BH01-1	Date	LEPHs	HEPHs
1.07	31-Jul-01	<250	760

BH01-2	Date	LEPHs	HEPHs	PAHs
1.07	31-Jul-01	<250	<250	<RDL

BH01-3	Date	Metals	MAHs	PAHs	VOCs
1.07	31-Jul-01	<AS	<RDL	<RDL	<RDL

BH01-4	Date	Metals	LEPHs	HEPHs	MAHs	PAHs	VOCs
1.83	31-Jul-01	<AS	<250	<250	<RDL	<RDL	<AS

BH18-1	Date	arsenic	chromium (total)	zinc	Other Metals	VPHs	LEPHs	HEPHs	MAHs	PAHs	MTBE	Other VOCs
0.1	21-Nov-18	108	81.4	245	<AS	<10	<100	810	<RDL	<AS	<0.1	--
0.4		8.55	17.9	58.6	--	--	--	--	--	--	--	--

BH18-4	Date	Metals	VPHs	LEPHs	HEPHs	MAHs	PAHs	VOCs
0.2	21-Nov-18	<AS	<10	<100	<100	<RDL	<AS	<AS

BH18-8	Date	Metals	LEPHs	HEPHs	PAHs
0.6	20-Nov-18	<AS	--	--	--
1.2		<AS	<100	<100	<AS

BH18-13	Date	Metals	VPHs	LEPHs	HEPHs	MAHs	PAHs	MTBE	Other VOCs	Miscellaneous Organics
0.4	22-Nov-18	<AS	<10	150	280	<RDL	<AS	<0.1	<AS	<RDL

BH18-17	Date	Metals	LEPHs	HEPHs	PAHs
0.3	23-Nov-18	<AS	<100	<100	<AS

MW01-1	Date	LEPHs	HEPHs	PAHs
1.07	31-Jul-01	<250	260	<AS

MW01-2	Date	Metals	MAHs	PAHs	VOCs
0.76	31-Jul-01	<AS	<AS	<RDL	<AS

MW18-2	Date	Metals	VPHs	LEPHs	HEPHs	MAHs	PAHs	VOCs
0.3	20-Nov-18	<AS	--	<100	1300	--	<AS	--
2.1	21-Nov-18	--	<10	<100	<100	<RDL	<RDL	<AS

MW18-3	Date	Metals	VPHs	LEPHs	HEPHs	MAHs	PAHs	VOCs
0.5	20-Nov-18	<AS	--	<100	<100	--	<AS	--
6.9		--	<10	<100	<100	<RDL	<AS	<AS
8.0		<AS	--	<100	<100	--	<AS	--

MW18-5	Date	zinc	Other Metals	VPHs	LEPHs	HEPHs	MAHs	PAHs	VOCs
0.5	21-Nov-18	182	<AS	--	<100	<100	--	<AS	--
		31.2	<AS	--	<100	110	--	<AS	--
1.2		58.1	--	--	--	--	--	--	--
2.8		--	--	<10	<100	<100	<RDL	<RDL	<AS

MW18-9	Date	Metals	VPHs	LEPHs	HEPHs	MAHs	PAHs	VOCs
0.3	21-Nov-18	<AS	--	<100	<100	--	<RDL	--
4.5		--	<10	<100	<100	<RDL	<RDL	<AS

MW18-12	Date	Metals	VPHs	LEPHs	HEPHs	MAHs	naphthalene	Other PAHs	MTBE	Other VOCs	Miscellaneous Organics
0.6	22-Nov-18	<AS	--	470	400	--	<0.01	<AS	--	--	--
1.2		<AS	1100	1500	210	<AS	0.76	<AS	<0.1	<AS	<RDL
1.8		--	<10	<100	--	<RDL	<0.01	<RDL	<0.1	<AS	--

MW18-14	Date	Metals	LEPHs	HEPHs	benzo[a]anthracene	benzo[b]fluoranthene	benzo[b+j]fluoranthene	indeno[1,2,3-cd]pyrene	naphthalene	Other PAHs
0.5	22-Nov-18	<AS	<400	5900	0.88	0.92	1.3	0.45	0.41	<AS
		<AS	<100	490	1.9	1.6	2.7	1.1	0.78	<AS
1.2		<AS	<100	180	0.12	0.11	0.18	0.095	<0.01	<AS

MW18-15	Date	Metals	VPHs	LEPHs	HEPHs	MAHs	PAHs	VOCs
1.2	21-Nov-18	<AS	<10	<100	<100	<RDL	<AS	<AS

MW18-16	Date	zinc	Other Metals	VPHs	LEPHs	HEPHs	MAHs	PAHs	VOCs
1.2	23-Nov-18	265	<AS	--	1200	1500	--	<AS	--
2.4		106	<AS	<10	<100	640	<RDL	<AS	<AS

SS18-1	Date	Metals	VPHs	LEPHs	HEPHs	MAHs	PAHs	VOCs
0.2	23-Nov-18	<AS	<10	<100	<100	<RDL	<AS	<AS
		<AS	<10	<100	<100	<RDL	<AS	<AS

SS18-2	Date	Metals	LEPHs	HEPHs	PAHs
0.2	23-Nov-18	<AS	<100	100	<AS

SS18-3	Date	Metals	LEPHs	HEPHs	PAHs
0.2	23-Nov-18	<AS	<100	120	<RDL

SS18-4	Date	Metals	LEPHs	HEPHs	PAHs
0.2	23-Nov-18	<AS	<100	140	<AS

SS18-5	Date	Metals	LEPHs	HEPHs	PAHs
0.2	23-Nov-18	<AS	<100	<100	<RDL

SS18-6	Date	Metals	LEPHs	HEPHs	PAHs
0.2	23-Nov-18	<AS	<100	230	<AS

TH15-1	Date	Metals	LEPHs	HEPHs	PAHs
0.3-0.5	28-May-15	<AS	100	340	<RDL

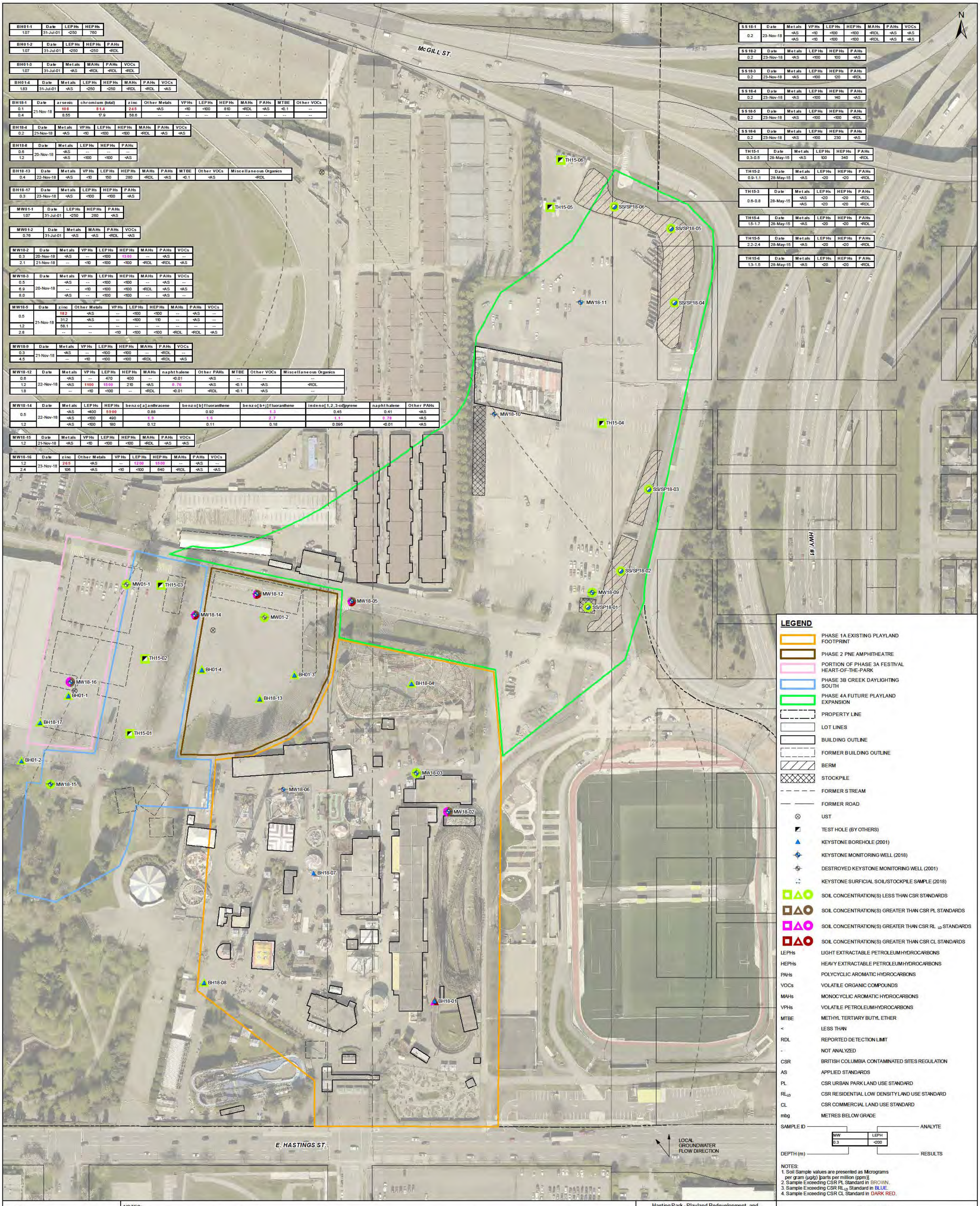
TH15-2	Date	Metals	LEPHs	HEPHs	PAHs
0.9-1.1	28-May-15	<AS	<20	<20	<RDL

TH15-3	Date	Metals	LEPHs	HEPHs	PAHs
0.6-0.8	28-May-15	<AS	<20	<20	<RDL
		<AS	<20	<20	<RDL

TH15-4	Date	Metals	LEPHs	HEPHs	PAHs
1.5-1.7	28-May-15	<AS	<20	<20	<RDL

TH15-5	Date	Metals	LEPHs	HEPHs	PAHs
2.2-2.4	28-May-15	<AS	<20	<20	<RDL

TH15-6	Date	Metals	LEPHs	HEPHs	PAHs
1.3-1.5	28-May-15	<AS	<20	<20	<RDL



LEGEND

- PHASE 1A EXISTING PLAYLAND FOOTPRINT
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- PHASE 3B CREEK DAYLIGHTING SOUTH
- PHASE 4A FUTURE PLAYLAND EXPANSION
- PROPERTY LINE
- LOT LINES
- BUILDING OUTLINE
- FORMER BUILDING OUTLINE
- BERM
- STOCKPILE
- FORMER STREAM
- FORMER ROAD
- UST
- TEST HOLE (BY OTHERS)
- KEYSTONE BOREHOLE (2001)
- KEYSTONE MONITORING WELL (2018)
- DESTROYED KEYSTONE MONITORING WELL (2001)
- KEYSTONE SURFICIAL SOIL/STOCKPILE SAMPLE (2018)
- SOIL CONCENTRATION(S) LESS THAN CSR STANDARDS
- SOIL CONCENTRATION(S) GREATER THAN CSR PL STANDARDS
- SOIL CONCENTRATION(S) GREATER THAN CSR RL_{LD} STANDARDS
- SOIL CONCENTRATION(S) GREATER THAN CSR CL STANDARDS

LEPHs	LIGHT EXTRACTABLE PETROLEUM HYDROCARBONS
HEPHs	HEAVY EXTRACTABLE PETROLEUM HYDROCARBONS
PAHs	POLYCYCLIC AROMATIC HYDROCARBONS
VOCs	VOLATILE ORGANIC COMPOUNDS
MAHs	MONOCYCLIC AROMATIC HYDROCARBONS
VPHs	VOLATILE PETROLEUM HYDROCARBONS
MTBE	METHYL TERTIARY BUTYL ETHER
<	LESS THAN
RDL	REPORTED DETECTION LIMIT
-	NOT ANALYZED
CSR	BRITISH COLUMBIA CONTAMINATED SITES REGULATION
AS	APPLIED STANDARDS
PL	CSR URBAN PARK LAND USE STANDARD
RL_{LD}	CSR RESIDENTIAL LOW DENSITY LAND USE STANDARD
CL	CSR COMMERCIAL LAND USE STANDARD
mbg	METRES BELOW GRADE

SAMPLE ID — ANALYTE

MW	LEPH
0.3	<200

DEPTH (m) — RESULTS

NOTES:
1. Soil Sample values are presented as Micrograms per gram (µg/g) [parts per million (ppm)].
2. Sample Exceeding CSR PL Standard in BROWN.
3. Sample Exceeding CSR RL_{LD} Standard in BLUE.
4. Sample Exceeding CSR CL Standard in DARK RED.

Keystone Environmental

NOTES:
1. THIS DRAWING IS FOR GENERAL INFORMATION ONLY. LOT BOUNDARIES AND FEATURES ARE APPROXIMATE.
2. DATE OF AERIAL PHOTO PHOTO IS 2015.

15 0 75 m

SCALE: 1:1,500 (approx.)

Hasting Park - Playland Redevelopment and Heart in the park
Vancouver, B C
City of Vancouver

REVISION No.	DATE	PROJECT No.
00	Apr. 2019	13639-02

Figure 6
Soil Analytical Results

DRAWN BY: CY DOCUMENT PATH: I:\13600-13699\13639\Phase 00002\Figs\Fig6-Soil-Analytical-R0.mxd

MW01-1	Screen Depth	EPHw $_{10-19}$	LEPHw	PAHs	Metals
02-Aug-01	--	<200	<200	<RDL	<AS

MW01-2	Screen Depth	EPHw $_{10-19}$	LEPHw	MAHs	PAHs	VOCs	Metals
02-Aug-01	--	<200	<200	<AS	<RDL	<RDL	<AS

MW18-2	Screen Depth	vanadium	Other Metals	VPHw	VHw $_{6-10}$	LEPHw	EPHw $_{10-19}$	MAHs	PAHs	VOCs
27-Nov-18	7.3-8.8	26.9	<AS	<300	<300	<200	<200	<RDL	<RDL	<RDL
14-Dec-18	7.3-8.8	12.2	--	--	--	--	--	--	--	--
19-Dec-18	7.3-8.8	10.6	--	--	--	--	--	--	--	--

MW18-3	Screen Depth	vanadium	Other Metals	VPHw	VHw $_{6-10}$	LEPHw	EPHw $_{10-19}$	MAHs	PAHs	VOCs
27-Nov-18	6.5-8.1	26.5	<AS	<300	<300	<200	<200	<RDL	<RDL	<RDL
14-Dec-18	6.5-8.1	8.1	--	--	--	--	--	--	--	--
19-Dec-18	6.5-8.1	<5	--	--	--	--	--	--	--	--

MW18-5	Screen Depth	Metals	VPHw	VHw $_{6-10}$	LEPHw	EPHw $_{10-19}$	MAHs	PAHs	VOCs
27-Nov-18	1.6-3.1	<AS	<300	<300	<200	<200	<RDL	<RDL	<RDL

MW18-6	Screen Depth	Metals	LEPHw	EPHw $_{10-19}$	PAHs
27-Nov-18	3.8-5.5	<AS	<200	<200	<AS

MW18-9	Screen Depth	Metals	VPHw	VHw $_{6-10}$	LEPHw	EPHw $_{10-19}$	MAHs	PAHs	VOCs
27-Nov-18	4.6-6.1	<AS	<300	<300	<200	<200	<RDL	<RDL	<AS

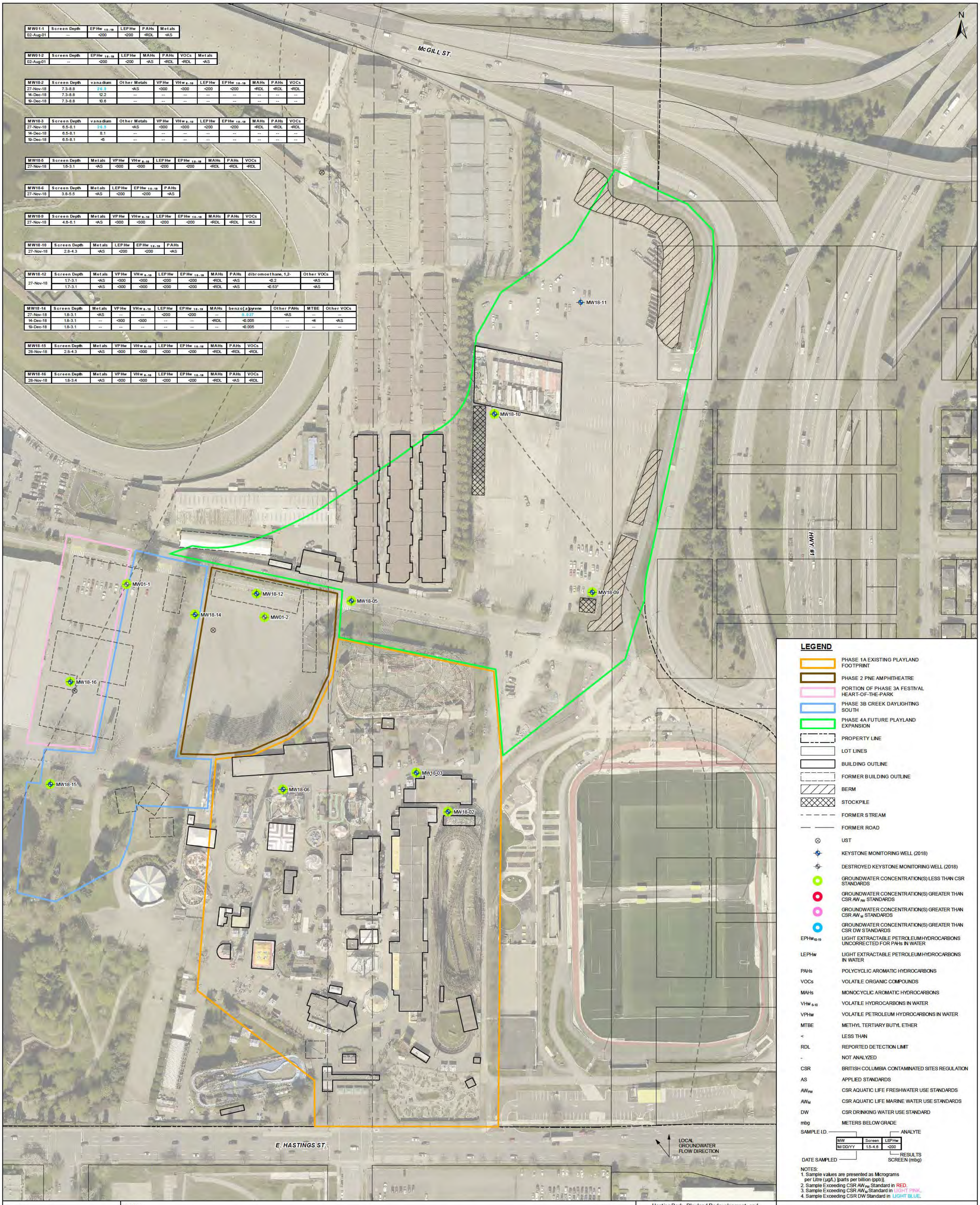
MW18-10	Screen Depth	Metals	LEPHw	EPHw $_{10-19}$	PAHs
27-Nov-18	2.8-4.3	<AS	<200	<200	<AS

MW18-12	Screen Depth	Metals	VPHw	VHw $_{6-10}$	LEPHw	EPHw $_{10-19}$	MAHs	PAHs	dibromoethane, 1,2-	Other VOCs
27-Nov-18	1.7-3.1	<AS	<300	<300	<200	<200	<RDL	<AS	<0.2	<AS
	1.7-3.1	<AS	<300	<300	<200	<200	<RDL	<AS	<0.53*	<AS

MW18-14	Screen Depth	Metals	VPHw	VHw $_{6-10}$	LEPHw	EPHw $_{10-19}$	MAHs	benzo[a]pyrene	Other PAHs	MTBE	Other VOCs
27-Nov-18	1.8-3.1	<AS	--	--	<200	<200	--	0.027	<AS	--	--
14-Dec-18	1.8-3.1	--	<300	<300	--	--	<RDL	<0.005	--	<4	<AS
19-Dec-18	1.8-3.1	--	--	--	--	--	--	<0.005	--	--	--

MW18-15	Screen Depth	Metals	VPHw	VHw $_{6-10}$	LEPHw	EPHw $_{10-19}$	MAHs	PAHs	VOCs
28-Nov-18	2.8-4.3	<AS	<300	<300	<200	<200	<RDL	<RDL	<RDL

MW18-16	Screen Depth	Metals	VPHw	VHw $_{6-10}$	LEPHw	EPHw $_{10-19}$	MAHs	PAHs	VOCs
28-Nov-18	1.8-3.4	<AS	<300	<300	<200	<200	<RDL	<AS	<RDL



LEGEND

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- STOCKPILE
- FORMER STREAM
- FORMER ROAD
- UST
- KEYSTONE MONITORING WELL (2018)
- DESTROYED KEYSTONE MONITORING WELL (2018)
- GROUNDWATER CONCENTRATION(S) LESS THAN CSR STANDARDS
- GROUNDWATER CONCENTRATION(S) GREATER THAN CSR AW $_{PW}$ STANDARDS
- GROUNDWATER CONCENTRATION(S) GREATER THAN CSR AW $_{M}$ STANDARDS
- GROUNDWATER CONCENTRATION(S) GREATER THAN CSR DW STANDARDS

EPHW$_{10-19}$	LIGHT EXTRACTABLE PETROLEUM HYDROCARBONS UNCORRECTED FOR PAHs IN WATER
LEPHw	LIGHT EXTRACTABLE PETROLEUM HYDROCARBONS IN WATER
PAHs	POLYCYCLIC AROMATIC HYDROCARBONS
VOCs	VOLATILE ORGANIC COMPOUNDS
MAHs	MONOCYCLIC AROMATIC HYDROCARBONS
VHw $_{6-10}$	VOLATILE HYDROCARBONS IN WATER
VPHw	VOLATILE PETROLEUM HYDROCARBONS IN WATER
MTBE	METHYL TERTIARY BUTYL ETHER
<	LESS THAN
RDL	REPORTED DETECTION LIMIT
-	NOT ANALYZED
CSR	BRITISH COLUMBIA CONTAMINATED SITES REGULATION
AS	APPLIED STANDARDS
AW$_{PW}$	CSR AQUATIC LIFE FRESHWATER USE STANDARDS
AW$_{M}$	CSR AQUATIC LIFE MARINE WATER USE STANDARDS
DW	CSR DRINKING WATER USE STANDARD
mbg	METERS BELOW GRADE

SAMPLE I.D. — ANALYTE

MW	Screen	LEPHw
M/DD/YY	1.5-4.6	<200

DATE SAMPLED — RESULTS SCREEN (mbg)

NOTES:
1. Sample values are presented as Micrograms per Litre (µg/L) [parts per billion (ppb)].
2. Sample Exceeding CSR AW $_{PW}$ Standard in RED.
3. Sample Exceeding CSR AW $_{M}$ Standard in LIGHT PINK.
4. Sample Exceeding CSR DW Standard in LIGHT BLUE.

Keystone Environmental

NOTES:
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2. DATE OF AERIAL PHOTO PHOTO IS 2015.

15 0 75 m
SCALE: 1:1,500 (approx.)

Hasting Park - Playland Redevelopment and Heart in the park
Vancouver, B C
City of Vancouver

REVISION No.	DATE	PROJECT No.
00	Apr. 2019	13639-02

Figure 7
Groundwater Analytical Results

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SV18-2	Date	Depth	Attenuation	VPHv	MAHs	Naphthalene	VOCs	Chlorinated Phenols	Miscellaneous Organics
PIVC (PL/RL)	29-Nov-18	1.0	2.8E-3	2.492E0	<PL/RL/CL	<0.0021	<PL/RL/CL	<RDL	<RDL
PIVC (CL)			3.7E-4	3.293E-1	<PL/RL/CL	<0.0002775	<PL/RL/CL	<RDL	<RDL
POVC			1.5E-6	1.335E-3	<AS	<0.00000125	<AS	<RDL	<RDL

SV18-3	Date	Depth	Attenuation	VPHv	MAHs	Naphthalene	VOCs	Chlorinated Phenols	Miscellaneous Organics
PIVC (PL/RL)	29-Nov-18	1.0	2.8E-3	<3.64E-1	<RDL	<0.0021	<RDL	<RDL	<RDL
Duplicate			2.8E-3	<3.64E-1	<RDL	<0.0021	<RDL	<RDL	<RDL
PIVC (CL)			3.7E-4	<4.81E-2	<RDL	<0.0002775	<RDL	<RDL	<RDL
Duplicate			3.7E-4	<4.81E-2	<RDL	<0.0002775	<RDL	<RDL	<RDL
POVC			1.5E-6	<1.95E-4	<RDL	<0.000001125	<RDL	<RDL	<RDL
Duplicate			1.5E-6	<1.95E-4	<RDL	<0.000001125	<RDL	<RDL	<RDL

SV18-5	Date	Depth	Attenuation	VPHv	MAHs	Naphthalene	VOCs	Chlorinated Phenols	Miscellaneous Organics
PIVC (PL/RL)	29-Nov-18	0.6	2.0E-2	<2.6E0	<RDL	<0.015	<RDL	<RDL	<RDL
PIVC (CL)			2.0E-2	<2.6E0	<RDL	<0.015	<RDL	<RDL	<RDL
POVC			1.0E-4	<1.3E-2	<RDL	<0.000075	<RDL	<RDL	<RDL

SV18-6	Date	Depth	Attenuation	VPHv	MAHs	Naphthalene	VOCs	Chlorinated Phenols	Miscellaneous Organics
PIVC (PL/RL)	29-Nov-18	1.0	2.8E-3	<3.64E-1	<RDL	<0.0021	<RDL	<RDL	<RDL
PIVC (CL)			3.7E-4	<4.81E-2	<RDL	<0.0002775	<RDL	<RDL	<RDL
POVC			1.5E-6	<1.95E-4	<RDL	<0.000001125	<RDL	<RDL	<RDL

SV18-9	Date	Depth	Attenuation	VPHv	MAHs	Naphthalene	VOCs	Chlorinated Phenols	Miscellaneous Organics
PIVC (PL/RL)	29-Nov-18	1.0	2.8E-3	7.28E0	<PL/RL/CL	<0.0021	<PL/RL/CL	<RDL	<RDL
PIVC (CL)			3.7E-4	9.62E-1	<PL/RL/CL	<0.0002775	<PL/RL/CL	<RDL	<RDL
POVC			1.5E-6	3.9E-3	<AS	<0.000001125	<AS	<RDL	<RDL

SV18-14	Date	Depth	Attenuation	VPHv	MAHs	Naphthalene	VOCs	Chlorinated Phenols	Miscellaneous Organics
PIVC (PL/RL)	29-Nov-18	1.0	2.8E-3	7.56E0	<PL/RL/CL	<0021	<PL/RL/CL	<RDL	<RDL
PIVC (CL)			3.7E-4	9.99E-1	<PL/RL/CL	<0.0002775	<PL/RL/CL	<RDL	<RDL
POVC			1.5E-6	4.05E-3	<AS	<0.00001125	<AS	<RDL	<RDL

SV18-15	Date	Depth	Attenuation	VPHv	MAHs	Naphthalene	VOCs	Chlorinated Phenols	Miscellaneous Organics
PIVC (PL/RL)	29-Nov-18	1.0	2.8E-3	8.68E-1	<PL/RL/CL	<0.0021	<PL/RL/CL	<RDL	<RDL
PIVC (CL)			3.7E-4	1.147E-1	<PL/RL/CL	<0.0002775	<PL/RL/CL	<RDL	<RDL
POVC			1.5E-6	4.65E-4	<AS	<0.000001125	<AS	<RDL	<RDL

SV18-16	Date	Depth	Attenuation	VPHv	MAHs	Naphthalene	VOCs	Chlorinated Phenols	Miscellaneous Organics
PIVC (PL/RL)	29-Nov-18	1.0	2.8E-3	5.6E0	<PL/RL/CL	<0021	<PL/RL/CL	<RDL	<PL/RL/CL
PIVC (CL)			3.7E-4	7.4E-1	<PL/RL/CL	<0.0002775	<PL/RL/CL	<RDL	<PL/RL/CL
POVC			1.5E-6	3E-3	<AS	<0.000001125	<AS	<RDL	<AS

LEGEND

- PHASE 1A EXISTING PLAYLAND FOOTPRINT
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- PORTION OF PHASE 3A FESTIVAL HEART-OF-THE-PARK
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- PROPERTY LINE
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- BUILDING OUTLINE
- FORMER BUILDING OUTLINE
- BERM
- STOCKPILE
- FORMER STREAM
- FORMER ROAD
- UST
- KEYSTONE MONITORING WELL (2018)
- DESTROYED KEYSTONE MONITORING WELL (2001)
- KEYSTONE VAPOUR WELL (2018)
- ATTENUATED VAPOUR CONCENTRATION(S) LESS THAN CSR STANDARDS
- ATTENUATED VAPOUR CONCENTRATION(S) GREATER THAN CSR PL STANDARDS
- ATTENUATED VAPOUR CONCENTRATION(S) GREATER THAN CSR RL STANDARDS
- ATTENUATED VAPOUR CONCENTRATION(S) GREATER THAN CSR CL STANDARDS

VOCs	VOLATILE ORGANIC COMPOUNDS
MAHs	MONOCYCLIC AROMATIC HYDROCARBONS
VPHv	VOLATILE PETROLEUM HYDROCARBONS
<	LESS THAN
RDL	REPORTED DETECTION LIMIT
-	NOT ANALYZED
CSR	BRITISH COLUMBIA CONTAMINATED SITES REGULATION
AS	APPLIED STANDARDS
PL	CSR URBAN PARK USE STANDARD
RL	CSR RESIDENTIAL USE STANDARD
CL	CSR COMMMERCIAL USE STANDARD
PIVC	PREDICTED INDOOR VAPOUR CONCENTRATION
POVC	PREDICTED OUTDOOR VAPOUR CONCENTRATION
TG4	TECHNICAL GUIDANCE 4
mbg	METRES BELOW GRADE

SAMPLE I.D. — ATTENUATION FACTOR(TG4) — ANALYTE

SV17-X	Date	Depth	Attenuation	naphthalene
Predicted Indoor Air	M/DD/YY	0.2	2.8E-03	<0.02

EXPOSURE — DEPTH (mbg) / DATE SAMPLE — RESULT

NOTES:
1. Sample values are presented as Micrograms per cubic meter (µg/m3).
2. Sample Exceeding CSR PL Standard in PINK.
3. Sample Exceeding CSR RL Standard in BLUE.
4. Sample Exceeding CSR CL Standard in DARK RED.

Keystone Environmental

NOTES:
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2. DATE OF AERIAL PHOTO PHOTO IS 2015.

15 0 75 m
SCALE: 1:1,500 (approx.)

Hasting Park - Playland Redevelopment and Heart in the park
Vancouver, B C
City of Vancouver

REVISION No.	DATE	PROJECT No.
00	Apr. 2019	13639-02

Figure 8
Vapour Analytical Results

DRAWN BY: CY DOCUMENT PATH: I:\13600-13699\13639\Phase 00002\Figs\Fig8-Vapour-Analytical-R0.mxd

McGILL ST.

E. HASTINGS ST.

HWY #1

MW18-11

MW18-10
95.037

MW18-09
97.23

MW18-05
97.934

MW18-12
97.356

MW18-14
97.758

MW01-1

MW01-2

MW18-16
94.313*

MW18-15
96.477

MW18-06
102.709*

MW18-03
98.296

MW18-02
98.37

96.0

97.0

98.0

N

LEGEND

- PHASE 1A EXISTING PLAYLAND FOOTPRINT
- PHASE 2 PNE AMPHITHEATRE
- PORTION OF PHASE 3A FESTIVAL HEART-OF-THE-PARK
- PHASE 3B CREEK DAYLIGHTING SOUTH
- PHASE 4A FUTURE PLAYLAND EXPANSION
- PROPERTY LINE
- LOT LINES
- BUILDING OUTLINE
- FORMER BUILDING OUTLINE
- BERM
- STOCKPILE
- FORMER STREAM
- FORMER ROAD
- UST
- DATA NOT CONTOURED
- MW18-10 95.037 — KEYSTONE MONITORING WELL (2011) GROUND WATER ELEVATION(m)
- 1044 — GROUNDWATER CONTOUR (DASHED INFERRED)
- GROUNDWATER FLOW DIRECTION

Keystone Environmental

NOTES:
1. THIS DRAWING IS FOR GENERAL INFORMATION ONLY. LOT BOUNDARIES AND FEATURES ARE APPROXIMATE.
2. DATE OF AERIAL PHOTO PHOTO IS 2015.

15 0 75 m

SCALE: 1:1,500 (approx.)

Hasting Park - Playland Redevelopment and Heart in the park
Vancouver, B C
City of Vancouver

REVISION No.	DATE	PROJECT No.
00	Apr. 2019	13639-02

Figure 9

Potentiometric Contour Plan for Novermber 28, 2018

DRAWN BY: CY DOCUMENT PATH: I:\13600-13699\13639\Phase 00002\Figs\Fig9-GW-Contour-R0.mxd

TABLES

Table 1 - On-Site Historical Review Summary
Portion of 2901 East Hastings Street - Phases 1A, 2, Portion 3A, 3B, and 4A
City of Vancouver
Project No. 13639

Former Address	Street Directories (SD)	Aerial Photographs (AP)	Fire Insurance Map (FIM)	Land Use Maps (LUM)
	Years Reviewed: 1915, 1920, 1925, 1930, 1935, 1940, 1945, 1950, 1955, 1960, 1970, 1975, 1980, 1985, 1991, 1996, 2001	**Years Reviewed: 1930, 1949, 1954, 1963, 1969, 1974, 1978, 1986, 1990, 1996, 2002, 2009, and 2015**	**Years Reviewed: 1925-1950 and 1954-1966**	**Years Reviewed: 1971, 1980, and 1983**
On-Site: Phase 1A - Existing Playland Footprint				
("west side" Windermere Street) (375 Windermere Street)	1935 Hastings Park Golf Course 1935 SFR 1940-1950 Exhibition Golf Course 1950-1955 SFR 1950 Exhibition Coffee Bar	1930 vacant and vegetated; former Windermere Street roadway present on the C portion 1949 vacant and vegetated; former Windermere Street roadway present on the C portion; former SFR and parking area on S portion (consistent with 375 Windermere Street) 1954 parking area located on SE portion (associated with adjacent Empire Stadium); remaining portions vacant and vegetated 1963-1969 Former SFR removed; existing Coaster roller coaster, concession buildings, and maintenance building on the E portion; existing restaurant building on S portion, various rides located on remaining portions (grounds appeared unpaved) 1974-1978 Various rides located on the Site, the concrete slab constructed on W portion; outdoor portions paved with the exception of the NE portion (where the Corkscrew is currently located) 1986 former buildings on NE portion (consistent with maintenance buildings); remaining portions relatively unchanged 1990 unknown objects stored in vicinity of former buildings on NE portion; remaining portions relatively unchanged 1996-2015 potential maintenance area on the NE portion removed and existing Corkscrew roller coaster present; former building located to the N of the Corkscrew (former paint storage area from 1996 report); remaining portions relatively unchanged	1925-1950 the portion located W of Windermere Street was occupied by a portion of the Municipal Golf Course; a former club house was located along the W side of Windermere Street; the remaining portions of the S portion of the Site were not depicted 1954-1966 the Pacific National Exhibition (PNE) was located on the existing Playland footprint; Burrard Amusement Ltd. occupied the C portion and the existing Coaster roller coaster (including the existing motor shed) and the existing concession buildings were located on the E portion of the area	1971, 1980, 1983 Exhibition Park
On-Site: Phase 2 - PNE Amphitheatre				
(no address)	*no listings*	1930 vacant and vegetated 1949 former barns 1954 former barns removed and former works building located on NW portion; remaining portions unpaved 1963 former buildings located on NW and E portions, adjacent to the S and W of the Site; outdoor portions unpaved and used for parking and storage of unknown objects 1969-1996 former works building removed and existing amphitheatre used for Lumberjack show and paved parking area 2002-2015 amphitheatre was vacant and paved	1925-1950 former cattle sheds and sheep and hog pens associated with Hastings Park Exhibition Grounds 1954-1966 Works Building on NW portion of existing amphitheatre	1971, 1980, 1983 Exhibition Park
On-Site: Portion of Phase 3A - Festival Heart of the Park				
(no address)	*no listings*	1930 vacant and vegetated 1949 former barn on S portion; former barn-like building on N portion 1954-1969 former barns on N and S portions; unpaved ground around barns 1974-1978 former barns on N and S portions; ground paved around barns 1986-1990 former barns on S portion; temporary tent structures on N portion 1996 former barns on S portion; paved on N portion 2002-2015 existing paved parking area	1925-1950 former creek 1954-1966 former creek not depicted; three former barns (poultry, swine, and sheep barns)	1971, 1980, 1983 Exhibition Park
On-Site: Phase 3B - Creek Daylighting South				
(no address)	*no listings*	1930-1949 vacant and vegetated 1954-1969 former barns on NW portion; paved parking on NE portion; outdoor bowl on S portion 1974 former barns and parking on N portion; outdoor bowl on S portion 1978 former barns and parking on N portion; interior of outdoor bowl paved for parking on S portion 1986-1996 former barns and paved parking on N portion; soil located in outdoor bowl on S portion 2002-2015 existing paved parking area on N portion and existing pond on S portion	1925-1950 former cattle sheds and sheep and hog pens on N portion; golf course on S portion 1954-1966 three former barns (poultry, swine, and sheep barns), outbuilding, and vacant area on N portion; outdoor bowl on S portion	1971, 1980, 1983 Exhibition Park
On-Site: Phase 4A - Future Playland Expansion				
(no address)	*no listings*	1930 vacant and vegetated; former Windermere Street roadway present on the W portion 1949 **W portion occupied by barns (existing horse barns located on W portion of Site); C&E portions vacant and vegetated** 1954 existing fence line separated Hastings Park from the remaining portions of the Future Playland Expansion area; C&E portions remained vacant and vegetated; W portion unchanged 1963-1969 C&E portion cleared of vegetation and vacant; on W portion two smaller barns replaced by existing large barn (to W of horse barns) 1974-1986 C&E portion paved for parking; W portion unchanged 1990 C&W portion unchanged; stockpiles observed on E portion associated with off-Site road construction (Cassiar tunnel and Bridgeway) 1996-2002 existing paved parking area on C&E portions; W portion unchanged 2009 existing paved parking area on C&E portions; fenced storage area on SE portion consistent with Playland storage currently located on W portion (fencing, rides, shipping containers were observed); W portion unchanged 2015 existing berms located on NE perimeter; former storage area on SE portion removed and existing fenced storage area on W portion present; stockpile located on SE portion in same location as existing Monster-Truck stockpile, the stockpile was uncovered and not located within concrete berm; existing Agrodome stockpile located on W portion; remaining portions unchanged	1925-1950 the portion located W of the former Windermere Street roadway was occupied by cattle sheds and sheep and hog pens associated with Hastings Park Exhibition Grounds; the portion located E of the former Rupert Street roadway was vacant; the C portion was not depicted 1954-1966 the W portion was occupied by the existing horse stables; the E portion was occupied by a parking area	1971, 1980, 1983 Exhibition Park

Notes & Definitions:

N, E, S, W, C	North, East, South, West, Central
m	Meters
SFR	Single Family Residence
( )	This address is a former address

Table 2 - Off-Site Historical Review Summary - Activities of Potential Environmental Concern
Portion of 2901 East Hastings Street - Phases 1A, 2, Portion 3A, 3B, and 4A
City of Vancouver
Project No. 13639

Area and Location	Aerial Photographs (AP)	Fire Insurance Map (FIM)	Land Use Maps (LUM)
	Years Reviewed: 1930, 1949, 1954, 1963, 1969, 1974, 1978, 1986, 1990, 1996, 2002, 2009, and 2015	**Years Reviewed: 1925-1950 and 1954-1966**	**Years Reviewed: 1971, 1980, and 1983**
Off-Site - Remaining Portions of 2901 East Hastings Street			
Remaining portions of Hastings Park adj to the W of the Phase 4A	1930 race track oriented slightly west of its current location; former creek located to the west of the former track location (adjacent to the east of the former Windermere roadway) 1949-1954 existing orientation of race track; structures consistent with FIM observations 1963-2015 existing maintenance area was located to the NE of the race track, approximately 150 m NW of the Site; remaining portions relatively unchanged	1925-1950 race track oriented slightly west of its current location and former creek was located to the west of the former Windermere roadway 1954-1966 occupied by the existing race track, grandstand/club house, and rides; the existing maintenance area was occupied by stables	1971, 1980, 1983 Exhibition Park
Playland Oil and Waste Storage Area adj. to the W of Phase 1A	1930-1949 vacant and vegetated 1954-1974 vacant (BC Building located to the W of the area) 1978 paved parking area (BC Building located to the W of the area) 1986-1996 existing Playland Flume ride (BC Building located to W of the area) 2002-2009 existing Playland Flume ride (BC Building replaced by Sanctuary Pond) 2015 existing Playland Flume ride and oil shed/material storage	1925-1950 vacant area associated with the Municipal Golf Course 1954-1966 vacant area between the Site and the former BC Building (occupied by trades exhibits), approx. 120 m W of the Site	1971, 1980, 1983 Exhibition Park
Empire Stadium/Fields adj. to the E of Phase 1A	1930-1949 vacant and vegetated 1954 Empire Stadium partially constructed 1963-1990 Empire Stadium 1996 stadium structures partially removed and area was used for parking 2002-2009 buildings on W portion; remaining portions occupied by grass field and running track 2015 existing sports fields and playground	1925-1950 former properties were primarily vacant or occupied by SFRs; a mushroom farm was located on the NE portion of the intersection between Albert Street and Rupert Street 1954-1966 Empire Stadium	1971, 1980, 1983 Exhibition Park

Notes & Definitions:

N, E, S, W, C	North, East, South, West, Central
m	Meters
FIM	fire insurance maps
SFR	Single Family Residence

Table 3 - Off-Site Activities of Potential Environmental Concern Rationale
Portion of 2901 East Hastings Street - Phases 1A, 2, Portion 3A, 3B, and 4A
City of Vancouver
Project No. 13639

Area and Location	Activities of Potential Environmental Concern	APEC Potential	Rationale
Off-Site - Remaining Portions of 2901 East Hastings Street			
Remaining portions of Hastings Park adj to the W of the Phase 4A	Fuelling and maintenance of the race track equipment, approximately 150 m northwest of the Site, since the late 1960s.	Low	The portions of the racetrack located within approximately 120 m of the Site have been primarily used for horse stables since the 1940s or earlier. Maintenance and repairs of the race track equipment is conducted in an area located approximately 150 m northwest of the Site, since the late 1960s. Prior the 1960s, the maintenance area was located adjacent to the west portion of the track (approximately 400 m northwest of the Site). During the 2017 Site reconnaissance, a gasoline UST (not in use), diesel AST, oil/water separator, and various workshops were observed in the maintenance area (approximatley 150 m NW of the Site). Staining was not observed on the unpaved ground surface in the vicinity of the gasoline pump station and the diesel AST. Based on the down-gradient distance of the maintenance area from the Site, there is considered to be a low potential for constituents of concern associated with the existing maintenance area to be present in the Site soil, groundwater, and/or vapour at concentrations greater than the applicable CSR land and water use standards.
Existing Playland Oil and Waste Storage Area adj. to the W of Phase 1A	Playland oil storage and waste/recyclable collection area, approximately 65 m and 80 m southwest of the Site, respectively since the early 2010s	Low	During the 2017 Site reconnaissance, a shipping container located to the south of the Flume ride (approximately 65 m southwest of the Site) was used to store various types of oils and lubricants, and a mobile oil change machine. The oils and lubricants were stored in approximately 20 L pails (drums and/or ASTs were not observed). Drains and/or staining was not observed on the plywood flooring inside the shipping container, or on the paved ground surface outside of the sipping container. In addition, a waste and recycling storage area was located to the west of the Flume ride (approximately 80 m southwest of the Site). In 2017 and 2018, empty oil pails, jerry cans, propane canisters, scrap metal, refuse, green-waste, and other materials were stored in the area. The grounds surface in the vicinity of the stored materials was pavement observed to be in good condition. Staining was not observed in the vicinity of the stored materials. Based on the relatively short duration, the distance from the Site, and that the materials were stored over pavement observed to be in good condition, there is considered to be a low potential for constituents of concern associated with the stored materials to be present in the Site soil, groundwater, and/or vapour at concentrations greater than the applicable CSR land and water use standards.
Empire Stadium/Fields adj. to the E of Phase 1A	Former drum storage, adjacent to the east of the Site, circa 1996	Low	During the 1996 PSI1, twenty four 205 L drums of waste absorb-all were located on the south portion of Empire Stadium, adjacent to the east of the Site. In 1996, it was reported by Mr. Vance Shaw (Playland Maintenance Department) that the drums were previously stored in the Playland welding shop, but due to maintenance activities in the welding shop, the were being temporarily stored at Empire Field. The drums were sealed and staining was not observed in the vicinity of the drums. The drums were not observed in the 1996 or 2000 aerial photographs. Based on the reported short duration of the drum storage at Empire Fields and that staining was not observed in the vicinity of the drums, there is considered to be a low potential for constituents of concern associated with the former stored drums to be present in the Site soil, groundwater, and/or vapour at concentrations greater than the applicable CSR land and water use standards.

Notes & Definitions:

N, E, S, W, C	North, East, South, West, Central	CSR	Contaminated Site Regulation
adj	Adjacent	PNE	Pacfic National Exhibition
m	Meters	PSI	Preliminary Site Investigation
APEC	Area of Potential Environmental Concern	UST	underground storage tank
AST	aboveground storage tank	( )	This address is a former address
BC ENV	Ministry of Environemnt and Cliate Change Strategy		

GLOSSARY: SOIL ANALYTICAL RESULTS
Portion of 2901 East Hastings Street, Vancouver, BC
City of Vancouver
Project #: 13639
January 2019

List of Acronyms

AL	Agricultural Land Use
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CL	Commercial Land Use
CSR	British Columbia Contaminated Sites Regulation
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
$EPHs_{10-19}$	Extractable Petroleum Hydrocarbons (carbon range 10 to 19)
$EPHs_{19-32}$	Extractable Petroleum Hydrocarbons (carbon range 19 to 32)
HEPHs	Heavy Extractable Petroleum Hydrocarbons (corrected for PAH)
HMW-PAHs	Heavy Molecular Weight Polycyclic Aromatic Hydrocarbons
HWR	British Columbia Hazardous Waste Regulation
IL	Industrial Land Use
LEPHs	Light Extractable Petroleum Hydrocarbons (corrected for PAH)
LMW-PAHs	Light Molecular Weight Polycyclic Aromatic Hydrocarbons
MTBE	Methyl tert-Butyl Ether
n/s	No Standard
PAHs	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PCDD	Polychlorinated Dibenzodioxins
PCDF	Polychlorinated Dibenzofurans
PL	Urban Park Land Use
RDL	Reported Detection Limit
RL_{HD}	Residential (High Density) Land Use
RL_{LD}	Residential (Low Density) Land Use
RPD	Relative Percent Difference
TEQ	Toxicity Equivalence Quotient
VHs_{6-10}	Volatile Petroleum Hydrocarbons (carbon range 6 to 10)
VOC	Volatile Organic Compounds
VPHs	Volatile Petroleum Hydrocarbons (corrected for BTEX)
WL_N	Wildlands (Natural) Land Use
WL_R	Wildlands (Reverted) Land Use

List of Symbols

--	Sample was not analyzed for the specified constituent
*	Laboratory reported detection limit is greater than applicable standard/guideline
<	Concentration is less than the laboratory reported detection limit
a	BC CSR Matrix Numerical Soil Standards (BC CSR Schedule 3.1, Part 1) site specific fac
	1 Intake of contaminated soil
	2 Groundwater used for drinking water
	3 Toxicity to soil invertebrates and plants
	6 Groundwater flow to surface water used by aquatic life (freshwater)
b	CSR standard is pH dependent
c	CSR standard for hexavalent chromium (Cr VI) used for conservativeness
d	Regional background soil quality for metals analyses from BC MOE Protocol 4
e	CSR standard for VPHs/LEPHs/HEPHs used for comparison

List of Units

mbg	Metres below grade
µg/g	Micrograms per gram
pg/g	Picograms per gram

Soil Exceedances

125	Exceeds CSR PL standards
125	Exceeds CSR RL_{LD} standards
125	Exceeds CSR CL standards

QA/QC Exceedances

45%	RPD exceeds 35%

Formulas

RPD RPD = ((Max. Concentration - Min. Concentration)/((Max. Concentration + Min. Concentration)/2))*100

TABLE 4: SOIL ANALYTICAL RESULTS
INORGANICS
Portion of 2901 East Hastings Street, Vancouver, BC
City of Vancouver
Project #: 13639
January 2019

CSR PL Standards	CSR RL_{LD} Standards	CSR CL Standards	SAMPLE ID	Units	MW01-1-3.5	MW01-2-2.5	BH01-2-3.5	BH01-3-3.5	BH01-4-6	TH15-1-1E	TH15-2-2E	TH15-3-1E	TH15-A	TH15-4-2E	TH15-5-3E	TH15-6-2E	BH18-1 (0.1)	BH18-1 (0.4)	MW18-2 (0.3)	MW18-3 (0.5)	MW18-3 (8.0)
			DATE SAMPLED		31-Jul-01	31-Jul-01	31-Jul-01	31-Jul-01	31-Jul-01	28-May-15	28-May-15	28-May-15	28-May-15	28-May-15	28-May-15	28-May-15	21-Nov-18	21-Nov-18	20-Nov-18	20-Nov-18	20-Nov-18
			LAB CERTIFICATE		--	--	--	--	--	15V979277	15V979277	15V979277	Duplicate of	15V979277	15V979277	15V979277	B8A2725	B8A2725	B8A2224	B8A2224	B8A2224
			LAB SAMPLE ID		--	--	--	--	--	--	--	--	TH15-3-1E	--	--	--	UV1873	UV1874	UU9325	UU9327	UU9336
			SAMPLE DEPTH (mbg)		1.07	0.76	1.07	1.07	1.83	0.3 - 0.5	0.9 - 1.1	0.6 - 0.8	0.6 - 0.8	1.5 - 1.7	2.2 - 2.4	1.3 - 1.5	0.1	0.4	0.3	0.5	8.0
n/s	n/s	n/s	pH	--	5.1	4.7	6.3	6.0	5.3	6.3	7.6	7.5	7.7	6.6	7.1	6.4	7.36	7.06	7.77	6.72	9.10
			Metals																		
40000	40000	250000	aluminum	µg/g	14400	6500	5950	8450	9870	--	--	--	--	--	--	--	10400	--	9780	14800	12200
20	20	40	antimony	µg/g	<10	<10	<10	<10	<10	0.2	0.4	0.2	0.2	0.2	0.2	0.1	0.86	--	0.28	0.15	0.18
15ad	15ad	15ad	arsenic	µg/g	<10	<10	<10	<10	<10	3.8	2.6	3	3	2.5	2.3	2	**108**	8.55	3.25	2.4	2.44
350a	350a	350a	barium	µg/g	83	33	38	46	64	53.6	65.9	118	119	64.1	77.6	69.1	45	--	48.6	73.9	72.2
1-500ab	1-500ab	1-500ab	beryllium	µg/g	<1	<1	<1	<1	<1	0.3	0.2	0.4	0.3	0.2	0.2	0.2	<0.20	--	<0.20	<0.20	<0.20
15000	8500	50000	boron	µg/g	--	13	30	--	36	--	--	--	--	--	--	--	2.8	--	1.3	1.1	1.7
1-50ab	1-50ab	1-75ab	cadmium	µg/g	<0.3	<0.3	<0.3	<0.3	<0.3	0.1	0.09	0.08	0.08	0.06	0.1	0.06	0.673	--	0.079	<0.050	0.08
100ad	100ad	100ad	chromium (total)	µg/g	16	9	13	16	19	19	14	21	22	20	16	13	**81.4**	17.9	12.6	12.9	21.4
25a	25a	25a	cobalt	µg/g	<1	<1	<1	<1	<1	7.5	7	11.5	11.7	6.1	7.5	4.9	7.08	--	4.73	4.71	6.89
100-1500abd	100-1500abd	100-1500abd	copper	µg/g	19	4	7	14	6	18.9	16.7	39.3	40.4	16.7	21.8	14.7	53.3	--	16.9	12.4	16.2
35000	35000	150000	iron	µg/g	19300	6160	13000	17200	11500	--	--	--	--	--	--	--	--	--	--	--	--
300-8500abd	300-8500abd	300-8500abd	lead	µg/g	<30	<30	<30	<30	<30	11	8.8	8.4	8.2	4	3.5	2.6	42.5	--	18.9	3.05	2.9
65	30	450	lithium	µg/g	--	--	--	--	--	8.4	6.2	8.9	8.5	5.5	6.3	3.8	--	--	--	--	--
n/s	n/s	n/s	magnesium	µg/g	5000	772	2280	3600	3020	--	--	--	--	--	--	--	--	--	--	--	--
2000a	2000a	2000a	manganese	µg/g	129	258	170	247	123	319	326	481	482	245	378	243	337	--	228	186	306
25a	10a	75a	mercury	µg/g	0.026	0.025	0.018	0.032	0.022	0.14	0.02	0.02	0.03	0.02	<0.01	<0.01	<0.050	--	<0.050	<0.050	<0.050
15a	15a	15a	molybdenum	µg/g	<4	<4	<4	<4	<4	0.8	0.4	0.5	0.5	0.6	0.3	0.2	4.68	--	0.3	0.32	0.35
75-500abd	75-500abd	75-500abd	nickel	µg/g	8	<2	5	6	7	13.4	9	17.8	18.5	9.7	10.9	7	15.2	--	7.21	7.42	11.5
2ad	2ad	2ad	selenium	µg/g	<3	<3	<3	<3	<3	0.7	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.50	--	<0.50	<0.50	<0.50
20	20	40	silver	µg/g	<2	<2	<2	<2	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.072	--	<0.050	<0.050	<0.050
20000	9500	150000	strontium	µg/g	25	15	24	24	15	31	51	61	60	29	57	43	24.3	--	30.6	17.6	53.5
9	9	25	thallium	µg/g	--	--	--	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	--	--	--	--
50	50	300	tin	µg/g	<5	<5	<5	<5	<5	0.7	0.4	0.4	0.6	0.7	0.4	0.3	0.78	--	0.38	0.26	0.32
n/s	n/s	n/s	titanium	µg/g	557	234	302	431	425	--	--	--	--	--	--	--	722	--	653	702	817
25	15	200	Tungsten_W	µg/g	--	--	--	--	--	--	--	--	--	--	--	--	<0.50	--	<0.50	<0.50	1.43
30a	30a	30a	uranium	µg/g	--	--	--	--	--	0.5	0.5	0.6	0.6	0.5	0.5	0.4	--	--	--	--	--
100a	100a	100a	vanadium	µg/g	42	14	31	39	29	60	53	66	69	53	59	51	49.4	--	45.3	45.9	56.9
150-450ab	150-450ab	150-450ab	zinc	µg/g	35	15	19	31	16	53	47	74	77	35	42	31	**245**	38.6	33.5	25.9	33.7

Soil Exceedances

125	Exceeds CSR PL standards
125	Exceeds CSR RL_{LD} standards
125	Exceeds CSR CL standards

QA/QC Exceedances

45%	RPD exceeds 35%

City of Vancouver - FOI 2023-228 - Page 395 of 1003

TABLE 4: SOIL ANALYTICAL RESULTS
INORGANICS
Portion of 2901 East Hastings Street, Vancouver, BC
City of Vancouver
Project #: 13639
January 2019

CSR PL Standards	CSR RL_{LD} Standards	CSR CL Standards	SAMPLE ID DATE SAMPLED LAB CERTIFICATE LAB SAMPLE ID SAMPLE DEPTH (mbg)	Units	BH18-4 (0.2) 21-Nov-18 B8A2725 UV1888 0.2	MW18-5 (0.5) 21-Nov-18 B8A2725 UV1891 0.5	MW18-E 21-Nov-18 B8A2725 UV1890 Duplicate of MW18-5 (0.5)	RPD for MW18-5 (0.5) and MW18-E	MW18-5 (1.2) 21-Nov-18 B8A2725 UV1892 1.2	MW18-A 20-Nov-18 B8A2224 UU9338 Duplicate of MW18-6(0.6)	BH18-8 (0.6) 20-Nov-18 B8A2224 UU9355 0.6	BH18-8 (1.2) 20-Nov-18 B8A2224 UU9356 1.2	MW18-9 (0.3) 21-Nov-18 B8A2725 UV1895 0.3	MW18-12 (0.6) 22-Nov-18 B8A3005 UV3356 0.6	MW18-12 (1.2) 22-Nov-18 B8A3005 UV3357 1.2	BH18-13 (0.4) 22-Nov-18 B8A3005 UV3360 0.4	MW18-14 (0.5) 22-Nov-18 B8A3005 UV3376 0.5	MW18-I 22-Nov-18 B8A3005 UV3364 Duplicate of MW18-14 (0.5)	RPD for MW18-14 (0.5) and MW18-I	MW18-14 (1.2) 22-Nov-18 B8A3005 UV3377 1.2	MW18-15(1.2) 21-Nov-18 B8A2682 UV1664 1.2
n/s	n/s	n/s	pH	--	7.44	7.08	6.03	--	6.17	7.03	7.09	7.29	6.53	8.28	6.34	6.67	6.32	6.93	--	6.54	6.70
			Metals																		
40000	40000	250000	aluminum	µg/g	11100	20600	25100	20%	--	10100	8530	9040	15100	15100	17800	18500	18300	19100	4%	16300	17300
20	20	40	antimony	µg/g	0.34	0.21	0.17	0.04<0.1	--	0.18	0.13	0.14	0.16	1.23	0.14	1.17	0.54	0.43	0.11>0.1	0.16	0.72
15ad	15ad	15ad	arsenic	µg/g	3.9	3	3.06	2%	--	2.91	2.01	2.03	2.56	4.63	2.41	3.75	4.2	3.33	23%	1.73	3.18
350a	350a	350a	barium	µg/g	55.1	52.5	43.4	19%	--	51.4	47.9	60.8	73.2	76.3	79.7	91.3	89.3	91.5	2%	93.6	87.6
1-500ab	1-500ab	1-500ab	beryllium	µg/g	<0.20	0.25	0.29	0.04<0.2	--	<0.20	<0.20	<0.20	<0.20	<0.20	0.25	0.24	0.25	0.24	0.01<0.2	<0.20	0.27
15000	8500	50000	boron	µg/g	1.4	1.9	2.3	0.4<1	--	1.3	<1.0	<1.0	3.5	1.8	2.7	3.9	2.7	2.4	0.3<1	1.2	2
1-50ab	1-50ab	1-75ab	cadmium	µg/g	0.125	0.262	0.072	0.19>0.05	--	0.074	0.05	0.055	0.053	0.239	0.12	0.283	0.346	0.215	0.131>0.05	0.069	0.184
100ad	100ad	100ad	chromium (total)	µg/g	16.8	15.4	13.9	10%	--	13.5	11.6	12.4	14.4	16.4	15.5	18.6	21	18.8	11%	14	16.5
25a	25a	25a	cobalt	µg/g	6.11	5.2	4.2	21%	--	4.74	4.46	4.67	5.17	6.43	4.41	6.73	7.71	7.76	1%	7.1	6.29
100-1500abd	100-1500abd	100-1500abd	copper	µg/g	43.4	13.3	11.6	14%	--	12.7	8.66	10.9	11.7	17.4	8.84	22.9	31.7	25.8	21%	23	26.5
35000	35000	150000	iron	µg/g	--	--	--	--	--	--	--	--	--	19600	13200	20200	20100	22200	10%	22800	--
300-8500abd	300-8500abd	300-8500abd	lead	µg/g	8.06	17.5	9.13	63%	--	2.71	2.14	2.24	29.6	46.8	14	41.1	108	49	75%	7.57	44.4
65	30	450	lithium	µg/g	--	--	--	--	--	--	--	--	--	5.9	7.9	8.5	8	7.9	12.7%	5.8	--
n/s	n/s	n/s	magnesium	µg/g	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2000a	2000a	2000a	manganese	µg/g	270	274	200	31%	--	230	211	239	260	333	243	281	293	362	21%	369	297
25a	10a	75a	mercury	µg/g	<0.050	0.078	0.087	10.9%	--	<0.050	<0.050	<0.050	<0.050	<0.050	0.055	0.055	0.09	0.054	0.036<0.05	<0.050	0.114
15a	15a	15a	molybdenum	µg/g	0.39	0.98	1.01	3%	--	0.25	0.22	0.2	0.39	0.46	0.78	0.79	0.8	0.73	9%	0.36	0.53
75-500abd	75-500abd	75-500abd	nickel	µg/g	10.2	8.65	7.31	17%	--	7.63	6.14	6.89	7.91	10.3	9.9	12.4	15.3	14	9%	8.03	11.1
2ad	2ad	2ad	selenium	µg/g	<0.50	<0.50	0.58	0.08<0.5	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
20	20	40	silver	µg/g	<0.050	0.092	0.068	0.024<0.05	--	<0.050	<0.050	<0.050	<0.050	<0.050	0.07	0.065	0.08	0.059	0.021<0.05	<0.050	0.089
20000	9500	150000	strontium	µg/g	28.9	17	14.4	17%	--	41.7	28.2	37.5	36.8	50.1	40.1	36.7	38.3	39.5	3%	42.6	25.9
9	9	25	thallium	µg/g	--	--	--	--	--	--	--	--	--	0.058	0.105	0.06	0.065	0.073	11.6%	0.069	--
50	50	300	tin	µg/g	1.09	0.65	0.54	18%	--	0.31	0.21	0.27	0.3	9.01	0.32	1.1	1.82	1.25	37%	0.54	4.34
n/s	n/s	n/s	titanium	µg/g	702	762	769	1%	--	761	590	738	853	864	453	848	865	943	9%	913	684
25	15	200	Tungsten_W	µg/g	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
30a	30a	30a	uranium	µg/g	--	--	--	--	--	--	--	--	--	0.487	0.538	0.502	0.707	0.527	29%	0.422	--
100a	100a	100a	vanadium	µg/g	49.5	46.7	49.9	7%	--	51.3	43.7	46.2	51.7	53.7	29.3	53.8	55.1	55.9	1%	61	44.1
150-450ab	150-450ab	150-450ab	zinc	µg/g	70.8	**182**	31.2	141%	58.1	25.2	21.6	23.3	27.5	44.6	28.7	73.5	80.9	70.7	13%	41.8	89.4

Soil Exceedances

125	Exceeds CSR PL standards
125	Exceeds CSR RL_{LD} standards
125	Exceeds CSR CL standards

0.127388535

QA/QC Exceedances

45%	RPD exceeds 35%

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TABLE 4: SOIL ANALYTICAL RESULTS
INORGANICS
Portion of 2901 East Hastings Street, Vancouver, BC
City of Vancouver
Project #: 13639
January 2019

CSR PL Standards	CSR RL_{LD} Standards	CSR CL Standards	SAMPLE ID DATE SAMPLED LAB CERTIFICATE LAB SAMPLE ID SAMPLE DEPTH (mbg)	Units	MW18-16 (1.2) 23-Nov-18 B8A3869 UV8298 1.2	MW18-16 (2.4) 23-Nov-18 B8A3869 UV8300 2.4	BH18-17 (0.3) 23-Nov-18 B8A3869 UV8305 0.3	SS18-1 23-Nov-18 B8A3861 UV8257 0.2	SS18-A 23-Nov-18 B8A3861 UV8263 Duplicate of SS18-1	RPD for SS18-1 and SS18-A	SS18-2 23-Nov-18 B8A3861 UV8258 0.2	SS18-3 23-Nov-18 B8A3861 UV8259 0.2	SS18-4 23-Nov-18 B8A3861 UV8260 0.2	SS18-5 23-Nov-18 B8A3861 UV8261 0.2	SS18-6 23-Nov-18 B8A3861 UV8262 0.2
n/s	n/s	n/s	pH	--	6.33	6.12	5.96	9.89	10.00	--	6.50	6.34	6.40	6.32	5.95
			Metals												
40000	40000	250000	aluminum	µg/g	20900	25200	24000	16300	15700	4%	7930	8310	11100	9310	11600
20	20	40	antimony	µg/g	0.97	0.74	0.27	0.39	0.39	0<0.1	0.29	0.41	0.36	0.42	0.51
15ad	15ad	15ad	arsenic	µg/g	6.74	5.21	3.53	3.2	3.14	2%	2.64	3.53	4.25	5.21	3.9
350a	350a	350a	barium	µg/g	245	87	65.4	80.4	79.1	2%	49.1	49.1	62.9	64.9	77.6
1-500ab	1-500ab	1-500ab	beryllium	µg/g	0.4	0.35	0.45	0.23	0.22	0.01<0.2	<0.20	<0.20	<0.20	<0.20	0.2
15000	8500	50000	boron	µg/g	11.2	4.5	2.6	2.3	2.3	0<1	2.7	4.2	3.2	3.5	3
1-50ab	1-50ab	1-75ab	cadmium	µg/g	0.364	0.168	0.199	0.106	0.123	0.017<0.05	0.152	0.229	0.19	0.197	0.24
100ad	100ad	100ad	chromium (total)	µg/g	25.7	22.1	26.4	19	22.6	17%	24.3	28.4	28	34.7	24.5
25a	25a	25a	cobalt	µg/g	7.35	7.36	5.93	7.05	6.77	4%	6.51	7.3	7.59	8.18	6.77
100-1500abd	100-1500abd	100-1500abd	copper	µg/g	87.3	22.9	16.5	22	21.2	4%	17.3	24.7	26.4	25	27.7
35000	35000	150000	iron	µg/g	--	--	--	--	--	--	--	--	--	--	--
300-8500abd	300-8500abd	300-8500abd	lead	µg/g	113	91	11.3	9.2	8.44	9%	4.78	6.65	9.01	7.6	23.3
65	30	450	lithium	µg/g	--	--	--	--	--	--	--	--	--	--	--
n/s	n/s	n/s	magnesium	µg/g	--	--	--	--	--	--	--	--	--	--	--
2000a	2000a	2000a	manganese	µg/g	390	777	189	339	338	0%	307	353	372	360	325
25a	10a	75a	mercury	µg/g	0.096	0.138	0.121	<0.050	<0.050	--	<0.050	<0.050	<0.050	<0.050	0.053
15a	15a	15a	molybdenum	µg/g	0.89	0.92	1.28	0.36	0.52	0.16>0.1	0.42	0.4	0.47	0.51	0.79
75-500abd	75-500abd	75-500abd	nickel	µg/g	19.3	12.6	9.84	13.5	13.9	3%	26.4	30.8	25.8	32.4	21.9
2ad	2ad	2ad	selenium	µg/g	<0.50	0.6	0.72	<0.50	<0.50	--	<0.50	<0.50	<0.50	<0.50	<0.50
20	20	40	silver	µg/g	0.105	0.158	0.165	<0.050	<0.050	--	<0.050	0.068	0.063	0.067	0.072
20000	9500	150000	strontium	µg/g	57.4	35.4	31.4	71.1	68	4%	27.3	31.7	34.3	35.5	45.8
9	9	25	thallium	µg/g	--	--	--	--	--	--	--	--	--	--	--
50	50	300	tin	µg/g	8.79	13.9	0.9	1.03	1.01	2%	0.57	0.63	0.72	0.69	2.3
n/s	n/s	n/s	titanium	µg/g	1020	1050	1280	933	942	1%	622	691	831	785	725
25	15	200	Tungsten_W	µg/g	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50	<0.50	<0.50	<0.50
30a	30a	30a	uranium	µg/g	--	--	--	--	--	--	--	--	--	--	--
100a	100a	100a	vanadium	µg/g	59.8	55.8	68.2	51.1	52.1	2%	36.3	40.3	47.9	44.9	41.6
150-450ab	150-450ab	150-450ab	zinc	µg/g	**265**	106	54.1	50.4	58.4	15%	51.3	70.3	67.5	75.6	81.3

Soil Exceedances

125	Exceeds CSR PL standards
125	Exceeds CSR RL_{LD} standards
125	Exceeds CSR CL standards

QA/QC Exceedances

45%	RPD exceeds 35%

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TABLE 5: SOIL ANALYTICAL RESULTS
HYDROCARBONS
Portion of 2901 East Hastings Street, Vancouver, BC
City of Vancouver
Project #: 13639
January 2019

CSR PL Standards	CSR RL_{LD} Standards	CSR CL Standards	SAMPLE ID	Units	MW01-1-3.5	MW01-2-2.5	BH01-1-3.5	BH01-2-3.5	BH01-3-3.5	BH01-4-6	TH15-1-1E	TH15-2-2E	TH15-3-1E	TH15-A	TH15-4-2E	TH15-5-3E	TH15-6-2E	BH18-1 (0.1)	MW18-2 (0.3)	MW18-2 (2.1)	MW18-3 (0.5)
			DATE SAMPLED		31-Jul-01	31-Jul-01	31-Jul-01	31-Jul-01	31-Jul-01	31-Jul-01	28-May-15	28-May-15	28-May-15	28-May-15	28-May-15	28-May-15	28-May-15	21-Nov-18	20-Nov-18	21-Nov-18	20-Nov-18
			LAB CERTIFICATE		--	--	--	--	--	--	15V979277	15V979277	15V979277	Duplicate of	--	--	--	B8A2725	B8A2224	B8A2725	B8A2224
			LAB SAMPLE ID		--	--	--	--	--	--	--	--	--	TH15-3-1E	--	--	--	UV1873	UU9325	UV1876	UU9327
			SAMPLE DEPTH (mbg)		1.07	0.76	1.07	1.07	1.07	1.83	0.3 - 0.5	0.9 - 1.1	0.6 - 0.8	0.6 - 0.8	1.5 - 1.7	2.2 - 2.4	1.3 - 1.5	0.1	0.3	2.1	0.5
			Petroleum Hydrocarbons																		
200	200	200	VPHs	µg/g	--	--	--	--	--	--	--	--	--	--	--	--	--	<10	--	<10	--
n/s	n/s	n/s	VHs_{6-10}	µg/g	--	--	--	--	--	--	--	--	--	--	--	--	--	<10	--	<10	--
1000	1000	2000	LEPHs	µg/g	<250	--	<250	<250	--	<250	100	<20	<20	<20	<20	<20	<20	<100	<100	<100	<100
n/s	n/s	n/s	$EPHs_{10-19}$	µg/g	<250	--	<250	<250	--	<250	100	<20	<20	<20	<20	<20	<20	<100	<100	<100	<100
1000	1000	5000	HEPHs	µg/g	260	--	<250	<250	--	<250	340	<20	<20	<20	<20	<20	<20	810	**1300**	<100	<100
n/s	n/s	n/s	$EPHs_{19-32}$	µg/g	260	--	760	<250	--	<250	340	<20	<20	<20	<20	<20	<20	810	1300	<100	<100
			Monocyclic Aromatic Hydrocarbons																		
0.035a	0.035a	0.035a	benzene	µg/g	--	<0.01	--	--	<0.01	<0.01	--	--	--	--	--	--	--	<0.0050	--	<0.0050	--
15a	15a	15a	ethylbenzene	µg/g	--	<0.01	--	--	<0.01	<0.01	--	--	--	--	--	--	--	<0.010	--	<0.010	--
5	5	50	styrene	µg/g	--	<0.01	--	--	<0.01	<0.01	--	--	--	--	--	--	--	<0.030	--	<0.030	--
0.5a	0.5a	0.5a	toluene	µg/g	--	<0.01	--	--	<0.01	<0.01	--	--	--	--	--	--	--	<0.020	--	<0.020	--
6.5a	6.5a	6.5a	xylenes	µg/g	--	0.02	--	--	<0.01	<0.01	--	--	--	--	--	--	--	<0.040	--	<0.040	--
			Polycyclic Aromatic Hydrocarbons																		
2000	950	15000	acenaphthene	µg/g	<0.05	<0.05	--	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.0050	<0.0050	<0.0050	<0.0050
n/s	n/s	n/s	acenaphthylene	µg/g	<0.05	<0.05	--	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.012	0.007	<0.0050	<0.0050
2.5a	2.5a	30a	anthracene	µg/g	--	--	--	--	--	--	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.035	0.0068	<0.0040	0.0083
1	1	10	benzo[a]anthracene	µg/g	0.06	<0.05	--	<0.05	<0.05	<0.05	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.074	<0.020	<0.020	<0.020
10a	5a	30a	benzo[a]pyrene	µg/g	0.06	<0.05	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.095	<0.020	<0.020	<0.020
1	1	10	benzo[b]fluoranthene	µg/g	0.09	<0.05	--	<0.05	<0.05	<0.05	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.15	<0.020	<0.020	<0.020
1	1	10	benzo[b+j]fluoranthene	µg/g	--	--	--	--	--	--	--	--	--	--	--	--	--	0.22	<0.020	<0.020	<0.020
n/s	n/s	n/s	benzo[g,h,i]perylene	µg/g	<0.05	<0.05	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.17	<0.050	<0.050	<0.050
1	1	10	benzo[k]fluoranthene	µg/g	--	--	--	--	--	--	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.059	<0.020	<0.020	<0.020
400	200	4500	chrysene	µg/g	0.07	<0.05	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.16	<0.020	<0.020	<0.020
1	1	10	dibenz[a,h]anthracene	µg/g	<0.05	<0.05	--	<0.05	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.028	<0.020	<0.020	<0.020
50a	50a	200a	fluoranthene	µg/g	0.08	<0.05	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.14	<0.020	<0.020	<0.020
1000	600	9500	fluorene	µg/g	<0.05	<0.05	--	<0.05	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.020	<0.020	<0.020	<0.020
1	1	10	indeno[1,2,3-cd]pyrene	µg/g	<0.05	<0.05	--	<0.05	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.12	<0.020	<0.020	<0.020
500	250	1000	methylnaphthalene, 1-	µg/g	--	--	--	--	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.050	<0.050	<0.050	<0.050
100	60	950	methylnaphthalene, 2-	µg/g	--	--	--	--	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.020	<0.020	<0.020	<0.020
0.6a	0.6a	20a	naphthalene	µg/g	0.08	<0.05	--	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.010	<0.010	<0.010	<0.010
5	5	50	phenanthrene	µg/g	--	<0.05	--	<0.05	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.035	<0.010	<0.010	<0.010
10	10	100	pyrene	µg/g	0.1	<0.05	--	<0.05	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.13	0.05	<0.020	<0.020
4.5	2.5	10	quinoline	µg/g	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.050	<0.050	<0.050	<0.050
n/s	n/s	n/s	Total HMW-PAHs	µg/g	0.46	--	--	--	--	--	--	--	--	--	--	--	--	1.2	0.05	<0.050	<0.050
n/s	n/s	n/s	Total LMW-PAHs	µg/g	0.08	--	--	--	--	--	--	--	--	--	--	--	--	0.082	<0.050	<0.050	<0.050
n/s	n/s	n/s	Total PAHs	µg/g	0.54	--	--	--	--	--	--	--	--	--	--	--	--	1.3	0.064	<0.050	<0.050
			Miscellaneous Organics																		
30000	15000	200000	acetone	µg/g	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Soil Exceedances

125	Exceeds CSR PL standards
125	Exceeds CSR RL_{LD} standards
125	Exceeds CSR CL standards

QA/QC Exceedances

45%	RPD exceeds 35%

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TABLE 5: SOIL ANALYTICAL RESULTS
HYDROCARBONS
Portion of 2901 East Hastings Street, Vancouver, BC
City of Vancouver
Project #: 13639
January 2019

CSR PL Standards	CSR RL_{LD} Standards	CSR CL Standards	SAMPLE ID / DATE SAMPLED / LAB CERTIFICATE / LAB SAMPLE ID / SAMPLE DEPTH (mbg)	Units	MW18-3 (6.9) 20-Nov-18 B8A2224 UU9334 6.9	MW18-3 (8.0) 20-Nov-18 B8A2224 UU9336 8.0	BH18-4 (0.2) 21-Nov-18 B8A2725 UV1888 0.2	MW18-5 (0.5) 21-Nov-18 B8A2725 UV1891 0.5	MW18-E 21-Nov-18 B8A2725 UV1890 Duplicate of MW18-5 (0.5)	RPD for MW18-5 (0.5) and MW18-E	MW18-5 (2.8) 21-Nov-18 B8A2725 UV1894 2.8	MW18-A 20-Nov-18 B8A2224 UU9338 Duplicate of MW18-6 (0.6)	BH18-8 (1.2) 20-Nov-18 B8A2224 UU9356 1.2	MW18-9 (0.3) 21-Nov-18 B8A2725 UV1895 0.3	MW18-9 (4.5) 21-Nov-18 B8A2725 UV1900 4.5	MW18-12 (0.6) 22-Nov-18 B8A3005 UV3356 0.6	MW18-12 (1.2) 22-Nov-18 B8A3005 UV3357 1.2	MW18-12 (1.8) 22-Nov-18 B8A3005 UV3358 1.8	BH18-13 (0.4) 22-Nov-18 B8A3005 UV3360 0.4	MW18-14 (0.5) 22-Nov-18 B8A3005 UV3376 0.5	MW18-I 22-Nov-18 B8A3005 UV3364 Duplicate of MW18-14 (0.5)
			Petroleum Hydrocarbons																		
200	200	200	VPHs	µg/g	<10	--	<10	--	--	--	<10	--	--	--	<10	--	**1100**	<10	<10	--	--
n/s	n/s	n/s	VHs_{6-10}	µg/g	<10	--	<10	--	--	--	<10	--	--	--	<10	--	1100	<10	<10	--	--
1000	1000	2000	LEPHs	µg/g	<100	<100	<100	<100	<100	--	<100	<100	<100	<100	<100	470	**1500**	<100	150	<400	<100
n/s	n/s	n/s	$EPHs_{10-19}$	µg/g	<100	<100	<100	<100	<100	--	<100	<100	<100	<100	<100	470	1500	<100	150	<400	<100
1000	1000	5000	HEPHs	µg/g	<100	<100	<100	<100	110	10<100	<100	<100	<100	<100	<100	400	210	--	280	**5900**	490
n/s	n/s	n/s	$EPHs_{19-32}$	µg/g	<100	<100	<100	<100	110	10<100	<100	<100	<100	<100	<100	400	210	--	290	6000	500
			Monocyclic Aromatic Hydrocarbons																		
0.035a	0.035a	0.035a	benzene	µg/g	<0.0050	--	<0.0050	--	--	--	<0.0050	--	--	--	<0.0050	--	0.019	<0.0050	<0.0050	--	--
15a	15a	15a	ethylbenzene	µg/g	<0.010	--	<0.010	--	--	--	<0.010	--	--	--	<0.010	--	0.13	<0.010	<0.010	--	--
5	5	50	styrene	µg/g	<0.030	--	<0.030	--	--	--	<0.030	--	--	--	<0.030	--	<0.030	<0.030	<0.030	--	--
0.5a	0.5a	0.5a	toluene	µg/g	<0.020	--	<0.020	--	--	--	<0.020	--	--	--	<0.020	--	0.051	<0.020	<0.020	--	--
6.5a	6.5a	6.5a	xylenes	µg/g	<0.040	--	<0.040	--	--	--	<0.040	--	--	--	<0.040	--	0.18	<0.040	<0.040	--	--
			Polycyclic Aromatic Hydrocarbons																		
2000	950	15000	acenaphthene	µg/g	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.058	0.031	--	0.039	0.1	0.27
n/s	n/s	n/s	acenaphthylene	µg/g	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	0.064	0.32	0.93
2.5a	2.5a	30a	anthracene	µg/g	<0.0040	<0.0040	0.0049	0.0048	<0.0040	0.0152<0.02	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.018	0.035	--	0.15	0.39	1.1
1	1	10	benzo[a]anthracene	µg/g	<0.020	<0.020	0.029	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	0.47	0.88	**1.9**
10a	5a	30a	benzo[a]pyrene	µg/g	<0.020	<0.020	0.027	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	0.64	0.9	2.1
1	1	10	benzo[b]fluoranthene	µg/g	<0.020	<0.020	0.022	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	0.43	0.92	**1.6**
1	1	10	benzo[b+j]fluoranthene	µg/g	<0.020	<0.020	0.022	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	0.73	**1.3**	**2.7**
n/s	n/s	n/s	benzo[g,h,i]perylene	µg/g	<0.050	<0.050	<0.050	<0.050	<0.050	--	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	--	0.4	0.53	1.2
1	1	10	benzo[k]fluoranthene	µg/g	<0.020	<0.020	<0.020	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	0.25	0.36	0.98
400	200	4500	chrysene	µg/g	<0.020	<0.020	0.027	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	0.036	<0.020	--	0.55	1.4	2
1	1	10	dibenz[a,h]anthracene	µg/g	<0.020	<0.020	<0.020	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	0.11	0.19	0.38
50a	50a	200a	fluoranthene	µg/g	<0.020	<0.020	0.045	0.033	<0.020	0.013<0.02	<0.020	<0.020	<0.020	<0.020	<0.020	0.034	0.04	--	0.93	1.9	4.5
1000	600	9500	fluorene	µg/g	<0.020	<0.020	<0.020	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	0.11	0.059	--	0.073	0.39	0.97
1	1	10	indeno[1,2,3-cd]pyrene	µg/g	<0.020	<0.020	<0.020	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	0.34	0.45	**1.1**
500	250	1000	methylnaphthalene, 1-	µg/g	<0.050	<0.050	<0.050	<0.050	<0.050	--	<0.050	<0.050	<0.050	<0.050	<0.050	0.27	0.56	--	<0.050	0.22	0.49
100	60	950	methylnaphthalene, 2-	µg/g	<0.020	<0.020	<0.020	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	0.15	1.2	--	0.037	0.27	0.62
0.6a	0.6a	20a	naphthalene	µg/g	<0.010	<0.010	<0.010	<0.010	<0.010	--	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	**0.76**	<0.010	0.043	0.41	**0.78**
5	5	50	phenanthrene	µg/g	<0.010	<0.010	0.012	0.023	0.011	0.012>0.01	<0.010	<0.010	<0.010	<0.010	<0.010	0.13	0.095	<0.010	0.49	1.9	4.8
10	10	100	pyrene	µg/g	<0.020	<0.020	0.036	0.029	<0.020	0.009<0.02	<0.020	<0.020	<0.020	<0.020	<0.020	0.062	0.052	--	1.1	1.7	4
4.5	2.5	10	quinoline	µg/g	<0.050	<0.050	<0.050	<0.050	<0.050	--	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	--	<0.050	<0.050	<0.050
n/s	n/s	n/s	Total HMW-PAHs	µg/g	<0.050	<0.050	0.19	0.062	<0.050	0.012<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	0.13	0.092	--	5.5	9.6	21
n/s	n/s	n/s	Total LMW-PAHs	µg/g	<0.050	<0.050	<0.050	<0.050	<0.050	--	<0.050	<0.050	<0.050	<0.050	<0.050	0.74	2.7	--	0.9	4.1	10
n/s	n/s	n/s	Total PAHs	µg/g	<0.050	<0.050	0.2	0.09	<0.050	0.04<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	0.87	2.8	--	6.4	14	31
			Miscellaneous Organics																		
30000	15000	200000	acetone	µg/g	--	--	--	--	--	--	--	--	--	--	--	--	--	<5.0	<5.0	--	--

Soil Exceedances

125	Exceeds CSR PL standards
125	Exceeds CSR RL_{LD} standards
125	Exceeds CSR CL standards

QA/QC Exceedances

45%	RPD exceeds 35%

TABLE 5: SOIL ANALYTICAL RESULTS
HYDROCARBONS
Portion of 2901 East Hastings Street, Vancouver, BC
City of Vancouver
Project #: 13639
January 2019

CSR PL Standards	CSR RL_{LD} Standards	CSR CL Standards	SAMPLE ID DATE SAMPLED LAB CERTIFICATE LAB SAMPLE ID SAMPLE DEPTH (mbg)	Units	RPD for MW18-14 (0.5) and MW18-I	MW18-14 (1.2) 22-Nov-18 B8A3005 UV3377 1.2	MW18-15(1.2) 21-Nov-18 B8A2682 UV1664 1.2	MW18-16 (1.2) 23-Nov-18 B8A3869 UV8298 1.2	MW18-16 (2.4) 23-Nov-18 B8A3869 UV8300 2.4	BH18-17 (0.3) 23-Nov-18 B8A3869 UV8305 0.3	SS18-1 23-Nov-18 B8A3861 UV8257 0.2	SS18-A 23-Nov-18 B8A3861 UV8263 Duplicate of SS18-1	RPD for SS18-1 and SS18-A	SS18-2 23-Nov-18 B8A3861 UV8258 0.2	SS18-3 23-Nov-18 B8A3861 UV8259 0.2	SS18-4 23-Nov-18 B8A3861 UV8260 0.2	SS18-5 23-Nov-18 B8A3861 UV8261 0.2	SS18-6 23-Nov-18 B8A3861 UV8262 0.2
			Petroleum Hydrocarbons															
200	200	200	VPHs	µg/g	--	--	<10	--	<10	--	<10	<10	--	--	--	--	--	--
n/s	n/s	n/s	VHs_{6-10}	µg/g	--	--	<10	--	<10	--	<10	<10	--	--	--	--	--	--
1000	1000	2000	LEPHs	µg/g	--	<100	<100	**1200**	<100	<100	<100	<100	--	<100	<100	<100	<100	<100
n/s	n/s	n/s	$EPHs_{10-19}$	µg/g	--	<100	<100	1200	<100	<100	<100	<100	--	<100	<100	<100	<100	<100
1000	1000	5000	HEPHs	µg/g	5410>400	180	<100	**1500**	640	<100	<100	<100	--	100	120	140	<100	230
n/s	n/s	n/s	$EPHs_{19-32}$	µg/g	169%	180	<100	1500	640	<100	<100	<100	--	110	120	140	<100	230
			Monocyclic Aromatic Hydrocarbons															
0.035a	0.035a	0.035a	benzene	µg/g	--	--	<0.0050	--	<0.0050	--	<0.0050	<0.0050	--	--	--	--	--	--
15a	15a	15a	ethylbenzene	µg/g	--	--	<0.010	--	<0.010	--	<0.010	<0.010	--	--	--	--	--	--
5	5	50	styrene	µg/g	--	--	<0.030	--	<0.030	--	<0.030	<0.030	--	--	--	--	--	--
0.5a	0.5a	0.5a	toluene	µg/g	--	--	<0.020	--	<0.020	--	<0.020	<0.020	--	--	--	--	--	--
6.5a	6.5a	6.5a	xylenes	µg/g	--	--	<0.040	--	<0.040	--	<0.040	<0.040	--	--	--	--	--	--
			Polycyclic Aromatic Hydrocarbons															
2000	950	15000	acenaphthene	µg/g	92%	0.0063	<0.0050	0.033	<0.0050	<0.0050	<0.0050	<0.0050	--	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
n/s	n/s	n/s	acenaphthylene	µg/g	98%	0.016	0.021	0.1	0.11	0.011	<0.0050	<0.0050	--	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
2.5a	2.5a	30a	anthracene	µg/g	95%	0.032	0.021	0.097	0.064	0.0047	0.0067	0.0053	0.0014<0.004	0.0056	<0.0040	0.0079	<0.0040	0.0093
1	1	10	benzo[a]anthracene	µg/g	73%	0.12	0.09	0.28	0.14	<0.020	0.021	0.02	0.001<0.02	<0.020	<0.020	<0.020	<0.020	0.046
10a	5a	30a	benzo[a]pyrene	µg/g	80%	0.15	0.12	0.34	0.35	0.068	0.023	0.022	0.001<0.02	<0.020	<0.020	<0.020	<0.020	0.049
1	1	10	benzo[b]fluoranthene	µg/g	54%	0.11	0.1	0.34	0.27	0.049	0.022	<0.020	0.002<0.02	<0.020	<0.020	<0.020	<0.020	0.05
1	1	10	benzo[b+j]fluoranthene	µg/g	70%	0.18	0.16	0.56	0.43	0.07	0.022	<0.020	0.002<0.02	<0.020	<0.020	<0.020	<0.020	0.074
n/s	n/s	n/s	benzo[g,h,i]perylene	µg/g	77%	0.11	0.093	0.32	0.37	0.091	<0.050	<0.050	--	<0.050	<0.050	<0.050	<0.050	<0.050
1	1	10	benzo[k]fluoranthene	µg/g	93%	0.063	0.054	0.17	0.14	<0.020	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	0.022
400	200	4500	chrysene	µg/g	35%	0.14	0.13	0.34	0.19	0.026	0.03	0.026	0.004<0.02	<0.020	<0.020	<0.020	<0.020	0.063
1	1	10	dibenz[a,h]anthracene	µg/g	67%	0.028	0.023	0.078	0.11	<0.020	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020
50a	50a	200a	fluoranthene	µg/g	81%	0.24	0.23	0.67	0.15	<0.020	0.058	0.05	0.008<0.02	0.02	<0.020	0.025	<0.020	0.092
1000	600	9500	fluorene	µg/g	85%	<0.020	<0.020	0.038	<0.020	<0.020	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020
1	1	10	indeno[1,2,3-cd]pyrene	µg/g	84%	0.095	0.089	0.27	0.31	0.042	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	0.037
500	250	1000	methylnaphthalene, 1-	µg/g	0.27>0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	--	<0.050	<0.050	<0.050	<0.050	<0.050
100	60	950	methylnaphthalene, 2-	µg/g	79%	<0.020	<0.020	0.042	<0.020	<0.020	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020
0.6a	0.6a	20a	naphthalene	µg/g	62%	<0.010	<0.010	0.031	<0.010	<0.010	<0.010	<0.010	--	<0.010	<0.010	<0.010	<0.010	<0.010
5	5	50	phenanthrene	µg/g	87%	0.1	0.1	0.33	0.043	<0.010	0.042	0.028	0.014>0.01	0.019	<0.010	0.028	<0.010	0.053
10	10	100	pyrene	µg/g	81%	0.24	0.21	0.62	0.17	<0.020	0.056	0.049	0.007<0.02	0.023	<0.020	0.027	<0.020	0.084
4.5	2.5	10	quinoline	µg/g	--	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	--	<0.050	<0.050	<0.050	<0.050	<0.050
n/s	n/s	n/s	Total HMW-PAHs	µg/g	75%	1.4	1.2	3.7	2.4	0.3	0.21	0.17	0.04<0.05	<0.050	<0.050	0.052	<0.050	0.47
n/s	n/s	n/s	Total LMW-PAHs	µg/g	84%	0.16	0.14	0.73	0.21	<0.050	<0.050	<0.050	--	<0.050	<0.050	<0.050	<0.050	0.063
n/s	n/s	n/s	Total PAHs	µg/g	76%	1.5	1.3	4.4	2.6	0.31	0.26	0.2	0.06>0.05	0.069	<0.050	0.087	<0.050	0.53
			Miscellaneous Organics															
30000	15000	200000	acetone	µg/g	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Soil Exceedances

125	Exceeds CSR PL standards
125	Exceeds CSR RL_{LD} standards
125	Exceeds CSR CL standards

QA/QC Exceedances

45%	RPD exceeds 35%

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TABLE 6: SOIL ANALYTICAL RESULTS
VOCS
Portion of 2901 East Hastings Street, Vancouver, BC
City of Vancouver
Project #: 13639
January 2019

CSR PL Standards	CSR RL_{LD} Standards	CSR CL Standards	SAMPLE ID	Units	MW01-2-2.5	BH01-3-3.5	BH01-4-6	BH18-1 (0.1)	MW18-2 (2.1)	MW18-3 (6.9)	BH18-4 (0.2)	MW18-5 (2.8)	MW18-9 (4.5)	MW18-12 (1.2)	MW18-12 (1.8)	BH18-13 (0.4)	MW18-15(1.2)	MW18-16 (2.4)	SS18-1	SS18-A	RPD for SS18-1 and SS18-A
			DATE SAMPLED		31-Jul-01	31-Jul-01	31-Jul-01	21-Nov-18	21-Nov-18	20-Nov-18	21-Nov-18	21-Nov-18	21-Nov-18	22-Nov-18	22-Nov-18	22-Nov-18	21-Nov-18	23-Nov-18	23-Nov-18	23-Nov-18	
			LAB CERTIFICATE		--	--	--	B8A2725	B8A2725	B8A2224	B8A2725	B8A2725	B8A2725	B8A3005	B8A3005	B8A3005	B8A2682	B8A3869	B8A3861	B8A3861	
			LAB SAMPLE ID		--	--	--	UV1873	UV1876	UU9334	UV1888	UV1894	UV1900	UV3357	UV3358	UV3360	UV1664	UV8300	UV8257	UV8263	
			SAMPLE DEPTH (mbg)		0.76	1.07	1.83	0.1	2.1	6.9	0.2	2.8	4.5	1.2	1.8	0.4	1.2	2.4	0.2	Duplicate of SS18-1	
			Halogenated Aliphatics																		
200	100	550	bromodichloromethane	µg/g	<0.01	<0.01	<0.01	--	<0.050	<0.050	<0.050	<0.050	<0.050	2.5	--	<0.050	<0.050	<0.050	<0.050	<0.050	--
650	300	4000	bromoform	µg/g	<0.01	<0.01	<0.01	--	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	--	<0.050	<0.050	<0.050	<0.050	<0.050	--
45	20	300	bromomethane	µg/g	<0.04	<0.04	<0.04	--	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	--	<0.30	<0.30	<0.30	<0.30	<0.30	--
5	5	50	carbon tetrachloride	µg/g	<0.01	<0.01	<0.01	--	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	--
n/s	n/s	n/s	chloroethane	µg/g	<0.02	<0.02	<0.02	--	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	--	<0.10	<0.10	<0.10	<0.10	<0.10	--
5	5	50	chloroform	µg/g	<0.01	<0.01	<0.01	--	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	--
n/s	n/s	n/s	chloromethane	µg/g	<0.04	<0.04	<0.04	--	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	--	<0.050	<0.050	<0.050	<0.050	<0.050	--
150	85	400	dibromochloromethane	µg/g	<0.01	<0.01	<0.01	--	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	--	<0.050	<0.050	<0.050	<0.050	<0.050	--
7	3.5	15	dibromoethane, 1,2-	µg/g	<0.01	<0.01	<0.01	--	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	--
n/s	n/s	n/s	dibromomethane	µg/g	<0.01	<0.01	<0.01	--	<0.20	<0.20	<0.20	<0.20	<0.20	--	--	--	<0.20	<0.20	<0.20	<0.20	--
6500	3000	45000	dichlorodifluoromethane	µg/g	<0.02	<0.02	<0.02	--	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	--	<0.20	<0.20	<0.20	<0.20	<0.20	--
5	5	50	dichloroethane, 1,1-	µg/g	<0.01	<0.01	<0.01	--	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	--	<0.025	<0.025	<0.025	<0.025	<0.025	--
5	5	50	dichloroethane, 1,2-	µg/g	<0.02	<0.02	<0.02	--	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	--
5	5	50	dichloroethene, 1,1-	µg/g	<0.01	<0.01	<0.01	--	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	--	<0.025	<0.025	<0.025	<0.025	<0.025	--
5	5	50	dichloroethene, 1,2- (cis)	µg/g	<0.01	<0.01	<0.01	--	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	--	<0.030	<0.030	<0.030	<0.030	<0.030	--
5	5	50	dichloroethene, 1,2- (trans)	µg/g	<0.01	<0.01	<0.01	--	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	--	<0.030	<0.030	<0.030	<0.030	<0.030	--
5	5	50	dichloromethane	µg/g	--	--	--	--	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080	--	<0.080	<0.080	<0.080	<0.080	<0.080	--
5	5	50	dichloropropane, 1,2-	µg/g	<0.01	<0.01	<0.01	--	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	--
5	5	50	dichloropropene, 1,3- (cis)	µg/g	<0.01	<0.01	<0.01	--	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	--
5	5	50	dichloropropene, 1,3- (trans)	µg/g	<0.01	<0.01	<0.01	--	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	--
30	15	250	hexachlorobutadiene, 1,3-	µg/g	--	--	--	--	--	--	--	--	--	<0.20	--	<0.20	--	--	--	--	--
550	250	1500	tetrachloroethane, 1,1,1,2-	µg/g	--	--	--	--	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	--
70	35	150	tetrachloroethane, 1,1,2,2-	µg/g	<0.01	<0.01	<0.01	--	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	--
2.5a	2.5a	2.5a	tetrachloroethene	µg/g	<0.01	<0.01	<0.01	--	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	--	<0.010	<0.010	<0.010	<0.010	<0.010	--
900000	450000	1000000	trichloro-1,2,2-trifluoroethane, 1,1,2-	µg/g	<0.01	<0.01	<0.01	--	--	--	--	--	--	<0.20	--	<0.20	--	--	--	--	--
5	5	50	trichloroethane, 1,1,1-	µg/g	<0.01	<0.01	<0.01	--	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	--
5	5	50	trichloroethane, 1,1,2-	µg/g	<0.01	<0.01	<0.01	--	<0.020	<0.020	<0.020	<0.020	<0.020	2.5	--	<0.020	<0.020	<0.020	<0.020	<0.020	--
0.3a	0.3a	0.3a	trichloroethene	µg/g	0.11	<0.01	0.02	--	<0.0090	<0.0090	<0.0090	<0.0090	<0.0090	<0.0090	--	<0.0090	<0.0090	<0.0090	<0.0090	<0.0090	--
9000	4500	70000	trichlorofluoromethane	µg/g	<0.01	<0.01	<0.01	--	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	--	<0.20	<0.20	<0.20	<0.20	<0.20	--
2	0.95	45	vinyl chloride	µg/g	<0.02	<0.02	<0.02	--	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	--	<0.040	<0.040	<0.040	<0.040	<0.040	--
			Halogenated Aromatics																		
250	150	2000	bromobenzene	µg/g	--	--	--	--	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	--	<0.20	<0.20	<0.20	<0.20	<0.20	--
1	1	10	dichlorobenzene, 1,2-	µg/g	<0.01	<0.01	<0.01	--	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	--
1	1	10	dichlorobenzene, 1,3-	µg/g	<0.01	<0.01	<0.01	--	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	--
1	1	10	dichlorobenzene, 1,4-	µg/g	<0.01	<0.01	<0.01	--	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	--
1	1	10	monochlorobenzene	µg/g	--	--	--	--	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	<0.020	<0.020	<0.020	<0.020	<0.020	--
2	2	10	trichlorobenzene, 1,2,3-	µg/g	--	--	--	--	--	--	--	--	--	0.048	--	0.065	--	--	--	--	--
2	2	10	trichlorobenzene, 1,2,4-	µg/g	--	--	--	--	--	--	--	--	--	<0.030	--	<0.030	--	--	--	--	--
			Non-Halogenated Aliphatics																		
4	2	9.5	butadiene, 1,3-	µg/g	--	--	--	--	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080	--	<0.080	<0.080	<0.080	<0.080	<0.080	--
20000	9500	150000	butanone, 2-	µg/g	--	--	--	--	<15	<15	<15	<15	<15	<15	--	<15	<15	<15	<15	<15	--
n/s	n/s	n/s	decane, n-	µg/g	--	--	--	--	--	--	--	--	--	4.4	<0.10	<2.0	--	--	--	--	--
8000	4000	20000	methyl tert-butyl ether	µg/g	--	--	--	<0.10	--	--	--	--	--	<0.10	--	<0.10	--	--	--	--	--
n/s	n/s	n/s	methyl-2-pentanone, 4-	µg/g	--	--	--	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50	<0.50	<0.50	<0.50	--
n/s	n/s	n/s	methylcyclohexane	µg/g	--	--	--	--	--	--	--	--	--	11	--	<0.20	--	--	--	--	--
			Non-Halogenated Aromatics																		
3000	1500	25000	isopropylbenzene	µg/g	--	--	--	--	--	--	--	--	--	0.41	--	<0.20	--	--	--	--	--
n/s	n/s	n/s	trimethylbenzene, 1,2,4-	µg/g	--	--	--	--	--	--	--	--	--	<0.20	--	<0.20	--	--	--	--	--
300	150	2500	trimethylbenzene, 1,3,5-	µg/g	--	--	--	--	--	--	--	--	--	<0.20	--	<0.20	--	--	--	--	--

Soil Exceedances

125	Exceeds CSR PL standards
125	Exceeds CSR RL_{LD} standards
125	Exceeds CSR CL standards

QA/QC Exceedances

45%	RPD exceeds 35%

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GLOSSARY: GROUNDWATER ANALYTICAL RESULTS
Portion of 2901 East Hastings Street, Vancouver, BC
City of Vancouver
Project #: 13639
January 2019

