	Laboratory reporting limits to be below relevant screening criteria.	LOR < lowest applicable screening/assessment criteria.	Laboratory LORs were below adopted assessment criteria	AS4482.1-2005
Laboratory Method Blank	Analytes reported at concentrations below the laboratory limit or reporting.	<LOR	No method blank outliers occurred.	US EPA Contract Laboratory Program
Laboratory Duplicates	RPD between duplicate samples within an acceptable range.	Results <10 x the LOR = no RPD range. Results between 10 and 20 x the LOR = RPD between 0 – 50%. Results >20 x the LOR	There were no reported laboratory duplicate values exceeding the acceptable RPD range.	NATA laboratory practice



Table 5 Summary and Evaluation of Laboratory Procedures

Data Quality Objective	Acceptability Limits	Comment	Reference
		= RPD between 0 – 20%.	
Matrix Spike Recoveries	Recoveries within adopted acceptability range.	As specified in laboratory QC report, if applicable. If not specified 70 – 130% is adopted	No Matrix Spike or Matrix Spike duplicate results were required to be reported. NATA laboratory practice
Laboratory Control Spike (LCS) Recoveries	Recoveries within adopted acceptability range.	Specific to chemicals analysed.	No Laboratory Control Spike (LCS) Recovery exceedences were reported. Dynamic recovery limits for individual compounds
Surrogate Spike Recoveries	Recoveries within adopted acceptability range.	As specified in laboratory QC report, if applicable. If not specified 70 – 130% is adopted.	Spike recoveries within adopted acceptability range. NATA laboratory practice.

4 Anomalous Results

Anomalous results for PCE were reported by MGT Eurofins at three locations. These are discussed in Section 2.3 above.

5 Data Quality Assessment

Based on the sampling procedures assessed against the data quality objectives, including non-conformances, the analytical data obtained for this report is deemed to be acceptable for interpretative use, noting that caution should be exercised in interpreting high PCE values reported by MGT Eurofins which are not reflective of historical data.



Sample ID	Date	QC Type	Sampling Method	Matrix	Parent Sample	Analysis	Lab
On-Site							
QC01	28-03-18	Duplicate	Summa Canister	Air	SV_EPA64A	VOCs	Eurofins mgt
QC02	28-03-18	Duplicate	Summa Canister	Air	SV_BSE05B	VOCs	Eurofins mgt
QC03	29-03-18	Triplicate	Summa Canister	Air	SV_BSE03C	VOCs, TRH/BTEX	Envirolab
QC04	29-03-18	Triplicate	Summa Canister	Air	SV13_6M	VOCs, TRH/BTEX	Envirolab
Off-Site							
QC01A	28-03-18	Duplicate	Summa Canister	Air	SV_EPA54	VOCs	Eurofins mgt
QC02A	28-03-18	Duplicate	Summa Canister	Air	SV_EPA51	VOCs	Eurofins mgt
QC03A	29-03-18	Triplicate	Summa Canister	Air	SV_EPA42	VOCs	Envirolab
QC04A	29-03-18	Triplicate	Summa Canister	Air	SV_EPA57	VOCs	Envirolab

Table H4 - Round 2 Soil Vapour Field Duplicates and Triplicates

ChemName	Units	EQL	Sample Type		RPD	Parent		Duplicate		RPD	Parent		Duplicate		RPD
			Lab SDG	Parent		Duplicate	Parent	Duplicate	Parent		Duplicate				
			Field ID	592707		592707	592707	592707	594516		594516				
			Date Sampled	SV_EPA64A		QC01	BSE_SV05B	QC02	SV_EPA54A		QC01A				
			28-03-18	28-03-18		28-03-18	28-03-18		28-03-18	28-03-18					
Chlorinated Hydrocarbons															
1,1-dichloroethene	µg/m3	2	<9.0	<9.0	0	<9.0	<9.0	0	<10.0	<10.0	0				
cis-1,2-dichloroethene	µg/m3	2	<9.0	<9.0	0	<9.0	<9.0	0	<10.0	<10.0	0				
Trichloroethene	µg/m3	2.7	5200.0	5500.0	6	1600.0	1100.0	37	<13.0	<13.0	0				
Tetrachloroethene	µg/m3	6.8	<16.0	<16.0	0	62.0	67.0	8	<16.0	<17.0	0				
trans-1,2-dichloroethene	µg/m3	2	<9.0	<9.0	0	<9.0	<9.0	0	<10.0	<10.0	0				
Vinyl chloride	µg/m3	1.3	<6.0	<6.0	0	<6.0	<6.0	0	<6.0	<6.0	0				
BTEX															
Benzene	µg/m3	1.6													
Ethylbenzene	µg/m3	2.2													
Toluene	µg/m3	7.5 (Primary): 1.9 (Interlab)													
Xylene (m & p)	µg/m3	2.2 (Primary): 4.3 (Interlab)													
Xylene (o)	µg/m3	2.2													