List of Acronyms

AW_{FW}	Aquatic Life Water Use (freshwater)
AW_{M}	Aquatic Life Water Use (marine)
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CSR	British Columbia Contaminated Sites Regulation
DW	Drinking Water Use
$EPHw_{10-19}$	Extractable Petroleum Hydrocarbons (carbon range 10 to 19)
$EPHw_{19-32}$	Extractable Petroleum Hydrocarbons (carbon range 19 to 32)
HEPHw	Heavy Extractable Petroleum Hydrocarbons (corrected for PAHs)
HMW-PAHs	Heavy Molecular Weight Polycyclic Aromatic Hydrocarbons
HWR	British Columbia Hazardous Waste Regulation
IW	Irrigation Water Use
LEPHw	Light Extractable Petroleum Hydrocarbons (corrected for PAHs)
LMW-PAHs	Light Molecular Weight Polycyclic Aromatic Hydrocarbons
LW	Livestock Water Use
MTBE	Methyl tert-Butyl Ether
n/s	No Standard
PAHs	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
RDL	Reported Detection Limit
RPD	Relative Percent Difference
TDS	Total Dissolved Solids
VHw_{6-10}	Volatile Petroleum Hydrocarbons (carbon range 6 to 10)
VOC	Volatile Organic Compounds
VPHw	Volatile Petroleum Hydrocarbons (corrected for BTEX)

List of Symbols

<	Concentration is less than the laboratory reported detection limit
*	Laboratory reported detection limit is greater than applicable standard/guideline
--	Sample was not analyzed for the specified constituent
a	CSR standard is hardness dependent
b	CSR standard is pH dependent
c	Temperature data not available, T>20°C assumed for conservativeness
d	CSR standard is Chloride dependent
e	CSR standard is Salinity dependent
f	CSR standard is pH and T dependent
g	Interim background groundwater concentration estimate

List of Units

mbg	Metres below grade
µg/L	Micrograms per litre
mg/L	Milligrams per litre

Groundwater Exceedances

125	Exceeds CSR AW_{FW} standards
125	Exceeds CSR AW_{M} standards
125	Exceeds CSR DW standards

QA/QC Exceedances

45%	RPD exceeds 20%

Formulas

RPD RPD = ((Max. Concentration - Min. Concentration)/((Max. Concentration + Min. Concentration)/2))*100

TABLE 7: GROUNDWATER ANALYTICAL RESULTS
INORGANICS
Portion of 2901 East Hastings Street, Vancouver, BC
City of Vancouver
Project #: 13639
January 2019

CSR AW_{FW} Standards	CSR AW_M Standards	CSR DW Standards	SAMPLE ID	Units	MW01-1	MW01-2	MW18-2	MW18-2	MW18-2	MW18-3	MW18-3	MW18-3	MW18-5	MW18-6	MW18-9	MW18-10	MW18-12	MW18-A	RPD	MW18-14	MW18-15	MW18-16
			DATE SAMPLED		02-Aug-01	02-Aug-01	27-Nov-18	14-Dec-18	19-Dec-18	27-Nov-18	14-Dec-18	19-Dec-18	27-Nov-18	27-Nov-18	27-Nov-18	27-Nov-18	27-Nov-18	27-Nov-18	for	27-Nov-18	28-Nov-18	28-Nov-18
			LAB CERTIFICATE		--	--	B8A3995	B8A9208	B8B0365	B8A3995	B8A9208	B8B0365	B8A3995	B8A3995	B8A3995	B8A3995	B8A3997	B8A3997	MW18-12	B8A3997	B8A4415	B8A4415
			LAB SAMPLE ID		--	--	UV9067	UY6235	UZ2012	UV9068	UY6236	UZ2013	UV9069	UV9070	UV9071	UV9072	UV9078	UV9080	and	UV9079	UW1101	UW1102
			TOP OF SCREEN (mbg)		--	--	7.3	7.3	7.3	6.5	6.5	6.5	1.6	3.8	4.6	2.8	1.7	Duplicate of	MW18-A	1.8	2.8	1.8
			BOTTOM OF SCREEN (mbg)		--	--	8.8	8.8	8.8	8.1	8.1	8.1	3.1	5.5	6.1	4.3	3.1	MW18-12		3.1	4.3	3.4
n/s	n/s	n/s	hardness	mg/L	212	196	77.8	86.8	72.2	77.5	152	127	176	386	745	117	142	144	--	322	91.4	606
			Dissolved Metals																			
n/s	n/s	9500	aluminum	µg/L	53	31	77.3	--	--	15.9	--	--	36.5	4.7	7.3	63.1	20.3	20.8	2%	22.2	13.8	53.2
90	2500	6	antimony	µg/L	<1.0	<1.0	1.08	--	--	1.12	--	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<1.0	<0.50	<1.0
50	125	13	arsenic	µg/L	<1.0	1	11.1	--	--	11	--	--	2.05	1.59	3.29	0.74	3.29	3.25	1%	0.65	0.29	1.38
10000	5000	1000	barium	µg/L	130	160	17.7	--	--	17	--	--	87.6	59.3	105	22.7	43.9	43.8	0%	299	15.3	111
1.5	1000	8	beryllium	µg/L	<1	<1	<0.10	--	--	<0.10	--	--	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	--	<0.20	<0.10	<0.20
n/s	n/s	n/s	bismuth	µg/L	<1	<1	<1.0	--	--	<1.0	--	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	<2.0	<1.0	<2.0
12000	12000	5000	boron	µg/L	80	100	63	--	--	65	--	--	<50	70	<50	<50	<50	<50	--	<100	<50	146
0.5-4a	15	5	cadmium	µg/L	<0.2	<0.2	<0.010	--	--	<0.010	--	--	0.127	0.111	0.144	0.044	<0.010	<0.010	--	0.191	0.11	0.088
n/s	n/s	n/s	calcium	µg/L	56600	59100	24900	--	--	24800	--	--	48000	117000	201000	36500	47900	48600	1%	98200	28200	203000
10	15	50	chromium (total)	µg/L	<1.0	<1.0	<1.0	--	--	<1.0	--	--	<1.0	<1.0	<1.0	3.2	1	<1.0	0<1	<2.0	<1.0	<2.0
40	40	20g	cobalt	µg/L	<1.0	<1.0	<0.20	--	--	<0.20	--	--	9.15	4.25	2.98	1.93	3.78	3.84	2%	12.1	1.99	10
20-90a	20	1500	copper	µg/L	<1.0	4	2.91	--	--	2.86	--	--	<0.20	1.57	1.15	3.07	<0.20	<0.20	--	1.89	1.01	1.4
n/s	n/s	6500	iron	µg/L	1120	700	48.6	--	--	<5.0	--	--	65700	102	21.9	18.6	10400	10600	2%	25400	6	3980
40-160a	20	10	lead	µg/L	<1.0	<1.0	<0.20	--	--	<0.20	--	--	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	--	<0.40	<0.20	<0.40
n/s	n/s	19	lithium	µg/L	<1.0	2	<2.0	--	--	<2.0	--	--	<2.0	3.3	4.3	2.5	<2.0	<2.0	--	<4.0	<2.0	8.7
n/s	n/s	n/s	magnesium	µg/L	17000	11600	3830	--	--	3770	--	--	13700	22800	59100	6320	5420	5520	2%	18800	5120	24000
n/s	n/s	1500	manganese	µg/L	3150	1490	22.7	--	--	22.6	--	--	5640	3320	1220	948	1800	1830	2%	6400	190	2520
0.25	0.25	1	mercury	µg/L	<0.05	<0.05	<0.0020	--	--	<0.0020	--	--	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	--	0.0024	<0.0020	0.0023
10000	10000	250	molybdenum	µg/L	<1	1	27.6	--	--	28.3	--	--	<1.0	2.2	3.7	1.9	1	1.1	0.1<1	<2.0	<1.0	<2.0
250-1500a	83	80	nickel	µg/L	12	23	<1.0	--	--	<1.0	--	--	5.4	7.2	8.1	1.1	2.2	2	0.2<1	4.8	7.3	15.5
n/s	n/s	n/s	potassium	µg/L	4170	3990	4610	--	--	4540	--	--	2140	5850	11300	4620	2720	2740	1%	11000	1320	9710
20	20	6	selenium	µg/L	<2.0	<2.0	4.19	--	--	4.49	--	--	0.34	1	0.38	<0.10	0.1	0.1	0<0.1	0.28	0.14	1.49
n/s	n/s	n/s	silicon	µg/L	13100	19400	5670	--	--	5440	--	--	6700	12200	11300	8690	8640	8830	2%	6450	8710	7900
0.5-15a	15	20	silver	µg/L	<0.1	<0.1	<0.020	--	--	<0.020	--	--	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	<0.040	<0.020	<0.040
n/s	n/s	2500	strontium	µg/L	330	2100	187	--	--	187	--	--	491	719	1110	289	307	301	2%	739	178	684
n/s	n/s	n/s	sulphur	µg/L			29600	--	--	28700	--	--	<3000	60000	22000	7000	4100	4400	300<3000	10600	6100	81700
3	3	n/s	thallium	µg/L	<0.1	0.1	<0.010	--	--	<0.010	--	--	0.073	0.027	0.063	<0.010	<0.010	<0.010	--	0.199	0.018	0.11
n/s	n/s	2500	tin	µg/L	<1.0	<1.0	<5.0	--	--	<5.0	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	--	<10	<5.0	<10
1000	1000	n/s	titanium	µg/L	<1.0	<1.0	<5.0	--	--	<5.0	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	--	<10	<5.0	<10
85	85	19	uranium	µg/L	<0.5	0.9	4.99	--	--	4.9	--	--	0.22	2.22	6.13	0.47	<0.10	<0.10	--	<0.20	<0.10	5.1
n/s	n/s	26	vanadium	µg/L	1	2	**26.9**	12.2	10.6	**26.5**	8.1	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	--	<10	<5.0	<10
75-3150a	100	3000	zinc	µg/L	21	<5	<5.0	--	--	<5.0	--	--	<5.0	<5.0	<5.0	23.3	<5.0	<5.0	--	10	<5.0	<10
n/s	n/s	n/s	zirconium	µg/L	40	100	<0.10	--	--	<0.10	--	--	0.38	<0.10	0.24	<0.10	0.14	0.17	0.03<0.1	<0.20	<0.10	0.66

Groundwater Exceedances

125	Exceeds CSR AW_{FW} standards
125	Exceeds CSR AW_M standards
125	Exceeds CSR DW standards

QA/QC Exceedances

45%	RPD exceeds 20%

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TABLE 8: GROUNDWATER ANALYTICAL RESULTS
HYDROCARBONS
Portion of 2901 East Hastings Street, Vancouver, BC
City of Vancouver
Project #: 13639
January 2019

CSR AW_{FW} Standards	CSR AW_{M} Standards	CSR DW Standards	SAMPLE ID	Units	MW01-1	MW01-2	MW18-2	MW18-3	MW18-5	MW18-6	MW18-9	MW18-10	MW18-12	MW18-A	RPD	MW18-14	MW18-14	MW18-14	MW18-15	MW18-16
			DATE SAMPLED		02-Aug-01	02-Aug-01	27-Nov-18	27-Nov-18	27-Nov-18	27-Nov-18	27-Nov-18	27-Nov-18	27-Nov-18	27-Nov-18	for	27-Nov-18	14-Dec-18	19-Dec-18	28-Nov-18	28-Nov-18
			LAB CERTIFICATE		--	--	B8A3995	B8A3995	B8A3995	B8A3995	B8A3995	B8A3995	B8A3997	B8A3997	MW18-12	B8A3997	B8A9205	B8B0362	B8A4415	B8A4415
			LAB SAMPLE ID		--	--	UV9067	UV9068	UV9069	UV9070	UV9071	UV9072	UV9078	UV9080	and	UV9079	UY6224	UZ2004	UW1101	UW1102
			TOP OF SCREEN (mbg)		--	--	7.3	6.5	1.6	3.8	4.6	2.8	1.7	Duplicate of	MW18-A	1.8	1.8	1.8	2.8	1.8
			BOTTOM OF SCREEN (mbg)		--	--	8.8	8.1	3.1	5.5	6.1	4.3	3.1	MW18-12		3.1	3.1	3.1	4.3	3.4
			Petroleum Hydrocarbons																	
1500	1500	n/s	VPHw	µg/L	--	--	<300	<300	<300	--	<300	--	<300	<300	--	--	<300	--	<300	<300
15000	15000	15000	VHw_{6-10}	µg/L	--	--	<300	<300	<300	--	<300	--	<300	<300	--	--	<300	--	<300	<300
500	500	n/s	LEPHw	µg/L	<250	<250	<200	<200	<200	<200	<200	<200	<200	<200	--	<200	--	--	<200	<200
5000	5000	5000	$EPHw_{10-19}$	µg/L	<250	<250	<200	<200	<200	<200	<200	<200	<200	<200	--	<200	--	--	<200	<200
n/s	n/s	n/s	HEPHw	µg/L	<250	<250	<200	<200	<200	<200	<200	<200	<200	<200	--	<200	--	--	<200	<200
n/s	n/s	n/s	$EPHw_{19-32}$	µg/L	<250	<250	<200	<200	<200	<200	<200	<200	<200	<200	--	<200	--	--	<200	<200
			Monocyclic Aromatic Hydrocarbons																	
400	1000	5	benzene	µg/L	--	0.2	<0.40	<0.40	<0.40	--	<0.40	--	<0.40	<0.40	--	--	<0.40	--	<0.40	<0.40
2000	2500	140	ethylbenzene	µg/L	--	0.2	<0.40	<0.40	<0.40	--	<0.40	--	<0.40	<0.40	--	--	<0.40	--	<0.40	<0.40
720	720	800	styrene	µg/L	--	--	<0.50	<0.50	<0.50	--	<0.50	--	<0.50	<0.50	--	--	<0.40	--	<0.50	<0.50
5	2000	60	toluene	µg/L	--	0.2	<0.40	<0.40	<0.40	--	<0.40	--	<0.40	<0.40	--	--	<0.40	--	<0.40	<0.40
300	300	90	xylenes	µg/L	--	0.9	<0.40	<0.40	<0.40	--	<0.40	--	<0.40	<0.40	--	--	<0.40	--	<0.40	<0.40
			Polycyclic Aromatic Hydrocarbons																	
60	60	250	acenaphthene	µg/L	<0.1	<0.1	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	--	<0.050	--	--	<0.050	<0.050
n/s	n/s	n/s	acenaphthylene	µg/L	<0.1	<0.1	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	--	<0.050	--	--	<0.050	<0.050
0.5	0.5	n/s	acridine	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	--	<0.050	--	--	<0.050	<0.050
1	1	1000	anthracene	µg/L	<0.050	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	--	<0.010	--	--	<0.010	<0.010
1	1	0.07	benzo[a]anthracene	µg/L	<0.01	<0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	--	0.025	--	--	<0.010	<0.010
0.1	0.1	0.01	benzo[a]pyrene	µg/L	<0.01	<0.01	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0074	0.0076	0.0002<0.005	**0.027**	<0.0050	<0.0050	<0.0050	0.0093
n/s	n/s	0.07	benzo[b+j]fluoranthene	µg/L	--	--	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	--	<0.030	--	--	<0.030	<0.030
n/s	n/s	n/s	benzo[g,h,i]perylene	µg/L	<0.01	<0.01	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	--	<0.050	--	--	<0.050	<0.050
n/s	n/s	n/s	benzo[k]fluoranthene	µg/L	<0.01	<0.01	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	--	<0.050	--	--	<0.050	<0.050
1	1	7	chrysene	µg/L	<0.01	<0.01	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	0.032	--	--	<0.020	<0.020
n/s	n/s	0.01	dibenz[a,h]anthracene	µg/L	<0.01	<0.01	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	--	0.0041	--	--	<0.0030	<0.0030
2	2	150	fluoranthene	µg/L	<0.05	<0.05	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	0.05	--	--	<0.020	<0.020
120	120	150	fluorene	µg/L	<0.05	<0.05	<0.050	<0.050	<0.050	0.082	<0.050	<0.050	<0.050	<0.050	--	<0.050	--	--	<0.050	<0.050
n/s	n/s	n/s	indeno[1,2,3-cd]pyrene	µg/L	<0.01	<0.01	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	--	<0.050	--	--	<0.050	<0.050
n/s	n/s	5.5	methylnaphthalene, 1-	µg/L	--	--	<0.050	<0.050	<0.050	0.64	<0.050	0.081	0.27	0.26	4%	0.14	--	--	<0.050	<0.050
n/s	n/s	15	methylnaphthalene, 2-	µg/L	--	--	<0.10	<0.10	<0.10	0.5	<0.10	<0.10	0.29	0.29	0<0.1	0.11	--	--	<0.10	<0.10
10	10	80	naphthalene	µg/L	<0.3	<0.3	<0.10	<0.10	<0.10	0.24	<0.10	<0.10	0.29	0.29	0<0.1	0.1	--	--	<0.10	<0.10
3	3	n/s	phenanthrene	µg/L	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	--	<0.050	--	--	<0.050	<0.050
0.2	0.2	100	pyrene	µg/L	<0.02	<0.02	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.022	0.022	0<0.02	0.051	--	--	<0.020	<0.020
34	34	0.05	quinoline	µg/L	--	--	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	--	<0.020	--	--	<0.020	<0.020
n/s	n/s	n/s	Total HMW-PAHs	µg/L	--	--	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	--	0.19	--	--	<0.050	<0.050
n/s	n/s	n/s	Total LMW-PAHs	µg/L	--	--	<0.10	<0.10	<0.10	1.5	<0.10	<0.10	0.85	0.83	2%	0.35	--	--	<0.10	<0.10
n/s	n/s	n/s	Total PAHs	µg/L	--	--	<0.10	<0.10	<0.10	1.5	<0.10	<0.10	0.88	0.86	2%	0.54	--	--	<0.10	<0.10

Groundwater Exceedances

125	Exceeds CSR AW_{FW} standards
125	Exceeds CSR AW_{M} standards
125	Exceeds CSR DW standards

QA/QC Exceedances

45%	RPD exceeds 20%

TABLE 9: GROUNDWATER ANALYTICAL RESULTS
VOCS
Portion of 2901 East Hastings Street, Vancouver, BC
City of Vancouver
Project #: 13639
January 2019

CSR AW_{FW} Standards	CSR AW_{M} Standards	CSR DW Standards	SAMPLE ID	Units	MW01-2	MW18-2	MW18-3	MW18-5	MW18-9	MW18-12	MW18-A	RPD for MW18-12 and MW18-A	MW18-15	MW18-16
			DATE SAMPLED		02-Aug-01	27-Nov-18	27-Nov-18	27-Nov-18	27-Nov-18	27-Nov-18	27-Nov-18		28-Nov-18	28-Nov-18
			LAB CERTIFICATE		--	B8A3995	B8A3995	B8A3995	B8A3995	B8A3997	B8A3997		B8A4415	B8A4415
			LAB SAMPLE ID		--	UV9067	UV9068	UV9069	UV9071	UV9078	UV9080		UW1101	UW1102
			TOP OF SCREEN (mbg)		--	7.3	6.5	1.6	4.6	1.7	Duplicate of		2.8	1.8
			BOTTOM OF SCREEN (mbg)		--	8.8	8.1	3.1	6.1	3.1	MW18-12		4.3	3.4
			Halogenated Aliphatics											
n/s	n/s	100	bromodichloromethane	µg/L	<0.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	<1.0	<1.0
n/s	n/s	100	bromoform	µg/L	<0.2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	<1.0	<1.0
n/s	n/s	5.5	bromomethane	µg/L	<0.8	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	<1.0	<1.0
130	130	2	carbon tetrachloride	µg/L	<0.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
n/s	n/s	n/s	chloroethane	µg/L	<0.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	<1.0	<1.0
20	20	100	chloroform	µg/L	<0.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	<1.0	<1.0
n/s	n/s	n/s	chloromethane	µg/L	<0.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	<1.0	<1.0
n/s	n/s	100	dibromochloromethane	µg/L	<0.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	<1.0	<1.0
n/s	n/s	0.5	dibromoethane, 1,2-	µg/L	<0.1	<0.20	<0.20	<0.20	<0.20	<0.20	<0.53*	--	<0.20	<0.20
n/s	n/s	n/s	dibromomethane	µg/L	<0.2	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	--	<0.90	<0.90
n/s	n/s	800	dichlorodifluoromethane	µg/L	<0.2	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	--	<2.0	<2.0
n/s	n/s	30	dichloroethane, 1,1-	µg/L	<0.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
1000	1000	5	dichloroethane, 1,2-	µg/L	<0.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
n/s	n/s	14	dichloroethene, 1,1-	µg/L	<0.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
n/s	n/s	8	dichloroethene, 1,2- (cis)	µg/L	<0.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	<1.0	<1.0
n/s	n/s	80	dichloroethene, 1,2- (trans)	µg/L	<0.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	<1.0	<1.0
980	980	50	dichloromethane	µg/L	--	<2.0	<2.0	<2.0	2.4	2.8	3.1	0.3<2	<2.0	<2.0
n/s	n/s	4.5	dichloropropane, 1,2-	µg/L	<0.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
n/s	n/s	1.5	dichloropropene, 1,3- (cis)	µg/L	<0.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	<1.0	<1.0
n/s	n/s	1.5	dichloropropene, 1,3- (trans)	µg/L	<0.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	<1.0	<1.0
n/s	n/s	6	tetrachloroethane, 1,1,1,2-	µg/L	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
n/s	n/s	0.8	tetrachloroethane, 1,1,2,2-	µg/L	<0.2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.51	--	<0.50	<0.50
1100	1100	30	tetrachloroethene	µg/L	<0.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
n/s	n/s	100000	trichloro-1,2,2-trifluoroethane, 1,1,2-	µg/L	<0.2	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	--	<2.0	<2.0
n/s	n/s	8000	trichloroethane, 1,1,1-	µg/L	<0.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
n/s	n/s	3	trichloroethane, 1,1,2-	µg/L	<0.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
200	200	5	trichloroethene	µg/L	<0.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
n/s	n/s	1000	trichlorofluoromethane	µg/L	<0.2	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	--	<4.0	<4.0
n/s	n/s	2	vinyl chloride	µg/L	<0.2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
			Halogenated Aromatics											
n/s	n/s	30	bromobenzene	µg/L	--	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	--	<2.0	<2.0
7	420	200	dichlorobenzene, 1,2-	µg/L	<0.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
1500	1500	n/s	dichlorobenzene, 1,3-	µg/L	<0.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
260	260	5	dichlorobenzene, 1,4-	µg/L	<0.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
13	250	80	monochlorobenzene	µg/L	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
			Non-Halogenated Aliphatics											
n/s	n/s	1	butadiene, 1,3-	µg/L	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
n/s	n/s	2500	butanone, 2-	µg/L	<5	<50	<50	<50	<50	<50	<50	--	<50	<50
n/s	n/s	n/s	methyl-2-pentanone, 4-	µg/L	<2	<10	<10	<10	<10	<10	<10	--	<10	<10

Groundwater Exceedances

125	Exceeds CSR AW_{FW} standards
125	Exceeds CSR AW_{M} standards
125	Exceeds CSR DW standards

QA/QC Exceedances

45%	RPD exceeds 20%

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GLOSSARY: VAPOUR ANALYTICAL RESULTS
Portion of 2901 East Hastings Street, Vancouver, BC
City of Vancouver
Project #: 13639
January 2019

List of Acronyms

AL	Agricultural Land Use
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CL	Commercial Land Use
CSR	British Columbia Contaminated Sites Regulation
IL	Industrial Land Use
MSVC	Measured Sub-surface Vapour Concentration
MTBE	Methyl Tertiary Butyl Ether
n/s	No Standard
PIVC	Predicted Indoor Vapour Concentration
POVC	Predicted Outdoor Vapour Concentration
PL	Urban Park Land Use
RDL	Reported Detection Limit
RL	Residential Land Use
RPD	Relative Percent Difference
VHv_{6-13}	Volatile Petroleum Hydrocarbons (carbon range 6 to 13)
VOC	Volatile Organic Compounds
VPHv	Volatile Petroleum Hydrocarbon (corrected for BTEX)

List of Symbols

<	Concentration is less than the laboratory reported detection limit
*	Laboratory reported detection limit is greater than applicable standard/guideline
--	Sample was not analyzed for the specified constituent

List of Units

mbg	Metres below grade
µg/m³	Micrograms per gram
L/min	Litres per minute
min	Minutes

Vapour Exceedances

125	Exceeds CSR PL standards
125	Exceeds CSR RL standards
125	Exceeds CSR CL standards

QA/QC Exceedances

45%	RPD exceeds 35%

Formulas

PIVC	PIVC = MSVC (µg/m3) * Attenuation Factor for PIVC (unitless)
POVC	POVC = MSVC (µg/m3) * Attenuation Factor for POVC (unitless)
RPD	RPD = [[Max Concentration - Min Concentration]/[[Max Concentration + Min Concentration]/2]]*100}

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TABLE 11: VAPOUR ANALYTICAL RESULTS
HYDROCARBONS AND NON-HALOGENATED VOCS
Portion of 2901 East Hastings Street, Vancouver, BC
City of Vancouver
Project #: 13639
January 2019

CSR PL Standards	CSR RL Standards	CSR CL Standards	SAMPLE ID	Units	SV18-2				SV18-3				SV18-A				RPD for SV18-3 and SV18-A
			DATE SAMPLED		29-Nov-18				29-Nov-18				29-Nov-18				
			LAB CERTIFICATE		B8A4803				B8A4803				B8A4803				
			LAB SAMPLE ID		UW2943				UW2944				UW2948				
			SAMPLE DEPTH (mbg)		1.0				1.0				Duplicate of				
			FLOW RATE (L/min)		0.2				0.1				SV18-3				
			FLOW DURATION (min)		20				40								
			VAPOUR CONCENTRATION		MSVC	PIVC (PL/RL)	PIVC (CL)	POVC	MSVC	PIVC (PL/RL)	PIVC (CL)	POVC	MSVC	PIVC (PL/RL)	PIVC (CL)	POVC	MSVC
			ATTENUATION FACTOR		--	2.8E-03	3.7E-04	1.5E-06	--	2.8E-03	3.7E-04	1.5E-06	--	2.8E-03	3.7E-04	1.5E-06	--
			Petroleum Hydrocarbons														
1000	1000	3000	VPHv	µg/m³	890	2.49	0.329	0.00134	<130	<0.364	<0.0481	<0.000195	<130	<0.364	<0.0481	<0.000195	--
n/s	n/s	n/s	VH_{6-13}	µg/m³	980	2.74	0.363	0.00147	<130	<0.364	<0.0481	<0.000195	<130	<0.364	<0.0481	<0.000195	--
			Monocyclic Aromatic Hydrocarbons														
1.5	1.5	4	benzene	µg/m³	**5.2**	0.015	0.0019	0.0000078	<0.38	<0.00106	<0.000141	<0.00000057	<0.38	<0.00106	<0.000141	<0.00000057	--
1000	1000	3000	ethylbenzene	µg/m³	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075	--
1000	1000	3000	styrene	µg/m³	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075	--
5000	5000	15000	toluene	µg/m³	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075	--
100	100	300	xylenes	µg/m³	5.3	0.015	0.002	0.000008	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	--
			Polycyclic Aromatic Hydrocarbons														
3	3	9	naphthalene	µg/m³	<0.75	<0.0021	<0.000278	<0.00000113	<0.75	<0.0021	<0.000278	<0.00000113	<0.75	<0.0021	<0.000278	<0.00000113	--
			Non-Halogenated Aliphatics														
2	2	2	butadiene, 1,3-	µg/m³	2	0.0056	0.00074	0.000003	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	--
5000	5000	15000	butanone, 2-	µg/m³	<130	<0.364	<0.0481	<0.000195	<130	<0.364	<0.0481	<0.000195	<130	<0.364	<0.0481	<0.000195	--
2500	2500	8000	decane, n-	µg/m³	<25	<0.07	<0.0093	<0.000038	<25	<0.07	<0.0093	<0.000038	<25	<0.07	<0.0093	<0.000038	--
700	700	2000	hexane, n-	µg/m³	81	0.23	0.03	0.00012	<25	<0.07	<0.0093	<0.000038	<25	<0.07	<0.0093	<0.000038	--
n/s	n/s	n/s	hexanone, 2-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	--
3000	3000	9000	methyl tert-butyl ether	µg/m³	<100	<0.28	<0.037	<0.00015	<100	<0.28	<0.037	<0.00015	<100	<0.28	<0.037	<0.00015	--
3000	3000	9000	methyl-2-pentanone, 4-	µg/m³	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075	--
1500	1500	5000	methylcyclohexane	µg/m³	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075	--
			Non-Halogenated Aromatics														
n/s	n/s	n/s	butylbenzene, n-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	--
n/s	n/s	n/s	butylbenzene, sec-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	--
n/s	n/s	n/s	butylbenzene, tert-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	--
400	400	1000	isopropylbenzene	µg/m³	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	--
n/s	n/s	n/s	isopropyltoluene, p-	µg/m³	40	0.11	0.015	0.00006	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	--
n/s	n/s	n/s	propylbenzene, n-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	--
n/s	n/s	n/s	trimethylbenzene, 1,2,3-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	--
7	7	20	trimethylbenzene, 1,2,4-	µg/m³	2.1	0.0059	0.00078	0.0000032	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	--
3.5	3.5	10	trimethylbenzene, 1,3,5-	µg/m³	0.73	0.00204	0.00027	0.0000011	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	--

Vapour Exceedances

125	Exceeds CSR PL standards
125	Exceeds CSR RL standards
125	Exceeds CSR CL standards

QA/QC Exceedances

45%	RPD exceeds 35%

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TABLE 11: VAPOUR ANALYTICAL RESULTS
HYDROCARBONS AND NON-HALOGENATED VOCS
Portion of 2901 East Hastings Street, Vancouver, BC
City of Vancouver
Project #: 13639
January 2019

CSR PL Standards	CSR RL Standards	CSR CL Standards	SAMPLE ID	Units	SV18-5				SV18-6				SV18-9			
			DATE SAMPLED		29-Nov-18				29-Nov-18				29-Nov-18			
			LAB CERTIFICATE		B8A4803				B8A4803				B8A4803			
			LAB SAMPLE ID		UW2945				UW2946				UW2947			
			SAMPLE DEPTH (mbg)		0.6				1.0				1.0			
			FLOW RATE (L/min)		0.2				0.2				0.2			
			FLOW DURATION (min)		20				20				20			
			VAPOUR CONCENTRATION		MSVC	PIVC (PL/RL)	PIVC (CL)	POVC	MSVC	PIVC (PL/RL)	PIVC (CL)	POVC	MSVC	PIVC (PL/RL)	PIVC (CL)	POVC
			ATTENUATION FACTOR		--	2.0E-02	2.0E-02	1.0E-04	--	2.8E-03	3.7E-04	1.5E-06	--	2.8E-03	3.7E-04	1.5E-06
			Petroleum Hydrocarbons													
1000	1000	3000	VPHv	µg/m³	<130	<2.6	<2.6	<0.013	<130	<0.364	<0.0481	<0.000195	**2600**	7.28	0.962	0.0039
n/s	n/s	n/s	VHv_{6-13}	µg/m³	<130	<2.6	<2.6	<0.013	<130	<0.364	<0.0481	<0.000195	3000	8.4	1.11	0.0045
			Monocyclic Aromatic Hydrocarbons													
1.5	1.5	4	benzene	µg/m³	<0.38	<0.0076	<0.0076	<0.000038	<0.38	<0.00106	<0.000141	<0.00000057	**43**	0.12	0.016	0.000065
1000	1000	3000	ethylbenzene	µg/m³	<50	<1	<1	<0.005	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075
1000	1000	3000	styrene	µg/m³	<50	<1	<1	<0.005	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075
5000	5000	15000	toluene	µg/m³	<50	<1	<1	<0.005	<50	<0.14	<0.019	<0.000075	120	0.336	0.0444	0.00018
100	100	300	xylenes	µg/m³	<2.5	<0.05	<0.05	<0.00025	<2.5	<0.007	<0.00093	<0.0000038	50	0.14	0.019	0.000075
			Polycyclic Aromatic Hydrocarbons													
3	3	9	naphthalene	µg/m³	<0.75	<0.015	<0.015	<0.000075	<0.75	<0.0021	<0.000278	<0.00000113	<0.75	<0.0021	<0.000278	<0.00000113
			Non-Halogenated Aliphatics													
2	2	2	butadiene, 1,3-	µg/m³	<0.5	<0.01	<0.01	<0.00005	<0.5	<0.0014	<0.000185	<0.00000075	**12**	0.034	0.0044	0.000018
5000	5000	15000	butanone, 2-	µg/m³	<130	<2.6	<2.6	<0.013	<130	<0.364	<0.0481	<0.000195	<130	<0.364	<0.0481	<0.000195
2500	2500	8000	decane, n-	µg/m³	<25	<0.5	<0.5	<0.0025	<25	<0.07	<0.0093	<0.000038	<25	<0.07	<0.0093	<0.000038
700	700	2000	hexane, n-	µg/m³	<25	<0.5	<0.5	<0.0025	<25	<0.07	<0.0093	<0.000038	110	0.308	0.0407	0.000165
n/s	n/s	n/s	hexanone, 2-	µg/m³	<2.5	<0.05	<0.05	<0.00025	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
3000	3000	9000	methyl tert-butyl ether	µg/m³	<100	<2	<2	<0.01	<100	<0.28	<0.037	<0.00015	<100	<0.28	<0.037	<0.00015
3000	3000	9000	methyl-2-pentanone, 4-	µg/m³	<50	<1	<1	<0.005	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075
1500	1500	5000	methylcyclohexane	µg/m³	<50	<1	<1	<0.005	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075
			Non-Halogenated Aromatics													
n/s	n/s	n/s	butylbenzene, n-	µg/m³	<2.5	<0.05	<0.05	<0.00025	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
n/s	n/s	n/s	butylbenzene, sec-	µg/m³	<2.5	<0.05	<0.05	<0.00025	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
n/s	n/s	n/s	butylbenzene, tert-	µg/m³	<2.5	<0.05	<0.05	<0.00025	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
400	400	1000	isopropylbenzene	µg/m³	<0.5	<0.01	<0.01	<0.00005	<0.5	<0.0014	<0.000185	<0.00000075	0.95	0.00266	0.000352	0.00000143
n/s	n/s	n/s	isopropyltoluene, p-	µg/m³	<2.5	<0.05	<0.05	<0.00025	<2.5	<0.007	<0.00093	<0.0000038	33	0.092	0.012	0.00005
n/s	n/s	n/s	propylbenzene, n-	µg/m³	<2.5	<0.05	<0.05	<0.00025	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
n/s	n/s	n/s	trimethylbenzene, 1,2,3-	µg/m³	<2.5	<0.05	<0.05	<0.00025	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
7	7	20	trimethylbenzene, 1,2,4-	µg/m³	<0.5	<0.01	<0.01	<0.00005	<0.5	<0.0014	<0.000185	<0.00000075	**7.5**	0.021	0.0028	0.000011
3.5	3.5	10	trimethylbenzene, 1,3,5-	µg/m³	<0.5	<0.01	<0.01	<0.00005	<0.5	<0.0014	<0.000185	<0.00000075	3	0.0084	0.0011	0.0000045

Vapour Exceedances

125	Exceeds CSR PL standards
125	Exceeds CSR RL standards
125	Exceeds CSR CL standards

QA/QC Exceedances

45%	RPD exceeds 35%

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TABLE 11: VAPOUR ANALYTICAL RESULTS
HYDROCARBONS AND NON-HALOGENATED VOCS
Portion of 2901 East Hastings Street, Vancouver, BC
City of Vancouver
Project #: 13639
January 2019

CSR PL Standards	CSR RL Standards	CSR CL Standards	SAMPLE ID	Units	SV18-14				SV18-15				SV18-16			
			DATE SAMPLED		29-Nov-18				29-Nov-18				29-Nov-18			
			LAB CERTIFICATE		B8A4806				B8A4806				B8A4806			
			LAB SAMPLE ID		UW2952				UW2951				UW2953			
			SAMPLE DEPTH (mbg)		1.0				1.0				1.0			
			FLOW RATE (L/min)		0.2				0.2				0.2			
			FLOW DURATION (min)		20				20				20			
			VAPOUR CONCENTRATION		MSVC	PIVC (PL/RL)	PIVC (CL)	POVC	MSVC	PIVC (PL/RL)	PIVC (CL)	POVC	MSVC	PIVC (PL/RL)	PIVC (CL)	POVC
			ATTENUATION FACTOR		--	2.8E-03	3.7E-04	1.5E-06	--	2.8E-03	3.7E-04	1.5E-06	--	2.8E-03	3.7E-04	1.5E-06
			Petroleum Hydrocarbons													
1000	1000	3000	VPHv	µg/m³	**2700**	7.56	0.999	0.00405	310	0.868	0.115	0.000465	**2000**	5.6	0.74	0.003
n/s	n/s	n/s	VH_{6-13}	µg/m³	2700	7.56	0.999	0.00405	330	0.924	0.122	0.000495	2100	5.88	0.777	0.00315
			Monocyclic Aromatic Hydrocarbons													
1.5	1.5	4	benzene	µg/m³	**6.3**	0.018	0.0023	0.0000095	**3.6**	0.01	0.0013	0.0000054	**13**	0.036	0.0048	0.00002
1000	1000	3000	ethylbenzene	µg/m³	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075
1000	1000	3000	styrene	µg/m³	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075
5000	5000	15000	toluene	µg/m³	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075
100	100	300	xylenes	µg/m³	51	0.14	0.019	0.000077	24	0.067	0.0089	0.000036	23	0.064	0.0085	0.000035
			Polycyclic Aromatic Hydrocarbons													
3	3	9	naphthalene	µg/m³	<0.75	<0.0021	<0.000278	<0.00000113	<0.75	<0.0021	<0.000278	<0.00000113	<0.75	<0.0021	<0.000278	<0.00000113
			Non-Halogenated Aliphatics													
2	2	2	butadiene, 1,3-	µg/m³	0.98	0.00274	0.000363	0.00000147	<0.5	<0.0014	<0.000185	<0.00000075	2	0.0056	0.00074	0.000003
5000	5000	15000	butanone, 2-	µg/m³	<130	<0.364	<0.0481	<0.000195	<130	<0.364	<0.0481	<0.000195	<130	<0.364	<0.0481	<0.000195
2500	2500	8000	decane, n-	µg/m³	<25	<0.07	<0.0093	<0.000038	<25	<0.07	<0.0093	<0.000038	<25	<0.07	<0.0093	<0.000038
700	700	2000	hexane, n-	µg/m³	<25	<0.07	<0.0093	<0.000038	<25	<0.07	<0.0093	<0.000038	99	0.28	0.037	0.00015
n/s	n/s	n/s	hexanone, 2-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
3000	3000	9000	methyl tert-butyl ether	µg/m³	<100	<0.28	<0.037	<0.00015	<100	<0.28	<0.037	<0.00015	<100	<0.28	<0.037	<0.00015
3000	3000	9000	methyl-2-pentanone, 4-	µg/m³	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075
1500	1500	5000	methylcyclohexane	µg/m³	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075
			Non-Halogenated Aromatics													
n/s	n/s	n/s	butylbenzene, n-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
n/s	n/s	n/s	butylbenzene, sec-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
n/s	n/s	n/s	butylbenzene, tert-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
400	400	1000	isopropylbenzene	µg/m³	0.85	0.00238	0.000315	0.00000128	<0.5	<0.0014	<0.000185	<0.00000075	0.68	0.0019	0.000252	0.00000102
n/s	n/s	n/s	isopropyltoluene, p-	µg/m³	15	0.042	0.0056	0.000023	31	0.087	0.011	0.000047	6.6	0.018	0.0024	0.0000099
n/s	n/s	n/s	propylbenzene, n-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
n/s	n/s	n/s	trimethylbenzene, 1,2,3-	µg/m³	4.2	0.012	0.0016	0.0000063	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
7	7	20	trimethylbenzene, 1,2,4-	µg/m³	**13**	0.036	0.0048	0.00002	**7.5**	0.021	0.0028	0.000011	3.9	0.011	0.0014	0.0000059
3.5	3.5	10	trimethylbenzene, 1,3,5-	µg/m³	**5.1**	0.014	0.0019	0.0000077	2.3	0.0064	0.00085	0.0000035	1.3	0.0036	0.00048	0.000002

Vapour Exceedances

125	Exceeds CSR PL standards
125	Exceeds CSR RL standards
125	Exceeds CSR CL standards

QA/QC Exceedances

45%	RPD exceeds 35%

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TABLE 11: VAPOUR ANALYTICAL RESULTS
HALOGENATED VOCS
Portion of 2901 East Hastings Street, Vancouver, BC
City of Vancouver
Project #: 13639
January 2019

CSR PL Standards	CSR RL Standards	CSR CL Standards	SAMPLE ID	Units	SV18-2				SV18-3				SV18-A			
			DATE SAMPLED		29-Nov-18				29-Nov-18				29-Nov-18			
			LAB CERTIFICATE		B8A4803				B8A4803				B8A4803			
			LAB SAMPLE ID		UW2943				UW2944				UW2948			
			SAMPLE DEPTH (mbg)		1.0				1.0				Duplicate of			
			FLOW RATE (L/min)		0.2				0.1				SV18-3			
			FLOW DURATION (min)		20				40							
			VAPOUR CONCENTRATION		MSVC	PIVC (PL/RL)	PIVC (CL)	POVC	MSVC	PIVC (PL/RL)	PIVC (CL)	POVC	MSVC	PIVC (PL/RL)	PIVC (CL)	POVC
			ATTENUATION FACTOR		--	2.8E-03	3.7E-04	1.5E-06	--	2.8E-03	3.7E-04	1.5E-06	--	2.8E-03	3.7E-04	1.5E-06
			Halogenated Aliphatics													
40	40	100	bromodichloromethane	µg/m³	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
9	9	30	bromoform	µg/m³	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
5	5	15	bromomethane	µg/m³	<1.3	<0.0036	<0.00048	<0.000002	<1.3	<0.0036	<0.00048	<0.000002	<1.3	<0.0036	<0.00048	<0.000002
1.5	1.5	5	carbon tetrachloride	µg/m³	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375
10000	10000	30000	chloroethane	µg/m³	<130	<0.364	<0.0481	<0.000195	<130	<0.364	<0.0481	<0.000195	<130	<0.364	<0.0481	<0.000195
100	100	300	chloroform	µg/m³	0.9	0.00252	0.000333	0.00000135	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
90	90	250	chloromethane	µg/m³	<5	<0.014	<0.0019	<0.0000075	<5	<0.014	<0.0019	<0.0000075	<5	<0.014	<0.0019	<0.0000075
1	1	1	dibromo-3-chloropropane, 1,2-	µg/m³	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375
40	40	100	dibromochloromethane	µg/m³	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
0.5	0.5	0.5	dibromoethane, 1,2-	µg/m³	<0.13	<0.000364	<0.0000481	<0.000000195	<0.13	<0.000364	<0.0000481	<0.000000195	<0.13	<0.000364	<0.0000481	<0.000000195
4	4	10	dibromomethane	µg/m³	<1	<0.003	<0.0004	<0.000002	<1	<0.003	<0.0004	<0.000002	<1	<0.003	<0.0004	<0.000002
100	100	300	dichlorodifluoromethane	µg/m³	<5	<0.014	<0.0019	<0.0000075	<5	<0.014	<0.0019	<0.0000075	<5	<0.014	<0.0019	<0.0000075
500	500	1500	dichloroethane, 1,1-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
7	7	20	dichloroethane, 1,2-	µg/m³	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
200	200	600	dichloroethene, 1,1-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
60	60	200	dichloroethene, 1,2- (cis)	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
60	60	200	dichloroethene, 1,2- (trans)	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
600	600	2000	dichloromethane	µg/m³	<13	<0.036	<0.0048	<0.00002	<13	<0.036	<0.0048	<0.00002	<13	<0.036	<0.0048	<0.00002
4	4	10	dichloropropane, 1,2-	µg/m³	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
1	1	3	dichloropropane, 1,3-	µg/m³	<0.38	<0.00106	<0.000141	<0.00000057	<0.38	<0.00106	<0.000141	<0.00000057	<0.38	<0.00106	<0.000141	<0.00000057
2.5	2.5	7.5	dichloropropene, 1,3- (cis)	µg/m³	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
2.5	2.5	7.5	dichloropropene, 1,3- (trans)	µg/m³	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
1	1	1.5	hexachlorobutadiene, 1,3-	µg/m³	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375
1.5	1.5	4	tetrachloroethane, 1,1,1,2-	µg/m³	<0.38	<0.00106	<0.000141	<0.00000057	<0.38	<0.00106	<0.000141	<0.00000057	<0.38	<0.00106	<0.000141	<0.00000057
40	40	100	tetrachloroethane, 1,1,2,2-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
40	40	100	tetrachloroethene	µg/m³	**63**	0.18	0.023	0.000095	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
5000	5000	15000	trichloroethane, 1,1,1-	µg/m³	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075
0.5	0.5	0.6	trichloroethane, 1,1,2-	µg/m³	<0.13	<0.000364	<0.0000481	<0.000000195	<0.13	<0.000364	<0.0000481	<0.000000195	<0.13	<0.000364	<0.0000481	<0.000000195
2	2	6	trichloroethene	µg/m³	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375
700	700	2000	trichlorofluoromethane	µg/m³	<25	<0.07	<0.0093	<0.000038	<25	<0.07	<0.0093	<0.000038	<25	<0.07	<0.0093	<0.000038
0.5	0.5	0.9	trichloropropane, 1,2,3-	µg/m³	<0.13	<0.000364	<0.0000481	<0.000000195	<0.13	<0.000364	<0.0000481	<0.000000195	<0.13	<0.000364	<0.0000481	<0.000000195
1	1	3.5	vinyl chloride	µg/m³	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375
			Halogenated Aromatics													
60	60	200	bromobenzene	µg/m³	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
40	40	100	chlorotoluene, 2-	µg/m³	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
n/s	n/s	n/s	chlorotoluene, 4-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
200	200	600	dichlorobenzene, 1,2-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
60	60	200	dichlorobenzene, 1,3-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
800	800	2500	dichlorobenzene, 1,4-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
10	10	30	monochlorobenzene	µg/m³	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
n/s	n/s	n/s	trichlorobenzene, 1,2,3-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
7	7	20	trichlorobenzene, 1,2,4-	µg/m³	<1.3	<0.0036	<0.00048	<0.000002	<1.3	<0.0036	<0.00048	<0.000002	<1.3	<0.0036	<0.00048	<0.000002

Vapour Exceedances

125	Exceeds CSR PL standards
125	Exceeds CSR RL standards
125	Exceeds CSR CL standards

QA/QC Exceedances

45%	RPD exceeds 35%

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TABLE 11: VAPOUR ANALYTICAL RESULTS
HALOGENATED VOCS
Portion of 2901 East Hastings Street, Vancouver, BC
City of Vancouver
Project #: 13639
January 2019

CSR PL Standards	CSR RL Standards	CSR CL Standards	SAMPLE ID	Units	RPD	SV18-5				SV18-6				SV18-9			
			DATE SAMPLED		for	29-Nov-18				29-Nov-18				29-Nov-18			
			LAB CERTIFICATE		SV18-3	B8A4803				B8A4803				B8A4803			
			LAB SAMPLE ID		and	UW2945				UW2946				UW2947			
			SAMPLE DEPTH (mbg)		SV18-A	0.6				1.0				1.0			
			FLOW RATE (L/min)			0.2				0.2				0.2			
			FLOW DURATION (min)			20				20				20			
			VAPOUR CONCENTRATION		MSVC	MSVC	PIVC (PL/RL)	PIVC (CL)	POVC	MSVC	PIVC (PL/RL)	PIVC (CL)	POVC	MSVC	PIVC (PL/RL)	PIVC (CL)	POVC
			ATTENUATION FACTOR		--	--	2.0E-02	2.0E-02	1.0E-04	--	2.8E-03	3.7E-04	1.5E-06	--	2.8E-03	3.7E-04	1.5E-06
			Halogenated Aliphatics														
40	40	100	bromodichloromethane	µg/m³	--	<0.5	<0.01	<0.01	<0.00005	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
9	9	30	bromoform	µg/m³	--	<0.5	<0.01	<0.01	<0.00005	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
5	5	15	bromomethane	µg/m³	--	<1.3	<0.026	<0.026	<0.00013	<1.3	<0.0036	<0.00048	<0.000002	<1.3	<0.0036	<0.00048	<0.000002
1.5	1.5	5	carbon tetrachloride	µg/m³	--	<0.25	<0.005	<0.005	<0.000025	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375
10000	10000	30000	chloroethane	µg/m³	--	<130	<2.6	<2.6	<0.013	<130	<0.364	<0.0481	<0.000195	<130	<0.364	<0.0481	<0.000195
100	100	300	chloroform	µg/m³	--	<0.5	<0.01	<0.01	<0.00005	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
90	90	250	chloromethane	µg/m³	--	<5	<0.1	<0.1	<0.0005	<5	<0.014	<0.0019	<0.0000075	<5	<0.014	<0.0019	<0.0000075
1	1	1	dibromo-3-chloropropane, 1,2-	µg/m³	--	<0.25	<0.005	<0.005	<0.000025	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375
40	40	100	dibromochloromethane	µg/m³	--	<0.5	<0.01	<0.01	<0.00005	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
0.5	0.5	0.5	dibromoethane, 1,2-	µg/m³	--	<0.13	<0.0026	<0.0026	<0.000013	<0.13	<0.000364	<0.0000481	<0.000000195	<0.13	<0.000364	<0.0000481	<0.000000195
4	4	10	dibromomethane	µg/m³	--	<1	<0.02	<0.02	<0.0001	<1	<0.003	<0.0004	<0.000002	<1	<0.003	<0.0004	<0.000002
100	100	300	dichlorodifluoromethane	µg/m³	--	<5	<0.1	<0.1	<0.0005	<5	<0.014	<0.0019	<0.0000075	<5	<0.014	<0.0019	<0.0000075
500	500	1500	dichloroethane, 1,1-	µg/m³	--	<2.5	<0.05	<0.05	<0.00025	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
7	7	20	dichloroethane, 1,2-	µg/m³	--	<0.5	<0.01	<0.01	<0.00005	<0.5	<0.0014	<0.000185	<0.00000075	2.6	0.0073	0.00096	0.0000039
200	200	600	dichloroethene, 1,1-	µg/m³	--	<2.5	<0.05	<0.05	<0.00025	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
60	60	200	dichloroethene, 1,2- (cis)	µg/m³	--	<2.5	<0.05	<0.05	<0.00025	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
60	60	200	dichloroethene, 1,2- (trans)	µg/m³	--	<2.5	<0.05	<0.05	<0.00025	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
600	600	2000	dichloromethane	µg/m³	--	<13	<0.26	<0.26	<0.0013	<13	<0.036	<0.0048	<0.00002	<13	<0.036	<0.0048	<0.00002
4	4	10	dichloropropane, 1,2-	µg/m³	--	<0.5	<0.01	<0.01	<0.00005	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
1	1	3	dichloropropane, 1,3-	µg/m³	--	<0.38	<0.0076	<0.0076	<0.000038	<0.38	<0.00106	<0.000141	<0.00000057	<0.38	<0.00106	<0.000141	<0.00000057
2.5	2.5	7.5	dichloropropene, 1,3- (cis)	µg/m³	--	<0.5	<0.01	<0.01	<0.00005	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
2.5	2.5	7.5	dichloropropene, 1,3- (trans)	µg/m³	--	<0.5	<0.01	<0.01	<0.00005	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
1	1	1.5	hexachlorobutadiene, 1,3-	µg/m³	--	<0.25	<0.005	<0.005	<0.000025	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375
1.5	1.5	4	tetrachloroethane, 1,1,1,2-	µg/m³	--	<0.38	<0.0076	<0.0076	<0.000038	<0.38	<0.00106	<0.000141	<0.00000057	<0.38	<0.00106	<0.000141	<0.00000057
40	40	100	tetrachloroethane, 1,1,2,2-	µg/m³	--	<2.5	<0.05	<0.05	<0.00025	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
40	40	100	tetrachloroethene	µg/m³	--	<2.5	<0.05	<0.05	<0.00025	<2.5	<0.007	<0.00093	<0.0000038	**280**	0.784	0.104	0.00042
5000	5000	15000	trichloroethane, 1,1,1-	µg/m³	--	<50	<1	<1	<0.005	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075
0.5	0.5	0.6	trichloroethane, 1,1,2-	µg/m³	--	<0.13	<0.0026	<0.0026	<0.000013	<0.13	<0.000364	<0.0000481	<0.000000195	<0.13	<0.000364	<0.0000481	<0.000000195
2	2	6	trichloroethene	µg/m³	--	<0.25	<0.005	<0.005	<0.000025	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375
700	700	2000	trichlorofluoromethane	µg/m³	--	<25	<0.5	<0.5	<0.0025	<25	<0.07	<0.0093	<0.000038	<25	<0.07	<0.0093	<0.000038
0.5	0.5	0.9	trichloropropane, 1,2,3-	µg/m³	--	<0.13	<0.0026	<0.0026	<0.000013	<0.13	<0.000364	<0.0000481	<0.000000195	<0.13	<0.000364	<0.0000481	<0.000000195
1	1	3.5	vinyl chloride	µg/m³	--	<0.25	<0.005	<0.005	<0.000025	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375
			Halogenated Aromatics														
60	60	200	bromobenzene	µg/m³	--	<0.5	<0.01	<0.01	<0.00005	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
40	40	100	chlorotoluene, 2-	µg/m³	--	<0.5	<0.01	<0.01	<0.00005	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
n/s	n/s	n/s	chlorotoluene, 4-	µg/m³	--	<2.5	<0.05	<0.05	<0.00025	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
200	200	600	dichlorobenzene, 1,2-	µg/m³	--	<2.5	<0.05	<0.05	<0.00025	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
60	60	200	dichlorobenzene, 1,3-	µg/m³	--	<2.5	<0.05	<0.05	<0.00025	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
800	800	2500	dichlorobenzene, 1,4-	µg/m³	--	<2.5	<0.05	<0.05	<0.00025	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
10	10	30	monochlorobenzene	µg/m³	--	<0.5	<0.01	<0.01	<0.00005	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
n/s	n/s	n/s	trichlorobenzene, 1,2,3-	µg/m³	--	<2.5	<0.05	<0.05	<0.00025	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
7	7	20	trichlorobenzene, 1,2,4-	µg/m³	--	<1.3	<0.026	<0.026	<0.00013	<1.3	<0.0036	<0.00048	<0.000002	<1.3	<0.0036	<0.00048	<0.000002

Vapour Exceedances

125	Exceeds CSR PL standards
125	Exceeds CSR RL standards
125	Exceeds CSR CL standards

QA/QC Exceedances

45%	RPD exceeds 35%

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TABLE 11: VAPOUR ANALYTICAL RESULTS
HALOGENATED VOCS
Portion of 2901 East Hastings Street, Vancouver, BC
City of Vancouver
Project #: 13639
January 2019

CSR PL Standards	CSR RL Standards	CSR CL Standards	SAMPLE ID	Units	SV18-14				SV18-15				SV18-16			
			DATE SAMPLED		29-Nov-18				29-Nov-18				29-Nov-18			
			LAB CERTIFICATE		B8A4806				B8A4806				B8A4806			
			LAB SAMPLE ID		UW2952				UW2951				UW2953			
			SAMPLE DEPTH (mbg)		1.0				1.0				1.0			
			FLOW RATE (L/min)		0.2				0.2				0.2			
			FLOW DURATION (min)		20				20				20			
			VAPOUR CONCENTRATION		MSVC	PIVC (PL/RL)	PIVC (CL)	POVC	MSVC	PIVC (PL/RL)	PIVC (CL)	POVC	MSVC	PIVC (PL/RL)	PIVC (CL)	POVC
			ATTENUATION FACTOR		--	2.8E-03	3.7E-04	1.5E-06	--	2.8E-03	3.7E-04	1.5E-06	--	2.8E-03	3.7E-04	1.5E-06
			Halogenated Aliphatics													
40	40	100	bromodichloromethane	µg/m³	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
9	9	30	bromoform	µg/m³	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
5	5	15	bromomethane	µg/m³	<1.3	<0.0036	<0.00048	<0.000002	<1.3	<0.0036	<0.00048	<0.000002	<1.3	<0.0036	<0.00048	<0.000002
1.5	1.5	5	carbon tetrachloride	µg/m³	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375
10000	10000	30000	chloroethane	µg/m³	<130	<0.364	<0.0481	<0.000195	<130	<0.364	<0.0481	<0.000195	<130	<0.364	<0.0481	<0.000195
100	100	300	chloroform	µg/m³	<0.5	<0.0014	<0.000185	<0.00000075	15	0.042	0.0056	0.000023	<0.5	<0.0014	<0.000185	<0.00000075
90	90	250	chloromethane	µg/m³	<5	<0.014	<0.0019	<0.0000075	<5	<0.014	<0.0019	<0.0000075	<5	<0.014	<0.0019	<0.0000075
1	1	1	dibromo-3-chloropropane, 1,2-	µg/m³	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375
40	40	100	dibromochloromethane	µg/m³	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
0.5	0.5	0.5	dibromoethane, 1,2-	µg/m³	<0.13	<0.000364	<0.0000481	<0.000000195	<0.13	<0.000364	<0.0000481	<0.000000195	<0.13	<0.000364	<0.0000481	<0.000000195
4	4	10	dibromomethane	µg/m³	<1	<0.003	<0.0004	<0.000002	<1	<0.003	<0.0004	<0.000002	<1	<0.003	<0.0004	<0.000002
100	100	300	dichlorodifluoromethane	µg/m³	<5	<0.014	<0.0019	<0.0000075	<5	<0.014	<0.0019	<0.0000075	<5	<0.014	<0.0019	<0.0000075
500	500	1500	dichloroethane, 1,1-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
7	7	20	dichloroethane, 1,2-	µg/m³	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	3.5	0.0098	0.0013	0.0000053
200	200	600	dichloroethene, 1,1-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
60	60	200	dichloroethene, 1,2- (cis)	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
60	60	200	dichloroethene, 1,2- (trans)	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
600	600	2000	dichloromethane	µg/m³	<13	<0.036	<0.0048	<0.00002	<13	<0.036	<0.0048	<0.00002	<13	<0.036	<0.0048	<0.00002
4	4	10	dichloropropane, 1,2-	µg/m³	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
1	1	3	dichloropropane, 1,3-	µg/m³	<0.38	<0.00106	<0.000141	<0.00000057	<0.38	<0.00106	<0.000141	<0.00000057	<0.38	<0.00106	<0.000141	<0.00000057
2.5	2.5	7.5	dichloropropene, 1,3- (cis)	µg/m³	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
2.5	2.5	7.5	dichloropropene, 1,3- (trans)	µg/m³	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
1	1	1.5	hexachlorobutadiene, 1,3-	µg/m³	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375
1.5	1.5	4	tetrachloroethane, 1,1,1,2-	µg/m³	<0.38	<0.00106	<0.000141	<0.00000057	<0.38	<0.00106	<0.000141	<0.00000057	<0.38	<0.00106	<0.000141	<0.00000057
40	40	100	tetrachloroethane, 1,1,2,2-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
40	40	100	tetrachloroethene	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	**130**	0.364	0.0481	0.000195	11	0.031	0.0041	0.000017
5000	5000	15000	trichloroethane, 1,1,1-	µg/m³	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075	<50	<0.14	<0.019	<0.000075
0.5	0.5	0.6	trichloroethane, 1,1,2-	µg/m³	<0.13	<0.000364	<0.0000481	<0.000000195	<0.13	<0.000364	<0.0000481	<0.000000195	<0.13	<0.000364	<0.0000481	<0.000000195
2	2	6	trichloroethene	µg/m³	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375
700	700	2000	trichlorofluoromethane	µg/m³	<25	<0.07	<0.0093	<0.000038	<25	<0.07	<0.0093	<0.000038	<25	<0.07	<0.0093	<0.000038
0.5	0.5	0.9	trichloropropane, 1,2,3-	µg/m³	<0.13	<0.000364	<0.0000481	<0.000000195	<0.13	<0.000364	<0.0000481	<0.000000195	<0.13	<0.000364	<0.0000481	<0.000000195
1	1	3.5	vinyl chloride	µg/m³	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375	<0.25	<0.0007	<0.0000925	<0.000000375
			Halogenated Aromatics													
60	60	200	bromobenzene	µg/m³	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
40	40	100	chlorotoluene, 2-	µg/m³	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
n/s	n/s	n/s	chlorotoluene, 4-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
200	200	600	dichlorobenzene, 1,2-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
60	60	200	dichlorobenzene, 1,3-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
800	800	2500	dichlorobenzene, 1,4-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
10	10	30	monochlorobenzene	µg/m³	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075	<0.5	<0.0014	<0.000185	<0.00000075
n/s	n/s	n/s	trichlorobenzene, 1,2,3-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
7	7	20	trichlorobenzene, 1,2,4-	µg/m³	<1.3	<0.0036	<0.00048	<0.000002	<1.3	<0.0036	<0.00048	<0.000002	<1.3	<0.0036	<0.00048	<0.000002

Vapour Exceedances

125	Exceeds CSR PL standards
125	Exceeds CSR RL standards
125	Exceeds CSR CL standards

QA/QC Exceedances

45%	RPD exceeds 35%

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TABLE 12: VAPOUR ANALYTICAL RESULTS
OTHER ORGANICS
Portion of 2901 East Hastings Street, Vancouver, BC
City of Vancouver
Project #: 13639
January 2019

CSR PL Standards	CSR RL Standards	CSR CL Standards	SAMPLE ID	Units	SV18-2				SV18-3				SV18-A			
			DATE SAMPLED		29-Nov-18				29-Nov-18				29-Nov-18			
			LAB CERTIFICATE		B8A4803				B8A4803				B8A4803			
			LAB SAMPLE ID		UW2943				UW2944				UW2948			
			SAMPLE DEPTH (mbg)		1.0				1.0				Duplicate of			
			FLOW RATE (L/min)		0.2				0.1				SV18-3			
			FLOW DURATION (min)		20				40							
			VAPOUR CONCENTRATION		MSVC	PIVC (PL/RL)	PIVC (CL)	POVC	MSVC	PIVC (PL/RL)	PIVC (CL)	POVC	MSVC	PIVC (PL/RL)	PIVC (CL)	POVC
			ATTENUATION FACTOR		--	2.8E-03	3.7E-04	1.5E-06	--	2.8E-03	3.7E-04	1.5E-06	--	2.8E-03	3.7E-04	1.5E-06
			Chlorinated Phenols													
10	10	30	monochlorophenol, 2-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
			Miscellaneous Organics													
2000	2000	5500	acetone	µg/m³	<5	<0.014	<0.0019	<0.0000075	<5	<0.014	<0.0019	<0.0000075	<5	<0.014	<0.0019	<0.0000075
70	70	200	ethyl acetate	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038

Vapour Exceedances

125	Exceeds CSR PL standards
125	Exceeds CSR RL standards
125	Exceeds CSR CL standards

QA/QC Exceedances

45%	RPD exceeds 35%

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TABLE 12: VAPOUR ANALYTICAL RESULTS
OTHER ORGANICS
Portion of 2901 East Hastings Street, Vancouver, BC
City of Vancouver
Project #: 13639
January 2019

CSR PL Standards	CSR RL Standards	CSR CL Standards	SAMPLE ID	Units	RPD	SV18-5				SV18-6				SV18-9				SV18-14			
			DATE SAMPLED		for	29-Nov-18				29-Nov-18				29-Nov-18				29-Nov-18			
			LAB CERTIFICATE		SV18-3	B8A4803				B8A4803				B8A4803				B8A4806			
			LAB SAMPLE ID		and	UW2945				UW2946				UW2947				UW2952			
			SAMPLE DEPTH (mbg)		SV18-A	0.6				1.0				1.0				1.0			
			FLOW RATE (L/min)			0.2				0.2				0.2				0.2			
			FLOW DURATION (min)			20				20				20				20			
			VAPOUR CONCENTRATION		MSVC	MSVC	PIVC (PL/RL)	PIVC (CL)	POVC	MSVC	PIVC (PL/RL)	PIVC (CL)	POVC	MSVC	PIVC (PL/RL)	PIVC (CL)	POVC	MSVC	PIVC (PL/RL)	PIVC (CL)	POVC
			ATTENUATION FACTOR		--	--	2.0E-02	2.0E-02	1.0E-04	--	2.8E-03	3.7E-04	1.5E-06	--	2.8E-03	3.7E-04	1.5E-06	--	2.8E-03	3.7E-04	1.5E-06
			Chlorinated Phenols																		
10	10	30	monochlorophenol, 2-	µg/m³	--	<2.5	<0.05	<0.05	<0.00025	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
			Miscellaneous Organics																		
2000	2000	5500	acetone	µg/m³	--	<5	<0.1	<0.1	<0.0005	<5	<0.014	<0.0019	<0.0000075	<5	<0.014	<0.0019	<0.0000075	<5	<0.014	<0.0019	<0.0000075
70	70	200	ethyl acetate	µg/m³	--	<2.5	<0.05	<0.05	<0.00025	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038

Vapour Exceedances

125	Exceeds CSR PL standards
125	Exceeds CSR RL standards
125	Exceeds CSR CL standards

QA/QC Exceedances

45%	RPD exceeds 35%

City of Vancouver - FOI 2023-228 - Page 414 of 1003

TABLE 12: VAPOUR ANALYTICAL RESULTS
OTHER ORGANICS
Portion of 2901 East Hastings Street, Vancouver, BC
City of Vancouver
Project #: 13639
January 2019

CSR PL Standards	CSR RL Standards	CSR CL Standards	SAMPLE ID	Units	SV18-15				SV18-16			
			DATE SAMPLED		29-Nov-18				29-Nov-18			
			LAB CERTIFICATE		B8A4806				B8A4806			
			LAB SAMPLE ID		UW2951				UW2953			
			SAMPLE DEPTH (mbg)		1.0				1.0			
			FLOW RATE (L/min)		0.2				0.2			
			FLOW DURATION (min)		20				20			
			VAPOUR CONCENTRATION		MSVC	PIVC (PL/RL)	PIVC (CL)	POVC	MSVC	PIVC (PL/RL)	PIVC (CL)	POVC
			ATTENUATION FACTOR		--	2.8E-03	3.7E-04	1.5E-06	--	2.8E-03	3.7E-04	1.5E-06
			Chlorinated Phenols									
10	10	30	monochlorophenol, 2-	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038
			Miscellaneous Organics									
2000	2000	5500	acetone	µg/m³	<5	<0.014	<0.0019	<0.0000075	6.6	0.018	0.0024	0.0000099
70	70	200	ethyl acetate	µg/m³	<2.5	<0.007	<0.00093	<0.0000038	<2.5	<0.007	<0.00093	<0.0000038

Vapour Exceedances

125	Exceeds CSR PL standards
125	Exceeds CSR RL standards
125	Exceeds CSR CL standards

QA/QC Exceedances

45%	RPD exceeds 35%

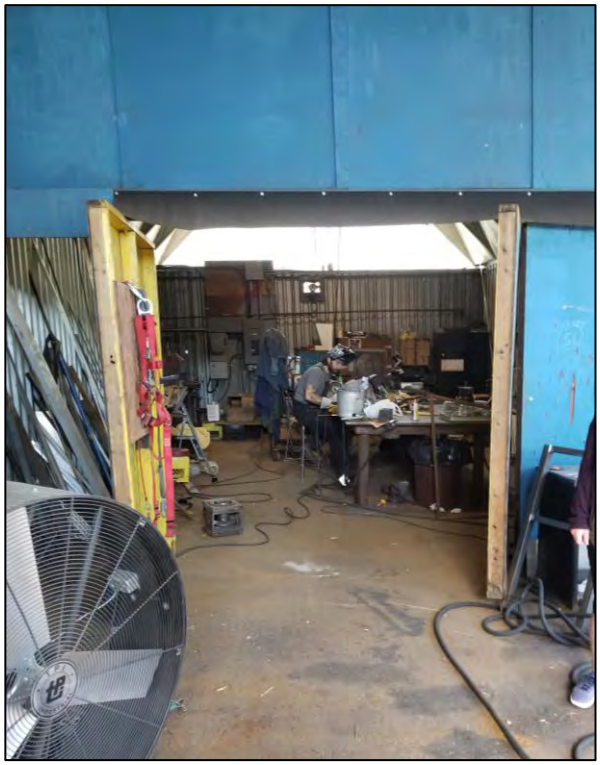
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APPENDIX A

PHOTOGRAPHIC DOCUMENTATION



Photograph 1: Phase 1A – Workshop with wood floors located on the northeast portion of Playland (July 26, 2017)



Photograph 2: Phase 1A – Welding shop located on the northeast portion of Playland (July 26, 2017)



Photograph 3: Phase 1A – Waste oil AST located in the oil storage area on the northeast portion of Playland (July 26, 2017)



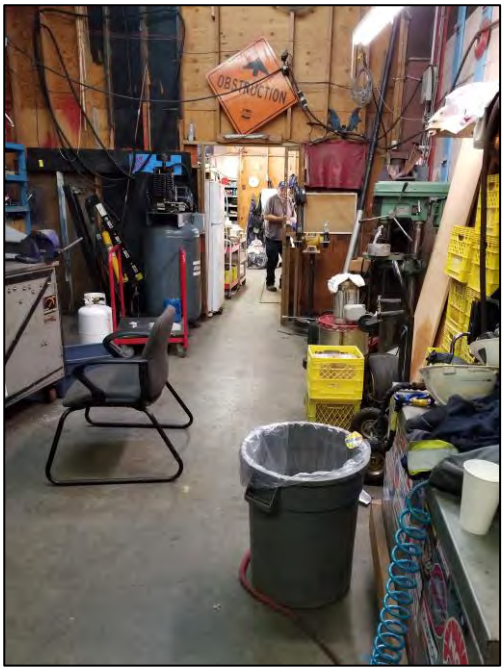
Photograph 4: Phase 1A – Drum and pail storage located in the oil storage area on the northeast portion of Playland (July 26, 2017)



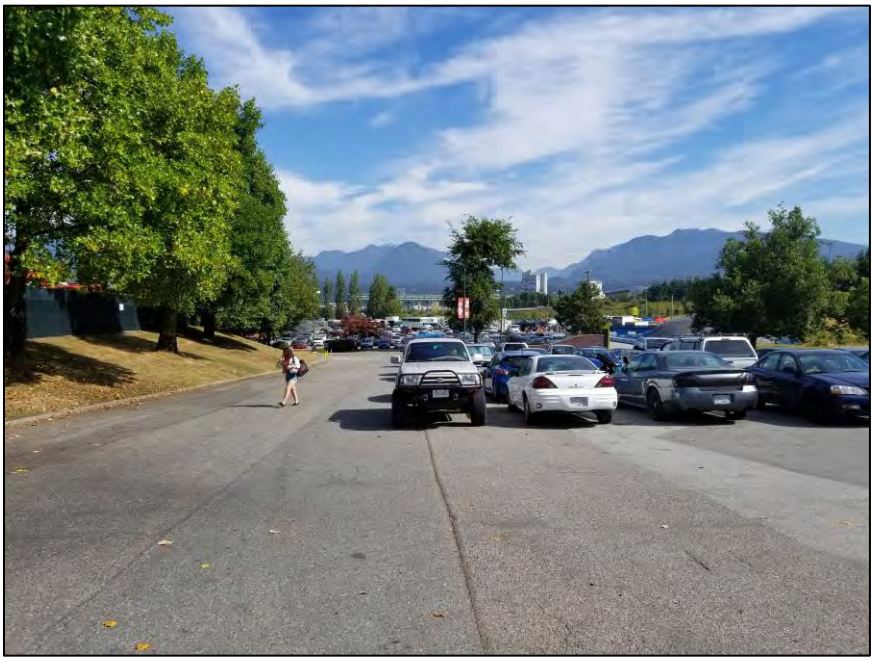
Photograph 5: Phase 1A–- Diesel tank located on the front car of the Coaster rollercoaster (July 26, 2017)



Photograph 6: Phase 1A – Oil distribution tank and chain lift located beneath the Coaster rollercoaster (July 26, 2017)



Photograph 7: Phase 1A – Lower-line workshop located to the south of the amphitheatre (July 26, 2017)



Photograph 8: Phase 4A – South portion of Parking Lot 9 – looking south from Playland (July 26, 2017)



Photograph 9: Phase 4A – Covered monster-truck stockpile located on the southeast portion of Parking Lot 9 – looking east (July 26, 2017)



Photograph 10: Phase 4A – Partially covered Agrodome stockpile located on the west portion of Parking Lot 9 – looking north (July 26, 2017)



Photograph 11: Phase 4A – Steel storage bins of horse manure located on the northeast portion of Parking Lot 9 – looking northeast (July 26, 2017)



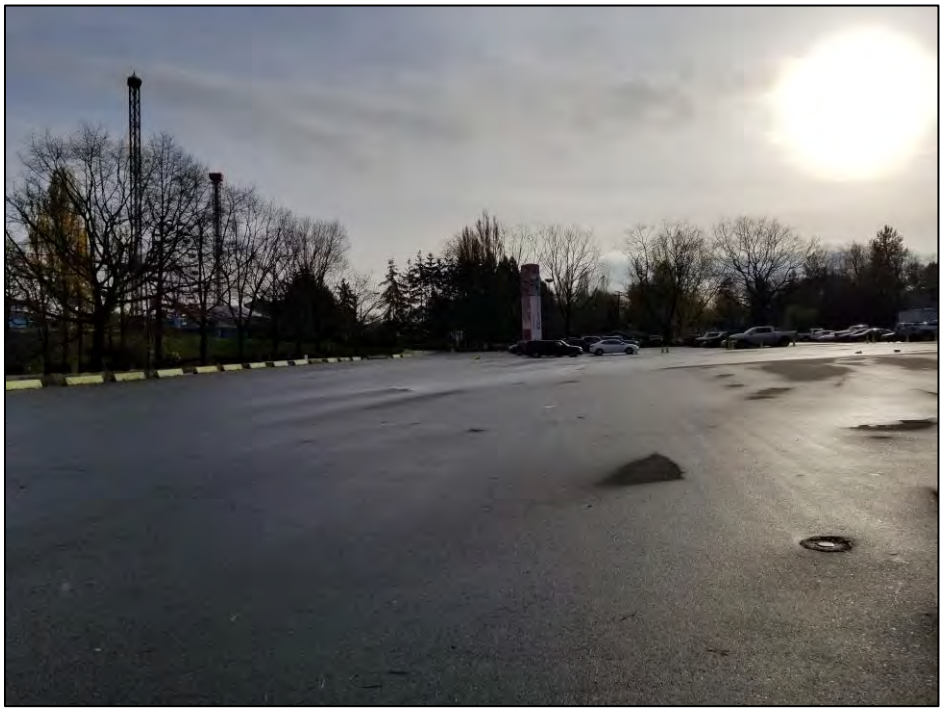
Photograph 12: Phase 4A – Horse stables located in Hastings Park – looking south (August 2, 2017)



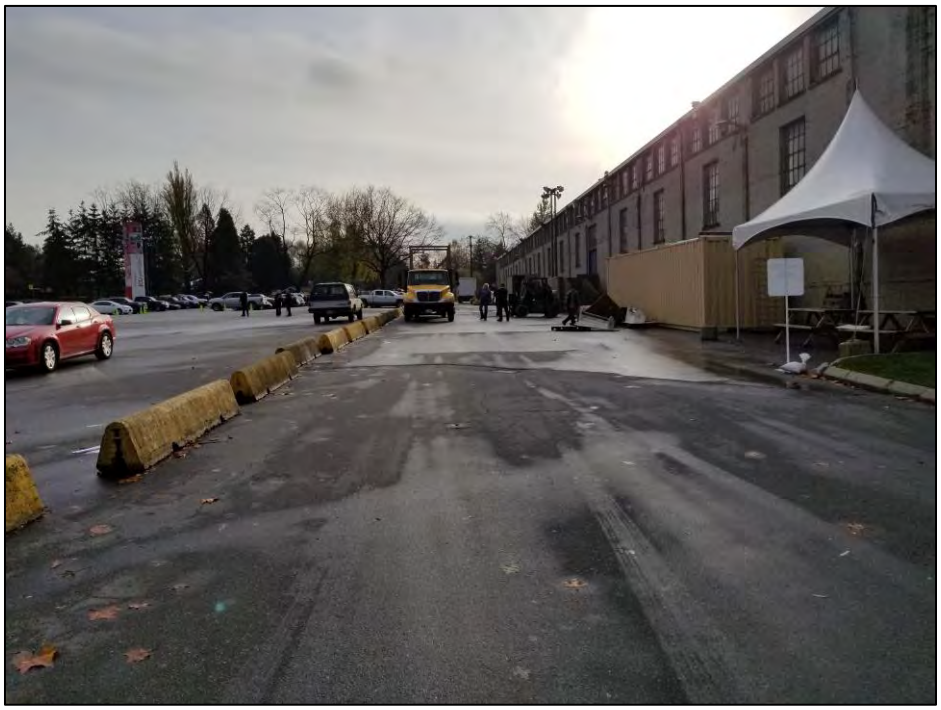
Photograph 13: Phase 4A – Pipe and metal plate located adjacent to the horse barns on the southeast portion of Hastings Park – looking west (August 2, 2017). A GPR and EM survey did not identify subsurface anomalies consistent with the size and/or shape of USTs.



Photograph 14: Phase 2 – Paved amphitheatre – looking south (November 14, 2018)



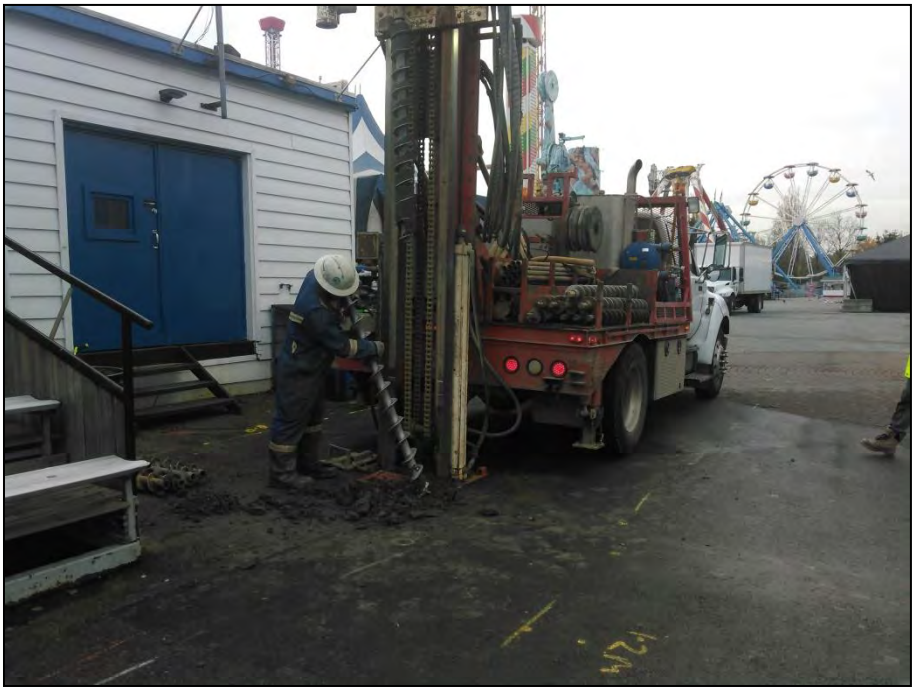
Photograph 15: Phase 3B – Paved parking area – looking south (November 14, 2018)



Photograph 16: Phase 3A – Paved parking area on the north portion of Phase 3A – looking south (November 14, 2018)



Photograph 27: A thin layer of fill over native till at BH18-1



Photograph 18: Drilling MW18-3 – looking west



Photograph 19: Fill on top of native soil at MW18-6



Photograph 20: Advancing BH18-8 with a hydrovacuum truck



Photograph 21: Fill on top of native till at MW18-11



Photograph 22: Groundwater at MW18-12 was approximately 5 cm below grade



Photograph 23: A piece of concrete found when hydrovacuuming at MW18-15



Photograph 24: Fill and native soil at MW18-16

APPENDIX B

CURRENT LAND TITLES

TITLE SEARCH PRINT 2018-12-06, 12:11:13

File Reference: 13639 Requestor: Jodine Restiaux

Declared Value $N/A

CURRENT INFORMATION ONLY - NO CANCELLED INFORMATION SHOWN

Title Issued Under	SECTION 172 LAND TITLE ACT
Land Title District	VANCOUVER
Land Title Office	VANCOUVER
Title Number	A37659
From Title Number	5377A FOL 451 VOL 13
Application Received	1973-06-13
Application Entered	1973-09-13

Registered Owner in Fee Simple

Registered Owner/Mailing Address: CITY OF VANCOUVER
NO ADDRESS ON FILE FOR THIS OWNER
IN TRUST, SEE A.F.B. VOLUME 13 FOLIO 451

Taxation Authority Vancouver, City of

Description of Land

Parcel Identifier: 008-348-219

Legal Description:

LOT 90 EXCEPT PART IN PLAN 13045 TOWN OF HASTINGS SUBURBAN LANDS
PLAN 100

Legal Notations

NOTICE OF INTEREST, BUILDERS LIEN ACT (S.3(2)), SEE BN120201
FILED 1999-05-13

PPSA NOTICE, SEE D.F. BH203976
(EXPIRES: MAY 19,2004)
EXTENDED TO 2014-05-19 SEE BW192726

PPSA NOTICE SEE BG112055

Charges, Liens and Interests

Nature:	RIGHT OF WAY
Registration Number:	321681M
Registration Date and Time:	1961-01-03 14:25
Registered Owner:	BRITISH COLUMBIA HYDRO AND POWER AUTHORITY BRITISH COLUMBIA TELEPHONE COMPANY
Remarks:	INTER ALIA ASSIGNMENT OF RIGHT OF WAY 173621M RECEIVED 15/07/1953 12:13 PART OUTLINED RED ON EXPLANATORY PLAN 3911 MODIFIED BY BJ215628 MODIFIED BY BR199875 MODIFIED BY BB981018 MODIFIED BY BB1708809

Nature:	STATUTORY RIGHT OF WAY
Registration Number:	L60395
Registration Date and Time:	1983-06-15 13:01
Registered Owner:	CITY OF VANCOUVER
Remarks:	PART IN REFERENCE PLAN 16664

Nature:	STATUTORY RIGHT OF WAY
Registration Number:	L118381
Registration Date and Time:	1983-12-15 14:35
Registered Owner:	CITY OF VANCOUVER
Remarks:	PART IN REFERENCE PLAN 16895

Nature:	STATUTORY RIGHT OF WAY
Registration Number:	N86969
Registration Date and Time:	1985-10-22 12:18
Registered Owner:	CITY OF VANCOUVER
Remarks:	PART IN EXPLANATORY PLAN 17864

Nature:	STATUTORY RIGHT OF WAY
Registration Number:	N93249
Registration Date and Time:	1985-11-05 13:34
Registered Owner:	CITY OF VANCOUVER
Remarks:	PART IN EXPLANATORY PLAN 17865

Nature:	STATUTORY RIGHT OF WAY
Registration Number:	BR151291
Registration Date and Time:	2001-06-21 13:50
Registered Owner:	CITY OF VANCOUVER
Remarks:	PLAN LMP50304

Duplicate Indefeasible Title NONE OUTSTANDING

Transfers	NONE
Pending Applications	NONE

TITLE SEARCH PRINT 2018-12-06, 12:11:12

File Reference: 13639 Requestor: Jodine Restiaux

Declared Value $N/A

CURRENT INFORMATION ONLY - NO CANCELLED INFORMATION SHOWN

Title Issued Under	SECTION 172 LAND TITLE ACT
Land Title District	VANCOUVER
Land Title Office	VANCOUVER
Title Number	G37165
From Title Number	G37164 143124 80914 93450K
Application Received	1979-06-07
Application Entered	1979-06-22
Registered Owner in Fee Simple	
Registered Owner/Mailing Address:	CITY OF VANCOUVER NO ADDRESS ON FILE FOR THIS OWNER
Taxation Authority	Vancouver, City of
Description of Land	
Parcel Identifier:	015-083-012
Legal Description:	
BLOCK W TOWN OF HASTINGS PLAN 17742	
Legal Notations	NONE
Charges, Liens and Interests	NONE
Duplicate Indefeasible Title	NONE OUTSTANDING
Transfers	NONE
Pending Applications	NONE

TITLE SEARCH PRINT 2018-12-06, 12:11:12

File Reference: 13639 Requestor: Jodine Restiaux

CURRENT INFORMATION ONLY - NO CANCELLED INFORMATION SHOWN

Title Issued Under	SECTION 172 LAND TITLE ACT
Land Title District	VANCOUVER
Land Title Office	VANCOUVER
Title Number	G40860
From Title Number	G39168 G39169 G39170 143103 143104 143113 168346 172266 178504 37012 46153 472266 47265 73156 73157 82984
Application Received	1979-06-22
Application Entered	1979-06-26
Registered Owner in Fee Simple	
Registered Owner/Mailing Address:	CITY OF VANCOUVER NO ADDRESS ON FILE FOR THIS OWNER
Taxation Authority	Vancouver, City of

Description of Land

Parcel Identifier: 007-260-776

Legal Description:

LOT A OF LOT 6 TOWN OF HASTINGS SUBURBAN LANDS PLAN 17749

Legal Notations	NONE
Charges, Liens and Interests	NONE

Duplicate Indefeasible Title	NONE OUTSTANDING
Transfers	NONE
Pending Applications	NONE

TITLE SEARCH PRINT 2018-12-06, 12:11:12

File Reference: 13639 Requestor: Jodine Restiaux

CURRENT INFORMATION ONLY - NO CANCELLED INFORMATION SHOWN

Title Issued Under	SECTION 172 LAND TITLE ACT
Land Title District	VANCOUVER
Land Title Office	VANCOUVER
Title Number	G53419
From Title Number	G53417 G53418 14525K 162802 3320 37019 62017I 62018I
Application Received	1979-08-01
Application Entered	1979-08-14
Registered Owner in Fee Simple	
Registered Owner/Mailing Address:	CITY OF VANCOUVER 453 WEST 12TH AVENUE VANCOUVER, BC
Taxation Authority	Vancouver, City of

Description of Land

Parcel Identifier: 007-255-071

Legal Description:

LOT A OF LOT 13 TOWN OF HASTINGS SUBURBAN LANDS PLAN 17798

Legal Notations	NONE
Charges, Liens and Interests	NONE
Duplicate Indefeasible Title	NONE OUTSTANDING
Transfers	NONE
Pending Applications	NONE

APPENDIX C

HISTORICAL AERIAL PHOTOGRAPHS



Photograph 1: 1930



Photograph 2: 1949



Photograph 3: 1954



Photograph 4: 1963



Photograph 5: 1969



Photograph 6: 1974



Photograph 7: 1978



Photograph 8: 1986



Photograph 9: 1990



Photograph 10: 1996



Photograph 11: 2002



Photograph 12: 2009



Photograph 13: 2015

APPENDIX D

BC ENV SITE REGISTRY SEARCH RESULTS

As Of: DEC 02, 2018 BC Online: Site Registry 18/12/06
For: PB64131 KEYSTONE ENVIRONMENTAL LTD. 14:01:22
Folio: 13639 Page 1

10 records selected for 0.5 km from latitude 49 deg, 17 min, 8.9 sec
and Longitude 123 deg, 2 min, 3.5 sec

Site Id	Lastupd	Address / City
0001089	02JUN26	NW CORNER HASTINGS AND CASSIAR VANCOUVER
0001292	01FEB09	3401 EAST HASTINGS STREET VANCOUVER
0008355	13NOV07	HASTINGS PARK RACECOURSE VANCOUVER
0010904	10FEB19	3399 BRIDGEWAY STREET VANCOUVER
0011601		3502 DUNDAS STREET VANCOUVER
0012656		3528 FRANKLIN STREET VANCOUVER
0015137		3510 OXFORD STREET VANCOUVER
0016242	14JAN24	3535 DUNDAS STREET SURREY
0016821	18FEB23	3421 FRANKLIN STREET VANCOUVER
0019648		3530 TRIUMPH STREET VANCOUVER

As Of: DEC 02, 2018 BC Online: Site Registry 18/12/06
For: PB64131 KEYSTONE ENVIRONMENTAL LTD. 14:01:56
Folio: 13639 Page 1

5 records selected for 0.5 km from latitude 49 deg, 17 min, 2.2 sec
and Longitude 123 deg, 2 min, 13.7 sec

Site Id	Lastupd	Address / City
0001089	02JUN26	NW CORNER HASTINGS AND CASSIAR VANCOUVER
0001292	01FEB09	3401 EAST HASTINGS STREET VANCOUVER
0008355	13NOV07	HASTINGS PARK RACECOURSE VANCOUVER
0012875		3114 EAST PENDER STREET VANCOUVER
0016821	18FEB23	3421 FRANKLIN STREET VANCOUVER

As of: JUL 23, 2017 BC Online: Site Registry 17-07-25
For: PB64131 KEYSTONE ENVIRONMENTAL LTD. 18:12:18
Folio: 13639 Page 1

Detail Report

SITE LOCATION

Site ID: 8355 Latitude: 49d 17m 06.0s
Victoria File: Longitude: 123d 02m 20.0s
Regional File: 26250-20/8355
Region: SURREY, LOWER MAINLAND

Site Address: HASTINGS PARK RACECOURSE
City: VANCOUVER Prov/State: BC
Postal Code: V5K 3N8

Registered: JUL 28, 2003 Updated: NOV 07, 2013 Detail Removed: NOV 04, 2013

Notations: 1 Participants: 2 Associated Sites: 0
Documents: 0 Susp. Land Use: 0 Parcel Descriptions: 0

Location Description: LAT/LONG CONFIRMED USING GOOGLE EARTH AND ICIS
2013-11-01

Record Status: NOT ASSIGNED
Fee category: UNRANKED

= = = =

- - - -

APPENDIX E

WATER WELL SEARCH



BRITISH COLUMBIA

Water Resources Atlas

Legend

- Water Wells - All

0 0.73 1.47 km

1: 36,112

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CAUTION: Maps obtained using this site are not designed to assist in navigation. These maps may be generalized and may not reflect current conditions. Uncharted hazards may exist. DO NOT USE THESE MAPS FOR NAVIGATIONAL PURPOSES.

Datum: NAD83
Projection: BC Albers

Key Map of British Columbia



APPENDIX F

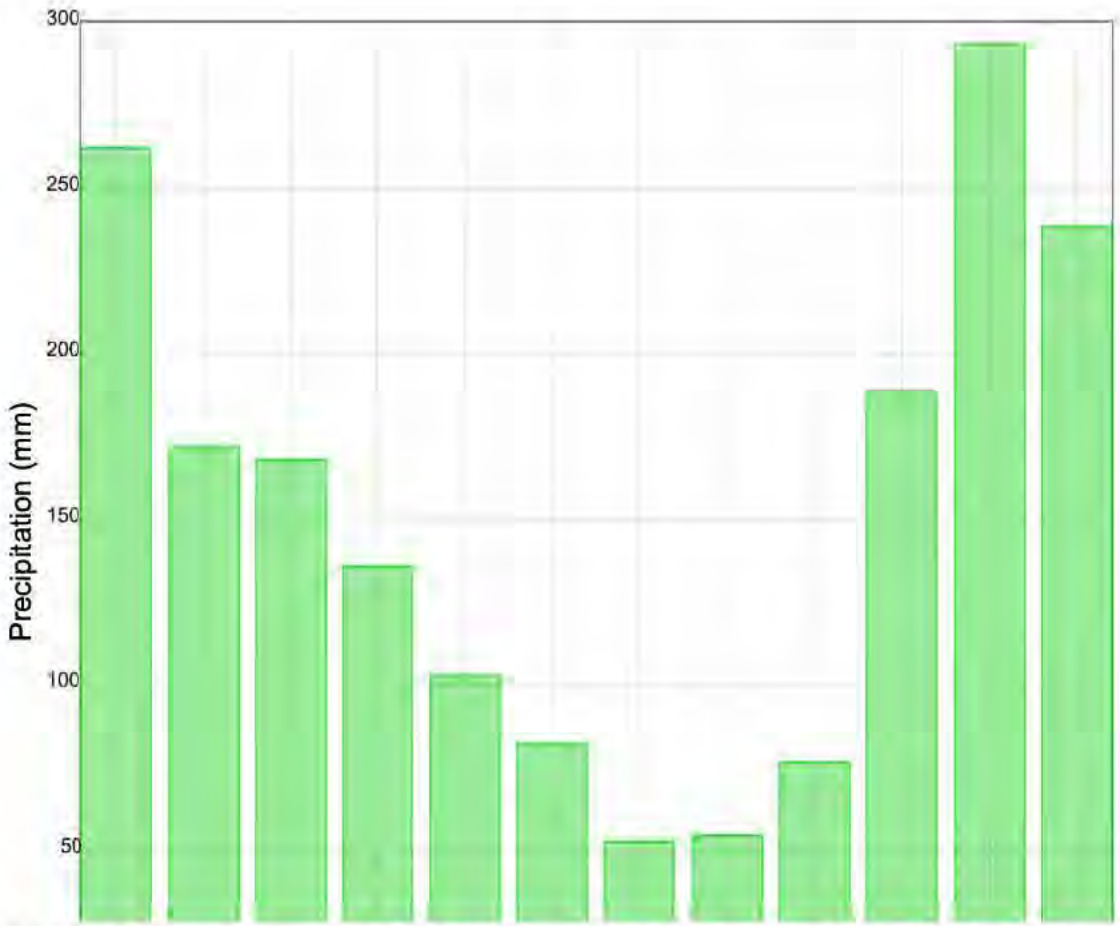
HISTORICAL CLIMATE DATA

Government of Canada / Gouvernement du Canada

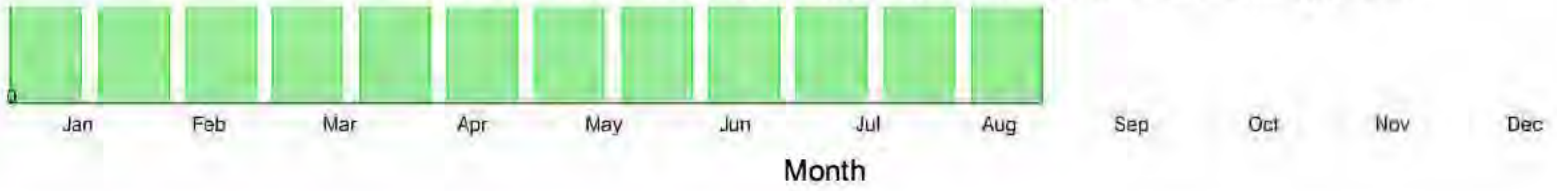
Canadian Climate Normals 1981-2010 Station Data

▼ Temperature and Precipitation Graph

Precipitation Graph for 1981 to 2010 Canadian Climate Normals
N VANCOUVER 2ND NARROWS



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Precipitation (mm)

▼ Normals Data

The minimum number of years used to calculate these Normals is indicated by a code for each element. A "+" beside an extreme date indicates that this date is the first occurrence of the extreme value. Values and dates in bold indicate all-time extremes for the location.

Data used in the calculation of these Normals may be subject to further quality assurance checks. This may result in minor changes to some values presented here.

N VANCOUVER 2ND NARROWS
BRITISH COLUMBIA

Latitude:	49°17'52.600" N
Longitude:	123°00'53.700" W
Elevation:	4.00 m
Climate ID:	1105666
WMO ID:	
TC ID:	

▼ Precipitation

Precipitation

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	Jan	Feb	Mar	Apr	Precipitation	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
Rainfall (mm)	255.3	167.7	166.8	136.1	103.3	82.5	53.2	54.9	76.8	189.0	290.2	229.9	1805.6	C
Snowfall (cm)	6.9	5.2	1.6	0.2	0.0	0.0	0.0	0.0	0.0	0.1	2.3	8.7	24.9	C
Precipitation (mm)	262.2	172.3	168.4	136.3	103.3	82.5	53.2	54.9	76.8	189.0	293.4	238.6	1830.8	C
Snow Depth at Month-end (cm)	0	0	0	0	0	0	0	0	0	0	0	0	0	C
Extreme Daily Rainfall (mm)	94.7	118.0	77.0	56.6	53.0	45.0	66.8	56.0	99.6	**126.8**	110.2	102.9		
Date (yyyy/dd)	1962/02	1982/14	1997/17	1991/03	1989/23	1990/09	1972/11	1991/26	1968/16	**2003/16**	1998/12	1972/25		
Extreme Daily Snowfall (cm)	25.4	25.4	20.3	2.0	0.0	0.0	0.0	0.0	0.0	1.2	15.0	**25.4**		
Date (yyyy/dd)	1971/11	1971/26	1962/01	1981/11	1958/01	1958/01	1958/01	1958/01	1958/01	1984/31	2006/26	**1975/12**		
Extreme Daily Precipitation (mm)	94.7	118.0	77.0	56.6	53.0	45.0	66.8	56.0	99.6	**126.8**	110.2	102.9		
Date (yyyy/dd)	1962/02	1982/14	1997/17	1991/03	1989/23	1990/09	1972/11	1991/26	1968/16	**2003/16**	1998/12	1972/25		
Extreme Snow Depth (cm)	0	0	0	0	0	0	0	0	0	0	0	**42**		
Date (yyyy/dd)	1981/01	1981/01	1981/01	1981/01	1981/01	1981/01	1981/01	1980/01	1981/01	1981/01	1980/01	**1996/29**		

▼ Days with Rainfall

Days with Rainfall

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
>= 0.2 mm	19.7	15.1	17.9	15.4	13.8	11.7	7.4	6.7	9.6	16	20.7	19.6	173.5	C
>= 5 mm	12.7	9.2	9.9	8.4	6.8	5	3.3	3	4.4	9.1	13.5	11.6	97	C
>= 10 mm	8.7	5.8	6.4	4.9	3.8	2.7	2	1.6	2.8	6.5	9.8	8.1	63	C
>= 25 mm	3	1.8	1.5	0.88	0.54	0.62	0.32	0.62	0.71	2.6	3.9	2.6	19	C

▶ Days With Snowfall

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▶ Days with Precipitation

Legend

- A = WMO "3 and 5 rule" (i.e. no more than 3 consecutive and no more than 5 total missing for **either** temperature **or** precipitation)
- B = At least 25 years
- C = At least 20 years
- D = At least 15 years

▼ Station / Element Metadata

Statistics listed below are provided as a guide to determine the validity of Normals and Extremes calculations. For example, a station with 30 years of record between 1981 and 2010 with no missing years would be a more reliable normal than a station with 15 years of record and 2 missing years. Less than 100% possible observations indicates that out of the total number of observations used, some records were missing.

N VANCOUVER 2ND NARROWS

Province	BC
Latitude (dd mm):	49 18 N
Country	CAN
Longitude (ddd mm):	123 01 W
Time Zone	PST
Latitude (decimal degrees):	49.3 N
Climate ID:	1105666
Longitude (decimal degrees):	123.01 W

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WMO ID:

Elevation (m): 4

TC ID:

▼ Precipitation

Precipitation

	Begin Year	End Year	Total Number of Years	Missing Years	Total Count of Observations	% of Possible Observations
Rainfall (mm)	1981	2007	26	2	9252	98.7
Snowfall (cm)	1981	2007	26	2	9252	98.7
Precipitation (mm)	1981	2007	26	2	9252	98.7
Snow Depth at Month-end (cm)	1981	2007	26	3	294	96.1
Extreme Daily Rainfall (mm)	1957	2007			17754	99.6
Extreme Daily Snowfall (cm)	1957	2007			17767	99.6
Extreme Daily Precipitation (mm)	1957	2007			17799	99.8
Extreme Snow Depth (cm)	1980	2007			8998	95.7

▼ Days with Rainfall

Days with Rainfall

	Begin Year	End Year	Total Number of Years	Missing Years	Total Count of Observations	% of Possible Observations
>= 0.2 mm	1981	2007	26	2	9282	99
>= 5 mm	1981	2007	26	2	9282	99
>= 10 mm	1981	2007	26	2	9282	99
>= 25 mm	1981	2007	26	2	9282	99

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- ▶ Days With Snowfall
- ▶ Days with Precipitation

Date modified:

2018-07-20

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APPENDIX G

INVESTIGATIVE METHODOLOGY

INVESTIGATIVE METHODOLOGY – UTILITY LOCATE PROCESS SUMMARY

Prior to commencing any intrusive work (including drilling, underground storage tank removal, and remedial excavations, etc.) completed by Keystone Environmental or its contractors and subcontractors, Keystone Environmental personnel obtain and review available utility information pertinent to the proposed work location (where Keystone Environmental is the prime contractor). Utility information is obtained by Keystone personnel and provided to the utility locator contractor. The procedure to locate utilities (subsurface and overhead) is accomplished in three main steps. The three main steps are summarized below.

Utility Information Compilation (Office Utility Locates)

This is the first step in completing the utility locate process and involves contacting various parties to obtain specific utility information (i.e. location and depth). Once the utility information has been compiled, it is standard procedure to plot the information on a scaled site drawing along with the proposed investigation locations. Parties that are contacted are as follows:

- Site owner – the site owner may have record drawings of site utilities or proposed development plans illustrating most of the utilities present at the site (this information, if available, is considered approximate).
- BC One Call – the placement of a BC One Call is required by Workers Compensation Board prior to the onset of fieldwork. BC One Call will contact registered members (typically Fortis Gas, BC Hydro and Telus).
- City/Municipality/District (water, storm, sanitary, and street lighting) – the City/Municipality will typically provide information for utilities located off the site property and in some cases detailed site utility information. The off property utility information will show connections of individual utilities onto the site. This information is to be considered approximate locations.
- Shaw/Rogers/other Cable – a review of the site location is conducted to determine the potential Cable companies with lines in the vicinity of the site. Each company is contacted to confirm the presence or absence of underground utilities.
- Other – Depending on the site, other utilities may be present and other parties may require contacting.

Most parties require between 3 to 5 days to respond to a request. The information is typically provided in electronic form. If the fieldwork does not proceed within two weeks of obtaining the utility information (two weeks from placing the BC One Call), the utility information compilation procedure must be completed again, as site conditions may have changed. Also, the BC One Call expires after two weeks of placing the call. If manholes are suspected or known to be present at the site, permission is requested to open the manholes for visual inspection of utilities, when contacting the appropriate parties.

Non-Intrusive Utility Locate (Field Utility Locates)

Using the compiled utility information, a non-intrusive utility locate is completed at the site, particularly at and around the proposed investigation locations using geophysical and utility locating equipment to identify and trace (i.e., physically mark the ground surface) the location of subsurface utilities. Overhead utilities (i.e., electric, telephone, cable) are reviewed to confirm the utility company's specified distance from the overhead utility is achievable. The following points are provided to summarize the steps involved when performing field locates:

- A reputable utility locator is contracted to complete the field utility locates.
- Field utility locates are typically performed 24 to 48 hours prior to conducting the scheduled investigative work.
- The compiled utility information is provided to the locator. The locator reviews the information and marks out the location of each utility on the ground, using appropriate coloured paint.
- The findings, limitations and confidence levels with respect to identifying each utility are discussed at the site. An estimate of the approximate depth of the utility is requested and recorded.
- Prior to a locator opening a manhole, permission to open the manhole from the appropriate utility company has been received. Also, prior to opening the manhole, volatile hydrocarbon concentrations within the ambient air of the manhole(s) are assessed using appropriate instrumentation for volatile headspace measurements.
- Once individual utilities have been located, a general scan is performed over the proposed investigation location for other potential and unknown utilities. The general scan is performed up to a ten-metre radius of the proposed investigation location, in the event that a step-out investigation is required.
- The utility locate contractor signs a sketch/figure acknowledging that utilities have been located and that investigation locations have been cleared or if daylighting (hydro vacuum) is required.
- The field utility locate is reviewed with senior staff and signed off prior to commencement of the intrusive program.

Intrusive Utility Locate

An intrusive utility locate is completed when a proposed investigation location is within 2 m of a known subsurface utility and at the discretion/requirement of senior staff, client, property owner, municipality or utility company. The intrusive utility locate is completed by daylighting (hydro vacuum) using a vacuum truck, hand digging or hand augering (as deemed appropriate) to expose and locate the subsurface utility. A low impact method of drilling or excavating, such as a vacuum truck or hand digging, may also be used to clear investigation locations as a precautionary measure where uncertainty exists (unidentified anomaly, interference or limited records). With this method, conventional drilling or excavation methods may be employed if no utility is identified past the suspected depth of the anomaly, or if observation of soil indicates that it is undisturbed (not in a trench). The intrusive utility locate must be completed to the reported depth of the nearby utilities to ensure that the subsurface utility has not been encountered. Exceptions to the above may be justified where obvious undisturbed native soil is encountered.

INVESTIGATIVE METHODOLOGY – DRILLING PROCESS AND SOIL SAMPLING PROCEDURES

Prior to commencement of the drilling program the appropriate drill rig is selected based on access and subsurface conditions. Drill rig options include track mounted and/or truck mounted drill rigs with auger (solid/hollow stem with split spoon sampling), rotary air percussion (ODEX), or sonic capabilities. Furthermore, a hydro-vacuum excavator may be required to clear areas with unknown underground utilities. Solid stem augers, hollow stem augers, stainless steel split spoon sampling core barrels, drill casing and/or drill bits are inspected prior to use to determine if they have been thoroughly cleaned and decontaminated.

Surface Soil Sampling Procedure

Surface soil sampling is completed using a stainless steel trowel or shovel to expose undisturbed soil approximately 0.2 m below the surface. The soil is then collected directly from the exposed soil. Between each soil sample, the stainless steel trowel or shovel is decontaminated using an Alconox solution and distilled water to prevent cross contamination.

Auger Drilling Process and Soil Sampling Procedure

Auger drilling is completed using 1.5 m long interconnecting solid stem or hollow stem steel augers. It is Keystone Environmental standard operating procedure to use hollow stem auger with spilt spoon sampler to collect soil samples when using an auger drill if ground conditions are suitable for penetrating and recovering sufficient soil volume. Where soil conditions are not suitable solid stem augers may be used.

For split spoon sampling a 2 inch ID by 60 cm (2 feet) long spilt spoon sample collection core barrel is attached to rods and inserted through the hollow stem auger casing to depth drilled. The core barrel is driven into the ground to a depth of 60 cm ahead of the lead auger bit using a standard 140 pound drop hammer or hydraulic impact hammer. Blow counts are tracked for each 15 cm depth and recorded in the field book. Once the full depth of 60 cm is reached the split spoon core barrel and rods are extracted from the drill hole and placed on a clean decontaminated flat surface. The drive shoe and head are unthreaded and the split spoon is cracked open into its component halves to reveal the core of soil. When the soil is exposed, the soil stratigraphy is logged and sample intervals selected. Wearing nitrile gloves and/or using a clean stainless steel trowel, soils are removed from the split spoon core barrel over the selected sample interval.

If soil conditions require the use of solid stem augers, the sampling procedure is discussed with the driller with the objective of reducing the amount of heat generation from friction and soil “spin up” on the augers. Ideally the auger is rotated into the soil under a constant speed and pressure to “corkscrew” into the ground rather than displacing soil. Upon retrieval of the solid stem augers from the drill holes, approximately 1 cm of soil is removed from the outer edge of the auger flights to expose soil that has not been in contact with material dragged from the walls of the borehole. Soil samples are collected directly from the solid stem augers and the

approximate depth interval from the 1.5 metre length drilled is recorded. In dense soils where significant soil displacement occurs, the drill penetration interval can be reduced to provide a higher resolution of sampling.

Hydro-Vacuum Excavator Process and Soil Sampling Procedure

Soil samples from the hydro vacuum excavator are collected by a shovel which is inserted down the open hole to scrape soil off the walls of the borehole at a specified depth.

Soil Sample Processing and Headspace Vapour Screening Procedure

Soil samples are divided into three portions, each representing the full depth interval of the sample. Two of the portions are placed into two 125 mL laboratory supplied glass jars with minimal headspace and secured with Teflon® lids. If volatile contaminants are to be analyzed, two portions of approximately 5 grams of soil are measured with a dedicated syringe and inserted into a vial of methanol, for field preservation. The third portion of the soil sample is collected in a Ziploc® polyethylene bag for field screening of headspace vapours using a photo ionization detector (PID) and/or a combustible gas meter.

Headspace screening provides an indication of the potential presence of volatile/semi-volatile organic contamination in soil and is used to support selection of samples for analysis. Field samples are screened for volatile constituents using a PID calibrated to isobutylene and/or a combustible gas meter calibrated to hexane. The headspace vapour screening procedure is described as follows:

- Field soil samples are allowed to warm for approximately 10 to 15 minutes to allow the release of hydrocarbon vapours into the headspace of the polyethylene bag.
- Following the 10 to 15 minute holding period, a hole is punctured into the polyethylene bag using the tip of the instrument and the maximum headspace vapour concentration measurement is obtained and recorded.

The soil headspace measurements, the observed stratigraphy, and the sample intervals for each borehole are indicated on the borehole log forms. Soil samples are collected in laboratory provided bottles, placed in chilled coolers, and transported under signed chain of custody documentation.

INVESTIGATIVE METHODOLOGY – GROUNDWATER MONITORING WELL CONSTRUCTION

Groundwater monitoring wells are constructed using 2.5 cm inside diameter, schedule-40 PVC, pipe with a well screen slot size of 0.25 mm (0.01 inch). Well screens are typically 1.5 m in length. The screened intervals are selected to intersect the water table or the desired zone of interest, and solid PVC riser-pipe extends from the top of each well screen to either ground level (flush-mounted) or above grade (stick up wells). Subsequent to the placement of the well casing, a filter sand pack is poured through the annulus between the well screen and the borehole walls while the hollow stem augers or sonic casing are incrementally retracted from the

borehole. This method is used to provide correct placement of the filter sand pack and bentonite seal. The filter sand pack is composed of 10/20 mesh filter sand, and extends approximately 0.3 m above the top of the well screen. A bentonite seal is placed immediately above the sand pack to an approximately depth of 0.3 m below grade (typical). The bentonite seal prevents vertical migration of groundwater or infiltration of surface water into the well. Each monitoring well is completed at surface with either a flush mount road box or stickup well cover set in a concrete surface plug. On secure sites with limited traffic PVC riser pipes may be left as stick-ups without a protective cover. A lockable J-plug is placed in the top of the well casing to seal the well and protect against unauthorized access.

The groundwater monitoring well construction details are documented on monitoring well logs.

INVESTIGATIVE METHODOLOGY – GROUNDWATER MONITORING WELL DEVELOPMENT, PURGING AND SAMPLING PROCEDURES

Groundwater monitoring wells are allowed to equilibrate for a minimum period of 24 hours prior to development. Headspace vapours are measured at each location using a PID and/or combustible gas meter upon removal of the J-plug and the readings are recorded on purge forms. Monitoring wells are developed prior to sampling using dedicated Waterra™ tubing, with a surge block and inertial pump foot-valve to remove fine-grained particles from the well and filter pack in preparation for groundwater monitoring and sampling. The volume of water in each well is calculated prior to developing, and a minimum of six (6) well casing volumes of water are removed during the procedure, or the well is developed dry three times.

Subsequent to development, the monitoring wells are allowed to settle for a minimum period of 24 hours prior to groundwater purging and sampling. The monitoring wells are purged using the low flow procedure[1] with a peristaltic pump and dedicated, disposable Masterflex™ (silicon tubing) and HDPE tubing. Well purging is conducted to remove water from the well column, and replace it with water from the formation for sampling. The produced groundwater is monitored for pH, specific conductance, temperature, and oxidation-reduction potential (ORP) during purging. The well is considered to be adequately purged when the values of pH, specific conductance, temperature and ORP were within ±0.1 units, ±3%, ±0.2°C, and ±10 mV, respectively, of the previous two measurements, or when in low permeability formations, until the wells were pumped dry.

A peristaltic pump utilizing a low flow sampling methodology is used to collect groundwater samples for extractable petroleum hydrocarbons, polycyclic aromatic hydrocarbons, dissolved metals, pesticides, glycols, chlorinated phenols, non-chlorinated phenols, total dissolved solids and conventional parameters. Waterra™ tubing with an inertial foot-valve pump is used to collect groundwater samples for volatile organic compounds, including benzene, toluene, ethylbenzene, xylene, volatile petroleum hydrocarbons. Dissolved metal samples are filtered in the field prior to the addition of laboratory provided preservative. Groundwater samples are collected in laboratory provided bottles, placed in chilled coolers, and transported under signed chain of custody documentation.

[1] USEPA Ground Water Issue, Low-Flow (Minimal Drawdown) Groundwater Sampling Procedures, EPA/540/S-95/504, April 1996.

INVESTIGATIVE METHODOLOGY – SOIL VAPOUR MONITORING WELL CONSTRUCTION

Soil vapour wells are constructed using a stainless steel Geoprobe® screen (approximately 0.15 m in length) connected to 6-mm diameter nylon tubing that extends from the top of the screen to the ground surface, and finished with a stop-valve. Following the placement of the probes in the borehole, silica filter sand is poured through the annulus between the probe screen and the borehole walls and brought up to approximately 5 cm above the top of the probe screen. A bentonite seal is placed immediately above the sand. The bentonite seal is slightly hydrated with deionized water to prevent the infiltration of surface water into the soil vapour well. The soil vapour wells are either finished with a flush mount cover installed in concrete or as a stick up.

INVESTIGATIVE METHODOLOGY – SOIL VAPOUR SAMPLING, AMBIENT AIR SAMPLING, LEAK TESTING AND APPLICATION OF AN ATTENUATION FACTOR

Vapour samples are collected using a laboratory supplied and calibrated pump (laboratory calibrated flow rates of 0.01 to 0.2 L/min) to draw soil vapour through laboratory supplied Thermal Desorption (TD) tubes. The soil vapour wells are purged for a minimum of 4 minutes prior to the start of sampling (purge times dependent on pump flow rate). Each sample is collected over a period of time depending on the pump flow rate, contaminant, and potential concentrations. The sample volume drawn through the TD tubes is based on the contaminant parameter being analyzed.

Ambient air samples are collected using a laboratory supplied and calibrated pump (laboratory calibrated flow rates of 0.01 to 0.2 L/min) to draw soil vapour through laboratory supplied TD tubes. The samples are collected over eight hours to provide a more representative sample of the concentration in the air over the day.

Leak testing is conducted prior to sampling at a newly installed soil vapour well (whether the installation is temporary or permanent) and once every 10 samples collected in previously installed soil vapour wells. Leak testing is undertaken to demonstrate that the surface seal and sampling train is functioning satisfactorily, and that subsurface vapours instead of ambient air are being extracted during sampling. Leak testing can be conducted using a reference gas such as helium (preferred method) or a liquid tracer such as isopropanol.

Helium Leak Testing

Helium leak testing is conducted by filling a shroud covering the soil vapour well with helium. The sample train is then tested for the presence of helium by filling a Tedlar® bag with vapour from the soil vapour well. If the helium concentration in the Tedlar® bag is greater than 2% (2% is equivalent to 20,000 ppm) of the measured concentration in the shroud, this is an indication that there may be a leak in the tubing or a potentially inadequate well surface seal.

$$\text{PERCENTAGE DIFFERENCE} = \frac{\text{Concentration of He in Tedlar Bag}}{\text{Concentration of He in Shroud}} * 100$$

Leak tests where the percentage difference is greater than 2% are repeated. If the helium concentration is again greater than 2% of the helium concentration in the shroud, but below 5%, atmospheric correction factors can be applied to analytical data and the well results are usable but with the correction factor. However, if the concentration in the Tedlar® bag was greater than 5% for the second consecutive test, the soil vapour well is considered compromised and would require a new installation.

Application of Attenuation Factor

Vapour characterization is used, in accordance with Technical Guidance 4 (TG4 BCMOE September, 2010), to predict concentrations of volatile constituents in outdoor and indoor air. Analysis of constituents in soil vapour samples are based upon the detection of constituents in soil and/or groundwater from the respective borehole/well locations and/or PCOCs for each area of potential environmental concern (APEC). The concentrations of the vapour PCOCs in the indoor and outdoor air are predicted from measured soil vapour concentrations using the following equation presented in the TG4 document:

$$C_{indoor/outdoor\ air} = C_{vapour} * \alpha$$

Where:

C_{air} ($\mu g/m^3$) is the estimated indoor/outdoor air concentration of the PCOC

C_{vapour} is the measured soil vapour concentration of the PCOC

α is the vapour attenuation factor (Table 1 – BCMOE, 2009)

The attenuation factors applied are location-specific and dependent on the soil vapour sampling depth.

INVESTIGATIVE METHODOLOGY – QUALITY ASSURANCE AND QUALITY CONTROL – RELATIVE PERCENT DIFFERENCE AND MAXIMUM SPREAD

To check the precision of field methods, quality control (QC) samples were collected for analysis. Field QC samples consisted of collecting duplicate/replicate samples of environmental media (i.e., soil, groundwater, surface water, sediment, ambient air and/or soil vapour). Field duplicate/replicate samples are collected on a frequency of one for every ten samples. The results of the duplicate samples are used to evaluate method precision to determine if the data are reasonably reliable for the purpose of the study.

The measure of the reproducibility or precision of the data is quantified by calculating the Relative Percent Difference (RPD) or Maximum Spread (MS). The RPD is calculated when the sample and duplicate concentration are both greater than or equal to five times the reported detection limit (RDL). When the sample and/or duplicate concentration is less than five times the RDL, the MS is calculated. If the concentration of both the sample and duplicate are less than the RDL, then RPD and MS are not calculated. Sample and duplicate results that are both less than the RDL are considered to be in general agreement. To calculate the RPD, the absolute value of the difference between the sample and the duplicate is divided by the average of the

sample and duplicate and multiplied by 100, to obtain a percentage. To calculate the MS the sample and duplicate value are subtracted to determine if the subtracted value is less than or greater than the RDL.

Generally, RPD values greater than 35% for soil, 20% for water, and 35% for soil vapour suggest further review. Furthermore, MS values greater than the RDL suggest further review. If the RPD or MS are greater than the percentages and criteria detailed above then it is generally necessary to determine a cause and decide whether the effect of the precision, or uncertainty, may alter the findings of the investigation. A RPD or MS that appears to indicate poor precision must be evaluated in relation to factors such as the sample pairing (e.g., confirming sample identification), nature of the sample (e.g., soil or groundwater, heterogeneous or homogeneous), the nature of the chemical or analysis (e.g., metals or organics) and the concentrations of the chemical (e.g., less than the applicable standard) before conclusions are drawn.

APPENDIX H

BOREHOLE, MONITORING WELL, VAPOUR WELL LOGS, FIELD WELL PURGE AND SAMPLING FORMS

Keystone Environmental
Knowledge-Driven Results

LOCATION ID: BH18-1

Keystone Environmental

Project Location: 2901 East Hastings Street, Vancouver
Drilling Contractor: KEL
Drilling Equipment/Method: Hand Auger
Location Type: Borehole

Project Name/No.: 13639
Client: City of Vancouver
Engineer/Geologist: SM
Drill Date: November 21, 2018 **Page:** 1 of 1

Depth (ft/m)	Symbol	Soil / Sediment Description	Sample Type	% Recovery	Sample Analyzed (Y,N)	Sample ID	Headspace (PID) ppm	Elevation (m)	Remarks
ft m		Ground Surface						109.14	
0 0		***SAND*** Brown fine to coarse grained SAND (fill), some fine to medium grained gravel, trace silt. Loose, moist, odours and/or staining were not observed		100	Y	BH18-1(0.1)/BH18-C	1.9	109.05	
1		***SAND*** Grey fine grained SAND (till), some silt, trace fine grained gravel. Very dense, moist, odours and/or staining were not observed.		100	Y	BH18-1(0.4)	0.6	108.54	
2		End of Hole							
3 1									
4									
5									
6 2									
7									
8									
9									
10 3									

Location of Borehole: Phase 1A

Borehole Diameter: 0.05 m
Depth of Borehole: 0.6 m

Borehole Elevation: 109.144 m
Co-ordinates: n/a
Datum: Local

MONITORING WELL ID: MW/SV18-2

Well Type: Groundwater and soil vapour monitoring wells
Project Location: 2901 East Hastings Street, Vancouver
Drilling Contractor: Southland Drilling Co. Ltd., Badger Daylighting
Drilling Equipment/Method: Solid Stem Augers, Hydrovacuum
Well Location: Phase 1A

Project Name/No.: 13639
Client: City of Vancouver
Engineer/Geologist: SM
Drill Date: November 21, 2018

Depth (ft/m)	Symbol	Soil / Sediment Description	Sample Type	% Recovery	Sample Analyzed	Sample ID	Headspace (PID) ppm	Elevation (m)	Well Construction	Remarks
ft m		Ground Surface						106.605		
0 0		**ASPHALT**		100	Y	MW18-2(0.3)	0.9	106.453		
		SAND and GRAVEL Grey fine to coarse grained SAND and GRAVEL (fill), trace silt. Dense, moist, odours and/or staining were not observed								
3 1		**SAND** Grey fine grained SAND (till), some silt, some fine to coarse grained gravel, trace cobbles. Very dense, moist, odours and/or staining were not observed.	G	100	N	MW18-2(1.2)	1.1			
7 2				100	Y	MW18-2(2.1)	1.6			
9				100	N	MW18-2(2.8)	1.1			
11 3		Silty at 3.3 m								
13 4				100	N	MW18-2(4.0)	1.1			
17 5				100	N	MW18-2(5.2)	0.9			
19 6				100	N	MW18-2(5.8)	1.1			
20										

Nylon Tubing
Flushmount and Concrete
Soil Vapour Screen
PVC Casing
Bentonite

Co-ordinates: n/a
Date of Water Level: November 28, 2018
Water Level (from TOC): 8.154 m
Surveyed Water Elevation (m): 98.370 m

Well-Borehole Diameter: 0.15 m
Well Casing Diameter: 0.05 m
Well Casing Material: Schedule 40 PVC
Well Screen Slot Size: 0.001 m

Depth of Well (TOC): 8.82 m
Well Elevation (TOC): 106.524 m
Well Elevation (Ground): 106.605 m
Datum: Local

MONITORING WELL ID: MW/SV18-2

Well Type: Groundwater and soil vapour monitoring wells
Project Location: 2901 East Hastings Street, Vancouver
Drilling Contractor: Southland Drilling Co. Ltd., Badger Daylighting
Drilling Equipment/Method: Solid Stem Augers, Hydrovacuum
Well Location: Phase 1A

Project Name/No.: 13639
Client: City of Vancouver
Engineer/Geologist: SM
Drill Date: November 21, 2018 **Page:** 2 of 2

Depth (ft/m)	Symbol	Soil / Sediment Description	Sample Type	% Recovery	Sample Analyzed	Sample ID	Headspace (PID) ppm (0 500 1000 1500 2000)	Elevation (m)	Well Construction	Remarks
21										
22										
23 (7)		Dense, moist to wet		100	N	MW18-2(7.0)	1.2	99.595		
24										
25										
26 (8)		Wet at 8.0 m		100	N	MW18-2(7.8)	0.9			
27										
28				100	N	MW18-2(8.5)	1.0			
29								97.613		
30 (9)		End of Hole								Well Screen and 10/20 Silica Sand
31										
32										
33 (10)										
34										
35										
36 (11)										
37										
38										
39										
40 (12)										

Co-ordinates: n/a
Date of Water Level: November 28, 2018
Water Level (from TOC): 8.154 m
Surveyed Water Elevation (m): 98.370 m

Well-Borehole Diameter: 0.15 m
Well Casing Diameter: 0.05 m
Well Casing Material: Schedule 40 PVC
Well Screen Slot Size: 0.001 m

Depth of Well (TOC): 8.82 m
Well Elevation (TOC): 106.524 m
Well Elevation (Ground): 106.605 m
Datum: Local

MONITORING WELL ID: MW/SV18-3

Well Type: Groundwater and soil vapour monitoring wells
Project Location: 2901 East Hastings Street, Vancouver
Drilling Contractor: Southland Drilling Co. Ltd., Badger Daylighting
Drilling Equipment/Method: Solid Stem Augers, Hydrovacuum
Well Location: Phase 1A

Keystone Environmental

Project Name/No.: 13639
Client: City of Vancouver
Engineer/Geologist: SM
Drill Date: November 20, 2018

Depth (ft/m)	Symbol	Soil / Sediment Description	Sample Type	% Recovery	Sample Analyzed	Sample ID	Headspace (PID) ppm	Elevation (m)	Well Construction	Remarks
0 / 0		Ground Surface						106.054		
0		**ASPHALT**								
1		**SAND and GRAVEL** Grey fine to coarse grained SAND and GRAVEL (fill), trace silt. Loose, moist, odours and/or staining were not observed	G	100	Y	MW18-3(0.5)/MW18-B	1.6			
2								105.292		
3 / 1		**SAND** Grey fine grained SAND (till), some silt, some fine to coarse grained gravel, trace cobbles. Very dense, moist, odours and/or staining were not observed.	G	100	N	MW18-3(1.0)	1.4			
4										
5				100	N	MW18-3(1.5)	1.5			
6 / 2				100	N	MW18-3(2.1)	2.2			
7										
8										
9										
10 / 3		Silty at 3.1 m		100	N	MW18-3(3.3)	1.8			
11										
12										
13 / 4										
14				100	N	MW18-3(4.3)	2.0			
15										
16 / 5										
17				100	N	MW18-3(5.3)	0.7			
18										
19										
20 / 6										

Ground Surface
Flushmount and Concrete
Nylon Tubing
Soil Vapour Screen
PVC Casing
Bentonite

Co-ordinates: n/a
Date of Water Level: November 28, 2018
Water Level (from TOC): 7.681 m
Surveyed Water Elevation (m): 98.296 m

Well-Borehole Diameter: 0.15 m
Well Casing Diameter: 0.05 m
Well Casing Material: Schedule 40 PVC
Well Screen Slot Size: 0.001 m

Depth of Well (TOC): 8.12 m
Well Elevation (TOC): 105.977 m
Well Elevation (Ground): 106.054 m
Datum: Local

MONITORING WELL ID: MW/SV18-3

Well Type: Groundwater and soil vapour monitoring wells
Project Location: 2901 East Hastings Street, Vancouver
Drilling Contractor: Southland Drilling Co. Ltd., Badger Daylighting
Drilling Equipment/Method: Solid Stem Augers, Hydrovacuum
Well Location: Phase 1A

Project Name/No.: 13639
Client: City of Vancouver
Engineer/Geologist: SM
Drill Date: November 20, 2018 **Page:** 2 of 2

Depth (ft/m)	Symbol	Soil / Sediment Description	Sample Type	% Recovery	Sample Analyzed	Sample ID	Headspace (PID) ppm (0 500 1000 1500 2000)	Elevation (m)	Well Construction	Remarks
7				100	Y	MW18-3(6.9)	0.9			
8				80	Y	MW18-3(8.0)	1.1	97.977		
		End of Hole								Well Screen and 10/20 Silica Sand

Co-ordinates: n/a
Date of Water Level: November 28, 2018
Water Level (from TOC): 7.681 m
Surveyed Water Elevation (m): 98.296 m

Well-Borehole Diameter: 0.15 m
Well Casing Diameter: 0.05 m
Well Casing Material: Schedule 40 PVC
Well Screen Slot Size: 0.001 m

Depth of Well (TOC): 8.12 m
Well Elevation (TOC): 105.977 m
Well Elevation (Ground): 106.054 m
Datum: Local

LOCATION ID: BH18-4

Keystone Environmental

Project Location: 2901 East Hastings Street, Vancouver
Drilling Contractor: KEL
Drilling Equipment/Method: Hand Auger
Location Type: Borehole

Project Name/No.: 13639
Client: City of Vancouver
Engineer/Geologist: SM
Drill Date: November 21, 2018 **Page:** 1 of 1

Depth (ft/m)	Symbol	Soil / Sediment Description	Sample Type	% Recovery	Sample Analyzed (Y,N)	Sample ID	Headspace (PID) ppm	Elevation (m)	Remarks
ft m		Ground Surface						105.08	
0 0		***GRAVEL*** Grey coarse grained GRAVEL (fill). Loose, moist, odours and/or staining were not observed		100	Y	BH18-4(0.2)	0.1		
1		***SAND*** Grey fine grained SAND (till), some silt, trace fine to coarse grained gravel. Dense, moist, odours and/or staining were not observed.		100	N	BH18-4(0.4)	0.3	104.62	
		End of Hole							

Headspace (PID) ppm: 0 500 1000 1500 2000

Location of Borehole: Phase 1A

Borehole Diameter: 0.05 m
Depth of Borehole: 0.6 m

Borehole Elevation: 105.079 m
Co-ordinates: n/a
Datum: Local

MONITORING WELL ID: MW/SV18-5

Well Type: Groundwater and soil vapour monitoring wells
Project Location: 2901 East Hastings Street, Vancouver
Drilling Contractor: Southland Drilling Co. Ltd.
Drilling Equipment/Method: Solid Stem Augers
Well Location: Phase 4A

Keystone Environmental

Project Name/No.: 13639
Client: City of Vancouver
Engineer/Geologist: SM
Drill Date: November 21, 2018 **Page:** 1 of 1

Depth (ft/m)	Symbol	Soil / Sediment Description	Sample Type	% Recovery	Sample Analyzed	Sample ID	Headspace (PID) ppm	Elevation (m)	Well Construction	Remarks
0 / 0		Ground Surface						98.491		
0		***ASPHALT***								
1		***SAND*** Brown fine to coarse grained SAND (fill), some fine to coarse grained gravel, some silt, trace cobbles. Dense, moist, odours and/or staining were not observed								
2				100	Y	MW18-5(0.5)/MW18-E	1.9		Bentonite	Flushmount and Concrete
3 / 1		Wet at 0.9 m							Nylon Tubing	
								97.455	Soil Vapour Screen	
4		***SAND*** Grey fine grained SAND (till), some silt, trace fine to coarse grained gravel. Very dense, moist, odours and/or staining were not observed.		100	Y	MW18-5(1.2)	1.3		PVC Casing	
5										
6		Silty at 1.8 m								
7 / 2				100	N	MW18-5(2.1)	2.7			
8		Some silt at 2.4 m								
9				50	Y	MW18-5(2.8)	2.9			
10 / 3								95.443		
		End of Hole								Well Screen and 10/20 Silica Sand
11										
12										
13 / 4										
14										
15										
16										
17 / 5										
18										
19										
20 / 6										

Co-ordinates: n/a
Date of Water Level: November 28, 2018
Water Level (from TOC): 0.454 m
Surveyed Water Elevation (m): 97.934 m

Well-Borehole Diameter: 0.15 m
Well Casing Diameter: 0.05 m
Well Casing Material: Schedule 40 PVC
Well Screen Slot Size: 0.001 m

Depth of Well (TOC): 2.96 m
Well Elevation (TOC): 98.388 m
Well Elevation (Ground): 98.491 m
Datum: Local

MONITORING WELL ID: MW/SV18-6

Well Type: Groundwater and soil vapour monitoring wells
Project Location: 2901 East Hastings Street, Vancouver
Drilling Contractor: Southland Drilling Co. Ltd., Badger Daylighting
Drilling Equipment/Method: Solid Stem Augers, Hydrovacuum
Well Location: Phase 1A

Keystone Environmental

Project Name/No.: 13639
Client: City of Vancouver
Engineer/Geologist: SM
Drill Date: November 20, 2018 **Page:** 1 of 1

Depth (ft/m)	Symbol	Soil / Sediment Description	Sample Type	% Recovery	Sample Analyzed	Sample ID	Headspace (PID) ppm	Elevation (m)	Well Construction	Remarks
0 / 0		Ground Surface						106.331		
		ASPHALT								
		SAND Grey fine to medium grained SAND (fill), some fine to coarse grained gravel, trace silt, trace cobbles. Dense, moist, odours and/or staining were not observed								
1 / 0.3				100	Y	MW18-6(0.5)/MW18-A	57.2			
2 / 0.6										
3 / 1										
4 / 1.2				100	N	MW18-6(1.2)	7.0			
5 / 1.5								104.807		
		SAND Grey fine grained SAND (till), some silt, trace fine to coarse grained gravel. Very dense, moist, odours and/or staining were not observed. Silty, dark brown at 2.1 m								
6 / 1.8				100	N	MW18-6(2.0)	2.0			
7 / 2.1				100	N	MW18-6(2.3)	31.0	103.893		
		Sandy SILT Grey fine grained sandy SILT(till), trace fine to coarse grained gravel. Dense, moist, odours and/or stianing were not observed. Sand increases with depth.								
9 / 2.7				100	N	MW18-6(2.8)	9.0			
10 / 3										
11 / 3.4										
12 / 3.7										
13 / 4				100	N	MW18-6(4.0)	1.8			
14 / 4.3										
15 / 4.6										
16 / 5				100	N	MW18-6(4.9)	1.9			
17 / 5.2										
18 / 5.5								100.692		
19 / 6		End of Hole								
20										

Headspace (PID) ■ 0 500 1000 1500 2000 ■ ppm

Well Construction: Flushmount and Concrete; Nylon Tubing; Soil Vapour Screen; Bentonite; PVC Casing; Well Screen and 10/20 Silica Sand

Co-ordinates: n/a
Date of Water Level: November 28, 2018
Water Level (from TOC): 3.535 m
Surveyed Water Elevation (m): 102.709 m

Well-Borehole Diameter: 0.15 m
Well Casing Diameter: 0.05 m
Well Casing Material: Schedule 40 PVC
Well Screen Slot Size: 0.001 m

Depth of Well (TOC): 5.60 m
Well Elevation (TOC): 106.244 m
Well Elevation (Ground): 106.31 m
Datum: Local

LOCATION ID: BH18-7

Keystone Environmental

Project Location: 2901 East Hastings Street, Vancouver
Project Name/No.: 13639
Drilling Contractor: Southland Drilling Co. Ltd., Badger Daylighting
Client: City of Vancouver
Drilling Equipment/Method: Solid Stem Augers, Hydrovacuum
Engineer/Geologist: SM
Location Type: Borehole
Drill Date: November 20, 2018 **Page:** 1 of 1

Depth (ft/m)	Symbol	Soil / Sediment Description	Sample Type	% Recovery	Sample Analyzed (Y,N)	Sample ID	Headspace (PID) ppm	Elevation (m)	Remarks
ft m							0 500 1000 1500 2000		
0 0		Ground Surface						107.87	
		ASPHALT							
		SAND							
1		Grey fine grained SAND (till), some silt, trace fine to medium grained gravel. Very dense, moist, odours and/or staining were not observed.	G	100	N	BH18-7(0.6)	0.8		
2									
3 1			G	100	N	BH18-7(1.0)	0.9		
4									
5									
6 2				100	N	BH18-7(1.8)	0.9		
7									
8									
9				100	N	BH18-7(2.8)	0.7		
10 3								104.82	
		End of Hole							
11									
12									
13 4									
14									
15									
16 5									
17									
18									
19									
20 6									

Location of Borehole: Phase 4A

Borehole Diameter: 0.15 m
Depth of Borehole: 3.1 m

Borehole Elevation: 32.8793856
Co-ordinates: n/a
Datum: Local

LOCATION ID: BH18-8

Keystone Environmental

Project Location: 2901 East Hastings Street, Vancouver
Project Name/No.: 13639
Drilling Contractor: Southland Drilling Co. Ltd., Badger Daylighting
Client: City of Vancouver
Drilling Equipment/Method: Solid Stem Augers, Hydrovacuum
Engineer/Geologist: SM
Location Type: Borehole
Drill Date: November 20, 2018 **Page:** 1 of 1

Depth (ft/m)	Symbol	Soil / Sediment Description	Sample Type	% Recovery	Sample Analyzed (Y,N)	Sample ID	Headspace (PID) ppm (0 500 1000 1500 2000)	Elevation (m)	Remarks
ft m 0 0		Ground Surface						109.83	
		ASPHALT							
1		***SAND*** Grey fine to coarse grained SAND (fill), some fine to coarse grained gravel, some silt, trace cobbles, trace boulders. Loose, moist, odours and/or staining were not observed.	G	100	Y	BH18-8(0.6)	0.1		
2 3 1			G	100	Y	BH18-8(1.2)	0.1		
4								108.46	
5		***SAND*** Grey fine grained SAND (till), some silt, trace fine to medium grained gravel. Very dense, moist, odours and/or staining were not observed.							
6 2				100	N	BH18-8(1.8)	0.2		
7 8									
9 3				100	N	BH18-8(2.8)	0.1		
10								106.79	
		End of Hole							
11 12 13 4 14 15 16 5 17 18 19 6 20									

Location of Borehole: Phase 4A
Borehole Diameter: 0.15 m
Depth of Borehole: 3.1 m
Borehole Elevation: 33.4774032
Co-ordinates: n/a
Datum: Local

MONITORING WELL ID: MW/SV18-9

Well Type: Groundwater and soil vapour monitoring wells
Project Location: 2901 East Hastings Street, Vancouver
Drilling Contractor: Southland Drilling Co. Ltd
Drilling Equipment/Method: Solid Stem Augers
Well Location: Phase 4A

Keystone Environmental

Project Name/No.: 13639
Client: City of Vancouver
Engineer/Geologist: SM
Drill Date: November 21, 2018 **Page:** 1 of 1

Depth (ft/m)	Soil / Sediment Description	Sample Type	% Recovery	Sample Analyzed	Sample ID	Headspace (PID) ppm	Elevation (m)	Remarks
0 / 0	Ground Surface						99.087	
0	**ASPHALT**							
1	**SAND** Brown fine to medium grained SAND (fill), some fine to coarse grained gravel, trace silt. Loose, moist, odours and/or staining were not observed		100	Y	MW18-9(0.3)	3.0	98.477	
2								
3 / 1	**SAND** Grey fine grained SAND (till), some silt, trace fine grained gravel. Very dense, moist, odours and/or staining were not observed.		100	N	MW18-9(0.9)	3.0		
4								
5								
6 / 2	Very dense at 1.8 m		100	N	MW18-9(1.8)	2.8		
7	Fine to medium gravel at 2.1 m							
8								
9 / 3			100	N	MW18-9(2.8)	3.1		
10								
11	Silty at 3.6 m		40	N	MW18-9(3.6)	5.3		
12								
13 / 4								
14	Some silt, moist to wet at 4.3 m		30	Y	MW18-9(4.5)	5.6		
15								
16	Wet at 4.9 m		70	N	MW18-9(5.0)/MW18-F	4.2		
17 / 5								
18								
19			80	N	MW18-9(5.8)	4.0		
20 / 6							92.991	

Well Construction: Flushmount and Concrete; Nylon Tubing; Soil Vapour Screen; Bentonite; PVC Casing; Well Screen and 10/20 Silica Sand

Co-ordinates: n/a
Date of Water Level: November 28, 2018
Water Level (from TOC): 1.804 m
Surveyed Water Elevation (m): 97.23 m

Well-Borehole Diameter: 0.15 m
Well Casing Diameter: 0.05 m
Well Casing Material: Schedule 40 PVC
Well Screen Slot Size: 0.001 m

Depth of Well (TOC): 6.70 m
Well Elevation (TOC): 99.034 m
Well Elevation (Ground): 99.087 m
Datum: Local

MONITORING WELL ID: MW/SV18-10

Well Type: Groundwater and soil vapour monitoring wells
Project Location: 2901 East Hastings Street, Vancouver
Drilling Contractor: Southland Drilling Co. Ltd
Drilling Equipment/Method: Solid Stem Augers
Well Location: Phase 4A

Keystone Environmental

Project Name/No.: 13639
Client: City of Vancouver
Engineer/Geologist: SM
Drill Date: November 22, 2018 **Page:** 1 of 1

Depth (ft/m)	Symbol	Soil / Sediment Description	Sample Type	% Recovery	Sample Analyzed	Sample ID	Headspace (PID) ppm	Elevation (m)	Well Construction	Remarks
0 / 0		Ground Surface						96.369		
		ASPHALT								
1		**Silty SAND** Brown silty fine to medium grained SAND (till), some fine to medium grained gravel. Dense, moist, odours and/or staining were not observed		100	N	MW18-10(0.3)/MW18-G	0.8			
2								95.759		
3 / 1		**SAND** Grey fine grained SAND (till), some silt, trace fine grained gravel. Dense, moist, odours and/or staining were not observed.		100	N	MW18-10(1.2)	0.4			
5		Brown, fine to coarse grained gravel at 1.8 m								
6 / 2				100	N	MW18-10(2.0)	0.3			
7										
8		Wet at 2.4 m								
9				100	N	MW18-10(2.6)	0.8			
10 / 3										
11				100	N	MW18-10(3.3)	1.1			
12										
13 / 4				100	N	MW18-10(4.0)	0.9			
14										
15								91.797		
		End of Hole								
16										
17 / 5										
18										
19										
20 / 6										

Bentonite
Soil Vapour Screen
Nylon Tubing
Flushmount and Concrete
PVC Casing
Well Screen and 10/20 Silica Sand

Co-ordinates: n/a
Date of Water Level: November 28, 2018
Water Level (from TOC): 1.245 m
Surveyed Water Elevation (m): 95.037 m

Well-Borehole Diameter: 0.15 m
Well Casing Diameter: 0.05 m
Well Casing Material: Schedule 40 PVC
Well Screen Slot Size: 0.001 m

Depth of Well (TOC): 4.29 m
Well Elevation (TOC): 96.282 m
Well Elevation (Ground): 96.369 m
Datum: Local

MONITORING WELL ID: MW/SV18-11

Well Type: Groundwater and soil vapour monitoring wells
Project Location: 2901 East Hastings Street, Vancouver
Drilling Contractor: Southland Drilling Co. Ltd
Drilling Equipment/Method: Solid Stem Augers
Well Location: Phase 4A

Keystone Environmental

Project Name/No.: 13639
Client: City of Vancouver
Engineer/Geologist: SM
Drill Date: November 22, 2018 **Page:** 1 of 2

Depth (ft/m)	Symbol	Soil / Sediment Description	Sample Type	% Recovery	Sample Analyzed	Sample ID	Headspace (PID) ppm	Elevation (m)	Well Construction	Remarks
0 ft / 0 m		Ground Surface						94.489		
		ASPHALT								
1		**SAND** Black fine to coarse grained SAND(fill), some fine to medium grained gravel, some silt. Loose, moist, low odours were observed, staining was not observed.		50	N	MW18-11(0.3)	16.1	94.032		
2				80	N	MW18-11(0.7)	4.0	93.727		
3 / 1		**SAND** Brown fine to medium grained SAND, some silt, trace fine gravel. Dense, moist, odours and/or staining were not observed.		100	N	MW18-11(1.2)	3.0			
4		**SAND** Grey fine grained SAND (till), some silt, trace fine to medium grained gravel. Dense, moist, odours and/or staining were not observed. Silty at 1.8 m		100	N	MW18-11(1.8)	1.6			
7 / 2		Gravel not observed below 2.4 m								
9				100	N	MW18-11(2.8)	2.2			
10 / 3										
13 / 4				100	N	MW18-11(4.0)	1.2			
15										
16 / 5				100	N	MW18-11(5.0)	1.6			
20 / 6										

Nylon Tubing
Flushmount and Concrete
Soil Vapour Screen
PVC Casing
Bentonite

Co-ordinates: n/a
Date of Water Level: November 28, 2018
Water Level (from TOC): Dry
Surveyed Water Elevation (m): n/a

Well-Borehole Diameter: 0.15 m
Well Casing Diameter: 0.05 m
Well Casing Material: Schedule 40 PVC
Well Screen Slot Size: 0.001 m

Depth of Well (TOC): 4.29 m
Well Elevation (TOC): 94.398 m
Well Elevation (Ground): 94.489 m
Datum: Local

MONITORING WELL ID: MW/SV18-11

Well Type: Groundwater and soil vapour monitoring wells
Project Location: 2901 East Hastings Street, Vancouver
Drilling Contractor: Southland Drilling Co. Ltd
Drilling Equipment/Method: Solid Stem Augers
Well Location: Phase 4A

Keystone Environmental

Project Name/No.: 13639
Client: City of Vancouver
Engineer/Geologist: SM
Drill Date: November 22, 2018 **Page:** 2 of 2

Depth (ft/m)	Symbol	Soil / Sediment Description	Sample Type	% Recovery	Sample Analyzed	Sample ID	Headspace (PID) ppm (0 500 1000 1500 2000)	Elevation (m)	Well Construction	Remarks
21										
22										
23 (7)				100	N	MW18-11(7.0)	1.2			
24										
25										
26 (8)				100	N	MW18-11(8.0)	0.7			
27										
28				100	N	MW18-11(8.5)	1.7			
29										
30 (9)								85.345		
31		End of Hole								Well Screen and 10/20 Silica Sand
32										
33 (10)										
34										
35										
36 (11)										
37										
38										
39										
40 (12)										

Co-ordinates: n/a
Date of Water Level: November 28, 2018
Water Level (from TOC): Dry
Surveyed Water Elevation (m): n/a

Well-Borehole Diameter: 0.15 m
Well Casing Diameter: 0.05 m
Well Casing Material: Schedule 40 PVC
Well Screen Slot Size: 0.001 m

Depth of Well (TOC): 4.29 m
Well Elevation (TOC): 94.398 m
Well Elevation (Ground): 94.489 m
Datum: Local

MONITORING WELL ID: MW18-12

Well Type: Groundwater monitoring well
Project Location: 2901 East Hastings Street, Vancouver
Drilling Contractor: Southland Drilling Co. Ltd
Drilling Equipment/Method: Solid Stem Augers
Well Location: Phase 2

Keystone Environmental

Project Name/No.: 13639
Client: City of Vancouver
Engineer/Geologist: SM
Drill Date: November 22, 2018 **Page:** 1 of 1

Depth (ft/m)	Symbol	Soil / Sediment Description	Sample Type	% Recovery	Sample Analyzed	Sample ID	Headspace (PID) ppm	Elevation (m)	Well Construction	Remarks
0 / 0		Ground Surface						97.435		
0		**ASPHALT**								
1		**SAND** Grey fine to coarse grained SAND(fill), some fine to medium grained gravel, trace silt. Loose, moist, odours and/or staining were not observed Wet at 0.6 m		70	Y	MW18-12(0.6)/MW18-H	1.3			
2										
3 / 1								96.368		
4		**PEAT** Brown PEAT. Soft, wet, odours and/or staining were not observed.		90	Y	MW18-12(1.2)	47.8			
5								95.911		
6		**SAND** Grey fine grained SAND (till), some silt, trace fine grained gravel, trace organics. Dense, moist, odours and/or staining were not observed. Silt increases with depth		100	Y	MW18-12(1.8)	2.1			
7 / 2										
8										
9		Very dense at 2.8 m		100	N	MW18-12(2.8)	1.7			
10 / 3								94.387		
11		End of Hole								
12										
13 / 4										
14										
15										
16 / 5										
17										
18										
19										
20 / 6										

Bentonite
Flushmount and Concrete
PVC Casing
Well Screen and 10/20 Silica Sand

Co-ordinates: n/a
Date of Water Level: November 28, 2018
Water Level (from TOC): 0 m
Surveyed Water Elevation (m): 97.356 m

Well-Borehole Diameter: 0.15 m
Well Casing Diameter: 0.05 m
Well Casing Material: Schedule 40 PVC
Well Screen Slot Size: 0.001 m

Depth of Well (TOC): 2.74 m
Well Elevation (TOC): 97.356 m
Well Elevation (Ground): 97.435 m
Datum: Local

LOCATION ID: BH18-13

Keystone Environmental

Project Location: 2901 East Hastings Street, Vancouver
Drilling Contractor: Southland Drilling Co. Ltd.
Drilling Equipment/Method: Solid Stem Augers
Location Type: Borehole

Project Name/No.: 13639
Client: City of Vancouver
Engineer/Geologist: SM
Drill Date: November 22, 2018 **Page:** 1 of 1

Depth (ft/m)	Symbol	Soil / Sediment Description	Sample Type	% Recovery	Sample Analyzed (Y,N)	Sample ID	Headspace (PID) ppm (0 500 1000 1500 2000)	Elevation (m)	Remarks
ft / m		Ground Surface						98.45	
0 / 0		***ASPHALT***							
1		***SAND*** Black fine to coarse grained SAND (fill), some silt, trace garbage. Loose, moist, odours and/or stianing were not observed.		100	Y	BH18-13(0.4)	4.1	97.84	
2		***PEAT*** Brown PEAT. Soft, wet, odours and/or staining were not observed.						97.69	
3 / 1				100	N	BH18-13(1.2)	1.1		
4		***SAND*** Grey fine grained SAND (till), some silt, trace fine to medium grained gravel. Very dense, moist, odours and/or staining were not observed. Silty at 1.5 m							
5									
6 / 2				90	N	BH18-13(1.8)	0.8		
7									
8									
9				80	N	BH18-13(2.8)	0.9		
10 / 3								95.40	
11		End of Hole							
12									
13 / 4									
14									
15									
16 / 5									
17									
18									
19									
20 / 6									

Location of Borehole: Phase 2

Borehole Diameter: 0.15 m
Depth of Borehole: 3.1 m

Borehole Elevation: 98.453 m
Co-ordinates: n/a
Datum: Local

MONITORING WELL ID: MW/SV18-14

Well Type: Groundwater and soil vapour monitoring wells
Project Location: 2901 East Hastings Street, Vancouver
Drilling Contractor: Southland Drilling Co. Ltd
Drilling Equipment/Method: Solid Stem Augers
Well Location: Phase 2

Keystone Environmental

Project Name/No.: 13639
Client: City of Vancouver
Engineer/Geologist: SM
Drill Date: November 22, 2018 **Page:** 1 of 1

Depth (ft/m)	Symbol	Soil / Sediment Description	Sample Type	% Recovery	Sample Analyzed	Sample ID	Headspace (PID) ppm (0 500 1000 1500 2000)	Elevation (m)	Well Construction	Remarks
0 m		Ground Surface						97.554		
0		***ASPHALT***								
1		***SAND*** Brown fine to coarse grained SAND (fill), some fine to coarse grained gravel, trace silt, trace cobbles, trace metal debris. Loose, moist, odours and/or staining were not observed		100	Y	MW18-14(0.5)/MW18-I	1.0		Bentonite	
2										
3	1								PVC Casing	Nylon Tubing
4				100	Y	MW18-14(1.2)	1.1			Flushmount and Concrete
5								96.930		
6		***SAND*** Mottled fine grained SAND (till), some silt, trace fine grained gravel. Dense, moist to wet, odours and/or staining were not observed.		100	N	MW18-14(2.0)	1.3			Soil Vapour Screen
7	2	Wet at at 1.8 m								
8		Very dense at 2.4 m								
9		Silty at 2.7 m		100	N	MW18-14(2.8)	1.1			
10	3							94.506		
11		End of Hole								Well Screen and 10/20 Silica Sand
12										
13	4									
14										
15										
16	5									
17										
18										
19										
20	6									

Co-ordinates: n/a
Date of Water Level: November 28, 2018
Water Level (from TOC): 1.687 m
Surveyed Water Elevation (m): 95.758 m

Well-Borehole Diameter: 0.15 m
Well Casing Diameter: 0.05 m
Well Casing Material: Schedule 40 PVC
Well Screen Slot Size: 0.001 m

Depth of Well (TOC): 2.93 m
Well Elevation (TOC): 97.445 m
Well Elevation (Ground): 97.554 m
Datum: Local

MONITORING WELL ID: MW/SV18-15

Well Type: Groundwater and soil vapour monitoring wells
Project Location: 2901 East Hastings Street, Vancouver
Drilling Contractor: Southland Drilling Co. Ltd., Badger Daylighting
Drilling Equipment/Method: Solid Stem Augers, Hydrovacuum
Well Location: Phase 3B

Project Name/No.: 13639
Client: City of Vancouver
Engineer/Geologist: SM
Drill Date: November 21, 2018 **Page:** 1 of 1

Depth (ft/m)	Symbol	Soil / Sediment Description	Sample Type	% Recovery	Sample Analyzed	Sample ID	Headspace (PID) ppm (0 500 1000 1500 2000)	Elevation (m)	Well Construction	Remarks
ft 0 / m 0		Ground Surface						98.611		
0–3 / 0–1		***SAND*** Dark grey fine to coarse grained SAND (fill), some fine to coarse grained gravel, trace silt, trace asphalt, trace concrete. Dense, moist, odours and/or staining were not observed		100	N	MW18-15(0.3)/MW18-D	1.9			
3–4 / 1										
4–5 / 1–2				100	Y	MW18-15(1.2)	2.1			
5–6 / 2				100	N	MW18-15(1.8)	0.5			
7 / 2		***SAND*** Grey fine grained SAND (till), some silt, trace fine grained gravel. Dense, moist to wet, odours and/or staining were not observed. Wet at at 3.1 m						96.477		
8–9 / 2–3				90	N	MW18-15(2.4)	1.2			
10–11 / 3				70	N	MW18-15(3.3)	1.1			
12–13 / 4				50	N	MW18-15(4.2)	1.0			
15 / 5		End of Hole						94.039		

Well Construction: PVC Casing; Nylon Tubing; Flushmount and Concrete; Soil Vapour Screen; Bentonite; Well Screen and 10/20 Silica Sand; Slough

Co-ordinates: n/a
Date of Water Level: November 28, 2018
Water Level (from TOC): 1.972 m
Surveyed Water Elevation (m): 96.477 m

Well-Borehole Diameter: 0.15 m
Well Casing Diameter: 0.05 m
Well Casing Material: Schedule 40 PVC
Well Screen Slot Size: 0.001 m

Depth of Well (TOC): 4.26 m
Well Elevation (TOC): 98.449 m
Well Elevation (Ground): 98.611 m
Datum: Local

MONITORING WELL ID: MWSV18-16

Well Type: Groundwater and soil vapour monitoring wells
Project Location: 2901 East Hastings Street, Vancouver
Drilling Contractor: Southland Drilling Co. Ltd.
Drilling Equipment/Method: Solid Stem Augers
Well Location: Portion of Phase 3A

Keystone Environmental

Project Name/No.: 13639
Client: City of Vancouver
Engineer/Geologist: SM
Drill Date: November 23, 2018 **Page:** 1 of 1

Depth (ft/m)	Symbol	Soil / Sediment Description	Sample Type	% Recovery	Sample Analyzed	Sample ID	Headspace (PID) ppm	Elevation (m)	Well Construction	Remarks
0 / 0		Ground Surface						97.248		
0–1 / 0		***SAND*** Brown fine to coarse grained SAND (fill), some fine to coarse grained gravel, some silt. Loose, moist, odours and/or staining were not observed		100	N	MW18-16(0.4)/MW18-J	0.9			
1–4 / 1		Silty at 1.2 m		100	Y	MW18-16(1.2)	1.8			
5–6 / 2				100	N	MW18-16(1.8)	0.7			
7–8 / 2		Wet at 2.4 m		80	Y	MW18-16(2.4)	1.1			
9–10 / 3		Dense at 3.1 m		100	N	MW18-16(3.3)	0.9			
11–13 / 4								92.981		
14–15 / 4		***SAND*** Grey fine grained SAND (till), some silt, trace fine grained gravel. Dense, moist to wet, odours and/or staining were not observed.		100	N	MW18-16(4.4)	1.2			
16–17 / 5				100	N	MW18-16(4.9)	1.3			
17–18 / 5		Fine to coarse grained gravel at 5.2 m								
19 / 6				100	N	MW18-16(5.8)	1.2			
20 / 6								91.152		

PVC Casing
Nylon Tubing
Flushmount and Concrete
Soil Vapour Screen
Bentonite
Well Screen and 10/20 Silica Sand
Slough

Co-ordinates: n/a
Date of Water Level: November 28, 2018
Water Level (from TOC): 2.825 m
Surveyed Water Elevation (m): 94.313 m

Well-Borehole Diameter: 0.15 m
Well Casing Diameter: 0.05 m
Well Casing Material: Schedule 40 PVC
Well Screen Slot Size: 0.001 m

Depth of Well (TOC): 3.41 m
Well Elevation (TOC): 97.138 m
Well Elevation (Ground): 97.248 m
Datum: Local

LOCATION ID: BH18-17

Keystone Environmental

Project Location: 2901 East Hastings Street, Vancouver
Drilling Contractor: Southland Drilling Co. Ltd.
Drilling Equipment/Method: Solid Stem Augers
Location Type: Borehole

Project Name/No.: 13639
Client: City of Vancouver
Engineer/Geologist: SM
Drill Date: November 23, 2018 **Page:** 1 of 1

Depth (ft/m)	Symbol	Soil / Sediment Description	Sample Type	% Recovery	Sample Analyzed (Y,N)	Sample ID	Headspace (PID) ppm (0 500 1000 1500 2000)	Elevation (m)	Remarks
ft 0 / m 0		Ground Surface						98.61	
0		***ASPHALT***							
1		***SAND*** Brown fine to coarse grained SAND (fill), some fine to coarse grained gravel, trace silt. Loose, moist, odours and/or staining were not observed.		70	Y	BH18-17(0.3)	0.7	98.15	
2		***Silty SAND*** Brown silty fine to coarse grained SAND (till), trace fine grained gravel. Dense, moist, odours and/or stianing were not observed.							
3 / 1				100	N	BH18-17(0.9)	1.5		
4									
5									
6				100	N	BH18-17(2.0)	1.7		
7 / 2									
8									
9				100	N	BH18-17(2.8)	1.6		
10 / 3								95.56	
11		End of Hole							
12									
13 / 4									
14									
15									
16 / 5									
17									
18									
19									
20 / 6									

Location of Borehole: Phase 3B

Borehole Diameter: 0.15 m
Depth of Borehole: 3.1 m

Borehole Elevation: 98.612 m
Co-ordinates: n/a
Datum: Local

Keystone Environmental Ltd.
Soil Vapour Sampling Record
Version 3.0

Keystone Environmental

GENERAL INFORMATION

Vapour Well ID: SV18-2 Project #: 13639-2
Date: November 29, 2018 Client: CoV
Sampler: SM

WEATHER

General Conditions: Cloudy Last rainfall date and volume (mm)*: Nov 28, 4mm

Other weather information and source:

** soil vapour samples should not be collected within 24h of a significant rainfall (over 10 mm).*
Good source for rainfall data: http://www.wunderground.com/global/stations/71201.html. Select the City, the Station and go to "Today's Almanac" tab.

LOCATION DETAILS

Area surface condition and/or preparation (if any): Asphalt

PURGING DETAILS

Pump Source/Make/Model/Lab Pump #: Maxxam/AirChek XR5000/17-0642

Calibrated Flow Rate (L/min): 0.2 Calibrated/Checked by: Maxxam/SM

Minimum Purging Time Required (5 minutes for wells < 3m deep // add 1 minute for each 3m increment): 5 minutes

*Note: Minimum purge volume is three times the tubing/casing volume (V = r2 * 3.14 * h = X cm3; then divide by 1000 for liters and multiplied by 3 to get the 3 well volumes)*

Purging Time Range/Rate (L/min): 10:28 - 10:33 / 0.2

LEAK TEST DETAILS

Previously completed: YES* ☐ NO ☑ Time:
**if yes, skip this step*

Isopropanol
Total time (min):

Conversion
1% = 10,000 ppm

Helium	
Concentration in Shroud (%):	81.1
Concentration in Tedlar Bag (ppm):	43600
Percentage difference**:	< 2%

***Calculated by [ ] of He in Tedlar bag / [ ] of He in shroud * 100*
See table beside for actions regarding % difference

% Diff.	MEANING	ACTION
0 - 1.99%	Not significant	Pass
2 - 5%	Possible leakage in the system	Check connections in the sampling train. Repeat test.
> 5%	Significant leakage in the system	Check connections in the sampling train. Repeat test. Possible fail if > 5% again.

Comments:

SAMPLING DETAILS

Flow rate when hooked up to well (L/min) and Vacuum measurement stable at (inches H_20)*: 0.2/84

** soil vapour samples should not be collected if vacuum is above 10 inches of H20*

Start Time**: 10:35

***Standard Run Time is 25 minutes at a flow rate of 0.2 L/min, adjust run time based on flow rate or predicted concentration*

Sample I.D.	Media Type/Serial #	Total Time (min)	Constituents
SV18-2	TD/C-0155760	20	VOC/MBT/propylbenzene

**** if using regular SKC pump you can get to set time run display by pressing separetely *; up; down; *;**

Laboratory: Maxxam
Submitted on: November 29, 2018

Additional Comments:

Keystone Environmental Ltd.
Soil Vapour Sampling Record
Version 3.0

Keystone Environmental

GENERAL INFORMATION

Vapour Well ID: SV18-3
Date: November 29, 2018
Sampler: SM

Project #: 13639-2
Client: CoV

WEATHER

General Conditions: Cloudy
Last rainfall date and volume (mm)*: Nov 28, 6mm
Other weather information and source:

** soil vapour samples should not be collected within 24h of a significant rainfall (over 10 mm).*
Good source for rainfall data: http://www.wunderground.com/global/stations/71201.html. Select the City, the Station and go to "Today's Almanac" tab.

LOCATION DETAILS

Area surface condition and/or preparation (if any): Asphalt

PURGING DETAILS

Pump Source/Make/Model/Lab Pump #: Maxxam/AirCheck XR5000/17-0642
Calibrated Flow Rate (L/min): 0.1L/min
Calibrated/Checked by: Maxxam/SM
Minimum Purging Time Required (5 minutes for wells < 3m deep // add 1 minute for each 3m increment): 5 minutes
*Note: Minimum purge volume is three times the tubing/casing volume (V = r2 * 3.14 * h = X cm3; then divide by 1000 for liters and multiplied by 3 to get the 3 well volumes)*
Purging Time Range/Rate (L/min): 08:59 - 0.1L/min

LEAK TEST DETAILS

Previously completed: YES* ☐ NO ☑ Time:
**if yes, skip this step*

Isopropanol
Total time (min):

Conversion
1% = 10,000 ppm

Helium	
Concentration in Shroud (%):	24.1
Concentration in Tedlar Bag (ppm):	625
Percentage difference**:	<2%

***Calculated by [ ] of He in Tedlar bag / [ ] of He in shroud * 100*
See lable beside for actions regarding % difference

% Diff.	MEANING	ACTION
0 - 1.99%	Not significant	Pass
2 - 5%	Possible leakage in the system	Check connections in the sampling train. Repeat test.
> 5%	Significant leakage in the system	Check connections in the sampling train. Repeat test. Possible fail if > 5% again.

Comments:

SAMPLING DETAILS

Flow rate when hooked up to well (L/min) and Vacuum measurement stable at (inches H_2O)*: 0.1L:0.2/6
** soil vapour samples should not be collected if vacuum is above 10 inches of H20*
Start Time**: 09:06
***Standard Run Time is 25 minutes at a flow rate of 0.2 L/min, adjust run time based on flow rate or predicted concentration*

Sample I.D.	Media Type/Serial #	Total Time (min)	Constituents
SV18-3	TD/G015[illegible]809	40	VOC/BTEX, naphthalene
SV18-A	TD/G015[illegible]650	11	11

**** if using regular SKC pump you can get to set time run display by pressing separetely *; up; down; *; **
Laboratory: Maxxam
Submitted on: November

Additional Comments:

Keystone Environmental Ltd.
Soil Vapour Sampling Record
Version 3.0

Keystone Environmental

GENERAL INFORMATION

Vapour Well ID: SV18- 5
Date: November 29, 2018
Sampler: SM

Project #: 13639-2
Client: CoV

WEATHER

General Conditions: Cloudy
Last rainfall date and volume (mm)*: Nov 28 - 4mm
Other weather information and source:

** soil vapour samples should not be collected within 24h of a significant rainfall (over 10 mm).*
Good source for rainfall data: http://www.wunderground.com/global/stations/71201.html. Select the City, the Station and go to "Today's Airnanac" tab.

LOCATION DETAILS

Area surface condition and/or preparation (if any): Asphalt

PURGING DETAILS

Pump Source/Make/Model/Lab Pump #: Maxxam/Air Inc 2B 500/17-06[7]
Calibrated Flow Rate (L/min): 0.2
Calibrated/Checked by: Maxxam/SM
Minimum Purging Time Required (5 minutes for wells < 3m deep // add 1 minute for each 3m increment): 5 minutes
*Note: Minimum purge volume is three times the tubing/casing volume (V = r2 * 3.14 * h = X cm3; then divide by 1000 for liters and multiplied by 3 to get the 3 well volumes)*
Purging Time Range/Rate (L/min): 08:07-08:32

LEAK TEST DETAILS

Previously completed: YES* ☐ NO ☑ Time:
**if yes, skip this step*

isopropanol
Total time (min):

Conversion
1% = 10,000 ppm

Helium	
Concentration in Shroud (%):	8.25
Concentration in Tedlar Bag (ppm):	700
Percentage difference**:	24

***Calculated by [ ] of He in Tedlar bag / [ ] of He in shroud * 100*
See table beside for actions regarding % difference

% Diff.	MEANING	ACTION
0 - 1.99%	Not significant	Pass
2 - 5%	Possible leakage in the system	Check connections in the sampling train. Repeat test.
> 5%	Significant leakage in the system	Check connections in the sampling train. Repeat test. Possible fail if > 5% again.

Comments:

SAMPLING DETAILS

Flow rate when hooked up to well (L/min) and Vacuum measurement stable at (inches H_2O)*: 0.2 @ 8
** soil vapour samples should not be collected if vacuum is above 10 inches of H20*
Start Time**: 08:34
***Standard Run Time is 25 minutes at a flow rate of 0.2 L/min, adjust run time based on flow rate or predicted concentration*

Sample I.D.	Media Type/Serial #	Total Time (min)	Constituents
SV18-5	TDV AD1005	20	VOC's/BTEX, Naphthalene & C

**** if using regular SKC pump you can get to set time run display by pressing separetely *; up; down; *; **

Laboratory: Maxxam
Submitted on: November 29, 2018

Additional Comments:

Keystone Environmental Ltd.
Soil Vapour Sampling Record
Version 3.0

Keystone Environmental

GENERAL INFORMATION

Vapour Well ID: SV18-6
Date: November 29, 2018
Sampler: SM
Project #: 13639-2
Client: CoV

WEATHER

General Conditions: Cloudy
Last rainfall date and volume (mm)*: Nov 28, 4mm
Other weather information and source:

** soil vapour samples should not be collected within 24h of a significant rainfall (over 10 mm).*
Good source for rainfall data: http://www.wunderground.com/global/stations/71201.html. Select the City, the Station and go to "Today's Almanac" tab.

LOCATION DETAILS

Area surface condition and/or preparation (if any): Asphalt

PURGING DETAILS

Pump Source/Make/Model/Lab Pump #: Maxam/AirChek XR5000/17-0692
Calibrated Flow Rate (L/min): 0.2
Calibrated/Checked by: Maxxam/SM
Minimum Purging Time Required (5 minutes for wells < 3m deep // add 1 minute for each 3m increment): 5 minutes
*Note: Minimum purge volume is three times the tubing/casing volume (V = r2 * 3.14 * h = X cm3, then divide by 1000 for liters and multiplied by 3 to get the 3 well volumes)*
Purging Time Range/Rate (L/min): 0951-0956

LEAK TEST DETAILS

Previously completed: YES* ☐ NO ☑ Time:
**if yes, skip this step*

isopropanol
Total time (min):

Conversion
1% = 10,000 ppm

Helium	
Concentration in Shroud (%):	9.62
Concentration in Tedlar Bag (ppm):	9500
Percentage difference**:	2%

***Calculated by [ ] of He in Tedlar bag / [ ] of He in shroud * 100*
See table beside for actions regarding % difference

% Diff.	MEANING	ACTION
0 - 1.99%	Not significant	Pass
2 - 5%	Possible leakage in the system	Check connections in the sampling train. Repeat test.
> 5%	Significant leakage in the system	Check connections in the sampling train. Repeat test. Possible fail if > 5% again.

Comments:

SAMPLING DETAILS

Flow rate when hooked up to well (L/min) and Vacuum measurement stable at (inches H_2O)*: 0.2/6
** soil vapour samples should not be collected if vacuum is above 10 inches of H20*
Start Time**: 09:58
***Standard Run Time is 25 minutes at a flow rate of 0.2 L/min, adjust run time based on flow rate or predicted concentration*

Sample I.D.	Media Type/Serial #	Total Time (min)	Constituents
SV18-6	TD/6015 3369	20	Naphthalene

**** if using regular SKC pump you can get to set time run display by pressing separetely "; up; down; "; "*

Laboratory: Maxxam
Submitted on: November 29, 2018

Additional Comments:

Keystone Environmental Ltd.
Soil Vapour Sampling Record
Version 3.0

Keystone Environmental

GENERAL INFORMATION

Vapour Well ID: SV18-09 | Project #: 13639-20
Date: November 24 | Client: CoV
Sampler: SM

WEATHER

General Conditions: Cloudy | Last rainfall date and volume (mm)*: Nov 24, 4mm
Other weather information and source:

** soil vapour samples should not be collected within 24h of a significant rainfall (over 10 mm).*
Good source for rainfall data: http://www.wunderground.com/global/stations/71201.html. Select the City, the Station and go to "Today's Almanac" tab.

LOCATION DETAILS

Area surface condition and/or preparation (if any): Asphalt

PURGING DETAILS

Pump Source/Make/Model/Lab Pump #: Maxxam/AirCheck XR5000/17-0641
Calibrated Flow Rate (L/min): 0.2 | Calibrated/Checked by: Maxxam/SM
Minimum Purging Time Required (5 minutes for wells < 3m deep // add 1 minute for each 3m increment): 5 minutes
*Note: Minimum purge volume is three times the tubing/casing volume (V = r2 * 3.14 * h = X cm3; then divide by 1000 for liters and multiplied by 3 to get the 3 well volumes)*
Purging Time Range/Rate (L/min): 07:50-07:55 / 0.2

LEAK TEST DETAILS

Previously completed: YES* ☐ NO ☑ | Time:
**if yes, skip this step*

Isopropanol
Total time (min):

Conversion
1% = 10,000 ppm

Helium	
Concentration in Shroud (%):	91.1
Concentration in Tedlar Bag (ppm):	2950
Percentage difference**:	<2%

***Calculated by [ ] of He in Tedlar bag / [ ] of He in shroud * 100*
See table beside for actions regarding % difference

% Diff.	MEANING	ACTION
0 - 1.99%	Not significant	Pass
2 - 5%	Possible leakage in the system	Check connections in the sampling train. Repeat test.
> 5%	Significant leakage in the system	Check connections in the sampling train. Repeat test. Possible fail if > 5% again

Comments:

SAMPLING DETAILS

Flow rate when hooked up to well (L/min) and Vacuum measurement stable at (inches H_20)*: 0.2 / 0
** soil vapour samples should not be collected if vacuum is above 10 inches of H20*
Start Time**: 07:57
***Standard Run Time is 25 minutes at a flow rate of 0.2 L/min, adjust run time based on flow rate or predicted concentration*

Sample I.D.	Media Type/Serial #	Total Time (min)	Constituents
SV18-09	Tedlar/0152270	20	VOCs/BTEX/naphthalene

**** if using regular SKC pump you can get to set time run display by pressing separetely *; up; down; *; **

Laboratory: Maxxam
Submitted on: November 24, 2018

Additional Comments:

Keystone Environmental Ltd.
Soil Vapour Sampling Record
Version 3.0

Keystone Environmental

GENERAL INFORMATION

Vapour Well ID: SV18-14 Project #: 13639-2
Date: November 29, 2018 Client: CoV
Sampler: SM

WEATHER

General Conditions: Sunny Last rainfall date and volume (mm)*: Nov 28, 4mm
Other weather information and source:

** soil vapour samples should not be collected within 24h of a significant rainfall (over 10 mm).*
Good source for rainfall data: http://www.wunderground.com/global/stations/71201.html. Select the City, the Station and go to "Today's Almanac" tab.

LOCATION DETAILS

Area surface condition and/or preparation (if any): Asphalt

PURGING DETAILS

Pump Source/Make/Model/Lab Pump #: Maxxam / AirCheck XR 5000
Calibrated Flow Rate (L/min): 0.2 Calibrated/Checked by: Maxxam/SM
Minimum Purging Time Required (5 minutes for wells < 3m deep // add 1 minute for each 3m increment): 5 minutes
*Note: Minimum purge volume is three times the tubing/casing volume (V = r2 * 3.14 * h = X cm3; then divide by 1000 for liters and multiplied by 3 to get the 3 well volumes)*
Purging Time Range/Rate (L/min): 11:07 - 11:12 / 0.2

LEAK TEST DETAILS

Previously completed: YES* ☐ NO ☑ Time:
**if yes, skip this step*

Isopropanol
Total time (min):

Conversion
1% = 10,000 ppm

Helium	
Concentration in Shroud (%):	83.4
Concentration in Tedlar Bag (ppm):	2550
Percentage difference**:	<3%

***Calculated by [ ] of He in Tedlar bag / [ ] of He in shroud * 100*
See table beside for actions regarding % difference

% Diff.	MEANING	ACTION
0 - 1.99%	Not significant	Pass
2 - 5%	Possible leakage in the system	Check connections in the sampling train. Repeat test.
> 5%	Significant leakage in the system	Check connections in the sampling train. Repeat test. Possible fail if > 5% again.

Comments:

SAMPLING DETAILS

Flow rate when hooked up to well (L/min) and Vacuum measurement stable at (inches H_20)*: 0.2/0
** soil vapour samples should not be collected if vacuum is above 10 inches of H20*
Start Time**: 11:14
***Standard Run Time is 25 minutes at a flow rate of 0.2 L/min, adjust run time based on flow rate or predicted concentration*

Sample I.D.	Media Type/Serial #	Total Time (min)	Constituents
SV18-14	TD/F0155737	20	VOC/VPH, naphthalene

**** if using regular SKC pump you can get to set time run display by pressing separetely *; up; down; *; **
Laboratory: Maxxam
Submitted on: November 29, 2018

Additional Comments:

Keystone Environmental Ltd.
Soil Vapour Sampling Record
Version 3.0

Keystone Environmental

GENERAL INFORMATION

Vapour Well ID: SV18- 15
Date: November 29, 2018
Sampler: SM
Project #: 13639-2
Client: CoV

WEATHER

General Conditions: Sunny
Last rainfall date and volume (mm)*: Nov 28 - 4mm
Other weather information and source:

** soil vapour samples should not be collected within 24h of a significant rainfall (over 10 mm).*
Good source for rainfall data: http://www.wunderground.com/global/stations/71201.html. Select the City, the Station and go to "Today's Almanac" tab.

LOCATION DETAILS

Area surface condition and/or preparation (if any): Grass

PURGING DETAILS

Pump Source/Make/Model/Lab Pump #: Maxxam/AirChek XR5000/17-0642
Calibrated Flow Rate (L/min): 0.2
Calibrated/Checked by: Maxxam/SM
Minimum Purging Time Required (5 minutes for wells < 3m deep // add 1 minute for each 3m increment): 5 minutes
*Note: Minimum purge volume is three times the tubing/casing volume (V = r2 * 3.14 * h = X cm3; then divide by 1000 for liters and multiplied by 3 to get the 3 well volumes)*
Purging Time Range/Rate (L/min): 11:42 - 11:47 / 0.2

LEAK TEST DETAILS

Previously completed: YES* ☐ NO ☑ Time:
**if yes, skip this step*

Isopropanol
Total time (min):

Conversion
1% = 10,000 ppm

Helium	
Concentration in Shroud (%):	16.7
Concentration in Tedlar Bag (ppm):	125
Percentage difference**:	<1%

***Calculated by [ ] of He in Tedlar bag / [ ] of He in shroud * 100*
See table beside for actions regarding % difference

% Diff.	MEANING	ACTION
0 - 1.99%	Not significant	Pass
2 - 5%	Possible leakage in the system	Check connections in the sampling train. Repeat test.
> 5%	Significant leakage in the system	Check connections in the sampling train. Repeat test Possible fail if > 5% again.

Comments:

SAMPLING DETAILS

Flow rate when hooked up to well (L/min) and Vacuum measurement stable at (inches H_2O)*: 0.2/0
** soil vapour samples should not be collected if vacuum is above 10 inches of H20*
Start Time**: 11:50
***Standard Run Time is 25 minutes at a flow rate of 0.2 L/min, adjust run time based on flow rate or predicted concentration*

Sample I.D.	Media Type/Serial #	Total Time (min)	Constituents
SV18-15	Tedlar/G0155364	20	VOC/VPH, naphthalene

**** if using regular SKC pump you can get to set time run display by pressing separetely *; up; down; *; **

Laboratory: Maxxam
Submitted on: November 29, 2018

Additional Comments:

Keystone Environmental Ltd.
Soil Vapour Sampling Record
Version 3.0

Keystone Environmental

GENERAL INFORMATION

Vapour Well ID: SV18-16 Project #: 13639-2
Date: November 29, 2018 Client: CoV
Sampler: SM

WEATHER

General Conditions: Sunny Last rainfall date and volume (mm)*: Nov 28 - 9mm
Other weather information and source:

** soil vapour samples should not be collected within 24h of a significant rainfall (over 10 mm).*
Good source for rainfall data: http://www.wunderground.com/global/stations/71201.html. Select the City, the Station and go to "Today's Almanac" tab.

LOCATION DETAILS

Area surface condition and/or preparation (if any): Asphalt

PURGING DETAILS

Pump Source/Make/Model/Lab Pump #: Maxxam Air Pro L XR5000 / 17-0642
Calibrated Flow Rate (L/min): 0.2 Calibrated/Checked by: Maxxam/SM
Minimum Purging Time Required (5 minutes for wells < 3m deep // add 1 minute for each 3m increment): 5 minutes
*Note: Minimum purge volume is three times the tubing/casing volume (V = r2 * 3.14 * h = X cm3; then divide by 1000 for liters and multiplied by 3 to get the 3 well volumes)*
Purging Time Range/Rate (L/min): 12:14 - 12:19

LEAK TEST DETAILS

Previously completed: YES* ☐ NO ☑ Time:
**if yes, skip this step*

Isopropanol
Total time (min):

Conversion
1% = 10,000 ppm

Helium	
Concentration in Shroud (%):	90.3
Concentration in Tedlar Bag (ppm):	150
Percentage difference**:	<1%

***Calculated by [ ] of He in Tedlar bag / [ ] of He in shroud * 100*
See table beside for actions regarding % difference

% Diff.	MEANING	ACTION
0 - 1.99%	Not significant	Pass
2 - 5%	Possible leakage in the system	Check connections in the sampling train. Repeat test.
> 5%	Significant leakage in the system	Check connections in the sampling train. Repeat test. Possible fail if > 5% again.

Comments:

SAMPLING DETAILS

Flow rate when hooked up to well (L/min) and Vacuum measurement stable at (inches H_20)*: 0.20
** soil vapour samples should not be collected if vacuum is above 10 inches of H20*
Start Time**: 12:20
***Standard Run Time is 25 minutes at a flow rate of 0.2 L/min, adjust run time based on flow rate or predicted concentration*

Sample I.D.	Media Type/Serial #	Total Time (min)	Constituents
SV18-16	TD/ A00-789	20	VOC/VPH, naphthalene

**** if using regular SKC pump you can get to set time run display by pressing separetely "; up; down; "; "*

Laboratory: Maxxam
Submitted on: November 29, 2018

Additional Comments:

Keystone Environmental Ltd.
Groundwater Developing, Purging and Sampling Record
Version 3.0

Keystone Environmental

GENERAL INFORMATION

Monitoring Well ID: MW18-2 Project #: 13639-2
Sampler: SM Client: City of Vancouver

WELL INFORMATION
Well Cover Type Flush ☑ Lock ☐ *Well Casing* 2-inch (51 mm) ☑
Stick-up ☐ _____ m above grade *Diameter* or other: _____
Well Head Vapour Reading 1.3 ppm or %LEL ☐ RKI Eagle ☑ MiniRae ☐ Other: _____

DEVELOPMENT INFORMATION AND OBSERVATIONS
Dev. Date: November 26, 2018 Weather: Heavy rain
Depth to Bottom of Well from TOC (X) 8.80 metres
Depth to Water from Top of Casing (Y) 3.138 metres
Depth to Product (if applicable) _____ metres
Length of Water Column (X-Y) 5.67 metres
Volume of Water in Well = (X - Y) • 2 11.4 *litres*
Minimum Volume = 6 • well volume 5 *litres*
Total Volume Developed 5 *litres*

Development Method
Waterra Pump ☑
Surge Block (time: 3) ☑
Bailer ☐
Other (specify) _____

***Turbidity Ratings** *
Before Dev. 10
After Dev. 8

PURGING INFORMATION AND OBSERVATIONS
Purge Date: November 27 Weather: Cloudy
Minimum Volume = 3 • well volume _____ *litres*

Purge/Sample Method
Waterra Pump ☑
Peristaltic (tubing set to: 8.6) ☑
Bailer ☐
Other (specify) _____

***Turbidity Ratings** * 4
Purging
Sampling 1

(Low flow sampling only)

Well volume Purged (L)	pH	Conductivity (uS/cm) or (mS/cm)	Temperature (°C)	ORP (mV)	DO (mg/L)	Time	DTW (mBTOC)	Rate (mL/min.)
~~07:30~~ 0	9.3	149	12.7	161	n/a	10:55	8.192	150
0.75	9.4	146	12.8	118	n/a	11:00	8.23	
1.5	9.3	148	12.8	101	n/a	11:05	8.27	
2.25	9.3	145	12.8	92	n/a	11:10	8.93	
3.0	9.3	147	12.6	86	n/a	11:15	8.57	
3.75	9.2	146	12.5	80	n/a	11:20	8.60	stopped purge
4.5					n/a	11:25		

Odour Yes ☐ No ☑ Description: _____
Sheen Yes ☐ No ☑ Description: _____
Colour (initial) light grey (stable) clear
Recovery ** Slow ☐ Moderate ☐ Fast ☑

NOTES: Field Parameter and Stability Guidance: pH (±0.1 standard units); Temperature (±0.2 °C); Specific Conductance (±3%); Oxidation-Reduction Potential (±10mV); and if applicable: Dissolved Oxygen (±10%)
*Turbidity may be determined subjectively using a scale of 1 to 10, where 1 is clear, 10 is opaque.
**Recovery Estimate - Slow: greater than 10 cm drawdown Moderate: slightly lower than 10 cm drawdown Fast: within 10 cm drawdown

SAMPLING PARAMETER INFORMATION Date and Time: November 27, 2018 Laboratory Maxxam

VOC/VPH	☑	BTEX/VPH/MTBE	☐	EPH	☐
LEPH/HEPH	☑	PAHs	☑	Glycols	☐
Non-Chlorinated Phenol	☐	Chlorinated Phenols	☐	PCBs	☐
Dissolved Metals	☑	Field Filter & Preserved?	☑	Total Metals	☐
Pesticides	☐	pH	☐	Other _____	☐

Duplicate Sample ID: _____ Duplicate Sample Parameters: _____

NOTES: Bottle and Preservative Requirements Correspond to Laboratory Standards

COMMENTS: Developed dry x3. well allowed to recharge before sampling

Keystone Environmental Ltd.
Groundwater Developing, Purging and Sampling Record
Version 3.0

Keystone Environmental

GENERAL INFORMATION

Monitoring Well ID: MW18-2 Project #: 13639-C
Sampler: SM Client: CoV

WELL INFORMATION

Well Cover Type Flush ☑ Stick-up ☐ _____ m above grade Lock ☐ *Well Casing Diameter* 2-inch (51 mm) ☑ or other: _____

Well Head Vapour Reading _____ ppm or %LEL ☐ RKI Eagle ☐ MiniRae ☐ Other: _____

DEVELOPMENT INFORMATION AND OBSERVATIONS

Dev. Date: November Weather: _____

Depth to Bottom of Well from TOC (X)	8.84	metres
Depth to Water from Top of Casing (Y)	_____	metres
Depth to Product (if applicable)	_____	metres
Length of Water Column (X-Y)	_____	metres
Volume of Water in Well = (X - Y) • 2	_____	*litres*
Minimum Volume = 6 • well volume	_____	*litres*
Total Volume Developed	_____	*litres*

Development Method
Waterra Pump ☐
Surge Block (time: _____) ☐
Bailer ☐
Other (specify) _____

***Turbidity Ratings** *
Before Dev. _____
After Dev. _____

PURGING INFORMATION AND OBSERVATIONS

Purge Date: December 14 Weather: Cloudy

Minimum Volume = 3 • well volume _____ *litres*

Purge/Sample Method
Waterra Pump ☐
Peristaltic (tubing set to: 7.1) ☑
Bailer ☐
Other (specify) _____

***Turbidity Ratings** *
Purging 1
Sampling 1

(Low flow sampling only)

Well volume Purged (L)	pH	Conductivity (uS/cm) or (mS/cm)	Temperature (°C)	ORP (mV)	DO (mg/L)	Time	DTW (mBTOC)	Rate (mL/min.)
0	8.9	460	12.0	52	n/a	09:25	4.120	100
0.5	8.5	464	12.3	36	n/a	09:30	4.37	
1.0	8.5	465	12.2	22	n/a	09:35	4.43	
1.5	8.5	458	12.0	11	n/a	09:40	4.51	
2.0	8.5	465	12.0	1	n/a	09:45	4.59	
2.5	8.4	465	11.9	-10	n/a	09:50	4.67	
3.0	8.5	463	12.0	-15	n/a	09:55	4.75	V

Odour Yes ☐ No ☑ Description: _____
Sheen Yes ☐ No ☑ Description: _____

Colour (initial) Cloudy (stable) Clear
Recovery ** Slow ☑ Moderate ☐ Fast ☐

NOTES: Field Parameter and Stability Guidance: pH (±0.1 standard units); Temperature (±0.2 °C); Specific Conductance (±3%); Oxidation-Reduction Potential (±10mV); and if applicable: Dissolved Oxygen (±10%)
*Turbidity may be determined subjectively using a scale of 1 to 10, where 1 is clear, 10 is opaque.
**Recovery Estimate - Slow: greater than 10 cm drawdown Moderate: slightly lower than 10 cm drawdown Fast: within 10 cm drawdown

SAMPLING PARAMETER INFORMATION Date and Time: December 14, 2018 Laboratory Maxxam

VOC/VPH	☐	BTEX/VPH/MTBE	☐	EPH	☐
LEPH/HEPH	☐	PAHs	☐	Glycols	☐
Non-Chlorinated Phenol	☐	Chlorinated Phenols	☐	PCBs	☐
Dissolved Metals	☐	Field Filter & Preserved?	☐	Total Metals	☐
Pesticides	☐	pH	☐	Other Diss'd Mg	☑

Duplicate Sample ID: _____ Duplicate Sample Parameters: _____

NOTES: Bottle and Preservative Requirements Correspond to Laboratory Standards

COMMENTS: _____

Keystone Environmental Ltd.
Groundwater Developing, Purging and Sampling Record
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Keystone Environmental

GENERAL INFORMATION

Monitoring Well ID: MW18-2 Project #: 13639-2C
Sampler: SM Client: CoV

WELL INFORMATION

Well Cover Type Flush ☑ Stick-up ☐ _____ m above grade Lock ☐ *Well Casing Diameter* 2-inch (51 mm) ☑ or other: _____

Well Head Vapour Reading 0.1 ppm or %LEL ☐ RKI Eagle ☑ MiniRae ☐ Other: _____

DEVELOPMENT INFORMATION AND OBSERVATIONS

Dev. Date: November 8/17 Weather: Heavy rain

Depth to Bottom of Well from TOC (X) 8.12 metres
Depth to Water from Top of Casing (Y) _____ metres
Depth to Product (if applicable) _____ metres
Length of Water Column (X-Y) _____ metres
Volume of Water in Well = (X - Y) • 2 _____ *litres*
Minimum Volume = 6 • well volume _____ *litres*
Total Volume Developed _____ *litres*

Development Method
Waterra Pump ☐
Surge Block (time: _____) ☐
Bailer ☐
Other (specify) _____

Turbidity Ratings *
Before Dev. _____
After Dev. _____

PURGING INFORMATION AND OBSERVATIONS

Purge Date: December 19, 2018 Weather: Cloudy

Minimum Volume = 3 • well volume _____ *litres*

Purge/Sample Method
Waterra Pump ☐
Peristaltic (tubing set to: 7.4) ☑
Bailer ☐
Other (specify) _____

Turbidity Ratings *
Purging 1
Sampling 1

(Low flow sampling only)

Well volume Purged (L)	pH	Conductivity (uS/cm) or (mS/cm)	Temperature (°C)	ORP (mV)	DO (mg/L)	Time	DTW (mBTOC)	Rate (mL/min.)
~~0Z:30~~ 0	9.0	2.85	10.4	55	n/a	09:24	4.04	100
0.5	8.6	481	11.4	39	n/a	09:33	4.28	|
1.0	8.6	475	11.6	31	n/a	09:38	4.38	|
1.5	8.6	465	11.7	22	n/a	09:43	4.51	|
2.0	8.6	459	11.7	16	n/a	09:48	4.63	|
2.5	8.5	455	11.8	11	n/a	09:53	4.77	|
3.0	8.5	453	11.8	10	n/a	09:58	4.89	|

Odour Yes ☐ No ☑ Description: _____
Sheen Yes ☐ No ☐ Description: _____

Colour (initial) Clear (stable) Clear
Recovery ** Slow ☐ Moderate ☐ Fast ☐

NOTES: Field Parameter and Stability Guidance: pH (±0.1 standard units); Temperature (±0.2 °C); Specific Conductance (±3%); Oxidation-Reduction Potential (±10mV); and if applicable: Dissolved Oxygen (±10%)
*Turbidity may be determined subjectively using a scale of 1 to 10, where 1 is clear, 10 is opaque.
**Recovery Estimate - Slow: greater than 10 cm drawdown Moderate: slightly lower than 10 cm drawdown Fast: within 10 cm drawdown

SAMPLING PARAMETER INFORMATION Date and Time: December 19, 2018 Laboratory Maxxam

VOC/VPH	☐	BTEX/VPH/MTBE	☐	EPH	☐
LEPH/HEPH	☐	PAHs	☐	Glycols	☐
Non-Chlorinated Phenol	☐	Chlorinated Phenols	☐	PCBs	☐
Dissolved Metals	☐	Field Filter & Preserved?	☐	Total Metals Diss Va	☑
Pesticides	☐	pH	☐	Other _____	☐

Duplicate Sample ID: _____ Duplicate Sample Parameters: _____

NOTES: Bottle and Preservative Requirements Correspond to Laboratory Standards

COMMENTS: _____

Keystone Environmental Ltd.
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Keystone Environmental

GENERAL INFORMATION

Monitoring Well ID: MW18-3 Project #: 13639-2
Sampler: SM Client: City of Vancouver

WELL INFORMATION

Well Cover Type Flush ☑ Stick-up ☐ _____ m above grade Lock ☐ *Well Casing Diameter* 2-inch (51 mm) ☑ or other: _____

Well Head Vapour Reading 3.9 ppm or %LEL ☐ RKI Eagle ☑ MiniRae ☐ Other: _____

DEVELOPMENT INFORMATION AND OBSERVATIONS

Dev. Date: November 26, 2018 Weather: Heavy rain

Depth to Bottom of Well from TOC (X) 8.12 metres
Depth to Water from Top of Casing (Y) 7.67 metres
Depth to Product (if applicable) _____ metres
Length of Water Column (X-Y) 0.5 metres
Volume of Water in Well = (X - Y) • 2 _____ *litres*
Minimum Volume = 6 • well volume 6 *litres*
Total Volume Developed _____ *litres*

Development Method
Waterra Pump ☑
Surge Block (time: _____) ☑
Bailer ☐
Other (specify) _____

Turbidity Ratings *
Before Dev. _____
After Dev. _____

PURGING INFORMATION AND OBSERVATIONS

Purge Date: November 27 Weather: Cloudy

Minimum Volume = 3 • well volume _____ *litres*

Purge/Sample Method
Waterra Pump ☐
Peristaltic (tubing set to: 7.9) ☑
Bailer ☐
Other (specify) _____

Turbidity Ratings *
Purging 1
Sampling 1

Well volume Purged (L)	pH	Conductivity (uS/cm or mS/cm)	Temperature (°C)	ORP (mV)	DO (mg/L)	Time (Low flow sampling only)	DTW (mBTOC)	Rate (mL/min.)
~~0.3~~	9.0	191	13.8	131	n/a	12:01	7.45	150
0.7	8.6	216	13.8	126	n/a	12:06	7.59	
1.5	8.7	207	14.0	123	n/a	12:11	7.68	
2.25	8.7	211	14.0	120	n/a	12:16	7.78	
3.0	8.7	207	14.0	117	n/a	12:21	7.86	
3.75					n/a	12:26	7.90	end purge here
~~4.5~~					n/a	12:31		↓

Odour Yes ☐ No ☑ Description: _____
Sheen Yes ☐ No ☑ Description: _____

Colour (initial) Clear (stable) Clear
Recovery ** Slow ☑ Moderate ☐ Fast ☐

NOTES: Field Parameter and Stability Guidance: pH (±0.1 standard units); Temperature (±0.2 °C); Specific Conductance (±3%); Oxidation-Reduction Potential (±10mV); and if applicable: Dissolved Oxygen (±10%)
*Turbidity may be determined subjectively using a scale of 1 to 10, where 1 is clear, 10 is opaque.
**Recovery Estimate - Slow: greater than 10 cm drawdown Moderate: slightly lower than 10 cm drawdown Fast: within 10 cm drawdown

SAMPLING PARAMETER INFORMATION

Date and Time: November 27, 2018 Laboratory Maxxam

VOC/VPH	☑	BTEX/VPH/MTBE	☐	EPH	☐
LEPH/HEPH	☑	PAHs	☑	Glycols	☐
Non-Chlorinated Phenol	☐	Chlorinated Phenols	☐	PCBs	☐
Dissolved Metals	☑	Field Filter & Preserved?	☑	Total Metals	☐
Pesticides	☐	pH	☐	Other _____	☐

Duplicate Sample ID: _____ Duplicate Sample Parameters: _____

NOTES: Bottle and Preservative Requirements Correspond to Laboratory Standards

COMMENTS: Insufficient water column to develop the well. Well allowed to recharge before sampling

Keystone Environmental Ltd.
Groundwater Developing, Purging and Sampling Record
Version 3.0

Keystone Environmental

GENERAL INFORMATION

Monitoring Well ID: MW18-3 Project #: 13639-C
Sampler: SM Client: CoV

WELL INFORMATION

Well Cover Type Flush ☑ Stick-up ☐ _____ m above grade Lock ☐ *Well Casing Diameter* 2-inch (51 mm) ☑ or other: _____

Well Head Vapour Reading _____ ppm or %LEL ☐ RKI Eagle ☐ MiniRae ☐ Other: _____

DEVELOPMENT INFORMATION AND OBSERVATIONS

Dev. Date: November Weather: _____

Depth to Bottom of Well from TOC (X)	8.13	metres
Depth to Water from Top of Casing (Y)	_____	metres
Depth to Product (if applicable)	_____	metres
Length of Water Column (X-Y)	_____	metres
Volume of Water in Well = (X - Y) • 2	_____	*litres*
Minimum Volume = 6 • well volume	_____	*litres*
Total Volume Developed	_____	*litres*

Development Method
Waterra Pump ☐
Surge Block (time: _____) ☐
Bailer ☐
Other (specify) _____

***Turbidity Ratings** *
Before Dev. _____
After Dev. _____

PURGING INFORMATION AND OBSERVATIONS

Purge Date: December 14 Weather: Cloudy, windy

Minimum Volume = 3 • well volume _____ *litres*

Purge/Sample Method
Waterra Pump ☐
Peristaltic (tubing set to: 7.6) ☑
Bailer ☐
Other (specify) _____

***Turbidity Ratings** *
Purging 1
Sampling 1

(Low flow sampling only)

Well volume Purged (L)	pH	Conductivity (uS/cm) or (mS/cm)	Temperature (°C)	ORP (mV)	DO (mg/L)	Time	DTW (mBTOC)	Rate (mL/min.)
0	7.7	1126	12.2	0	n/a	08:16	5.076	100
0.5	7.7	1115	12.1	4	n/a	08:21	5.23	
1.0	7.5	1101	12.3	7	n/a	08:26	5.32	
1.5	7.5	1096	12.3	8	n/a	08:31	5.38	
2.0	7.5	1086	12.4	9	n/a	08:36	5.45	
2.5	7.5	1080	12.4	9	n/a	08:41	5.52	
3.0	7.5	1075	12.4	8	n/a	08:46	5.59	↓

Odour Yes ☐ No ☑ Description: _____
Sheen Yes ☐ No ☑ Description: _____

Colour (initial) Clear (stable) Clear
Recovery ** Slow ☑ Moderate ☐ Fast ☐

NOTES: Field Parameter and Stability Guidance: pH (±0.1 standard units); Temperature (±0.2 °C); Specific Conductance (±3%); Oxidation-Reduction Potential (±10mV); and if applicable: Dissolved Oxygen (±10%)
*Turbidity may be determined subjectively using a scale of 1 to 10, where 1 is clear, 10 is opaque.
**Recovery Estimate - Slow: greater than 10 cm drawdown Moderate: slightly lower than 10 cm drawdown Fast: within 10 cm drawdown

SAMPLING PARAMETER INFORMATION Date and Time: December 14, 2018 Laboratory Maxxam

VOC/VPH	☐	BTEX/VPH/MTBE	☐	EPH	☐
LEPH/HEPH	☐	PAHs	☐	Glycols	☐
Non-Chlorinated Phenol	☐	Chlorinated Phenols	☐	PCBs	☐
Dissolved Metals	☐	Field Filter & Preserved?	☐	Total Metals	☐
Pesticides	☐	pH	☐	Other Diss Mn	☑

Duplicate Sample ID: _____ Duplicate Sample Parameters: _____

NOTES: Bottle and Preservative Requirements Correspond to Laboratory Standards

COMMENTS: _____

Keystone Environmental Ltd.
Groundwater Developing, Purging and Sampling Record
Version 3.0

Keystone Environmental

GENERAL INFORMATION

Monitoring Well ID: MW18- 3 Project #: 13639-2 (6
Sampler: SM Client: CoV

WELL INFORMATION

Well Cover Type Flush ☑ Stick-up ☐ _____ m above grade Lock ☐ *Well Casing* 2-inch (51 mm) ☑ *Diameter* or other: _____

Well Head Vapour Reading _____ ppm or %LEL ☐ RKI Eagle ☑ MiniRae ☐ Other: _____

DEVELOPMENT INFORMATION AND OBSERVATIONS

Dev. Date: November 26 Weather: Heavy rain

Depth to Bottom of Well from TOC (X)	8.82	metres
Depth to Water from Top of Casing (Y)	5.125	metres
Depth to Product (if applicable)	/	metres
Length of Water Column (X-Y)	3.7	metres
Volume of Water in Well = (X - Y) • 2	14	*litres*
Minimum Volume = 6 • well volume	8	*litres*
Total Volume Developed	5	*litres*

Development Method
Waterra Pump ☑
Surge Block (time: 5 min) ☐
Bailer ☐
Other (specify) _____

***Turbidity Ratings** *
Before Dev. 10
After Dev. 8

PURGING INFORMATION AND OBSERVATIONS

Purge Date: December 19, 201 Weather: Cloudy

Minimum Volume = 3 • well volume _____ *litres*

Purge/Sample Method
Waterra Pump ☐
Peristaltic (tubing set to: 8.1) ☑
Bailer ☐
Other (specify) _____

***Turbidity Ratings** *
Purging 1
Sampling _____

(Low flow sampling only)

Well volume Purged (L)	pH	Conductivity (uS/cm) or (mS/cm)	Temperature (°C)	ORP (mV)	DO (mg/L)	Time	DTW (mBTOC)	Rate (mL/min.)
~~07:30~~ 0	7.8	1550	11.8	8	n/a	08:33	4.856	100
0.5	7.6	1556	11.6	19	n/a	08:38	5.14	
1.0	7.5	1559	11.6	26	n/a	08:43	5.23	
1.5	7.4	1556	11.5	25	n/a	08:48	5.32	
2.0	7.4	1558	11.4	32	n/a	08:53	5.39	
2.5	7.4	1556	11.3	39	n/a	08:58	5.48	
3.0	7.4	1553	11.3	36	n/a	09:03	5.56	↓

Odour Yes ☐ No ☑ Description: _____ Colour (initial) Clear (stable) _____
Sheen Yes ☐ No ☐ Description: _____ Recovery ** Slow ☑ Moderate ☐ Fast ☐

NOTES: Field Parameter and Stability Guidance: pH (±0.1 standard units); Temperature (±0.2 °C); Specific Conductance (±3%); Oxidation-Reduction Potential (±10mV); and if applicable: Dissolved Oxygen (±10%)
*Turbidity may be determined subjectively using a scale of 1 to 10, where 1 is clear, 10 is opaque.
**Recovery Estimate - Slow: greater than 10 cm drawdown Moderate: slightly lower than 10 cm drawdown Fast: within 10 cm drawdown

SAMPLING PARAMETER INFORMATION Date and Time: December 19, 2018 Laboratory Maxxam

VOC/VPH	☐	BTEX/VPH/MTBE	☐	EPH	☐
LEPH/HEPH	☐	PAHs	☐	Glycols	☐
Non-Chlorinated Phenol	☐	Chlorinated Phenols	☐	PCBs	☐
Dissolved Metals	☐	Field Filter & Preserved?	☐	Total Metals	☐
Pesticides	☐	pH	☐	Other Diss Hg	☑

Duplicate Sample ID: _____ Duplicate Sample Parameters: _____

NOTES: Bottle and Preservative Requirements Correspond to Laboratory Standards

COMMENTS: _____

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Keystone Environmental

GENERAL INFORMATION

Monitoring Well ID: MW18- 5 Project #: 13639-2
Sampler: SM Client: City of Vancouver

WELL INFORMATION

Well Cover Type Flush ☑ Stick-up ☐ _____ m above grade Lock ☐ *Well Casing Diameter* 2-inch (51 mm) ☑ or other: _____

Well Head Vapour Reading 0.3 ppm or %LEL ☐ RKI Eagle ☑ MiniRae ☐ Other: _____

DEVELOPMENT INFORMATION AND OBSERVATIONS

Dev. Date: November 26 2018 Weather: Heavy rain

Depth to Bottom of Well from TOC (X)	3.96	metres
Depth to Water from Top of Casing (Y)	0.767	metres
Depth to Product (if applicable)		metres
Length of Water Column (X-Y)	3.2	metres
Volume of Water in Well = (X - Y) • 2	4.9	*litres*
Minimum Volume = 6 • well volume	29.5	*litres*
Total Volume Developed	30	*litres*

Development Method
Waterra Pump ☑
Surge Block (time: 5 min) ☑
Bailer ☐
Other (specify) _____

***Turbidity Ratings** **
Before Dev. 5
After Dev. 5

PURGING INFORMATION AND OBSERVATIONS

Purge Date: November 27 Weather: Cloudy

Minimum Volume = 3 • well volume _____ *litres*

Purge/Sample Method
Waterra Pump ☐
Peristaltic (tubing set to: 2.2) ☑
Bailer ☐
Other (specify) _____

***Turbidity Ratings** **
Purging 1
Sampling 1

(Low flow sampling only)