Table H4 - Round 2 Soil Vapour Field Duplicates and Triplicates



			Sample Type	Parent	Duplicate			Parent	Triplicate			Parent	Triplicate	RPD		
			Lab SDG	594516	594516	RPD			592707	189059	RPD			592707	189059	RPD
			Field ID	SV_EPA51	QC02A				BSE_SV03C	QC03				SV13_6M	QC04	
			Date Sampled	28-03-18	28-03-18				29-03-18	29-03-18				29-03-18	29-03-18	
ChemName	Units	EQL														
Chlorinated Hydrocarbons																
1,1-dichloroethene	µg/m3	2	<10.0	<10.0	0	<9.0	<2.0	0	<9.0	<100.0	0					
cis-1,2-dichloroethene	µg/m3	2	<10.0	<10.0	0	<9.0	<2.0	0	7600.0	14000.0	59					
Trichloroethene	µg/m3	2.7	<13.0	<13.0	0	<13.0	28.0	73	380000.0	220000.0	53					
Tetrachloroethene	µg/m3	6.8	<17.0	<17.0	0	10000.0	10.0	200	700.0	830.0	17					
trans-1,2-dichloroethene	µg/m3	2	<10.0	<10.0	0	<9.0	<2.0	0	560.0	900.0	47					
Vinyl chloride	µg/m3	1.3	<6.0	<6.0	0	<6.0	<1.3	0	<6.0	<60.0	0					
BTEX																
Benzene	µg/m3	1.6				<8.0	<1.6	0								
Ethylbenzene	µg/m3	2.2				<10.0	7.0	0								
Toluene	µg/m3	7.5 (Primary): 1.9 (Interlab)				<9.0	4.0	0								
Xylene (m & p)	µg/m3	2.2 (Primary): 4.3 (Interlab)				<10.0	10.0	0								
Xylene (o)	µg/m3	2.2				<10.0	<2.2	0								

Table H4 - Round 2 Soil Vapour Field Duplicates and Triplicates



ChemName	Units	EQL	Sample Type		RPD	Parent		TriPLICATE	
			Lab SDG	594516		189059	594516	189059	
			Field ID	SV_EPA42		QC03A	SV_EPA57A	QC04A	
			Date Sampled	29-03-18		29-03-18	29-03-18	29-03-18	
Chlorinated Hydrocarbons									
1,1-dichloroethene	µg/m3	2	<9.0	<2.0	0	<9.0	<2.0	0	
cis-1,2-dichloroethene	µg/m3	2	<9.0	<2.0	0	<9.0	<2.0	0	
Trichloroethene	µg/m3	2.7	70.0	65.0	7	210.0	150.0	33	
Tetrachloroethene	µg/m3	6.8	<16.0	<3.4	0	<15.0	4.0	0	
trans-1,2-dichloroethene	µg/m3	2	<9.0	<2.0	0	<9.0	<2.0	0	
Vinyl chloride	µg/m3	1.3	<6.0	<1.3	0	<6.0	<1.3	0	
BTEX									
Benzene	µg/m3	1.6							
Ethylbenzene	µg/m3	2.2							
Toluene	µg/m3	7.5 (Primary): 1.9 (Interlab)							
Xylene (m & p)	µg/m3	2.2 (Primary): 4.3 (Interlab)							
Xylene (o)	µg/m3	2.2							