Well volume Purged (L)	pH	Conductivity (uS/cm) or (mS/cm)	Temperature (°C)	ORP (mV)	DO (mg/L)	Time	DTW (mBTOC)	Rate (mL/min.)
~~0.30~~	7.2	192	11.6	-18	n/a	13:01	0.474	150
0.75	6.8	188	11.4	-19	n/a	13:06	0.49	
1.5	6.5	187	11.1	-28	n/a	13:11	0.51	
2.25	6.3	183	11.1	-38	n/a	13:16	0.52	
3.0	6.3	185	11.1	-46	n/a	13:21	0.54	
3.75	6.3	181	11.1	-48	n/a	13:26	0.55	
4.5	6.3	182	11.0	-50	n/a	13:31	0.56	↓

Odour Yes ☐ No ☑ Description: _____ Colour (initial) clear (stable) clear
Sheen Yes ☐ No ☑ Description: _____ Recovery ** Slow ☐ Moderate ☐ Fast ☑

NOTES: Field Parameter and Stability Guidance: pH (±0.1 standard units); Temperature (±0.2 °C); Specific Conductance (±3%); Oxidation-Reduction Potential (±10mV); and if applicable: Dissolved Oxygen (±10%)
*Turbidity may be determined subjectively using a scale of 1 to 10, where 1 is clear, 10 is opaque.
**Recovery Estimate - Slow: greater than 10 cm drawdown Moderate: slightly lower than 10 cm drawdown Fast: within 10 cm drawdown

SAMPLING PARAMETER INFORMATION

Date and Time: Nov 27 2018 Laboratory Maxxam

VOC/VPH	☑	BTEX/VPH/MTBE	☐	EPH	☐
LEPH/HEPH	☑	PAHs	☑	Glycols	☐
Non-Chlorinated Phenol	☐	Chlorinated Phenols	☐	PCBs	☐
Dissolved Metals	☑	Field Filter & Preserved?	☑	Total Metals	☐
Pesticides	☐	pH	☐	Other _____	☐

Duplicate Sample ID: _____ Duplicate Sample Parameters: _____

NOTES: Bottle and Preservative Requirements Correspond to Laboratory Standards

COMMENTS: _____

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Keystone Environmental

GENERAL INFORMATION

Monitoring Well ID: MW18-6 Project #: 13639-2
Sampler: SM Client: City of Vancouver

WELL INFORMATION
Well Cover Type Flush ☑ Stick-up ☐ _____ m above grade Lock ☐ *Well Casing Diameter* 2-inch (51 mm) ☑ or other: _____
Well Head Vapour Reading: 2.1 ppm or %LEL ☐ RKI Eagle ☑ MiniRae ☐ Other: _____

DEVELOPMENT INFORMATION AND OBSERVATIONS
Dev. Date: November 26, 2018 Weather: Heavy rain

Depth to Bottom of Well from TOC (X)	5.62	metres
Depth to Water from Top of Casing (Y)	3.42	metres
Depth to Product (if applicable)		metres
Length of Water Column (X-Y)	2.2	metres
Volume of Water in Well = (X - Y) • 2	4.4	litres
Minimum Volume = 6 • well volume	26	litres
Total Volume Developed	24	litres

Development Method
Waterra Pump ☑
Surge Block (time: 5 min) ☑
Bailer ☐
Other (specify) _____

***Turbidity Ratings** **
Before Dev. 6
After Dev. 5

PURGING INFORMATION AND OBSERVATIONS
Purge Date: November 27 Weather: Cloudy

Minimum Volume = 3 • well volume _____ litres

Purge/Sample Method
Waterra Pump ☐
Peristaltic (tubing set to: 5.2) ☑
Bailer ☐
Other (specify) _____

***Turbidity Ratings** **
Purging 1
Sampling 1

(Low flow sampling only)

Well volume Purged (L)	pH	Conductivity (uS/cm) or (mS/cm)	Temperature (°C)	ORP (mV)	DO (mg/L)	Time	DTW (mBTOC)	Rate (mL/min.)
0	8.1	223	13.7	141	n/a	09:50	4.53	150
0.75	6.9	234	14.0	104	n/a	09:55	4.66	
1.5	6.8	223	14.1	105	n/a	10:00	4.7	
2.25	6.7	225	14.2	108	n/a	10:05	4.81	
3.0	6.8	223	14.2	108	n/a	10:10	4.86	
3.75	6.7	230	14.2	108	n/a	10:15	4.92	
4.5	6.7	226	14.3	104	n/a	10:20	4.97	

Odour Yes ☐ No ☑ Description: _____
Sheen Yes ☐ No ☑ Description: _____
Colour (initial) Clear (stable) _____
Recovery ** Slow ☑ Moderate ☐ Fast ☐

NOTES: Field Parameter and Stability Guidance: pH (±0.1 standard units); Temperature (±0.2 °C); Specific Conductance (±3%); Oxidation-Reduction Potential (±10mV); and if applicable: Dissolved Oxygen (±10%)
*Turbidity may be determined subjectively using a scale of 1 to 10, where 1 is clear, 10 is opaque.
**Recovery Estimate - Slow: greater than 10 cm drawdown Moderate: slightly lower than 10 cm drawdown Fast: within 10 cm drawdown

SAMPLING PARAMETER INFORMATION Date and Time: Nov 27, 2018 Laboratory Maxxam

VOC/VPH	☐	BTEX/VPH/MTBE	☐	EPH	☐
LEPH/HEPH	☑	PAHs	☑	Glycols	☐
Non-Chlorinated Phenol	☐	Chlorinated Phenols	☐	PCBs	☐
Dissolved Metals	☑	Field Filter & Preserved?	☑	Total Metals	☐
Pesticides	☐	pH	☐	Other _____	☐

Duplicate Sample ID: _____ Duplicate Sample Parameters: _____

NOTES: Bottle and Preservative Requirements Correspond to Laboratory Standards

COMMENTS: Developed dry x3

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Keystone Environmental

GENERAL INFORMATION

Monitoring Well ID: MW18-9 **Project #:** 13639-2
Sampler: SM Client: City of Vancouver

WELL INFORMATION
Well Cover Type Flush ☑ Stick-up ☐ _____ m above grade Lock ☐ *Well Casing Diameter* 2-inch (51 mm) ☑ or other: _____
Well Head Vapour Reading 0.5 ppm or %LEL ☐ RKI Eagle ☑ MiniRae ☐ Other: _____

DEVELOPMENT INFORMATION AND OBSERVATIONS

Dev. Date: November 23, 2018 Weather: Cloudy

Depth to Bottom of Well from TOC (X)	6.07	metres
Depth to Water from Top of Casing (Y)	2.57	metres
Depth to Product (if applicable)		metres
Length of Water Column (X-Y)	3.5	metres
Volume of Water in Well = (X - Y) • 2	7	*litres*
Minimum Volume = 6 • well volume	42	*litres*
Total Volume Developed	51	*litres*

Development Method
Waterra Pump ☑
Surge Block (time: 5 min) ☑
Bailer ☐
Other (specify) _____

Turbidity Ratings *
Before Dev. 10
After Dev. 8

PURGING INFORMATION AND OBSERVATIONS

Purge Date: November 27 Weather: Cloudy

Minimum Volume = 3 • well volume _____ *litres*

Purge/Sample Method
Waterra Pump ☑
Peristaltic (tubing set to: 5.3) ☑
Bailer ☐
Other (specify) _____

Turbidity Ratings *
Purging 1
Sampling 1

Well volume Purged (L)	pH	Conductivity (uS/cm) or (mS/cm)	Temperature (°C)	ORP (mV)	DO (mg/L)	Time (Low flow sampling only)	DTW (mBTOC) (Low flow sampling only)	Rate (mL/min.) (Low flow sampling only)
~~0.150~~ 0	7.2	226	13.5	161	n/a	08:50	1.731	150
0.75	7.0	236	14.1	130	n/a	08:55	2.18	
1.5	7.0	232	14.2	124	n/a	09:00	2.38	
~~2.225~~	7.0	304	14.3	119	n/a	09:05	2.57	
3.0	7.0	306	14.4	112	n/a	09:10	2.73	
3.75	7.0	311	14.5	105	n/a	09:15	2.86	
4.5	7.0	312	14.5	99	n/a	09:20	2.98	↓

Odour Yes ☐ No ☑ Description: _____
Sheen Yes ☐ No ☑ Description: _____
Colour (initial) Clear (stable) Clear
Recovery ** Slow ☑ Moderate ☐ Fast ☐

NOTES: Field Parameter and Stability Guidance: pH (±0.1 standard units); Temperature (±0.2 °C); Specific Conductance (±3%); Oxidation-Reduction Potential (±10mV); and if applicable: Dissolved Oxygen (±10%)
*Turbidity may be determined subjectively using a scale of 1 to 10, where 1 is clear, 10 is opaque.
**Recovery Estimate - Slow: greater than 10 cm drawdown Moderate: slightly lower than 10 cm drawdown Fast: within 10 cm drawdown

SAMPLING PARAMETER INFORMATION Date and Time: Nov 27, 2018 Laboratory Maxxam

VOC/VPH	☑	BTEX/VPH/MTBE	☐	EPH	☐
LEPH/HEPH	☐	PAHs	☑	Glycols	☐
Non-Chlorinated Phenol	☐	Chlorinated Phenols	☐	PCBs	☐
Dissolved Metals	☑	Field Filter & Preserved?	☑	Total Metals	☐
Pesticides	☐	pH	☐	Other _____	☐

Duplicate Sample ID: _____ Duplicate Sample Parameters: _____

NOTES: Bottle and Preservative Requirements Correspond to Laboratory Standards

COMMENTS: Developed dry x3

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Keystone Environmental

GENERAL INFORMATION

Monitoring Well ID: MW18-10 Project #: 13639-2
Sampler: SM Client: City of Vancouver

WELL INFORMATION

Well Cover Type Flush ☑ Stick-up ☐ _____ m above grade Lock ☐ *Well Casing Diameter* 2-inch (51 mm) ☑ or other: _____

Well Head Vapour Reading 0.6 ppm or %LEL ☐ RKI Eagle ☑ MiniRae ☐ Other: _____

DEVELOPMENT INFORMATION AND OBSERVATIONS

Dev. Date: November 26, 2018 Weather: Cloudy

Depth to Bottom of Well from TOC (X)	4.29	metres
Depth to Water from Top of Casing (Y)	2.79	metres
Depth to Product (if applicable)		metres
Length of Water Column (X-Y)	1.5	metres
Volume of Water in Well = (X - Y) • 2	3	*litres*
Minimum Volume = 6 • well volume	18	*litres*
Total Volume Developed	25	*litres*

Development Method
Waterra Pump ☑
Surge Block (time: 5min) ☑
Bailer ☐
Other (specify) _____

***Turbidity Ratings** *
Before Dev. 10
After Dev. 5

PURGING INFORMATION AND OBSERVATIONS

Purge Date: November 27 Weather: Cloudy

Minimum Volume = 3 • well volume _____ *litres*

Purge/Sample Method
Waterra Pump ☐
Peristaltic (tubing set to: 3.5) ☑
Bailer ☐
Other (specify) _____

***Turbidity Ratings** *
Purging 1
Sampling 1

(Low flow sampling only)

Well volume Purged (L)	pH	Conductivity (uS/cm) or (mS/cm)	Temperature (°C)	ORP (mV)	DO (mg/L)	Time	DTW (mBTOC)	Rate (mL/min.)
~~07:00~~ 0	8.4	141	13.4	-10	n/a	08:00	1.241	150
0.75	7.8	151	13.5	-21	n/a	08:05	1.41	
1.5	7.3	159	13.5	-34	n/a	08:10	1.68	
2.25	7.0	160	13.5	-41	n/a	08:15	2.00	
3	6.9	165	13.5	-44	n/a	08:20	2.36	
3.75	6.9	164	13.5	-43	n/a	08:25	2.60	
4.5	6.9	165	13.5	-42	n/a	08:30	2.82	↓

Odour Yes ☐ No ☑ Description: _____
Sheen Yes ☐ No ☑ Description: _____
Colour (initial) Clear (stable) Clear
Recovery ** Slow ☑ Moderate ☐ Fast ☐

NOTES: Field Parameter and Stability Guidance: pH (±0.1 standard units); Temperature (±0.2 °C); Specific Conductance (±3%); Oxidation-Reduction Potential (±10mV); and if applicable: Dissolved Oxygen (±10%)
*Turbidity may be determined subjectively using a scale of 1 to 10, where 1 is clear, 10 is opaque.
**Recovery Estimate - Slow: greater than 10 cm drawdown Moderate: slightly lower than 10 cm drawdown Fast: within 10 cm drawdown

SAMPLING PARAMETER INFORMATION Date and Time: Nov 27, 2018 Laboratory Maxxam

VOC/VPH	☑	BTEX/VPH/MTBE	☐	EPH	☐
LEPH/HEPH	☑	PAHs	☑	Glycols	☐
Non-Chlorinated Phenol	☐	Chlorinated Phenols	☐	PCBs	☐
Dissolved Metals	☑	Field Filter & Preserved?	☑	Total Metals	☐
Pesticides	☐	pH	☐	Other _____	☐

Duplicate Sample ID: _____ Duplicate Sample Parameters: _____

NOTES: Bottle and Preservative Requirements Correspond to Laboratory Standards

COMMENTS: Developed over 3. Water allowed to recharge before sampling

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Keystone Environmental

GENERAL INFORMATION

Monitoring Well ID: MW18-11 Project #: 13639-2
Sampler: SM Client: City of Vancouver

WELL INFORMATION

Well Cover Type Flush ☑ Lock ☐ *Well Casing* 2-inch (51 mm) ☑
Stick-up ☐ _____ m above grade *Diameter* or other: _____

Well Head Vapour Reading 1.8 ppm or %LEL ☐ RKI Eagle ☑ MiniRae ☐ Other: _____

DEVELOPMENT INFORMATION AND OBSERVATIONS

Dev. Date: November 23,208 Weather: Cloudy

Depth to Bottom of Well from TOC (X)	9.14	metres
Depth to Water from Top of Casing (Y)	/	metres
Depth to Product (if applicable)	/	metres
Length of Water Column (X-Y)	/	metres
Volume of Water in Well = (X - Y) • 2	/	*litres*
Minimum Volume = 6 • well volume	/	*litres*
Total Volume Developed	/	*litres*

Development Method
Waterra Pump ☑
Surge Block (time: _____) ☑
Bailer ☐
Other (specify) _____

***Turbidity Ratings** **
Before Dev. _____
After Dev. _____

PURGING INFORMATION AND OBSERVATIONS

Purge Date: November Weather: _____

Minimum Volume = 3 • well volume _____ *litres*

Purge/Sample Method
Waterra Pump ☐
Peristaltic (tubing set to: _____) ☑
Bailer ☐
Other (specify) _____

***Turbidity Ratings** **
Purging _____
Sampling _____

Well volume Purged (L)	pH	Conductivity (uS/cm) or (mS/cm)	Temperature (°C)	ORP (mV)	DO (mg/L)	(Low flow sampling only) Time	DTW (mBTOC)	Rate (mL/min.)
07:30					n/a			
					n/a			
					n/a			
					n/a			
					n/a			
					n/a			
					n/a			
					n/a			

Odour Yes ☐ No ☐ Description: _____ Colour (initial) _____ (stable) _____
Sheen Yes ☐ No ☐ Description: _____ Recovery ** Slow ☐ Moderate ☐ Fast ☐

NOTES: Field Parameter and Stability Guidance: pH (±0.1 standard units); Temperature (±0.2 °C); Specific Conductance (±3%); Oxidation-Reduction Potential (±10mV); and if applicable: Dissolved Oxygen (±10%)
*Turbidity may be determined subjectively using a scale of 1 to 10, where 1 is clear, 10 is opaque.
**Recovery Estimate - Slow: greater than 10 cm drawdown Moderate: slightly lower than 10 cm drawdown Fast: within 10 cm drawdown

SAMPLING PARAMETER INFORMATION Date and Time: _____ Laboratory Maxxam

VOC/VPH	☐	BTEX/VPH/MTBE	☐	EPH	☐
LEPH/HEPH	☐	PAHs	☐	Glycols	☐
Non-Chlorinated Phenol	☐	Chlorinated Phenols	☐	PCBs	☐
Dissolved Metals	☐	Field Filter & Preserved?	☐	Total Metals	☐
Pesticides	☐	pH	☐	Other _____	☐

Duplicate Sample ID: _____ Duplicate Sample Parameters: _____

NOTES: Bottle and Preservative Requirements Correspond to Laboratory Standards

COMMENTS: Dry

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Keystone Environmental

GENERAL INFORMATION

Monitoring Well ID: MW18-12
Sampler: SM
Project #: 13639-2
Client: City of Vancouver

WELL INFORMATION

Well Cover Type: Flush ☑ Stick-up ☐ _____ m above grade
Lock ☐
Well Casing Diameter: 2-inch (51 mm) ☑ or other: _____
Well Head Vapour Reading: 42.6 ppm or %LEL ☐ RKI Eagle ☑ MiniRae ☐ Other: _____

DEVELOPMENT INFORMATION AND OBSERVATIONS

Dev. Date: November 26 2018 Weather: Heavy rain

Depth to Bottom of Well from TOC (X)	2.74	metres
Depth to Water from Top of Casing (Y)	1.04	metres
Depth to Product (if applicable)		metres
Length of Water Column (X-Y)	1.7	metres
Volume of Water in Well = (X - Y) • 2	3.4	litres
Minimum Volume = 6 • well volume	20	litres
Total Volume Developed	18	litres

Development Method
Waterra Pump ☑
Surge Block (time: 5 min) ☑
Bailer ☐
Other (specify) _____

***Turbidity Ratings** ***
Before Dev. 10
After Dev. 8

PURGING INFORMATION AND OBSERVATIONS

Purge Date: November 27 Weather: Cloudy
Minimum Volume = 3 • well volume _____ *litres*

Purge/Sample Method
Waterra Pump ☑
Peristaltic (tubing set to: 2.0) ☑
Bailer ☐
Other (specify) _____

***Turbidity Ratings** ***
Purging 1
Sampling 1

(Low flow sampling only)

Well volume Purged (L)	pH	Conductivity (uS/cm) or (mS/cm)	Temperature (°C)	ORP (mV)	DO (mg/L)	Time	DTW (mBTOC)	Rate (mL/min.)
~~07:30~~ 0	7.6	158	13.3	-30	n/a	13:59	0	150
0.75	6.6	162	13.4	-39	n/a	14:04	<0.05	
1.5	6.8	162	12.8	-47	n/a	14:09	<0.1	
2.25	6.6	165	12.6	-52	n/a	14:14	"	
3.0	6.5	163	12.5	-54	n/a	14:19	"	
3.75	6.5	165	12.4	-58	n/a	14:24	"	
4.5	6.5	167	12.3	-60	n/a	14:29	↓	↓

Odour: Yes ☐ No ☑ Description: _____
Sheen: Yes ☐ No ☑ Description: _____
Colour (initial) Clear (stable) Clear
Recovery ** Slow ☑ Moderate ☐ Fast ☐

NOTES: Field Parameter and Stability Guidance: pH (±0.1 standard units); Temperature (±0.2 °C); Specific Conductance (±3%); Oxidation-Reduction Potential (±10mV); and if applicable: Dissolved Oxygen (±10%)
*Turbidity may be determined subjectively using a scale of 1 to 10, where 1 is clear, 10 is opaque.
**Recovery Estimate - Slow: greater than 10 cm drawdown Moderate: slightly lower than 10 cm drawdown Fast: within 10 cm drawdown

SAMPLING PARAMETER INFORMATION

Date and Time: November 27, 2018 Laboratory: Maxxam

VOC/VPH	☑	BTEX/VPH/MTBE	☐	EPH	☐
LEPH/HEPH	☐	PAHs	☑	Glycols	☐
Non-Chlorinated Phenol	☐	Chlorinated Phenols	☐	PCBs	☐
Dissolved Metals	☑	Field Filter & Preserved?	☑	Total Metals	☐
Pesticides	☐	pH	☐	Other _____	☐

Duplicate Sample ID: MW18-1 Duplicate Sample Parameters: all indicated above

NOTES: Bottle and Preservative Requirements Correspond to Laboratory Standards

COMMENTS: Developed dry x3

Keystone Environmental Ltd.
Groundwater Developing, Purging and Sampling Record
Version 3.0

Keystone Environmental

GENERAL INFORMATION

Monitoring Well ID: MW18- 14 Project #: 13639-2
Sampler: SM Client: City of Vancouver

WELL INFORMATION

Well Cover Type Flush ☑ Stick-up ☐ _____ m above grade Lock ☐ *Well Casing Diameter* 2-inch (51 mm) ☑ or other: _____

Well Head Vapour Reading 2.5 ppm or %LEL ☐ RKI Eagle ☑ MiniRae ☐ Other: _____

DEVELOPMENT INFORMATION AND OBSERVATIONS

Dev. Date: November 26, 2018 Weather: Cold/rain

Depth to Bottom of Well from TOC (X)	2.93	metres
Depth to Water from Top of Casing (Y)	2.127	metres
Depth to Product (if applicable)		metres
Length of Water Column (X-Y)	0.8	metres
Volume of Water in Well = (X - Y) • 2	1.6	*litres*
Minimum Volume = 6 • well volume	10	*litres*
Total Volume Developed	4	*litres*

Development Method
Waterra Pump ☑
Surge Block (time: 3 min) ☑
Bailer ☐
Other (specify) _____

***Turbidity Ratings** **
Before Dev. 10
After Dev. 10

PURGING INFORMATION AND OBSERVATIONS

Purge Date: November 27 Weather: light rain

Minimum Volume = 3 • well volume _____ *litres*

Purge/Sample Method
Waterra Pump ☑
Peristaltic (tubing set to: 2.4) ☑
Bailer ☐
Other (specify) _____

***Turbidity Ratings** **
Purging 1
Sampling 1

Well volume Purged (L)	pH	Conductivity (uS/cm) or (mS/cm)	Temperature (°C)	ORP (mV)	DO (mg/L)	(Low flow sampling only) Time	DTW (mBTOC)	Rate (mL/min.)
~~0.30~~ 0	6.6	370	12.6	37	n/a	15:00	1.578	150
0.75	6.6	377	12.7	16	n/a	15:05	1.80	
1.5	6.2	378	12.6	-11	n/a	15:10	1.90	
2.25	6.3	373	12.6	-19	n/a	15:15	1.99	
3.0	6.3	355	12.6	-22	n/a	15:20	2.14	
3.75	6.3	350	12.6	-18	n/a	15:25	2.28	
4.5	6.3	348	12.7	-17	n/a	15:30	2.41	

Odour Yes ☐ No ☑ Description: _____
Sheen Yes ☐ No ☑ Description: _____
Colour (initial) clear (stable) clear
Recovery ** Slow ☐ Moderate ☐ Fast ☐

NOTES: Field Parameter and Stability Guidance: pH (±0.1 standard units); Temperature (±0.2 °C); Specific Conductance (±3%); Oxidation-Reduction Potential (±10mV); and if applicable: Dissolved Oxygen (±10%)
*Turbidity may be determined subjectively using a scale of 1 to 10, where 1 is clear, 10 is opaque.
**Recovery Estimate - Slow: greater than 10 cm drawdown Moderate: slightly lower than 10 cm drawdown Fast: within 10 cm drawdown

SAMPLING PARAMETER INFORMATION Date and Time: November 27, 2018 Laboratory Maxxam

VOC/VPH	☑	BTEX/VPH/MTBE	☑	EPH	☐
LEPH/HEPH	☑	PAHs	☑	Glycols	☐
Non-Chlorinated Phenol	☑	Chlorinated Phenols	☑	PCBs	☐
Dissolved Metals	☑	Field Filter & Preserved?	☑	Total Metals	☐
Pesticides	☐	pH	☐	Other _____	☐

Duplicate Sample ID: _____ Duplicate Sample Parameters: _____

NOTES: Bottle and Preservative Requirements Correspond to Laboratory Standards

COMMENTS: Developed dry x3

Keystone Environmental Ltd.
Groundwater Developing, Purging and Sampling Record
Version 3.0

Keystone Environmental

GENERAL INFORMATION

Monitoring Well ID: MW18-14 Project #: 13639-20
Sampler: SM Client: CoV

WELL INFORMATION

Well Cover Type Flush ☑ Stick-up ☐ _____ m above grade Lock ☐ *Well Casing Diameter* 2-inch (51 mm) ☑ or other: _____

Well Head Vapour Reading _____ ppm or %LEL ☐ RKI Eagle ☐ MiniRae ☐ Other: _____

DEVELOPMENT INFORMATION AND OBSERVATIONS

Dev. Date: November Weather: _____

Depth to Bottom of Well from TOC (X)	2.91	metres
Depth to Water from Top of Casing (Y)	_____	metres
Depth to Product (if applicable)	_____	metres
Length of Water Column (X-Y)	_____	metres
Volume of Water in Well = (X - Y) • 2	_____	*litres*
Minimum Volume = 6 • well volume	_____	*litres*
Total Volume Developed	_____	*litres*

Development Method
Waterra Pump ☐
Surge Block (time: _____) ☐
Bailer ☐
Other (specify) _____

***Turbidity Ratings** *
Before Dev. _____
After Dev. _____

PURGING INFORMATION AND OBSERVATIONS

Purge Date: December 14 Weather: Cloudy

Minimum Volume = 3 • well volume _____ *litres*

Purge/Sample Method
Waterra Pump ☑
Peristaltic (tubing set to: 2.2) ☑
Bailer ☐
Other (specify) _____

***Turbidity Ratings** *
Purging 1
Sampling 1

Well volume Purged (L)	pH	Conductivity (uS/cm) or (mS/cm)	Temperature (°C)	ORP (mV)	DO (mg/L)	Time (Low flow sampling only)	DTW (mBTOC) (Low flow sampling only)	Rate (mL/min.) (Low flow sampling only)
0	7.1	2.23	10.3	26	n/a	10:18	1.42	100
0.5	6.2	2.27	10.4	23	n/a	10:23	1.58	
1.0	6.2	2.26	10.4	17	n/a	10:28	1.60	
1.5	6.1	2.27	10.5	11	n/a	10:33	1.62	
2.0	6.1	2.23	10.5	5	n/a	10:38	1.62	
2.5	6.1	2.25	10.4	-1	n/a	10:43	1.62	
3.0	6.1	2.24	10.3	-4	n/a	10:48	1.62	

Odour Yes ☐ No ☑ Description: _____
Sheen Yes ☐ No ☑ Description: _____

Colour (initial) Clear (stable) Clear
Recovery ** Slow ☐ Moderate ☐ Fast ☐

NOTES: Field Parameter and Stability Guidance: pH (±0.1 standard units); Temperature (±0.2 °C); Specific Conductance (±3%); Oxidation-Reduction Potential (±10mV); and if applicable: Dissolved Oxygen (±10%)
*Turbidity may be determined subjectively using a scale of 1 to 10, where 1 is clear, 10 is opaque.
**Recovery Estimate - Slow: greater than 10 cm drawdown Moderate: slightly lower than 10 cm drawdown Fast: within 10 cm drawdown

SAMPLING PARAMETER INFORMATION Date and Time: December 14, 2018 Laboratory Maxxam

VOC/VPH	☐	BTEX/VPH/MTBE	☑	EPH	☐
LEPH/HEPH	☐	PAHs	☐	Glycols	☐
Non-Chlorinated Phenol	☐	Chlorinated Phenols	☐	PCBs	☐
Dissolved Metals	☐	Field Filter & Preserved?	☐	Total Metals	☐
Pesticides	☐	pH	☐	Other Benzo(a)pyrene	☑

Duplicate Sample ID: _____ Duplicate Sample Parameters: _____

NOTES: Bottle and Preservative Requirements Correspond to Laboratory Standards

COMMENTS: _____

Keystone Environmental Ltd.
Groundwater Developing, Purging and Sampling Record
Version 3.0

Keystone Environmental

GENERAL INFORMATION

Monitoring Well ID: MW18-14 Project #: 13639-2 D
Sampler: SM Client: CoV

WELL INFORMATION

Well Cover Type Flush ☑ Stick-up ☐ _____ m above grade Lock ☐ *Well Casing Diameter* 2-inch (51 mm) ☑ or other: _____

Well Head Vapour Reading _____ ppm or %LEL ☐ RKI Eagle ☑ MiniRae ☐ Other: _____

DEVELOPMENT INFORMATION AND OBSERVATIONS

Dev. Date: November 26 Weather: Heavy rain

Depth to Bottom of Well from TOC (X)	2.93	metres
Depth to Water from Top of Casing (Y)	2.13	metres
Depth to Product (if applicable)		metres
Length of Water Column (X-Y)	0.8	metres
Volume of Water in Well = (X - Y) • 2	1.6	*litres*
Minimum Volume = 6 • well volume	10	*litres*
Total Volume Developed		*litres*

Development Method
Waterra Pump ☐
Surge Block (time: 5 min) ☑
Bailer ☐
Other (specify) _____

Turbidity Ratings *
Before Dev. 16
After Dev. 13

PURGING INFORMATION AND OBSERVATIONS

Purge Date: December 19, 201 Weather: Cloudy

Minimum Volume = 3 • well volume _____ *litres*

Purge/Sample Method
Waterra Pump ☐
Peristaltic (tubing set to: 2.2) ☑
Bailer ☐
Other (specify) _____

Turbidity Ratings *
Purging /
Sampling /

Well volume Purged (L)	pH	Conductivity (uS/cm) or (mS/cm)	Temperature (°C)	ORP (mV)	DO (mg/L)	Time (Low flow sampling only)	DTW (mBTOC) (Low flow sampling only)	Rate (mL/min.) (Low flow sampling only)
07:30	6.6	2.21	9.4	4	n/a	10:30	1.723	100
2.5	6.4	2.24	10.2	5	n/a	10:35	1.82	
5.0	6.3	2.30	10.3	5	n/a	10:40	1.84	
7.5	6.3	2.28	10.4	4	n/a	10:45	1.86	
20	6.3	2.32	10.5	3	n/a	10:50	1.88	
22.5	6.3	2.30	10.5	2	n/a	10:55	1.90	
30	6.3	2.31	10.6	2	n/a	11:00	1.91	V

Odour Yes ☐ No ☑ Description: _____
Sheen Yes ☐ No ☐ Description: _____
Colour (initial) Clear (stable) Clear
Recovery ** Slow ☐ Moderate ☑ Fast ☐

NOTES: Field Parameter and Stability Guidance: pH (±0.1 standard units); Temperature (±0.2 °C); Specific Conductance (±3%); Oxidation-Reduction Potential (±10mV); and if applicable: Dissolved Oxygen (±10%)
*Turbidity may be determined subjectively using a scale of 1 to 10, where 1 is clear, 10 is opaque.
**Recovery Estimate - Slow: greater than 10 cm drawdown Moderate: slightly lower than 10 cm drawdown Fast: within 10 cm drawdown

SAMPLING PARAMETER INFORMATION Date and Time: December 19, 2018 Laboratory Maxxam

VOC/VPH	☐	BTEX/VPH/MTBE	☐	EPH	☐
LEPH/HEPH	☐	PAHs	☐	Glycols	☐
Non-Chlorinated Phenol	☐	Chlorinated Phenols	☐	PCBs	☐
Dissolved Metals	☐	Field Filter & Preserved?	☐	Total Metals	☐
Pesticides	☐	pH	☐	Other Diss Fe	☑

Duplicate Sample ID: _____ Duplicate Sample Parameters: _____

NOTES: Bottle and Preservative Requirements Correspond to Laboratory Standards

COMMENTS: _____

Keystone Environmental Ltd.
Groundwater Developing, Purging and Sampling Record
Version 3.0

Keystone Environmental

GENERAL INFORMATION

Monitoring Well ID: MW18-15 Project #: 13639-2D
Sampler: SM Client: CoV

WELL INFORMATION

Well Cover Type Flush ☑ Stick-up ☐ _____ m above grade Lock ☐ *Well Casing Diameter* 2-inch (51 mm) ☑ or other: _____

Well Head Vapour Reading 1.9 ppm or %LEL ☐ RKI Eagle ☑ MiniRae ☐ Other: _____

DEVELOPMENT INFORMATION AND OBSERVATIONS

Dev. Date: November 26 Weather: Heavy rain

Depth to Bottom of Well from TOC (X)	9.26	metres
Depth to Water from Top of Casing (Y)	2.19	metres
Depth to Product (if applicable)		metres
Length of Water Column (X-Y)	7.07	metres
Volume of Water in Well = (X - Y) • 2	24	*litres*
Minimum Volume = 6 • well volume	24	*litres*
Total Volume Developed	24	*litres*

Development Method
Waterra Pump ☑
Surge Block (time: 5min) ☐
Bailer ☐
Other (specify) _____

Turbidity Ratings *
Before Dev. 10
After Dev. 8

PURGING INFORMATION AND OBSERVATIONS

Purge Date: November 28 Weather: Cloudy

Minimum Volume = 3 • well volume _____ *litres*

Purge/Sample Method
Waterra Pump ☑
Peristaltic (tubing set to: 3.5) ☐
Bailer ☐
Other (specify) _____

Turbidity Ratings *
Purging 1
Sampling 1

(Low flow sampling only)

Well volume Purged (L)	pH	Conductivity (uS/cm) or (mS/cm)	Temperature (°C)	ORP (mV)	DO (mg/L)	Time	DTW (mBTOC)	Rate (mL/min.)
0	7.5	137	11.8	117	n/a	08:44	1.972	150
0.75	6.6	135	12.0	141		08:49	2.18	
1.5	6.5	126	12.1	152		08:54	2.28	
2.25	6.3	133	12.1	159		08:59	2.37	
3.0	6.3	129	12.2	162		09:04	2.41	
3.75	6.3	118	12.2	167		09:09	2.46	
4.5	6.3	116	12.2	169	↓	09:14	2.52	↓

Odour Yes ☐ No ☑ Description: _____ Colour (initial) Clear (stable) Clear
Sheen Yes ☐ No ☐ Description: _____ Recovery ** Slow ☑ Moderate ☐ Fast ☐

NOTES: Field Parameter and Stability Guidance: pH (±0.1 standard units); Temperature (±0.2 °C); Specific Conductance (±3%); Oxidation-Reduction Potential (±10mV); and if applicable: Dissolved Oxygen (±10%)
*Turbidity may be determined subjectively using a scale of 1 to 10, where 1 is clear, 10 is opaque.
**Recovery Estimate - Slow: greater than 10 cm drawdown Moderate: slightly lower than 10 cm drawdown Fast: within 10 cm drawdown

SAMPLING PARAMETER INFORMATION Date and Time: ~~November 28~~ Nov 28, 2018 Laboratory Maxxam

VOC/VPH	☑	BTEX/VPH/MTBE	☑	EPH	☐
LEPH/HEPH	☑	PAHs	☑	Glycols	☐
Non-Chlorinated Phenol	☐	Chlorinated Phenols	☑	PCBs	☐
Dissolved Metals	☑	Field Filter & Preserved?	☑	Total Metals	☐
Pesticides	☐	pH	☐	Other	☐

Duplicate Sample ID: _____ Duplicate Sample Parameters: _____

NOTES: Bottle and Preservative Requirements Correspond to Laboratory Standards

COMMENTS: _____

Keystone Environmental Ltd.
Groundwater Developing, Purging and Sampling Record
Version 3.0

Keystone Environmental

GENERAL INFORMATION

Monitoring Well ID: MW18-16 Project #: 13639-2
Sampler: SM Client: City of Vancouver

WELL INFORMATION

Well Cover Type Flush ☑ Stick-up ☐ ____ m above grade Lock ☐ *Well Casing Diameter* 2-inch (51 mm) ☑ or other: ____

Well Head Vapour Reading 1.9 ppm or %LEL ☐ RKI Eagle ☑ MiniRae ☐ Other: ____

DEVELOPMENT INFORMATION AND OBSERVATIONS

Dev. Date: November 26, 2018 Weather: Heavy rain

Depth to Bottom of Well from TOC (X)	3.41	metres
Depth to Water from Top of Casing (Y)	2.079	metres
Depth to Product (if applicable)		metres
Length of Water Column (X-Y)	0.3	metres
Volume of Water in Well = (X - Y) • 2	2.6	*litres*
Minimum Volume = 6 • well volume	2	*litres*
Total Volume Developed	2	*litres*

Development Method
Waterra Pump ☑
Surge Block (time: 5 min) ☑
Bailer ☐
Other (specify) ____

Turbidity Ratings *
Before Dev. 19
After Dev. 10

PURGING INFORMATION AND OBSERVATIONS

Purge Date: November 28 Weather: Cloudy

Minimum Volume = 3 • well volume ____ *litres*

Purge/Sample Method
Waterra Pump ☐
Peristaltic (tubing set to: 2.4 3.2) ☑
Bailer ☐
Other (specify) ____

Turbidity Ratings *
Purging 1
Sampling ____

(Low flow sampling only)

Well volume Purged (L)	pH	Conductivity (uS/cm) or (mS/cm)	Temperature (°C)	ORP (mV)	DO (mg/L)	Time	DTW (mBTOC)	Rate (mL/min.)
0	6.7	250	13.8	6	n/a	07:37	2.825	150
0.75	6.5	248	13.9	0	n/a	07:42	2.99	
1.5	6.6	280	13.8	-1	n/a	07:47	3.04	
2.25	6.5	320	13.8	-1	n/a	07:52	3.07	
3.0	6.5	318	13.8	7	n/a	07:57	3.16	
3.75	6.4	330	13.8	3	n/a	08:02	3.20	
4.5					n/a	08:07		

Stop purge here

Odour Yes ☐ No ☑ Description: ____
Sheen Yes ☐ No ☑ Description: ____
Colour (initial) Clear (stable) ____
Recovery ** Slow ☑ Moderate ☐ Fast ☐

NOTES: Field Parameter and Stability Guidance: pH (±0.1 standard units); Temperature (±0.2 °C); Specific Conductance (±3%); Oxidation-Reduction Potential (±10mV); and if applicable: Dissolved Oxygen (±10%)
*Turbidity may be determined subjectively using a scale of 1 to 10, where 1 is clear, 10 is opaque.
**Recovery Estimate - Slow: greater than 10 cm drawdown Moderate: slightly lower than 10 cm drawdown Fast: within 10 cm drawdown

SAMPLING PARAMETER INFORMATION

Date and Time: November 28, 2018 Laboratory: Maxxam

VOC/VPH	☑	BTEX/VPH/MTBE	☐	EPH	☐
LEPH/HEPH	☑	PAHs	☑	Glycols	☐
Non-Chlorinated Phenol	☐	Chlorinated Phenols	☐	PCBs	☐
Dissolved Metals	☑	Field Filter & Preserved?	☑	Total Metals	☐
Pesticides	☐	pH	☐	Other ____	☐

Duplicate Sample ID: ____ Duplicate Sample Parameters: ____

NOTES: Bottle and Preservative Requirements Correspond to Laboratory Standards

COMMENTS: Developed Inv 3

APPENDIX I

ELEVATION SURVEY

ELEVATION DATA
2901 East Hastings Street, Vancouver
City of Vancouver
Project #: 13639

Well ID	Screen Interval (mbg)			Measured Depth to Bottom (mbgs)	Screen Stratigraphy	Hydrostratigraphic Zone	Ground Elevation	Top of Casing Elevation	Screen Interval (elev)			GW Levels November 28, 2018	GW Elevation
BH18-1	--	--	--	--	--	--	109.144	--	--	--	--	--	--
MW18-2	7.3	-	8.8	8.82	Till	Shallow	106.605	106.524	99.224	-	97.724	8.154	98.37
MW18-3	6.6	-	8.1	8.12	Till	Shallow	106.054	105.977	99.377	-	97.877	7.681	98.296
BH18-4	--	--	--	--	--	--	105.079	--	--	--	--	--	--
MW18-5	1.5	-	3.1	2.96	Till	Shallow	98.491	98.388	96.888	-	95.288	0.454	97.934
MW18-6	4.1	-	5.6	5.60	Till	Shallow	106.331	106.244	102.144	-	100.644	3.535	102.709
BH18-7	--	--	--	--	--	--	107.872	--	--	--	--	--	--
BH18-8	--	--	--	--	--	--	109.834	--	--	--	--	--	--
MW18-9	4.6	-	6.1	6.70	Till	Shallow	99.087	99.034	94.4	-	92.9	1.804	97.23
MW18-10	2.7	-	4.2	4.29	Till	Shallow	96.369	96.282	93.582	-	92.082	1.245	95.037
MW18-11	7.6	-	9.1	9.14	Till	Shallow	94.489	94.398	86.798	-	85.298	*	*
MW18-12	1.7	-	3.1	2.74	Till	Shallow	97.435	97.356	95.656	-	94.256	0	97.356
BH18-13	--	--	--	--	--	--	98.453	--	--	--	--	--	--
MW18-14	1.8	-	3.1	2.93	Till	Shallow	97.554	97.445	95.645	-	94.345	1.687	95.758
MW18-15	2.8	-	4.3	4.26	Till	Shallow	98.611	98.449	95.649	-	94.149	1.972	96.477
MW18-16	2.1	-	3.4	3.41	Fill	Shallow	97.248	97.138	95.038	-	93.738	2.825	94.313
BH18-17	--	--	--	--	--	--	98.612	--	--	--	--	--	--

Legend	
*	DRY well
mbgs	metres below ground surface
elev	elevation
mbToC	metres below top of casing
GW	Groundwater

APPENDIX J

LABORATORY ANALYTICAL REPORTS

Keystone Environmental
Knowledge-Driven Results

Your Project #: 13639-2C
Your C.O.C. #: K021465

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/11/26
Report #: R2656025
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8A2682
Received: 2018/11/21, 18:20

Sample Matrix: Soil
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Elements by ICPMS (total)	1	2018/11/26	2018/11/26	BBY7SOP-00004 / BBY7SOP-00001	EPA 6020b R2 m
Moisture	1	2018/11/22	2018/11/23	BBY8SOP-00017	BCMOE BCLM Dec2000 m
PAH in Soil by GC/MS (SIM)	1	2018/11/22	2018/11/23	BBY8SOP-00022	BCMOE BCLM Jul2017m
Total PAH and B(a)P Calculation (1)	1	N/A	2018/11/26	BBY WI-00033	Auto Calc
pH (2:1 DI Water Extract)	1	2018/11/26	2018/11/26	BBY6SOP-00028	BCMOE BCLM Mar2005 m
EPH less PAH in Soil By GC/FID (2)	1	N/A	2018/11/26	BBY WI-00033	Auto Calc
EPH in Soil by GC/FID	1	2018/11/22	2018/11/23	BBY8SOP-00029	BCMOE BCLM Jul 2016
Extra VOCs in Soil - Field Pres. (3)	1	N/A	2018/11/23	BBY8SOP-00040	BCMOE BCLM Sep 2017m
VOCs, VH, F1, LH in Soil - Field Pres. (3)	1	N/A	2018/11/24	BBY8SOP-00009/11/12	BCMOE BCLM Sep 2017m
Volatile HC-BTEX for Soil (4)	1	N/A	2018/11/26	BBY WI-00033	Auto Calc

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your Project #: 13639-2C
Your C.O.C. #: K021465

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/11/26
Report #: R2656025
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8A2682
Received: 2018/11/21, 18:20

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Total PAHs in Soil include: Quinoline, Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Acridine, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b&j)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, and Benzo(g,h,i)perylene.

Total PAHs in Sediment include: Naphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(a)pyrene, and Dibenz(a,h)anthracene.
(2) LEPH = EPH (C10 to C19) - (Naphthalene + Phenanthrene)
HEPH = EPH (C19 to C32) - (Benzo(a)anthracene + Benzo(a)pyrene + Benzo(b)fluoranthene + Benzo(k)fluoranthene + Dibenz(a,h)anthracene + Indeno(1,2,3-cd)pyrene + Pyrene)
(3) The extraction date for VOC, BTEX, VH, or F1 samples that are field preserved with methanol equals the date sampled, unless otherwise stated.
(4) VPH = VH - (Benzene + Toluene + Ethylbenzene + m & p-Xylene + o-Xylene + Styrene)

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Gail Pedersen, Project Manager –Environmental Customer Service
Email: gpedersen@maxxam.ca
Phone# (604) 734 7276

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Maxxam Job #: B8A2682
Report Date: 2018/11/26

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

PHYSICAL TESTING (SOIL)

Maxxam ID		UV1664		
Sampling Date		2018/11/21 10:40		
COC Number		K021465		
	UNITS	MW18-15(1.2)	RDL	QC Batch
Physical Properties				
Moisture	%	18	0.30	9238455
RDL = Reportable Detection Limit				

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City of Vancouver - FOI 2023-228 - Page 525 of 1003

Maxxam Job #: B8A2682
Report Date: 2018/11/26

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		UV1664	UV1664		
Sampling Date		2018/11/21 10:40	2018/11/21 10:40		
COC Number		K021465	K021465		
	UNITS	**MW18-15(1.2)**	**MW18-15(1.2) Lab-Dup**	**RDL**	**QC Batch**
Volatiles					
Extractable (MeOH) 2-Butanone (MEK)	mg/kg	<15	<15	15	9239625
Extractable (MeOH) 4-Methyl-2-pentanone (MIBK)	mg/kg	<0.50	<0.50	0.50	9239625
Surrogate Recovery (%)					
Extractable (MeOH) 1,4-Difluorobenzene (sur.)	%	103	102		9239625
Extractable (MeOH) 4-Bromofluorobenzene (sur.)	%	102	103		9239625
Extractable (MeOH) D4-1,2-Dichloroethane (sur.)	%	104	101		9239625

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8A2682
Report Date: 2018/11/26

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

LEPH & HEPH WITH PAH FOR CSR IN SOIL (SOIL)

Maxxam ID		UV1664		
Sampling Date		2018/11/21 10:40		
COC Number		K021465		
	UNITS	MW18-15(1.2)	RDL	QC Batch
Calculated Parameters				
Low Molecular Weight PAH`s	ug/g	0.14	0.050	9238001
High Molecular Weight PAH`s	ug/g	1.2	0.050	9238001
Total PAH	ug/g	1.3	0.050	9238001
Polycyclic Aromatics				
Quinoline	ug/g	<0.050	0.050	9239137
Naphthalene	ug/g	<0.010	0.010	9239137
1-Methylnaphthalene	ug/g	<0.050	0.050	9239137
2-Methylnaphthalene	ug/g	<0.020	0.020	9239137
Acenaphthylene	ug/g	0.021	0.0050	9239137
Acenaphthene	ug/g	<0.0050	0.0050	9239137
Fluorene	ug/g	<0.020	0.020	9239137
Phenanthrene	ug/g	0.10	0.010	9239137
Anthracene	ug/g	0.021	0.0040	9239137
Fluoranthene	ug/g	0.23	0.020	9239137
Pyrene	ug/g	0.21	0.020	9239137
Benzo(a)anthracene	ug/g	0.090	0.020	9239137
Chrysene	ug/g	0.13	0.020	9239137
Benzo(b&j)fluoranthene	ug/g	0.16	0.020	9239137
Benzo(b)fluoranthene	ug/g	0.10	0.020	9239137
Benzo(k)fluoranthene	ug/g	0.054	0.020	9239137
Benzo(a)pyrene	ug/g	0.12	0.020	9239137
Indeno(1,2,3-cd)pyrene	ug/g	0.089	0.020	9239137
Dibenz(a,h)anthracene	ug/g	0.023	0.020	9239137
Benzo(g,h,i)perylene	ug/g	0.093	0.050	9239137
Calculated Parameters				
LEPH (C10-C19 less PAH)	mg/kg	<100	100	9238012
HEPH (C19-C32 less PAH)	mg/kg	<100	100	9238012
Hydrocarbons				
EPH (C10-C19)	mg/kg	<100	100	9239142
EPH (C19-C32)	mg/kg	<100	100	9239142
Surrogate Recovery (%)				
D10-ANTHRACENE (sur.)	%	87		9239137
RDL = Reportable Detection Limit				

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Maxxam Job #: B8A2682
Report Date: 2018/11/26

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

LEPH & HEPH WITH PAH FOR CSR IN SOIL (SOIL)

Maxxam ID		UV1664		
Sampling Date		2018/11/21 10:40		
COC Number		K021465		
	UNITS	**MW18-15(1.2)**	**RDL**	**QC Batch**
D8-ACENAPHTHYLENE (sur.)	%	81		9239137
D8-NAPHTHALENE (sur.)	%	72		9239137
TERPHENYL-D14 (sur.)	%	84		9239137
O-TERPHENYL (sur.)	%	94		9239142
RDL = Reportable Detection Limit				

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Maxxam Job #: B8A2682
Report Date: 2018/11/26

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

CSR/CCME METALS IN SOIL WITH HG (SOIL)

Maxxam ID		UV1664	UV1664		
Sampling Date		2018/11/21 10:40	2018/11/21 10:40		
COC Number		K021465	K021465		
	UNITS	MW18-15(1.2)	MW18-15(1.2) Lab-Dup	RDL	QC Batch
Physical Properties					
Soluble (2:1) pH	pH	6.70	6.71	N/A	9241713
Total Metals by ICPMS					
Total Aluminum (Al)	mg/kg	17300	17600	100	9241709
Total Antimony (Sb)	mg/kg	0.72	0.68	0.10	9241709
Total Arsenic (As)	mg/kg	3.18	3.25	0.50	9241709
Total Barium (Ba)	mg/kg	87.6	88.5	0.10	9241709
Total Beryllium (Be)	mg/kg	0.27	0.28	0.20	9241709
Total Boron (B)	mg/kg	2.0	2.2	1.0	9241709
Total Cadmium (Cd)	mg/kg	0.184	0.167	0.050	9241709
Total Chromium (Cr)	mg/kg	16.5	17.0	1.0	9241709
Total Cobalt (Co)	mg/kg	6.29	6.62	0.30	9241709
Total Copper (Cu)	mg/kg	26.5	25.5	0.50	9241709
Total Lead (Pb)	mg/kg	44.4	42.9	0.10	9241709
Total Manganese (Mn)	mg/kg	297	327	0.20	9241709
Total Mercury (Hg)	mg/kg	0.114	0.103	0.050	9241709
Total Molybdenum (Mo)	mg/kg	0.53	0.53	0.10	9241709
Total Nickel (Ni)	mg/kg	11.1	11.5	0.80	9241709
Total Selenium (Se)	mg/kg	<0.50	<0.50	0.50	9241709
Total Silver (Ag)	mg/kg	0.089	0.079	0.050	9241709
Total Strontium (Sr)	mg/kg	25.9	26.7	0.10	9241709
Total Tin (Sn)	mg/kg	4.34	5.34	0.10	9241709
Total Titanium (Ti)	mg/kg	684	779	1.0	9241709
Total Tungsten (W)	mg/kg	<0.50	<0.50	0.50	9241709
Total Vanadium (V)	mg/kg	44.1	45.7	2.0	9241709
Total Zinc (Zn)	mg/kg	89.4	90.1	1.0	9241709

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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Maxxam Job #: B8A2682
Report Date: 2018/11/26

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

CSR VOC + VPH IN SOIL - FIELD PRESERVED (SOIL)

Maxxam ID		UV1664			UV1664		
Sampling Date		2018/11/21 10:40			2018/11/21 10:40		
COC Number		K021465			K021465		
	UNITS	MW18-15(1.2)	RDL	QC Batch	MW18-15(1.2) Lab-Dup	RDL	QC Batch
Calculated Parameters							
VPH (VH6 to 10 - BTEX)	mg/kg	<10	10	9238013			
Volatiles							
VH C6-C10	mg/kg	<10	10	9239585	<10	10	9239585
1,1,1,2-tetrachloroethane	mg/kg	<0.020	0.020	9239585	<0.020	0.020	9239585
1,1,1-trichloroethane	mg/kg	<0.020	0.020	9239585	<0.020	0.020	9239585
1,1,2,2-tetrachloroethane	mg/kg	<0.020	0.020	9239585	<0.020	0.020	9239585
1,1,2-trichloroethane	mg/kg	<0.020	0.020	9239585	<0.020	0.020	9239585
1,1-dichloroethane	mg/kg	<0.025	0.025	9239585	<0.025	0.025	9239585
1,1-dichloroethene	mg/kg	<0.025	0.025	9239585	<0.025	0.025	9239585
1,2-dibromoethane	mg/kg	<0.020	0.020	9239585	<0.020	0.020	9239585
1,2-dichlorobenzene	mg/kg	<0.020	0.020	9239585	<0.020	0.020	9239585
1,2-dichloroethane	mg/kg	<0.020	0.020	9239585	<0.020	0.020	9239585
1,2-dichloropropane	mg/kg	<0.020	0.020	9239585	<0.020	0.020	9239585
1,3-Butadiene	mg/kg	<0.080 (1)	0.080	9239585	<0.080	0.080	9239585
1,3-dichlorobenzene	mg/kg	<0.020	0.020	9239585	<0.020	0.020	9239585
1,4-dichlorobenzene	mg/kg	<0.020	0.020	9239585	<0.020	0.020	9239585
Benzene	mg/kg	<0.0050	0.0050	9239585	<0.0050	0.0050	9239585
Bromobenzene	mg/kg	<0.20	0.20	9239585	<0.20	0.20	9239585
Bromodichloromethane	mg/kg	<0.050	0.050	9239585	<0.050	0.050	9239585
Bromoform	mg/kg	<0.050	0.050	9239585	<0.050	0.050	9239585
Bromomethane	mg/kg	<0.30	0.30	9239585	<0.30	0.30	9239585
Carbon tetrachloride	mg/kg	<0.020	0.020	9239585	<0.020	0.020	9239585
Chlorobenzene	mg/kg	<0.020	0.020	9239585	<0.020	0.020	9239585
Chlorodibromomethane	mg/kg	<0.050	0.050	9239585	<0.050	0.050	9239585
Chloroethane	mg/kg	<0.10	0.10	9239585	<0.10	0.10	9239585
Chloroform	mg/kg	<0.020	0.020	9239585	<0.020	0.020	9239585
Chloromethane	mg/kg	<0.050	0.050	9239585	<0.050	0.050	9239585
cis-1,2-dichloroethene	mg/kg	<0.030	0.030	9239585	<0.030	0.030	9239585
cis-1,3-dichloropropene	mg/kg	<0.020	0.020	9239585	<0.020	0.020	9239585
Dibromomethane	mg/kg	<0.20	0.20	9239585	<0.20	0.20	9239585

RDL = Reportable Detection Limit

Lab-Dup = Laboratory Initiated Duplicate

(1) Matrix spike recovery belows acceptance criteria. As results are non-detect, there is no impact on data quality. Sensitivity not an issue.

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Maxxam Job #: B8A2682
Report Date: 2018/11/26

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

CSR VOC + VPH IN SOIL - FIELD PRESERVED (SOIL)

Maxxam ID		UV1664			UV1664		
Sampling Date		2018/11/21 10:40			2018/11/21 10:40		
COC Number		K021465			K021465		
	UNITS	**MW18-15(1.2)**	**RDL**	**QC Batch**	**MW18-15(1.2) Lab-Dup**	**RDL**	**QC Batch**
Dichlorodifluoromethane	mg/kg	<0.20	0.20	9239585	<0.20	0.20	9239585
Dichloromethane	mg/kg	<0.080	0.080	9239585	<0.080	0.080	9239585
Ethylbenzene	mg/kg	<0.010	0.010	9239585	<0.010	0.010	9239585
Styrene	mg/kg	<0.030	0.030	9239585	<0.030	0.030	9239585
Tetrachloroethene	mg/kg	<0.010	0.010	9239585	<0.010	0.010	9239585
Toluene	mg/kg	<0.020	0.020	9239585	<0.020	0.020	9239585
trans-1,2-dichloroethene	mg/kg	<0.030	0.030	9239585	<0.030	0.030	9239585
trans-1,3-dichloropropene	mg/kg	<0.020	0.020	9239585	<0.020	0.020	9239585
Trichloroethene	mg/kg	<0.0090	0.0090	9239585	<0.0090	0.0090	9239585
Trichlorofluoromethane	mg/kg	<0.20	0.20	9239585	<0.20	0.20	9239585
Vinyl chloride	mg/kg	<0.040	0.040	9239585	<0.040	0.040	9239585
m & p-Xylene	mg/kg	<0.040	0.040	9239585	<0.040	0.040	9239585
o-Xylene	mg/kg	<0.040	0.040	9239585	<0.040	0.040	9239585
Xylenes (Total)	mg/kg	<0.040	0.040	9239585	<0.040	0.040	9239585
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	101		9239585	101		9239585
4-Bromofluorobenzene (sur.)	%	97		9239585	96		9239585
D10-ETHYLBENZENE (sur.)	%	96		9239585	97		9239585
D4-1,2-Dichloroethane (sur.)	%	98		9239585	98		9239585

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8A2682
Report Date: 2018/11/26

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	12.0°C
Package 2	14.0°C

Results relate only to the items tested.

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Maxxam Job #: B8A2682
Report Date: 2018/11/26

QUALITY ASSURANCE REPORT

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9239137	D10-ANTHRACENE (sur.)	2018/11/23	84	50 - 140	85	50 - 140	91	%				
9239137	D8-ACENAPHTHYLENE (sur.)	2018/11/23	80	50 - 140	79	50 - 140	84	%				
9239137	D8-NAPHTHALENE (sur.)	2018/11/23	75	50 - 140	73	50 - 140	75	%				
9239137	TERPHENYL-D14 (sur.)	2018/11/23	81	50 - 140	81	50 - 140	86	%				
9239142	O-TERPHENYL (sur.)	2018/11/23	83	60 - 140	80	60 - 140	93	%				
9239585	1,4-Difluorobenzene (sur.)	2018/11/23	101	50 - 140	99	50 - 140	101	%				
9239585	4-Bromofluorobenzene (sur.)	2018/11/23	106	50 - 140	106	50 - 140	97	%				
9239585	D10-ETHYLBENZENE (sur.)	2018/11/23	93	50 - 140	83	50 - 140	88	%				
9239585	D4-1,2-Dichloroethane (sur.)	2018/11/23	109	50 - 140	108	50 - 140	99	%				
9239625	Extractable (MeOH) 1,4-Difluorobenzene (sur.)	2018/11/23			103	50 - 140	103	%				
9239625	Extractable (MeOH) 4-Bromofluorobenzene (sur.)	2018/11/23			99	50 - 140	101	%				
9239625	Extractable (MeOH) D4-1,2-Dichloroethane (sur.)	2018/11/23			102	50 - 140	101	%				
9238455	Moisture	2018/11/23					<0.30	%	2.0	20		
9239137	1-Methylnaphthalene	2018/11/23	86	50 - 140	86	50 - 140	<0.050	ug/g				
9239137	2-Methylnaphthalene	2018/11/23	85	50 - 140	85	50 - 140	<0.020	ug/g				
9239137	Acenaphthene	2018/11/23	84	50 - 140	84	50 - 140	<0.0050	ug/g				
9239137	Acenaphthylene	2018/11/23	85	50 - 140	84	50 - 140	<0.0050	ug/g				
9239137	Anthracene	2018/11/23	85	50 - 140	86	50 - 140	<0.0040	ug/g				
9239137	Benzo(a)anthracene	2018/11/23	86	50 - 140	86	50 - 140	<0.020	ug/g				
9239137	Benzo(a)pyrene	2018/11/23	82	50 - 140	84	50 - 140	<0.020	ug/g				
9239137	Benzo(b&j)fluoranthene	2018/11/23	86	50 - 140	90	50 - 140	<0.020	ug/g				
9239137	Benzo(b)fluoranthene	2018/11/23	88	50 - 140	92	50 - 140	<0.020	ug/g				
9239137	Benzo(g,h,i)perylene	2018/11/23	81	50 - 140	88	50 - 140	<0.050	ug/g				
9239137	Benzo(k)fluoranthene	2018/11/23	87	50 - 140	84	50 - 140	<0.020	ug/g				
9239137	Chrysene	2018/11/23	85	50 - 140	86	50 - 140	<0.020	ug/g				
9239137	Dibenz(a,h)anthracene	2018/11/23	84	50 - 140	88	50 - 140	<0.020	ug/g				
9239137	Fluoranthene	2018/11/23	86	50 - 140	86	50 - 140	<0.020	ug/g				
9239137	Fluorene	2018/11/23	85	50 - 140	84	50 - 140	<0.020	ug/g				
9239137	Indeno(1,2,3-cd)pyrene	2018/11/23	75	50 - 140	80	50 - 140	<0.020	ug/g				

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Maxxam Job #: B8A2682
Report Date: 2018/11/26

QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9239137	Naphthalene	2018/11/23	85	50 - 140	85	50 - 140	<0.010	ug/g	NC	50		
9239137	Phenanthrene	2018/11/23	85	50 - 140	84	50 - 140	<0.010	ug/g	NC	50		
9239137	Pyrene	2018/11/23	86	50 - 140	86	50 - 140	<0.020	ug/g				
9239137	Quinoline	2018/11/23	114	50 - 140	113	50 - 140	<0.050	ug/g				
9239142	EPH (C10-C19)	2018/11/23	80	60 - 140	82	70 - 130	<100	mg/kg	NC	40		
9239142	EPH (C19-C32)	2018/11/23	82	60 - 140	84	70 - 130	<100	mg/kg				
9239585	1,1,1,2-tetrachloroethane	2018/11/24	102	50 - 140	103	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,1,1-trichloroethane	2018/11/24	95	50 - 140	98	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,1,2,2-tetrachloroethane	2018/11/24	102	50 - 140	110	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,1,2-trichloroethane	2018/11/24	103	50 - 140	109	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,1-dichloroethane	2018/11/24	93	50 - 140	101	60 - 130	<0.025	mg/kg	NC	50		
9239585	1,1-dichloroethene	2018/11/24	92	50 - 140	99	60 - 130	<0.025	mg/kg	NC	50		
9239585	1,2-dibromoethane	2018/11/24	104	50 - 140	112	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,2-dichlorobenzene	2018/11/24	111	50 - 140	115	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,2-dichloroethane	2018/11/24	89	50 - 140	97	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,2-dichloropropane	2018/11/24	97	50 - 140	104	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,3-Butadiene	2018/11/24	35 (1)	50 - 140	91	60 - 130	<0.080	mg/kg	NC	50		
9239585	1,3-dichlorobenzene	2018/11/24	110	50 - 140	113	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,4-dichlorobenzene	2018/11/24	108	50 - 140	111	60 - 130	<0.020	mg/kg	NC	50		
9239585	Benzene	2018/11/24	94	50 - 140	100	60 - 130	<0.0050	mg/kg	NC	50		
9239585	Bromobenzene	2018/11/24	107	50 - 140	110	60 - 130	<0.20	mg/kg	NC	50		
9239585	Bromodichloromethane	2018/11/24	96	50 - 140	106	60 - 130	<0.050	mg/kg	NC	50		
9239585	Bromoform	2018/11/24	100	50 - 140	106	60 - 130	<0.050	mg/kg	NC	50		
9239585	Bromomethane	2018/11/24	80	50 - 140	95	60 - 130	<0.30	mg/kg	NC	50		
9239585	Carbon tetrachloride	2018/11/24	98	50 - 140	101	60 - 130	<0.020	mg/kg	NC	50		
9239585	Chlorobenzene	2018/11/24	98	50 - 140	104	60 - 130	<0.020	mg/kg	NC	50		
9239585	Chlorodibromomethane	2018/11/24	100	50 - 140	107	60 - 130	<0.050	mg/kg	NC	50		
9239585	Chloroethane	2018/11/24	81	50 - 140	79	60 - 130	<0.10	mg/kg	NC	50		
9239585	Chloroform	2018/11/24	94	50 - 140	100	60 - 130	<0.020	mg/kg	NC	50		
9239585	Chloromethane	2018/11/24	71	50 - 140	90	60 - 130	<0.050	mg/kg	NC	50		
9239585	cis-1,2-dichloroethene	2018/11/24	95	50 - 140	101	60 - 130	<0.030	mg/kg	NC	50		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9239585	cis-1,3-dichloropropene	2018/11/24	91	50 - 140	101	50 - 140	<0.020	mg/kg	NC	50		
9239585	Dibromomethane	2018/11/24	106	50 - 140	109	60 - 130	<0.20	mg/kg	NC	50		
9239585	Dichlorodifluoromethane	2018/11/24	55	50 - 140	76	60 - 130	<0.20	mg/kg	NC	50		
9239585	Dichloromethane	2018/11/24	90	50 - 140	100	60 - 130	<0.080	mg/kg	NC	50		
9239585	Ethylbenzene	2018/11/24	105	50 - 140	109	60 - 130	<0.010	mg/kg	NC	50		
9239585	m & p-Xylene	2018/11/24	106	50 - 140	110	60 - 130	<0.040	mg/kg	NC	50		
9239585	o-Xylene	2018/11/24	105	50 - 140	110	60 - 130	<0.040	mg/kg	NC	50		
9239585	Styrene	2018/11/24	118	50 - 140	122	60 - 130	<0.030	mg/kg	NC	50		
9239585	Tetrachloroethene	2018/11/24	104	50 - 140	106	60 - 130	<0.010	mg/kg	NC	50		
9239585	Toluene	2018/11/24	100	50 - 140	104	60 - 130	<0.020	mg/kg	NC	50		
9239585	trans-1,2-dichloroethene	2018/11/24	97	50 - 140	101	60 - 130	<0.030	mg/kg	NC	50		
9239585	trans-1,3-dichloropropene	2018/11/24	106	50 - 140	119	50 - 140	<0.020	mg/kg	NC	50		
9239585	Trichloroethene	2018/11/24	100	50 - 140	99	60 - 130	<0.0090	mg/kg	NC	50		
9239585	Trichlorofluoromethane	2018/11/24	94	50 - 140	98	60 - 130	<0.20	mg/kg	NC	50		
9239585	VH C6-C10	2018/11/24			99	60 - 130	<10	mg/kg	NC	50		
9239585	Vinyl chloride	2018/11/24	71	50 - 140	76	60 - 130	<0.040	mg/kg	NC	50		
9239585	Xylenes (Total)	2018/11/24					<0.040	mg/kg	NC	50		
9239625	Extractable (MeOH) 2-Butanone (MEK)	2018/11/23			109	50 - 140	<15	mg/kg	NC	50		
9239625	Extractable (MeOH) 4-Methyl-2-pentanone (MIBK)	2018/11/23			102	50 - 140	<0.50	mg/kg	NC	50		
9241709	Total Aluminum (Al)	2018/11/26					<100	mg/kg	1.6	40	100	70 - 130
9241709	Total Antimony (Sb)	2018/11/26	100	75 - 125	98	75 - 125	<0.10	mg/kg	5.3	30	109	70 - 130
9241709	Total Arsenic (As)	2018/11/26	105	75 - 125	100	75 - 125	<0.50	mg/kg	2.1	30	98	70 - 130
9241709	Total Barium (Ba)	2018/11/26	NC	75 - 125	96	75 - 125	<0.10	mg/kg	1.0	40	102	70 - 130
9241709	Total Beryllium (Be)	2018/11/26	114	75 - 125	105	75 - 125	<0.20	mg/kg	4.3	30	106	70 - 130
9241709	Total Boron (B)	2018/11/26					<1.0	mg/kg	10	30		
9241709	Total Cadmium (Cd)	2018/11/26	107	75 - 125	100	75 - 125	<0.050	mg/kg	9.5	30	111	70 - 130
9241709	Total Chromium (Cr)	2018/11/26	108	75 - 125	101	75 - 125	<1.0	mg/kg	2.8	30	105	70 - 130
9241709	Total Cobalt (Co)	2018/11/26	106	75 - 125	100	75 - 125	<0.30	mg/kg	5.1	30	100	70 - 130
9241709	Total Copper (Cu)	2018/11/26	102	75 - 125	100	75 - 125	<0.50	mg/kg	3.8	30	108	70 - 130
9241709	Total Lead (Pb)	2018/11/26	102	75 - 125	97	75 - 125	<0.10	mg/kg	3.5	40	111	70 - 130

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Maxxam Job #: B8A2682
Report Date: 2018/11/26

QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9241709	Total Manganese (Mn)	2018/11/26	NC	75 - 125	98	75 - 125	<0.20	mg/kg	9.6	30	99	70 - 130
9241709	Total Mercury (Hg)	2018/11/26	112	75 - 125	104	75 - 125	<0.050	mg/kg	10	40	101	70 - 130
9241709	Total Molybdenum (Mo)	2018/11/26	109	75 - 125	101	75 - 125	<0.10	mg/kg	0.77	40	111	70 - 130
9241709	Total Nickel (Ni)	2018/11/26	104	75 - 125	100	75 - 125	<0.80	mg/kg	3.3	30	109	70 - 130
9241709	Total Selenium (Se)	2018/11/26	106	75 - 125	103	75 - 125	<0.50	mg/kg	NC	30		
9241709	Total Silver (Ag)	2018/11/26	110	75 - 125	103	75 - 125	<0.050	mg/kg	13	40	133 (2)	70 - 130
9241709	Total Strontium (Sr)	2018/11/26	110	75 - 125	97	75 - 125	<0.10	mg/kg	3.2	40	107	70 - 130
9241709	Total Tin (Sn)	2018/11/26	100	75 - 125	99	75 - 125	<0.10	mg/kg	21	40	102	70 - 130
9241709	Total Titanium (Ti)	2018/11/26	NC	75 - 125	99	75 - 125	<1.0	mg/kg	13	40		
9241709	Total Tungsten (W)	2018/11/26					<0.50	mg/kg	NC	30		
9241709	Total Vanadium (V)	2018/11/26	108	75 - 125	100	75 - 125	<2.0	mg/kg	3.5	30	104	70 - 130
9241709	Total Zinc (Zn)	2018/11/26	NC	75 - 125	100	75 - 125	<1.0	mg/kg	0.77	30	107	70 - 130
9241713	Soluble (2:1) pH	2018/11/26			101	97 - 103			0.15	20		

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

(2) Reference Material exceeds exceeds acceptance criteria for Ag. 10% of analytes failure in multielement scan is allowed.

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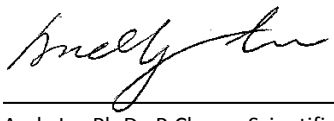
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Maxxam Job #: B8A2682
Report Date: 2018/11/26

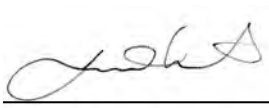
KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Andy Lu, Ph.D., P.Chem., Scientific Specialist



Jas Khatkar, BBY Organics

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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City of Vancouver - FOI 2023-228 - Page 537 of 1003

Updated CoC 1/1

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CHAIN OF CUSTODY RECORD

K021465

BBY FCD00077107

Page 1 of 1

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #: B61898	☑ Regular TAT 5 days (Most analyses)
Contact Name: Nicole MacDonald	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: 13639-26	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☐ 2 Days
Phone: (604) 430-0671	Phone:	Site #:	☐ 1 Day ☐ 3 Days
Email: nmacdonald@keystoneenvironmental.ca	Email: sarabirtle@keystoneenvironmental.com	Sampled By: Stewart McBride	Date Required:

Regulatory Criteria

- ☑ BC CSR Soil
- ☐ BC CSR Water
- ☐ YK CSR Soil
- ☐ YK CSR Water
- ☐ CCME (Specify)
- ☐ Other (Specify)
- ☐ Drinking Water
- ☐ BC Water Quality

Special Instructions

- ☐ Return Cooler
- ☐ Ship Sample Bottles (Please Specify)

Analysis Requested

MTBE; VOC / BTEX / F1; LEPH/HEPH/PAH; F2 - F4; Preserved?; Preserved?; Filtered?; Filtered?; Field Preserved?; Field Preserved?; Sulphate; COD; Alkalinity; Ammonia; BTEX / VPH; BTEX / F1; PAH; TPH; Dissolved Metals; Dissolved Mercury; Total Metals; Total Mercury; Chloride; TDS; BOD; Conductivity; Nitrate; pH; Nitrite; Ref Matrix; TOP CONTAINERS SUBMITTED; HOLD - DO NOT ANALYZE

LABORATORY USE ONLY

CUSTODY SEAL Y / N (Present / Intact); COOLER TEMPERATURES

COOLING MEDIA PRESENT Y / N

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	COMMENTS
1	MW18-D	2018/11/21	10:35	Soil	
2	MW18-1S (0.3)		10:35		
3	(1.2)		10:40		
4	(1.8)		10:45		
5	(2.4)		10:55		
6	(3.3)		11:10		
7	↓ (4.2)	↓	11:15	↓	
8					
9					
10					

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Stewart McBride	2018/11/21					

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms which are available for view

COC-1027 Keystone

B8A2682_COC

K021465

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CHAIN OF CUSTODY RECORD

BBY FCD-00077107
Page 1 of 1

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #: B61896	☑ Regular TAT 5 days (Most analyses)
Contact Name: Nicole MacDonald	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: 13639-2C	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☐ 2 Days
Phone: (604) 430-0671	Phone:	Site #:	☐ 1 Day ☐ 3 Days
Email: nmacdonald@keystoneenviro.ca	Email: smcbride@keystoneenviro.com	Sampled By: Stewart McBride	Date Required:

Regulatory Criteria	Special Instructions
☑ BC CSR Soil ☐ BC CSR Water	☐ Return Cooler
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)
☐ CCME (Specify) ☐ Other (Specify)	
☐ Drinking Water ☐ BC Water Quality	

Rush Confirmation #:

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested: ☐ MTBE; ☐ VOC / BTEX / VPH; ☐ VOC / BTEX / F1; ☐ LEPH/HEPH/PAH; ☐ F2 - F4; ☐ Preserved?; ☐ Preserved?; ☐ Preserved?; ☐ Field Preserved?; ☐ Field Preserved?; ☐ Sulphate; ☐ COD; ☐ Alkalinity; ☐ Ammonia; ☐ BTEX / VPH; ☐ BTEX / F1; ☐ PAH; ☐ EPH; ☐ TEH; ☐ Filtered?; ☐ Filtered?; ☐ Dissolved Metals; ☐ Dissolved Mercury; ☐ Total Metals; ☐ Total Mercury; ☐ Chloride; ☐ Fluoride; ☐ TDS; ☐ BOD; ☐ Conductivity; ☐ Nitrate; ☐ TSS; ☐ pH; ☐ Nitrite; # OF CONTAINERS SUBMITTED; HOLD - DO NOT ANALYZE

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE
1	MW18-D	2018/11/21	10:35	Soil	4	Y
2	MW18-15 (0.3)		10:35			
3	(1.2)		10:40			
4	(1.8)		10:45			
5	(2.4)		10:55			
6	(3.3)		11:10			
7	(4.2)		11:15			
8						
9						
10						

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
N/A		11,12,13
		14,14,14

COOLING MEDIA PRESENT (Y) / N

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Stewart McBride	2018/11/21	18:12	SHANJACOB JOY	2018/11/21	18:20

B8A2682_COC

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms which are available for viewing at v

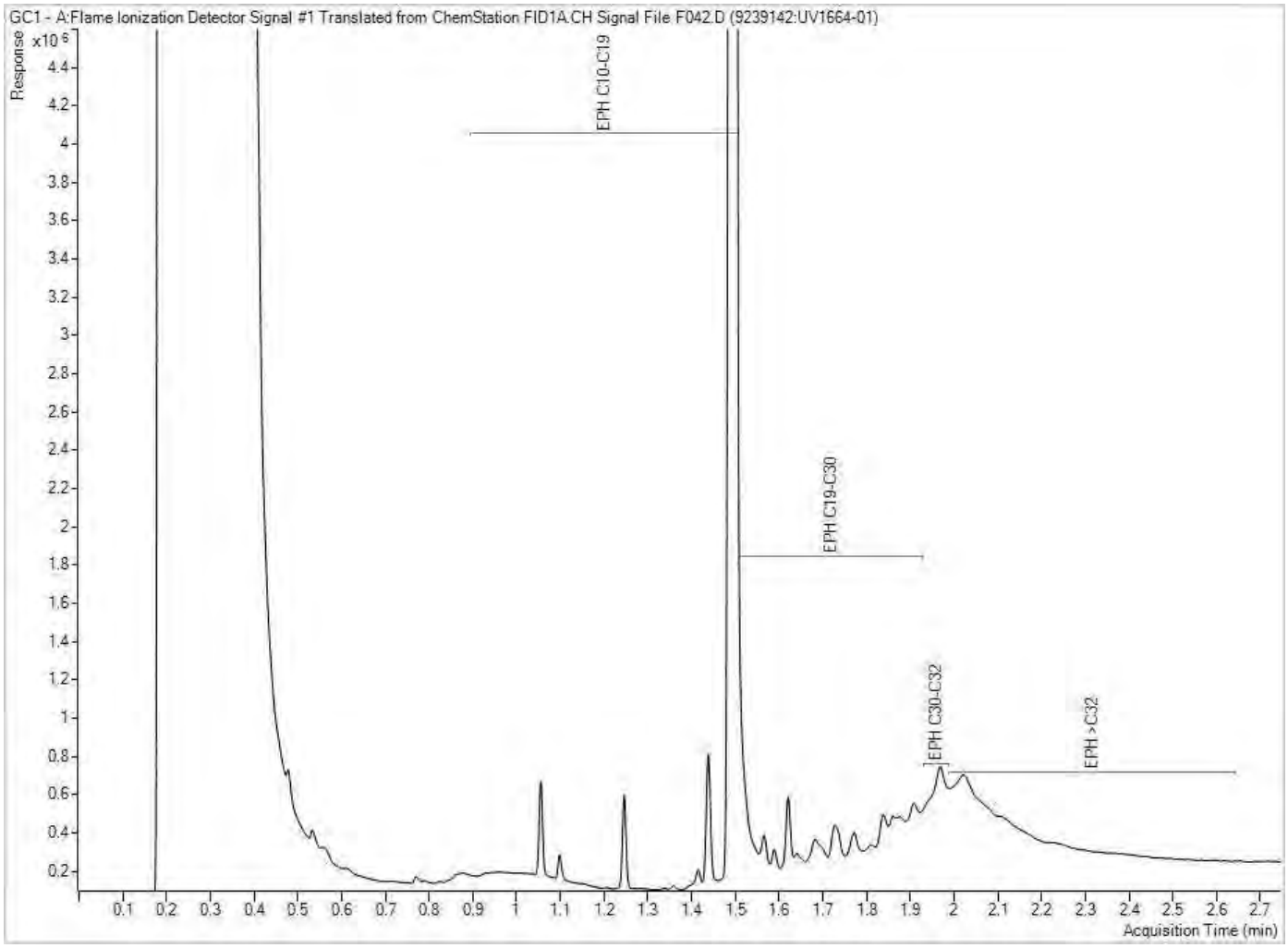
COC-1027 Keystone
18/7

City of Vancouver - FOI 2023-228 - Page 539 of 1003

Maxxam Job #: B8A2682
Report Date: 2018/11/26
Maxxam Sample: UV1664

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Client ID: MW18-15(1.2)

EPH in Soil by GC/FID Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Your Project #: 13639-2D
Your C.O.C. #: K021470, K021471

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/11/29
Report #: R2658110
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8A3869
Received: 2018/11/23, 16:25

Sample Matrix: Soil
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Elements by ICPMS (total)	3	2018/11/28	2018/11/28	BBY7SOP-00004 / BBY7SOP-00001	EPA 6020b R2 m
Moisture	3	2018/11/27	2018/11/28	BBY8SOP-00017	BCMOE BCLM Dec2000 m
PAH in Soil by GC/MS (SIM)	3	2018/11/27	2018/11/28	BBY8SOP-00022	BCMOE BCLM Jul2017m
Total PAH and B(a)P Calculation (1)	3	N/A	2018/11/29	BBY WI-00033	Auto Calc
pH (2:1 DI Water Extract)	3	2018/11/28	2018/11/28	BBY6SOP-00028	BCMOE BCLM Mar2005 m
EPH less PAH in Soil By GC/FID (2)	3	N/A	2018/11/29	BBY WI-00033	Auto Calc
EPH in Soil by GC/FID	3	2018/11/27	2018/11/28	BBY8SOP-00029	BCMOE BCLM Jul 2016
Extra VOCs in Soil - Field Pres. (3)	1	N/A	2018/11/28	BBY8SOP-00040	BCMOE BCLM Sep 2017m
VOCs, VH, F1, LH in Soil - Field Pres. (3)	1	N/A	2018/11/29	BBY8SOP-00009/11/12	BCMOE BCLM Sep 2017m
Volatile HC-BTEX for Soil (4)	1	N/A	2018/11/29	BBY WI-00033	Auto Calc

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your Project #: 13639-2D
Your C.O.C. #: K021470, K021471

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/11/29
Report #: R2658110
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8A3869

Received: 2018/11/23, 16:25

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Total PAHs in Soil include: Quinoline, Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Acridine, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b&j)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, and Benzo(g,h,i)perylene.

Total PAHs in Sediment include: Naphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(a)pyrene, and Dibenz(a,h)anthracene.
(2) LEPH = EPH (C10 to C19) - (Naphthalene + Phenanthrene)
HEPH = EPH (C19 to C32) - (Benzo(a)anthracene + Benzo(a)pyrene + Benzo(b)fluoranthene + Benzo(k)fluoranthene + Dibenz(a,h)anthracene + Indeno(1,2,3-cd)pyrene + Pyrene)
(3) The extraction date for VOC, BTEX, VH, or F1 samples that are field preserved with methanol equals the date sampled, unless otherwise stated.
(4) VPH = VH - (Benzene + Toluene + Ethylbenzene + m & p-Xylene + o-Xylene + Styrene)

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Gail Pedersen, Project Manager –Environmental Customer Service
Email: gpedersen@maxxam.ca
Phone# (604) 734 7276

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Maxxam Job #: B8A3869
Report Date: 2018/11/29

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

PHYSICAL TESTING (SOIL)

Maxxam ID		UV8298	UV8300	UV8305		
Sampling Date		2018/11/23 08:05	2018/11/23 08:20	2018/11/23 09:55		
COC Number		K021470	K021470	K021470		
	UNITS	MW18-16 (1.2)	MW18-16 (2.4)	BH18-17 (0.3)	RDL	QC Batch
Physical Properties						
Moisture	%	26	36	24	0.30	9244161
RDL = Reportable Detection Limit						

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Maxxam Job #: B8A3869
Report Date: 2018/11/29

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		UV8300		
Sampling Date		2018/11/23 08:20		
COC Number		K021470		
	UNITS	**MW18-16 (2.4)**	**RDL**	**QC Batch**
Volatiles				
Extractable (MeOH) 2-Butanone (MEK)	mg/kg	<15	15	9245055
Extractable (MeOH) 4-Methyl-2-pentanone (MIBK)	mg/kg	<0.50	0.50	9245055
Surrogate Recovery (%)				
Extractable (MeOH) 1,4-Difluorobenzene (sur.)	%	105		9245055
Extractable (MeOH) 4-Bromofluorobenzene (sur.)	%	104		9245055
Extractable (MeOH) D4-1,2-Dichloroethane (sur.)	%	99		9245055
RDL = Reportable Detection Limit				

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Maxxam Job #: B8A3869
Report Date: 2018/11/29

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

LEPH & HEPH WITH PAH FOR CSR IN SOIL (SOIL)

Maxxam ID		UV8298	UV8300	UV8305		
Sampling Date		2018/11/23 08:05	2018/11/23 08:20	2018/11/23 09:55		
COC Number		K021470	K021470	K021470		
	UNITS	MW18-16 (1.2)	MW18-16 (2.4)	BH18-17 (0.3)	RDL	QC Batch
Calculated Parameters						
Low Molecular Weight PAH`s	ug/g	0.73	0.21	<0.050	0.050	9243605
High Molecular Weight PAH`s	ug/g	3.7	2.4	0.30	0.050	9243605
Total PAH	ug/g	4.4	2.6	0.31	0.050	9243605
Polycyclic Aromatics						
Quinoline	ug/g	<0.050	<0.050	<0.050	0.050	9244642
Naphthalene	ug/g	0.031	<0.010	<0.010	0.010	9244642
1-Methylnaphthalene	ug/g	<0.050	<0.050	<0.050	0.050	9244642
2-Methylnaphthalene	ug/g	0.042 (1)	<0.020	<0.020	0.020	9244642
Acenaphthylene	ug/g	0.10	0.11	0.011	0.0050	9244642
Acenaphthene	ug/g	0.033 (1)	<0.0050	<0.0050	0.0050	9244642
Fluorene	ug/g	0.038	<0.020	<0.020	0.020	9244642
Phenanthrene	ug/g	0.33	0.043	<0.010	0.010	9244642
Anthracene	ug/g	0.097	0.064	0.0047	0.0040	9244642
Fluoranthene	ug/g	0.67	0.15	<0.020	0.020	9244642
Pyrene	ug/g	0.62	0.17	<0.020	0.020	9244642
Benzo(a)anthracene	ug/g	0.28	0.14	<0.020	0.020	9244642
Chrysene	ug/g	0.34	0.19 (1)	0.026	0.020	9244642
Benzo(b&j)fluoranthene	ug/g	0.56	0.43	0.070	0.020	9244642
Benzo(b)fluoranthene	ug/g	0.34	0.27	0.049	0.020	9244642
Benzo(k)fluoranthene	ug/g	0.17	0.14	<0.020	0.020	9244642
Benzo(a)pyrene	ug/g	0.34	0.35	0.068	0.020	9244642
Indeno(1,2,3-cd)pyrene	ug/g	0.27	0.31	0.042	0.020	9244642
Dibenz(a,h)anthracene	ug/g	0.078	0.11	<0.020	0.020	9244642
Benzo(g,h,i)perylene	ug/g	0.32	0.37	0.091	0.050	9244642
Calculated Parameters						
LEPH (C10-C19 less PAH)	mg/kg	1200	<100	<100	100	9243610
HEPH (C19-C32 less PAH)	mg/kg	1500	640	<100	100	9243610
Hydrocarbons						
EPH (C10-C19)	mg/kg	1200	<100	<100	100	9244663
EPH (C19-C32)	mg/kg	1500	640	<100	100	9244663

RDL = Reportable Detection Limit
(1) Tentatively identified result and may be potentially biased high due to matrix interference.

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Maxxam Job #: B8A3869
Report Date: 2018/11/29

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

LEPH & HEPH WITH PAH FOR CSR IN SOIL (SOIL)

Maxxam ID		UV8298	UV8300	UV8305		
Sampling Date		2018/11/23 08:05	2018/11/23 08:20	2018/11/23 09:55		
COC Number		K021470	K021470	K021470		
	UNITS	MW18-16 (1.2)	MW18-16 (2.4)	BH18-17 (0.3)	RDL	QC Batch
Surrogate Recovery (%)						
D10-ANTHRACENE (sur.)	%	94	92	86		9244642
D8-ACENAPHTHYLENE (sur.)	%	73	77	80		9244642
D8-NAPHTHALENE (sur.)	%	75	72	73		9244642
TERPHENYL-D14 (sur.)	%	86	81	83		9244642
O-TERPHENYL (sur.)	%	97	88	89		9244663
RDL = Reportable Detection Limit						

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Maxxam Job #: B8A3869
Report Date: 2018/11/29

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR/CCME METALS IN SOIL WITH HG (SOIL)

Maxxam ID		UV8298	UV8300	UV8305		
Sampling Date		2018/11/23 08:05	2018/11/23 08:20	2018/11/23 09:55		
COC Number		K021470	K021470	K021470		
	UNITS	MW18-16 (1.2)	MW18-16 (2.4)	BH18-17 (0.3)	RDL	QC Batch
Physical Properties						
Soluble (2:1) pH	pH	6.33	6.12	5.96	N/A	9244574
Total Metals by ICPMS						
Total Aluminum (Al)	mg/kg	20900	25200	24000	100	9244569
Total Antimony (Sb)	mg/kg	0.97	0.74	0.27	0.10	9244569
Total Arsenic (As)	mg/kg	6.74	5.21	3.53	0.50	9244569
Total Barium (Ba)	mg/kg	245	87.0	65.4	0.10	9244569
Total Beryllium (Be)	mg/kg	0.40	0.35	0.45	0.20	9244569
Total Boron (B)	mg/kg	11.2	4.5	2.6	1.0	9244569
Total Cadmium (Cd)	mg/kg	0.364	0.168	0.199	0.050	9244569
Total Chromium (Cr)	mg/kg	25.7	22.1	26.4	1.0	9244569
Total Cobalt (Co)	mg/kg	7.35	7.36	5.93	0.30	9244569
Total Copper (Cu)	mg/kg	87.3	22.9	16.5	0.50	9244569
Total Lead (Pb)	mg/kg	113	91.0	11.3	0.10	9244569
Total Manganese (Mn)	mg/kg	390	777	189	0.20	9244569
Total Mercury (Hg)	mg/kg	0.096	0.138	0.121	0.050	9244569
Total Molybdenum (Mo)	mg/kg	0.89	0.92	1.28	0.10	9244569
Total Nickel (Ni)	mg/kg	19.3	12.6	9.84	0.80	9244569
Total Selenium (Se)	mg/kg	<0.50	0.60	0.72	0.50	9244569
Total Silver (Ag)	mg/kg	0.105	0.158	0.165	0.050	9244569
Total Strontium (Sr)	mg/kg	57.4	35.4	31.4	0.10	9244569
Total Tin (Sn)	mg/kg	8.79	13.9	0.90	0.10	9244569
Total Titanium (Ti)	mg/kg	1020	1050	1280	1.0	9244569
Total Tungsten (W)	mg/kg	<0.50	<0.50	<0.50	0.50	9244569
Total Vanadium (V)	mg/kg	59.8	55.8	68.2	2.0	9244569
Total Zinc (Zn)	mg/kg	265	106	54.1	1.0	9244569

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B8A3869
Report Date: 2018/11/29

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR VOC + VPH IN SOIL - FIELD PRESERVED (SOIL)

Maxxam ID		UV8300		
Sampling Date		2018/11/23 08:20		
COC Number		K021470		
	UNITS	MW18-16 (2.4)	RDL	QC Batch
Calculated Parameters				
VPH (VH6 to 10 - BTEX)	mg/kg	<10	10	9243615
Volatiles				
VH C6-C10	mg/kg	<10	10	9244759
1,1,1,2-tetrachloroethane	mg/kg	<0.020	0.020	9244759
1,1,1-trichloroethane	mg/kg	<0.020	0.020	9244759
1,1,2,2-tetrachloroethane	mg/kg	<0.020	0.020	9244759
1,1,2-trichloroethane	mg/kg	<0.020	0.020	9244759
1,1-dichloroethane	mg/kg	<0.025	0.025	9244759
1,1-dichloroethene	mg/kg	<0.025	0.025	9244759
1,2-dibromoethane	mg/kg	<0.020	0.020	9244759
1,2-dichlorobenzene	mg/kg	<0.020	0.020	9244759
1,2-dichloroethane	mg/kg	<0.020	0.020	9244759
1,2-dichloropropane	mg/kg	<0.020	0.020	9244759
1,3-Butadiene	mg/kg	<0.080	0.080	9244759
1,3-dichlorobenzene	mg/kg	<0.020	0.020	9244759
1,4-dichlorobenzene	mg/kg	<0.020	0.020	9244759
Benzene	mg/kg	<0.0050	0.0050	9244759
Bromobenzene	mg/kg	<0.20	0.20	9244759
Bromodichloromethane	mg/kg	<0.050	0.050	9244759
Bromoform	mg/kg	<0.050	0.050	9244759
Bromomethane	mg/kg	<0.30	0.30	9244759
Carbon tetrachloride	mg/kg	<0.020	0.020	9244759
Chlorobenzene	mg/kg	<0.020	0.020	9244759
Chlorodibromomethane	mg/kg	<0.050	0.050	9244759
Chloroethane	mg/kg	<0.10	0.10	9244759
Chloroform	mg/kg	<0.020	0.020	9244759
Chloromethane	mg/kg	<0.050	0.050	9244759
cis-1,2-dichloroethene	mg/kg	<0.030	0.030	9244759
cis-1,3-dichloropropene	mg/kg	<0.020	0.020	9244759
Dibromomethane	mg/kg	<0.20	0.20	9244759
Dichlorodifluoromethane	mg/kg	<0.20	0.20	9244759
Dichloromethane	mg/kg	<0.080	0.080	9244759
RDL = Reportable Detection Limit				

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Maxxam Job #: B8A3869
Report Date: 2018/11/29

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR VOC + VPH IN SOIL - FIELD PRESERVED (SOIL)

Maxxam ID		UV8300		
Sampling Date		2018/11/23 08:20		
COC Number		K021470		
	UNITS	**MW18-16 (2.4)**	**RDL**	**QC Batch**
Ethylbenzene	mg/kg	<0.010	0.010	9244759
Styrene	mg/kg	<0.030	0.030	9244759
Tetrachloroethene	mg/kg	<0.010	0.010	9244759
Toluene	mg/kg	<0.020	0.020	9244759
trans-1,2-dichloroethene	mg/kg	<0.030	0.030	9244759
trans-1,3-dichloropropene	mg/kg	<0.020	0.020	9244759
Trichloroethene	mg/kg	<0.0090	0.0090	9244759
Trichlorofluoromethane	mg/kg	<0.20	0.20	9244759
Vinyl chloride	mg/kg	<0.040	0.040	9244759
m & p-Xylene	mg/kg	<0.040	0.040	9244759
o-Xylene	mg/kg	<0.040	0.040	9244759
Xylenes (Total)	mg/kg	<0.040	0.040	9244759
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	100		9244759
4-Bromofluorobenzene (sur.)	%	83		9244759
D10-ETHYLBENZENE (sur.)	%	90		9244759
D4-1,2-Dichloroethane (sur.)	%	82		9244759
RDL = Reportable Detection Limit				

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Maxxam Job #: B8A3869
Report Date: 2018/11/29

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	9.3°C

Results relate only to the items tested.

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Maxxam Job #: B8A3869
Report Date: 2018/11/29

QUALITY ASSURANCE REPORT

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9244642	D10-ANTHRACENE (sur.)	2018/11/28	81	50 - 140	73	50 - 140	71	%				
9244642	D8-ACENAPHTHYLENE (sur.)	2018/11/28	79	50 - 140	74	50 - 140	65	%				
9244642	D8-NAPHTHALENE (sur.)	2018/11/28	72	50 - 140	69	50 - 140	62	%				
9244642	TERPHENYL-D14 (sur.)	2018/11/28	81	50 - 140	75	50 - 140	69	%				
9244663	O-TERPHENYL (sur.)	2018/11/28	70	60 - 140	67	60 - 140	86	%				
9244759	1,4-Difluorobenzene (sur.)	2018/11/29	99	50 - 140	99	50 - 140	100	%				
9244759	4-Bromofluorobenzene (sur.)	2018/11/29	100	50 - 140	96	50 - 140	96	%				
9244759	D10-ETHYLBENZENE (sur.)	2018/11/29	106	50 - 140	84	50 - 140	102	%				
9244759	D4-1,2-Dichloroethane (sur.)	2018/11/29	106	50 - 140	96	50 - 140	95	%				
9245055	Extractable (MeOH) 1,4-Difluorobenzene (sur.)	2018/11/28			125	50 - 140	106	%				
9245055	Extractable (MeOH) 4-Bromofluorobenzene (sur.)	2018/11/28			102	50 - 140	102	%				
9245055	Extractable (MeOH) D4-1,2-Dichloroethane (sur.)	2018/11/28			89	50 - 140	101	%				
9244161	Moisture	2018/11/28					<0.30	%	4.5	20		
9244569	Total Aluminum (Al)	2018/11/28					118, RDL=100 (1)	mg/kg	8.1	40	110	70 - 130
9244569	Total Antimony (Sb)	2018/11/28	92	75 - 125	101	75 - 125	<0.10	mg/kg	6.2	30	119	70 - 130
9244569	Total Arsenic (As)	2018/11/28	99	75 - 125	101	75 - 125	<0.50	mg/kg	0.34	30	101	70 - 130
9244569	Total Barium (Ba)	2018/11/28	NC	75 - 125	105	75 - 125	<0.10	mg/kg	1.9	40	107	70 - 130
9244569	Total Beryllium (Be)	2018/11/28	104	75 - 125	110	75 - 125	<0.20	mg/kg	2.3	30	123	70 - 130
9244569	Total Boron (B)	2018/11/28					<1.0	mg/kg	18	30		
9244569	Total Cadmium (Cd)	2018/11/28	103	75 - 125	105	75 - 125	<0.050	mg/kg	0.19	30	103	70 - 130
9244569	Total Chromium (Cr)	2018/11/28	98	75 - 125	105	75 - 125	<1.0	mg/kg	7.0	30	116	70 - 130
9244569	Total Cobalt (Co)	2018/11/28	100	75 - 125	104	75 - 125	<0.30	mg/kg	1.2	30	107	70 - 130
9244569	Total Copper (Cu)	2018/11/28	97	75 - 125	104	75 - 125	<0.50	mg/kg	2.7	30	115	70 - 130
9244569	Total Lead (Pb)	2018/11/28	99	75 - 125	102	75 - 125	<0.10	mg/kg	4.5	40	121	70 - 130
9244569	Total Manganese (Mn)	2018/11/28	NC	75 - 125	102	75 - 125	<0.20	mg/kg	2.7	30	108	70 - 130
9244569	Total Mercury (Hg)	2018/11/28	104	75 - 125	105	75 - 125	<0.050	mg/kg	NC	40	107	70 - 130
9244569	Total Molybdenum (Mo)	2018/11/28	101	75 - 125	103	75 - 125	<0.10	mg/kg	10	40	113	70 - 130
9244569	Total Nickel (Ni)	2018/11/28	98	75 - 125	103	75 - 125	<0.80	mg/kg	1.4	30	112	70 - 130

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Maxxam Job #: B8A3869
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QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9244569	Total Selenium (Se)	2018/11/28	100	75 - 125	103	75 - 125	<0.50	mg/kg	NC	30		
9244569	Total Silver (Ag)	2018/11/28	100	75 - 125	99	75 - 125	<0.050	mg/kg	30	40	97	70 - 130
9244569	Total Strontium (Sr)	2018/11/28	NC	75 - 125	101	75 - 125	<0.10	mg/kg	7.2	40	116	70 - 130
9244569	Total Tin (Sn)	2018/11/28	99	75 - 125	104	75 - 125	<0.10	mg/kg	11	40	115	70 - 130
9244569	Total Titanium (Ti)	2018/11/28	NC	75 - 125	106	75 - 125	<1.0	mg/kg	7.9	40		
9244569	Total Tungsten (W)	2018/11/28					<0.50	mg/kg	NC	30		
9244569	Total Vanadium (V)	2018/11/28	NC	75 - 125	103	75 - 125	<2.0	mg/kg	0.98	30	112	70 - 130
9244569	Total Zinc (Zn)	2018/11/28	NC	75 - 125	104	75 - 125	<1.0	mg/kg	0.77	30	115	70 - 130
9244574	Soluble (2:1) pH	2018/11/28			100	97 - 103						
9244642	1-Methylnaphthalene	2018/11/28	85	50 - 140	77	50 - 140	<0.050	ug/g	NC	50		
9244642	2-Methylnaphthalene	2018/11/28	86	50 - 140	77	50 - 140	<0.020	ug/g	NC	50		
9244642	Acenaphthene	2018/11/28	85	50 - 140	77	50 - 140	<0.0050	ug/g	NC	50		
9244642	Acenaphthylene	2018/11/28	85	50 - 140	78	50 - 140	<0.0050	ug/g	NC	50		
9244642	Anthracene	2018/11/28	83	50 - 140	75	50 - 140	<0.0040	ug/g	NC	50		
9244642	Benzo(a)anthracene	2018/11/28	77	50 - 140	71	50 - 140	<0.020	ug/g	NC	50		
9244642	Benzo(a)pyrene	2018/11/28	80	50 - 140	74	50 - 140	<0.020	ug/g	NC	50		
9244642	Benzo(b&j)fluoranthene	2018/11/28	80	50 - 140	72	50 - 140	<0.020	ug/g	NC	50		
9244642	Benzo(b)fluoranthene	2018/11/28	83	50 - 140	73	50 - 140	<0.020	ug/g	NC	50		
9244642	Benzo(g,h,i)perylene	2018/11/28	92	50 - 140	84	50 - 140	<0.050	ug/g	NC	50		
9244642	Benzo(k)fluoranthene	2018/11/28	75	50 - 140	74	50 - 140	<0.020	ug/g	NC	50		
9244642	Chrysene	2018/11/28	76	50 - 140	71	50 - 140	<0.020	ug/g	NC	50		
9244642	Dibenz(a,h)anthracene	2018/11/28	86	50 - 140	79	50 - 140	<0.020	ug/g	NC	50		
9244642	Fluoranthene	2018/11/28	83	50 - 140	77	50 - 140	<0.020	ug/g	NC	50		
9244642	Fluorene	2018/11/28	80	50 - 140	73	50 - 140	<0.020	ug/g	NC	50		
9244642	Indeno(1,2,3-cd)pyrene	2018/11/28	83	50 - 140	76	50 - 140	<0.020	ug/g	NC	50		
9244642	Naphthalene	2018/11/28	87	50 - 140	80	50 - 140	<0.010	ug/g	19	50		
9244642	Phenanthrene	2018/11/28	82	50 - 140	75	50 - 140	<0.010	ug/g	NC	50		
9244642	Pyrene	2018/11/28	82	50 - 140	76	50 - 140	<0.020	ug/g	NC	50		
9244642	Quinoline	2018/11/28	119	50 - 140	119	50 - 140	<0.050	ug/g	NC	50		
9244663	EPH (C10-C19)	2018/11/28	86	60 - 140	81	70 - 130	<100	mg/kg	NC	40		
9244663	EPH (C19-C32)	2018/11/28	82	60 - 140	79	70 - 130	<100	mg/kg	NC	40		

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City of Vancouver - FOI 2023-228 - Page 552 of 1003

Maxxam Job #: B8A3869
Report Date: 2018/11/29

QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9244759	1,1,1,2-tetrachloroethane	2018/11/29	104	50 - 140	98	60 - 130	<0.020	mg/kg	NC	50		
9244759	1,1,1-trichloroethane	2018/11/29	101	50 - 140	97	60 - 130	<0.020	mg/kg	NC	50		
9244759	1,1,2,2-tetrachloroethane	2018/11/29	111	50 - 140	102	60 - 130	<0.020	mg/kg	NC	50		
9244759	1,1,2-trichloroethane	2018/11/29	111	50 - 140	104	60 - 130	<0.020	mg/kg	NC	50		
9244759	1,1-dichloroethane	2018/11/29	101	50 - 140	100	60 - 130	<0.025	mg/kg	NC	50		
9244759	1,1-dichloroethene	2018/11/29	96	50 - 140	98	60 - 130	<0.025	mg/kg	NC	50		
9244759	1,2-dibromoethane	2018/11/29	107	50 - 140	106	60 - 130	<0.020	mg/kg	NC	50		
9244759	1,2-dichlorobenzene	2018/11/29	113	50 - 140	111	60 - 130	<0.020	mg/kg	NC	50		
9244759	1,2-dichloroethane	2018/11/29	98	50 - 140	98	60 - 130	<0.020	mg/kg	NC	50		
9244759	1,2-dichloropropane	2018/11/29	109	50 - 140	106	60 - 130	<0.020	mg/kg	NC	50		
9244759	1,3-Butadiene	2018/11/29	47 (2)	50 - 140	52 (2)	60 - 130	<0.080	mg/kg	NC	50		
9244759	1,3-dichlorobenzene	2018/11/29	112	50 - 140	112	60 - 130	<0.020	mg/kg	NC	50		
9244759	1,4-dichlorobenzene	2018/11/29	108	50 - 140	108	60 - 130	<0.020	mg/kg	NC	50		
9244759	Benzene	2018/11/29	99	50 - 140	100	60 - 130	<0.0050	mg/kg	NC	50		
9244759	Bromobenzene	2018/11/29	109	50 - 140	105	60 - 130	<0.20	mg/kg				
9244759	Bromodichloromethane	2018/11/29	104	50 - 140	100	60 - 130	<0.050	mg/kg	NC	50		
9244759	Bromoform	2018/11/29	107	50 - 140	100	60 - 130	<0.050	mg/kg	NC	50		
9244759	Bromomethane	2018/11/29	96	50 - 140	100	60 - 130	<0.30	mg/kg	NC	50		
9244759	Carbon tetrachloride	2018/11/29	103	50 - 140	99	60 - 130	<0.020	mg/kg	NC	50		
9244759	Chlorobenzene	2018/11/29	106	50 - 140	102	60 - 130	<0.020	mg/kg	NC	50		
9244759	Chlorodibromomethane	2018/11/29	103	50 - 140	100	60 - 130	<0.050	mg/kg	NC	50		
9244759	Chloroethane	2018/11/29	74	50 - 140	80	60 - 130	<0.10	mg/kg	NC	50		
9244759	Chloroform	2018/11/29	98	50 - 140	97	60 - 130	<0.020	mg/kg	NC	50		
9244759	Chloromethane	2018/11/29	72	50 - 140	87	60 - 130	<0.050	mg/kg	NC	50		
9244759	cis-1,2-dichloroethene	2018/11/29	101	50 - 140	100	60 - 130	<0.030	mg/kg	NC	50		
9244759	cis-1,3-dichloropropene	2018/11/29	111	50 - 140	111	50 - 140	<0.020	mg/kg	NC	50		
9244759	Dibromomethane	2018/11/29	102	50 - 140	98	60 - 130	<0.20	mg/kg				
9244759	Dichlorodifluoromethane	2018/11/29			65	60 - 130	<0.20	mg/kg				
9244759	Dichloromethane	2018/11/29	95	50 - 140	97	60 - 130	<0.080	mg/kg	NC	50		
9244759	Ethylbenzene	2018/11/29	110	50 - 140	113	60 - 130	<0.010	mg/kg	NC	50		
9244759	m & p-Xylene	2018/11/29	110	50 - 140	117	60 - 130	<0.040	mg/kg	NC	50		

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City of Vancouver - FOI 2023-228 - Page 553 of 1003

Maxxam Job #: B8A3869
Report Date: 2018/11/29

QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9244759	o-Xylene	2018/11/29	108	50 - 140	115	60 - 130	<0.040	mg/kg	NC	50		
9244759	Styrene	2018/11/29	115	50 - 140	102	60 - 130	<0.030	mg/kg	NC	50		
9244759	Tetrachloroethene	2018/11/29	106	50 - 140	115	60 - 130	<0.010	mg/kg	NC	50		
9244759	Toluene	2018/11/29	105	50 - 140	107	60 - 130	<0.020	mg/kg	NC	50		
9244759	trans-1,2-dichloroethene	2018/11/29	99	50 - 140	99	60 - 130	<0.030	mg/kg	NC	50		
9244759	trans-1,3-dichloropropene	2018/11/29	110	50 - 140	115	50 - 140	<0.020	mg/kg	NC	50		
9244759	Trichloroethene	2018/11/29	102	50 - 140	97	60 - 130	<0.0090	mg/kg	NC	50		
9244759	Trichlorofluoromethane	2018/11/29	95	50 - 140	92	60 - 130	<0.20	mg/kg	NC	50		
9244759	VH C6-C10	2018/11/29			81	60 - 130	<10	mg/kg	NC	50		
9244759	Vinyl chloride	2018/11/29	76	50 - 140	76	60 - 130	<0.040	mg/kg	NC	50		
9244759	Xylenes (Total)	2018/11/29					<0.040	mg/kg	NC	50		
9245055	Extractable (MeOH) 2-Butanone (MEK)	2018/11/28			77	50 - 140	<15	mg/kg	NC	50		
9245055	Extractable (MeOH) 4-Methyl-2-pentanone (MIBK)	2018/11/28			69	50 - 140	<0.50	mg/kg	NC	50		

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Method Blank exceeds acceptance limits. Sample values for Al are >10x the concentration of the method blank and the contamination is considered insignificant.

(2) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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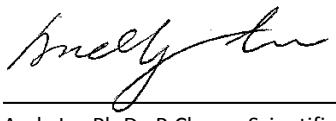
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Maxxam Job #: B8A3869
Report Date: 2018/11/29

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Andy Lu, Ph.D., P.Chem., Scientific Specialist



Jose Cueva, Supervisor, Organics-VOC & HC

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Updated CoC 1/2

CHAIN OF CUSTODY RECORD

K021470

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BBY FCD-00077/07

Page 1 of 2

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3783 - Keystone Environmental Ltd.	Company Name:	Quotation #: B61848	☑ Regular TAT 5 days (most analysis)
Contact Name: Nicole MacDonald	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: 13639-20	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☐ 3 Days
Phone: (604) 430-0671	Phone:	Site #:	☐ 1 Day ☐ 4 Days
Email: nmacdonald@keystoneenviro.com	Email: SubmitHere@keystoneenviro.com	Sampled By: Stewart McBride	Date Required:

Regulatory Criteria	Special Instructions
☑ BC CSR Soil ☐ BC CSR Water	☐ Return Cooler
☐ Yk CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)
☐ CCME (Specify) ☐ Other (Specify)	
☐ Drinking Water ☐ BC Water Quality	

Rush Confirmation #:

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	BTEX / VPH	BTEX / F1	PAH	EPH	Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Chloride	TDS	pH	Nitrate/Nitrite	Key metals	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE
1	MW18-5	2018/11/23	08:00	Soil														4	X
2	MW18-16 (0.4)		08:20																
3	(1.2)		08:05				X										X		
4	(1.8)		08:15																
5	(2.4)		08:20		X		X										X		
6	(3.3)		08:30																
7	(4.4)		08:35																
8	(4.9)		08:45																
9	(5.8)		08:50																
10	BH18-17 (0.3)		09:55				X										X		

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Stewart McBride	2018/11/23	15:22	MONA AZIZ	2018-11-23	16:25

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LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
N	—	9.2, 10

COOLING MEDIA PRESENT (Y) N

COMMENTS

COC-1027 Keystone

0106

B8A3869_COC

Updated CoC 2/2

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Page 2 of 2

Invoice Information		Report Information (if differs from invoice)		Project Information (where applicable)		Turnaround Time (TAT) Required
Company Name:	3763 - Keystone Environmental Ltd.	Company Name:		Quotation #:	BC893	☑ Regular TAT 5 days (Most analyses)
Contact Name:	Nicole Macdonald	Contact Name:		P.O. #/ AFE#:		PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address:	#320 - 4400 Dominion Street	Address:		Project #:	13654-10	Rush TAT (Surcharges will be applied)
	Burnaby, BC PC: V5G 4G3		PC:	Site Location:		☐ Same Day ☐ 2 Days
Phone:	(604) 430-0671	Phone:		Site #:		☐ 1 Day ☐ 3 Days
Email:	nmacdonald@keystoneenviro.com	Email:	smcbride@keystoneenviro.com	Sampled By:	Stewart McBride	Date Required:

Regulatory Criteria		Special Instructions	Analysis Requested	Rush Confirmation #:
☑ BC CSR Soil	☐ BC CSR Water	☐ Return Cooler		
☐ YK CSR Soil	☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)		
☐ CCME (Specify)	☐ Other (Specify)			
☐ Drinking Water	☐ BC Water Quality			

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE
1	BH18-17 (0.9)	2018/11/23	09:50	Soil	4	X
2	(2.0)		10:10			
3	(2.3)		10:15			
4						
5						
6						
7						
8						
9						
10						

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
N	-	7.5, 10

COOLING MEDIA PRESENT: Y / N

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Stewart McBride	2018/11/23	15:22	MONA AZIZ	2018-11-23	16:25

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Page 1 of ____

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from Invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #: B61898	☑ Regular TAT 5 days (Most analyses)
Contact Name: Nicole MacDonald	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: 13639-20	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☐ 2 Days
Phone: (604) 430-0671	Phone:	Site #:	☐ 1 Day ☐ 3 Days
Email: nmacdonald@keystoneenviro.com	Email: sarbinder@keystoneenviro.com	Sampled By: Stewart McBride	Date Required:

Regulatory Criteria	Special Instructions	Rush Confirmation #:
☑ BC CSR Soil ☐ BC CSR Water	☐ Return Cooler	
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)	
☐ CCME (Specify) ☐ Other (Specify)		
☐ Drinking Water ☐ BC Water Quality		

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested: ☐ MTBE; ☐ VOC / BTEXS / VPH; ☐ VOC / BTEX / F1; ☐ LEPH/HEPH/PAH; ☐ F2 - F4; ☐ Preserved?; ☐ Preserved?; ☐ Field Preserved?; ☐ Field Preserved?; ☐ Sulphate; ☐ COD; ☐ Alkalinity; ☐ Ammonia; ☐ BTEXS / VPH; ☐ BTEX / F1; ☐ PAH; ☐ EPH; ☐ TEH; ☐ Filtered?; ☐ Filtered?; ☐ Dissolved Metals; ☐ Dissolved Mercury; ☐ Total Metals; ☐ Total Mercury; ☐ Chloride; ☐ Fluoride; ☐ BOD; ☐ TDS; ☐ TSS; ☐ pH; ☐ Conductivity; ☐ Nitrate; ☐ Nitrite; # OF CONTAINERS SUBMITTED; HOLD - DO NOT ANALYZE

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
N	—	9, 9, 10

COOLING MEDIA PRESENT Y (N)

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE	COMMENTS
1	MW18-1	2018/11/23	08:00	Soil	4	✓	
2	MW18-16 (0.4)		08:00				
3	(1.2)		08:05				
4	(1.8)		08:15				
5	(2.4)		08:20				
6	(3.3)		08:30				
7	(4.9)		08:35				
8	(4.9)		08:45				
9	(5.8)		08:50				
10	BH18-17 (0.3)		09:55				

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Stewart McBride	2018/11/23	17:22	MONA AZIZ	2018-11-23	16:25

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Page 2 of 2

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

Invoice information	Report information (if differs from invoice)	Project information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #: B61898	☑ Regular TAT 5 days (Most analyses)
Contact Name: Nicole MacDonald	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: 13659-20	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☐ 2 Days
Phone: (604) 430-0671	Phone:	Site #:	☐ 1 Day ☐ 3 Days
Email: nmacdonald@keystoneenviro.com	Email: smbride@keystoneenviro.com	Sampled By: Stewart McBride	Date Required:

Regulatory Criteria	Special Instructions
☑ BC CSR Soil ☐ BC CSR Water	☐ Return Cooler
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)
☐ CCME (Specify) ☐ Other (Specify)	
☐ Drinking Water ☐ BC Water Quality	

Rush Confirmation #:

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	BTEX/VPH	BTEX/F1	PAH	EPH	Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Chloride	TSS	pH	Nitrite	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE
1	BH18-17 (0.9)	2018/11/23	09:57	Soil													4	X
2	(2.0)	↓	10:10	↓													↓	↓
3	(2.8)	↓	10:15	↓													↓	↓
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Analysis Requested: MTBE; VOC / BTEX / VPH; VOC / BTEX / F1; LEPH/HEPH/PAH; F2 - F4; Preserved?; Preserved?; Filtered?; Field Preserved?; Field Preserved?; Sulphate; COD; Alkalinity; Ammonia; Filtered?; Filtered?; Dissolved Metals; Dissolved Mercury; Total Metals; Total Mercury; Chloride; Fluoride; BOD; TDS; Conductivity; Nitrate; TSS; pH; Nitrite

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
N	–	9.9.10

COOLING MEDIA PRESENT (Y) / N

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Stewart McBride	2018/11/23	16:22	MONA AZIZ	2018-11-23	16:25

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COC-1027 Keystone

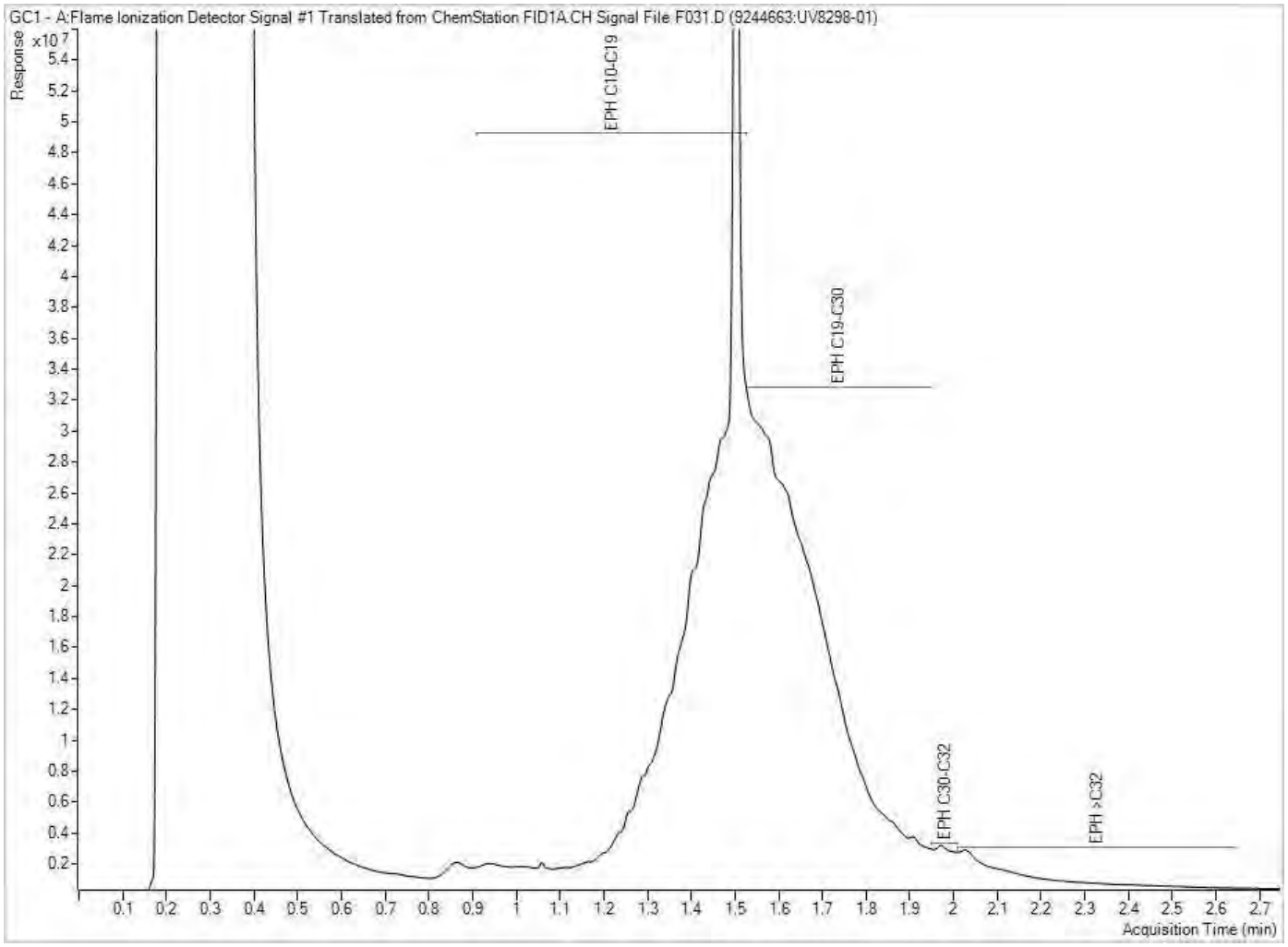
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B8A3869_COC

Maxxam Job #: B8A3869
Report Date: 2018/11/29
Maxxam Sample: UV8298

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-16 (1.2)

EPH in Soil by GC/FID Chromatogram



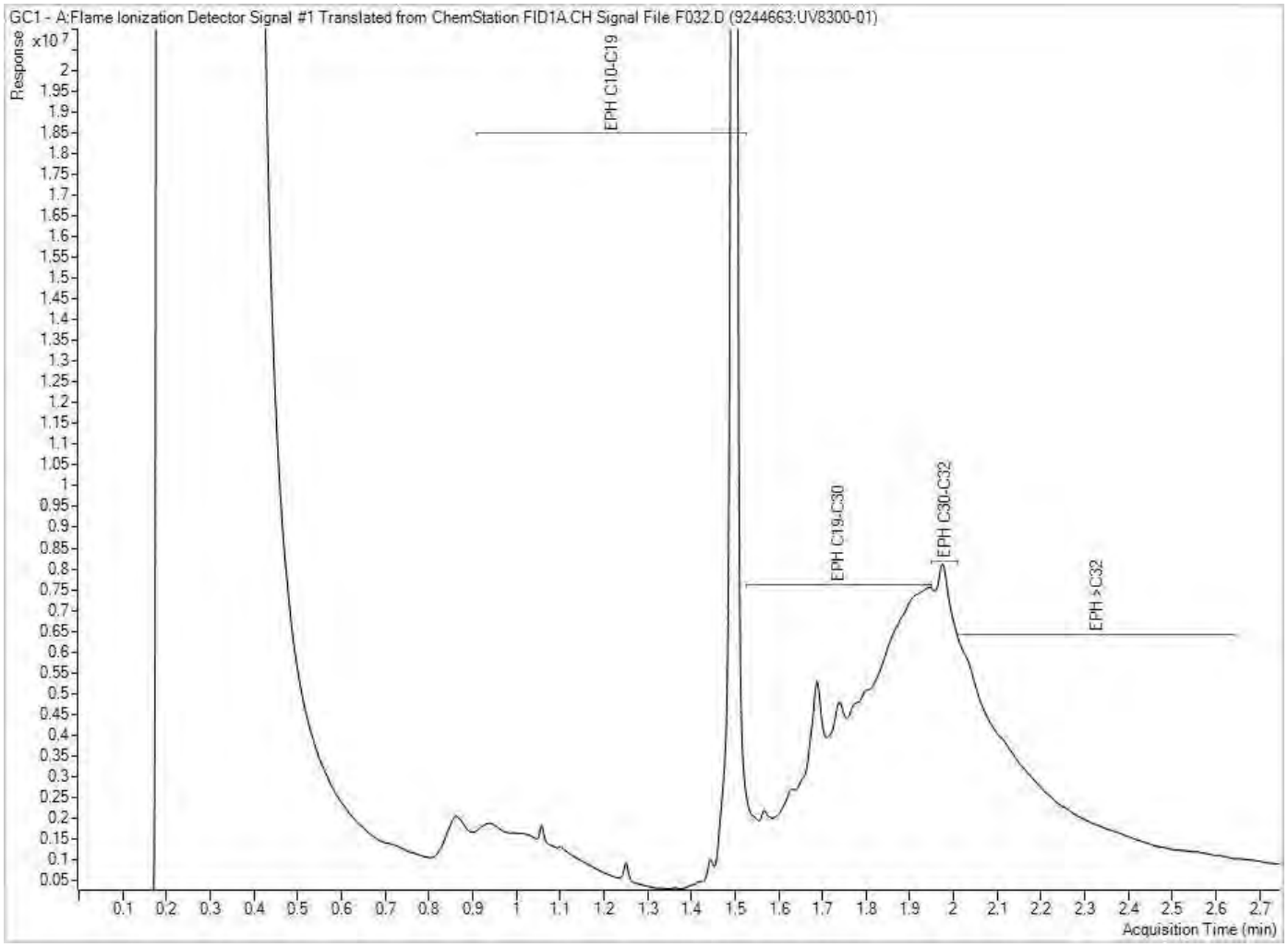
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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Maxxam Job #: B8A3869
Report Date: 2018/11/29
Maxxam Sample: UV8300

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-16 (2.4)

EPH in Soil by GC/FID Chromatogram



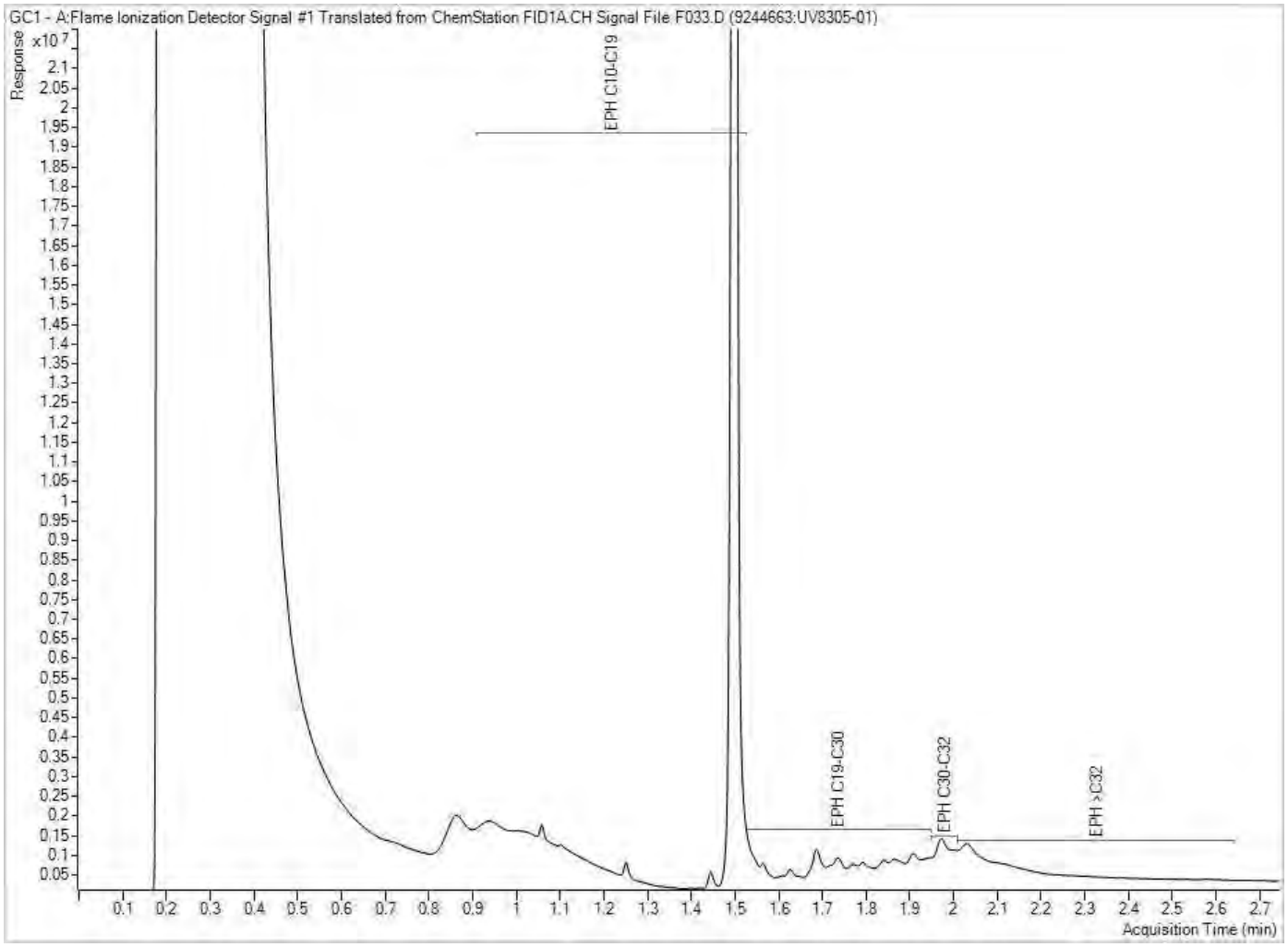
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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Maxxam Job #: B8A3869
Report Date: 2018/11/29
Maxxam Sample: UV8305

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: BH18-17 (0.3)

EPH in Soil by GC/FID Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

City of Vancouver - FOI 2023-228 - Page 562 of 1003

Your Project #: 13639-2C
Your C.O.C. #: K021472

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/11/30
Report #: R2658713
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8A3861
Received: 2018/11/23, 16:25

Sample Matrix: Soil
Samples Received: 7

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Elements by ICPMS (total)	2	2018/11/28	2018/11/28	BBY7SOP-00004 / BBY7SOP-00001	EPA 6020b R2 m
Elements by ICPMS (total)	5	2018/11/29	2018/11/29	BBY7SOP-00004 / BBY7SOP-00001	EPA 6020b R2 m
Moisture	7	2018/11/27	2018/11/28	BBY8SOP-00017	BCMOE BCLM Dec2000 m
PAH in Soil by GC/MS (SIM)	3	2018/11/27	2018/11/28	BBY8SOP-00022	BCMOE BCLM Jul2017m
PAH in Soil by GC/MS (SIM)	4	2018/11/28	2018/11/28	BBY8SOP-00022	BCMOE BCLM Jul2017m
Total PAH and B(a)P Calculation (1)	2	N/A	2018/11/29	BBY WI-00033	Auto Calc
Total PAH and B(a)P Calculation (1)	5	N/A	2018/11/30	BBY WI-00033	Auto Calc
pH (2:1 DI Water Extract)	2	2018/11/28	2018/11/28	BBY6SOP-00028	BCMOE BCLM Mar2005 m
pH (2:1 DI Water Extract)	5	2018/11/29	2018/11/29	BBY6SOP-00028	BCMOE BCLM Mar2005 m
EPH less PAH in Soil By GC/FID (2)	2	N/A	2018/11/29	BBY WI-00033	Auto Calc
EPH less PAH in Soil By GC/FID (2)	5	N/A	2018/11/30	BBY WI-00033	Auto Calc
EPH in Soil by GC/FID	3	2018/11/27	2018/11/28	BBY8SOP-00029	BCMOE BCLM Jul 2016
EPH in Soil by GC/FID	4	2018/11/28	2018/11/28	BBY8SOP-00029	BCMOE BCLM Jul 2016
Extra VOCs in Soil - Field Pres. (3)	2	N/A	2018/11/28	BBY8SOP-00040	BCMOE BCLM Sep 2017m
VOCs, VH, F1, LH in Soil - Field Pres. (3)	2	N/A	2018/11/29	BBY8SOP-00009/11/12	BCMOE BCLM Sep 2017m
Volatile HC-BTEX for Soil (4)	2	N/A	2018/11/29	BBY WI-00033	Auto Calc

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise

City of Vancouver - FOI 2023-228 - Page 563 of 1003

Your Project #: 13639-2C
Your C.O.C. #: K021472

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/11/30
Report #: R2658713
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8A3861
Received: 2018/11/23, 16:25

agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Total PAHs in Soil include: Quinoline, Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Acridine, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b&j)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, and Benzo(g,h,i)perylene.

Total PAHs in Sediment include: Naphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(a)pyrene, and Dibenz(a,h)anthracene.
(2) LEPH = EPH (C10 to C19) - (Naphthalene + Phenanthrene)
HEPH = EPH (C19 to C32) - (Benzo(a)anthracene + Benzo(a)pyrene + Benzo(b)fluoranthene + Benzo(k)fluoranthene + Dibenz(a,h)anthracene + Indeno(1,2,3-cd)pyrene + Pyrene)
(3) The extraction date for VOC, BTEX, VH, or F1 samples that are field preserved with methanol equals the date sampled, unless otherwise stated.
(4) VPH = VH - (Benzene + Toluene + Ethylbenzene + m & p-Xylene + o-Xylene + Styrene)

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Gail Pedersen, Project Manager –Environmental Customer Service
Email: gpedersen@maxxam.ca
Phone# (604) 734 7276

==========

This report has been generated and distributed using a secure automated process.
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam Job #: B8A3861
Report Date: 2018/11/30

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

PHYSICAL TESTING (SOIL)

Maxxam ID		UV8257	UV8258	UV8259	UV8260	UV8261	UV8262	UV8263		
Sampling Date		2018/11/23 11:10	2018/11/23 11:20	2018/11/23 11:40	2018/11/23 11:55	2018/11/23 12:10	2018/11/23 12:25	2018/11/23 12:10		
COC Number		K021472	K021472	K021472	K021472	K021472	K021472	K021472		
	UNITS	**SS18-1**	**SS18-2**	**SS18-3**	**SS18-4**	**SS18-5**	**SS18-6**	**SS18-A**	**RDL**	**QC Batch**
Physical Properties										
Moisture	%	14	18	21	19	16	26	13	0.30	9244260
RDL = Reportable Detection Limit										

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Maxxam Job #: B8A3861
Report Date: 2018/11/30

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		UV8257	UV8263		
Sampling Date		2018/11/23 11:10	2018/11/23 12:10		
COC Number		K021472	K021472		
	UNITS	SS18-1	SS18-A	RDL	QC Batch
Volatiles					
Extractable (MeOH) 2-Butanone (MEK)	mg/kg	<15	<15	15	9245055
Extractable (MeOH) 4-Methyl-2-pentanone (MIBK)	mg/kg	<0.50	<0.50	0.50	9245055
Surrogate Recovery (%)					
Extractable (MeOH) 1,4-Difluorobenzene (sur.)	%	105	105		9245055
Extractable (MeOH) 4-Bromofluorobenzene (sur.)	%	103	102		9245055
Extractable (MeOH) D4-1,2-Dichloroethane (sur.)	%	97	99		9245055
RDL = Reportable Detection Limit					

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Maxxam Job #: B8A3861
Report Date: 2018/11/30

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

LEPH & HEPH WITH PAH FOR CSR IN SOIL (SOIL)

Maxxam ID		UV8257			UV8257			UV8258	UV8259		
Sampling Date		2018/11/23 11:10			2018/11/23 11:10			2018/11/23 11:20	2018/11/23 11:40		
COC Number		K021472			K021472			K021472	K021472		
	UNITS	SS18-1	RDL	QC Batch	SS18-1 Lab-Dup	RDL	QC Batch	SS18-2	SS18-3	RDL	QC Batch
Calculated Parameters											
Low Molecular Weight PAH`s	ug/g	<0.050	0.050	9243605				<0.050	<0.050	0.050	9243605
High Molecular Weight PAH`s	ug/g	0.21	0.050	9243605				<0.050	<0.050	0.050	9243605
Total PAH	ug/g	0.26	0.050	9243605				0.069	<0.050	0.050	9243605
Polycyclic Aromatics											
Quinoline	ug/g	<0.050	0.050	9245024	<0.050	0.050	9245024	<0.050	<0.050	0.050	9245024
Naphthalene	ug/g	<0.010	0.010	9245024	<0.010	0.010	9245024	<0.010	<0.010	0.010	9245024
1-Methylnaphthalene	ug/g	<0.050	0.050	9245024	<0.050	0.050	9245024	<0.050	<0.050	0.050	9245024
2-Methylnaphthalene	ug/g	<0.020	0.020	9245024	<0.020	0.020	9245024	<0.020	<0.020	0.020	9245024
Acenaphthylene	ug/g	<0.0050	0.0050	9245024	<0.0050	0.0050	9245024	<0.0050	<0.0050	0.0050	9245024
Acenaphthene	ug/g	<0.0050	0.0050	9245024	<0.0050	0.0050	9245024	<0.0050	<0.0050	0.0050	9245024
Fluorene	ug/g	<0.020	0.020	9245024	<0.020	0.020	9245024	<0.020	<0.020	0.020	9245024
Phenanthrene	ug/g	0.042	0.010	9245024	0.029	0.010	9245024	0.019	<0.010	0.010	9245024
Anthracene	ug/g	0.0067	0.0040	9245024	0.0076	0.0040	9245024	0.0056	<0.0040	0.0040	9245024
Fluoranthene	ug/g	0.058	0.020	9245024	0.058	0.020	9245024	0.020	<0.020	0.020	9245024
Pyrene	ug/g	0.056	0.020	9245024	0.055	0.020	9245024	0.023	<0.020	0.020	9245024
Benzo(a)anthracene	ug/g	0.021	0.020	9245024	<0.020	0.020	9245024	<0.020	<0.020	0.020	9245024
Chrysene	ug/g	0.030	0.020	9245024	0.026	0.020	9245024	<0.020	<0.020	0.020	9245024
Benzo(b&j)fluoranthene	ug/g	0.022	0.020	9245024	<0.020	0.020	9245024	<0.020	<0.020	0.020	9245024
Benzo(b)fluoranthene	ug/g	0.022	0.020	9245024	<0.020	0.020	9245024	<0.020	<0.020	0.020	9245024
Benzo(k)fluoranthene	ug/g	<0.020	0.020	9245024	<0.020	0.020	9245024	<0.020	<0.020	0.020	9245024
Benzo(a)pyrene	ug/g	0.023	0.020	9245024	<0.020	0.020	9245024	<0.020	<0.020	0.020	9245024
Indeno(1,2,3-cd)pyrene	ug/g	<0.020	0.020	9245024	<0.020	0.020	9245024	<0.020	<0.020	0.020	9245024
Dibenz(a,h)anthracene	ug/g	<0.020	0.020	9245024	<0.020	0.020	9245024	<0.020	<0.020	0.020	9245024
Benzo(g,h,i)perylene	ug/g	<0.050	0.050	9245024	<0.050	0.050	9245024	<0.050	<0.050	0.050	9245024
Calculated Parameters											
LEPH (C10-C19 less PAH)	mg/kg	<100	100	9243610				<100	<100	100	9243610
HEPH (C19-C32 less PAH)	mg/kg	<100	100	9243610				100	120	100	9243610
Hydrocarbons											
EPH (C10-C19)	mg/kg	<100	100	9245040	<100	100	9245040	<100	<100	100	9245040
EPH (C19-C32)	mg/kg	<100	100	9245040	<100	100	9245040	110	120	100	9245040

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

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Maxxam Job #: B8A3861
Report Date: 2018/11/30

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

LEPH & HEPH WITH PAH FOR CSR IN SOIL (SOIL)

Maxxam ID		UV8257			UV8257			UV8258	UV8259		
Sampling Date		2018/11/23 11:10			2018/11/23 11:10			2018/11/23 11:20	2018/11/23 11:40		
COC Number		K021472			K021472			K021472	K021472		
	UNITS	SS18-1	RDL	QC Batch	SS18-1 Lab-Dup	RDL	QC Batch	SS18-2	SS18-3	RDL	QC Batch
Surrogate Recovery (%)											
D10-ANTHRACENE (sur.)	%	84		9245024	84		9245024	83	85		9245024
D8-ACENAPHTHYLENE (sur.)	%	76		9245024	75		9245024	78	80		9245024
D8-NAPHTHALENE (sur.)	%	66		9245024	65		9245024	68	71		9245024
TERPHENYL-D14 (sur.)	%	82		9245024	80		9245024	81	83		9245024
O-TERPHENYL (sur.)	%	86		9245040	85		9245040	86	87		9245040

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B8A3861
Report Date: 2018/11/30

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

LEPH & HEPH WITH PAH FOR CSR IN SOIL (SOIL)

Maxxam ID		UV8260		UV8261		UV8262		UV8263		
Sampling Date		2018/11/23 11:55		2018/11/23 12:10		2018/11/23 12:25		2018/11/23 12:10		
COC Number		K021472		K021472		K021472		K021472		
	UNITS	SS18-4	QC Batch	SS18-5	QC Batch	SS18-6	QC Batch	SS18-A	RDL	QC Batch
Calculated Parameters										
Low Molecular Weight PAH`s	ug/g	<0.050	9243605	<0.050	9243605	0.063	9243605	<0.050	0.050	9243605
High Molecular Weight PAH`s	ug/g	0.052	9243605	<0.050	9243605	0.47	9243605	0.17	0.050	9243605
Total PAH	ug/g	0.087	9243605	<0.050	9243605	0.53	9243605	0.20	0.050	9243605
Polycyclic Aromatics										
Quinoline	ug/g	<0.050	9245024	<0.050	9244642	<0.050	9245024	<0.050	0.050	9244642
Naphthalene	ug/g	<0.010	9245024	<0.010	9244642	<0.010	9245024	<0.010	0.010	9244642
1-Methylnaphthalene	ug/g	<0.050	9245024	<0.050	9244642	<0.050	9245024	<0.050	0.050	9244642
2-Methylnaphthalene	ug/g	<0.020	9245024	<0.020	9244642	<0.020	9245024	<0.020	0.020	9244642
Acenaphthylene	ug/g	<0.0050	9245024	<0.0050	9244642	<0.0050	9245024	<0.0050	0.0050	9244642
Acenaphthene	ug/g	<0.0050	9245024	<0.0050	9244642	<0.0050	9245024	<0.0050	0.0050	9244642
Fluorene	ug/g	<0.020	9245024	<0.020	9244642	<0.020	9245024	<0.020	0.020	9244642
Phenanthrene	ug/g	0.028	9245024	<0.010	9244642	0.053	9245024	0.028	0.010	9244642
Anthracene	ug/g	0.0079	9245024	<0.0040	9244642	0.0093	9245024	0.0053	0.0040	9244642
Fluoranthene	ug/g	0.025	9245024	<0.020	9244642	0.092	9245024	0.050	0.020	9244642
Pyrene	ug/g	0.027	9245024	<0.020	9244642	0.084	9245024	0.049	0.020	9244642
Benzo(a)anthracene	ug/g	<0.020	9245024	<0.020	9244642	0.046	9245024	0.020	0.020	9244642
Chrysene	ug/g	<0.020	9245024	<0.020	9244642	0.063	9245024	0.026	0.020	9244642
Benzo(b&j)fluoranthene	ug/g	<0.020	9245024	<0.020	9244642	0.074	9245024	<0.020	0.020	9244642
Benzo(b)fluoranthene	ug/g	<0.020	9245024	<0.020	9244642	0.050	9245024	<0.020	0.020	9244642
Benzo(k)fluoranthene	ug/g	<0.020	9245024	<0.020	9244642	0.022	9245024	<0.020	0.020	9244642
Benzo(a)pyrene	ug/g	<0.020	9245024	<0.020	9244642	0.049	9245024	0.022	0.020	9244642
Indeno(1,2,3-cd)pyrene	ug/g	<0.020	9245024	<0.020	9244642	0.037	9245024	<0.020	0.020	9244642
Dibenz(a,h)anthracene	ug/g	<0.020	9245024	<0.020	9244642	<0.020	9245024	<0.020	0.020	9244642
Benzo(g,h,i)perylene	ug/g	<0.050	9245024	<0.050	9244642	<0.050	9245024	<0.050	0.050	9244642
Calculated Parameters										
LEPH (C10-C19 less PAH)	mg/kg	<100	9243610	<100	9243610	<100	9243610	<100	100	9243610
HEPH (C19-C32 less PAH)	mg/kg	140	9243610	<100	9243610	230	9243610	<100	100	9243610
Hydrocarbons										
EPH (C10-C19)	mg/kg	<100	9245040	<100	9244663	<100	9245040	<100	100	9244663
EPH (C19-C32)	mg/kg	140	9245040	<100	9244663	230	9245040	<100	100	9244663
Surrogate Recovery (%)										
D10-ANTHRACENE (sur.)	%	86	9245024	90	9244642	84	9245024	84		9244642

RDL = Reportable Detection Limit

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Maxxam Job #: B8A3861
Report Date: 2018/11/30

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

LEPH & HEPH WITH PAH FOR CSR IN SOIL (SOIL)

Maxxam ID		UV8260		UV8261		UV8262		UV8263		
Sampling Date		2018/11/23 11:55		2018/11/23 12:10		2018/11/23 12:25		2018/11/23 12:10		
COC Number		K021472		K021472		K021472		K021472		
	UNITS	SS18-4	QC Batch	SS18-5	QC Batch	SS18-6	QC Batch	SS18-A	RDL	QC Batch
D8-ACENAPHTHYLENE (sur.)	%	81	9245024	77	9244642	79	9245024	78		9244642
D8-NAPHTHALENE (sur.)	%	72	9245024	73	9244642	70	9245024	72		9244642
TERPHENYL-D14 (sur.)	%	83	9245024	82	9244642	82	9245024	80		9244642
O-TERPHENYL (sur.)	%	88	9245040	89	9244663	88	9245040	88		9244663
RDL = Reportable Detection Limit										

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City of Vancouver - FOI 2023-228 - Page 570 of 1003

Maxxam Job #: B8A3861
Report Date: 2018/11/30

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

CSR/CCME METALS IN SOIL WITH HG (SOIL)

Maxxam ID		UV8257			UV8257			UV8258	UV8259		
Sampling Date		2018/11/23 11:10			2018/11/23 11:10			2018/11/23 11:20	2018/11/23 11:40		
COC Number		K021472			K021472			K021472	K021472		
	UNITS	SS18-1	RDL	QC Batch	SS18-1 Lab-Dup	RDL	QC Batch	SS18-2	SS18-3	RDL	QC Batch
Physical Properties											
Soluble (2:1) pH	pH	9.89	N/A	9244574				6.50	6.34	N/A	9245999
Total Metals by ICPMS											
Total Aluminum (Al)	mg/kg	16300	100	9244569	15000	100	9244569	7930	8310	100	9245998
Total Antimony (Sb)	mg/kg	0.39	0.10	9244569	0.37	0.10	9244569	0.29	0.41	0.10	9245998
Total Arsenic (As)	mg/kg	3.20	0.50	9244569	3.21	0.50	9244569	2.64	3.53	0.50	9245998
Total Barium (Ba)	mg/kg	80.4	0.10	9244569	82.0	0.10	9244569	49.1	49.1	0.10	9245998
Total Beryllium (Be)	mg/kg	0.23	0.20	9244569	0.24	0.20	9244569	<0.20	<0.20	0.20	9245998
Total Boron (B)	mg/kg	2.3	1.0	9244569	2.0	1.0	9244569	2.7	4.2	1.0	9245998
Total Cadmium (Cd)	mg/kg	0.106	0.050	9244569	0.106	0.050	9244569	0.152	0.229	0.050	9245998
Total Chromium (Cr)	mg/kg	19.0	1.0	9244569	17.7	1.0	9244569	24.3	28.4	1.0	9245998
Total Cobalt (Co)	mg/kg	7.05	0.30	9244569	7.14	0.30	9244569	6.51	7.30	0.30	9245998
Total Copper (Cu)	mg/kg	22.0	0.50	9244569	21.4	0.50	9244569	17.3	24.7	0.50	9245998
Total Lead (Pb)	mg/kg	9.20	0.10	9244569	8.80	0.10	9244569	4.78	6.65	0.10	9245998
Total Manganese (Mn)	mg/kg	339	0.20	9244569	348	0.20	9244569	307	353	0.20	9245998
Total Mercury (Hg)	mg/kg	<0.050	0.050	9244569	<0.050	0.050	9244569	<0.050	<0.050	0.050	9245998
Total Molybdenum (Mo)	mg/kg	0.36	0.10	9244569	0.40	0.10	9244569	0.42	0.40	0.10	9245998
Total Nickel (Ni)	mg/kg	13.5	0.80	9244569	13.3	0.80	9244569	26.4	30.8	0.80	9245998
Total Selenium (Se)	mg/kg	<0.50	0.50	9244569	<0.50	0.50	9244569	<0.50	<0.50	0.50	9245998
Total Silver (Ag)	mg/kg	<0.050	0.050	9244569	0.068	0.050	9244569	<0.050	0.068	0.050	9245998
Total Strontium (Sr)	mg/kg	71.1	0.10	9244569	66.1	0.10	9244569	27.3	31.7	0.10	9245998
Total Tin (Sn)	mg/kg	1.03	0.10	9244569	0.92	0.10	9244569	0.57	0.63	0.10	9245998
Total Titanium (Ti)	mg/kg	933	1.0	9244569	863	1.0	9244569	622	691	1.0	9245998
Total Tungsten (W)	mg/kg	<0.50	0.50	9244569	<0.50	0.50	9244569	<0.50	<0.50	0.50	9245998
Total Vanadium (V)	mg/kg	51.1	2.0	9244569	50.6	2.0	9244569	36.3	40.3	2.0	9245998
Total Zinc (Zn)	mg/kg	50.4	1.0	9244569	50.8	1.0	9244569	51.3	70.3	1.0	9245998

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

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Maxxam Job #: B8A3861
Report Date: 2018/11/30

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

CSR/CCME METALS IN SOIL WITH HG (SOIL)

Maxxam ID		UV8260	UV8261	UV8262		UV8263		
Sampling Date		2018/11/23 11:55	2018/11/23 12:10	2018/11/23 12:25		2018/11/23 12:10		
COC Number		K021472	K021472	K021472		K021472		
	UNITS	SS18-4	SS18-5	SS18-6	QC Batch	SS18-A	RDL	QC Batch
Physical Properties								
Soluble (2:1) pH	pH	6.40	6.32	5.95	9245999	10.0	N/A	9244574
Total Metals by ICPMS								
Total Aluminum (Al)	mg/kg	11100	9310	11600	9245998	15700	100	9244569
Total Antimony (Sb)	mg/kg	0.36	0.42	0.51	9245998	0.39	0.10	9244569
Total Arsenic (As)	mg/kg	4.25	5.21	3.90	9245998	3.14	0.50	9244569
Total Barium (Ba)	mg/kg	62.9	64.9	77.6	9245998	79.1	0.10	9244569
Total Beryllium (Be)	mg/kg	<0.20	<0.20	0.20	9245998	0.22	0.20	9244569
Total Boron (B)	mg/kg	3.2	3.5	3.0	9245998	2.3	1.0	9244569
Total Cadmium (Cd)	mg/kg	0.190	0.197	0.240	9245998	0.123	0.050	9244569
Total Chromium (Cr)	mg/kg	28.0	34.7	24.5	9245998	22.6	1.0	9244569
Total Cobalt (Co)	mg/kg	7.59	8.18	6.77	9245998	6.77	0.30	9244569
Total Copper (Cu)	mg/kg	26.4	25.0	27.7	9245998	21.2	0.50	9244569
Total Lead (Pb)	mg/kg	9.01	7.60	23.3	9245998	8.44	0.10	9244569
Total Manganese (Mn)	mg/kg	372	360	325	9245998	338	0.20	9244569
Total Mercury (Hg)	mg/kg	<0.050	<0.050	0.053	9245998	<0.050	0.050	9244569
Total Molybdenum (Mo)	mg/kg	0.47	0.51	0.79	9245998	0.52	0.10	9244569
Total Nickel (Ni)	mg/kg	25.8	32.4	21.9	9245998	13.9	0.80	9244569
Total Selenium (Se)	mg/kg	<0.50	<0.50	<0.50	9245998	<0.50	0.50	9244569
Total Silver (Ag)	mg/kg	0.063	0.067	0.072	9245998	<0.050	0.050	9244569
Total Strontium (Sr)	mg/kg	34.3	35.5	45.8	9245998	68.0	0.10	9244569
Total Tin (Sn)	mg/kg	0.72	0.69	2.30	9245998	1.01	0.10	9244569
Total Titanium (Ti)	mg/kg	831	785	725	9245998	942	1.0	9244569
Total Tungsten (W)	mg/kg	<0.50	<0.50	<0.50	9245998	<0.50	0.50	9244569
Total Vanadium (V)	mg/kg	47.9	44.9	41.6	9245998	52.1	2.0	9244569
Total Zinc (Zn)	mg/kg	67.5	75.6	81.3	9245998	58.4	1.0	9244569

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B8A3861
Report Date: 2018/11/30

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

CSR VOC + VPH IN SOIL - FIELD PRESERVED (SOIL)

Maxxam ID		UV8257	UV8263		
Sampling Date		2018/11/23 11:10	2018/11/23 12:10		
COC Number		K021472	K021472		
	UNITS	SS18-1	SS18-A	RDL	QC Batch
Calculated Parameters					
VPH (VH6 to 10 - BTEX)	mg/kg	<10	<10	10	9243615
Volatiles					
VH C6-C10	mg/kg	<10	<10	10	9244759
1,1,1,2-tetrachloroethane	mg/kg	<0.020	<0.020	0.020	9244759
1,1,1-trichloroethane	mg/kg	<0.020	<0.020	0.020	9244759
1,1,2,2-tetrachloroethane	mg/kg	<0.020	<0.020	0.020	9244759
1,1,2-trichloroethane	mg/kg	<0.020	<0.020	0.020	9244759
1,1-dichloroethane	mg/kg	<0.025	<0.025	0.025	9244759
1,1-dichloroethene	mg/kg	<0.025	<0.025	0.025	9244759
1,2-dibromoethane	mg/kg	<0.020	<0.020	0.020	9244759
1,2-dichlorobenzene	mg/kg	<0.020	<0.020	0.020	9244759
1,2-dichloroethane	mg/kg	<0.020	<0.020	0.020	9244759
1,2-dichloropropane	mg/kg	<0.020	<0.020	0.020	9244759
1,3-Butadiene	mg/kg	<0.080	<0.080	0.080	9244759
1,3-dichlorobenzene	mg/kg	<0.020	<0.020	0.020	9244759
1,4-dichlorobenzene	mg/kg	<0.020	<0.020	0.020	9244759
Benzene	mg/kg	<0.0050	<0.0050	0.0050	9244759
Bromobenzene	mg/kg	<0.20	<0.20	0.20	9244759
Bromodichloromethane	mg/kg	<0.050	<0.050	0.050	9244759
Bromoform	mg/kg	<0.050	<0.050	0.050	9244759
Bromomethane	mg/kg	<0.30	<0.30	0.30	9244759
Carbon tetrachloride	mg/kg	<0.020	<0.020	0.020	9244759
Chlorobenzene	mg/kg	<0.020	<0.020	0.020	9244759
Chlorodibromomethane	mg/kg	<0.050	<0.050	0.050	9244759
Chloroethane	mg/kg	<0.10	<0.10	0.10	9244759
Chloroform	mg/kg	<0.020	<0.020	0.020	9244759
Chloromethane	mg/kg	<0.050	<0.050	0.050	9244759
cis-1,2-dichloroethene	mg/kg	<0.030	<0.030	0.030	9244759
cis-1,3-dichloropropene	mg/kg	<0.020	<0.020	0.020	9244759
Dibromomethane	mg/kg	<0.20	<0.20	0.20	9244759
Dichlorodifluoromethane	mg/kg	<0.20	<0.20	0.20	9244759
Dichloromethane	mg/kg	<0.080	<0.080	0.080	9244759
RDL = Reportable Detection Limit					

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Maxxam Job #: B8A3861
Report Date: 2018/11/30

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

CSR VOC + VPH IN SOIL - FIELD PRESERVED (SOIL)

Maxxam ID		UV8257	UV8263		
Sampling Date		2018/11/23 11:10	2018/11/23 12:10		
COC Number		K021472	K021472		
	UNITS	**SS18-1**	**SS18-A**	**RDL**	**QC Batch**
Ethylbenzene	mg/kg	<0.010	<0.010	0.010	9244759
Styrene	mg/kg	<0.030	<0.030	0.030	9244759
Tetrachloroethene	mg/kg	<0.010	<0.010	0.010	9244759
Toluene	mg/kg	<0.020	<0.020	0.020	9244759
trans-1,2-dichloroethene	mg/kg	<0.030	<0.030	0.030	9244759
trans-1,3-dichloropropene	mg/kg	<0.020	<0.020	0.020	9244759
Trichloroethene	mg/kg	<0.0090	<0.0090	0.0090	9244759
Trichlorofluoromethane	mg/kg	<0.20	<0.20	0.20	9244759
Vinyl chloride	mg/kg	<0.040	<0.040	0.040	9244759
m & p-Xylene	mg/kg	<0.040	<0.040	0.040	9244759
o-Xylene	mg/kg	<0.040	<0.040	0.040	9244759
Xylenes (Total)	mg/kg	<0.040	<0.040	0.040	9244759
Surrogate Recovery (%)					
1,4-Difluorobenzene (sur.)	%	99	100		9244759
4-Bromofluorobenzene (sur.)	%	82	85		9244759
D10-ETHYLBENZENE (sur.)	%	91	88		9244759
D4-1,2-Dichloroethane (sur.)	%	84	83		9244759
RDL = Reportable Detection Limit					

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Maxxam Job #: B8A3861
Report Date: 2018/11/30

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	9.3°C

Change Request (2018/11/28): Metals analysis added for Samples SS18-2, SS18-3, SS18-4, SS18-5 and SS18-6 as per Nicole MacDonald.

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

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Maxxam Job #: B8A3861
Report Date: 2018/11/30

QUALITY ASSURANCE REPORT

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9244642	D10-ANTHRACENE (sur.)	2018/11/28	81	50 - 140	73	50 - 140	71	%				
9244642	D8-ACENAPHTHYLENE (sur.)	2018/11/28	79	50 - 140	74	50 - 140	65	%				
9244642	D8-NAPHTHALENE (sur.)	2018/11/28	72	50 - 140	69	50 - 140	62	%				
9244642	TERPHENYL-D14 (sur.)	2018/11/28	81	50 - 140	75	50 - 140	69	%				
9244663	O-TERPHENYL (sur.)	2018/11/28	70	60 - 140	67	60 - 140	86	%				
9244759	1,4-Difluorobenzene (sur.)	2018/11/29	99	50 - 140	99	50 - 140	100	%				
9244759	4-Bromofluorobenzene (sur.)	2018/11/29	100	50 - 140	96	50 - 140	96	%				
9244759	D10-ETHYLBENZENE (sur.)	2018/11/29	106	50 - 140	84	50 - 140	102	%				
9244759	D4-1,2-Dichloroethane (sur.)	2018/11/29	106	50 - 140	96	50 - 140	95	%				
9245024	D10-ANTHRACENE (sur.)	2018/11/28	80	50 - 140	85	50 - 140	90	%				
9245024	D8-ACENAPHTHYLENE (sur.)	2018/11/28	77	50 - 140	77	50 - 140	82	%				
9245024	D8-NAPHTHALENE (sur.)	2018/11/28	69	50 - 140	66	50 - 140	73	%				
9245024	TERPHENYL-D14 (sur.)	2018/11/28	79	50 - 140	82	50 - 140	85	%				
9245040	O-TERPHENYL (sur.)	2018/11/28	68	60 - 140	68	60 - 140	87	%				
9245055	Extractable (MeOH) 1,4-Difluorobenzene (sur.)	2018/11/28			125	50 - 140	106	%				
9245055	Extractable (MeOH) 4-Bromofluorobenzene (sur.)	2018/11/28			102	50 - 140	102	%				
9245055	Extractable (MeOH) D4-1,2-Dichloroethane (sur.)	2018/11/28			89	50 - 140	101	%				
9244260	Moisture	2018/11/28					<0.30	%	1.7	20		
9244569	Total Aluminum (Al)	2018/11/28					118, RDL=100 (1)	mg/kg	8.1	40	110	70 - 130
9244569	Total Antimony (Sb)	2018/11/28	92	75 - 125	101	75 - 125	<0.10	mg/kg	6.2	30	119	70 - 130
9244569	Total Arsenic (As)	2018/11/28	99	75 - 125	101	75 - 125	<0.50	mg/kg	0.34	30	101	70 - 130
9244569	Total Barium (Ba)	2018/11/28	NC	75 - 125	105	75 - 125	<0.10	mg/kg	1.9	40	107	70 - 130
9244569	Total Beryllium (Be)	2018/11/28	104	75 - 125	110	75 - 125	<0.20	mg/kg	2.3	30	123	70 - 130
9244569	Total Boron (B)	2018/11/28					<1.0	mg/kg	18	30		
9244569	Total Cadmium (Cd)	2018/11/28	103	75 - 125	105	75 - 125	<0.050	mg/kg	0.19	30	103	70 - 130
9244569	Total Chromium (Cr)	2018/11/28	98	75 - 125	105	75 - 125	<1.0	mg/kg	7.0	30	116	70 - 130
9244569	Total Cobalt (Co)	2018/11/28	100	75 - 125	104	75 - 125	<0.30	mg/kg	1.2	30	107	70 - 130
9244569	Total Copper (Cu)	2018/11/28	97	75 - 125	104	75 - 125	<0.50	mg/kg	2.7	30	115	70 - 130

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Maxxam Job #: B8A3861
Report Date: 2018/11/30

QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9244569	Total Lead (Pb)	2018/11/28	99	75 - 125	102	75 - 125	<0.10	mg/kg	4.5	40	121	70 - 130
9244569	Total Manganese (Mn)	2018/11/28	NC	75 - 125	102	75 - 125	<0.20	mg/kg	2.7	30	108	70 - 130
9244569	Total Mercury (Hg)	2018/11/28	104	75 - 125	105	75 - 125	<0.050	mg/kg	NC	40	107	70 - 130
9244569	Total Molybdenum (Mo)	2018/11/28	101	75 - 125	103	75 - 125	<0.10	mg/kg	10	40	113	70 - 130
9244569	Total Nickel (Ni)	2018/11/28	98	75 - 125	103	75 - 125	<0.80	mg/kg	1.4	30	112	70 - 130
9244569	Total Selenium (Se)	2018/11/28	100	75 - 125	103	75 - 125	<0.50	mg/kg	NC	30		
9244569	Total Silver (Ag)	2018/11/28	100	75 - 125	99	75 - 125	<0.050	mg/kg	30	40	97	70 - 130
9244569	Total Strontium (Sr)	2018/11/28	NC	75 - 125	101	75 - 125	<0.10	mg/kg	7.2	40	116	70 - 130
9244569	Total Tin (Sn)	2018/11/28	99	75 - 125	104	75 - 125	<0.10	mg/kg	11	40	115	70 - 130
9244569	Total Titanium (Ti)	2018/11/28	NC	75 - 125	106	75 - 125	<1.0	mg/kg	7.9	40		
9244569	Total Tungsten (W)	2018/11/28					<0.50	mg/kg	NC	30		
9244569	Total Vanadium (V)	2018/11/28	NC	75 - 125	103	75 - 125	<2.0	mg/kg	0.98	30	112	70 - 130
9244569	Total Zinc (Zn)	2018/11/28	NC	75 - 125	104	75 - 125	<1.0	mg/kg	0.77	30	115	70 - 130
9244574	Soluble (2:1) pH	2018/11/28			100	97 - 103						
9244642	1-Methylnaphthalene	2018/11/28	85	50 - 140	77	50 - 140	<0.050	ug/g	NC	50		
9244642	2-Methylnaphthalene	2018/11/28	86	50 - 140	77	50 - 140	<0.020	ug/g	NC	50		
9244642	Acenaphthene	2018/11/28	85	50 - 140	77	50 - 140	<0.0050	ug/g	NC	50		
9244642	Acenaphthylene	2018/11/28	85	50 - 140	78	50 - 140	<0.0050	ug/g	NC	50		
9244642	Anthracene	2018/11/28	83	50 - 140	75	50 - 140	<0.0040	ug/g	NC	50		
9244642	Benzo(a)anthracene	2018/11/28	77	50 - 140	71	50 - 140	<0.020	ug/g	NC	50		
9244642	Benzo(a)pyrene	2018/11/28	80	50 - 140	74	50 - 140	<0.020	ug/g	NC	50		
9244642	Benzo(b&j)fluoranthene	2018/11/28	80	50 - 140	72	50 - 140	<0.020	ug/g	NC	50		
9244642	Benzo(b)fluoranthene	2018/11/28	83	50 - 140	73	50 - 140	<0.020	ug/g	NC	50		
9244642	Benzo(g,h,i)perylene	2018/11/28	92	50 - 140	84	50 - 140	<0.050	ug/g	NC	50		
9244642	Benzo(k)fluoranthene	2018/11/28	75	50 - 140	74	50 - 140	<0.020	ug/g	NC	50		
9244642	Chrysene	2018/11/28	76	50 - 140	71	50 - 140	<0.020	ug/g	NC	50		
9244642	Dibenz(a,h)anthracene	2018/11/28	86	50 - 140	79	50 - 140	<0.020	ug/g	NC	50		
9244642	Fluoranthene	2018/11/28	83	50 - 140	77	50 - 140	<0.020	ug/g	NC	50		
9244642	Fluorene	2018/11/28	80	50 - 140	73	50 - 140	<0.020	ug/g	NC	50		
9244642	Indeno(1,2,3-cd)pyrene	2018/11/28	83	50 - 140	76	50 - 140	<0.020	ug/g	NC	50		
9244642	Naphthalene	2018/11/28	87	50 - 140	80	50 - 140	<0.010	ug/g	19	50		

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Maxxam Job #: B8A3861
Report Date: 2018/11/30

QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9244642	Phenanthrene	2018/11/28	82	50 - 140	75	50 - 140	<0.010	ug/g	NC	50		
9244642	Pyrene	2018/11/28	82	50 - 140	76	50 - 140	<0.020	ug/g	NC	50		
9244642	Quinoline	2018/11/28	119	50 - 140	119	50 - 140	<0.050	ug/g	NC	50		
9244663	EPH (C10-C19)	2018/11/28	86	60 - 140	81	70 - 130	<100	mg/kg	NC	40		
9244663	EPH (C19-C32)	2018/11/28	82	60 - 140	79	70 - 130	<100	mg/kg	NC	40		
9244759	1,1,1,2-tetrachloroethane	2018/11/29	104	50 - 140	98	60 - 130	<0.020	mg/kg	NC	50		
9244759	1,1,1-trichloroethane	2018/11/29	101	50 - 140	97	60 - 130	<0.020	mg/kg	NC	50		
9244759	1,1,2,2-tetrachloroethane	2018/11/29	111	50 - 140	102	60 - 130	<0.020	mg/kg	NC	50		
9244759	1,1,2-trichloroethane	2018/11/29	111	50 - 140	104	60 - 130	<0.020	mg/kg	NC	50		
9244759	1,1-dichloroethane	2018/11/29	101	50 - 140	100	60 - 130	<0.025	mg/kg	NC	50		
9244759	1,1-dichloroethene	2018/11/29	96	50 - 140	98	60 - 130	<0.025	mg/kg	NC	50		
9244759	1,2-dibromoethane	2018/11/29	107	50 - 140	106	60 - 130	<0.020	mg/kg	NC	50		
9244759	1,2-dichlorobenzene	2018/11/29	113	50 - 140	111	60 - 130	<0.020	mg/kg	NC	50		
9244759	1,2-dichloroethane	2018/11/29	98	50 - 140	98	60 - 130	<0.020	mg/kg	NC	50		
9244759	1,2-dichloropropane	2018/11/29	109	50 - 140	106	60 - 130	<0.020	mg/kg	NC	50		
9244759	1,3-Butadiene	2018/11/29	47 (2)	50 - 140	52 (2)	60 - 130	<0.080	mg/kg	NC	50		
9244759	1,3-dichlorobenzene	2018/11/29	112	50 - 140	112	60 - 130	<0.020	mg/kg	NC	50		
9244759	1,4-dichlorobenzene	2018/11/29	108	50 - 140	108	60 - 130	<0.020	mg/kg	NC	50		
9244759	Benzene	2018/11/29	99	50 - 140	100	60 - 130	<0.0050	mg/kg	NC	50		
9244759	Bromobenzene	2018/11/29	109	50 - 140	105	60 - 130	<0.20	mg/kg				
9244759	Bromodichloromethane	2018/11/29	104	50 - 140	100	60 - 130	<0.050	mg/kg	NC	50		
9244759	Bromoform	2018/11/29	107	50 - 140	100	60 - 130	<0.050	mg/kg	NC	50		
9244759	Bromomethane	2018/11/29	96	50 - 140	100	60 - 130	<0.30	mg/kg	NC	50		
9244759	Carbon tetrachloride	2018/11/29	103	50 - 140	99	60 - 130	<0.020	mg/kg	NC	50		
9244759	Chlorobenzene	2018/11/29	106	50 - 140	102	60 - 130	<0.020	mg/kg	NC	50		
9244759	Chlorodibromomethane	2018/11/29	103	50 - 140	100	60 - 130	<0.050	mg/kg	NC	50		
9244759	Chloroethane	2018/11/29	74	50 - 140	80	60 - 130	<0.10	mg/kg	NC	50		
9244759	Chloroform	2018/11/29	98	50 - 140	97	60 - 130	<0.020	mg/kg	NC	50		
9244759	Chloromethane	2018/11/29	72	50 - 140	87	60 - 130	<0.050	mg/kg	NC	50		
9244759	cis-1,2-dichloroethene	2018/11/29	101	50 - 140	100	60 - 130	<0.030	mg/kg	NC	50		
9244759	cis-1,3-dichloropropene	2018/11/29	111	50 - 140	111	50 - 140	<0.020	mg/kg	NC	50		

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Maxxam Job #: B8A3861
Report Date: 2018/11/30

QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9244759	Dibromomethane	2018/11/29	102	50 - 140	98	60 - 130	<0.20	mg/kg				
9244759	Dichlorodifluoromethane	2018/11/29			65	60 - 130	<0.20	mg/kg				
9244759	Dichloromethane	2018/11/29	95	50 - 140	97	60 - 130	<0.080	mg/kg	NC	50		
9244759	Ethylbenzene	2018/11/29	110	50 - 140	113	60 - 130	<0.010	mg/kg	NC	50		
9244759	m & p-Xylene	2018/11/29	110	50 - 140	117	60 - 130	<0.040	mg/kg	NC	50		
9244759	o-Xylene	2018/11/29	108	50 - 140	115	60 - 130	<0.040	mg/kg	NC	50		
9244759	Styrene	2018/11/29	115	50 - 140	102	60 - 130	<0.030	mg/kg	NC	50		
9244759	Tetrachloroethene	2018/11/29	106	50 - 140	115	60 - 130	<0.010	mg/kg	NC	50		
9244759	Toluene	2018/11/29	105	50 - 140	107	60 - 130	<0.020	mg/kg	NC	50		
9244759	trans-1,2-dichloroethene	2018/11/29	99	50 - 140	99	60 - 130	<0.030	mg/kg	NC	50		
9244759	trans-1,3-dichloropropene	2018/11/29	110	50 - 140	115	50 - 140	<0.020	mg/kg	NC	50		
9244759	Trichloroethene	2018/11/29	102	50 - 140	97	60 - 130	<0.0090	mg/kg	NC	50		
9244759	Trichlorofluoromethane	2018/11/29	95	50 - 140	92	60 - 130	<0.20	mg/kg	NC	50		
9244759	VH C6-C10	2018/11/29			81	60 - 130	<10	mg/kg	NC	50		
9244759	Vinyl chloride	2018/11/29	76	50 - 140	76	60 - 130	<0.040	mg/kg	NC	50		
9244759	Xylenes (Total)	2018/11/29					<0.040	mg/kg	NC	50		
9245024	1-Methylnaphthalene	2018/11/28	80	50 - 140	85	50 - 140	<0.050	ug/g	NC	50		
9245024	2-Methylnaphthalene	2018/11/28	80	50 - 140	84	50 - 140	<0.020	ug/g	NC	50		
9245024	Acenaphthene	2018/11/28	79	50 - 140	83	50 - 140	<0.0050	ug/g	NC	50		
9245024	Acenaphthylene	2018/11/28	79	50 - 140	82	50 - 140	<0.0050	ug/g	NC	50		
9245024	Anthracene	2018/11/28	79	50 - 140	86	50 - 140	<0.0040	ug/g	13	50		
9245024	Benzo(a)anthracene	2018/11/28	77	50 - 140	84	50 - 140	<0.020	ug/g	6.7	50		
9245024	Benzo(a)pyrene	2018/11/28	77	50 - 140	82	50 - 140	<0.020	ug/g	13	50		
9245024	Benzo(b&j)fluoranthene	2018/11/28	78	50 - 140	86	50 - 140	<0.020	ug/g	9.9	50		
9245024	Benzo(b)fluoranthene	2018/11/28	81	50 - 140	88	50 - 140	<0.020	ug/g	9.9	50		
9245024	Benzo(g,h,i)perylene	2018/11/28	85	50 - 140	89	50 - 140	<0.050	ug/g	NC	50		
9245024	Benzo(k)fluoranthene	2018/11/28	80	50 - 140	87	50 - 140	<0.020	ug/g	NC	50		
9245024	Chrysene	2018/11/28	74	50 - 140	83	50 - 140	<0.020	ug/g	12	50		
9245024	Dibenz(a,h)anthracene	2018/11/28	86	50 - 140	87	50 - 140	<0.020	ug/g	NC	50		
9245024	Fluoranthene	2018/11/28	79	50 - 140	85	50 - 140	<0.020	ug/g	0.40	50		
9245024	Fluorene	2018/11/28	79	50 - 140	81	50 - 140	<0.020	ug/g	NC	50		

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Maxxam Job #: B8A3861
Report Date: 2018/11/30

QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9245024	Indeno(1,2,3-cd)pyrene	2018/11/28	78	50 - 140	82	50 - 140	<0.020	ug/g	NC	50		
9245024	Naphthalene	2018/11/28	80	50 - 140	85	50 - 140	<0.010	ug/g	NC	50		
9245024	Phenanthrene	2018/11/28	75	50 - 140	79	50 - 140	<0.010	ug/g	37	50		
9245024	Pyrene	2018/11/28	78	50 - 140	83	50 - 140	<0.020	ug/g	1.7	50		
9245024	Quinoline	2018/11/28	110	50 - 140	112	50 - 140	<0.050	ug/g	NC	50		
9245040	EPH (C10-C19)	2018/11/28	83	60 - 140	82	70 - 130	<100	mg/kg	NC	40		
9245040	EPH (C19-C32)	2018/11/28	81	60 - 140	81	70 - 130	<100	mg/kg	NC	40		
9245055	Extractable (MeOH) 2-Butanone (MEK)	2018/11/28			77	50 - 140	<15	mg/kg	NC	50		
9245055	Extractable (MeOH) 4-Methyl-2-pentanone (MIBK)	2018/11/28			69	50 - 140	<0.50	mg/kg	NC	50		
9245998	Total Aluminum (Al)	2018/11/29					<100	mg/kg			107	70 - 130
9245998	Total Antimony (Sb)	2018/11/29	91	75 - 125	102	75 - 125	<0.10	mg/kg			119	70 - 130
9245998	Total Arsenic (As)	2018/11/29	92	75 - 125	103	75 - 125	<0.50	mg/kg			99	70 - 130
9245998	Total Barium (Ba)	2018/11/29	NC	75 - 125	111	75 - 125	<0.10	mg/kg			112	70 - 130
9245998	Total Beryllium (Be)	2018/11/29	96	75 - 125	106	75 - 125	<0.20	mg/kg			117	70 - 130
9245998	Total Boron (B)	2018/11/29					<1.0	mg/kg				
9245998	Total Cadmium (Cd)	2018/11/29	107	75 - 125	106	75 - 125	<0.050	mg/kg			113	70 - 130
9245998	Total Chromium (Cr)	2018/11/29	99	75 - 125	109	75 - 125	<1.0	mg/kg			113	70 - 130
9245998	Total Cobalt (Co)	2018/11/29	96	75 - 125	107	75 - 125	<0.30	mg/kg			109	70 - 130
9245998	Total Copper (Cu)	2018/11/29	NC	75 - 125	108	75 - 125	<0.50	mg/kg			120	70 - 130
9245998	Total Lead (Pb)	2018/11/29	105	75 - 125	107	75 - 125	<0.10	mg/kg			118	70 - 130
9245998	Total Manganese (Mn)	2018/11/29	NC	75 - 125	107	75 - 125	<0.20	mg/kg			110	70 - 130
9245998	Total Mercury (Hg)	2018/11/29	113	75 - 125	109	75 - 125	<0.050	mg/kg			110	70 - 130
9245998	Total Molybdenum (Mo)	2018/11/29	101	75 - 125	105	75 - 125	<0.10	mg/kg			116	70 - 130
9245998	Total Nickel (Ni)	2018/11/29	99	75 - 125	106	75 - 125	<0.80	mg/kg			115	70 - 130
9245998	Total Selenium (Se)	2018/11/29	98	75 - 125	102	75 - 125	<0.50	mg/kg				
9245998	Total Silver (Ag)	2018/11/29	112	75 - 125	107	75 - 125	<0.050	mg/kg			133 (3)	70 - 130
9245998	Total Strontium (Sr)	2018/11/29	108	75 - 125	105	75 - 125	<0.10	mg/kg			118	70 - 130
9245998	Total Tin (Sn)	2018/11/29	106	75 - 125	107	75 - 125	<0.10	mg/kg			110	70 - 130
9245998	Total Titanium (Ti)	2018/11/29	NC	75 - 125	113	75 - 125	<1.0	mg/kg				
9245998	Total Tungsten (W)	2018/11/29					<0.50	mg/kg				

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Maxxam Job #: B8A3861
Report Date: 2018/11/30

QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9245998	Total Vanadium (V)	2018/11/29	NC	75 - 125	107	75 - 125	<2.0	mg/kg	0.84	30	115	70 - 130
9245998	Total Zinc (Zn)	2018/11/29	NC	75 - 125	108	75 - 125	<1.0	mg/kg			115	70 - 130
9245999	Soluble (2:1) pH	2018/11/29			100	97 - 103			0.89	20		

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Method Blank exceeds acceptance limits. Sample values for Al are >10x the concentration of the method blank and the contamination is considered insignificant.

(2) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

(3) Reference Material exceeds acceptance criteria for Ag. 10% of analytes failure in multielement scan is allowed.

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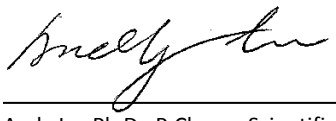
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Maxxam Job #: B8A3861
Report Date: 2018/11/30

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Andy Lu, Ph.D., P.Chem., Scientific Specialist



Jose Cueva, Supervisor, Organics-VOC & HC

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Updated CoC 1/1

CHAIN OF CUSTODY RECORD

K021472

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5 Toll Free (800) 665-8566

BBY ECD-0007/07
Page 1 of 1

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #: B61898	☑ Regular TAT 5 days (Most analyses)
Contact Name: Nicole MacDonald	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: 13639-20	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PO:	Site Location:	☐ Same Day ☐ 2 Days
Phone: (604) 430-0671	Phone:	Site #:	☐ 1 Day ☐ 3 Days
Email: nmacdonald@keystoneenviro.com	Email: sbrisbois@keystoneenviro.com	Sampled By: Stewart McBride	Date Required:

Regulatory Criteria	Special Instructions	Rush Confirmation #:
☑ BC CSR Soil ☐ BC CSR Water	☐ Return Cooler	
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)	
☐ CCME (Specify) ☐ Other (Specify)		
☐ Drinking Water ☐ BC Water Quality		

SAMPLES MUST KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	VOC / BTEX / VPH	VOC / BTEX / F1	LEPH/HEPH/Diesel	TSH	F2 - F4	Phenols?	Dissolved Metals	Dissolved Mercury	Filtered?	Field Preserved?	Total Metals	Total Mercury	Chloride	TSS	Turbidity - COD	BOD	Conductivity	pH	Ammonia	Nitrate	Nitrite	Keg metals					# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE	LABORATORY USE ONLY: CUSTODY SEAL Y / N (Present / Intact)	COOLER TEMPERATURES	COMMENTS
1	SS18-1	2018/11/23	11:10	SOIL	X		X																			X					4	X		9.9.10	
2	SS18-2		11:20				X																												
3	SS18-3		11:40				X																												
4	SS18-4		11:55				X																												
5	SS18-5		12:10				X																												
6	SS18-6		12:25				X																												
7	SS18-A				X		X																			X								12:10	
8																																			
9																																			
10																																			

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Stewart McBride	2018/11/23	16:30				

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COC-1027 Keystone
0106

B8A3861_COC

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CHAIN OF CUSTODY RECORD

BBY FCD-00077/07

Page 1 of 1

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #: B61098	☑ Regular TAT 5 days (Most analyses)
Contact Name: Nicole MacDonald	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: 13639-2C	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☐ 2 Days
Phone: (604) 430-0671	Phone:	Site #:	☐ 1 Day ☐ 3 Days
Email: nmacdonald@keystoneenviro.com	Email: sbridge@keystoneenviro.com	Sampled By: Stewart McBride	Date Required:

Regulatory Criteria	Special Instructions	Rush Confirmation #:
☑ BC CSR Soil ☐ BC CSR Water	☐ Return Cooler	
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)	
☐ CCME (Specify) ☐ Other (Specify)		
☐ Drinking Water ☐ BC Water Quality		

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	BTEX/VPH	BTEX / F1	PAH	EPH	Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Chloride	TSS	pH	Nitrite	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE	COMMENTS
1	SS18-1	2018/11/23	11:10	Soil													4	X	
2	SS18-2		11:20																
3	SS18-3		11:40																
4	SS18-4		11:55																
5	SS18-5		12:10																
6	SS18-6		12:25																
7	SS18-A		[illegible]																12:10
8																			
9																			
10																			

Analysis Requested																				
MTBE	VOC / BTEX/VPH	VOC / BTEX / F1	LEPH/HEPH/PAH	F2 - F4	Preserved?	Preserved?	Filtered?	Field Preserved?	Sulphate	COD	Alkalinity	Ammonia								
	Filtered?			TEH	Filtered?	Filtered?	Field Preserved?		Fluoride	BOD	Conductivity	Nitrate								
	BTEX/VPH	BTEX / F1	PAH	EPH	Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Chloride	TDS	pH	Nitrite								

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
N	—	9, 9, 10

COOLING MEDIA PRESENT Y / N

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Stewart McBride	2018/11/23	16:22	MONA AZIZ	2018-11-23	16:25	

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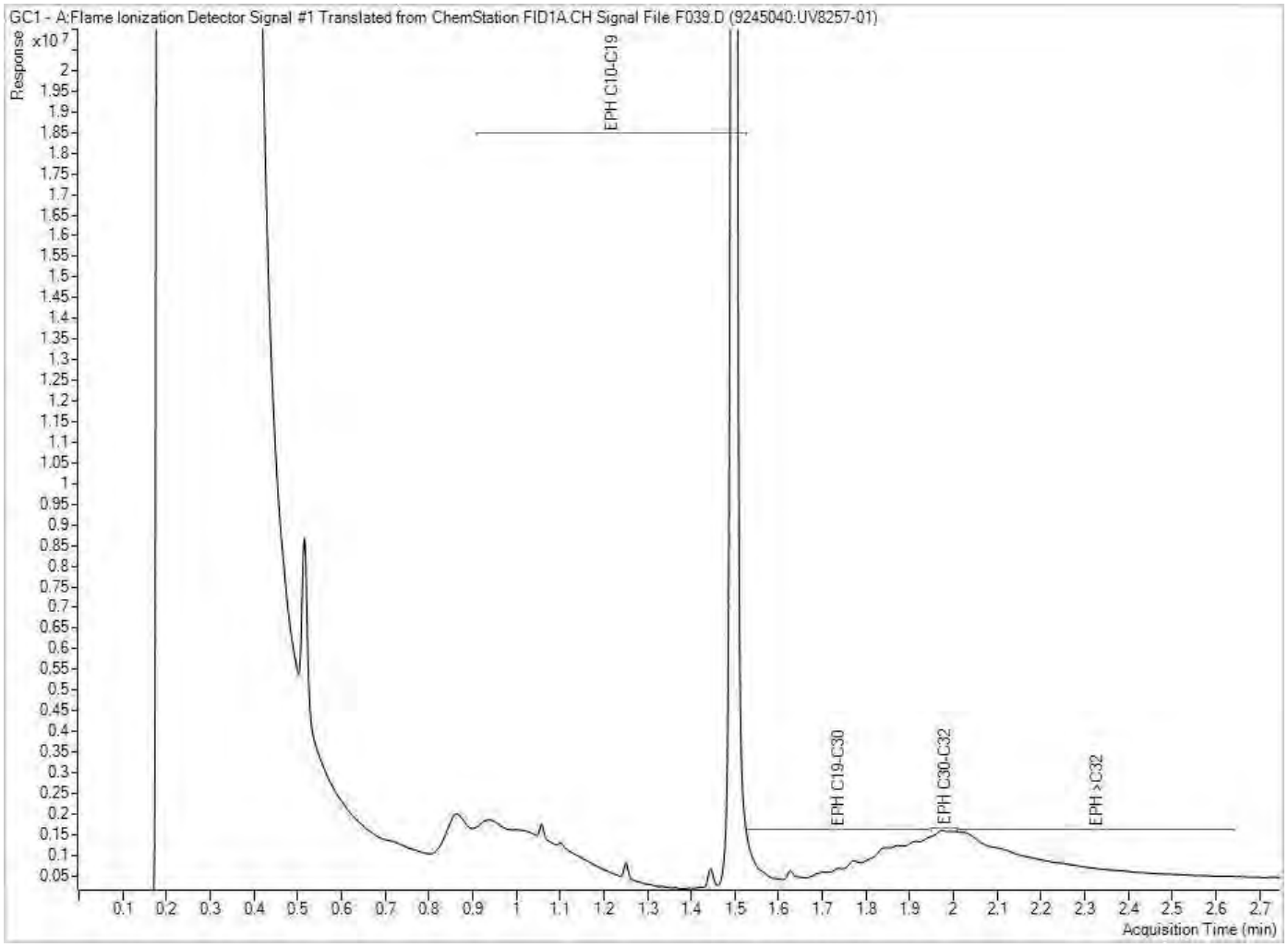
COC-1027 Keystone

0106

Maxxam Job #: B8A3861
Report Date: 2018/11/30
Maxxam Sample: UV8257

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Client ID: SS18-1

EPH in Soil by GC/FID Chromatogram

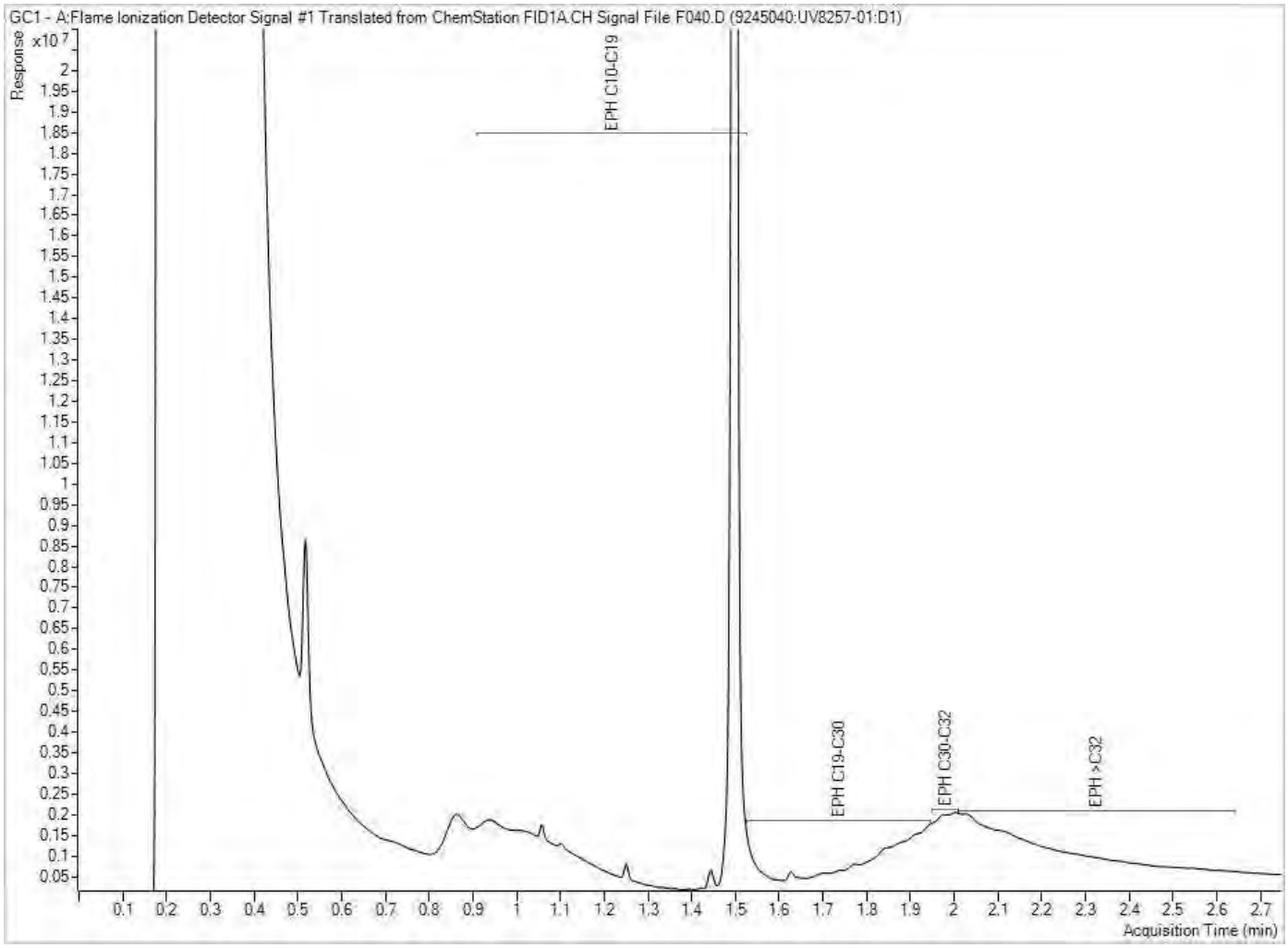


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B8A3861
Report Date: 2018/11/30
Maxxam Sample: UV8257 Lab-Dup

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Client ID: SS18-1

EPH in Soil by GC/FID Chromatogram



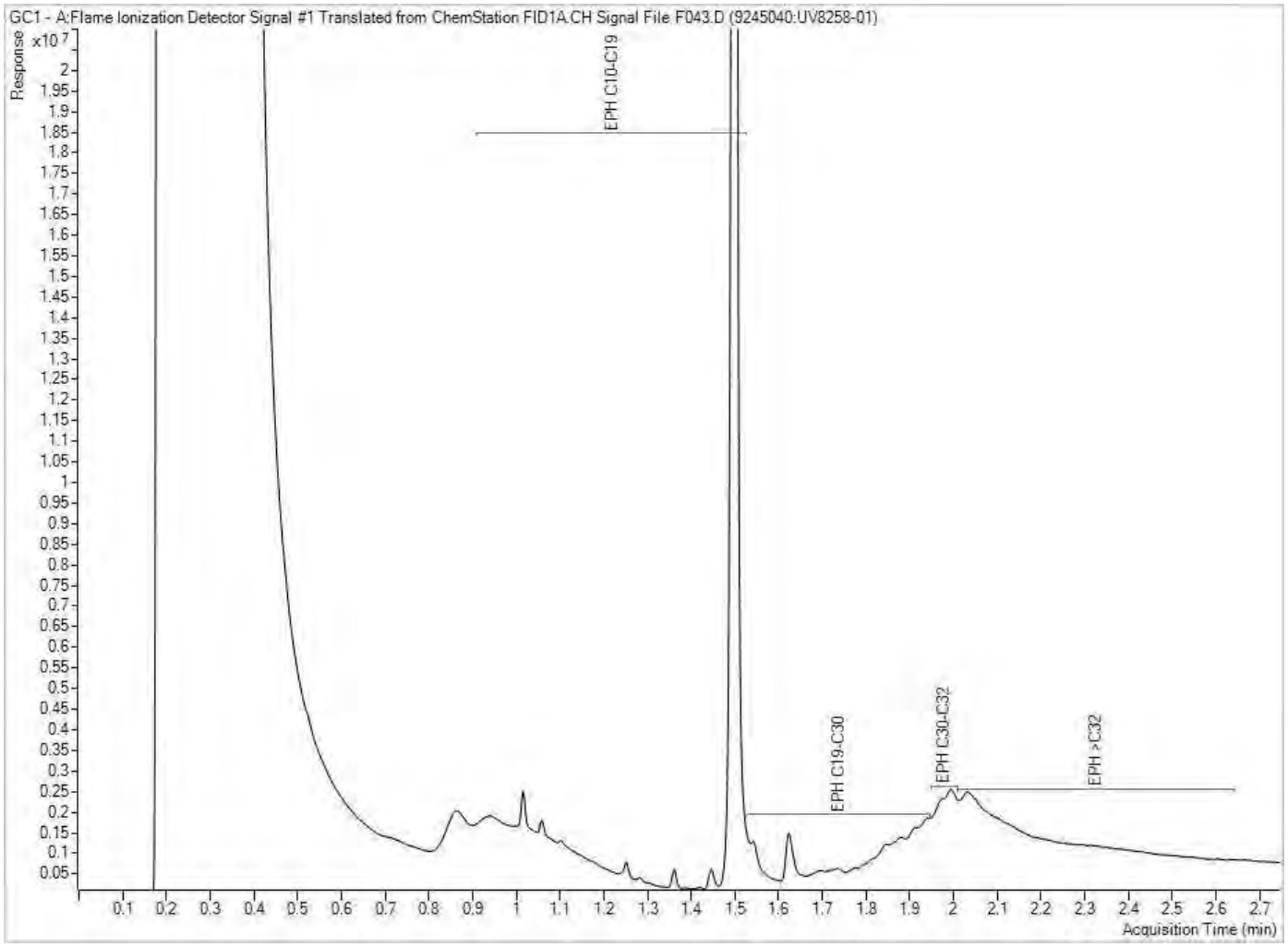
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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Maxxam Job #: B8A3861
Report Date: 2018/11/30
Maxxam Sample: UV8258

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Client ID: SS18-2

EPH in Soil by GC/FID Chromatogram



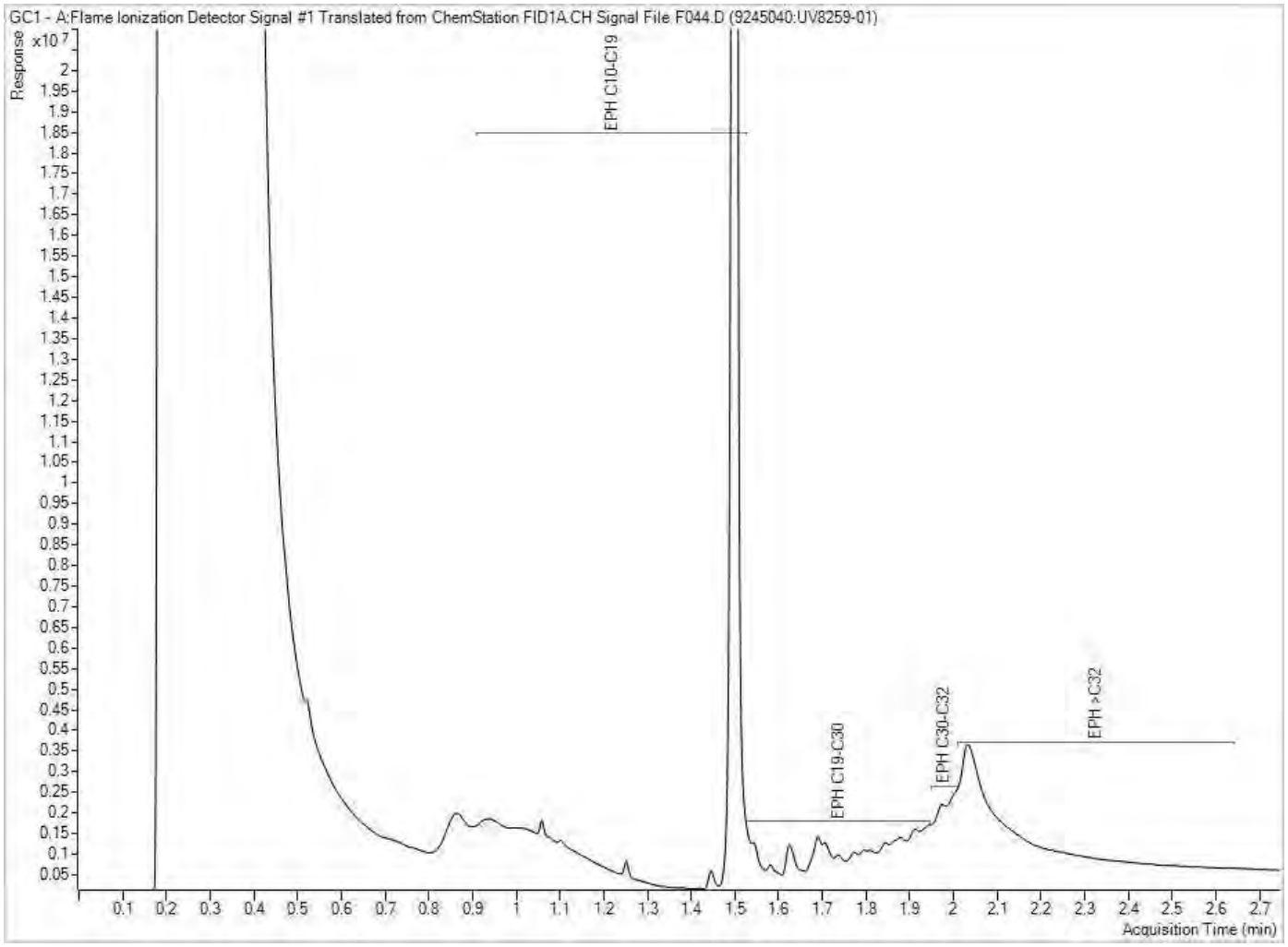
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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Maxxam Job #: B8A3861
Report Date: 2018/11/30
Maxxam Sample: UV8259

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Client ID: SS18-3

EPH in Soil by GC/FID Chromatogram



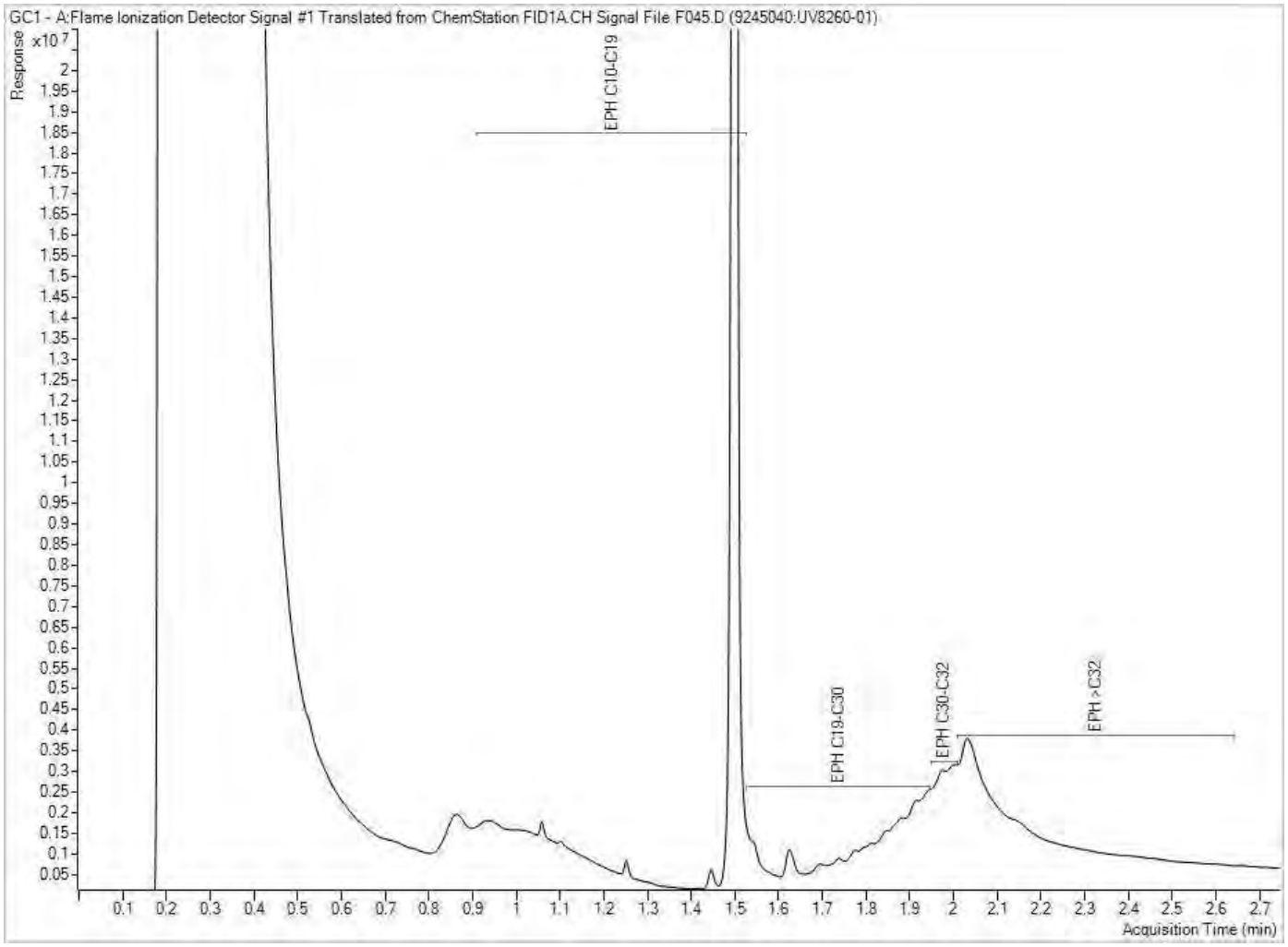
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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Maxxam Job #: B8A3861
Report Date: 2018/11/30
Maxxam Sample: UV8260

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Client ID: SS18-4

EPH in Soil by GC/FID Chromatogram



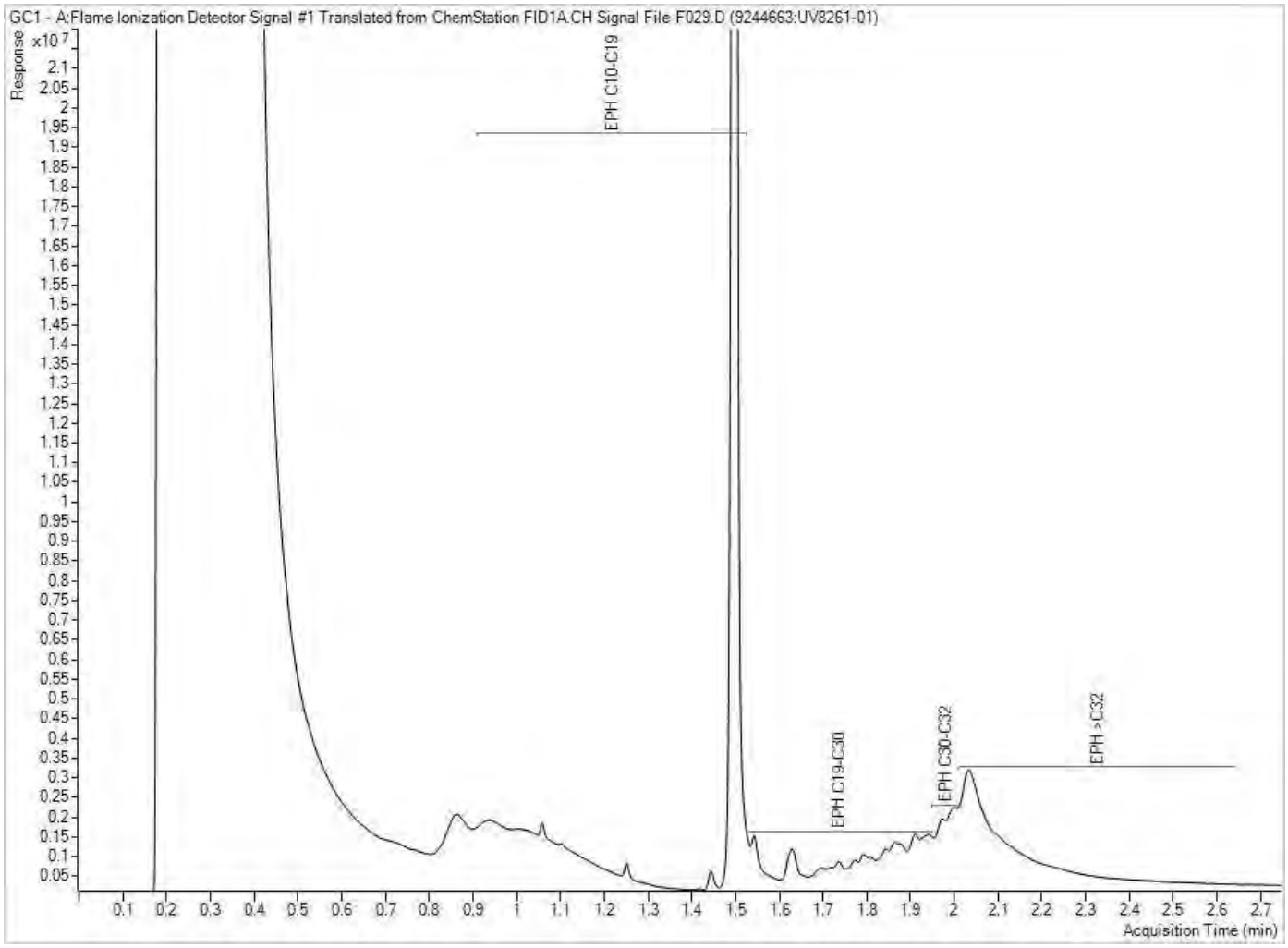
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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Maxxam Job #: B8A3861
Report Date: 2018/11/30
Maxxam Sample: UV8261

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Client ID: SS18-5

EPH in Soil by GC/FID Chromatogram

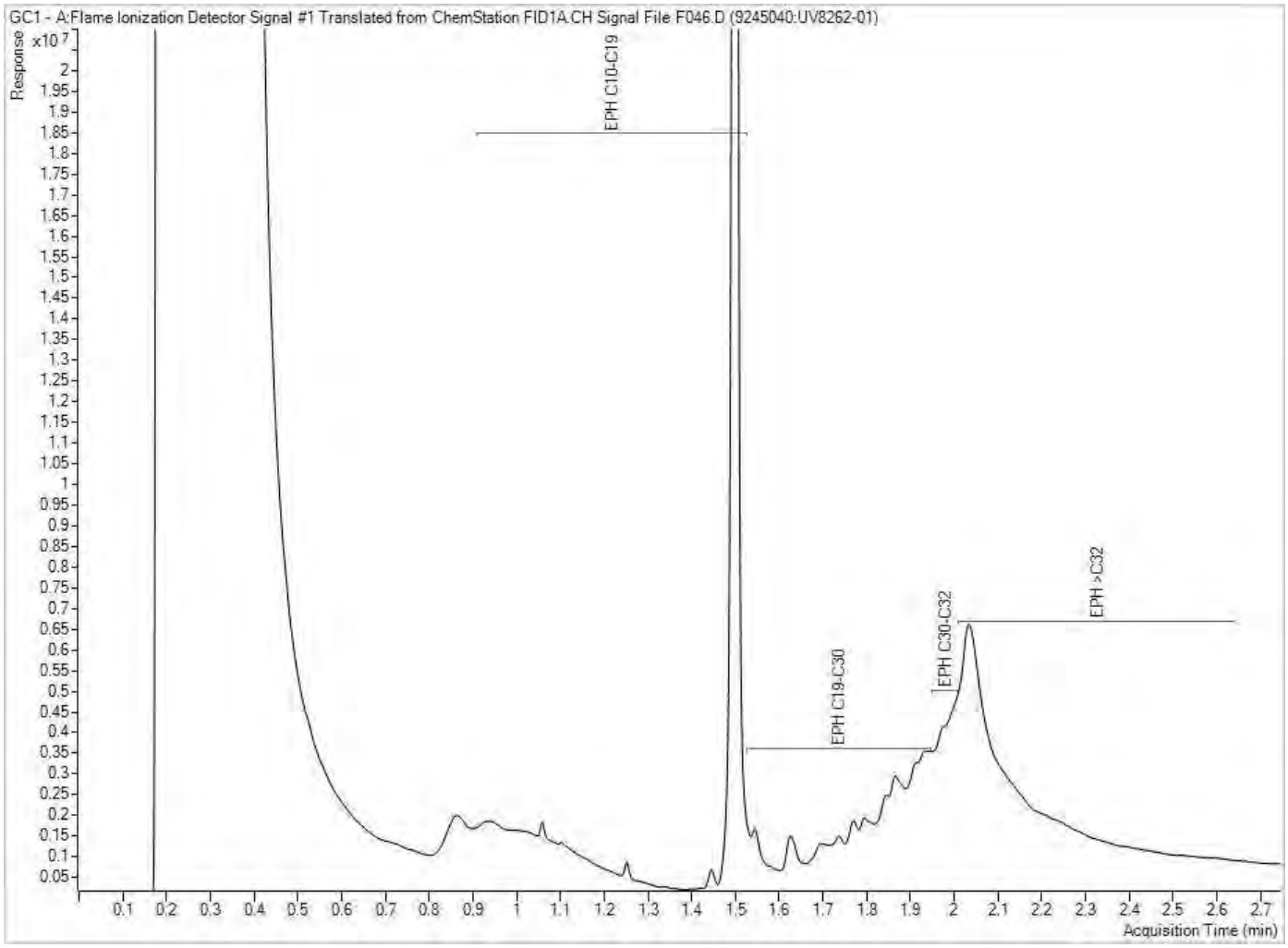


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B8A3861
Report Date: 2018/11/30
Maxxam Sample: UV8262

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Client ID: SS18-6

EPH in Soil by GC/FID Chromatogram



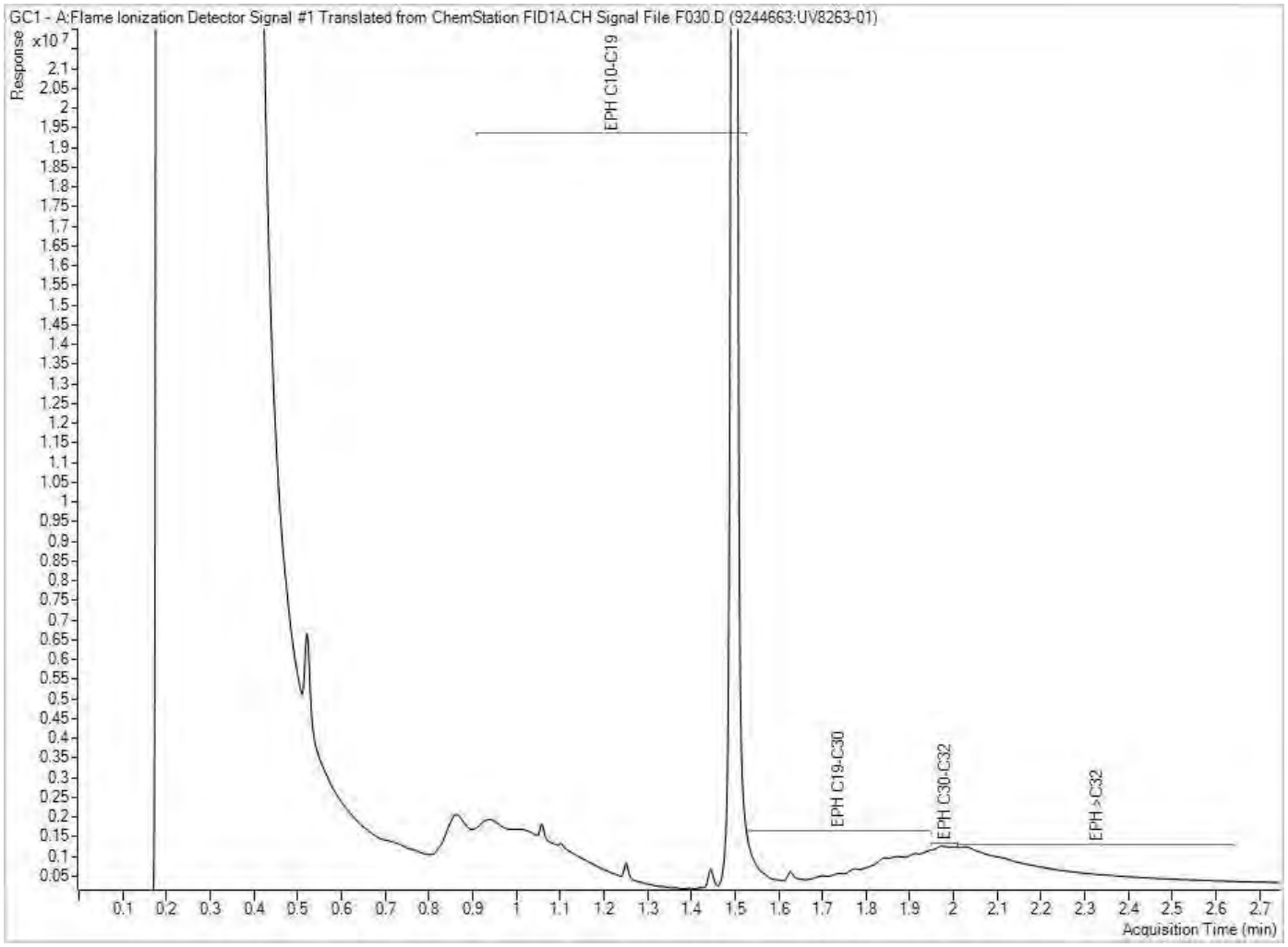
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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Maxxam Job #: B8A3861
Report Date: 2018/11/30
Maxxam Sample: UV8263

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Client ID: SS18-A

EPH in Soil by GC/FID Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Your Project #: 13639-2D
Your C.O.C. #: K021463, K021464, K021466

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/12/07
Report #: R2661209
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8A2725
Received: 2018/11/21, 18:20

Sample Matrix: Soil
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/MTBE LH VH F1 in Soil - Field Pres. (1)	1	N/A	2018/11/23	BBY8SOP-00010/11/12	BCMOE BCLM Jul 2017
Elements by ICPMS (total)	5	2018/11/23	2018/11/23	BBY7SOP-00004 / BBY7SOP-00001	EPA 6020b R2 m
Elements by ICPMS (total)	2	2018/12/05	2018/12/05	BBY7SOP-00004 / BBY7SOP-00001	EPA 6020b R2 m
Moisture	8	2018/11/22	2018/11/23	BBY8SOP-00017	BCMOE BCLM Dec2000 m
PAH in Soil by GC/MS (SIM)	1	2018/11/22	2018/11/23	BBY8SOP-00022	BCMOE BCLM Jul2017m
PAH in Soil by GC/MS (SIM)	7	2018/11/22	2018/11/25	BBY8SOP-00022	BCMOE BCLM Jul2017m
Total PAH and B(a)P Calculation (2)	1	N/A	2018/11/23	BBY WI-00033	Auto Calc
Total PAH and B(a)P Calculation (2)	7	N/A	2018/11/26	BBY WI-00033	Auto Calc
pH (2:1 DI Water Extract)	5	2018/11/23	2018/11/23	BBY6SOP-00028	BCMOE BCLM Mar2005 m
pH (2:1 DI Water Extract)	2	2018/12/05	2018/12/05	BBY6SOP-00028	BCMOE BCLM Mar2005 m
EPH less PAH in Soil By GC/FID (3)	1	N/A	2018/11/23	BBY WI-00033	Auto Calc
EPH less PAH in Soil By GC/FID (3)	7	N/A	2018/11/26	BBY WI-00033	Auto Calc
EPH in Soil by GC/FID	8	2018/11/22	2018/11/23	BBY8SOP-00029	BCMOE BCLM Jul 2016
Extra VOCs in Soil - Field Pres. (1)	4	N/A	2018/11/23	BBY8SOP-00040	BCMOE BCLM Sep 2017m
VOCs, VH, F1, LH in Soil - Field Pres. (1)	4	N/A	2018/11/24	BBY8SOP-00009/11/12	BCMOE BCLM Sep 2017m
Volatile HC-BTEX for Soil (4)	1	N/A	2018/11/24	BBY WI-00033	Auto Calc
Volatile HC-BTEX for Soil (4)	4	N/A	2018/11/26	BBY WI-00033	Auto Calc

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

City of Vancouver - FOI 2023-228 - Page 593 of 1003

Your Project #: 13639-2D
Your C.O.C. #: K021463, K021464, K021466

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/12/07
Report #: R2661209
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8A2725
Received: 2018/11/21, 18:20

Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) The extraction date for VOC, BTEX, VH, or F1 samples that are field preserved with methanol equals the date sampled, unless otherwise stated.
(2) Total PAHs in Soil include: Quinoline, Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Acridine, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b&j)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, and Benzo(g,h,i)perylene.

Total PAHs in Sediment include: Naphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(a)pyrene, and Dibenz(a,h)anthracene.
(3) LEPH = EPH (C10 to C19) - (Naphthalene + Phenanthrene)
HEPH = EPH (C19 to C32) - (Benzo(a)anthracene + Benzo(a)pyrene + Benzo(b)fluoranthene + Benzo(k)fluoranthene + Dibenz(a,h)anthracene + Indeno(1,2,3-cd)pyrene + Pyrene)
(4) VPH = VH - (Benzene + Toluene + Ethylbenzene + m & p-Xylene + o-Xylene + Styrene)

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Gail Pedersen, Project Manager –Environmental Customer Service
Email: gpedersen@maxxam.ca
Phone# (604) 734 7276

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

City of Vancouver - FOI 2023-228 - Page 594 of 1003

Maxxam Job #: B8A2725
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

PHYSICAL TESTING (SOIL)

Maxxam ID		UV1873	UV1876	UV1888	UV1890	UV1891	UV1894		
Sampling Date		2018/11/21 08:00	2018/11/21 08:15	2018/11/21 10:10	2018/11/21 12:40	2018/11/21 12:40	2018/11/21 13:00		
COC Number		K021463	K021463	K021464	K021464	K021464	K021464		
	UNITS	BH18-1 (0.1)	MW18-2 (2.1)	BH18-4 (0.2)	MW18-E	MW18-5 (0.5)	MW18-5 (2.8)	RDL	QC Batch
Physical Properties									
Moisture	%	9.8	9.9	9.9	32	19	11	0.30	9239013
RDL = Reportable Detection Limit									

Maxxam ID		UV1895	UV1900		
Sampling Date		2018/11/21 14:00	2018/11/21 14:40		
COC Number		K021464	K021466		
	UNITS	MW18-9 (0.3)	MW18-9 (4.5)	RDL	QC Batch
Physical Properties					
Moisture	%	11	8.8	0.30	9239013
RDL = Reportable Detection Limit					

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Maxxam Job #: B8A2725
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		UV1876	UV1888	UV1894	UV1900		
Sampling Date		2018/11/21 08:15	2018/11/21 10:10	2018/11/21 13:00	2018/11/21 14:40		
COC Number		K021463	K021464	K021464	K021466		
	UNITS	MW18-2 (2.1)	BH18-4 (0.2)	MW18-5 (2.8)	MW18-9 (4.5)	RDL	QC Batch
Volatiles							
Extractable (MeOH) 2-Butanone (MEK)	mg/kg	<15	<15	<15	<15	15	9239625
Extractable (MeOH) 4-Methyl-2-pentanone (MIBK)	mg/kg	<0.50	<0.50	<0.50	<0.50	0.50	9239625
Surrogate Recovery (%)							
Extractable (MeOH) 1,4-Difluorobenzene (sur.)	%	102	102	102	101		9239625
Extractable (MeOH) 4-Bromofluorobenzene (sur.)	%	101	103	103	103		9239625
Extractable (MeOH) D4-1,2-Dichloroethane (sur.)	%	104	104	103	104		9239625
RDL = Reportable Detection Limit							

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Maxxam Job #: B8A2725
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR BTEX/VPH IN SOIL - FIELD PRESERVED (SOIL)

Maxxam ID		UV1873		
Sampling Date		2018/11/21 08:00		
COC Number		K021463		
	UNITS	**BH18-1 (0.1)**	**RDL**	**QC Batch**
Calculated Parameters				
VPH (VH6 to 10 - BTEX)	mg/kg	<10	10	9238013
Volatiles				
Methyl-tert-butylether (MTBE)	mg/kg	<0.10	0.10	9239544
Benzene	mg/kg	<0.0050	0.0050	9239544
Toluene	mg/kg	<0.020	0.020	9239544
Ethylbenzene	mg/kg	<0.010	0.010	9239544
m & p-Xylene	mg/kg	<0.040	0.040	9239544
o-Xylene	mg/kg	<0.040	0.040	9239544
Styrene	mg/kg	<0.030	0.030	9239544
Xylenes (Total)	mg/kg	<0.040	0.040	9239544
VH C6-C10	mg/kg	<10	10	9239544
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	103		9239544
4-Bromofluorobenzene (sur.)	%	96		9239544
D10-ETHYLBENZENE (sur.)	%	104		9239544
D4-1,2-Dichloroethane (sur.)	%	118		9239544
RDL = Reportable Detection Limit				

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Maxxam Job #: B8A2725
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

LEPH & HEPH WITH PAH FOR CSR IN SOIL (SOIL)

Maxxam ID		UV1873			UV1873			UV1876		
Sampling Date		2018/11/21 08:00			2018/11/21 08:00			2018/11/21 08:15		
COC Number		K021463			K021463			K021463		
	UNITS	BH18-1 (0.1)	RDL	QC Batch	BH18-1 (0.1) Lab-Dup	RDL	QC Batch	MW18-2 (2.1)	RDL	QC Batch
Calculated Parameters										
Low Molecular Weight PAH`s	ug/g	0.082	0.050	9238001				<0.050	0.050	9238001
High Molecular Weight PAH`s	ug/g	1.2	0.050	9238001				<0.050	0.050	9238001
Total PAH	ug/g	1.3	0.050	9238001				<0.050	0.050	9238001
Polycyclic Aromatics										
Quinoline	ug/g	<0.050	0.050	9239148	<0.050	0.050	9239148	<0.050	0.050	9239148
Naphthalene	ug/g	<0.010	0.010	9239148	<0.010	0.010	9239148	<0.010	0.010	9239148
1-Methylnaphthalene	ug/g	<0.050	0.050	9239148	<0.050	0.050	9239148	<0.050	0.050	9239148
2-Methylnaphthalene	ug/g	<0.020	0.020	9239148	<0.020	0.020	9239148	<0.020	0.020	9239148
Acenaphthylene	ug/g	0.012	0.0050	9239148	0.014	0.0050	9239148	<0.0050	0.0050	9239148
Acenaphthene	ug/g	<0.0050	0.0050	9239148	<0.0050	0.0050	9239148	<0.0050	0.0050	9239148
Fluorene	ug/g	<0.020	0.020	9239148	<0.020	0.020	9239148	<0.020	0.020	9239148
Phenanthrene	ug/g	0.035	0.010	9239148	0.037	0.010	9239148	<0.010	0.010	9239148
Anthracene	ug/g	0.035	0.0040	9239148	0.035	0.0040	9239148	<0.0040	0.0040	9239148
Fluoranthene	ug/g	0.14	0.020	9239148	0.14	0.020	9239148	<0.020	0.020	9239148
Pyrene	ug/g	0.13	0.020	9239148	0.14	0.020	9239148	<0.020	0.020	9239148
Benzo(a)anthracene	ug/g	0.074	0.020	9239148	0.074	0.020	9239148	<0.020	0.020	9239148
Chrysene	ug/g	0.16	0.020	9239148	0.16	0.020	9239148	<0.020	0.020	9239148
Benzo(b&j)fluoranthene	ug/g	0.22	0.020	9239148	0.22	0.020	9239148	<0.020	0.020	9239148
Benzo(b)fluoranthene	ug/g	0.15	0.020	9239148	0.15	0.020	9239148	<0.020	0.020	9239148
Benzo(k)fluoranthene	ug/g	0.059	0.020	9239148	0.056	0.020	9239148	<0.020	0.020	9239148
Benzo(a)pyrene	ug/g	0.095	0.020	9239148	0.098	0.020	9239148	<0.020	0.020	9239148
Indeno(1,2,3-cd)pyrene	ug/g	0.12	0.020	9239148	0.12	0.020	9239148	<0.020	0.020	9239148
Dibenz(a,h)anthracene	ug/g	0.028	0.020	9239148	0.027	0.020	9239148	<0.020	0.020	9239148
Benzo(g,h,i)perylene	ug/g	0.17	0.050	9239148	0.16	0.050	9239148	<0.050	0.050	9239148
Calculated Parameters										
LEPH (C10-C19 less PAH)	mg/kg	<100	100	9238012				<100	100	9238012
HEPH (C19-C32 less PAH)	mg/kg	810	100	9238012				<100	100	9238012
Hydrocarbons										
EPH (C10-C19)	mg/kg	<100	100	9239152	<100	100	9239152	<100	100	9239152
EPH (C19-C32)	mg/kg	810	100	9239152	880	100	9239152	<100	100	9239152

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B8A2725
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

LEPH & HEPH WITH PAH FOR CSR IN SOIL (SOIL)

Maxxam ID		UV1873			UV1873			UV1876		
Sampling Date		2018/11/21 08:00			2018/11/21 08:00			2018/11/21 08:15		
COC Number		K021463			K021463			K021463		
	UNITS	BH18-1 (0.1)	RDL	QC Batch	BH18-1 (0.1) Lab-Dup	RDL	QC Batch	MW18-2 (2.1)	RDL	QC Batch
Surrogate Recovery (%)										
D10-ANTHRACENE (sur.)	%	87		9239148	92		9239148	90		9239148
D8-ACENAPHTHYLENE (sur.)	%	77		9239148	78		9239148	78		9239148
D8-NAPHTHALENE (sur.)	%	74		9239148	73		9239148	73		9239148
TERPHENYL-D14 (sur.)	%	79		9239148	81		9239148	85		9239148
O-TERPHENYL (sur.)	%	91		9239152	89		9239152	93		9239152

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B8A2725
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

LEPH & HEPH WITH PAH FOR CSR IN SOIL (SOIL)

Maxxam ID		UV1888	UV1890	UV1891	UV1894	UV1895	UV1900		
Sampling Date		2018/11/21 10:10	2018/11/21 12:40	2018/11/21 12:40	2018/11/21 13:00	2018/11/21 14:00	2018/11/21 14:40		
COC Number		K021464	K021464	K021464	K021464	K021464	K021466		
	UNITS	BH18-4 (0.2)	MW18-E	MW18-5 (0.5)	MW18-5 (2.8)	MW18-9 (0.3)	MW18-9 (4.5)	RDL	QC Batch
Calculated Parameters									
Low Molecular Weight PAH`s	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	9238001
High Molecular Weight PAH`s	ug/g	0.19	<0.050	0.062	<0.050	<0.050	<0.050	0.050	9238001
Total PAH	ug/g	0.20	<0.050	0.090	<0.050	<0.050	<0.050	0.050	9238001
Polycyclic Aromatics									
Quinoline	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	9239148
Naphthalene	ug/g	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	9239148
1-Methylnaphthalene	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	9239148
2-Methylnaphthalene	ug/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	9239148
Acenaphthylene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9239148
Acenaphthene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9239148
Fluorene	ug/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	9239148
Phenanthrene	ug/g	0.012	0.011	0.023	<0.010	<0.010	<0.010	0.010	9239148
Anthracene	ug/g	0.0049	<0.0040	0.0048	<0.0040	<0.0040	<0.0040	0.0040	9239148
Fluoranthene	ug/g	0.045	<0.020	0.033	<0.020	<0.020	<0.020	0.020	9239148
Pyrene	ug/g	0.036	<0.020	0.029	<0.020	<0.020	<0.020	0.020	9239148
Benzo(a)anthracene	ug/g	0.029	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	9239148
Chrysene	ug/g	0.027	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	9239148
Benzo(b&j)fluoranthene	ug/g	0.022	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	9239148
Benzo(b)fluoranthene	ug/g	0.022	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	9239148
Benzo(k)fluoranthene	ug/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	9239148
Benzo(a)pyrene	ug/g	0.027	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	9239148
Indeno(1,2,3-cd)pyrene	ug/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	9239148
Dibenz(a,h)anthracene	ug/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	9239148
Benzo(g,h,i)perylene	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	9239148
Calculated Parameters									
LEPH (C10-C19 less PAH)	mg/kg	<100	<100	<100	<100	<100	<100	100	9238012
HEPH (C19-C32 less PAH)	mg/kg	<100	110	<100	<100	<100	<100	100	9238012
Hydrocarbons									
EPH (C10-C19)	mg/kg	<100	<100	<100	<100	<100	<100	100	9239152
EPH (C19-C32)	mg/kg	<100	110	<100	<100	<100	<100	100	9239152
RDL = Reportable Detection Limit									

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Maxxam Job #: B8A2725
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

LEPH & HEPH WITH PAH FOR CSR IN SOIL (SOIL)

Maxxam ID		UV1888	UV1890	UV1891	UV1894	UV1895	UV1900		
Sampling Date		2018/11/21 10:10	2018/11/21 12:40	2018/11/21 12:40	2018/11/21 13:00	2018/11/21 14:00	2018/11/21 14:40		
COC Number		K021464	K021464	K021464	K021464	K021464	K021466		
	UNITS	BH18-4 (0.2)	MW18-E	MW18-5 (0.5)	MW18-5 (2.8)	MW18-9 (0.3)	MW18-9 (4.5)	RDL	QC Batch
Surrogate Recovery (%)									
D10-ANTHRACENE (sur.)	%	93	90	90	94	91	89		9239148
D8-ACENAPHTHYLENE (sur.)	%	80	78	78	81	80	79		9239148
D8-NAPHTHALENE (sur.)	%	75	75	74	74	74	74		9239148
TERPHENYL-D14 (sur.)	%	86	84	85	89	86	85		9239148
O-TERPHENYL (sur.)	%	93	93	95	94	93	92		9239152

RDL = Reportable Detection Limit

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Maxxam Job #: B8A2725
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR/CCME METALS IN SOIL WITH HG (SOIL)

Maxxam ID		UV1873			UV1874			UV1888	UV1890		
Sampling Date		2018/11/21 08:00			2018/11/21 08:10			2018/11/21 10:10	2018/11/21 12:40		
COC Number		K021463			K021463			K021464	K021464		
	UNITS	BH18-1 (0.1)	RDL	QC Batch	BH18-1 (0.4)	RDL	QC Batch	BH18-4 (0.2)	MW18-E	RDL	QC Batch
Physical Properties											
Soluble (2:1) pH	pH	7.36	N/A	9239193	7.06	N/A	9253381	7.44	6.03	N/A	9239193
Total Metals by ICPMS											
Total Aluminum (Al)	mg/kg	10400	100	9239188				11100	25100	100	9239188
Total Antimony (Sb)	mg/kg	0.86	0.10	9239188				0.34	0.17	0.10	9239188
Total Arsenic (As)	mg/kg	108	0.50	9239188	8.55	0.50	9253378	3.90	3.06	0.50	9239188
Total Barium (Ba)	mg/kg	45.0	0.10	9239188				55.1	43.4	0.10	9239188
Total Beryllium (Be)	mg/kg	<0.20	0.20	9239188				<0.20	0.29	0.20	9239188
Total Boron (B)	mg/kg	2.8	1.0	9239188				1.4	2.3	1.0	9239188
Total Cadmium (Cd)	mg/kg	0.673	0.050	9239188				0.125	0.072	0.050	9239188
Total Chromium (Cr)	mg/kg	81.4	1.0	9239188	17.9	1.0	9253378	16.8	13.9	1.0	9239188
Total Cobalt (Co)	mg/kg	7.08	0.30	9239188				6.11	4.20	0.30	9239188
Total Copper (Cu)	mg/kg	53.3	0.50	9239188				43.4	11.6	0.50	9239188
Total Lead (Pb)	mg/kg	42.5	0.10	9239188				8.06	9.13	0.10	9239188
Total Manganese (Mn)	mg/kg	337	0.20	9239188				270	200	0.20	9239188
Total Mercury (Hg)	mg/kg	<0.050	0.050	9239188				<0.050	0.087	0.050	9239188
Total Molybdenum (Mo)	mg/kg	4.68	0.10	9239188				0.39	1.01	0.10	9239188
Total Nickel (Ni)	mg/kg	15.2	0.80	9239188				10.2	7.31	0.80	9239188
Total Selenium (Se)	mg/kg	<0.50	0.50	9239188				<0.50	0.58	0.50	9239188
Total Silver (Ag)	mg/kg	0.072	0.050	9239188				<0.050	0.068	0.050	9239188
Total Strontium (Sr)	mg/kg	24.3	0.10	9239188				28.9	14.4	0.10	9239188
Total Tin (Sn)	mg/kg	0.78	0.10	9239188				1.09	0.54	0.10	9239188
Total Titanium (Ti)	mg/kg	722	1.0	9239188				702	769	1.0	9239188
Total Tungsten (W)	mg/kg	<0.50	0.50	9239188				<0.50	<0.50	0.50	9239188
Total Vanadium (V)	mg/kg	49.4	2.0	9239188				49.5	49.9	2.0	9239188
Total Zinc (Zn)	mg/kg	245	1.0	9239188	38.6	1.0	9253378	70.8	31.2	1.0	9239188

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B8A2725
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR/CCME METALS IN SOIL WITH HG (SOIL)

Maxxam ID		UV1891			UV1892			UV1895	UV1895		
Sampling Date		2018/11/21 12:40			2018/11/21 12:45			2018/11/21 14:00	2018/11/21 14:00		
COC Number		K021464			K021464			K021464	K021464		
	UNITS	MW18-5 (0.5)	RDL	QC Batch	MW18-5 (1.2)	RDL	QC Batch	MW18-9 (0.3)	MW18-9 (0.3) Lab-Dup	RDL	QC Batch
Physical Properties											
Soluble (2:1) pH	pH	7.08	N/A	9239193	6.17	N/A	9253381	6.53	6.47	N/A	9239193
Total Metals by ICPMS											
Total Aluminum (Al)	mg/kg	20600	100	9239188				15100	14200	100	9239188
Total Antimony (Sb)	mg/kg	0.21	0.10	9239188				0.16	0.15	0.10	9239188
Total Arsenic (As)	mg/kg	3.00	0.50	9239188				2.56	2.40	0.50	9239188
Total Barium (Ba)	mg/kg	52.5	0.10	9239188				73.2	68.4	0.10	9239188
Total Beryllium (Be)	mg/kg	0.25	0.20	9239188				<0.20	<0.20	0.20	9239188
Total Boron (B)	mg/kg	1.9	1.0	9239188				3.5	3.4	1.0	9239188
Total Cadmium (Cd)	mg/kg	0.262	0.050	9239188				0.053	<0.050	0.050	9239188
Total Chromium (Cr)	mg/kg	15.4	1.0	9239188				14.4	13.5	1.0	9239188
Total Cobalt (Co)	mg/kg	5.20	0.30	9239188				5.17	4.89	0.30	9239188
Total Copper (Cu)	mg/kg	13.3	0.50	9239188				11.7	11.1	0.50	9239188
Total Lead (Pb)	mg/kg	17.5	0.10	9239188				29.6	25.4	0.10	9239188
Total Manganese (Mn)	mg/kg	274	0.20	9239188				260	245	0.20	9239188
Total Mercury (Hg)	mg/kg	0.078	0.050	9239188				<0.050	<0.050	0.050	9239188
Total Molybdenum (Mo)	mg/kg	0.98	0.10	9239188				0.39	0.41	0.10	9239188
Total Nickel (Ni)	mg/kg	8.65	0.80	9239188				7.91	7.40	0.80	9239188
Total Selenium (Se)	mg/kg	<0.50	0.50	9239188				<0.50	<0.50	0.50	9239188
Total Silver (Ag)	mg/kg	0.092	0.050	9239188				<0.050	<0.050	0.050	9239188
Total Strontium (Sr)	mg/kg	17.0	0.10	9239188				36.8	35.8	0.10	9239188
Total Tin (Sn)	mg/kg	0.65	0.10	9239188				0.30	0.41	0.10	9239188
Total Titanium (Ti)	mg/kg	762	1.0	9239188				853	815	1.0	9239188
Total Tungsten (W)	mg/kg	<0.50	0.50	9239188				<0.50	<0.50	0.50	9239188
Total Vanadium (V)	mg/kg	46.7	2.0	9239188				51.7	48.5	2.0	9239188
Total Zinc (Zn)	mg/kg	182	1.0	9239188	58.1	1.0	9253378	27.5	26.0	1.0	9239188

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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Maxxam Job #: B8A2725
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR VOC + VPH IN SOIL - FIELD PRESERVED (SOIL)

Maxxam ID		UV1876	UV1888	UV1894	UV1900		
Sampling Date		2018/11/21 08:15	2018/11/21 10:10	2018/11/21 13:00	2018/11/21 14:40		
COC Number		K021463	K021464	K021464	K021466		
	UNITS	MW18-2 (2.1)	BH18-4 (0.2)	MW18-5 (2.8)	MW18-9 (4.5)	RDL	QC Batch
Calculated Parameters							
VPH (VH6 to 10 - BTEX)	mg/kg	<10	<10	<10	<10	10	9238013
Volatiles							
VH C6-C10	mg/kg	<10	<10	<10	<10	10	9239585
1,1,1,2-tetrachloroethane	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	9239585
1,1,1-trichloroethane	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	9239585
1,1,2,2-tetrachloroethane	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	9239585
1,1,2-trichloroethane	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	9239585
1,1-dichloroethane	mg/kg	<0.025	<0.025	<0.025	<0.025	0.025	9239585
1,1-dichloroethene	mg/kg	<0.025	<0.025	<0.025	<0.025	0.025	9239585
1,2-dibromoethane	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	9239585
1,2-dichlorobenzene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	9239585
1,2-dichloroethane	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	9239585
1,2-dichloropropane	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	9239585
1,3-Butadiene	mg/kg	<0.080	<0.080	<0.080	<0.080	0.080	9239585
1,3-dichlorobenzene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	9239585
1,4-dichlorobenzene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	9239585
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9239585
Bromobenzene	mg/kg	<0.20	<0.20	<0.20	<0.20	0.20	9239585
Bromodichloromethane	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	9239585
Bromoform	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	9239585
Bromomethane	mg/kg	<0.30	<0.30	<0.30	<0.30	0.30	9239585
Carbon tetrachloride	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	9239585
Chlorobenzene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	9239585
Chlorodibromomethane	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	9239585
Chloroethane	mg/kg	<0.10	<0.10	<0.10	<0.10	0.10	9239585
Chloroform	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	9239585
Chloromethane	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	9239585
cis-1,2-dichloroethene	mg/kg	<0.030	<0.030	<0.030	<0.030	0.030	9239585
cis-1,3-dichloropropene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	9239585
Dibromomethane	mg/kg	<0.20	<0.20	<0.20	<0.20	0.20	9239585
Dichlorodifluoromethane	mg/kg	<0.20	<0.20	<0.20	<0.20	0.20	9239585
Dichloromethane	mg/kg	<0.080	<0.080	<0.080	<0.080	0.080	9239585
RDL = Reportable Detection Limit							

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Maxxam Job #: B8A2725
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR VOC + VPH IN SOIL - FIELD PRESERVED (SOIL)

Maxxam ID		UV1876	UV1888	UV1894	UV1900		
Sampling Date		2018/11/21 08:15	2018/11/21 10:10	2018/11/21 13:00	2018/11/21 14:40		
COC Number		K021463	K021464	K021464	K021466		
	UNITS	MW18-2 (2.1)	BH18-4 (0.2)	MW18-5 (2.8)	MW18-9 (4.5)	RDL	QC Batch
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	9239585
Styrene	mg/kg	<0.030	<0.030	<0.030	<0.030	0.030	9239585
Tetrachloroethene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	9239585
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	9239585
trans-1,2-dichloroethene	mg/kg	<0.030	<0.030	<0.030	<0.030	0.030	9239585
trans-1,3-dichloropropene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	9239585
Trichloroethene	mg/kg	<0.0090	<0.0090	<0.0090	<0.0090	0.0090	9239585
Trichlorofluoromethane	mg/kg	<0.20	<0.20	<0.20	<0.20	0.20	9239585
Vinyl chloride	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	9239585
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	9239585
o-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	9239585
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	9239585
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	101	100	102	101		9239585
4-Bromofluorobenzene (sur.)	%	97	96	98	93		9239585
D10-ETHYLBENZENE (sur.)	%	97	93	93	93		9239585
D4-1,2-Dichloroethane (sur.)	%	97	95	95	94		9239585
RDL = Reportable Detection Limit							

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Maxxam Job #: B8A2725
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	12.0°C
Package 2	14.0°C

Version 2: Report reissued to include results for BH18-1(0.4) – arsenic, chromium and zinc, and MW18-5(1.2) – Zinc as per request from Stewart McBride on 2018/12/04

Results relate only to the items tested.

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Maxxam Job #: B8A2725
Report Date: 2018/12/07

QUALITY ASSURANCE REPORT

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9239148	D10-ANTHRACENE (sur.)	2018/11/23	84	50 - 140	84	50 - 140	86	%				
9239148	D8-ACENAPHTHYLENE (sur.)	2018/11/23	78	50 - 140	81	50 - 140	79	%				
9239148	D8-NAPHTHALENE (sur.)	2018/11/23	73	50 - 140	78	50 - 140	74	%				
9239148	TERPHENYL-D14 (sur.)	2018/11/23	81	50 - 140	84	50 - 140	84	%				
9239152	O-TERPHENYL (sur.)	2018/11/23	78	60 - 140	71	60 - 140	92	%				
9239544	1,4-Difluorobenzene (sur.)	2018/11/23	97	70 - 130	98	70 - 130	105	%				
9239544	4-Bromofluorobenzene (sur.)	2018/11/23	96	70 - 130	95	70 - 130	96	%				
9239544	D10-ETHYLBENZENE (sur.)	2018/11/23	103	60 - 130	86	60 - 130	97	%				
9239544	D4-1,2-Dichloroethane (sur.)	2018/11/23	102	70 - 130	101	70 - 130	116	%				
9239585	1,4-Difluorobenzene (sur.)	2018/11/23	101	50 - 140	99	50 - 140	101	%				
9239585	4-Bromofluorobenzene (sur.)	2018/11/23	106	50 - 140	106	50 - 140	97	%				
9239585	D10-ETHYLBENZENE (sur.)	2018/11/23	93	50 - 140	83	50 - 140	88	%				
9239585	D4-1,2-Dichloroethane (sur.)	2018/11/23	109	50 - 140	108	50 - 140	99	%				
9239625	Extractable (MeOH) 1,4-Difluorobenzene (sur.)	2018/11/23			103	50 - 140	103	%				
9239625	Extractable (MeOH) 4-Bromofluorobenzene (sur.)	2018/11/23			99	50 - 140	101	%				
9239625	Extractable (MeOH) D4-1,2-Dichloroethane (sur.)	2018/11/23			102	50 - 140	101	%				
9239013	Moisture	2018/11/23					<0.30	%	6.9	20		
9239148	1-Methylnaphthalene	2018/11/23	84	50 - 140	85	50 - 140	<0.050	ug/g	NC	50		
9239148	2-Methylnaphthalene	2018/11/23	84	50 - 140	86	50 - 140	<0.020	ug/g	NC	50		
9239148	Acenaphthene	2018/11/23	84	50 - 140	86	50 - 140	<0.0050	ug/g	NC	50		
9239148	Acenaphthylene	2018/11/23	83	50 - 140	86	50 - 140	<0.0050	ug/g	14	50		
9239148	Anthracene	2018/11/23	87	50 - 140	87	50 - 140	<0.0040	ug/g	0.32	50		
9239148	Benzo(a)anthracene	2018/11/23	77	50 - 140	80	50 - 140	<0.020	ug/g	0.45	50		
9239148	Benzo(a)pyrene	2018/11/23	80	50 - 140	82	50 - 140	<0.020	ug/g	2.6	50		
9239148	Benzo(b&j)fluoranthene	2018/11/23	80	50 - 140	82	50 - 140	<0.020	ug/g	1.0	50		
9239148	Benzo(b)fluoranthene	2018/11/23	82	50 - 140	83	50 - 140	<0.020	ug/g	1.5	50		
9239148	Benzo(g,h,i)perylene	2018/11/23	89	50 - 140	94	50 - 140	<0.050	ug/g	4.1	50		
9239148	Benzo(k)fluoranthene	2018/11/23	75	50 - 140	79	50 - 140	<0.020	ug/g	4.4	50		
9239148	Chrysene	2018/11/23	77	50 - 140	80	50 - 140	<0.020	ug/g	1.4	50		

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Maxxam Job #: B8A2725
Report Date: 2018/12/07

QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9239148	Dibenz(a,h)anthracene	2018/11/23	81	50 - 140	88	50 - 140	<0.020	ug/g	0.44	50		
9239148	Fluoranthene	2018/11/23	83	50 - 140	87	50 - 140	<0.020	ug/g	2.4	50		
9239148	Fluorene	2018/11/23	79	50 - 140	80	50 - 140	<0.020	ug/g	NC	50		
9239148	Indeno(1,2,3-cd)pyrene	2018/11/23	82	50 - 140	84	50 - 140	<0.020	ug/g	2.7	50		
9239148	Naphthalene	2018/11/23	85	50 - 140	89	50 - 140	<0.010	ug/g	NC	50		
9239148	Phenanthrene	2018/11/23	82	50 - 140	83	50 - 140	<0.010	ug/g	5.8	50		
9239148	Pyrene	2018/11/23	84	50 - 140	86	50 - 140	<0.020	ug/g	4.1	50		
9239148	Quinoline	2018/11/23	120	50 - 140	119	50 - 140	<0.050	ug/g	NC	50		
9239152	EPH (C10-C19)	2018/11/23	82	60 - 140	83	70 - 130	<100	mg/kg	NC	40		
9239152	EPH (C19-C32)	2018/11/23	65	60 - 140	84	70 - 130	<100	mg/kg	8.3	40		
9239188	Total Aluminum (Al)	2018/11/23					<100	mg/kg	5.9	40	105	70 - 130
9239188	Total Antimony (Sb)	2018/11/23	92	75 - 125	104	75 - 125	<0.10	mg/kg	5.8	30	117	70 - 130
9239188	Total Arsenic (As)	2018/11/23	99	75 - 125	97	75 - 125	<0.50	mg/kg	6.1	30	104	70 - 130
9239188	Total Barium (Ba)	2018/11/23	NC	75 - 125	106	75 - 125	<0.10	mg/kg	6.8	40	108	70 - 130
9239188	Total Beryllium (Be)	2018/11/23	102	75 - 125	101	75 - 125	<0.20	mg/kg	NC	30	107	70 - 130
9239188	Total Boron (B)	2018/11/23					<1.0	mg/kg	3.7	30		
9239188	Total Cadmium (Cd)	2018/11/23	100	75 - 125	99	75 - 125	<0.050	mg/kg	5.3	30	108	70 - 130
9239188	Total Chromium (Cr)	2018/11/23	97	75 - 125	98	75 - 125	<1.0	mg/kg	6.7	30	113	70 - 130
9239188	Total Cobalt (Co)	2018/11/23	101	75 - 125	100	75 - 125	<0.30	mg/kg	5.5	30	106	70 - 130
9239188	Total Copper (Cu)	2018/11/23	97	75 - 125	98	75 - 125	<0.50	mg/kg	4.6	30	113	70 - 130
9239188	Total Lead (Pb)	2018/11/23	89	75 - 125	102	75 - 125	<0.10	mg/kg	15	40	117	70 - 130
9239188	Total Manganese (Mn)	2018/11/23	NC	75 - 125	96	75 - 125	<0.20	mg/kg	6.3	30	108	70 - 130
9239188	Total Mercury (Hg)	2018/11/23	104	75 - 125	104	75 - 125	<0.050	mg/kg	NC	40	117	70 - 130
9239188	Total Molybdenum (Mo)	2018/11/23	102	75 - 125	98	75 - 125	<0.10	mg/kg	6.3	40	115	70 - 130
9239188	Total Nickel (Ni)	2018/11/23	99	75 - 125	98	75 - 125	<0.80	mg/kg	6.7	30	113	70 - 130
9239188	Total Selenium (Se)	2018/11/23	103	75 - 125	104	75 - 125	<0.50	mg/kg	NC	30		
9239188	Total Silver (Ag)	2018/11/23	87	75 - 125	81	75 - 125	<0.050	mg/kg	NC	40	94	70 - 130
9239188	Total Strontium (Sr)	2018/11/23	96	75 - 125	95	75 - 125	<0.10	mg/kg	2.6	40	114	70 - 130
9239188	Total Tin (Sn)	2018/11/23	103	75 - 125	103	75 - 125	<0.10	mg/kg	31	40	109	70 - 130
9239188	Total Titanium (Ti)	2018/11/23	NC	75 - 125	97	75 - 125	<1.0	mg/kg	4.5	40		
9239188	Total Tungsten (W)	2018/11/23					<0.50	mg/kg	NC	30		

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Maxxam Job #: B8A2725
Report Date: 2018/12/07

QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9239188	Total Vanadium (V)	2018/11/23	NC	75 - 125	97	75 - 125	<2.0	mg/kg	6.4	30	110	70 - 130
9239188	Total Zinc (Zn)	2018/11/23	97	75 - 125	100	75 - 125	<1.0	mg/kg	5.5	30	116	70 - 130
9239193	Soluble (2:1) pH	2018/11/23			100	97 - 103			0.92	20		
9239544	Benzene	2018/11/23	97	60 - 140	106	70 - 130	<0.0050	mg/kg	NC	40		
9239544	Ethylbenzene	2018/11/23	96	60 - 140	100	70 - 130	<0.010	mg/kg	NC	40		
9239544	m & p-Xylene	2018/11/23	94	60 - 140	100	70 - 130	<0.040	mg/kg	NC	40		
9239544	Methyl-tert-butylether (MTBE)	2018/11/23	98	60 - 140	111	70 - 130	<0.10	mg/kg	NC	40		
9239544	o-Xylene	2018/11/23	99	60 - 140	102	70 - 130	<0.040	mg/kg	NC	40		
9239544	Styrene	2018/11/23	107	60 - 140	111	70 - 130	<0.030	mg/kg	NC	40		
9239544	Toluene	2018/11/23	93	60 - 140	99	70 - 130	<0.020	mg/kg	NC	40		
9239544	VH C6-C10	2018/11/23			77	70 - 130	<10	mg/kg	NC	40		
9239544	Xylenes (Total)	2018/11/23					<0.040	mg/kg	NC	40		
9239585	1,1,1,2-tetrachloroethane	2018/11/24	102	50 - 140	103	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,1,1-trichloroethane	2018/11/24	95	50 - 140	98	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,1,2,2-tetrachloroethane	2018/11/24	102	50 - 140	110	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,1,2-trichloroethane	2018/11/24	103	50 - 140	109	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,1-dichloroethane	2018/11/24	93	50 - 140	101	60 - 130	<0.025	mg/kg	NC	50		
9239585	1,1-dichloroethene	2018/11/24	92	50 - 140	99	60 - 130	<0.025	mg/kg	NC	50		
9239585	1,2-dibromoethane	2018/11/24	104	50 - 140	112	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,2-dichlorobenzene	2018/11/24	111	50 - 140	115	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,2-dichloroethane	2018/11/24	89	50 - 140	97	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,2-dichloropropane	2018/11/24	97	50 - 140	104	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,3-Butadiene	2018/11/24	35 (1)	50 - 140	91	60 - 130	<0.080	mg/kg	NC	50		
9239585	1,3-dichlorobenzene	2018/11/24	110	50 - 140	113	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,4-dichlorobenzene	2018/11/24	108	50 - 140	111	60 - 130	<0.020	mg/kg	NC	50		
9239585	Benzene	2018/11/24	94	50 - 140	100	60 - 130	<0.0050	mg/kg	NC	50		
9239585	Bromobenzene	2018/11/24	107	50 - 140	110	60 - 130	<0.20	mg/kg	NC	50		
9239585	Bromodichloromethane	2018/11/24	96	50 - 140	106	60 - 130	<0.050	mg/kg	NC	50		
9239585	Bromoform	2018/11/24	100	50 - 140	106	60 - 130	<0.050	mg/kg	NC	50		
9239585	Bromomethane	2018/11/24	80	50 - 140	95	60 - 130	<0.30	mg/kg	NC	50		
9239585	Carbon tetrachloride	2018/11/24	98	50 - 140	101	60 - 130	<0.020	mg/kg	NC	50		

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Maxxam Job #: B8A2725
Report Date: 2018/12/07

QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9239585	Chlorobenzene	2018/11/24	98	50 - 140	104	60 - 130	<0.020	mg/kg	NC	50		
9239585	Chlorodibromomethane	2018/11/24	100	50 - 140	107	60 - 130	<0.050	mg/kg	NC	50		
9239585	Chloroethane	2018/11/24	81	50 - 140	79	60 - 130	<0.10	mg/kg	NC	50		
9239585	Chloroform	2018/11/24	94	50 - 140	100	60 - 130	<0.020	mg/kg	NC	50		
9239585	Chloromethane	2018/11/24	71	50 - 140	90	60 - 130	<0.050	mg/kg	NC	50		
9239585	cis-1,2-dichloroethene	2018/11/24	95	50 - 140	101	60 - 130	<0.030	mg/kg	NC	50		
9239585	cis-1,3-dichloropropene	2018/11/24	91	50 - 140	101	50 - 140	<0.020	mg/kg	NC	50		
9239585	Dibromomethane	2018/11/24	106	50 - 140	109	60 - 130	<0.20	mg/kg	NC	50		
9239585	Dichlorodifluoromethane	2018/11/24	55	50 - 140	76	60 - 130	<0.20	mg/kg	NC	50		
9239585	Dichloromethane	2018/11/24	90	50 - 140	100	60 - 130	<0.080	mg/kg	NC	50		
9239585	Ethylbenzene	2018/11/24	105	50 - 140	109	60 - 130	<0.010	mg/kg	NC	50		
9239585	m & p-Xylene	2018/11/24	106	50 - 140	110	60 - 130	<0.040	mg/kg	NC	50		
9239585	o-Xylene	2018/11/24	105	50 - 140	110	60 - 130	<0.040	mg/kg	NC	50		
9239585	Styrene	2018/11/24	118	50 - 140	122	60 - 130	<0.030	mg/kg	NC	50		
9239585	Tetrachloroethene	2018/11/24	104	50 - 140	106	60 - 130	<0.010	mg/kg	NC	50		
9239585	Toluene	2018/11/24	100	50 - 140	104	60 - 130	<0.020	mg/kg	NC	50		
9239585	trans-1,2-dichloroethene	2018/11/24	97	50 - 140	101	60 - 130	<0.030	mg/kg	NC	50		
9239585	trans-1,3-dichloropropene	2018/11/24	106	50 - 140	119	50 - 140	<0.020	mg/kg	NC	50		
9239585	Trichloroethene	2018/11/24	100	50 - 140	99	60 - 130	<0.0090	mg/kg	NC	50		
9239585	Trichlorofluoromethane	2018/11/24	94	50 - 140	98	60 - 130	<0.20	mg/kg	NC	50		
9239585	VH C6-C10	2018/11/24			99	60 - 130	<10	mg/kg	NC	50		
9239585	Vinyl chloride	2018/11/24	71	50 - 140	76	60 - 130	<0.040	mg/kg	NC	50		
9239585	Xylenes (Total)	2018/11/24					<0.040	mg/kg	NC	50		
9239625	Extractable (MeOH) 2-Butanone (MEK)	2018/11/23			109	50 - 140	<15	mg/kg	NC	50		
9239625	Extractable (MeOH) 4-Methyl-2-pentanone (MIBK)	2018/11/23			102	50 - 140	<0.50	mg/kg	NC	50		
9253378	Total Arsenic (As)	2018/12/05	99	75 - 125	99	75 - 125	<0.50	mg/kg	4.6	30	101	70 - 130
9253378	Total Chromium (Cr)	2018/12/05	104	75 - 125	105	75 - 125	<1.0	mg/kg	1.9	30	110	70 - 130
9253378	Total Zinc (Zn)	2018/12/05	NC	75 - 125	103	75 - 125	<1.0	mg/kg	3.5	30	116	70 - 130

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Maxxam Job #: B8A2725
Report Date: 2018/12/07

QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9253381	Soluble (2:1) pH	2018/12/05			100	97 - 103			1.3	20		

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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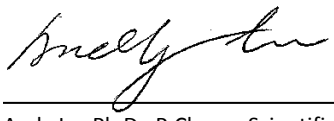
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Maxxam Job #: B8A2725
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Andy Lu, Ph.D., P.Chem., Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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CHAIN OF CUSTODY RECORD

K021463

BBY FCD-00077/07

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Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5, Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #: B67898	☑ Regular TAT 5 days (Most analyses)
Contact Name: Nicole MacDonald	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: 13631-20	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☐ 2 Days
Phone: (604) 430-0671	Phone:	Site #:	☐ 1 Day ☐ 3 Days
Email: nmacdonald@keystoneenviro.com	Email: smcbride@keystoneenviro.com	Sampled By: Stewart McBride	Date Required:

Regulatory Criteria	Special Instructions	Rush Confirmation #:
☑ BC CSR Soil ☐ BC CSR Water	☐ Return Cooler	
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)	
☐ CCME (Specify) ☐ Other (Specify)		
☐ Drinking Water ☐ BC Water Quality		

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE
1	BH18-1 (0.1) (0.4)	2018/11/21	08:00	Soil	4	X
2	↓		08:10		3	
3	BH18-C		08:00		4	
4	~~BH18-2~~ MW18-2 (2.1)		08:15			
5	(2.8)		08:20			
6	(4.0)		08:30			
7	(5.2)		08:40			
8	(5.8)		08:50			
9	(7.0)		09:00			
10	(7.8)	↓	09:10	↓	↓	↓

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
		11, 12, 13
		14, 14, 14

COOLING MEDIA PRESENT (Y) / N

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Stewart McBride	2018/11/21	18:12	SHAWN JACOB JOY	2018/11/21	18:20

MAXXAM JOB #

B8A2725_COC

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms which are available for viewing at

COC-1027 Keystone

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CHAIN OF CUSTODY RECORD

K021464

BBY FCD-00077/07

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Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5, Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #: B61898	☑ Regular TAT 5 days (Most analyses)
Contact Name: Nicole MacDonald	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: ~~B61~~ 13739-20	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☐ 2 Days
Phone: (604) 430-0671	Phone:	Site #:	☐ 1 Day ☐ 3 Days
Email: nmacdonald@keystoneenv.ca	Email: smcbride@keystoneenviro.com	Sampled By: Stewart McBride	Date Required:

Regulatory Criteria	Special Instructions
☑ BC CSR Soil ☐ BC CSR Water	☐ Return Cooler
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)
☐ CCME (Specify) ☐ Other (Specify)	
☐ Drinking Water ☐ BC Water Quality	

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Rush Confirmation #:

LABORATORY USE ONLY

CUSTODY SEAL Y / N (Present / Intact) | COOLER TEMPERATURES

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	BTEX/VPH	BTEX/F1	PAH	EPH	Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Chloride	TSS	pH	Nitrite	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE	COOLER TEMPERATURES
1	MW18-2 (8.5)	2018/11/21	09:15	Soil													4	X	11,12,13
2	BH18-4 (0.2)		10:10														4		N/A
3	" (0.4)		10:20														4		14,14,14
4	MW18-~~11~~ 10 E		12:40														4		
5	MW18-5 (0.5)		12:40																
6	" (1.2)		12:45																
7	" (2.1)		12:55																
8	" (2.8)		13.00																
9	MW18-9 (0.3)		14:00																
10	" (2.9)		14:05																

COOLING MEDIA PRESENT (Y / N) (6)

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Stewart McBride	2018/11/21	18:12	SHAN JACOB JOY	2018/11/21	18:20

MAXXAM JOB #

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms which are available for viewing at

COC-1027 Keystone

B8A2725_COC

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CHAIN OF CUSTODY RECORD

K021466

BBY FCD-00077/07

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Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #: B61890	☐ Regular TAT 5 days (Most analyses)
Contact Name: Nicole MacDonald	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: 13639-2D	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☐ 2 Days
Phone: (604) 430-0671	Phone:	Site #:	☐ 1 Day ☐ 3 Days
Email: nmacdonald@keystoneenviro.com	Email: smcbride@keystoneenviro.com	Sampled By: Stewart McBride	Date Required:

Regulatory Criteria	Special Instructions
☑ BC CSR Soil ☐ BC CSR Water	☐ Return Cooler
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)
☐ CCME (Specify) ☐ Other (Specify)	
☐ Drinking Water ☐ BC Water Quality	

Rush Confirmation #:

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	BTEXS / VPH	BTEX / F1	PAH	EPH	Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Chloride	TSS	pH	Nitrite	# QF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE
1	MW18-9 (1.8)	2018/11/21	14:15	Soil													4	X
2	(2.8)	↓	14:20	↓													↓	↓
3	(3.5)		14:30															
4	(4.5)		14:40															
5	(5.0)		15:10															
6	(5.8)		15:15															
7	MW18-F	↓	15:10	↓													↓	↓
8																		
9																		
10																		

Analysis Requested	
MTBE	☐
VOC / BTEXS / VPH	☐
VOC / BTEX / F1	☐
LEPH/HEPH/PAH	☐
F2 - F4	☐
TEH	☐
Preserved?	☐
Filtered?	☐
Preserved?	☐
Filtered?	☐
Field Preserved?	☐
Field Preserved?	☐
Sulphate	☐
Fluoride	☐
COD	☐
BOD	☐
Alkalinity	☐
Conductivity	☐
Ammonia	☐
Nitrate	☐

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
N/A		11, 12, 13
		12, 14, 14

COOLING MEDIA PRESENT: Y / N

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Stewart McBride	2018/11/21	18:12	SHAN TAYLOR JT4	2018/11/21	18:20

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgement and acceptance of our terms which are available for viewing at

COC-1027 Keystone

B8A2725_COC

Updated CoC 1/3

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CHAIN OF CUSTODY RECORD

K021463

BBY FCD00072107
Page 1 of 3

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from Invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #: B61898	☑ Regular TAT 5 days (Most analyses)
Contact Name: Nicole MacDonald	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: 8320 - 6400 Dominion Street	Address:	Project #: 13631-20	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☐ 2 Days
Phone: (604) 430-0671	Phone:	Site #:	☐ 1 Day ☐ 3 Days
Email: nmacdonald@keystoneenviro.com	Email: smcbride@keystoneenviro.com	Sampled By: Stewart McBride	Date Required:

Regulatory Criteria	Special Instructions	Rush Confirmation #:
☑ BC CSR Soil ☐ BC CSR Water	☐ Return Cooler	
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)	
☐ CCME (Specify) ☐ Other (Specify)		
☐ Drinking Water ☐ BC Water Quality		

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested: ☐ MTBE; ☐ VOC / BTEX / F1; ☑ LEPH/HEPH/PAH; ☐ F2 - F4; ☐ Preserved?; ☐ Preserved?; ☐ Field Preserved?; ☐ Field Preserved?; ☐ Sulphate; ☐ COD; ☐ Alkalinity; ☐ Ammonia; ☑ VOC / BTEX / F1; ☐ PAH; ☐ EPH; ☐ Filtered?; ☐ Filtered?; ☐ Dissolved Mercury; ☐ Total Metals; ☐ Total Mercury; ☐ Chloride; ☐ BOD; ☐ Conductivity; ☐ Nitrate; ☐ TSS; ☐ pH; ☐ Nitrite; KEI metals; # OF CONTAINERS SUBMITTED; HOLD - DO NOT ANALYZE

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	

COOLING MEDIA PRESENT Y / N

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix																COMMENTS
1	BH18-1 (0.1) (0.4)	2018/11/21	08:10	Soil	X		X									X			X	BTEX + VPH only
2	"		08:11																	
3	BH18-C		08:30																	
4	~~BH18-2~~ BH18-2 (2.1)		08:15		X		X													VOC/BTEX/VPH
5	(2.8)		08:20																	
6	(4.4)		08:30																	
7	(5.2)		08:40																	
8	(5.8)		08:50																	
9	(7.0)		09:00																	
10	(7.8)	"	09:10	"																

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Stewart McBride	2018/11/21				

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms which are available for viewing at v

COC-1027 Keystone

B8A2725_COC

Updated CoC 2/3

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CHAIN OF CUSTODY RECORD

K021464

BBY FCO-00072407

Page 2 of 3

Burnaby, 4606 Canada Way, Burnaby, BC V5G 1K5, Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #: B61698	☑ Regular TAT 5 days (Most analyses)
Contact Name: Nicole MacDonald	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: B61398-20	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location	☐ Same Day ☐ 2 Days
Phone: (604) 430-0671	Phone:	Site #:	☐ 1 Day ☐ 3 Days
Email: nmacdonald@keystoneenviro.com	Email: sombride@keystoneenviro.com	Sampled By: Stewart McBride	Date Required:

Regulatory Criteria	Special Instructions
☑ BC CSR Soil ☐ BC CSR Water	☐ Return Cooler
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)
☐ CCME (Specify) ☐ Other (Specify)	
☐ Drinking Water ☐ BC Water Quality	

Rush Confirmation #:

LABORATORY USE ONLY

CUSTODY SEAL Y / N (Present / Intact) | COOLER TEMPERATURES

COOLING MEDIA PRESENT Y / N

COMMENTS

Analysis Requested: BTEX/F1 | VOC/BTEX/F1 | LEPH/HEPH/PAH | F2 - F4 | Preserved? | Filtered? | Dissolved Mercury | Dissolved Metals | Total Metals | Total Mercury | Field Preserved? | Field Preserved? | Sulphate | Fluoride | Chloride | COD | BOD | TDS | TSS | Alkalinity | Conductivity | pH | Ammonia | Nitrate | Nitrite | KEL metals | # OF CONTAINERS SUBMITTED | HOLD - DO NOT ANALYZE

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix
1	MW18-2 (8.5)	2018/11/21	09:15	Soil
2	BH18-4 (0.2)		10:00	
3	" (0.4)		10:20	
4	MW18-[illegible]E		12:40	
5	MW18-5 (0.5)		12:50	
6	" (1.2)		12:45	
7	" (2.1)		12:55	
8	" (2.8)		13:00	
9	MW18-9 (0.3)		14:00	
10	" (1.1)		14:05	

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Stewart McBride	2018/11/21				

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COC-1027 Keystone

B8A2725_COC

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Updated CoC 3/3

CHAIN OF CUSTODY RECORD

K021466

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

BBY FCD-00077/07

Page 3 of 3

Invoice Information		Report Information (if differs from invoice)		Project Information (where applicable)		Turnaround Time (TAT) Required
Company Name:	3763 - Keystone Environmental Ltd.	Company Name:		Quotation #:	B61890	☐ Regular TAT 5 days (Most analyses)
Contact Name:	Nicole MacDonald	Contact Name:		P.O. #/ AFE#:		PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address:	#320 - 4600 Dominion Street	Address:		Project #:	13639-20	Rush TAT (Surcharges will be applied)
	Burnaby, BC PC: V5G 4G3		PC:	Site Location:		☐ Same Day ☐ 2 Days
Phone:	(604) 430-0671	Phone:		Site #:		☐ 1 Day ☐ 3 Days
Email:	nmacdonald@keystoneenviro.com	Email:	smcbride@keystoneenviro.com	Sampled By:	Stewart McBride	Date Required:

Regulatory Criteria	Special Instructions
☑ BC CSR Soil ☐ BC CSR Water	☐ Return Cooler
☐ YK CSA Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)
☐ CCME (Specify) ☐ Other (Specify)	
☐ Drinking Water ☐ BC Water Quality	

Rush Confirmation #:

Analysis Requested

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	BTEX/VPH	VOC/BTEX/F1	LEPH/HEPH/PAH	F2 - F4	Preserved?	Preserved?	Field Preserved?	Field Preserved?	Sulphate	COD	Alkalinity	Ammonia	# of CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE
1	MW13-9 (1.8)	2018/11/21	14:15	S:I														
2	(3.8)		14:20															
3	(3.5)		14:30															
4	(4.5)		14:40		X		X											
5	(5.0)		15:10															
6	(5.8)		15:15															
7	MW18-F	↓	15:10	↓													↓	↓
8																		
9																		
10																		

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	

COOLING MEDIA PRESENT Y / N

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Stewart McBride	2018/11/21				

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COC-1027 Keystone

B8A2725_COC

Alfred Ngai Keystone - off hold.

From: Gail Pedersen
Sent: Thursday, November 22, 2018 12:06 PM
To: Billo Puni; Kevin Chong; Alfred Ngai
Subject: ANALYTICAL IN: HOLD Submissions Proj# 13639-2C COCs K021465 and K021463
Attachments: Image (2).jpg; Image (3).jpg; Image (4).jpg; Image (5).jpg

updated COCs

Hi All,

Please see attached updated COCs with analytical for hold submission proj# 13639

Any Qs please ask.

Confirmation date/time: Thursday, November 22, 2018 10:24 AM REG TAT

Thank you!

With warm thanks,

GAIL PEDERSEN, B.Sc.
Senior Project Manager, Site Assessment & Remediation BC Environmental Services

Office 604.639.8432
Mobile 604.347.7292
Toll Free 800.665.8566
gpedersen@maxxam.ca

4606 Canada Way, Burnaby, BC V5G 1K5
maxxam.ca

B8A2725_INTERNAL

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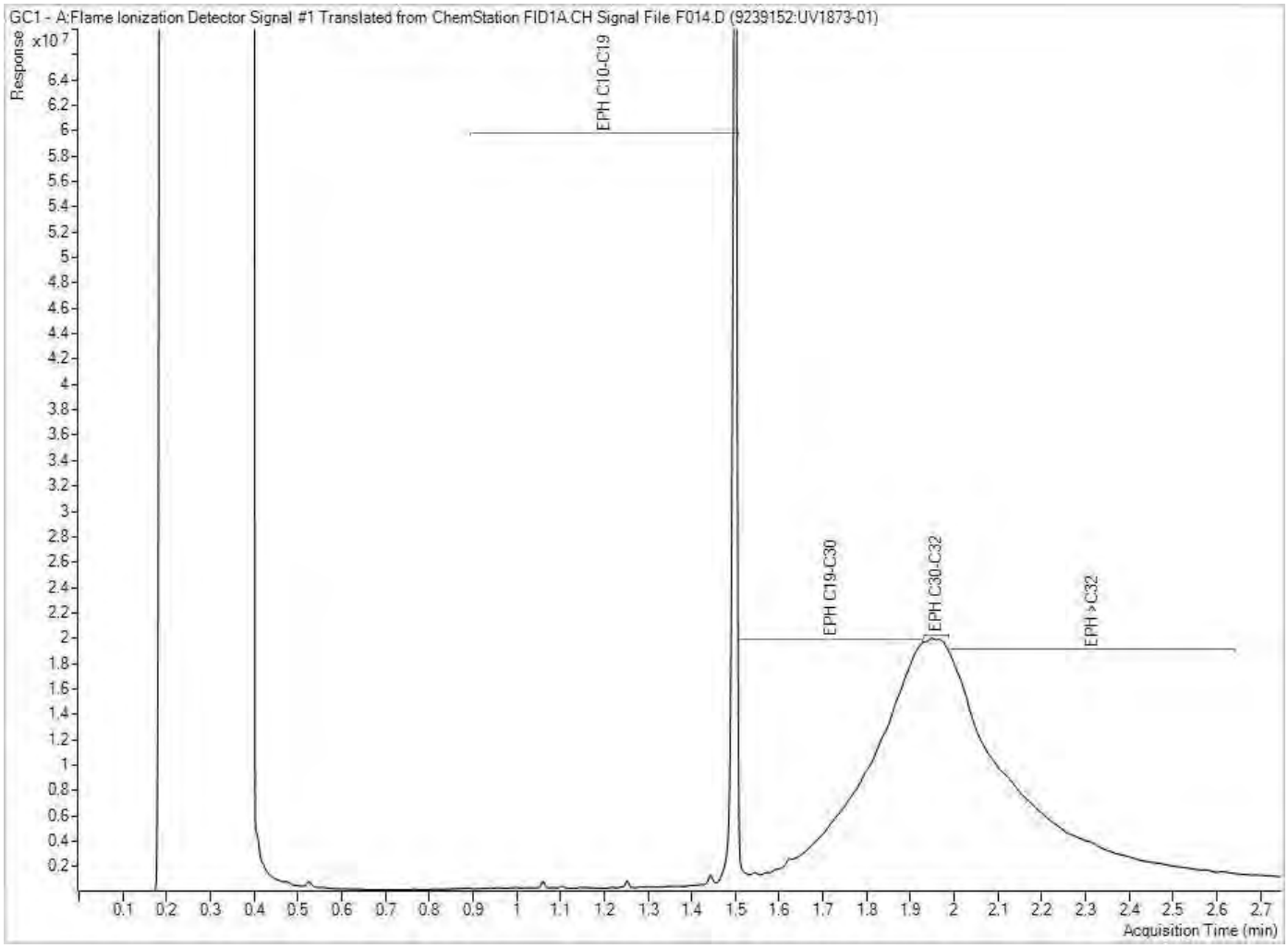
The information in this e-mail and any attachments is confidential and for the sole use of the intended recipient(s). If you have received this e-mail in error, please: accept our apologies for the inconvenience; note that any use of the information is strictly prohibited; notify the sender as soon as possible; and then delete all copies from your system.

-----Original Message-----
From: Nicole MacDonald [mailto:nmacdonald@keystoneenvironmental.ca]
Sent: Thursday, November 22, 2018 10:24 AM
To: Gail Pedersen; Stewart McBride
Subject: RE: HOLD Submissions Proj# 13639-2C COCs K021465 and K021463

Maxxam Job #: B8A2725
Report Date: 2018/12/07
Maxxam Sample: UV1873

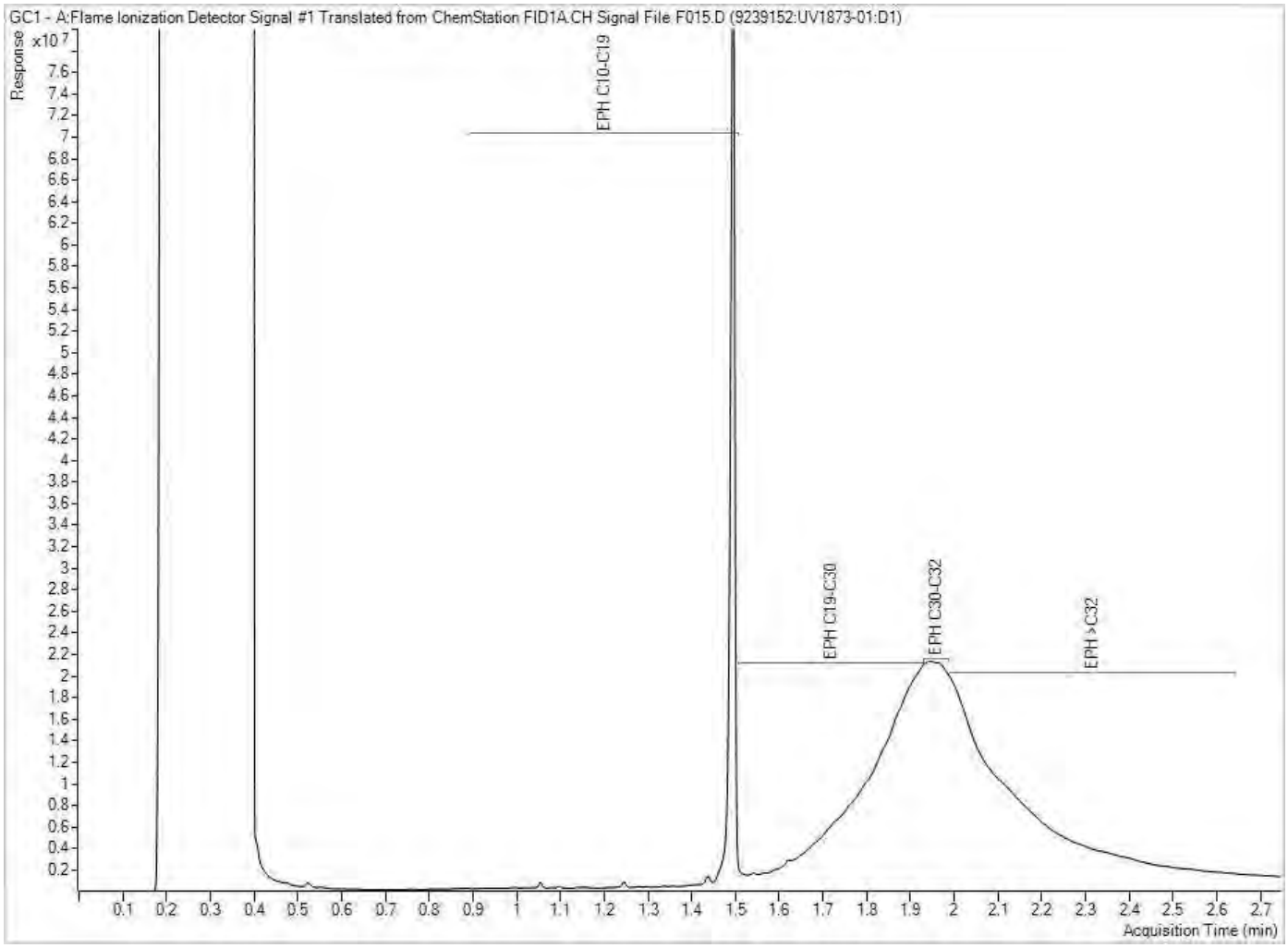
KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: BH18-1 (0.1)

EPH in Soil by GC/FID Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

EPH in Soil by GC/FID Chromatogram

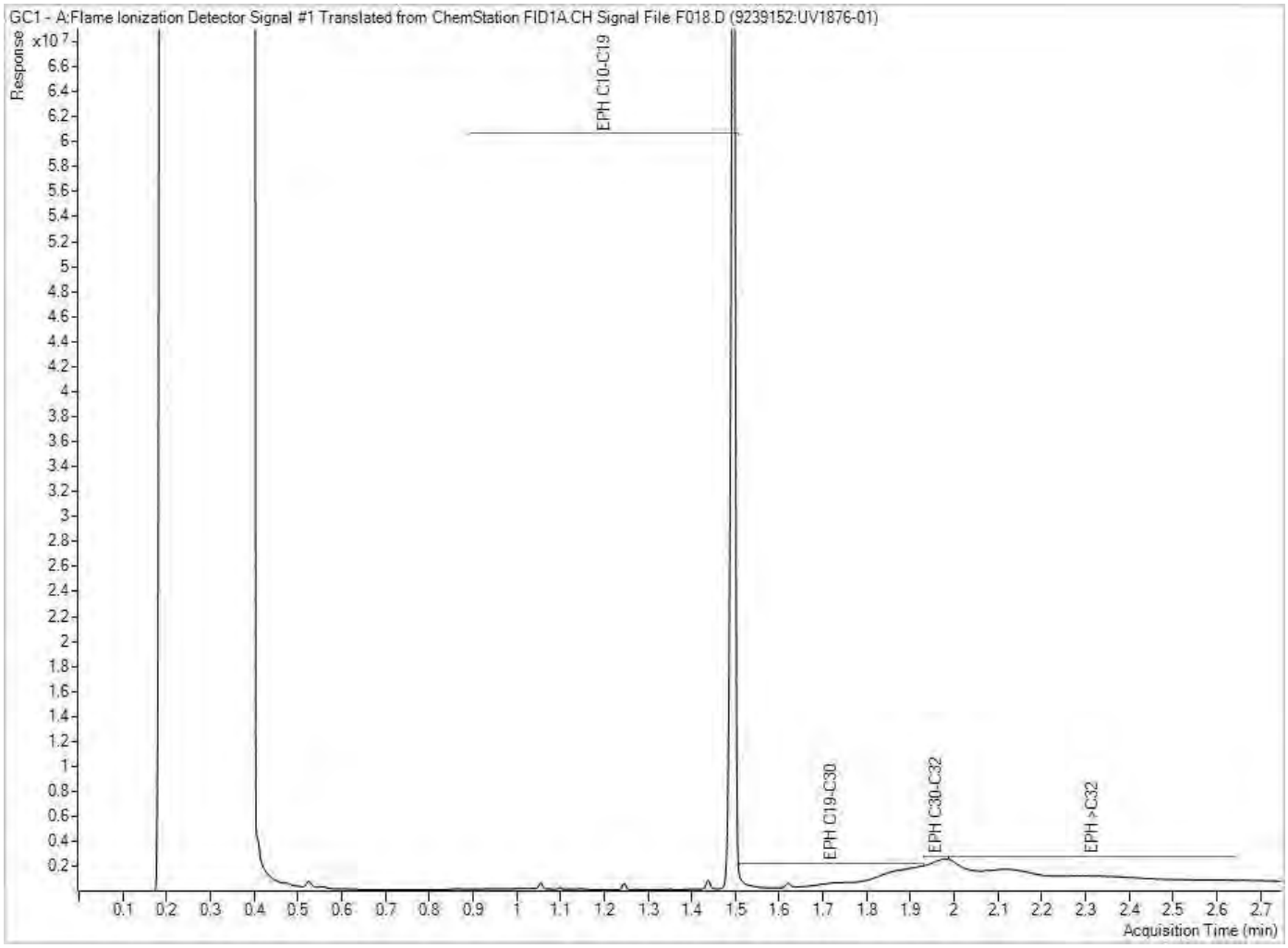


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B8A2725
Report Date: 2018/12/07
Maxxam Sample: UV1876

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-2 (2.1)

EPH in Soil by GC/FID Chromatogram



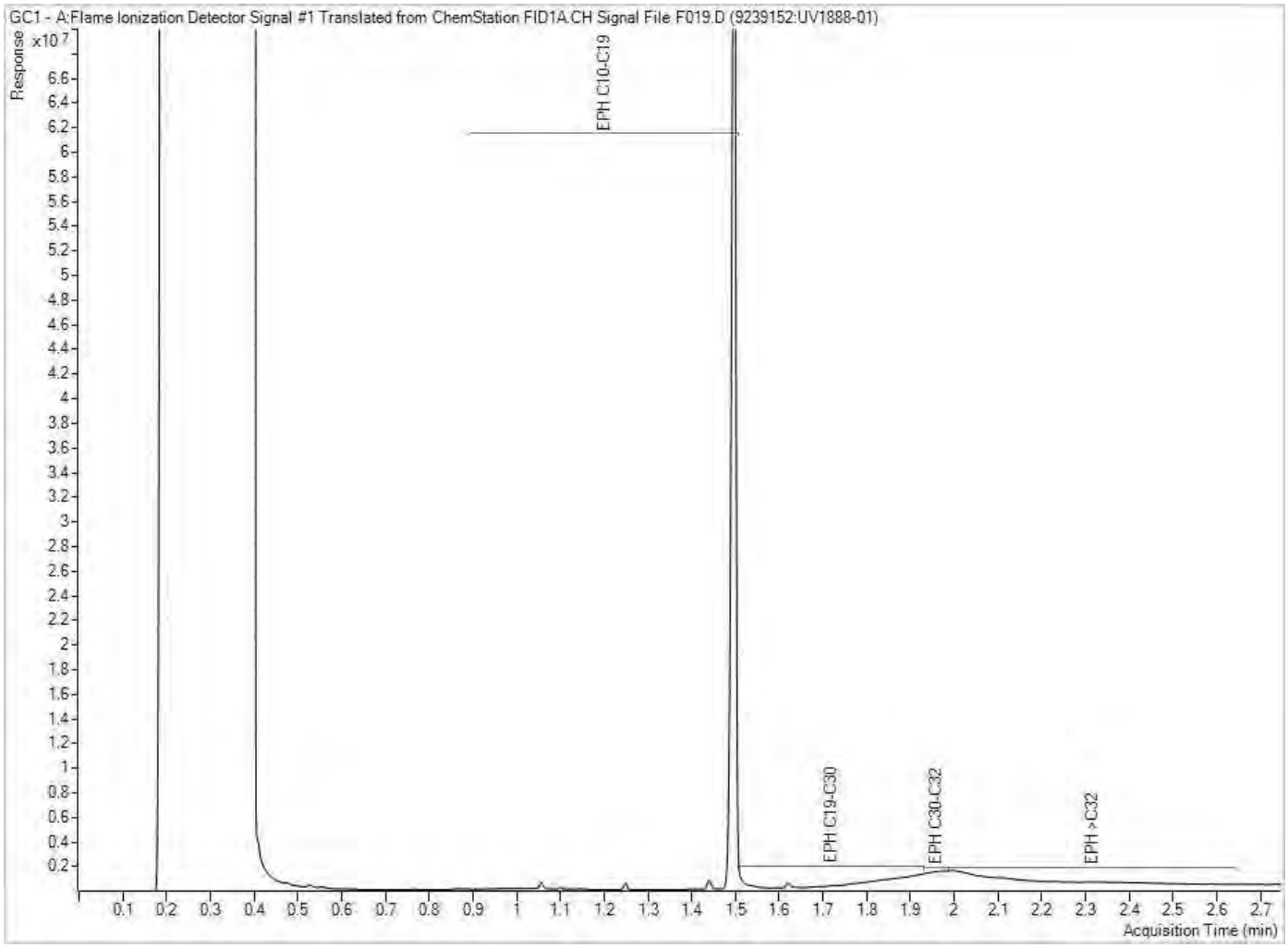
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

City of Vancouver - FOI 2023-228 - Page 622 of 1003

Maxxam Job #: B8A2725
Report Date: 2018/12/07
Maxxam Sample: UV1888

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: BH18-4 (0.2)

EPH in Soil by GC/FID Chromatogram



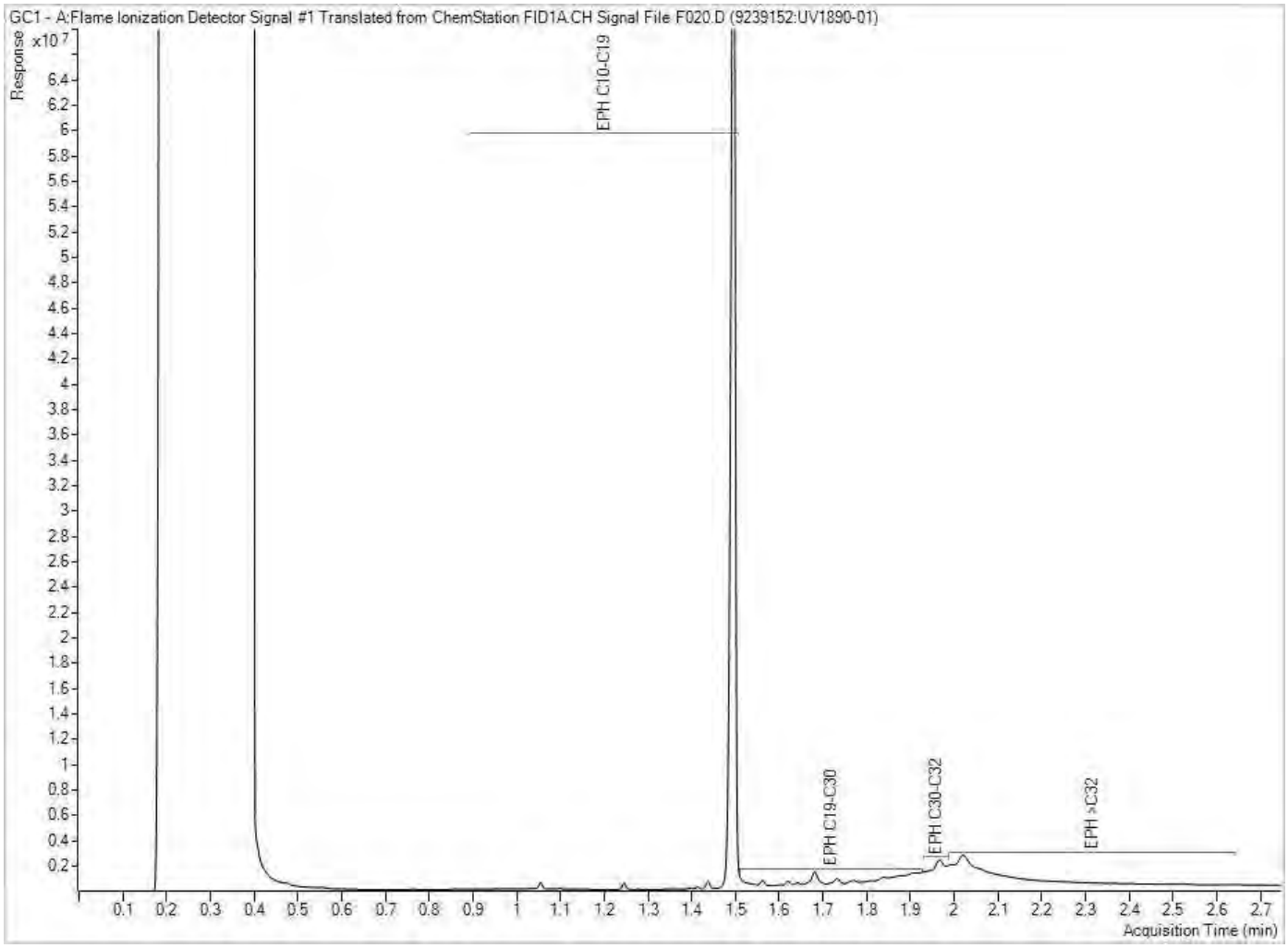
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

City of Vancouver - FOI 2023-228 - Page 623 of 1003

Maxxam Job #: B8A2725
Report Date: 2018/12/07
Maxxam Sample: UV1890

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-E

EPH in Soil by GC/FID Chromatogram

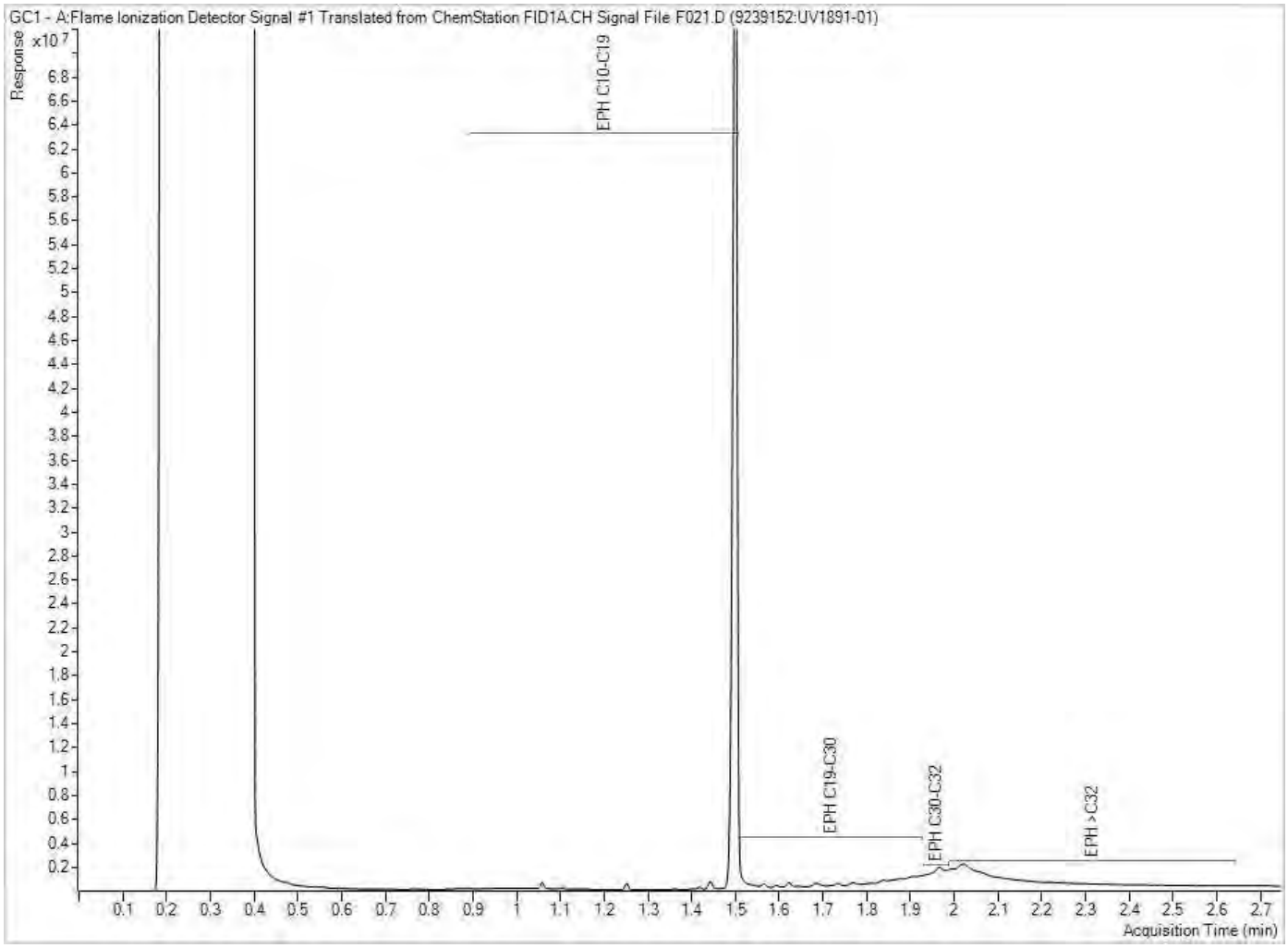


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B8A2725
Report Date: 2018/12/07
Maxxam Sample: UV1891

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-5 (0.5)

EPH in Soil by GC/FID Chromatogram



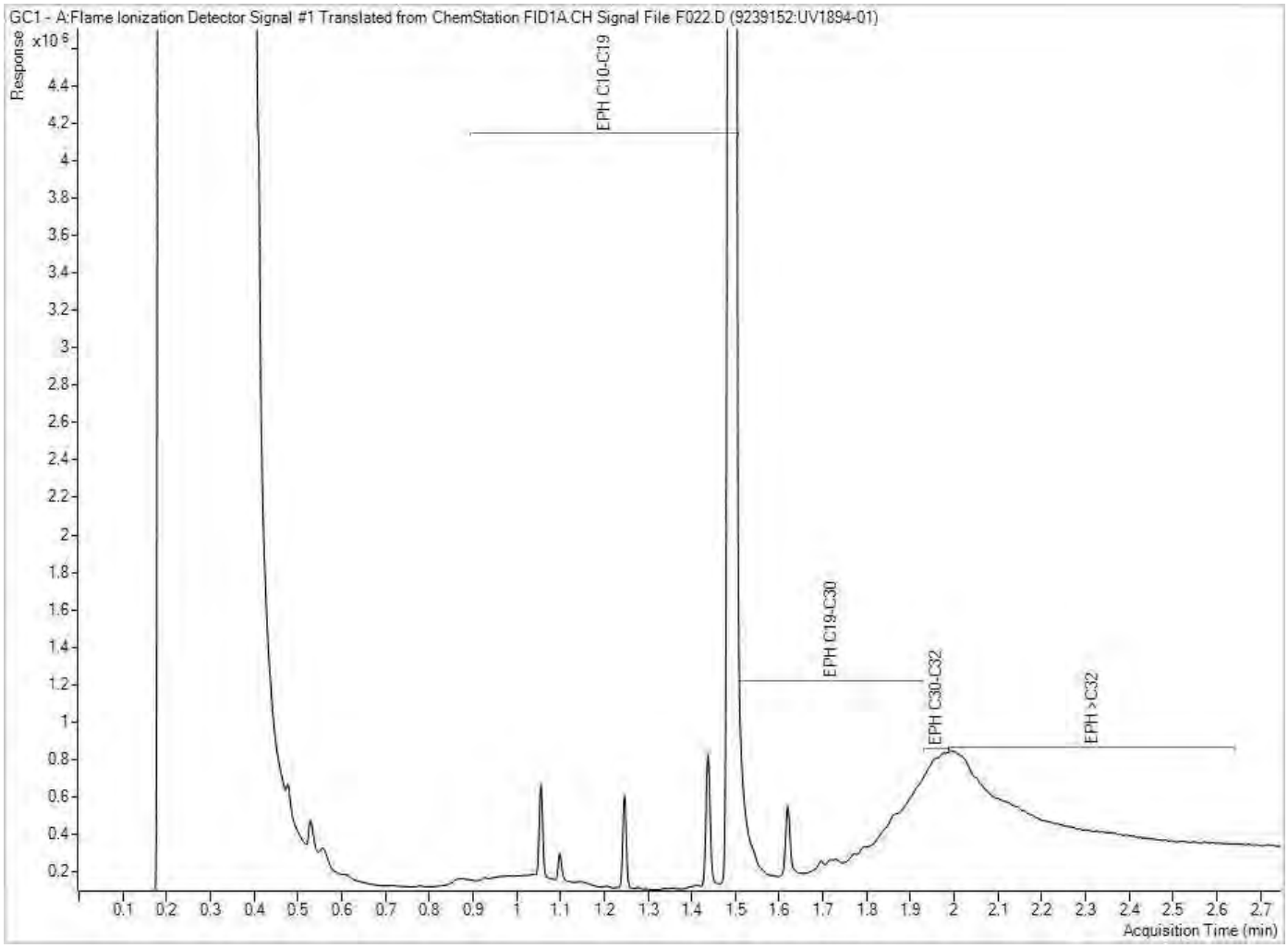
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

City of Vancouver - FOI 2023-228 - Page 625 of 1003

Maxxam Job #: B8A2725
Report Date: 2018/12/07
Maxxam Sample: UV1894

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-5 (2.8)

EPH in Soil by GC/FID Chromatogram



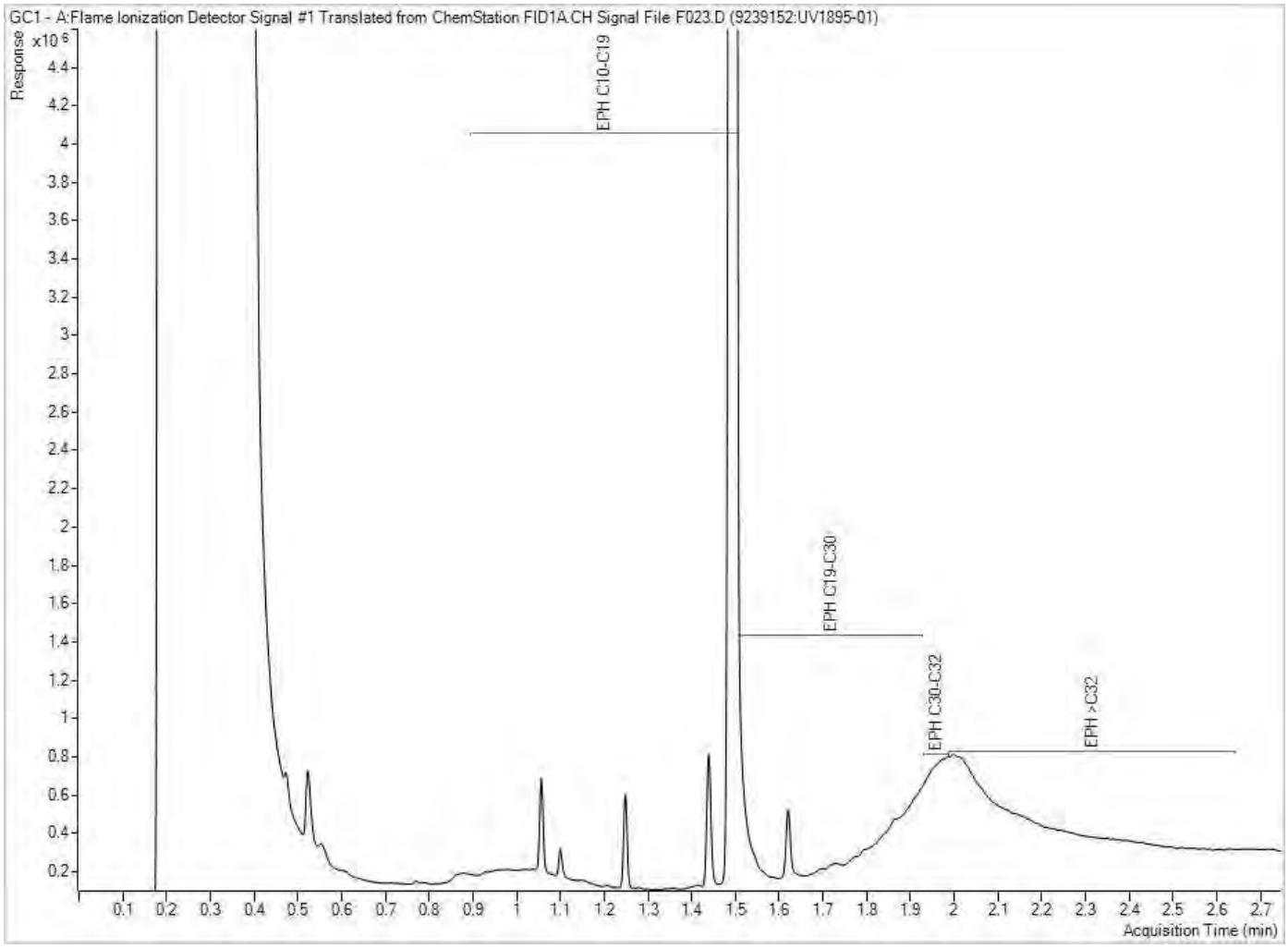
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

City of Vancouver - FOI 2023-228 - Page 626 of 1003

Maxxam Job #: B8A2725
Report Date: 2018/12/07
Maxxam Sample: UV1895

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-9 (0.3)

EPH in Soil by GC/FID Chromatogram

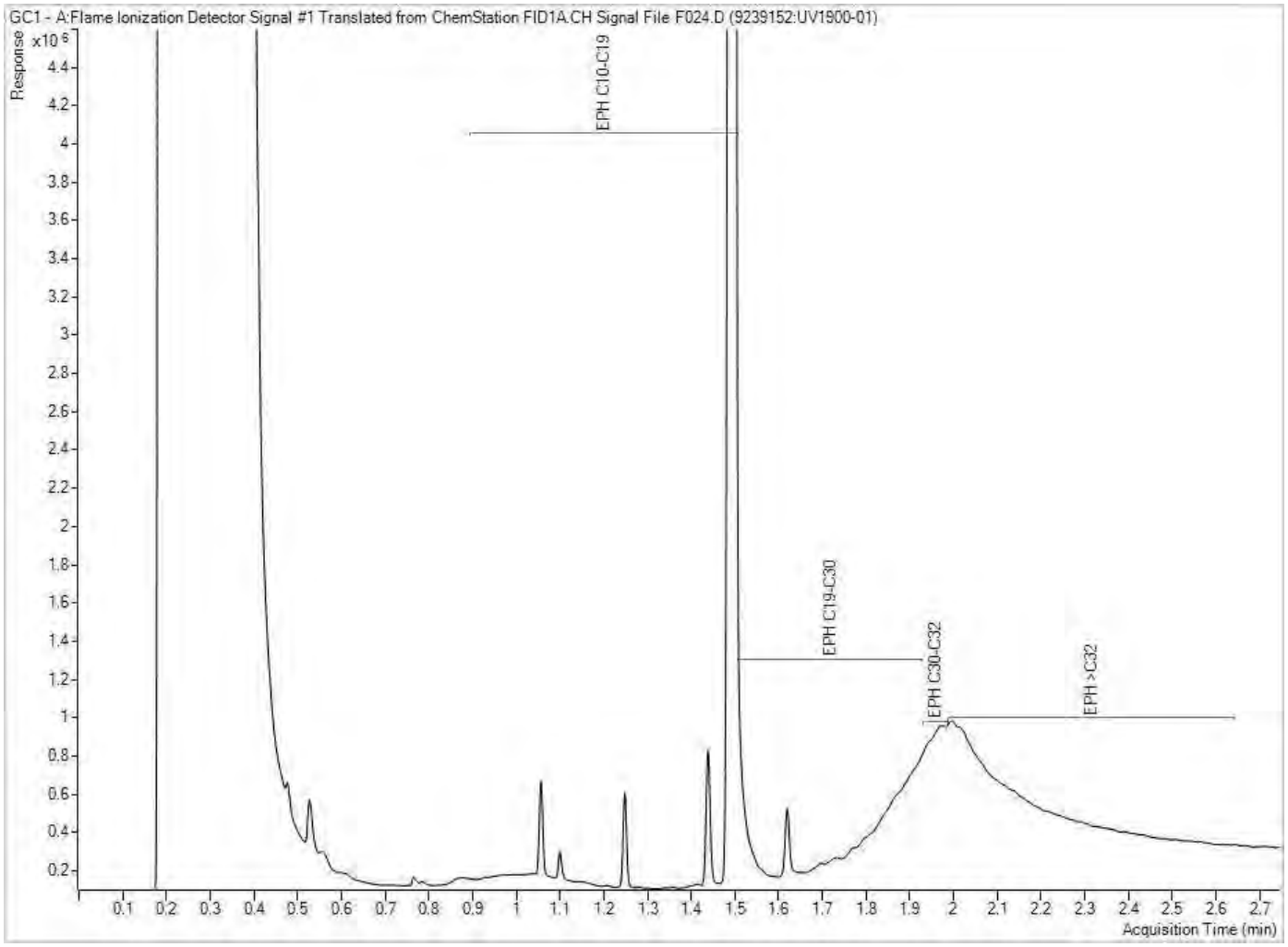


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B8A2725
Report Date: 2018/12/07
Maxxam Sample: UV1900

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-9 (4.5)

EPH in Soil by GC/FID Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Your Project #: 13639-2D
Your C.O.C. #: K021459, K021460, K021461

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/12/07
Report #: R2661210
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8A2224
Received: 2018/11/20, 18:26

Sample Matrix: Soil
Samples Received: 7

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Elements by ICPMS (total)	5	2018/11/22	2018/11/22	BBY7SOP-00004 / BBY7SOP-00001	EPA 6020b R2 m
Elements by ICPMS (total)	1	2018/12/05	2018/12/05	BBY7SOP-00004 / BBY7SOP-00001	EPA 6020b R2 m
Moisture	6	2018/11/21	2018/11/22	BBY8SOP-00017	BCMOE BCLM Dec2000 m
PAH in Soil by GC/MS (SIM)	6	2018/11/21	2018/11/22	BBY8SOP-00022	BCMOE BCLM Jul2017m
Total PAH and B(a)P Calculation (1)	6	N/A	2018/11/23	BBY WI-00033	Auto Calc
pH (2:1 DI Water Extract)	5	2018/11/22	2018/11/22	BBY6SOP-00028	BCMOE BCLM Mar2005 m
pH (2:1 DI Water Extract)	1	2018/12/05	2018/12/05	BBY6SOP-00028	BCMOE BCLM Mar2005 m
EPH less PAH in Soil By GC/FID (2)	6	N/A	2018/11/23	BBY WI-00033	Auto Calc
EPH in Soil by GC/FID	6	2018/11/21	2018/11/22	BBY8SOP-00029	BCMOE BCLM Jul 2016
Extra VOCs in Soil - Field Pres. (3)	1	N/A	2018/11/23	BBY8SOP-00040	BCMOE BCLM Sep 2017m
VOCs, VH, F1, LH in Soil - Field Pres. (3)	1	N/A	2018/11/24	BBY8SOP-00009/11/12	BCMOE BCLM Sep 2017m
Volatile HC-BTEX for Soil (4)	1	N/A	2018/11/26	BBY WI-00033	Auto Calc

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

City of Vancouver - FOI 2023-228 - Page 629 of 1003

Your Project #: 13639-2D
Your C.O.C. #: K021459, K021460, K021461

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/12/07
Report #: R2661210
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8A2224
Received: 2018/11/20, 18:26

dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Total PAHs in Soil include: Quinoline, Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Acridine, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b&j)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, and Benzo(g,h,i)perylene.

Total PAHs in Sediment include: Naphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(a)pyrene, and Dibenz(a,h)anthracene.
(2) LEPH = EPH (C10 to C19) - (Naphthalene + Phenanthrene)
HEPH = EPH (C19 to C32) - (Benzo(a)anthracene + Benzo(a)pyrene + Benzo(b)fluoranthene + Benzo(k)fluoranthene + Dibenz(a,h)anthracene + Indeno(1,2,3-cd)pyrene + Pyrene)
(3) The extraction date for VOC, BTEX, VH, or F1 samples that are field preserved with methanol equals the date sampled, unless otherwise stated.
(4) VPH = VH - (Benzene + Toluene + Ethylbenzene + m & p-Xylene + o-Xylene + Styrene)

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Gail Pedersen, Project Manager –Environmental Customer Service
Email: gpedersen@maxxam.ca
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==========
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Maxxam Job #: B8A2224
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

PHYSICAL TESTING (SOIL)

Maxxam ID		UU9325	UU9327	UU9327	UU9334	UU9336	UU9338		
Sampling Date		2018/11/20 15:20	2018/11/20 13:05	2018/11/20 13:05	2018/11/20 14:10	2018/11/20 14:20	2018/11/20 11:30		
COC Number		K021459	K021459	K021459	K021459	K021460	K021460		
	UNITS	MW18-2 (0.3)	MW18-3 (0.5)	MW18-3 (0.5) Lab-Dup	MW18-3 (6.9)	MW18-3 (8.0)	MW18-A	RDL	QC Batch
Physical Properties									
Moisture	%	8.4	12	11	8.5	9.6	7.5	0.30	9237379

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

Maxxam ID		UU9356		
Sampling Date		2018/11/20 08:25		
COC Number		K021461		
	UNITS	BH18-8 (1.2)	RDL	QC Batch
Physical Properties				
Moisture	%	11	0.30	9237379

RDL = Reportable Detection Limit

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Maxxam Job #: B8A2224
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		UU9334		
Sampling Date		2018/11/20 14:10		
COC Number		K021459		
	UNITS	**MW18-3 (6.9)**	**RDL**	**QC Batch**
Volatiles				
Extractable (MeOH) 2-Butanone (MEK)	mg/kg	<15	15	9239625
Extractable (MeOH) 4-Methyl-2-pentanone (MIBK)	mg/kg	<0.50	0.50	9239625
Surrogate Recovery (%)				
Extractable (MeOH) 1,4-Difluorobenzene (sur.)	%	86		9239625
Extractable (MeOH) 4-Bromofluorobenzene (sur.)	%	108		9239625
Extractable (MeOH) D4-1,2-Dichloroethane (sur.)	%	127		9239625
RDL = Reportable Detection Limit				

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Maxxam Job #: B8A2224
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

LEPH & HEPH WITH PAH FOR CSR IN SOIL (SOIL)

Maxxam ID		UU9325	UU9327			UU9327		
Sampling Date		2018/11/20 15:20	2018/11/20 13:05			2018/11/20 13:05		
COC Number		K021459	K021459			K021459		
	UNITS	MW18-2 (0.3)	MW18-3 (0.5)	RDL	QC Batch	MW18-3 (0.5) Lab-Dup	RDL	QC Batch
Calculated Parameters								
Low Molecular Weight PAH`s	ug/g	<0.050	<0.050	0.050	9237518			
High Molecular Weight PAH`s	ug/g	0.050	<0.050	0.050	9237518			
Total PAH	ug/g	0.064	<0.050	0.050	9237518			
Polycyclic Aromatics								
Quinoline	ug/g	<0.050	<0.050	0.050	9237885	<0.050	0.050	9237885
Naphthalene	ug/g	<0.010	<0.010	0.010	9237885	<0.010	0.010	9237885
1-Methylnaphthalene	ug/g	<0.050	<0.050	0.050	9237885	<0.050	0.050	9237885
2-Methylnaphthalene	ug/g	<0.020	<0.020	0.020	9237885	<0.020	0.020	9237885
Acenaphthylene	ug/g	0.0070	<0.0050	0.0050	9237885	<0.0050	0.0050	9237885
Acenaphthene	ug/g	<0.0050	<0.0050	0.0050	9237885	<0.0050	0.0050	9237885
Fluorene	ug/g	<0.020	<0.020	0.020	9237885	<0.020	0.020	9237885
Phenanthrene	ug/g	<0.010	<0.010	0.010	9237885	<0.010	0.010	9237885
Anthracene	ug/g	0.0068	0.0083	0.0040	9237885	0.0094	0.0040	9237885
Fluoranthene	ug/g	<0.020	<0.020	0.020	9237885	0.020	0.020	9237885
Pyrene	ug/g	0.050	<0.020	0.020	9237885	<0.020	0.020	9237885
Benzo(a)anthracene	ug/g	<0.020	<0.020	0.020	9237885	<0.020	0.020	9237885
Chrysene	ug/g	<0.020	<0.020	0.020	9237885	<0.020	0.020	9237885
Benzo(b&j)fluoranthene	ug/g	<0.020	<0.020	0.020	9237885	<0.020	0.020	9237885
Benzo(b)fluoranthene	ug/g	<0.020	<0.020	0.020	9237885	<0.020	0.020	9237885
Benzo(k)fluoranthene	ug/g	<0.020	<0.020	0.020	9237885	<0.020	0.020	9237885
Benzo(a)pyrene	ug/g	<0.020	<0.020	0.020	9237885	<0.020	0.020	9237885
Indeno(1,2,3-cd)pyrene	ug/g	<0.020	<0.020	0.020	9237885	<0.020	0.020	9237885
Dibenz(a,h)anthracene	ug/g	<0.020	<0.020	0.020	9237885	<0.020	0.020	9237885
Benzo(g,h,i)perylene	ug/g	<0.050	<0.050	0.050	9237885	<0.050	0.050	9237885
Calculated Parameters								
LEPH (C10-C19 less PAH)	mg/kg	<100	<100	100	9237538			
HEPH (C19-C32 less PAH)	mg/kg	1300	<100	100	9237538			
Hydrocarbons								
EPH (C10-C19)	mg/kg	<100	<100	100	9237888	<100	100	9237888
EPH (C19-C32)	mg/kg	1300	<100	100	9237888	<100	100	9237888

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8A2224
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

LEPH & HEPH WITH PAH FOR CSR IN SOIL (SOIL)

Maxxam ID		UU9325	UU9327			UU9327		
Sampling Date		2018/11/20 15:20	2018/11/20 13:05			2018/11/20 13:05		
COC Number		K021459	K021459			K021459		
	UNITS	MW18-2 (0.3)	MW18-3 (0.5)	RDL	QC Batch	MW18-3 (0.5) Lab-Dup	RDL	QC Batch
Surrogate Recovery (%)								
D10-ANTHRACENE (sur.)	%	94	94		9237885	89		9237885
D8-ACENAPHTHYLENE (sur.)	%	83	85		9237885	82		9237885
D8-NAPHTHALENE (sur.)	%	74	74		9237885	72		9237885
TERPHENYL-D14 (sur.)	%	86	89		9237885	85		9237885
O-TERPHENYL (sur.)	%	70	87		9237888	87		9237888

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8A2224
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

LEPH & HEPH WITH PAH FOR CSR IN SOIL (SOIL)

Maxxam ID		UU9334	UU9336	UU9338	UU9356		
Sampling Date		2018/11/20 14:10	2018/11/20 14:20	2018/11/20 11:30	2018/11/20 08:25		
COC Number		K021459	K021460	K021460	K021461		
	UNITS	MW18-3 (6.9)	MW18-3 (8.0)	MW18-A	BH18-8 (1.2)	RDL	QC Batch
Calculated Parameters							
Low Molecular Weight PAH`s	ug/g	<0.050	<0.050	<0.050	<0.050	0.050	9237518
High Molecular Weight PAH`s	ug/g	<0.050	<0.050	<0.050	<0.050	0.050	9237518
Total PAH	ug/g	<0.050	<0.050	<0.050	<0.050	0.050	9237518
Polycyclic Aromatics							
Quinoline	ug/g	<0.050	<0.050	<0.050	<0.050	0.050	9237885
Naphthalene	ug/g	<0.010	<0.010	<0.010	<0.010	0.010	9237885
1-Methylnaphthalene	ug/g	<0.050	<0.050	<0.050	<0.050	0.050	9237885
2-Methylnaphthalene	ug/g	<0.020	<0.020	<0.020	<0.020	0.020	9237885
Acenaphthylene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9237885
Acenaphthene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9237885
Fluorene	ug/g	<0.020	<0.020	<0.020	<0.020	0.020	9237885
Phenanthrene	ug/g	<0.010	<0.010	<0.010	<0.010	0.010	9237885
Anthracene	ug/g	<0.0040	<0.0040	<0.0040	<0.0040	0.0040	9237885
Fluoranthene	ug/g	<0.020	<0.020	<0.020	<0.020	0.020	9237885
Pyrene	ug/g	<0.020	<0.020	<0.020	<0.020	0.020	9237885
Benzo(a)anthracene	ug/g	<0.020	<0.020	<0.020	<0.020	0.020	9237885
Chrysene	ug/g	<0.020	<0.020	<0.020	<0.020	0.020	9237885
Benzo(b&j)fluoranthene	ug/g	<0.020	<0.020	<0.020	<0.020	0.020	9237885
Benzo(b)fluoranthene	ug/g	<0.020	<0.020	<0.020	<0.020	0.020	9237885
Benzo(k)fluoranthene	ug/g	<0.020	<0.020	<0.020	<0.020	0.020	9237885
Benzo(a)pyrene	ug/g	<0.020	<0.020	<0.020	<0.020	0.020	9237885
Indeno(1,2,3-cd)pyrene	ug/g	<0.020	<0.020	<0.020	<0.020	0.020	9237885
Dibenz(a,h)anthracene	ug/g	<0.020	<0.020	<0.020	<0.020	0.020	9237885
Benzo(g,h,i)perylene	ug/g	<0.050	<0.050	<0.050	<0.050	0.050	9237885
Calculated Parameters							
LEPH (C10-C19 less PAH)	mg/kg	<100	<100	<100	<100	100	9237538
HEPH (C19-C32 less PAH)	mg/kg	<100	<100	<100	<100	100	9237538
Hydrocarbons							
EPH (C10-C19)	mg/kg	<100	<100	<100	<100	100	9237888
EPH (C19-C32)	mg/kg	<100	<100	<100	<100	100	9237888
RDL = Reportable Detection Limit							

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Maxxam Job #: B8A2224
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

LEPH & HEPH WITH PAH FOR CSR IN SOIL (SOIL)

Maxxam ID		UU9334	UU9336	UU9338	UU9356		
Sampling Date		2018/11/20 14:10	2018/11/20 14:20	2018/11/20 11:30	2018/11/20 08:25		
COC Number		K021459	K021460	K021460	K021461		
	UNITS	MW18-3 (6.9)	MW18-3 (8.0)	MW18-A	BH18-8 (1.2)	RDL	QC Batch
Surrogate Recovery (%)							
D10-ANTHRACENE (sur.)	%	93	92	91	90		9237885
D8-ACENAPHTHYLENE (sur.)	%	85	83	82	81		9237885
D8-NAPHTHALENE (sur.)	%	74	74	73	72		9237885
TERPHENYL-D14 (sur.)	%	87	86	85	83		9237885
O-TERPHENYL (sur.)	%	89	88	88	89		9237888
RDL = Reportable Detection Limit							

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Maxxam Job #: B8A2224
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR/CCME METALS IN SOIL WITH HG (SOIL)

Maxxam ID		UU9325	UU9327	UU9336	UU9338		UU9355		
Sampling Date		2018/11/20 15:20	2018/11/20 13:05	2018/11/20 14:20	2018/11/20 11:30		2018/11/20 08:20		
COC Number		K021459	K021459	K021460	K021460		K021461		
	UNITS	MW18-2 (0.3)	MW18-3 (0.5)	MW18-3 (8.0)	MW18-A	QC Batch	BH18-8 (0.6)	RDL	QC Batch
Physical Properties									
Soluble (2:1) pH	pH	7.77	6.72	9.10	7.03	9237657	7.09	N/A	9253381
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	9780	14800	12200	10100	9237653	8530	100	9253378
Total Antimony (Sb)	mg/kg	0.28	0.15	0.18	0.18	9237653	0.13	0.10	9253378
Total Arsenic (As)	mg/kg	3.25	2.40	2.44	2.91	9237653	2.01	0.50	9253378
Total Barium (Ba)	mg/kg	48.6	73.9	72.2	51.4	9237653	47.9	0.10	9253378
Total Beryllium (Be)	mg/kg	<0.20	<0.20	<0.20	<0.20	9237653	<0.20	0.20	9253378
Total Boron (B)	mg/kg	1.3	1.1	1.7	1.3	9237653	<1.0	1.0	9253378
Total Cadmium (Cd)	mg/kg	0.079	<0.050	0.080	0.074	9237653	0.050	0.050	9253378
Total Chromium (Cr)	mg/kg	12.6	12.9	21.4	13.5	9237653	11.6	1.0	9253378
Total Cobalt (Co)	mg/kg	4.73	4.71	6.89	4.74	9237653	4.46	0.30	9253378
Total Copper (Cu)	mg/kg	16.9	12.4	16.2	12.7	9237653	8.66	0.50	9253378
Total Lead (Pb)	mg/kg	18.9	3.05	2.90	2.71	9237653	2.14	0.10	9253378
Total Manganese (Mn)	mg/kg	228	186	306	230	9237653	211	0.20	9253378
Total Mercury (Hg)	mg/kg	<0.050	<0.050	<0.050	<0.050	9237653	<0.050	0.050	9253378
Total Molybdenum (Mo)	mg/kg	0.30	0.32	0.35	0.25	9237653	0.22	0.10	9253378
Total Nickel (Ni)	mg/kg	7.21	7.42	11.5	7.63	9237653	6.14	0.80	9253378
Total Selenium (Se)	mg/kg	<0.50	<0.50	<0.50	<0.50	9237653	<0.50	0.50	9253378
Total Silver (Ag)	mg/kg	<0.050	<0.050	<0.050	<0.050	9237653	<0.050	0.050	9253378
Total Strontium (Sr)	mg/kg	30.6	17.6	53.5	41.7	9237653	28.2	0.10	9253378
Total Tin (Sn)	mg/kg	0.38	0.26	0.32	0.31	9237653	0.21	0.10	9253378
Total Titanium (Ti)	mg/kg	653	702	817	761	9237653	590	1.0	9253378
Total Tungsten (W)	mg/kg	<0.50	<0.50	1.43	<0.50	9237653	<0.50	0.50	9253378
Total Vanadium (V)	mg/kg	45.3	45.9	56.9	51.3	9237653	43.7	2.0	9253378
Total Zinc (Zn)	mg/kg	33.5	25.9	33.7	25.2	9237653	21.6	1.0	9253378

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B8A2224
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR/CCME METALS IN SOIL WITH HG (SOIL)

Maxxam ID		UU9356		
Sampling Date		2018/11/20 08:25		
COC Number		K021461		
	UNITS	BH18-8 (1.2)	RDL	QC Batch
Physical Properties				
Soluble (2:1) pH	pH	7.29	N/A	9237657
Total Metals by ICPMS				
Total Aluminum (Al)	mg/kg	9040	100	9237653
Total Antimony (Sb)	mg/kg	0.14	0.10	9237653
Total Arsenic (As)	mg/kg	2.03	0.50	9237653
Total Barium (Ba)	mg/kg	60.8	0.10	9237653
Total Beryllium (Be)	mg/kg	<0.20	0.20	9237653
Total Boron (B)	mg/kg	<1.0	1.0	9237653
Total Cadmium (Cd)	mg/kg	0.055	0.050	9237653
Total Chromium (Cr)	mg/kg	12.4	1.0	9237653
Total Cobalt (Co)	mg/kg	4.67	0.30	9237653
Total Copper (Cu)	mg/kg	10.9	0.50	9237653
Total Lead (Pb)	mg/kg	2.24	0.10	9237653
Total Manganese (Mn)	mg/kg	239	0.20	9237653
Total Mercury (Hg)	mg/kg	<0.050	0.050	9237653
Total Molybdenum (Mo)	mg/kg	0.20	0.10	9237653
Total Nickel (Ni)	mg/kg	6.89	0.80	9237653
Total Selenium (Se)	mg/kg	<0.50	0.50	9237653
Total Silver (Ag)	mg/kg	<0.050	0.050	9237653
Total Strontium (Sr)	mg/kg	37.5	0.10	9237653
Total Tin (Sn)	mg/kg	0.27	0.10	9237653
Total Titanium (Ti)	mg/kg	738	1.0	9237653
Total Tungsten (W)	mg/kg	<0.50	0.50	9237653
Total Vanadium (V)	mg/kg	46.2	2.0	9237653
Total Zinc (Zn)	mg/kg	23.3	1.0	9237653

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B8A2224
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR VOC + VPH IN SOIL - FIELD PRESERVED (SOIL)

Maxxam ID		UU9334		
Sampling Date		2018/11/20 14:10		
COC Number		K021459		
	UNITS	MW18-3 (6.9)	RDL	QC Batch
Calculated Parameters				
VPH (VH6 to 10 - BTEX)	mg/kg	<10	10	9237553
Volatiles				
VH C6-C10	mg/kg	<10	10	9239585
1,1,1,2-tetrachloroethane	mg/kg	<0.020	0.020	9239585
1,1,1-trichloroethane	mg/kg	<0.020	0.020	9239585
1,1,2,2-tetrachloroethane	mg/kg	<0.020	0.020	9239585
1,1,2-trichloroethane	mg/kg	<0.020	0.020	9239585
1,1-dichloroethane	mg/kg	<0.025	0.025	9239585
1,1-dichloroethene	mg/kg	<0.025	0.025	9239585
1,2-dibromoethane	mg/kg	<0.020	0.020	9239585
1,2-dichlorobenzene	mg/kg	<0.020	0.020	9239585
1,2-dichloroethane	mg/kg	<0.020	0.020	9239585
1,2-dichloropropane	mg/kg	<0.020	0.020	9239585
1,3-Butadiene	mg/kg	<0.080	0.080	9239585
1,3-dichlorobenzene	mg/kg	<0.020	0.020	9239585
1,4-dichlorobenzene	mg/kg	<0.020	0.020	9239585
Benzene	mg/kg	<0.0050	0.0050	9239585
Bromobenzene	mg/kg	<0.20	0.20	9239585
Bromodichloromethane	mg/kg	<0.050	0.050	9239585
Bromoform	mg/kg	<0.050	0.050	9239585
Bromomethane	mg/kg	<0.30	0.30	9239585
Carbon tetrachloride	mg/kg	<0.020	0.020	9239585
Chlorobenzene	mg/kg	<0.020	0.020	9239585
Chlorodibromomethane	mg/kg	<0.050	0.050	9239585
Chloroethane	mg/kg	<0.10	0.10	9239585
Chloroform	mg/kg	<0.020	0.020	9239585
Chloromethane	mg/kg	<0.050	0.050	9239585
cis-1,2-dichloroethene	mg/kg	<0.030	0.030	9239585
cis-1,3-dichloropropene	mg/kg	<0.020	0.020	9239585
Dibromomethane	mg/kg	<0.20	0.20	9239585
Dichlorodifluoromethane	mg/kg	<0.20	0.20	9239585
Dichloromethane	mg/kg	<0.080	0.080	9239585
RDL = Reportable Detection Limit				

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Maxxam Job #: B8A2224
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR VOC + VPH IN SOIL - FIELD PRESERVED (SOIL)

Maxxam ID		UU9334		
Sampling Date		2018/11/20 14:10		
COC Number		K021459		
	UNITS	**MW18-3 (6.9)**	**RDL**	**QC Batch**
Ethylbenzene	mg/kg	<0.010	0.010	9239585
Styrene	mg/kg	<0.030	0.030	9239585
Tetrachloroethene	mg/kg	<0.010	0.010	9239585
Toluene	mg/kg	<0.020	0.020	9239585
trans-1,2-dichloroethene	mg/kg	<0.030	0.030	9239585
trans-1,3-dichloropropene	mg/kg	<0.020	0.020	9239585
Trichloroethene	mg/kg	<0.0090	0.0090	9239585
Trichlorofluoromethane	mg/kg	<0.20	0.20	9239585
Vinyl chloride	mg/kg	<0.040	0.040	9239585
m & p-Xylene	mg/kg	<0.040	0.040	9239585
o-Xylene	mg/kg	<0.040	0.040	9239585
Xylenes (Total)	mg/kg	<0.040	0.040	9239585
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	101		9239585
4-Bromofluorobenzene (sur.)	%	109		9239585
D10-ETHYLBENZENE (sur.)	%	127		9239585
D4-1,2-Dichloroethane (sur.)	%	114		9239585
RDL = Reportable Detection Limit				

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Maxxam Job #: B8A2224
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KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	10.0°C

Version 2: Report reissued to include results for Keystone Metals on sample BH18-8(0.6) as per request from Stewart McBride on 2018/12/04

Results relate only to the items tested.

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Maxxam Job #: B8A2224
Report Date: 2018/12/07

QUALITY ASSURANCE REPORT

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9237885	D10-ANTHRACENE (sur.)	2018/11/22	91	50 - 140	86	50 - 140	94	%				
9237885	D8-ACENAPHTHYLENE (sur.)	2018/11/22	86	50 - 140	81	50 - 140	84	%				
9237885	D8-NAPHTHALENE (sur.)	2018/11/22	77	50 - 140	76	50 - 140	76	%				
9237885	TERPHENYL-D14 (sur.)	2018/11/22	88	50 - 140	83	50 - 140	87	%				
9237888	O-TERPHENYL (sur.)	2018/11/22	60	60 - 140	64	60 - 140	89	%				
9239585	1,4-Difluorobenzene (sur.)	2018/11/23	101	50 - 140	99	50 - 140	101	%				
9239585	4-Bromofluorobenzene (sur.)	2018/11/23	106	50 - 140	106	50 - 140	97	%				
9239585	D10-ETHYLBENZENE (sur.)	2018/11/23	93	50 - 140	83	50 - 140	88	%				
9239585	D4-1,2-Dichloroethane (sur.)	2018/11/23	109	50 - 140	108	50 - 140	99	%				
9239625	Extractable (MeOH) 1,4-Difluorobenzene (sur.)	2018/11/23			103	50 - 140	103	%				
9239625	Extractable (MeOH) 4-Bromofluorobenzene (sur.)	2018/11/23			99	50 - 140	101	%				
9239625	Extractable (MeOH) D4-1,2-Dichloroethane (sur.)	2018/11/23			102	50 - 140	101	%				
9237379	Moisture	2018/11/22					<0.30	%	1.7	20		
9237653	Total Aluminum (Al)	2018/11/22					<100	mg/kg	4.9	40	108	70 - 130
9237653	Total Antimony (Sb)	2018/11/22	96	75 - 125	97	75 - 125	<0.10	mg/kg	10	30	150 (1)	70 - 130
9237653	Total Arsenic (As)	2018/11/22	102	75 - 125	102	75 - 125	<0.50	mg/kg	5.4	30	98	70 - 130
9237653	Total Barium (Ba)	2018/11/22	100	75 - 125	106	75 - 125	<0.10	mg/kg	2.9	40	106	70 - 130
9237653	Total Beryllium (Be)	2018/11/22	107	75 - 125	106	75 - 125	<0.20	mg/kg	NC	30	112	70 - 130
9237653	Total Boron (B)	2018/11/22					<1.0	mg/kg	14	30		
9237653	Total Cadmium (Cd)	2018/11/22	103	75 - 125	101	75 - 125	<0.050	mg/kg	6.4	30	105	70 - 130
9237653	Total Chromium (Cr)	2018/11/22	100	75 - 125	106	75 - 125	<1.0	mg/kg	0.17	30	115	70 - 130
9237653	Total Cobalt (Co)	2018/11/22	104	75 - 125	104	75 - 125	<0.30	mg/kg	1.5	30	105	70 - 130
9237653	Total Copper (Cu)	2018/11/22	100	75 - 125	103	75 - 125	<0.50	mg/kg	5.1	30	123	70 - 130
9237653	Total Lead (Pb)	2018/11/22	99	75 - 125	100	75 - 125	<0.10	mg/kg	1.1	40	123	70 - 130
9237653	Total Manganese (Mn)	2018/11/22	NC	75 - 125	99	75 - 125	<0.20	mg/kg	6.9	30	106	70 - 130
9237653	Total Mercury (Hg)	2018/11/22	98	75 - 125	101	75 - 125	<0.050	mg/kg	NC	40	101	70 - 130
9237653	Total Molybdenum (Mo)	2018/11/22	96	75 - 125	98	75 - 125	<0.10	mg/kg	22	40	108	70 - 130
9237653	Total Nickel (Ni)	2018/11/22	99	75 - 125	102	75 - 125	<0.80	mg/kg	10	30	112	70 - 130
9237653	Total Selenium (Se)	2018/11/22	108	75 - 125	109	75 - 125	<0.50	mg/kg	NC	30		

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QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9237653	Total Silver (Ag)	2018/11/22	107	75 - 125	99	75 - 125	<0.050	mg/kg	NC	40	109	70 - 130
9237653	Total Strontium (Sr)	2018/11/22	100	75 - 125	99	75 - 125	<0.10	mg/kg	5.5	40	111	70 - 130
9237653	Total Tin (Sn)	2018/11/22	99	75 - 125	97	75 - 125	<0.10	mg/kg	11	40	103	70 - 130
9237653	Total Titanium (Ti)	2018/11/22	NC	75 - 125	97	75 - 125	<1.0	mg/kg	12	40		
9237653	Total Tungsten (W)	2018/11/22					<0.50	mg/kg	12	30		
9237653	Total Vanadium (V)	2018/11/22	NC	75 - 125	103	75 - 125	<2.0	mg/kg	4.9	30	110	70 - 130
9237653	Total Zinc (Zn)	2018/11/22	96	75 - 125	102	75 - 125	<1.0	mg/kg	10	30	110	70 - 130
9237657	Soluble (2:1) pH	2018/11/22			101	97 - 103			0.78	20		
9237885	1-Methylnaphthalene	2018/11/22	90	50 - 140	88	50 - 140	<0.050	ug/g	NC	50		
9237885	2-Methylnaphthalene	2018/11/22	89	50 - 140	87	50 - 140	<0.020	ug/g	NC	50		
9237885	Acenaphthene	2018/11/22	89	50 - 140	86	50 - 140	<0.0050	ug/g	NC	50		
9237885	Acenaphthylene	2018/11/22	89	50 - 140	85	50 - 140	<0.0050	ug/g	NC	50		
9237885	Anthracene	2018/11/22	91	50 - 140	87	50 - 140	<0.0040	ug/g	13	50		
9237885	Benzo(a)anthracene	2018/11/22	91	50 - 140	88	50 - 140	<0.020	ug/g	NC	50		
9237885	Benzo(a)pyrene	2018/11/22	90	50 - 140	86	50 - 140	<0.020	ug/g	NC	50		
9237885	Benzo(b&j)fluoranthene	2018/11/22	92	50 - 140	89	50 - 140	<0.020	ug/g	NC	50		
9237885	Benzo(b)fluoranthene	2018/11/22	95	50 - 140	87	50 - 140	<0.020	ug/g	NC	50		
9237885	Benzo(g,h,i)perylene	2018/11/22	96	50 - 140	94	50 - 140	<0.050	ug/g	NC	50		
9237885	Benzo(k)fluoranthene	2018/11/22	92	50 - 140	86	50 - 140	<0.020	ug/g	NC	50		
9237885	Chrysene	2018/11/22	88	50 - 140	87	50 - 140	<0.020	ug/g	NC	50		
9237885	Dibenz(a,h)anthracene	2018/11/22	95	50 - 140	94	50 - 140	<0.020	ug/g	NC	50		
9237885	Fluoranthene	2018/11/22	92	50 - 140	88	50 - 140	<0.020	ug/g	0.70	50		
9237885	Fluorene	2018/11/22	89	50 - 140	85	50 - 140	<0.020	ug/g	NC	50		
9237885	Indeno(1,2,3-cd)pyrene	2018/11/22	86	50 - 140	86	50 - 140	<0.020	ug/g	NC	50		
9237885	Naphthalene	2018/11/22	89	50 - 140	88	50 - 140	<0.010	ug/g	NC	50		
9237885	Phenanthrene	2018/11/22	89	50 - 140	86	50 - 140	<0.010	ug/g	NC	50		
9237885	Pyrene	2018/11/22	90	50 - 140	87	50 - 140	<0.020	ug/g	NC	50		
9237885	Quinoline	2018/11/22	113	50 - 140	114	50 - 140	<0.050	ug/g	NC	50		
9237888	EPH (C10-C19)	2018/11/22	91	60 - 140	93	70 - 130	<100	mg/kg	NC	40		
9237888	EPH (C19-C32)	2018/11/22	83	60 - 140	87	70 - 130	<100	mg/kg	NC	40		
9239585	1,1,1,2-tetrachloroethane	2018/11/24	102	50 - 140	103	60 - 130	<0.020	mg/kg	NC	50		

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QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9239585	1,1,1-trichloroethane	2018/11/24	95	50 - 140	98	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,1,2,2-tetrachloroethane	2018/11/24	102	50 - 140	110	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,1,2-trichloroethane	2018/11/24	103	50 - 140	109	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,1-dichloroethane	2018/11/24	93	50 - 140	101	60 - 130	<0.025	mg/kg	NC	50		
9239585	1,1-dichloroethene	2018/11/24	92	50 - 140	99	60 - 130	<0.025	mg/kg	NC	50		
9239585	1,2-dibromoethane	2018/11/24	104	50 - 140	112	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,2-dichlorobenzene	2018/11/24	111	50 - 140	115	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,2-dichloroethane	2018/11/24	89	50 - 140	97	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,2-dichloropropane	2018/11/24	97	50 - 140	104	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,3-Butadiene	2018/11/24	35 (2)	50 - 140	91	60 - 130	<0.080	mg/kg	NC	50		
9239585	1,3-dichlorobenzene	2018/11/24	110	50 - 140	113	60 - 130	<0.020	mg/kg	NC	50		
9239585	1,4-dichlorobenzene	2018/11/24	108	50 - 140	111	60 - 130	<0.020	mg/kg	NC	50		
9239585	Benzene	2018/11/24	94	50 - 140	100	60 - 130	<0.0050	mg/kg	NC	50		
9239585	Bromobenzene	2018/11/24	107	50 - 140	110	60 - 130	<0.20	mg/kg	NC	50		
9239585	Bromodichloromethane	2018/11/24	96	50 - 140	106	60 - 130	<0.050	mg/kg	NC	50		
9239585	Bromoform	2018/11/24	100	50 - 140	106	60 - 130	<0.050	mg/kg	NC	50		
9239585	Bromomethane	2018/11/24	80	50 - 140	95	60 - 130	<0.30	mg/kg	NC	50		
9239585	Carbon tetrachloride	2018/11/24	98	50 - 140	101	60 - 130	<0.020	mg/kg	NC	50		
9239585	Chlorobenzene	2018/11/24	98	50 - 140	104	60 - 130	<0.020	mg/kg	NC	50		
9239585	Chlorodibromomethane	2018/11/24	100	50 - 140	107	60 - 130	<0.050	mg/kg	NC	50		
9239585	Chloroethane	2018/11/24	81	50 - 140	79	60 - 130	<0.10	mg/kg	NC	50		
9239585	Chloroform	2018/11/24	94	50 - 140	100	60 - 130	<0.020	mg/kg	NC	50		
9239585	Chloromethane	2018/11/24	71	50 - 140	90	60 - 130	<0.050	mg/kg	NC	50		
9239585	cis-1,2-dichloroethene	2018/11/24	95	50 - 140	101	60 - 130	<0.030	mg/kg	NC	50		
9239585	cis-1,3-dichloropropene	2018/11/24	91	50 - 140	101	50 - 140	<0.020	mg/kg	NC	50		
9239585	Dibromomethane	2018/11/24	106	50 - 140	109	60 - 130	<0.20	mg/kg	NC	50		
9239585	Dichlorodifluoromethane	2018/11/24	55	50 - 140	76	60 - 130	<0.20	mg/kg	NC	50		
9239585	Dichloromethane	2018/11/24	90	50 - 140	100	60 - 130	<0.080	mg/kg	NC	50		
9239585	Ethylbenzene	2018/11/24	105	50 - 140	109	60 - 130	<0.010	mg/kg	NC	50		
9239585	m & p-Xylene	2018/11/24	106	50 - 140	110	60 - 130	<0.040	mg/kg	NC	50		
9239585	o-Xylene	2018/11/24	105	50 - 140	110	60 - 130	<0.040	mg/kg	NC	50		

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Maxxam Job #: B8A2224
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QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9239585	Styrene	2018/11/24	118	50 - 140	122	60 - 130	<0.030	mg/kg	NC	50		
9239585	Tetrachloroethene	2018/11/24	104	50 - 140	106	60 - 130	<0.010	mg/kg	NC	50		
9239585	Toluene	2018/11/24	100	50 - 140	104	60 - 130	<0.020	mg/kg	NC	50		
9239585	trans-1,2-dichloroethene	2018/11/24	97	50 - 140	101	60 - 130	<0.030	mg/kg	NC	50		
9239585	trans-1,3-dichloropropene	2018/11/24	106	50 - 140	119	50 - 140	<0.020	mg/kg	NC	50		
9239585	Trichloroethene	2018/11/24	100	50 - 140	99	60 - 130	<0.0090	mg/kg	NC	50		
9239585	Trichlorofluoromethane	2018/11/24	94	50 - 140	98	60 - 130	<0.20	mg/kg	NC	50		
9239585	VH C6-C10	2018/11/24			99	60 - 130	<10	mg/kg	NC	50		
9239585	Vinyl chloride	2018/11/24	71	50 - 140	76	60 - 130	<0.040	mg/kg	NC	50		
9239585	Xylenes (Total)	2018/11/24					<0.040	mg/kg	NC	50		
9239625	Extractable (MeOH) 2-Butanone (MEK)	2018/11/23			109	50 - 140	<15	mg/kg	NC	50		
9239625	Extractable (MeOH) 4-Methyl-2-pentanone (MIBK)	2018/11/23			102	50 - 140	<0.50	mg/kg	NC	50		
9253378	Total Aluminum (Al)	2018/12/05					<100	mg/kg	1.8	40	104	70 - 130
9253378	Total Antimony (Sb)	2018/12/05	93	75 - 125	98	75 - 125	<0.10	mg/kg	12	30	113	70 - 130
9253378	Total Arsenic (As)	2018/12/05	99	75 - 125	99	75 - 125	<0.50	mg/kg	4.6	30	101	70 - 130
9253378	Total Barium (Ba)	2018/12/05	104	75 - 125	106	75 - 125	<0.10	mg/kg	0.78	40	107	70 - 130
9253378	Total Beryllium (Be)	2018/12/05	106	75 - 125	104	75 - 125	<0.20	mg/kg	16	30	112	70 - 130
9253378	Total Boron (B)	2018/12/05					<1.0	mg/kg				
9253378	Total Cadmium (Cd)	2018/12/05	103	75 - 125	102	75 - 125	<0.050	mg/kg	1.3	30	109	70 - 130
9253378	Total Chromium (Cr)	2018/12/05	104	75 - 125	105	75 - 125	<1.0	mg/kg	1.9	30	110	70 - 130
9253378	Total Cobalt (Co)	2018/12/05	99	75 - 125	103	75 - 125	<0.30	mg/kg	0.55	30	106	70 - 130
9253378	Total Copper (Cu)	2018/12/05	102	75 - 125	106	75 - 125	<0.50	mg/kg	4.4	30	114	70 - 130
9253378	Total Lead (Pb)	2018/12/05	99	75 - 125	103	75 - 125	<0.10	mg/kg	5.8	40	115	70 - 130
9253378	Total Manganese (Mn)	2018/12/05	NC	75 - 125	102	75 - 125	<0.20	mg/kg	0.78	30	111	70 - 130
9253378	Total Mercury (Hg)	2018/12/05	103	75 - 125	103	75 - 125	<0.050	mg/kg	NC	40	107	70 - 130
9253378	Total Molybdenum (Mo)	2018/12/05	104	75 - 125	106	75 - 125	<0.10	mg/kg	7.7	40	118	70 - 130
9253378	Total Nickel (Ni)	2018/12/05	NC	75 - 125	105	75 - 125	<0.80	mg/kg	0.023	30	118	70 - 130
9253378	Total Selenium (Se)	2018/12/05	103	75 - 125	101	75 - 125	<0.50	mg/kg	NC	30		
9253378	Total Silver (Ag)	2018/12/05	101	75 - 125	102	75 - 125	<0.050	mg/kg	4.1	40	95	70 - 130
9253378	Total Strontium (Sr)	2018/12/05	65 (2)	75 - 125	98	75 - 125	<0.10	mg/kg	61 (2)	40	112	70 - 130

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Maxxam Job #: B8A2224
Report Date: 2018/12/07

QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9253378	Total Tin (Sn)	2018/12/05	100	75 - 125	100	75 - 125	<0.10	mg/kg	17	40	102	70 - 130
9253378	Total Titanium (Ti)	2018/12/05	NC	75 - 125	104	75 - 125	<1.0	mg/kg	0.57	40		
9253378	Total Tungsten (W)	2018/12/05					<0.50	mg/kg				
9253378	Total Vanadium (V)	2018/12/05	102	75 - 125	102	75 - 125	<2.0	mg/kg	0.81	30	113	70 - 130
9253378	Total Zinc (Zn)	2018/12/05	NC	75 - 125	103	75 - 125	<1.0	mg/kg	3.5	30	116	70 - 130
9253381	Soluble (2:1) pH	2018/12/05			100	97 - 103			1.3	20		

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Reference Material exceeds acceptance criteria for Sb. Reanalysis yeilds similar results

(2) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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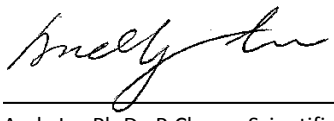
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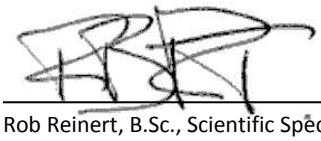
KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Andy Lu, Ph.D., P.Chem., Scientific Specialist



Rob Reinert, B.Sc., Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

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CHAIN OF CUSTODY RECORD

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free 1800) 665-8566

KU21439

BBY FCD00077107

Page 1 of 2

Invoice Information	Report information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #: B61898	☑ Regular TAT 5 days (Most analyses)
Contact Name: Nicole MacDonald	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: 13634-20	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☐ 2 Days
Phone: (604) 430-0671	Phone:	Site #:	☐ 1 Day ☐ 3 Days
Email: nmacdonald@keystoneenviro.com	Email:	Sampled By: Stewart McBride	Date Required:

Regulatory Criteria	Special Instructions
☑ BC CSR Soil ☐ BC CSR Water	☐ Return Cooler
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)
☐ CCME (Specify) ☐ Other (Specify)	
☐ Drinking Water ☐ BC Water Quality	

Rush Confirmation #:

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	BTEX/VPH	BTEX/F1	PAH	EPH	Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Chloride	TSS	pH	Nitrite	KEL Metals	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE
1	MW18-2 (0.3)	2018/11/20	15:20	Soil			X										X	4	X
2	" (1.2)		15:30																
3	MW18-3 (0.5)		13:05				X										X		
4	(1.0)		13:10																
5	(1.5)		13:15																
6	(2.1)		13:30																
7	(3.3)		13:35																
8	(4.3)		13:45																
9	(5.3)		13:50																
10	(6.9)		14:10		X		X										X		

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	

COOLING MEDIA PRESENT Y / N

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Stewart McBride	2018/11/20				

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COC-1027 Keystone

B8A2224_COC

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CHAIN OF CUSTODY RECORD

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5, Toll Free (800) 665-8566

BBY FCD-00077/07

Page 1 of 3

Invoice Information		Report Information (if differs from invoice)		Project Information (where applicable)		Turnaround Time (TAT) Required
Company Name:	3763 - Keystone Environmental Ltd.	Company Name:		Quotation #:	B61898	☐ Regular TAT 5 days (Most analyses)
Contact Name:	Nicole MacDonald	Contact Name:		P.O. #/ AFE#:		PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address:	#320 - 4400 Dominion Street	Address:		Project #:	1360-21	Rush TAT (Surcharges will be applied)
	Burnaby, BC PC: V5G 4G3		PC:	Site Location:		☐ Same Day ☐ 2 Days
Phone:	(604) 430-0671	Phone:		Site #:		☐ 1 Day ☐ 3 Days
Email:	nmacdonald@keystoneenviro.com	Email:	SMcbride@keystoneenviro.com	Sampled By:	Stuart McBride	Date Required:

Regulatory Criteria	Special Instructions
☑ BC CSR Soil ☐ BC CSR Water	☐ Return Cooler
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)
☐ CCME (Specify) ☐ Other (Specify)	
☐ Drinking Water ☐ BC Water Quality	

Rush Confirmation #:

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	BTEX/VPH	VOC/BTEX/F1	PAH	EPH	Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Chloride	TSS	pH	Nitrate	KEL metals	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE
1 MW18-3 (8.0)	2018/11/20	14:20	SOIL			X										X	4	X
2 MW18-B		13:05																
3 MW18-A		11:30				X										X		
4 MW18-6 (0.6)		11:30																
5 (1.2)		11:35																
6 (2.0)		11:45																
7 (2.3)		11:50																
8 (2.8)		11:55																
9 (4.0)		12:00																
10 (4.9)		12:10																

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	

COOLING MEDIA PRESENT Y / N

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Stuart McBride	2018/11/20					B8A2224

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COC-1027 Keystone

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CHAIN OF CUSTODY RECORD

K0214

BBY FCD-0

Page 3

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

Invoice Information		Report Information (if differs from invoice)		Project Information (where applicable)		Turnaround Time (TAT) Require
Company Name:	3763 - Keystone Environmental Ltd.	Company Name:		Quotation #:	B61898	☑ Regular TAT 5 days (Most ana
Contact Name:	Nicole MacDonald	Contact Name:		P.O. #/ AFE#:		PLEASE PROVIDE ADVANCE NOTICE FOR RUSH
Address:	#320 - 4400 Dominion Street	Address:		Project #:	13631-3D	Rush TAT (Surcharges will be appl
	Burnaby, BC PC: V5G 4G3		PC:	Site Location:		☐ Same Day ☐ 2 D
Phone:	(604) 430-0671	Phone:		Site #:		☐ 1 Day ☐ 3 D
Email:	nmacdonald@keystoneenviro.com	Email:	stmcbride@keystoneenviro.com	Sampled By:	Stewart McBride	Date Required:

Regulatory Criteria		Special Instructions
☑ BC CSR Soil	☐ BC CSR Water	☐ Return Cooler
☐ YK CSR Soil	☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)
☐ CCME (Specify)	☐ Other (Specify)	
☐ Drinking Water	☐ BC Water Quality	

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

Rush Confirmation #:

LABORATORY USE ONLY

CUSTODY SEAL Y / N (Present / Intact) | COOL TEMPERA

COOLING MEDIA PRESENT Y

COMMENTS

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	MTBE / VPH	VOC / BTEX / F1	LEPH/HEPH/PAH	F2 - F4	Preserved?	Preserved?	Field Preserved?	Field Preserved?	Sulphate	COD	Alkalinity	Ammonia	Mercury by ICP-MS				# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE
					VOC / BTEX / VPH	VOC / BTEX / F1	PAH	EPH	Filtered?	Filtered?	Field Preserved?	Field Preserved?	Chloride	BOD	Conductivity	Nitrate	Total Metals	Total Mercury	TSS	pH		
					BTEX / F1				Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Fluoride	TDS	pH	Nitrite						
1	BH18-7 (0.6)	2018/11/20	09:10	Soil																	4	X
2	(1.0)		09:20																			
3	(1.8)		09:30																			
4	(2.8)		09:40																			
5	BH18-8 (0.6)		08:20																			
6	(1.2)		08:25				X									X						
7	(1.8)		08:35																			
8	(2.8)		08:40																			
9																						
10																						

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Stewart McBride	2018/11/20					B8A2224

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COC-1027 Keystone

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CHAIN OF CUSTODY RECORD

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Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #: B61898	☑ Regular TAT 5 days (Most analyses)
Contact Name: Nicole MacDonald	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: 13634-20	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☐ 2 Days
Phone: (604) 430-0671	Phone:	Site #:	☐ 1 Day ☐ 3 Days
Email: nmacdonald@keystoneenviro.com	Email:	Sampled By: Stewart McBride	Date Required:

Regulatory Criteria	Special Instructions	Rush Confirmation #:
☑ BC CSR Soil ☐ BC CSR Water	☐ Return Cooler	
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)	
☐ CCME (Specify) ☐ Other (Specify)		
☐ Drinking Water ☐ BC Water Quality		

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix
1	MW18-2 (0.3)	2018/11/20	15:20	Soil
2	(1.2)		15:30	
3	MW18-3 (0.5)		13:05	
4	(1.0)		13:10	
5	(1.5)		13:15	
6	(2.1)		13:30	
7	(3.3)		13:35	
8	(4.3)		13:45	
9	(5.3)		13:50	
10	(6.9)		14:10	

Analysis Requested: ☐ MTBE; ☐ VOC / BTEX / VPH; ☐ VOC / BTEX / F1; ☐ LEPH/HEPH/PAH; ☐ F2 - F4; ☐ Preserved?; ☐ Preserved?; ☐ Preserved?; ☐ Sulphate; ☐ COD; ☐ Alkalinity; ☐ Ammonia; ☐ BTEX / VPH; ☐ BTEX / F1; ☐ PAH; ☐ EPH; ☐ TEH; ☐ Filtered?; ☐ Filtered?; ☐ Field Preserved?; ☐ Field Preserved?; ☐ Fluoride; ☐ BOD; ☐ Conductivity; ☐ Nitrate; ☐ Dissolved Metals; ☐ Dissolved Mercury; ☐ Total Metals; ☐ Total Mercury; ☐ Chloride; ☐ TDS; ☐ pH; ☐ Nitrite; # OF CONTAINERS SUBMITTED; HOLD - DO NOT ANALYZE

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
N/A		9, 11, 10

COOLING MEDIA PRESENT (Y) N

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Stewart McBride	2018/11/20	18:20	SHAN JACOB JOY	2018/11/20	18:26	B8A2224

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COC-1027 Keystone
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City of Vancouver - FOI 2023-228 - Page 651 of 1003

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CHAIN OF CUSTODY RECORD

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

BBY FGD-00077/07
Page 1 of 3

Invoice Information		Report Information (if differs from invoice)		Project Information (where applicable)		Turnaround Time (TAT) Required
Company Name:	3763 - Keystone Environmental Ltd.	Company Name:		Quotation #:	B61898	☐ Regular TAT 5 days (Most analyses)
Contact Name:	Nicole MacDonald	Contact Name:		P.O. #/ AFE#:		PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address:	#320 - 4400 Dominion Street	Address:		Project #:	13639-21	Rush TAT (Surcharges will be applied)
	Burnaby, BC PC: V5G 4G3		PC:	Site Location:		☐ Same Day ☐ 2 Days ☐ 1 Day ☐ 3 Days
Phone:	(604) 430-0671	Phone:		Site #:		Date Required:
Email:	nmacdonald@keystoneenviro.com	Email:	SMcbride@keystoneenviro.com	Sampled By:	Stuart McBride	Rush Confirmation #:

Regulatory Criteria		Special Instructions
☑ BC CSR Soil	☐ BC CSR Water	☐ Return Cooler
☐ YK CSR Soil	☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)
☐ CCME (Specify)	☐ Other (Specify)	
☐ Drinking Water	☐ BC Water Quality	

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested: ☐ MTBE; ☐ VOC / BTEX / VPH; ☐ VOC / BTEX / F1; ☐ LEPH/HEPH/PAH; ☐ F2 - F4; ☐ TEH; ☐ Preserved?; ☐ Filtered?; ☐ Dissolved Metals; ☐ Preserved?; ☐ Filtered?; ☐ Dissolved Mercury; ☐ Field Preserved?; ☐ Total Metals; ☐ Field Preserved?; ☐ Total Mercury; ☐ Sulphate; ☐ Fluoride; ☐ Chloride; ☐ COD; ☐ BOD; ☐ TDS; ☐ Alkalinity; ☐ Conductivity; ☐ pH; ☐ Ammonia; ☐ Nitrate; ☐ Nitrite; ☐ BTEX / F1; ☐ PAH; ☐ EPH; ☐ BTEXS / VPH

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE
1	MW18-3 (8.0)	2018/11/20	14:20	(Soil)	3	X
2	MW18-5		13:05		4	
3	MW18-6A		11:30			
4	MW18-6 (0.6)		11:30			
5	(1.2)		11:35			
6	(2.0)		11:45			
7	(2.3)		11:50			
8	(2.8)		11:55			
9	(4.0)		12:00			
10	(4.9)		12:10			

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
N/A		9, 11, 10

COOLING MEDIA PRESENT: Y / N

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Stuart McBride	2018/11/20	18:20	SHANTHOB JOY	2018/11/20	18:26	B8A2224

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COC-1027 Keystone

City of Vancouver - FOI 2023-228 - Page 652 of 1003

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CHAIN OF CUSTODY RECORD

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BBY FCD-00077/07

Page 3 of 3

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5, Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #: B61898	☑ Regular TAT 5 days (Most analyses)
Contact Name: Nicole MacDonald	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: 13639-30	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☐ 2 Days
Phone: (604) 430-0671	Phone:	Site #:	☐ 1 Day ☐ 3 Days
Email: nmacdonald@keystoneenviro.com	Email: smcbride@keystoneenviro.com	Sampled By: Stewart McBride	Date Required:

Regulatory Criteria	Special Instructions	Rush Confirmation #:
☑ BC CSR Soil ☐ BC CSR Water	☐ Return Cooler	
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)	
☐ CCME (Specify) ☐ Other (Specify)		
☐ Drinking Water ☐ BC Water Quality		

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested: MTBE; VOC / BTEX/S / VPH; VOC / BTEX / F1; LEPH/HEPH/PAH; F2 - F4; TEH; Preserved?; Filtered?; Dissolved Metals; Preserved?; Filtered?; Dissolved Mercury; Field Preserved?; Total Metals; Field Preserved?; Total Mercury; Sulphate; Fluoride; Chloride; COD; BOD; TDS; TSS; Alkalinity; Conductivity; pH; Ammonia; Nitrate; Nitrite; # OF CONTAINERS SUBMITTED; HOLD - DO NOT ANALYZE

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE
1	BH18-7 (0.6)	2018/11/20	09:10	Soil	4	X
2	(1.0)		09:20			
3	(1.8)		09:30			
4	(2.8)		09:40			
5	BH18-8 (0.6)		08:20			
6	(1.2)		08:25			
7	(1.8)		08:35			
8	(2.8)		08:40			
9						
10						

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
N/A		9, 11, 10

COOLING MEDIA PRESENT (Y) / N

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Stewart McBride	2018/11/20	18:20	SHONJACOB JO4	2018/11/20	18:26	B8A2224

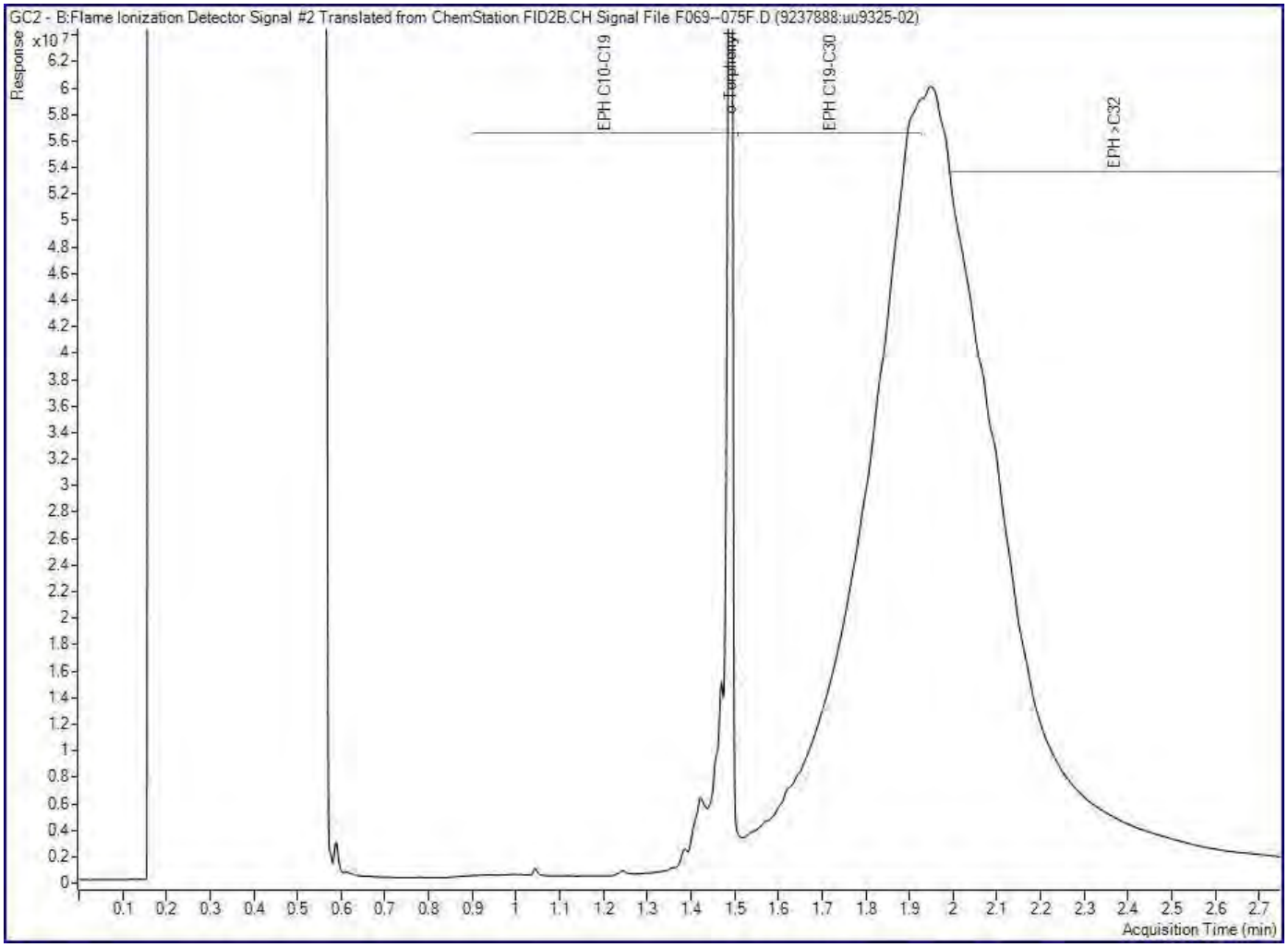
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COC-1027 Keystone

Maxxam Job #: B8A2224
Report Date: 2018/12/07
Maxxam Sample: UU9325

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-2 (0.3)

EPH in Soil by GC/FID Chromatogram



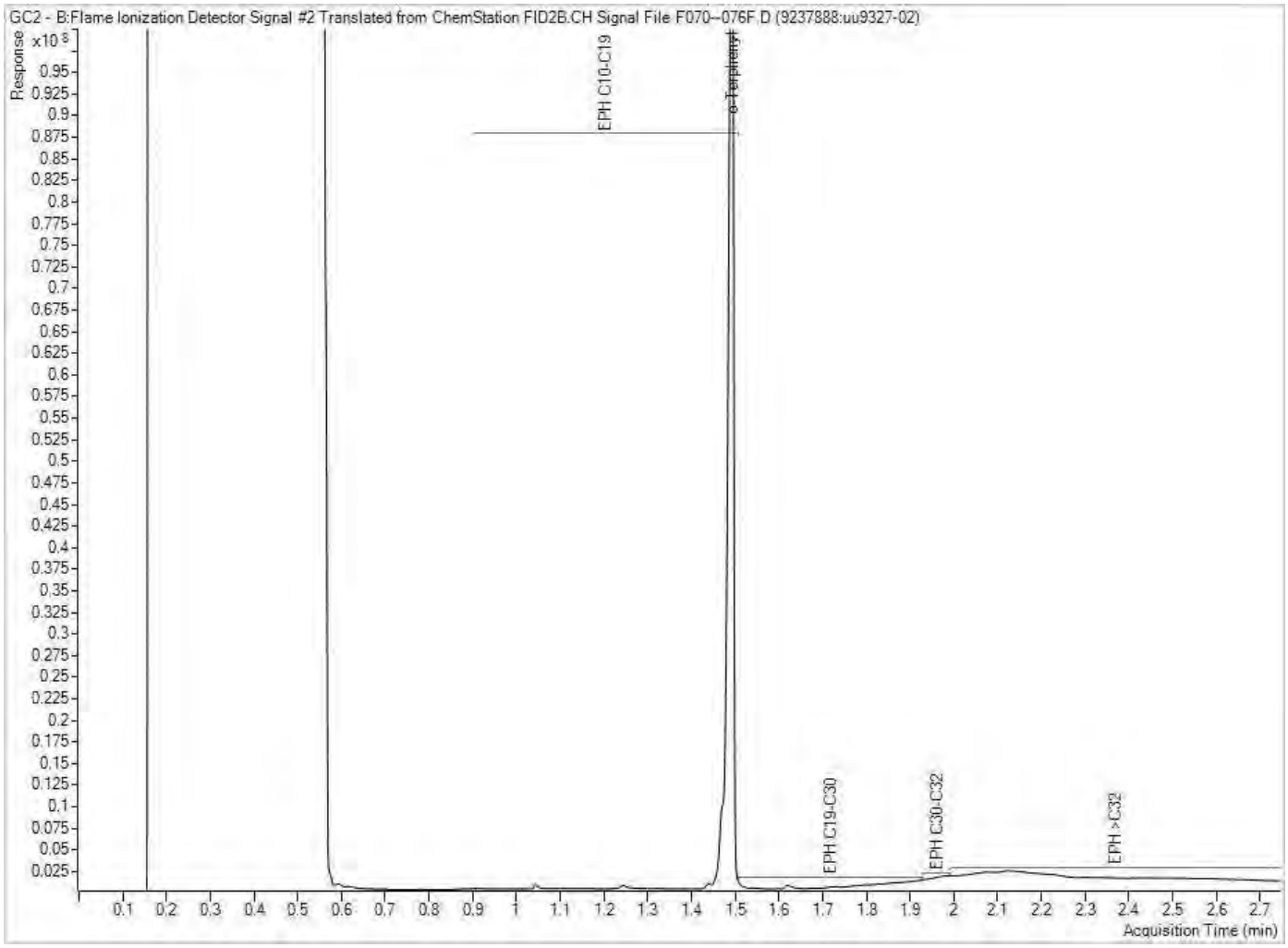
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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Maxxam Job #: B8A2224
Report Date: 2018/12/07
Maxxam Sample: UU9327

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-3 (0.5)

EPH in Soil by GC/FID Chromatogram



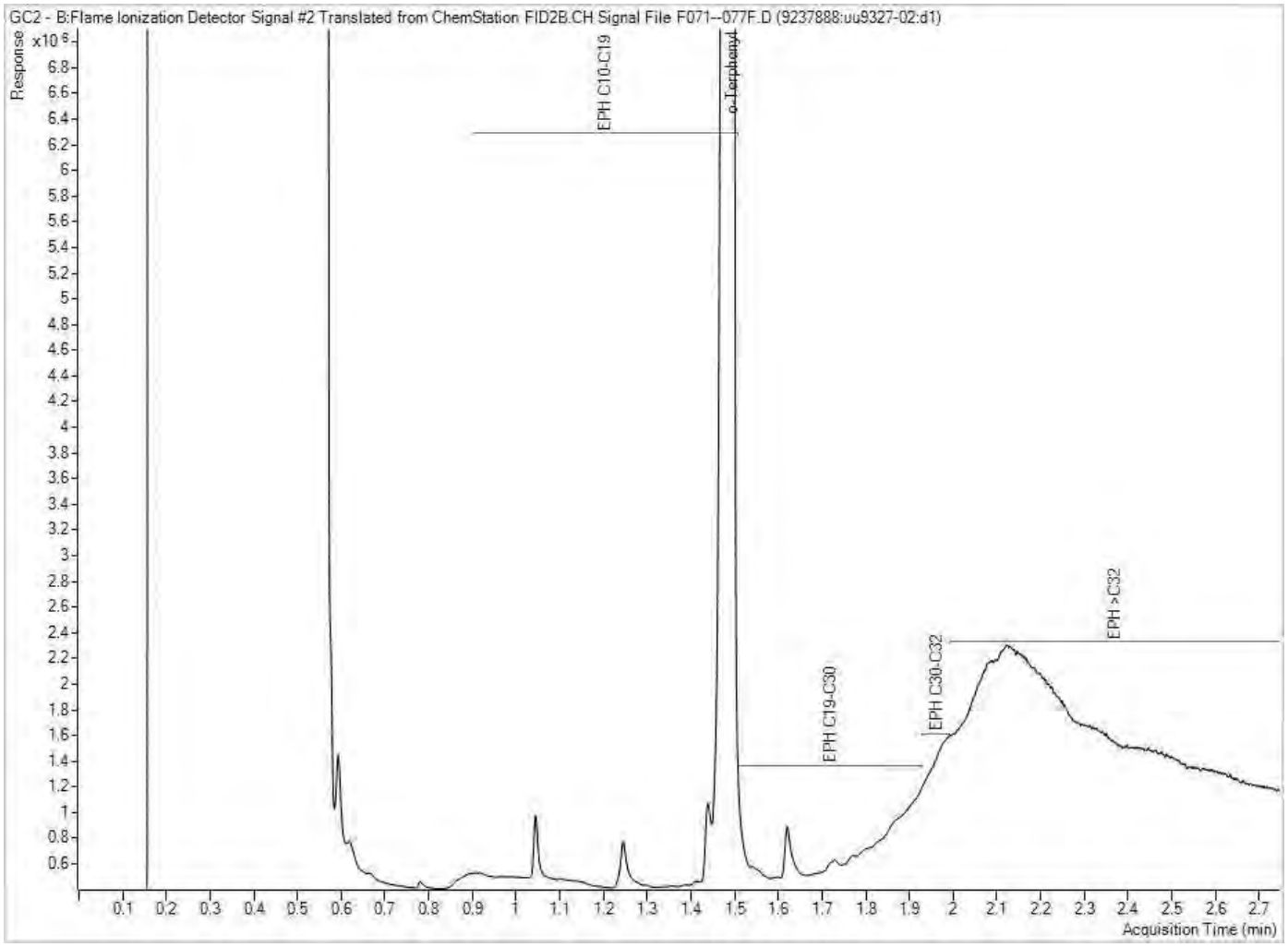
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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Maxxam Job #: B8A2224
Report Date: 2018/12/07
Maxxam Sample: UU9327 Lab-Dup

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-3 (0.5)

EPH in Soil by GC/FID Chromatogram



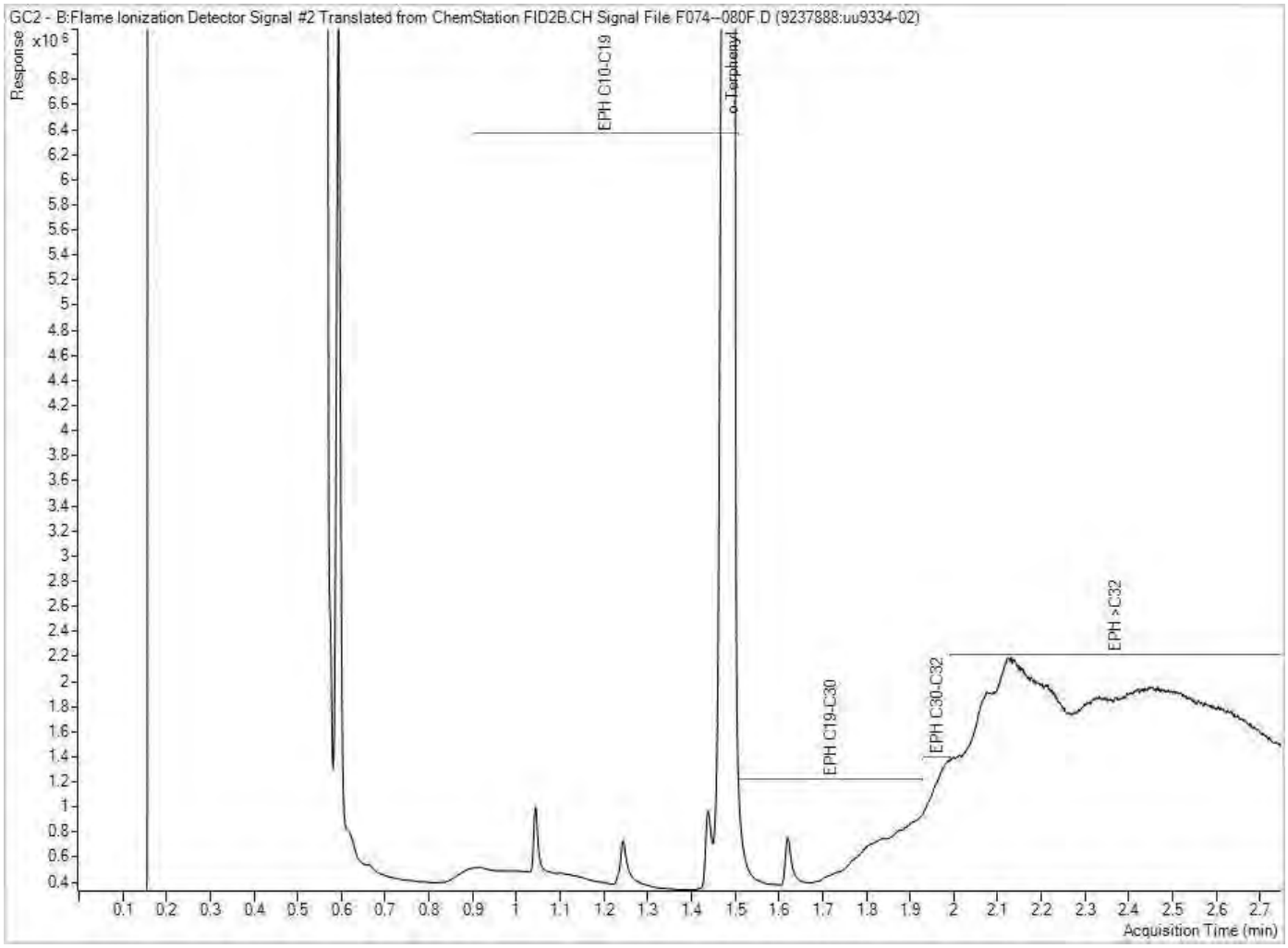
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

City of Vancouver - FOI 2023-228 - Page 656 of 1003

Maxxam Job #: B8A2224
Report Date: 2018/12/07
Maxxam Sample: UU9334

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-3 (6.9)

EPH in Soil by GC/FID Chromatogram



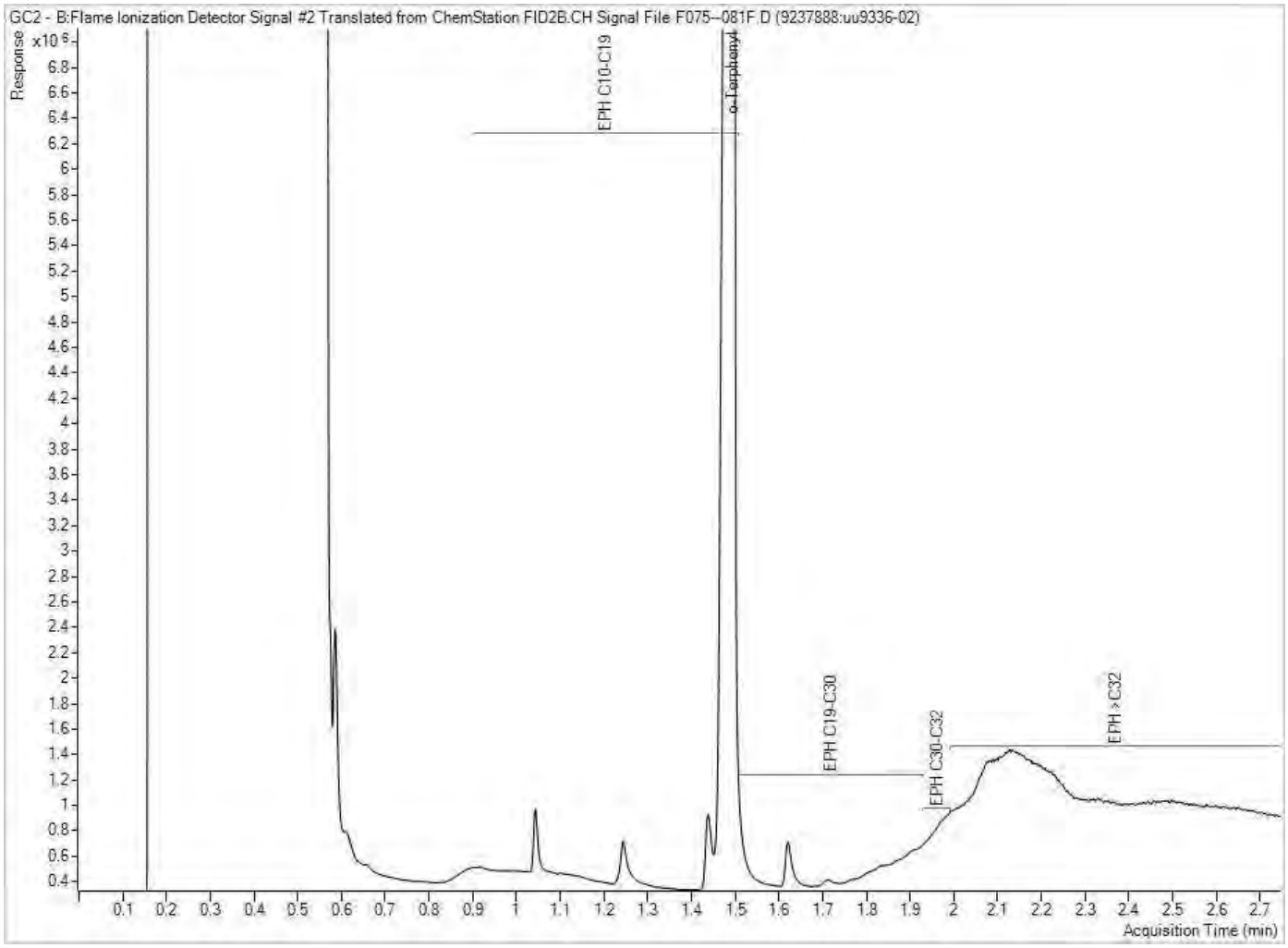
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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Maxxam Job #: B8A2224
Report Date: 2018/12/07
Maxxam Sample: UU9336

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-3 (8.0)

EPH in Soil by GC/FID Chromatogram



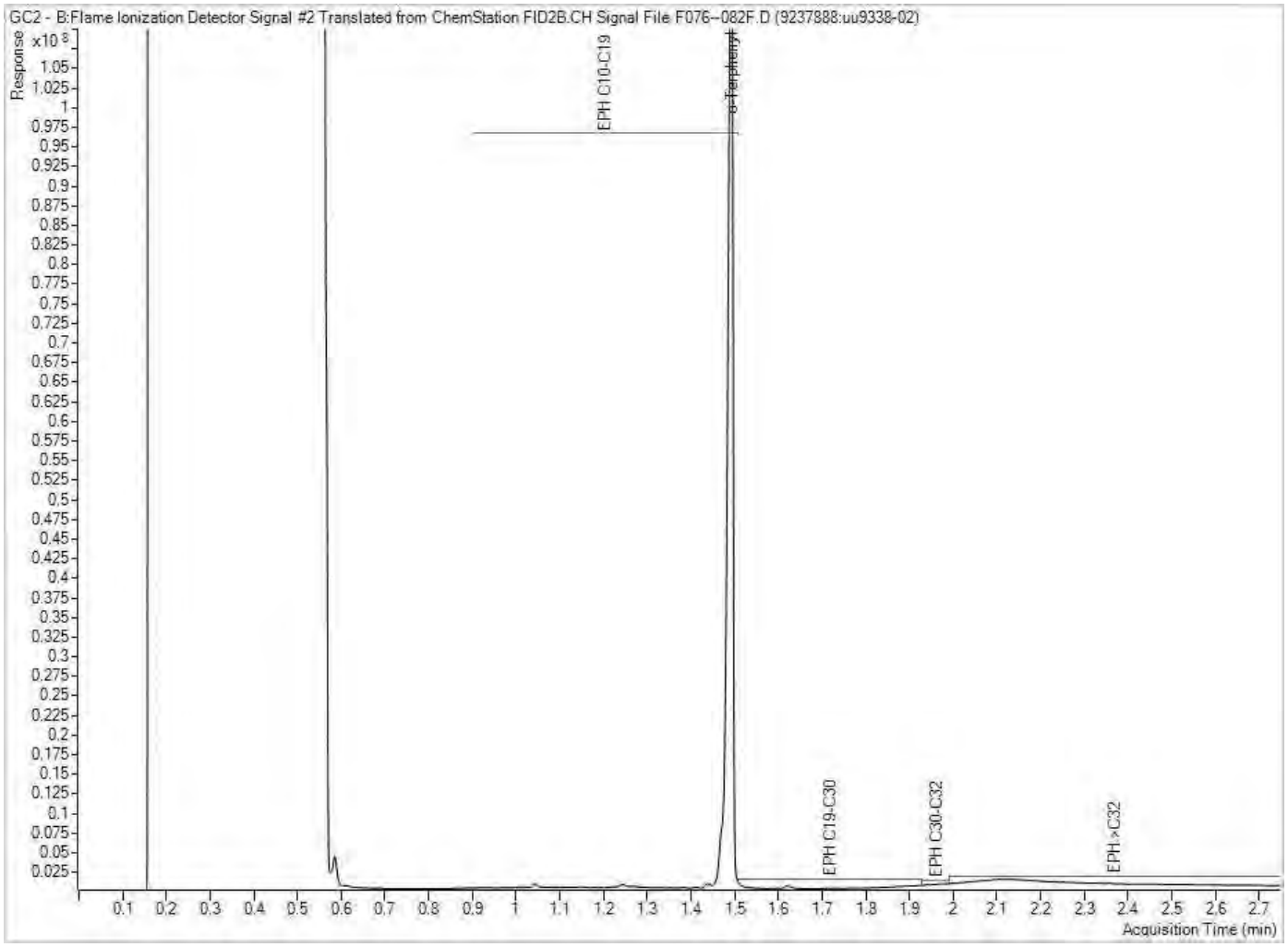
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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Maxxam Job #: B8A2224
Report Date: 2018/12/07
Maxxam Sample: UU9338

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-A

EPH in Soil by GC/FID Chromatogram



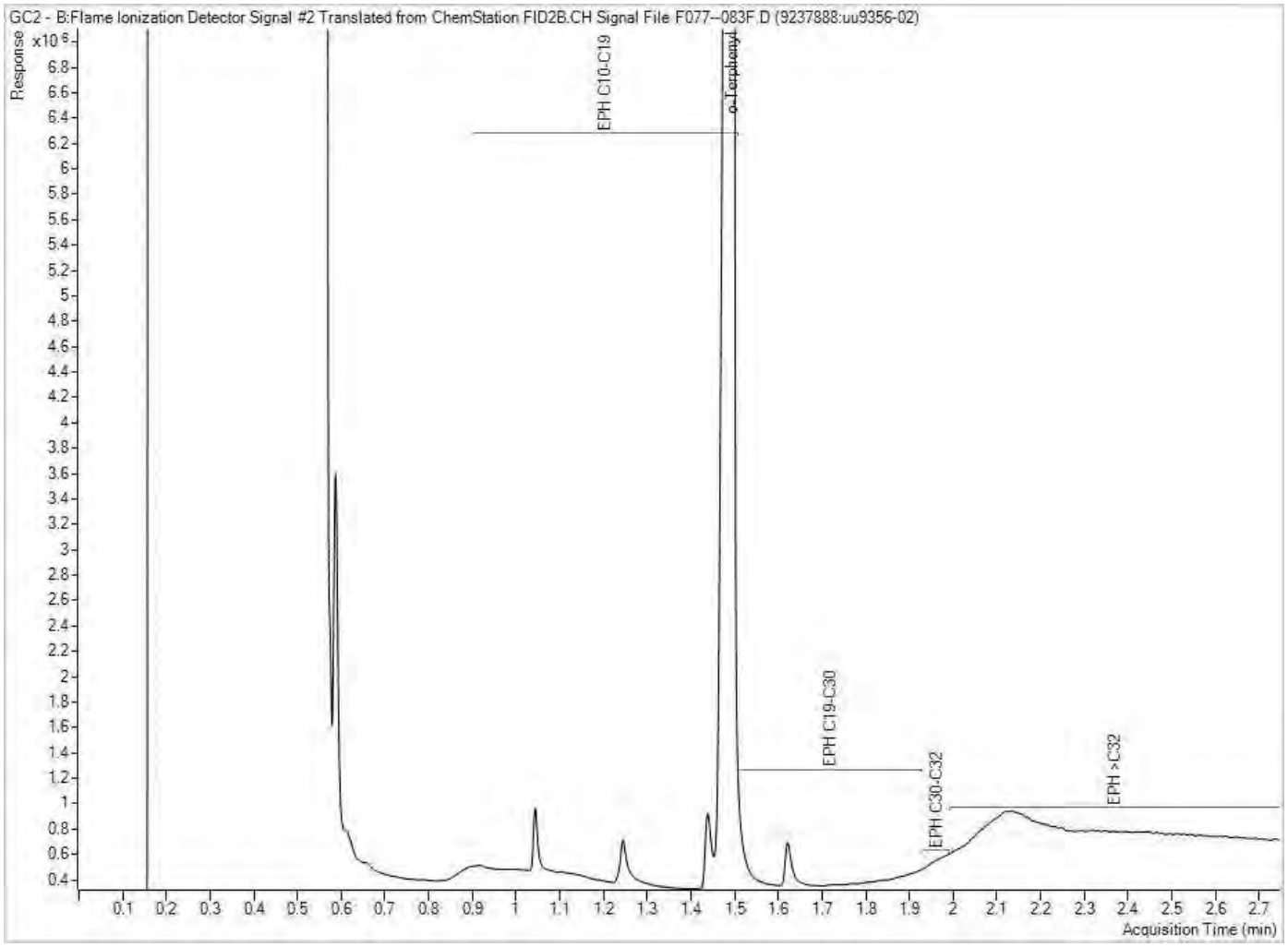
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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Maxxam Job #: B8A2224
Report Date: 2018/12/07
Maxxam Sample: UU9356

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: BH18-8 (1.2)

EPH in Soil by GC/FID Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

City of Vancouver - FOI 2023-228 - Page 660 of 1003

Your Project #: 13639-2D
Your C.O.C. #: K021468, K021469

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/12/07
Report #: R2661211
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8A3005
Received: 2018/11/22, 18:00

Sample Matrix: Soil
Samples Received: 7

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/MTBE LH VH F1 in Soil - Field Pres. (1)	1	N/A	2018/12/05	BBY8SOP-00010/11/12	BCMOE BCLM Jul 2017
Elements by ICPMS (total)	5	2018/11/26	2018/11/26	BBY7SOP-00004 / BBY7SOP-00001	EPA 6020b R2 m
Elements by ICPMS (total)	1	2018/11/28	2018/11/28	BBY7SOP-00004 / BBY7SOP-00001	EPA 6020b R2 m
Moisture	6	2018/11/23	2018/11/24	BBY8SOP-00017	BCMOE BCLM Dec2000 m
Moisture	1	2018/12/04	2018/12/05	BBY8SOP-00017	BCMOE BCLM Dec2000 m
PAH in Soil by GC/MS (SIM)	6	2018/11/23	2018/11/26	BBY8SOP-00022	BCMOE BCLM Jul2017m
PAH in Soil by GC/MS (SIM)	1	2018/12/04	2018/12/05	BBY8SOP-00022	BCMOE BCLM Jul2017m
Total PAH and B(a)P Calculation (2)	6	N/A	2018/11/27	BBY WI-00033	Auto Calc
pH (2:1 DI Water Extract)	5	2018/11/26	2018/11/26	BBY6SOP-00028	BCMOE BCLM Mar2005 m
pH (2:1 DI Water Extract)	1	2018/11/28	2018/11/28	BBY6SOP-00028	BCMOE BCLM Mar2005 m
EPH less PAH in Soil By GC/FID (3)	6	N/A	2018/11/27	BBY WI-00033	Auto Calc
EPH less PAH in Soil By GC/FID (3)	1	N/A	2018/12/06	BBY WI-00033	Auto Calc
EPH in Soil by GC/FID	5	2018/11/23	2018/11/26	BBY8SOP-00029	BCMOE BCLM Jul 2016
EPH in Soil by GC/FID	1	2018/11/23	2018/11/27	BBY8SOP-00029	BCMOE BCLM Jul 2016
EPH in Soil by GC/FID	1	2018/12/04	2018/12/05	BBY8SOP-00029	BCMOE BCLM Jul 2016
Extra VOCs in Soil - Field Pres. (1)	1	N/A	2018/11/26	BBY8SOP-00040	BCMOE BCLM Sep 2017m
Extra VOCs in Soil - Field Pres. (1)	1	N/A	2018/11/27	BBY8SOP-00040	BCMOE BCLM Sep 2017m
VOCs, VH, F1, LH in Soil - Field Pres. (1)	1	N/A	2018/11/27	BBY8SOP-00009/11/12	BCMOE BCLM Sep 2017m
VOCs, VH, F1, LH in Soil - Field Pres. (1)	1	N/A	2018/11/28	BBY8SOP-00009/11/12	BCMOE BCLM Sep 2017m
Volatile HC-BTEX for Soil (4)	2	N/A	2018/11/28	BBY WI-00033	Auto Calc
Volatile HC-BTEX for Soil (4)	1	N/A	2018/12/06	BBY WI-00033	Auto Calc

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless

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City of Vancouver - FOI 2023-228 - Page 661 of 1003

Your Project #: 13639-2D
Your C.O.C. #: K021468, K021469

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/12/07
Report #: R2661211
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8A3005
Received: 2018/11/22, 18:00

indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) The extraction date for VOC, BTEX, VH, or F1 samples that are field preserved with methanol equals the date sampled, unless otherwise stated.
(2) Total PAHs in Soil include: Quinoline, Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Acridine, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b&j)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, and Benzo(g,h,i)perylene.

Total PAHs in Sediment include: Naphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(a)pyrene, and Dibenz(a,h)anthracene.
(3) LEPH = EPH (C10 to C19) - (Naphthalene + Phenanthrene)
HEPH = EPH (C19 to C32) - (Benzo(a)anthracene + Benzo(a)pyrene + Benzo(b)fluoranthene + Benzo(k)fluoranthene + Dibenz(a,h)anthracene + Indeno(1,2,3-cd)pyrene + Pyrene)
(4) VPH = VH - (Benzene + Toluene + Ethylbenzene + m & p-Xylene + o-Xylene + Styrene)

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Gail Pedersen, Project Manager –Environmental Customer Service
Email: gpedersen@maxxam.ca
Phone# (604) 734 7276
==========
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

City of Vancouver - FOI 2023-228 - Page 662 of 1003

Maxxam Job #: B8A3005
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

PHYSICAL TESTING (SOIL)

Maxxam ID		UV3356	UV3357		UV3358	UV3358		
Sampling Date		2018/11/22 11:50	2018/11/22 11:55		2018/11/22 12:05	2018/11/22 12:05		
COC Number		K021468	K021468		K021468	K021468		
	UNITS	MW18-12 (0.6)	MW18-12 (1.2)	QC Batch	MW18-12 (1.8)	MW18-12 (1.8) Lab-Dup	RDL	QC Batch
Physical Properties								
Moisture	%	15	41	9240549	20	21	0.30	9253135

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

Maxxam ID		UV3360	UV3364	UV3376	UV3376	UV3377		
Sampling Date		2018/11/22 13:10	2018/11/22 14:30	2018/11/22 14:30	2018/11/22 14:30	2018/11/22 14:35		
COC Number		K021468	K021468	K021469	K021469	K021469		
	UNITS	BH18-13 (0.4)	MW18-I	MW18-14 (0.5)	MW18-14 (0.5) Lab-Dup	MW18-14 (1.2)	RDL	QC Batch
Physical Properties								
Moisture	%	15	13	14	13	11	0.30	9240549

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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City of Vancouver - FOI 2023-228 - Page 663 of 1003

Maxxam Job #: B8A3005
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		UV3357	UV3360		
Sampling Date		2018/11/22 11:55	2018/11/22 13:10		
COC Number		K021468	K021468		
	UNITS	MW18-12 (1.2)	BH18-13 (0.4)	RDL	QC Batch
Volatiles					
Extractable (MeOH) 2-Butanone (MEK)	mg/kg	<15	<15	15	9242033
Extractable (MeOH) 4-Methyl-2-pentanone (MIBK)	mg/kg	<0.50	<0.50	0.50	9242033
Extractable (MeOH) Acetone	mg/kg	<5.0	<5.0	5.0	9242033
Surrogate Recovery (%)					
Extractable (MeOH) 1,4-Difluorobenzene (sur.)	%	113	109		9242033
Extractable (MeOH) 4-Bromofluorobenzene (sur.)	%	89	100		9242033
Extractable (MeOH) D4-1,2-Dichloroethane (sur.)	%	74	99		9242033
RDL = Reportable Detection Limit					

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Maxxam Job #: B8A3005
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR BTEX/VPH IN SOIL - FIELD PRESERVED (SOIL)

Maxxam ID		UV3358			UV3358		
Sampling Date		2018/11/22 12:05			2018/11/22 12:05		
COC Number		K021468			K021468		
	UNITS	MW18-12 (1.8)	RDL	QC Batch	MW18-12 (1.8) Lab-Dup	RDL	QC Batch
Calculated Parameters							
VPH (VH6 to 10 - BTEX)	mg/kg	<10	10	9252333			
Volatiles							
Methyl-tert-butylether (MTBE)	mg/kg	<0.10	0.10	9254427	<0.10	0.10	9254427
Benzene	mg/kg	<0.0050	0.0050	9254427	<0.0050	0.0050	9254427
Toluene	mg/kg	<0.020	0.020	9254427	<0.020	0.020	9254427
Ethylbenzene	mg/kg	<0.010	0.010	9254427	<0.010	0.010	9254427
m & p-Xylene	mg/kg	<0.040	0.040	9254427	<0.040	0.040	9254427
o-Xylene	mg/kg	<0.040	0.040	9254427	<0.040	0.040	9254427
Styrene	mg/kg	<0.030	0.030	9254427	<0.030	0.030	9254427
Xylenes (Total)	mg/kg	<0.040	0.040	9254427	<0.040	0.040	9254427
VH C6-C10	mg/kg	<10	10	9254427	<10	10	9254427
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	98		9254427	96		9254427
4-Bromofluorobenzene (sur.)	%	106		9254427	105		9254427
D10-ETHYLBENZENE (sur.)	%	101		9254427	99		9254427
D4-1,2-Dichloroethane (sur.)	%	110		9254427	109		9254427

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8A3005
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

LEPH & HEPH WITH PAH FOR CSR IN SOIL (SOIL)

Maxxam ID		UV3356	UV3357			UV3358		
Sampling Date		2018/11/22 11:50	2018/11/22 11:55			2018/11/22 12:05		
COC Number		K021468	K021468			K021468		
	UNITS	MW18-12 (0.6)	MW18-12 (1.2)	RDL	QC Batch	MW18-12 (1.8)	RDL	QC Batch
Calculated Parameters								
Low Molecular Weight PAH`s	ug/g	0.74	2.7	0.050	9240264			
High Molecular Weight PAH`s	ug/g	0.13	0.092	0.050	9240264			
Total PAH	ug/g	0.87	2.8	0.050	9240264			
Polycyclic Aromatics								
Quinoline	ug/g	<0.050	<0.050	0.050	9242088			
Naphthalene	ug/g	<0.010	0.76	0.010	9242088	<0.010	0.010	9253648
1-Methylnaphthalene	ug/g	0.27	0.56	0.050	9242088			
2-Methylnaphthalene	ug/g	0.15	1.2	0.020	9242088			
Acenaphthylene	ug/g	<0.0050	<0.0050	0.0050	9242088			
Acenaphthene	ug/g	0.058	0.031	0.0050	9242088			
Fluorene	ug/g	0.11	0.059	0.020	9242088			
Phenanthrene	ug/g	0.13	0.095	0.010	9242088	<0.010	0.010	9253648
Anthracene	ug/g	0.018 (1)	0.035	0.0040	9242088			
Fluoranthene	ug/g	0.034	0.040	0.020	9242088			
Pyrene	ug/g	0.062	0.052	0.020	9242088			
Benzo(a)anthracene	ug/g	<0.020	<0.020	0.020	9242088			
Chrysene	ug/g	0.036	<0.020	0.020	9242088			
Benzo(b&j)fluoranthene	ug/g	<0.020	<0.020	0.020	9242088			
Benzo(b)fluoranthene	ug/g	<0.020	<0.020	0.020	9242088			
Benzo(k)fluoranthene	ug/g	<0.020	<0.020	0.020	9242088			
Benzo(a)pyrene	ug/g	<0.020	<0.020	0.020	9242088			
Indeno(1,2,3-cd)pyrene	ug/g	<0.020	<0.020	0.020	9242088			
Dibenz(a,h)anthracene	ug/g	<0.020	<0.020	0.020	9242088			
Benzo(g,h,i)perylene	ug/g	<0.050	<0.050	0.050	9242088			
Calculated Parameters								
LEPH (C10-C19 less PAH)	mg/kg	470	1500	100	9240272	<100	100	9252318
HEPH (C19-C32 less PAH)	mg/kg	400	210	100	9240272			
Hydrocarbons								
EPH (C10-C19)	mg/kg	470	1500	100	9242096	<100	100	9253642
EPH (C19-C32)	mg/kg	400	210	100	9242096			

RDL = Reportable Detection Limit
(1) Tentatively identified result and may be potentially biased high due to matrix interference.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

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Maxxam Job #: B8A3005
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

LEPH & HEPH WITH PAH FOR CSR IN SOIL (SOIL)

Maxxam ID		UV3356	UV3357			UV3358		
Sampling Date		2018/11/22 11:50	2018/11/22 11:55			2018/11/22 12:05		
COC Number		K021468	K021468			K021468		
	UNITS	MW18-12 (0.6)	MW18-12 (1.2)	RDL	QC Batch	MW18-12 (1.8)	RDL	QC Batch
Surrogate Recovery (%)								
D10-ANTHRACENE (sur.)	%	88	88		9242088	90		9253648
D8-ACENAPHTHYLENE (sur.)	%	74	70		9242088	85		9253648
D8-NAPHTHALENE (sur.)	%	68	66		9242088	73		9253648
TERPHENYL-D14 (sur.)	%	82	84		9242088	89		9253648
O-TERPHENYL (sur.)	%	88	91		9242096	94		9253642
RDL = Reportable Detection Limit								

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City of Vancouver - FOI 2023-228 - Page 667 of 1003

Maxxam Job #: B8A3005
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

LEPH & HEPH WITH PAH FOR CSR IN SOIL (SOIL)

Maxxam ID		UV3360	UV3364			UV3376		
Sampling Date		2018/11/22 13:10	2018/11/22 14:30			2018/11/22 14:30		
COC Number		K021468	K021468			K021469		
	UNITS	BH18-13 (0.4)	MW18-I	RDL	QC Batch	MW18-14 (0.5)	RDL	QC Batch
Calculated Parameters								
Low Molecular Weight PAH`s	ug/g	0.90	10	0.050	9240264	4.1	0.050	9240264
High Molecular Weight PAH`s	ug/g	5.5	21	0.050	9240264	9.6	0.050	9240264
Total PAH	ug/g	6.4	31	0.050	9240264	14	0.050	9240264
Polycyclic Aromatics								
Quinoline	ug/g	<0.050	<0.050	0.050	9242088	<0.050	0.050	9242014
Naphthalene	ug/g	0.043	0.78	0.010	9242088	0.41	0.010	9242014
1-Methylnaphthalene	ug/g	<0.050	0.49	0.050	9242088	0.22	0.050	9242014
2-Methylnaphthalene	ug/g	0.037 (1)	0.62	0.020	9242088	0.27	0.020	9242014
Acenaphthylene	ug/g	0.064	0.93	0.0050	9242088	0.32	0.0050	9242014
Acenaphthene	ug/g	0.039	0.27	0.0050	9242088	0.10	0.0050	9242014
Fluorene	ug/g	0.073	0.97	0.020	9242088	0.39	0.020	9242014
Phenanthrene	ug/g	0.49	4.8	0.010	9242088	1.9	0.010	9242014
Anthracene	ug/g	0.15	1.1	0.0040	9242088	0.39	0.0040	9242014
Fluoranthene	ug/g	0.93	4.5	0.020	9242088	1.9	0.020	9242014
Pyrene	ug/g	1.1	4.0	0.020	9242088	1.7	0.020	9242014
Benzo(a)anthracene	ug/g	0.47	1.9	0.020	9242088	0.88	0.020	9242014
Chrysene	ug/g	0.55	2.0	0.020	9242088	1.4	0.020	9242014
Benzo(b&j)fluoranthene	ug/g	0.73	2.7	0.020	9242088	1.3	0.020	9242014
Benzo(b)fluoranthene	ug/g	0.43	1.6	0.020	9242088	0.92	0.020	9242014
Benzo(k)fluoranthene	ug/g	0.25	0.98	0.020	9242088	0.36	0.020	9242014
Benzo(a)pyrene	ug/g	0.64	2.1	0.020	9242088	0.90	0.020	9242014
Indeno(1,2,3-cd)pyrene	ug/g	0.34	1.1	0.020	9242088	0.45	0.020	9242014
Dibenz(a,h)anthracene	ug/g	0.11	0.38	0.020	9242088	0.19	0.020	9242014
Benzo(g,h,i)perylene	ug/g	0.40	1.2	0.050	9242088	0.53	0.050	9242014
Calculated Parameters								
LEPH (C10-C19 less PAH)	mg/kg	150	<100	100	9240272	<400	400	9240272
HEPH (C19-C32 less PAH)	mg/kg	280	490	100	9240272	5900	400	9240272
Hydrocarbons								
EPH (C10-C19)	mg/kg	150	<100	100	9242096	<400 (2)	400	9242049

RDL = Reportable Detection Limit
(1) Tentatively identified result and may be potentially biased high due to matrix interference.
(2) Detection limits raised due to dilution to bring analyte within the calibrated range.
Duplicate exceeds acceptance criteria due to sample non homogeneity. Reanalysis yields similar results.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B8A3005
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

LEPH & HEPH WITH PAH FOR CSR IN SOIL (SOIL)

Maxxam ID		UV3360	UV3364			UV3376		
Sampling Date		2018/11/22 13:10	2018/11/22 14:30			2018/11/22 14:30		
COC Number		K021468	K021468			K021469		
	UNITS	BH18-13 (0.4)	MW18-I	RDL	QC Batch	MW18-14 (0.5)	RDL	QC Batch
EPH (C19-C32)	mg/kg	290	500	100	9242096	6000 (1)	400	9242049
Surrogate Recovery (%)								
D10-ANTHRACENE (sur.)	%	85	78		9242088	82		9242014
D8-ACENAPHTHYLENE (sur.)	%	74	78		9242088	76		9242014
D8-NAPHTHALENE (sur.)	%	73	75		9242088	72		9242014
TERPHENYL-D14 (sur.)	%	79	79		9242088	82		9242014
O-TERPHENYL (sur.)	%	89	92		9242096	82		9242049

RDL = Reportable Detection Limit
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
Duplicate exceeds acceptance criteria due to sample non homogeneity. Reanalysis yields similar results.

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Maxxam Job #: B8A3005
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KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

LEPH & HEPH WITH PAH FOR CSR IN SOIL (SOIL)

Maxxam ID		UV3376			UV3376			UV3377		
Sampling Date		2018/11/22 14:30			2018/11/22 14:30			2018/11/22 14:35		
COC Number		K021469			K021469			K021469		
	UNITS	MW18-14 (0.5) Lab-Dup	RDL	QC Batch	MW18-14 (0.5) Lab-Dup 2	RDL	QC Batch	MW18-14 (1.2)	RDL	QC Batch
Calculated Parameters										
Low Molecular Weight PAH`s	ug/g							0.16	0.050	9240264
High Molecular Weight PAH`s	ug/g							1.4	0.050	9240264
Total PAH	ug/g							1.5	0.050	9240264
Polycyclic Aromatics										
Quinoline	ug/g	<0.050	0.050	9242014				<0.050	0.050	9242088
Naphthalene	ug/g	0.25	0.010	9242014				<0.010	0.010	9242088
1-Methylnaphthalene	ug/g	0.16	0.050	9242014				<0.050	0.050	9242088
2-Methylnaphthalene	ug/g	0.20	0.020	9242014				<0.020	0.020	9242088
Acenaphthylene	ug/g	0.29	0.0050	9242014				0.016	0.0050	9242088
Acenaphthene	ug/g	0.13	0.0050	9242014				0.0063	0.0050	9242088
Fluorene	ug/g	0.37	0.020	9242014				<0.020	0.020	9242088
Phenanthrene	ug/g	2.1	0.010	9242014				0.10	0.010	9242088
Anthracene	ug/g	0.49	0.0040	9242014				0.032	0.0040	9242088
Fluoranthene	ug/g	2.2	0.020	9242014				0.24	0.020	9242088
Pyrene	ug/g	1.9	0.020	9242014				0.24	0.020	9242088
Benzo(a)anthracene	ug/g	1.0	0.020	9242014				0.12	0.020	9242088
Chrysene	ug/g	1.0	0.020	9242014				0.14	0.020	9242088
Benzo(b&j)fluoranthene	ug/g	1.3	0.020	9242014				0.18	0.020	9242088
Benzo(b)fluoranthene	ug/g	0.84	0.020	9242014				0.11	0.020	9242088
Benzo(k)fluoranthene	ug/g	0.44	0.020	9242014				0.063	0.020	9242088
Benzo(a)pyrene	ug/g	0.98	0.020	9242014				0.15	0.020	9242088
Indeno(1,2,3-cd)pyrene	ug/g	0.65	0.020	9242014				0.095	0.020	9242088
Dibenz(a,h)anthracene	ug/g	0.21	0.020	9242014				0.028	0.020	9242088
Benzo(g,h,i)perylene	ug/g	0.61	0.050	9242014				0.11	0.050	9242088
Calculated Parameters										
LEPH (C10-C19 less PAH)	mg/kg							<100	100	9240272
HEPH (C19-C32 less PAH)	mg/kg							180	100	9240272
Hydrocarbons										
EPH (C10-C19)	mg/kg	<100	100	9242049	<100	100	9242049	<100	100	9242096

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8A3005
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

LEPH & HEPH WITH PAH FOR CSR IN SOIL (SOIL)

Maxxam ID		UV3376			UV3376			UV3377		
Sampling Date		2018/11/22 14:30			2018/11/22 14:30			2018/11/22 14:35		
COC Number		K021469			K021469			K021469		
	UNITS	**MW18-14 (0.5) Lab-Dup**	**RDL**	**QC Batch**	**MW18-14 (0.5) Lab-Dup 2**	**RDL**	**QC Batch**	**MW18-14 (1.2)**	**RDL**	**QC Batch**
EPH (C19-C32)	mg/kg	390 (1)	100	9242049	220 (1)	100	9242049	180	100	9242096
Surrogate Recovery (%)										
D10-ANTHRACENE (sur.)	%	80		9242014				89		9242088
D8-ACENAPHTHYLENE (sur.)	%	80		9242014				78		9242088
D8-NAPHTHALENE (sur.)	%	71		9242014				73		9242088
TERPHENYL-D14 (sur.)	%	79		9242014				80		9242088
O-TERPHENYL (sur.)	%	93		9242049	93		9242049	92		9242096

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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Maxxam Job #: B8A3005
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR/CCME METALS IN SOIL WITH HG (SOIL)

Maxxam ID		UV3356	UV3357	UV3360	UV3364		UV3376		
Sampling Date		2018/11/22 11:50	2018/11/22 11:55	2018/11/22 13:10	2018/11/22 14:30		2018/11/22 14:30		
COC Number		K021468	K021468	K021468	K021468		K021469		
	UNITS	MW18-12 (0.6)	MW18-12 (1.2)	BH18-13 (0.4)	MW18-I	QC Batch	MW18-14 (0.5)	RDL	QC Batch
Physical Properties									
Soluble (2:1) pH	pH	8.28	6.34	6.67	6.93	9241724	6.32	N/A	9244574
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	15100	17800	18500	19100	9241721	18300	100	9244569
Total Antimony (Sb)	mg/kg	1.23	0.14	1.17	0.43	9241721	0.54	0.10	9244569
Total Arsenic (As)	mg/kg	4.63	2.41	3.75	3.33	9241721	4.20	0.50	9244569
Total Barium (Ba)	mg/kg	76.3	79.7	91.3	91.5	9241721	89.3	0.10	9244569
Total Beryllium (Be)	mg/kg	<0.20	0.25	0.24	0.24	9241721	0.25	0.20	9244569
Total Boron (B)	mg/kg	1.8	2.7	3.9	2.4	9241721	2.7	1.0	9244569
Total Cadmium (Cd)	mg/kg	0.239	0.120	0.283	0.215	9241721	0.346	0.050	9244569
Total Chromium (Cr)	mg/kg	16.4	15.5	18.6	18.8	9241721	21.0	1.0	9244569
Total Cobalt (Co)	mg/kg	6.43	4.41	6.73	7.76	9241721	7.71	0.30	9244569
Total Copper (Cu)	mg/kg	17.4	8.84	22.9	25.8	9241721	31.7	0.50	9244569
Total Iron (Fe)	mg/kg	19600	13200	20200	22200	9241721	20100	100	9244569
Total Lead (Pb)	mg/kg	46.8	14.0	41.1	49.0	9241721	108	0.10	9244569
Total Lithium (Li)	mg/kg	5.9	7.9	8.5	7.9	9241721	8.0	5.0	9244569
Total Manganese (Mn)	mg/kg	333	243	281	362	9241721	293	0.20	9244569
Total Mercury (Hg)	mg/kg	<0.050	0.055	0.055	0.054	9241721	0.090	0.050	9244569
Total Molybdenum (Mo)	mg/kg	0.46	0.78	0.79	0.73	9241721	0.80	0.10	9244569
Total Nickel (Ni)	mg/kg	10.3	9.90	12.4	14.0	9241721	15.3	0.80	9244569
Total Selenium (Se)	mg/kg	<0.50	<0.50	<0.50	<0.50	9241721	<0.50	0.50	9244569
Total Silver (Ag)	mg/kg	<0.050	0.070	0.065	0.059	9241721	0.080	0.050	9244569
Total Strontium (Sr)	mg/kg	50.1	40.1	36.7	39.5	9241721	38.3	0.10	9244569
Total Thallium (Tl)	mg/kg	0.058	0.105	0.060	0.073	9241721	0.065	0.050	9244569
Total Tin (Sn)	mg/kg	9.01	0.32	1.10	1.25	9241721	1.82	0.10	9244569
Total Titanium (Ti)	mg/kg	864	453	848	943	9241721	865	1.0	9244569
Total Tungsten (W)	mg/kg	<0.50	<0.50	<0.50	<0.50	9241721	<0.50	0.50	9244569
Total Uranium (U)	mg/kg	0.487	0.538	0.502	0.527	9241721	0.707	0.050	9244569
Total Vanadium (V)	mg/kg	53.7	29.3	53.8	55.9	9241721	55.1	2.0	9244569
Total Zinc (Zn)	mg/kg	44.6	28.7	73.5	70.7	9241721	80.9	1.0	9244569

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B8A3005
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR/CCME METALS IN SOIL WITH HG (SOIL)

Maxxam ID		UV3377		
Sampling Date		2018/11/22 14:35		
COC Number		K021469		
	UNITS	MW18-14 (1.2)	RDL	QC Batch
Physical Properties				
Soluble (2:1) pH	pH	6.54	N/A	9241724
Total Metals by ICPMS				
Total Aluminum (Al)	mg/kg	16300	100	9241721
Total Antimony (Sb)	mg/kg	0.16	0.10	9241721
Total Arsenic (As)	mg/kg	1.73	0.50	9241721
Total Barium (Ba)	mg/kg	93.6	0.10	9241721
Total Beryllium (Be)	mg/kg	<0.20	0.20	9241721
Total Boron (B)	mg/kg	1.2	1.0	9241721
Total Cadmium (Cd)	mg/kg	0.069	0.050	9241721
Total Chromium (Cr)	mg/kg	14.0	1.0	9241721
Total Cobalt (Co)	mg/kg	7.10	0.30	9241721
Total Copper (Cu)	mg/kg	23.0	0.50	9241721
Total Iron (Fe)	mg/kg	22800	100	9241721
Total Lead (Pb)	mg/kg	7.57	0.10	9241721
Total Lithium (Li)	mg/kg	5.8	5.0	9241721
Total Manganese (Mn)	mg/kg	369	0.20	9241721
Total Mercury (Hg)	mg/kg	<0.050	0.050	9241721
Total Molybdenum (Mo)	mg/kg	0.36	0.10	9241721
Total Nickel (Ni)	mg/kg	8.03	0.80	9241721
Total Selenium (Se)	mg/kg	<0.50	0.50	9241721
Total Silver (Ag)	mg/kg	<0.050	0.050	9241721
Total Strontium (Sr)	mg/kg	42.6	0.10	9241721
Total Thallium (Tl)	mg/kg	0.069	0.050	9241721
Total Tin (Sn)	mg/kg	0.54	0.10	9241721
Total Titanium (Ti)	mg/kg	913	1.0	9241721
Total Tungsten (W)	mg/kg	<0.50	0.50	9241721
Total Uranium (U)	mg/kg	0.422	0.050	9241721
Total Vanadium (V)	mg/kg	61.0	2.0	9241721
Total Zinc (Zn)	mg/kg	41.8	1.0	9241721

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B8A3005
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR VOC + VPH IN SOIL - FIELD PRESERVED (SOIL)

Maxxam ID		UV3357		UV3360		
Sampling Date		2018/11/22 11:55		2018/11/22 13:10		
COC Number		K021468		K021468		
	UNITS	MW18-12 (1.2)	RDL	BH18-13 (0.4)	RDL	QC Batch
Calculated Parameters						
VPH (VH6 to 10 - BTEX)	mg/kg	1100	50	<10	10	9239695
Volatiles						
VH C6-C10	mg/kg	1100	50	<10	10	9241980
1,1,1,2-tetrachloroethane	mg/kg	<0.020	0.020	<0.020	0.020	9241980
1,1,1-trichloroethane	mg/kg	<0.020	0.020	<0.020	0.020	9241980
1,1,2,2-tetrachloroethane	mg/kg	<0.020	0.020	<0.020	0.020	9241980
1,1,2Trichloro-1,2,2Trifluoroethane	mg/kg	<0.20	0.20	<0.20	0.20	9241980
1,1,2-trichloroethane	mg/kg	2.5 (1)	0.020	<0.020	0.020	9241980
1,1-dichloroethane	mg/kg	<0.025	0.025	<0.025	0.025	9241980
1,1-dichloroethene	mg/kg	<0.025	0.025	<0.025	0.025	9241980
1,2,3-trichlorobenzene	mg/kg	0.048 (1)	0.030	0.065 (1)	0.030	9241980
1,2,4-trichlorobenzene	mg/kg	<0.030	0.030	<0.030	0.030	9241980
1,2,4-trimethylbenzene	mg/kg	<0.20	0.20	<0.20	0.20	9241980
1,2-dibromoethane	mg/kg	<0.020	0.020	<0.020	0.020	9241980
1,2-dichlorobenzene	mg/kg	<0.020	0.020	<0.020	0.020	9241980
1,2-dichloroethane	mg/kg	<0.020	0.020	<0.020	0.020	9241980
1,2-dichloropropane	mg/kg	<0.020	0.020	<0.020	0.020	9241980
1,3,5-trimethylbenzene	mg/kg	<0.20	0.20	<0.20	0.20	9241980
1,3-Butadiene	mg/kg	<0.080	0.080	<0.080	0.080	9241980
1,3-dichlorobenzene	mg/kg	<0.020	0.020	<0.020	0.020	9241980
1,4-dichlorobenzene	mg/kg	<0.020	0.020	<0.020	0.020	9241980
Benzene	mg/kg	0.019 (1)	0.0050	<0.0050	0.0050	9241980
Bromobenzene	mg/kg	<0.20	0.20	<0.20	0.20	9241980
Bromodichloromethane	mg/kg	2.5 (1)	0.050	<0.050	0.050	9241980
Bromoform	mg/kg	<0.050	0.050	<0.050	0.050	9241980
Bromomethane	mg/kg	<0.30	0.30	<0.30	0.30	9241980
Carbon tetrachloride	mg/kg	<0.020	0.020	<0.020	0.020	9241980
Chlorobenzene	mg/kg	<0.020	0.020	<0.020	0.020	9241980
Chlorodibromomethane	mg/kg	<0.050	0.050	<0.050	0.050	9241980
Chloroethane	mg/kg	<0.10	0.10	<0.10	0.10	9241980
Chloroform	mg/kg	<0.020	0.020	<0.020	0.020	9241980

RDL = Reportable Detection Limit
(1) Tentatively identified result and may be potentially biased high due to matrix interference.

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Maxxam Job #: B8A3005
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR VOC + VPH IN SOIL - FIELD PRESERVED (SOIL)

Maxxam ID		UV3357		UV3360		
Sampling Date		2018/11/22 11:55		2018/11/22 13:10		
COC Number		K021468		K021468		
	UNITS	MW18-12 (1.2)	RDL	BH18-13 (0.4)	RDL	QC Batch
Chloromethane	mg/kg	<0.050	0.050	<0.050	0.050	9241980
cis-1,2-dichloroethene	mg/kg	<0.030	0.030	<0.030	0.030	9241980
cis-1,3-dichloropropene	mg/kg	<0.020	0.020	<0.020	0.020	9241980
Dichlorodifluoromethane	mg/kg	<0.20	0.20	<0.20	0.20	9241980
Dichloromethane	mg/kg	<0.080	0.080	<0.080	0.080	9241980
Ethylbenzene	mg/kg	0.13	0.010	<0.010	0.010	9241980
Hexachlorobutadiene	mg/kg	<0.20	0.20	<0.20	0.20	9241980
Isopropylbenzene	mg/kg	0.41	0.20	<0.20	0.20	9241980
Methylcyclohexane	mg/kg	11	0.20	<0.20	0.20	9241980
Methyl-tert-butylether (MTBE)	mg/kg	<0.10	0.10	<0.10	0.10	9241980
n-Decane	mg/kg	4.4 (1)	2.0	<2.0	2.0	9241980
Styrene	mg/kg	<0.030	0.030	<0.030	0.030	9241980
Tetrachloroethene	mg/kg	<0.010	0.010	<0.010	0.010	9241980
Toluene	mg/kg	0.051	0.020	<0.020	0.020	9241980
trans-1,2-dichloroethene	mg/kg	<0.030	0.030	<0.030	0.030	9241980
trans-1,3-dichloropropene	mg/kg	<0.020	0.020	<0.020	0.020	9241980
Trichloroethene	mg/kg	<0.0090	0.0090	<0.0090	0.0090	9241980
Trichlorofluoromethane	mg/kg	<0.20	0.20	<0.20	0.20	9241980
Vinyl chloride	mg/kg	<0.040	0.040	<0.040	0.040	9241980
m & p-Xylene	mg/kg	0.13	0.040	<0.040	0.040	9241980
o-Xylene	mg/kg	0.052	0.040	<0.040	0.040	9241980
Xylenes (Total)	mg/kg	0.18	0.040	<0.040	0.040	9241980
Surrogate Recovery (%)						
1,4-Difluorobenzene (sur.)	%	93		99		9241980
4-Bromofluorobenzene (sur.)	%	98		112		9241980
D10-ETHYLBENZENE (sur.)	%	119		125		9241980
D4-1,2-Dichloroethane (sur.)	%	97		106		9241980

RDL = Reportable Detection Limit
(1) Tentatively identified result and may be potentially biased high due to matrix interference.

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Maxxam Job #: B8A3005
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	7.7°C
Package 2	9.0°C

Version 2: Report reissued to include results for LEPH, VPH, naphthalene on sample MW18-12(1.8) as per request from Stewart McBride on 2018/12/04

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9241980	1,4-Difluorobenzene (sur.)	2018/11/28	87	50 - 140	87	50 - 140	100	%				
9241980	4-Bromofluorobenzene (sur.)	2018/11/28	96	50 - 140	99	50 - 140	100	%				
9241980	D10-ETHYLBENZENE (sur.)	2018/11/28	112	50 - 140	99	50 - 140	120	%				
9241980	D4-1,2-Dichloroethane (sur.)	2018/11/28	99	50 - 140	102	50 - 140	102	%				
9242014	D10-ANTHRACENE (sur.)	2018/11/26	87	50 - 140	86	50 - 140	88	%				
9242014	D8-ACENAPHTHYLENE (sur.)	2018/11/26	84	50 - 140	81	50 - 140	81	%				
9242014	D8-NAPHTHALENE (sur.)	2018/11/26	75	50 - 140	76	50 - 140	73	%				
9242014	TERPHENYL-D14 (sur.)	2018/11/26	84	50 - 140	83	50 - 140	83	%				
9242033	Extractable (MeOH) 1,4-Difluorobenzene (sur.)	2018/11/26			105	50 - 140	107	%				
9242033	Extractable (MeOH) 4-Bromofluorobenzene (sur.)	2018/11/26			100	50 - 140	102	%				
9242033	Extractable (MeOH) D4-1,2-Dichloroethane (sur.)	2018/11/26			97	50 - 140	102	%				
9242049	O-TERPHENYL (sur.)	2018/11/26	79	60 - 140	78	60 - 140	95	%				
9242088	D10-ANTHRACENE (sur.)	2018/11/26	75	50 - 140	79	50 - 140	85	%				
9242088	D8-ACENAPHTHYLENE (sur.)	2018/11/26	76	50 - 140	78	50 - 140	81	%				
9242088	D8-NAPHTHALENE (sur.)	2018/11/26	68	50 - 140	76	50 - 140	78	%				
9242088	TERPHENYL-D14 (sur.)	2018/11/26	76	50 - 140	79	50 - 140	83	%				
9242096	O-TERPHENYL (sur.)	2018/11/26	78	60 - 140	77	60 - 140	90	%				
9253642	O-TERPHENYL (sur.)	2018/12/05	78	60 - 140	78	60 - 140	92	%				
9253648	D10-ANTHRACENE (sur.)	2018/12/05	89	50 - 140	93	50 - 140	93	%				
9253648	D8-ACENAPHTHYLENE (sur.)	2018/12/05	87	50 - 140	85	50 - 140	85	%				
9253648	D8-NAPHTHALENE (sur.)	2018/12/05	79	50 - 140	72	50 - 140	76	%				
9253648	TERPHENYL-D14 (sur.)	2018/12/05	87	50 - 140	90	50 - 140	81	%				
9254427	1,4-Difluorobenzene (sur.)	2018/12/05	93	70 - 130	94	70 - 130	99	%				
9254427	4-Bromofluorobenzene (sur.)	2018/12/05	107	70 - 130	107	70 - 130	104	%				
9254427	D10-ETHYLBENZENE (sur.)	2018/12/05	100	60 - 130	86	60 - 130	91	%				
9254427	D4-1,2-Dichloroethane (sur.)	2018/12/05	95	70 - 130	99	70 - 130	106	%				
9240549	Moisture	2018/11/24					<0.30	%	7.6	20		
9241721	Total Aluminum (Al)	2018/11/26					<100	mg/kg	0.21	40	107	70 - 130
9241721	Total Antimony (Sb)	2018/11/26	95	75 - 125	102	75 - 125	<0.10	mg/kg	2.2	30	123	70 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9241721	Total Arsenic (As)	2018/11/26	105	75 - 125	99	75 - 125	<0.50	mg/kg	1.7	30	102	70 - 130
9241721	Total Barium (Ba)	2018/11/26	NC	75 - 125	100	75 - 125	<0.10	mg/kg	2.6	40	112	70 - 130
9241721	Total Beryllium (Be)	2018/11/26	108	75 - 125	98	75 - 125	<0.20	mg/kg	NC	30	104	70 - 130
9241721	Total Boron (B)	2018/11/26					<1.0	mg/kg	1.4	30		
9241721	Total Cadmium (Cd)	2018/11/26	106	75 - 125	101	75 - 125	<0.050	mg/kg	2.3	30	104	70 - 130
9241721	Total Chromium (Cr)	2018/11/26	103	75 - 125	99	75 - 125	<1.0	mg/kg	1.6	30	117	70 - 130
9241721	Total Cobalt (Co)	2018/11/26	103	75 - 125	98	75 - 125	<0.30	mg/kg	1.1	30	104	70 - 130
9241721	Total Copper (Cu)	2018/11/26	100	75 - 125	95	75 - 125	<0.50	mg/kg	1.2	30	108	70 - 130
9241721	Total Iron (Fe)	2018/11/26					<100	mg/kg	0.66	30	108	70 - 130
9241721	Total Lead (Pb)	2018/11/26	99	75 - 125	98	75 - 125	<0.10	mg/kg	4.8	40	115	70 - 130
9241721	Total Lithium (Li)	2018/11/26	104	75 - 125	97	75 - 125	<5.0	mg/kg	NC	30	104	70 - 130
9241721	Total Manganese (Mn)	2018/11/26	NC	75 - 125	96	75 - 125	<0.20	mg/kg	5.6	30	107	70 - 130
9241721	Total Mercury (Hg)	2018/11/26	106	75 - 125	102	75 - 125	<0.050	mg/kg	NC	40	118	70 - 130
9241721	Total Molybdenum (Mo)	2018/11/26	107	75 - 125	103	75 - 125	<0.10	mg/kg	0.63	40	115	70 - 130
9241721	Total Nickel (Ni)	2018/11/26	101	75 - 125	97	75 - 125	<0.80	mg/kg	0.92	30	110	70 - 130
9241721	Total Selenium (Se)	2018/11/26	105	75 - 125	101	75 - 125	<0.50	mg/kg	NC	30		
9241721	Total Silver (Ag)	2018/11/26	109	75 - 125	108	75 - 125	<0.050	mg/kg	NC	40	111	70 - 130
9241721	Total Strontium (Sr)	2018/11/26	107	75 - 125	100	75 - 125	<0.10	mg/kg	2.5	40	119	70 - 130
9241721	Total Thallium (Tl)	2018/11/26	102	75 - 125	98	75 - 125	<0.050	mg/kg	NC	30	101	70 - 130
9241721	Total Tin (Sn)	2018/11/26	107	75 - 125	101	75 - 125	<0.10	mg/kg	3.0	40	119	70 - 130
9241721	Total Titanium (Ti)	2018/11/26	NC	75 - 125	99	75 - 125	<1.0	mg/kg	7.1	40		
9241721	Total Tungsten (W)	2018/11/26					<0.50	mg/kg	NC	30		
9241721	Total Uranium (U)	2018/11/26	99	75 - 125	94	75 - 125	<0.050	mg/kg	5.1	30	119	70 - 130
9241721	Total Vanadium (V)	2018/11/26	98	75 - 125	98	75 - 125	<2.0	mg/kg	2.1	30	112	70 - 130
9241721	Total Zinc (Zn)	2018/11/26	105	75 - 125	98	75 - 125	<1.0	mg/kg	2.7	30	110	70 - 130
9241724	Soluble (2:1) pH	2018/11/26			100	97 - 103			0.14	20		
9241980	1,1,1,2-tetrachloroethane	2018/11/27	106	50 - 140	115	60 - 130	<0.020	mg/kg	NC	50		
9241980	1,1,1-trichloroethane	2018/11/27	100	50 - 140	110	60 - 130	<0.020	mg/kg	NC	50		
9241980	1,1,2,2-tetrachloroethane	2018/11/27	101	50 - 140	104	60 - 130	<0.020	mg/kg	NC	50		
9241980	1,1,2Trichloro-1,2,2Trifluoroethane	2018/11/27	97	50 - 140	108	60 - 130	<0.20	mg/kg	NC	50		
9241980	1,1,2-trichloroethane	2018/11/27	111	50 - 140	120	60 - 130	<0.020	mg/kg	NC	50		

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			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9241980	1,1-dichloroethane	2018/11/27	102	50 - 140	112	60 - 130	<0.025	mg/kg	NC	50		
9241980	1,1-dichloroethene	2018/11/27	97	50 - 140	113	60 - 130	<0.025	mg/kg	NC	50		
9241980	1,2,3-trichlorobenzene	2018/11/27	107	50 - 140	118	60 - 130	<0.030	mg/kg	NC	50		
9241980	1,2,4-trichlorobenzene	2018/11/27	109	50 - 140	119	60 - 130	<0.030	mg/kg	NC	50		
9241980	1,2,4-trimethylbenzene	2018/11/27	124	50 - 140	126	60 - 130	<0.20	mg/kg	NC	50		
9241980	1,2-dibromoethane	2018/11/27	110	50 - 140	121	60 - 130	<0.020	mg/kg	NC	50		
9241980	1,2-dichlorobenzene	2018/11/27	112	50 - 140	120	60 - 130	<0.020	mg/kg	NC	50		
9241980	1,2-dichloroethane	2018/11/27	96	50 - 140	104	60 - 130	<0.020	mg/kg	NC	50		
9241980	1,2-dichloropropane	2018/11/27	108	50 - 140	117	60 - 130	<0.020	mg/kg	NC	50		
9241980	1,3,5-trimethylbenzene	2018/11/27	118	50 - 140	123	60 - 130	<0.20	mg/kg	NC	50		
9241980	1,3-Butadiene	2018/11/27	22 (1)	50 - 140	52 (1)	60 - 130	<0.080	mg/kg	NC	50		
9241980	1,3-dichlorobenzene	2018/11/27	111	50 - 140	118	60 - 130	<0.020	mg/kg	NC	50		
9241980	1,4-dichlorobenzene	2018/11/27	108	50 - 140	114	60 - 130	<0.020	mg/kg	NC	50		
9241980	Benzene	2018/11/27	102	50 - 140	112	60 - 130	<0.0050	mg/kg	NC	50		
9241980	Bromobenzene	2018/11/27	104	50 - 140	112	60 - 130	<0.20	mg/kg	NC	50		
9241980	Bromodichloromethane	2018/11/27	103	50 - 140	116	60 - 130	<0.050	mg/kg	NC	50		
9241980	Bromoform	2018/11/27	99	50 - 140	104	60 - 130	<0.050	mg/kg	NC	50		
9241980	Bromomethane	2018/11/27	90	50 - 140	112	60 - 130	<0.30	mg/kg	NC	50		
9241980	Carbon tetrachloride	2018/11/27	103	50 - 140	115	60 - 130	<0.020	mg/kg	NC	50		
9241980	Chlorobenzene	2018/11/27	98	50 - 140	107	60 - 130	<0.020	mg/kg	NC	50		
9241980	Chlorodibromomethane	2018/11/27	105	50 - 140	118	60 - 130	<0.050	mg/kg	NC	50		
9241980	Chloroethane	2018/11/27	82	50 - 140	86	60 - 130	<0.10	mg/kg	NC	50		
9241980	Chloroform	2018/11/27	101	50 - 140	112	60 - 130	<0.020	mg/kg	NC	50		
9241980	Chloromethane	2018/11/27	70	50 - 140	95	60 - 130	<0.050	mg/kg	NC	50		
9241980	cis-1,2-dichloroethene	2018/11/27	101	50 - 140	114	60 - 130	<0.030	mg/kg	NC	50		
9241980	cis-1,3-dichloropropene	2018/11/27	106	50 - 140	115	50 - 140	<0.020	mg/kg	NC	50		
9241980	Dichlorodifluoromethane	2018/11/27	44 (1)	50 - 140	76	60 - 130	<0.20	mg/kg	NC	50		
9241980	Dichloromethane	2018/11/27	96	50 - 140	112	60 - 130	<0.080	mg/kg	NC	50		
9241980	Ethylbenzene	2018/11/27	116	50 - 140	125	60 - 130	<0.010	mg/kg	NC	50		
9241980	Hexachlorobutadiene	2018/11/27	107	50 - 140	114	50 - 130	<0.20	mg/kg	NC	50		
9241980	Isopropylbenzene	2018/11/27	114	50 - 140	119	60 - 130	<0.20	mg/kg	NC	50		

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			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9241980	m & p-Xylene	2018/11/27	116	50 - 140	126	60 - 130	<0.040	mg/kg	NC	50		
9241980	Methylcyclohexane	2018/11/27	106	N/A	115	60 - 130	<0.20	mg/kg	NC	50		
9241980	Methyl-tert-butylether (MTBE)	2018/11/27	95	50 - 140	107	60 - 130	<0.10	mg/kg	NC	50		
9241980	n-Decane	2018/11/27	115	50 - 140	127	60 - 130	<2.0	mg/kg	NC	50		
9241980	o-Xylene	2018/11/27	118	50 - 140	125	60 - 130	<0.040	mg/kg	NC	50		
9241980	Styrene	2018/11/27	124	50 - 140	124	60 - 130	<0.030	mg/kg	NC	50		
9241980	Tetrachloroethene	2018/11/27	109	50 - 140	122	60 - 130	<0.010	mg/kg	NC	50		
9241980	Toluene	2018/11/27	111	50 - 140	121	60 - 130	<0.020	mg/kg	NC	50		
9241980	trans-1,2-dichloroethene	2018/11/27	100	50 - 140	113	60 - 130	<0.030	mg/kg	NC	50		
9241980	trans-1,3-dichloropropene	2018/11/27	114	50 - 140	121	50 - 140	<0.020	mg/kg	NC	50		
9241980	Trichloroethene	2018/11/27	103	50 - 140	112	60 - 130	<0.0090	mg/kg	NC	50		
9241980	Trichlorofluoromethane	2018/11/27	94	50 - 140	107	60 - 130	<0.20	mg/kg	NC	50		
9241980	VH C6-C10	2018/11/27			101	60 - 130	<10	mg/kg	NC	50		
9241980	Vinyl chloride	2018/11/27	72	50 - 140	83	60 - 130	<0.040	mg/kg	NC	50		
9241980	Xylenes (Total)	2018/11/27					<0.040	mg/kg	NC	50		
9242014	1-Methylnaphthalene	2018/11/26	76	50 - 140	87	50 - 140	<0.050	ug/g	28	50		
9242014	2-Methylnaphthalene	2018/11/26	72	50 - 140	87	50 - 140	<0.020	ug/g	34	50		
9242014	Acenaphthene	2018/11/26	88	50 - 140	85	50 - 140	<0.0050	ug/g	26	50		
9242014	Acenaphthylene	2018/11/26	75	50 - 140	85	50 - 140	<0.0050	ug/g	8.3	50		
9242014	Anthracene	2018/11/26	85	50 - 140	87	50 - 140	<0.0040	ug/g	22	50		
9242014	Benzo(a)anthracene	2018/11/26	82	50 - 140	87	50 - 140	<0.020	ug/g	13	50		
9242014	Benzo(a)pyrene	2018/11/26	84	50 - 140	86	50 - 140	<0.020	ug/g	8.5	50		
9242014	Benzo(b&j)fluoranthene	2018/11/26	77	50 - 140	88	50 - 140	<0.020	ug/g	2.6	50		
9242014	Benzo(b)fluoranthene	2018/11/26	76	50 - 140	86	50 - 140	<0.020	ug/g	9.0	50		
9242014	Benzo(g,h,i)perylene	2018/11/26	69	50 - 140	93	50 - 140	<0.050	ug/g	14	50		
9242014	Benzo(k)fluoranthene	2018/11/26	95	50 - 140	85	50 - 140	<0.020	ug/g	20	50		
9242014	Chrysene	2018/11/26	NC	50 - 140	86	50 - 140	<0.020	ug/g	33	50		
9242014	Dibenz(a,h)anthracene	2018/11/26	89	50 - 140	93	50 - 140	<0.020	ug/g	8.6	50		
9242014	Fluoranthene	2018/11/26	NC	50 - 140	88	50 - 140	<0.020	ug/g	16	50		
9242014	Fluorene	2018/11/26	71	50 - 140	85	50 - 140	<0.020	ug/g	5.7	50		
9242014	Indeno(1,2,3-cd)pyrene	2018/11/26	76	50 - 140	85	50 - 140	<0.020	ug/g	37	50		

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			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9242014	Naphthalene	2018/11/26	63	50 - 140	87	50 - 140	<0.010	ug/g	47	50		
9242014	Phenanthrene	2018/11/26	NC	50 - 140	86	50 - 140	<0.010	ug/g	11	50		
9242014	Pyrene	2018/11/26	NC	50 - 140	87	50 - 140	<0.020	ug/g	11	50		
9242014	Quinoline	2018/11/26	113	50 - 140	115	50 - 140	<0.050	ug/g	NC	50		
9242033	Extractable (MeOH) 2-Butanone (MEK)	2018/11/26			100	50 - 140	<15	mg/kg	NC	50		
9242033	Extractable (MeOH) 4-Methyl-2-pentanone (MIBK)	2018/11/26			92	50 - 140	<0.50	mg/kg	NC	50		
9242033	Extractable (MeOH) Acetone	2018/11/26			88	50 - 140	<5.0	mg/kg	NC	50		
9242049	EPH (C10-C19)	2018/11/26	66	60 - 140	80	70 - 130	<100	mg/kg	NC	40		
9242049	EPH (C19-C32)	2018/11/26	NC	60 - 140	81	70 - 130	<100	mg/kg	176 (1)	40		
9242088	1-Methylnaphthalene	2018/11/26	80	50 - 140	83	50 - 140	<0.050	ug/g	NC	50		
9242088	2-Methylnaphthalene	2018/11/26	79	50 - 140	83	50 - 140	<0.020	ug/g	29	50		
9242088	Acenaphthene	2018/11/26	82	50 - 140	84	50 - 140	<0.0050	ug/g	99 (1)	50		
9242088	Acenaphthylene	2018/11/26	82	50 - 140	84	50 - 140	<0.0050	ug/g	93 (1)	50		
9242088	Anthracene	2018/11/26	75	50 - 140	83	50 - 140	<0.0040	ug/g	129 (1)	50		
9242088	Benzo(a)anthracene	2018/11/26	70	50 - 140	76	50 - 140	<0.020	ug/g	103 (1)	50		
9242088	Benzo(a)pyrene	2018/11/26	75	50 - 140	80	50 - 140	<0.020	ug/g	81 (1)	50		
9242088	Benzo(b&j)fluoranthene	2018/11/26	73	50 - 140	79	50 - 140	<0.020	ug/g	67 (1)	50		
9242088	Benzo(b)fluoranthene	2018/11/26	75	50 - 140	78	50 - 140	<0.020	ug/g	60 (1)	50		
9242088	Benzo(g,h,i)perylene	2018/11/26	82	50 - 140	91	50 - 140	<0.050	ug/g	37	50		
9242088	Benzo(k)fluoranthene	2018/11/26	70	50 - 140	77	50 - 140	<0.020	ug/g	76 (1)	50		
9242088	Chrysene	2018/11/26	69	50 - 140	76	50 - 140	<0.020	ug/g	95 (1)	50		
9242088	Dibenz(a,h)anthracene	2018/11/26	79	50 - 140	88	50 - 140	<0.020	ug/g	NC	50		
9242088	Fluoranthene	2018/11/26	80	50 - 140	83	50 - 140	<0.020	ug/g	89 (1)	50		
9242088	Fluorene	2018/11/26	76	50 - 140	77	50 - 140	<0.020	ug/g	125 (1)	50		
9242088	Indeno(1,2,3-cd)pyrene	2018/11/26	74	50 - 140	83	50 - 140	<0.020	ug/g	52 (1)	50		
9242088	Naphthalene	2018/11/26	77	50 - 140	86	50 - 140	<0.010	ug/g	24	50		
9242088	Phenanthrene	2018/11/26	80	50 - 140	82	50 - 140	<0.010	ug/g	118 (1)	50		
9242088	Pyrene	2018/11/26	79	50 - 140	82	50 - 140	<0.020	ug/g	93 (1)	50		
9242088	Quinoline	2018/11/26	118	50 - 140	119	50 - 140	<0.050	ug/g	NC	50		
9242096	EPH (C10-C19)	2018/11/26	84	60 - 140	79	70 - 130	<100	mg/kg	NC	40		

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			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9242096	EPH (C19-C32)	2018/11/26	82	60 - 140	83	70 - 130	<100	mg/kg	33	40		
9244569	Total Aluminum (Al)	2018/11/28					118, RDL=100 (2)	mg/kg	8.1	40	110	70 - 130
9244569	Total Antimony (Sb)	2018/11/28	92	75 - 125	101	75 - 125	<0.10	mg/kg	6.2	30	119	70 - 130
9244569	Total Arsenic (As)	2018/11/28	99	75 - 125	101	75 - 125	<0.50	mg/kg	0.34	30	101	70 - 130
9244569	Total Barium (Ba)	2018/11/28	NC	75 - 125	105	75 - 125	<0.10	mg/kg	1.9	40	107	70 - 130
9244569	Total Beryllium (Be)	2018/11/28	104	75 - 125	110	75 - 125	<0.20	mg/kg	2.3	30	123	70 - 130
9244569	Total Boron (B)	2018/11/28					<1.0	mg/kg	18	30		
9244569	Total Cadmium (Cd)	2018/11/28	103	75 - 125	105	75 - 125	<0.050	mg/kg	0.19	30	103	70 - 130
9244569	Total Chromium (Cr)	2018/11/28	98	75 - 125	105	75 - 125	<1.0	mg/kg	7.0	30	116	70 - 130
9244569	Total Cobalt (Co)	2018/11/28	100	75 - 125	104	75 - 125	<0.30	mg/kg	1.2	30	107	70 - 130
9244569	Total Copper (Cu)	2018/11/28	97	75 - 125	104	75 - 125	<0.50	mg/kg	2.7	30	115	70 - 130
9244569	Total Iron (Fe)	2018/11/28					<100	mg/kg			110	70 - 130
9244569	Total Lead (Pb)	2018/11/28	99	75 - 125	102	75 - 125	<0.10	mg/kg	4.5	40	121	70 - 130
9244569	Total Lithium (Li)	2018/11/28	100	75 - 125	103	75 - 125	<5.0	mg/kg			106	70 - 130
9244569	Total Manganese (Mn)	2018/11/28	NC	75 - 125	102	75 - 125	<0.20	mg/kg	2.7	30	108	70 - 130
9244569	Total Mercury (Hg)	2018/11/28	104	75 - 125	105	75 - 125	<0.050	mg/kg	NC	40	107	70 - 130
9244569	Total Molybdenum (Mo)	2018/11/28	101	75 - 125	103	75 - 125	<0.10	mg/kg	10	40	113	70 - 130
9244569	Total Nickel (Ni)	2018/11/28	98	75 - 125	103	75 - 125	<0.80	mg/kg	1.4	30	112	70 - 130
9244569	Total Selenium (Se)	2018/11/28	100	75 - 125	103	75 - 125	<0.50	mg/kg	NC	30		
9244569	Total Silver (Ag)	2018/11/28	100	75 - 125	99	75 - 125	<0.050	mg/kg	30	40	97	70 - 130
9244569	Total Strontium (Sr)	2018/11/28	NC	75 - 125	101	75 - 125	<0.10	mg/kg	7.2	40	116	70 - 130
9244569	Total Thallium (Tl)	2018/11/28	99	75 - 125	104	75 - 125	<0.050	mg/kg			104	70 - 130
9244569	Total Tin (Sn)	2018/11/28	99	75 - 125	104	75 - 125	<0.10	mg/kg	11	40	115	70 - 130
9244569	Total Titanium (Ti)	2018/11/28	NC	75 - 125	106	75 - 125	<1.0	mg/kg	7.9	40		
9244569	Total Tungsten (W)	2018/11/28					<0.50	mg/kg	NC	30		
9244569	Total Uranium (U)	2018/11/28	104	75 - 125	105	75 - 125	<0.050	mg/kg			109	70 - 130
9244569	Total Vanadium (V)	2018/11/28	NC	75 - 125	103	75 - 125	<2.0	mg/kg	0.98	30	112	70 - 130
9244569	Total Zinc (Zn)	2018/11/28	NC	75 - 125	104	75 - 125	<1.0	mg/kg	0.77	30	115	70 - 130
9244574	Soluble (2:1) pH	2018/11/28			100	97 - 103						
9253135	Moisture	2018/12/05					<0.30	%	1.5	20		

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			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9253642	EPH (C10-C19)	2018/12/05	99	60 - 140	97	70 - 130	<100	mg/kg	NC	40		
9253648	Naphthalene	2018/12/05	93	50 - 140	93	50 - 140	<0.010	ug/g	NC	50		
9253648	Phenanthrene	2018/12/05	91	50 - 140	93	50 - 140	<0.010	ug/g	3.8	50		
9254427	Benzene	2018/12/05	82	60 - 140	84	70 - 130	<0.0050	mg/kg	NC	40		
9254427	Ethylbenzene	2018/12/05	90	60 - 140	96	70 - 130	<0.010	mg/kg	NC	40		
9254427	m & p-Xylene	2018/12/05	89	60 - 140	95	70 - 130	<0.040	mg/kg	NC	40		
9254427	Methyl-tert-butylether (MTBE)	2018/12/05	82	60 - 140	80	70 - 130	<0.10	mg/kg	NC	40		
9254427	o-Xylene	2018/12/05	90	60 - 140	97	70 - 130	<0.040	mg/kg	NC	40		
9254427	Styrene	2018/12/05	91	60 - 140	99	70 - 130	<0.030	mg/kg	NC	40		
9254427	Toluene	2018/12/05	82	60 - 140	87	70 - 130	<0.020	mg/kg	NC	40		
9254427	VH C6-C10	2018/12/05			77	70 - 130	<10	mg/kg	NC	40		
9254427	Xylenes (Total)	2018/12/05					<0.040	mg/kg	NC	40		

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

(2) Method Blank exceeds acceptance limits. Sample values for Al are >10x the concentration of the method blank and the contamination is considered insignificant.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

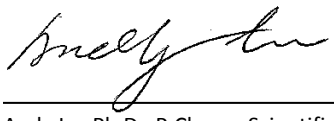
City of Vancouver - FOI 2023-228 - Page 683 of 1003

Maxxam Job #: B8A3005
Report Date: 2018/12/07

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Andy Lu, Ph.D., P.Chem., Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Updated CoC pg 1/2

CHAIN OF CUSTODY RECORD

KUC1408

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 668-8566

BBY FCD-00077/07

Page 1 of 2

Invoice Information		Report Information (if differs from invoice)		Project Information (where applicable)		Turnaround Time (TAT) Required
Company Name:	3763 - Keystone Environmental Ltd.	Company Name:		Quotation #:		☑ Regular TAT 5 days (Most analyses)
Contact Name:	Nicole MacDonald	Contact Name:		P.O. #/ AFE#:		PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address:	#320 - 4400 Dominion Street	Address:		Project #:	13639-20	Rush TAT (Surcharges will be applied)
	Burnaby, BC PC: V5G 4G3		PC:	Site Location:		☐ Same Day ☐ 2 Days
Phone:	(604) 430-0671	Phone:		Site #:		☐ 1 Day ☐ 3 Days
Email:	amacdonald@keystoneenviro.com	Email:	smcbride@keystoneenviro.com	Sampled By:	Stewart McBride	Date Required:

Regulatory Criteria		Special Instructions
☑ BC CSR Soil	☐ BC CSR Water	☐ Return Cooler
☐ YK CSR Soil	☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)
☐ CCME (Specify)	☐ Other (Specify)	
☐ Drinking Water	☐ BC Water Quality	

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

Rush Confirmation #:

LABORATORY USE ONLY

CUSTODY SEAL Y / N (Present / Intact) | COOLER TEMPERATURES

COOLING MEDIA PRESENT Y / N

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	BTEX / VPH	BTEX / F1	PAH	EPH	Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Chloride	TSS	pH	Nitrite	Key metals	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE	COMMENTS
1	MW18-H	2018/11/22	11:50	Soil														4	X	
2	MW18-12 (0.6)		11:50				X										X			
3	(1.2)		11:55		X		X										X			
4	(1.8)		12:05																	
5	(2.8)		12:10																	
6	BH18-13 (0.4)		13:10		X		X										X			
7	(1.2)		13:05																	
8	(1.8)		13:15																	
9	(2.8)		13:20																	
10	MW18-I		14:30				X										X			

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Stewart McBride	2018/11/22				

MAXXAM JOB #

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COC-1027 Keystone

B8A3005_COC

City of Vancouver - FOI 2023-228 - Page 685 of 1003

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Updated CoC pg 2/2

CHAIN OF CUSTODY RECORD

K0C1409

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5, Toll Free (800) 665-8566

BBY FCD-00072/07

Page 2 of 2

Invoice Information		Report Information (if differs from invoice)		Project Information (where applicable)		Turnaround Time (TAT) Required
Company Name:	3763 - Keystone Environmental Ltd.	Company Name:		Quotation #:	B61898	☑ Regular TAT 5 days (Most analyses)
Contact Name:	Nicole MacDonald	Contact Name:		P.O. #/ AFE#:		PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address:	#320 - 4400 Dominion Street	Address:		Project #:	13639-20	Rush TAT (Surcharges will be applied)
	Burnaby, BC PC: V5G 4G3		PC:	Site Location:		☐ Same Day ☐ 2 Days
Phone:	(604) 430-0671	Phone:		Site #:		☐ 1 Day ☐ 3 Days
Email:	nmacdonald@keystoneenviro.com	Email:	smcbride@keystoneenviro.com	Sampled By:	Stewart McBride	Date Required:

Regulatory Criteria		Special Instructions
☑ BC CSR Soil	☐ BC CSR Water	☐ Return Cooler
☐ YK CSR Soil	☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)
☐ CCME (Specify)	☐ Other (Specify)	
☐ Drinking Water	☐ BC Water Quality	

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	BTEX/VPH	BTEX/F1	PAH	CPH	Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Chloride	TSS	pH	Nitrite	Kel meter LC	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE
1	MW18-14 (0.5)	2018/11/22	14:30	Soil			X										X	4	X
2	(1.2)		14:35				X										X		
3	(2.0)		14:45																
4	(2.8)		14:50																
5																			
6																			
7																			
8																			
9																			
10																			

Analysis Requested: MTBE; VOC/BTEX/VPH; VOC/BTEX/F1; LEPH/HEPH/PAH; F2-F4; TEH; Preserved?; Filtered?; Field Preserved?; Field Preserved?; Sulphate; COD; Alkalinity; Ammonia; Fluoride; BOD; Conductivity; Nitrate

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	

COOLING MEDIA PRESENT Y / N

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Stewart McBride	2018/11/22					

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COC-1027 Keystone

B8A3005_COC

City of Vancouver - FOI 2023-228 - Page 686 of 1003

K021468

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CHAIN OF CUSTODY RECORD

BBY FCD-00077/07
Page 1 of 2

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #:	☑ Regular TAT 5 days (Most analyses)
Contact Name: Nicole MacDonald	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: 13639-20	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☐ 2 Days
Phone: (604) 430-0671	Phone:	Site #:	☐ 1 Day ☐ 3 Days
Email: nmacdonald@keystoneenviro.com	Email: sackville@keystoneenviro.com	Sampled By: Stewart McBride	Date Required:

Regulatory Criteria	Special Instructions	Rush Confirmation #:
☑ BC CSR Soil ☐ BC CSR Water	☐ Return Cooler	
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)	
☐ CCME (Specify) ☐ Other (Specify)		
☐ Drinking Water ☐ BC Water Quality		

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	BTEXS / VPH	BTEX / F1	PAH	EPH	Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Chloride	TSS	pH	Nitrite	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE
1	MW18-H	2018/11/22	11:30	Soil													4	X
2	MW18-12 (0.6)		11:50															
3	(1.2)		11:55															
4	(1.8)		12:05															
5	(2.8)		12:10															
6	BH18-13 (0.4)		13:10															
7	(1.2)		13:05															
8	(1.8)		13:15															
9	(2.8)		13:20															
10	MW18-I		14:30															

| Analysis Requested | | | | | | | | | | | | | | |

K021469

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CHAIN OF CUSTODY RECORD

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5 Toll Free (800) 665-8566

BBY FCD-00077/07
Page 2 of 2

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #: BG1898	☑ Regular TAT 5 days (Most analyses)
Contact Name: Nicole MacDonald	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: 13631-20	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☐ 2 Days
Phone: (604) 430-0671	Phone:	Site #:	☐ 1 Day ☐ 3 Days
Email: nmacdonald@keystoneenviro.com	Email: smcbride@keystoneenviro.com	Sampled By: Stewart McBride	Date Required:

Regulatory Criteria	Special Instructions
☑ BC CSR Soil ☐ BC CSR Water	☐ Return Cooler
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)
☐ CCME (Specify) ☐ Other (Specify)	
☐ Drinking Water ☐ BC Water Quality	

Rush Confirmation #:

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	BTEX/F1 - VOC	BTEX/F1	PAH - LEPH/HEPH	EPH - F2-F4	Dissolved Metals - Filtered?	Dissolved Mercury - Filtered?	Total Metals - Field Preserved?	Total Mercury - Field Preserved?	Chloride - Sulphate	TSS - BOD - COD	pH - Conductivity - Alkalinity	Nitrite - Nitrate - Ammonia	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE
1	MW18-14 (0.5)	2018/11/22	14:30	Soil													4	X
2	(1.2)		14:35															
3	(2.8)		14:45															
4	(2.8)		14:50															
5																		
6																		
7																		
8																		
9																		
10																		

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
N/A		7.8, 8
		7.10, 10

COOLING MEDIA PRESENT Y / N
COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Stewart McBride	2018/11/22	17:56	SHAN JALOB JO4	2018/11/22	18:00

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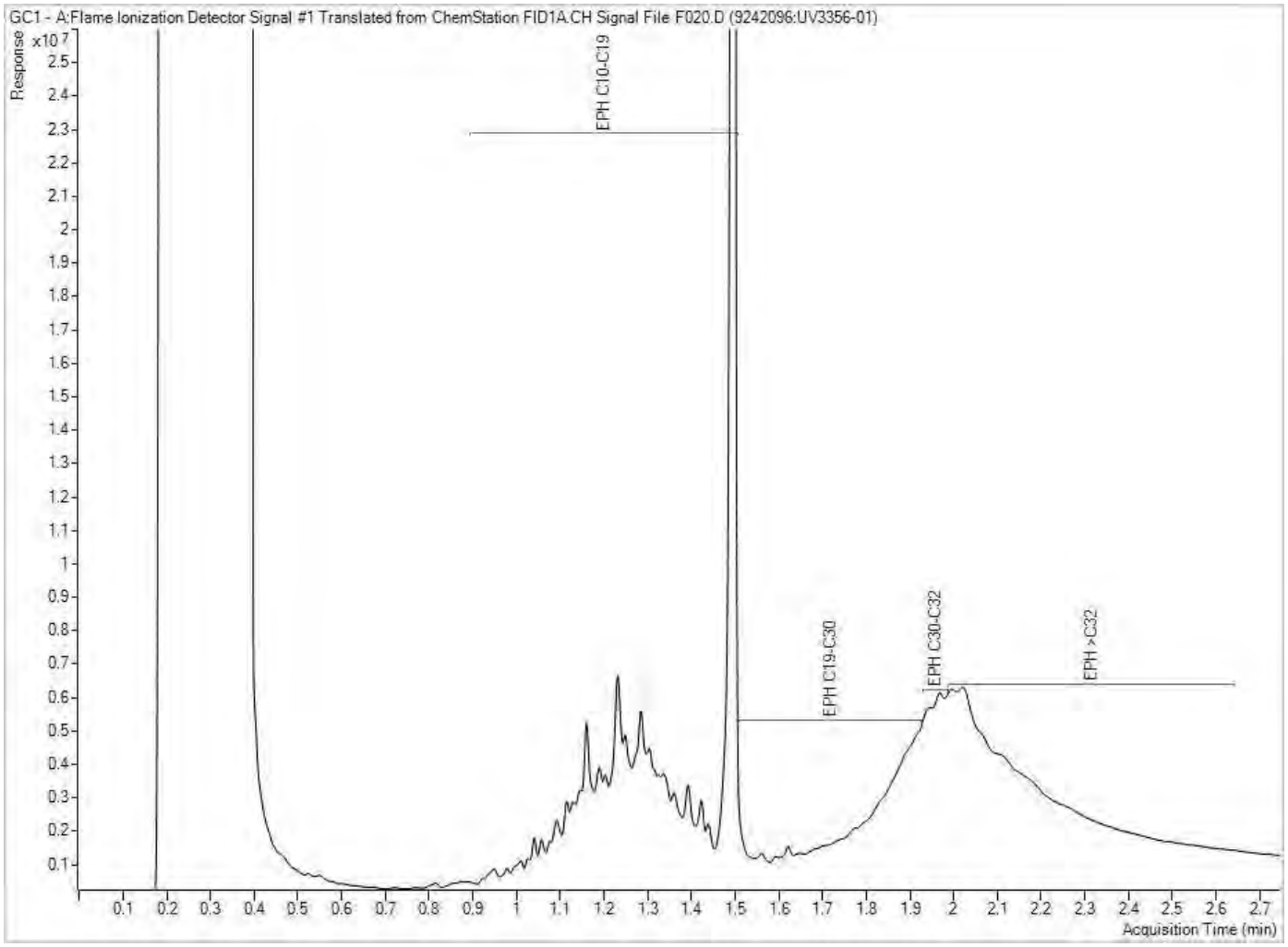
COC-1027 Keystone

B8A3005_COC

Maxxam Job #: B8A3005
Report Date: 2018/12/07
Maxxam Sample: UV3356

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-12 (0.6)

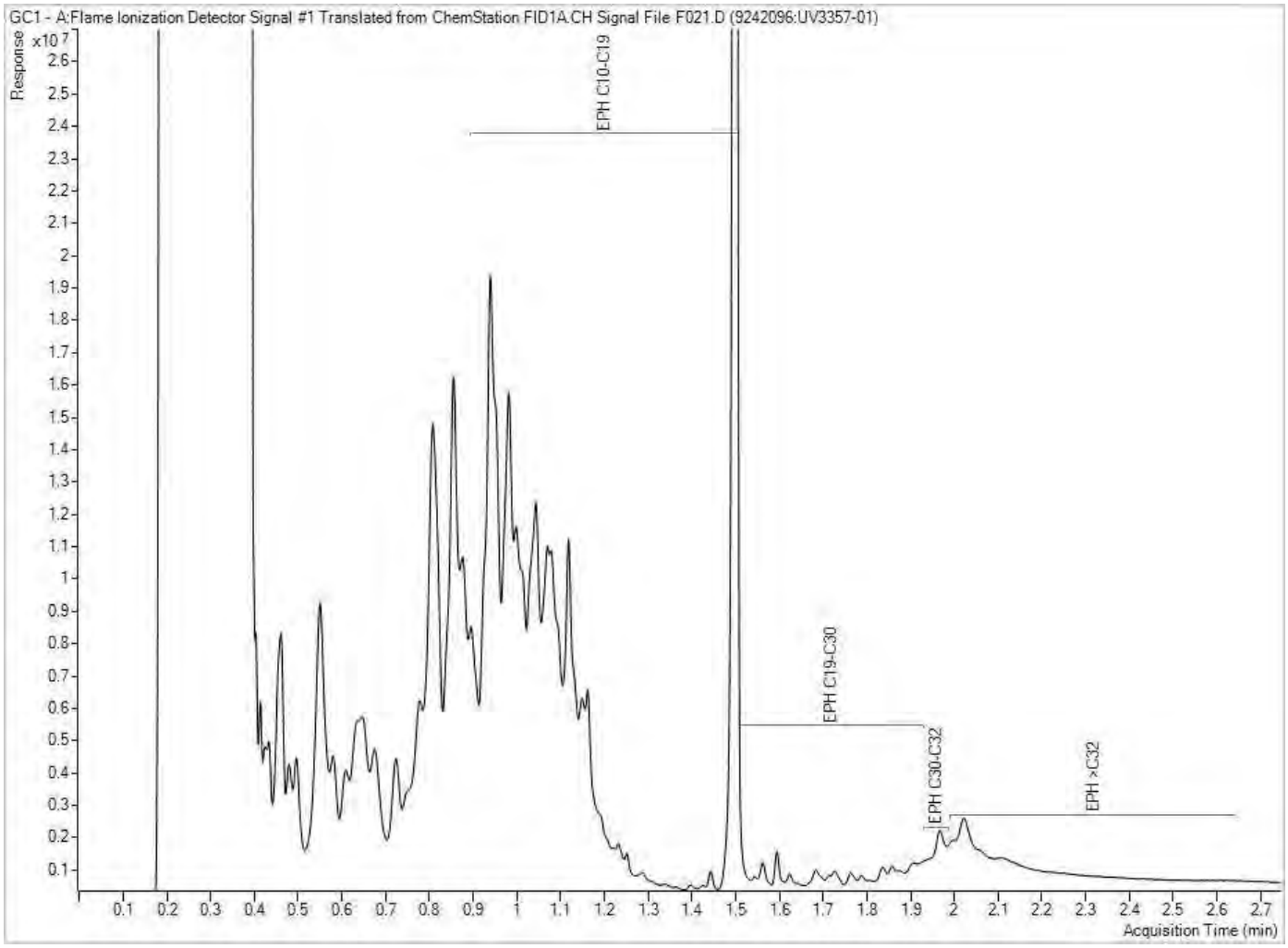
EPH in Soil by GC/FID Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

City of Vancouver - FOI 2023-228 - Page 689 of 1003

EPH in Soil by GC/FID Chromatogram

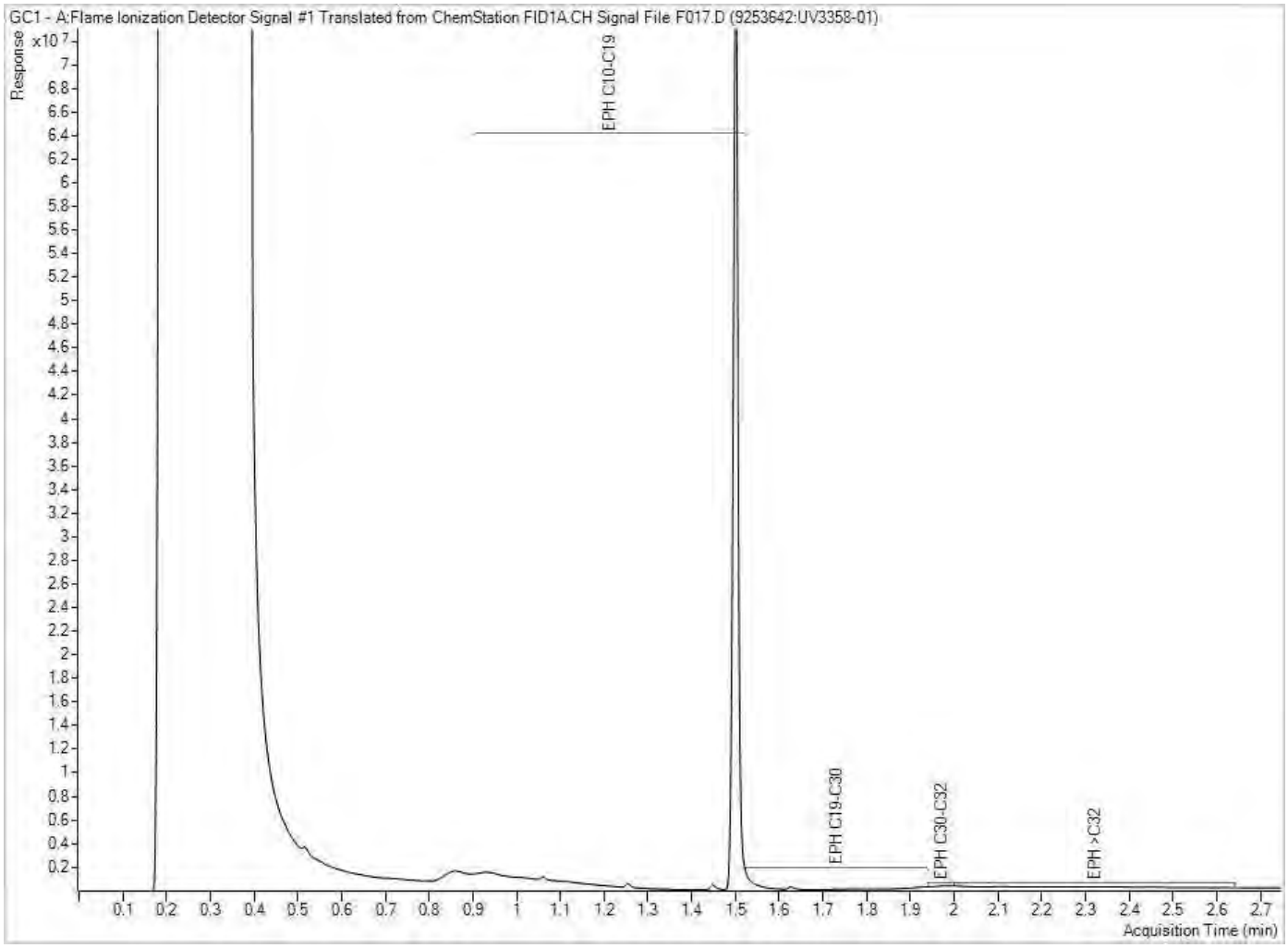


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B8A3005
Report Date: 2018/12/07
Maxxam Sample: UV3358

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-12 (1.8)

EPH in Soil by GC/FID Chromatogram

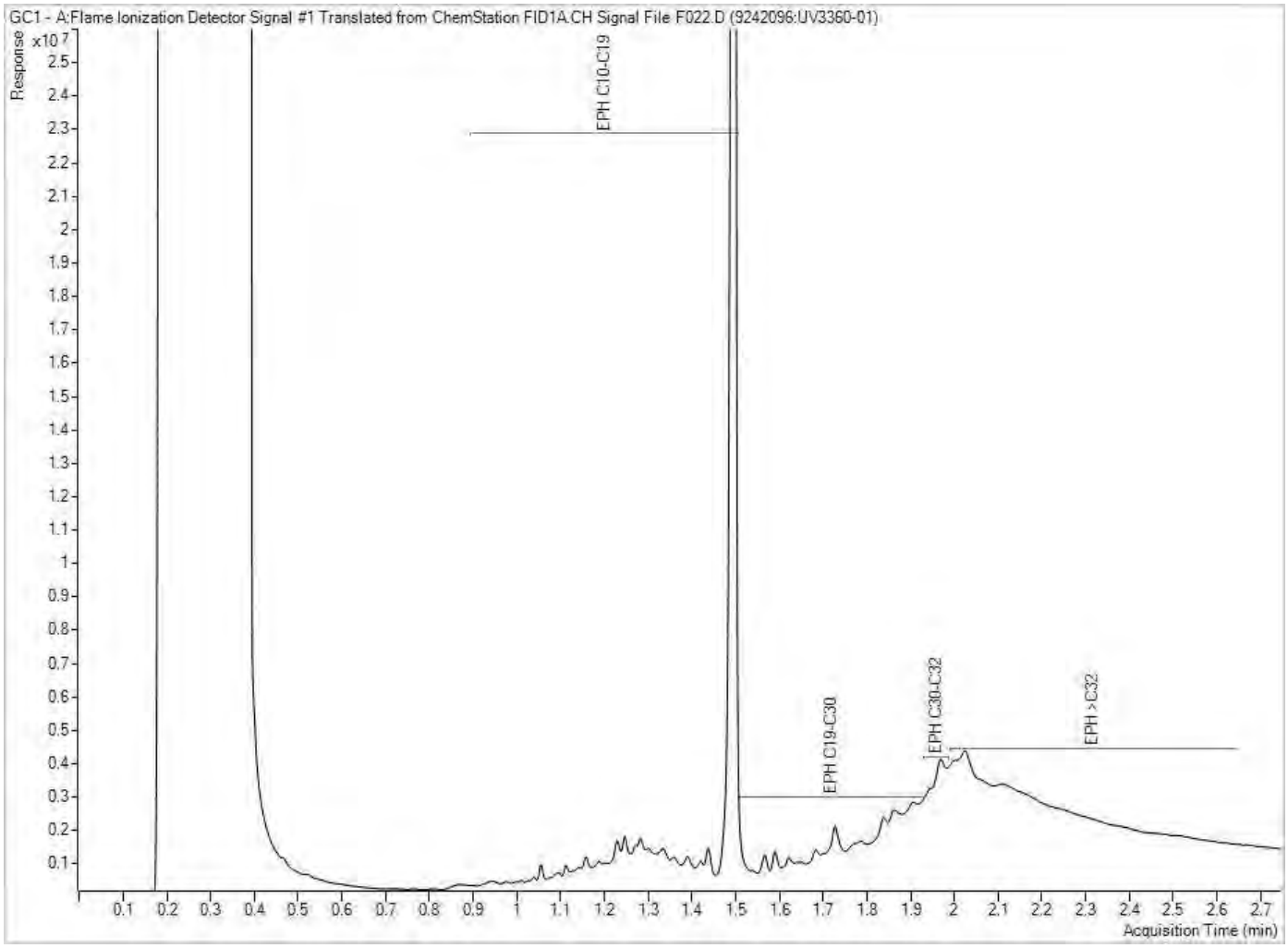


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B8A3005
Report Date: 2018/12/07
Maxxam Sample: UV3360

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: BH18-13 (0.4)

EPH in Soil by GC/FID Chromatogram

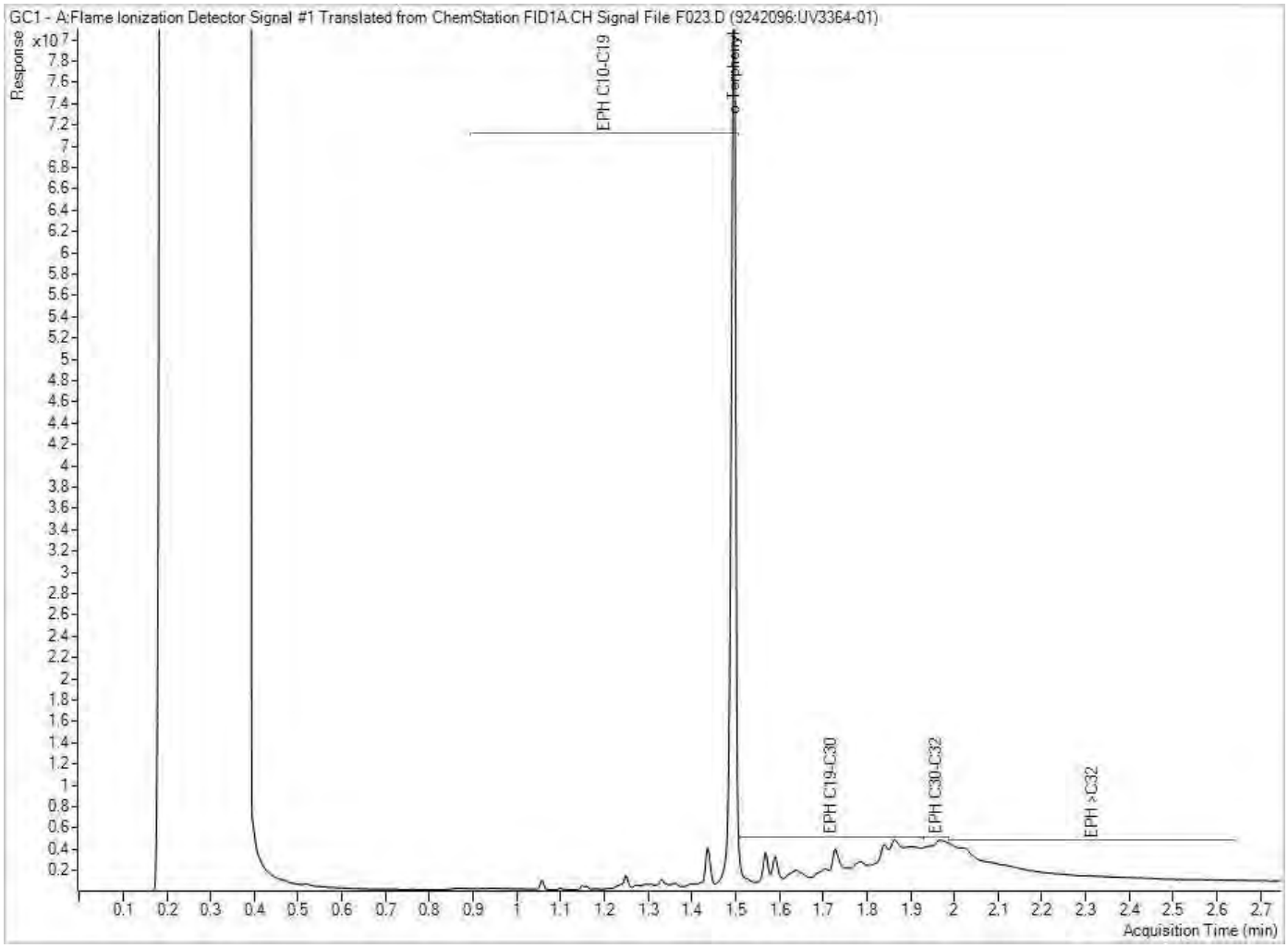


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B8A3005
Report Date: 2018/12/07
Maxxam Sample: UV3364

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-I

EPH in Soil by GC/FID Chromatogram



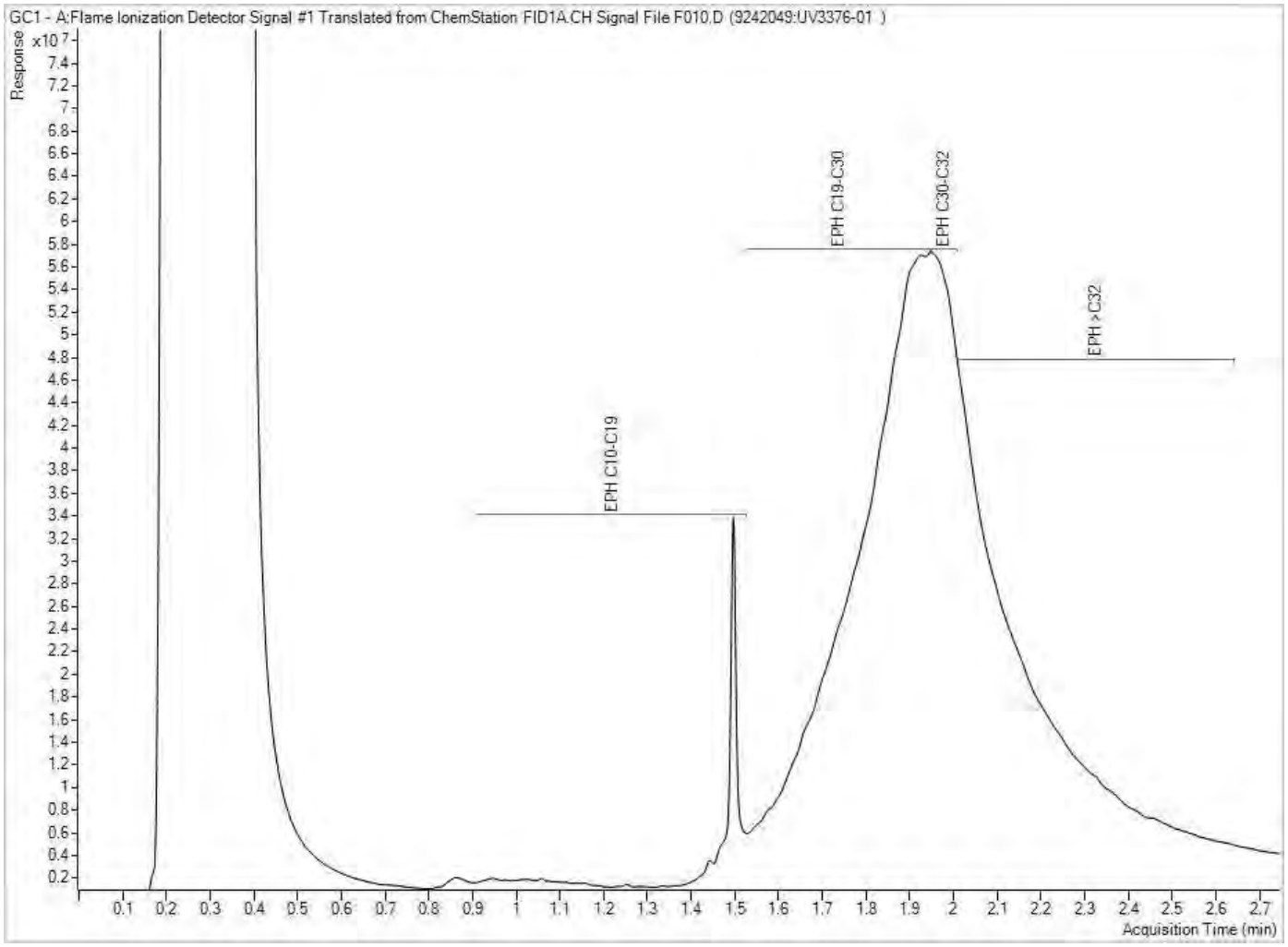
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

City of Vancouver - FOI 2023-228 - Page 693 of 1003

Maxxam Job #: B8A3005
Report Date: 2018/12/07
Maxxam Sample: UV3376

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-14 (0.5)

EPH in Soil by GC/FID Chromatogram



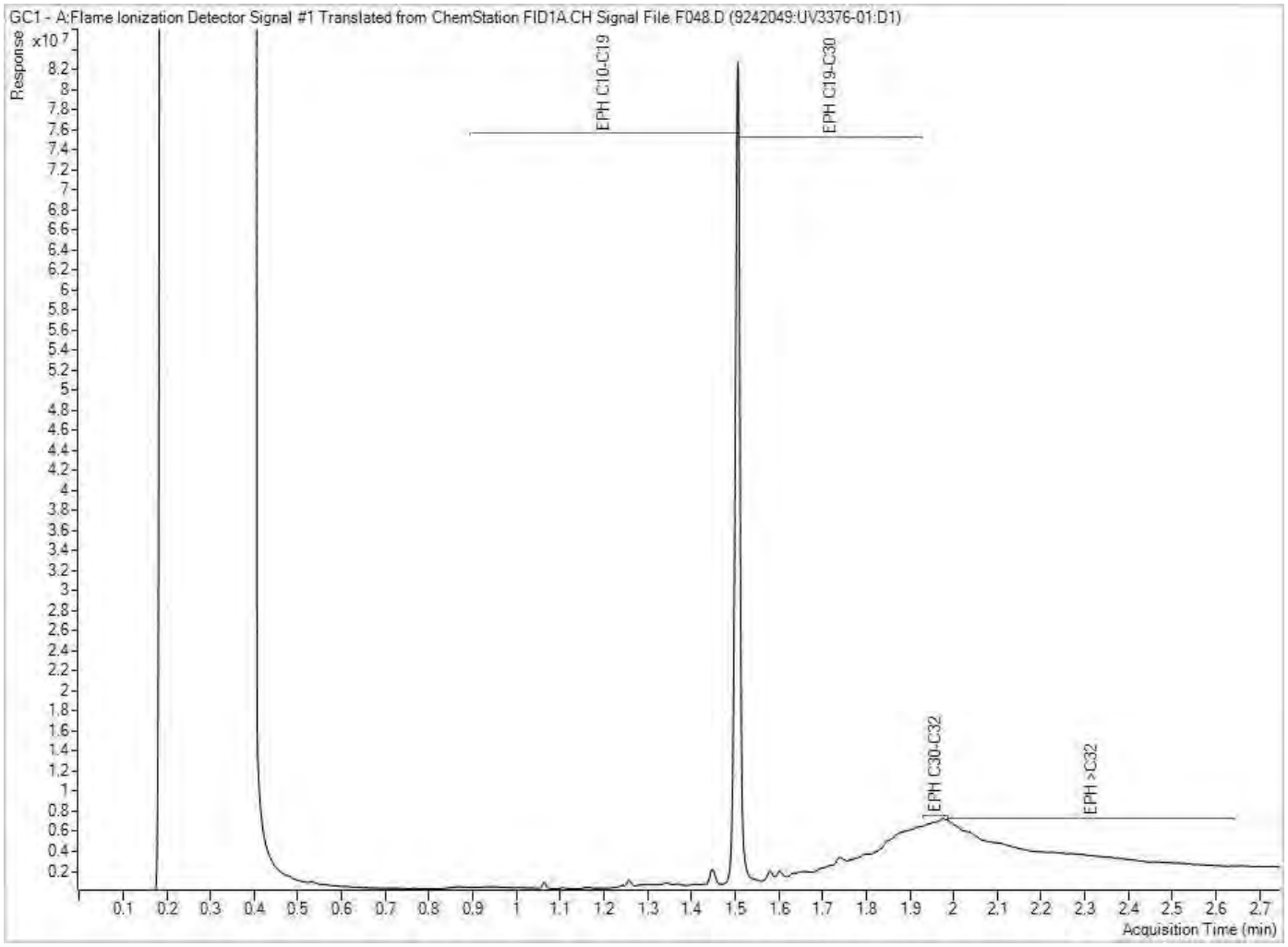
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

City of Vancouver - FOI 2023-228 - Page 694 of 1003

Maxxam Job #: B8A3005
Report Date: 2018/12/07
Maxxam Sample: UV3376 Lab-Dup

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-14 (0.5)

EPH in Soil by GC/FID Chromatogram

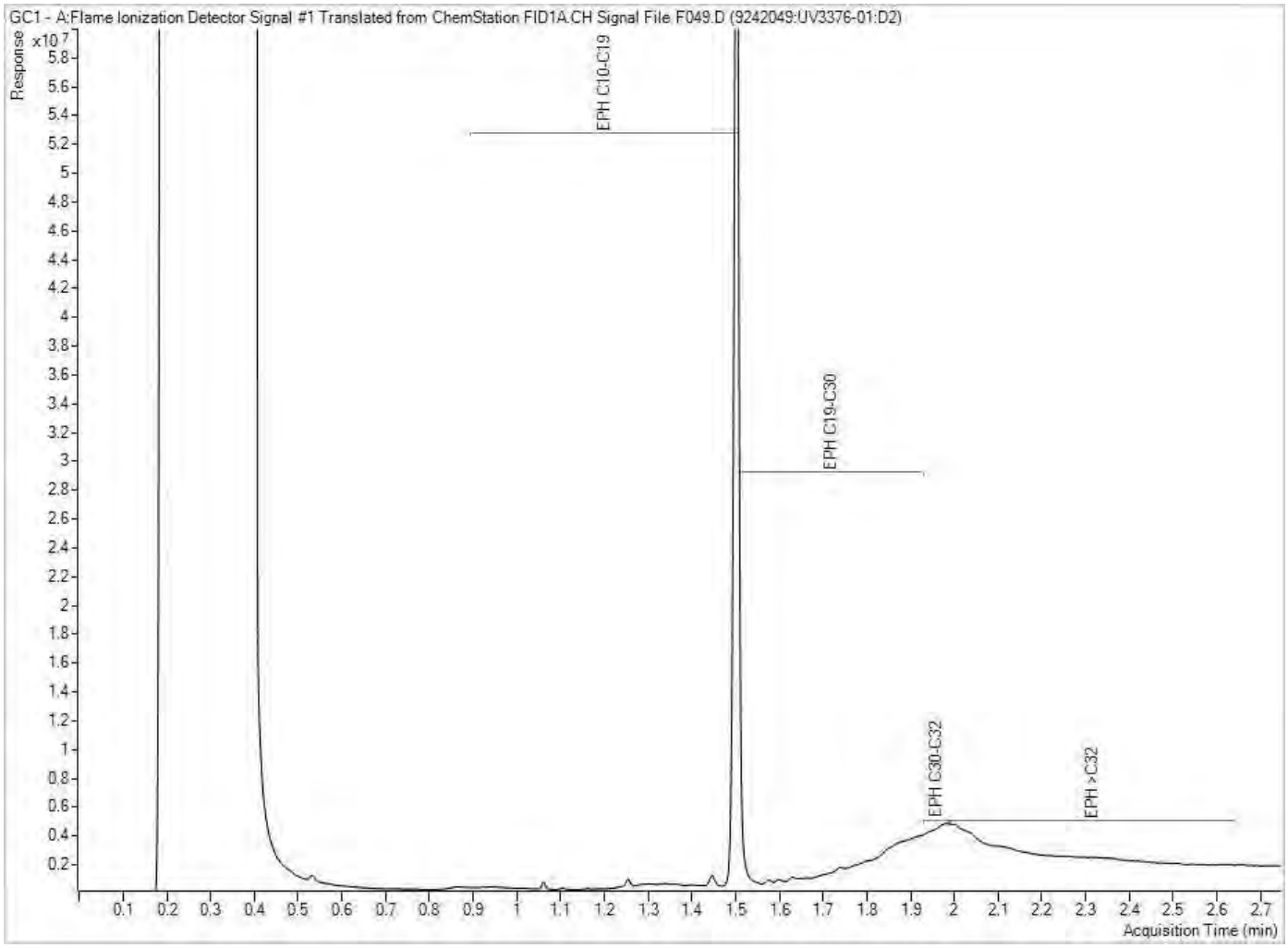


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B8A3005
Report Date: 2018/12/07
Maxxam Sample: UV3376 Lab-Dup 2

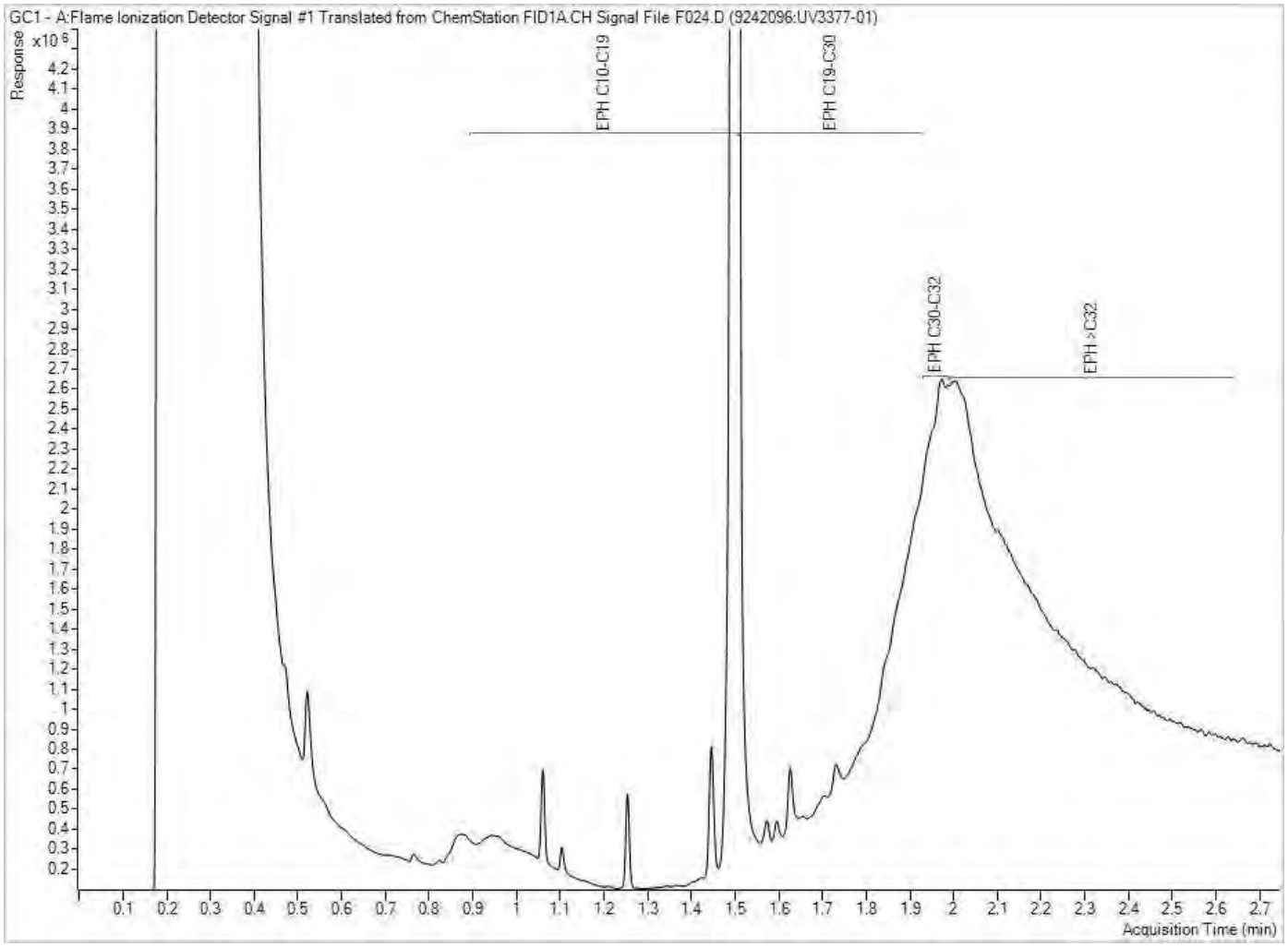
KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-14 (0.5)

EPH in Soil by GC/FID Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

EPH in Soil by GC/FID Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Your Project #: 13639-2D
Your C.O.C. #: K021377

Attention: Stewart McBride

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/11/30
Report #: R2658706
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8A3997
Received: 2018/11/27, 17:40

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Hardness (calculated as CaCO3)	3	N/A	2018/11/29	BBY WI-00033	Auto Calc
Mercury (Dissolved) by CVAF	3	N/A	2018/11/28	BBY7SOP-00015	BCMOE BCLM Oct2013 m
EPH in Water when PAH required	3	2018/11/28	2018/11/28	BBY8SOP-00029	BCMOE BCLM Mar 2017
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	3	N/A	2018/11/29	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	3	N/A	2018/11/29	BBY7SOP-00002	EPA 6020b R2 m
PAH in Water by GC/MS (SIM)	3	2018/11/28	2018/11/29	BBY8SOP-00021	BCMOE BCLM Jul2017m
Total LMW, HMW, Total PAH Calc (1)	3	N/A	2018/11/30	BBY WI-00033	Auto Calc
Filter and HNO3 Preserve for Metals	3	N/A	2018/11/27	BBY7 WI-00004	BCMOE Reqs 08/14
EPH less PAH in Water by GC/FID (2)	3	N/A	2018/11/30	BBY WI-00033	Auto Calc
Extra VOCs in Water by HS GC/MS	2	N/A	2018/11/28	BBY8SOP-00040	BCMOE BCLM Jul 2017m
VOCs, VH, F1, LH in Water by HS GC/MS	2	N/A	2018/11/30	BBY8SOP-00009/11/12	BCMOE BCLM Jul 2017
Volatile HC-BTEX (3)	2	N/A	2018/11/30	BBY WI-00033	Auto Calc

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.

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City of Vancouver - FOI 2023-228 - Page 698 of 1003

Your Project #: 13639-2D
Your C.O.C. #: K021377

Attention: Stewart McBride

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/11/30
Report #: R2658706
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8A3997
Received: 2018/11/27, 17:40

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Total PAHs in Water include: Quinoline, Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Acridine, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b&j)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, and Benzo(g,h,i)perylene.
(2) LEPH = EPH (C10 to C19) - (Acenaphthene + Acridine + Anthracene + Fluorene + Naphthalene + Phenanthrene)
HEPH = EPH (C19 to C32) - (Benzo(a)anthracene + Benzo(a)pyrene + Fluoranthene + Pyrene)
(3) VPH = VH - (Benzene + Toluene + Ethylbenzene + m & p-Xylene + o-Xylene + Styrene)

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Gail Pedersen, Project Manager –Environmental Customer Service
Email: gpedersen@maxxam.ca
Phone# (604) 734 7276

==========

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Maxxam Job #: B8A3997
Report Date: 2018/11/30

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UV9078	UV9079	UV9080	
Sampling Date		2018/11/27 14:45	2018/11/27 15:35	2018/11/27 14:45	
COC Number		K021377	K021377	K021377	
	UNITS	**MW18-12**	**MW18-14**	**MW18-A**	**QC Batch**
Calculated Parameters					
Filter and HNO3 Preservation	N/A	FIELD	FIELD	FIELD	ONSITE

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Maxxam Job #: B8A3997
Report Date: 2018/11/30

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		UV9078	UV9080		
Sampling Date		2018/11/27 14:45	2018/11/27 14:45		
COC Number		K021377	K021377		
	UNITS	**MW18-12**	**MW18-A**	**RDL**	**QC Batch**
Volatiles					
2-Butanone (MEK)	ug/L	<50	<50	50	9245003
4-Methyl-2-pentanone (MIBK)	ug/L	<10	<10	10	9245003
Surrogate Recovery (%)					
1,4-Difluorobenzene (sur.)	%	102	101		9245003
4-Bromofluorobenzene (sur.)	%	95	96		9245003
D4-1,2-Dichloroethane (sur.)	%	95	93		9245003
RDL = Reportable Detection Limit					

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Maxxam Job #: B8A3997
Report Date: 2018/11/30

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

LEPH & HEPH WITH CSR/CCME PAH IN WATER (WATER)

Maxxam ID		UV9078	UV9079	UV9080		
Sampling Date		2018/11/27 14:45	2018/11/27 15:35	2018/11/27 14:45		
COC Number		K021377	K021377	K021377		
	UNITS	MW18-12	MW18-14	MW18-A	RDL	QC Batch
Calculated Parameters						
Low Molecular Weight PAH`s	ug/L	0.85	0.35	0.83	0.10	9243400
High Molecular Weight PAH`s	ug/L	<0.050	0.19	<0.050	0.050	9243400
Total PAH	ug/L	0.88	0.54	0.86	0.10	9243400
Polycyclic Aromatics						
Quinoline	ug/L	<0.020	<0.020	<0.020	0.020	9245190
Naphthalene	ug/L	0.29	0.10	0.29	0.10	9245190
1-Methylnaphthalene	ug/L	0.27	0.14	0.26	0.050	9245190
2-Methylnaphthalene	ug/L	0.29	0.11	0.29	0.10	9245190
Acenaphthylene	ug/L	<0.050	<0.050	<0.050	0.050	9245190
Acenaphthene	ug/L	<0.050	<0.050	<0.050	0.050	9245190
Fluorene	ug/L	<0.050	<0.050	<0.050	0.050	9245190
Phenanthrene	ug/L	<0.050	<0.050	<0.050	0.050	9245190
Anthracene	ug/L	<0.010	<0.010	<0.010	0.010	9245190
Acridine	ug/L	<0.050	<0.050	<0.050	0.050	9245190
Fluoranthene	ug/L	<0.020	0.050	<0.020	0.020	9245190
Pyrene	ug/L	0.022	0.051	0.022	0.020	9245190
Benzo(a)anthracene	ug/L	<0.010	0.025	<0.010	0.010	9245190
Chrysene	ug/L	<0.020	0.032	<0.020	0.020	9245190
Benzo(b&j)fluoranthene	ug/L	<0.030	<0.030	<0.030	0.030	9245190
Benzo(k)fluoranthene	ug/L	<0.050	<0.050	<0.050	0.050	9245190
Benzo(a)pyrene	ug/L	0.0074	0.027	0.0076	0.0050	9245190
Indeno(1,2,3-cd)pyrene	ug/L	<0.050	<0.050	<0.050	0.050	9245190
Dibenz(a,h)anthracene	ug/L	<0.0030	0.0041	<0.0030	0.0030	9245190
Benzo(g,h,i)perylene	ug/L	<0.050	<0.050	<0.050	0.050	9245190
Calculated Parameters						
LEPH (C10-C19 less PAH)	mg/L	<0.20	<0.20	<0.20	0.20	9243401
HEPH (C19-C32 less PAH)	mg/L	<0.20	<0.20	<0.20	0.20	9243401
Ext. Pet. Hydrocarbon						
EPH (C10-C19)	mg/L	<0.20	<0.20	<0.20	0.20	9245243
EPH (C19-C32)	mg/L	<0.20	<0.20	<0.20	0.20	9245243
Surrogate Recovery (%)						
O-TERPHENYL (sur.)	%	101	98	99		9245243

RDL = Reportable Detection Limit

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Maxxam Job #: B8A3997
Report Date: 2018/11/30

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

LEPH & HEPH WITH CSR/CCME PAH IN WATER (WATER)

Maxxam ID		UV9078	UV9079	UV9080		
Sampling Date		2018/11/27 14:45	2018/11/27 15:35	2018/11/27 14:45		
COC Number		K021377	K021377	K021377		
	UNITS	MW18-12	MW18-14	MW18-A	RDL	QC Batch
D10-ANTHRACENE (sur.)	%	101	96	98		9245190
D8-ACENAPHTHYLENE (sur.)	%	98	96	95		9245190
D8-NAPHTHALENE (sur.)	%	79	73	73		9245190
TERPHENYL-D14 (sur.)	%	93	88	89		9245190
RDL = Reportable Detection Limit						

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Maxxam Job #: B8A3997
Report Date: 2018/11/30

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR DISSOLVED METALS IN WATER WITH CV HG (WATER)

Maxxam ID		UV9078			UV9078			UV9079		
Sampling Date		2018/11/27 14:45			2018/11/27 14:45			2018/11/27 15:35		
COC Number		K021377			K021377			K021377		
	UNITS	MW18-12	RDL	QC Batch	MW18-12 Lab-Dup	RDL	QC Batch	MW18-14	RDL	QC Batch
Calculated Parameters										
Dissolved Hardness (CaCO3)	mg/L	142	0.50	9243132				322	0.50	9243132
Elements										
Dissolved Mercury (Hg)	ug/L	<0.0020	0.0020	9244449	<0.0020	0.0020	9244449	0.0024	0.0020	9244449
Dissolved Metals by ICPMS										
Dissolved Aluminum (Al)	ug/L	20.3	3.0	9244420	19.8	3.0	9244420	22.2	6.0	9244420
Dissolved Antimony (Sb)	ug/L	<0.50	0.50	9244420	<0.50	0.50	9244420	<1.0	1.0	9244420
Dissolved Arsenic (As)	ug/L	3.29	0.10	9244420	3.16	0.10	9244420	0.65	0.20	9244420
Dissolved Barium (Ba)	ug/L	43.9	1.0	9244420	43.7	1.0	9244420	299	2.0	9244420
Dissolved Beryllium (Be)	ug/L	<0.10	0.10	9244420	<0.10	0.10	9244420	<0.20	0.20	9244420
Dissolved Bismuth (Bi)	ug/L	<1.0	1.0	9244420	<1.0	1.0	9244420	<2.0	2.0	9244420
Dissolved Boron (B)	ug/L	<50	50	9244420	<50	50	9244420	<100	100	9244420
Dissolved Cadmium (Cd)	ug/L	<0.010	0.010	9244420	<0.010	0.010	9244420	0.191	0.020	9244420
Dissolved Chromium (Cr)	ug/L	1.0	1.0	9244420	1.0	1.0	9244420	<2.0	2.0	9244420
Dissolved Cobalt (Co)	ug/L	3.78	0.20	9244420	3.85	0.20	9244420	12.1	0.40	9244420
Dissolved Copper (Cu)	ug/L	<0.20	0.20	9244420	<0.20	0.20	9244420	1.89	0.40	9244420
Dissolved Iron (Fe)	ug/L	10400	5.0	9244420	10400	5.0	9244420	25400	10	9244420
Dissolved Lead (Pb)	ug/L	<0.20	0.20	9244420	<0.20	0.20	9244420	<0.40	0.40	9244420
Dissolved Lithium (Li)	ug/L	<2.0	2.0	9244420	<2.0	2.0	9244420	<4.0	4.0	9244420
Dissolved Manganese (Mn)	ug/L	1800	1.0	9244420	1830	1.0	9244420	6400	2.0	9244420
Dissolved Molybdenum (Mo)	ug/L	1.0	1.0	9244420	1.0	1.0	9244420	<2.0	2.0	9244420
Dissolved Nickel (Ni)	ug/L	2.2	1.0	9244420	2.3	1.0	9244420	4.8	2.0	9244420
Dissolved Selenium (Se)	ug/L	0.10	0.10	9244420	0.10	0.10	9244420	0.28	0.20	9244420
Dissolved Silicon (Si)	ug/L	8640	100	9244420	8820	100	9244420	6450	200	9244420
Dissolved Silver (Ag)	ug/L	<0.020	0.020	9244420	<0.020	0.020	9244420	<0.040	0.040	9244420
Dissolved Strontium (Sr)	ug/L	307	1.0	9244420	305	1.0	9244420	739	2.0	9244420
Dissolved Thallium (Tl)	ug/L	<0.010	0.010	9244420	<0.010	0.010	9244420	0.199	0.020	9244420
Dissolved Tin (Sn)	ug/L	<5.0	5.0	9244420	<5.0	5.0	9244420	<10	10	9244420
Dissolved Titanium (Ti)	ug/L	<5.0	5.0	9244420	<5.0	5.0	9244420	<10	10	9244420
Dissolved Uranium (U)	ug/L	<0.10	0.10	9244420	<0.10	0.10	9244420	<0.20	0.20	9244420
Dissolved Vanadium (V)	ug/L	<5.0	5.0	9244420	<5.0	5.0	9244420	<10	10	9244420
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	9244420	<5.0	5.0	9244420	10	10	9244420

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8A3997
Report Date: 2018/11/30

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR DISSOLVED METALS IN WATER WITH CV HG (WATER)

Maxxam ID		UV9078			UV9078			UV9079		
Sampling Date		2018/11/27 14:45			2018/11/27 14:45			2018/11/27 15:35		
COC Number		K021377			K021377			K021377		
	UNITS	MW18-12	RDL	QC Batch	MW18-12 Lab-Dup	RDL	QC Batch	MW18-14	RDL	QC Batch
Dissolved Zirconium (Zr)	ug/L	0.14	0.10	9244420	0.17	0.10	9244420	<0.20	0.20	9244420
Dissolved Calcium (Ca)	mg/L	47.9	0.050	9243581				98.2	0.10	9243581
Dissolved Magnesium (Mg)	mg/L	5.42	0.050	9243581				18.8	0.10	9243581
Dissolved Potassium (K)	mg/L	2.72	0.050	9243581				11.0	0.10	9243581
Dissolved Sulphur (S)	mg/L	4.1	3.0	9243581				10.6	6.0	9243581

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8A3997
Report Date: 2018/11/30

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR DISSOLVED METALS IN WATER WITH CV HG (WATER)

Maxxam ID		UV9080		
Sampling Date		2018/11/27 14:45		
COC Number		K021377		
	UNITS	**MW18-A**	**RDL**	**QC Batch**
Calculated Parameters				
Dissolved Hardness (CaCO3)	mg/L	144	0.50	9243132
Elements				
Dissolved Mercury (Hg)	ug/L	<0.0020	0.0020	9244449
Dissolved Metals by ICPMS				
Dissolved Aluminum (Al)	ug/L	20.8	3.0	9244420
Dissolved Antimony (Sb)	ug/L	<0.50	0.50	9244420
Dissolved Arsenic (As)	ug/L	3.25	0.10	9244420
Dissolved Barium (Ba)	ug/L	43.8	1.0	9244420
Dissolved Beryllium (Be)	ug/L	<0.10	0.10	9244420
Dissolved Bismuth (Bi)	ug/L	<1.0	1.0	9244420
Dissolved Boron (B)	ug/L	<50	50	9244420
Dissolved Cadmium (Cd)	ug/L	<0.010	0.010	9244420
Dissolved Chromium (Cr)	ug/L	<1.0	1.0	9244420
Dissolved Cobalt (Co)	ug/L	3.84	0.20	9244420
Dissolved Copper (Cu)	ug/L	<0.20	0.20	9244420
Dissolved Iron (Fe)	ug/L	10600	5.0	9244420
Dissolved Lead (Pb)	ug/L	<0.20	0.20	9244420
Dissolved Lithium (Li)	ug/L	<2.0	2.0	9244420
Dissolved Manganese (Mn)	ug/L	1830	1.0	9244420
Dissolved Molybdenum (Mo)	ug/L	1.1	1.0	9244420
Dissolved Nickel (Ni)	ug/L	2.0	1.0	9244420
Dissolved Selenium (Se)	ug/L	0.10	0.10	9244420
Dissolved Silicon (Si)	ug/L	8830	100	9244420
Dissolved Silver (Ag)	ug/L	<0.020	0.020	9244420
Dissolved Strontium (Sr)	ug/L	301	1.0	9244420
Dissolved Thallium (Tl)	ug/L	<0.010	0.010	9244420
Dissolved Tin (Sn)	ug/L	<5.0	5.0	9244420
Dissolved Titanium (Ti)	ug/L	<5.0	5.0	9244420
Dissolved Uranium (U)	ug/L	<0.10	0.10	9244420
Dissolved Vanadium (V)	ug/L	<5.0	5.0	9244420
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	9244420
Dissolved Zirconium (Zr)	ug/L	0.17	0.10	9244420
RDL = Reportable Detection Limit				

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Maxxam Job #: B8A3997
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KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR DISSOLVED METALS IN WATER WITH CV HG (WATER)

Maxxam ID		UV9080		
Sampling Date		2018/11/27 14:45		
COC Number		K021377		
	UNITS	MW18-A	RDL	QC Batch
Dissolved Calcium (Ca)	mg/L	48.6	0.050	9243581
Dissolved Magnesium (Mg)	mg/L	5.52	0.050	9243581
Dissolved Potassium (K)	mg/L	2.74	0.050	9243581
Dissolved Sulphur (S)	mg/L	4.4	3.0	9243581
RDL = Reportable Detection Limit				

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Maxxam Job #: B8A3997
Report Date: 2018/11/30

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR VOC + VPH IN WATER (WATER)

Maxxam ID		UV9078		UV9080		
Sampling Date		2018/11/27 14:45		2018/11/27 14:45		
COC Number		K021377		K021377		
	UNITS	MW18-12	RDL	MW18-A	RDL	QC Batch
Calculated Parameters						
VPH (VHW6 to 10 - BTEX)	ug/L	<300	300	<300	300	9243405
Volatiles						
VH C6-C10	ug/L	<300	300	<300	300	9244956
1,1,1,2-tetrachloroethane	ug/L	<0.50	0.50	<0.50	0.50	9244956
1,1,1-trichloroethane	ug/L	<0.50	0.50	<0.50	0.50	9244956
1,1,2,2-tetrachloroethane	ug/L	<0.50	0.50	<0.51 (1)	0.51	9244956
1,1,2Trichloro-1,2,2Trifluoroethane	ug/L	<2.0	2.0	<2.0	2.0	9244956
1,1,2-trichloroethane	ug/L	<0.50	0.50	<0.50	0.50	9244956
1,1-dichloroethane	ug/L	<0.50	0.50	<0.50	0.50	9244956
1,1-dichloroethene	ug/L	<0.50	0.50	<0.50	0.50	9244956
1,2-dibromoethane	ug/L	<0.20	0.20	<0.53 (1)	0.53	9244956
1,2-dichlorobenzene	ug/L	<0.50	0.50	<0.50	0.50	9244956
1,2-dichloroethane	ug/L	<0.50	0.50	<0.50	0.50	9244956
1,2-dichloropropane	ug/L	<0.50	0.50	<0.50	0.50	9244956
1,3-Butadiene	ug/L	<0.50	0.50	<0.50	0.50	9244956
1,3-dichlorobenzene	ug/L	<0.50	0.50	<0.50	0.50	9244956
1,4-dichlorobenzene	ug/L	<0.50	0.50	<0.50	0.50	9244956
Benzene	ug/L	<0.40	0.40	<0.40	0.40	9244956
Bromobenzene	ug/L	<2.0	2.0	<2.0	2.0	9244956
Bromodichloromethane	ug/L	<1.0	1.0	<1.0	1.0	9244956
Bromoform	ug/L	<1.0	1.0	<1.0	1.0	9244956
Bromomethane	ug/L	<1.0	1.0	<1.0	1.0	9244956
Carbon tetrachloride	ug/L	<0.50	0.50	<0.50	0.50	9244956
Chlorobenzene	ug/L	<0.50	0.50	<0.50	0.50	9244956
Chlorodibromomethane	ug/L	<1.0	1.0	<1.0	1.0	9244956
Chloroethane	ug/L	<1.0	1.0	<1.0	1.0	9244956
Chloroform	ug/L	<1.0	1.0	<1.0	1.0	9244956
Chloromethane	ug/L	<1.0	1.0	<1.0	1.0	9244956
cis-1,2-dichloroethene	ug/L	<1.0	1.0	<1.0	1.0	9244956
cis-1,3-dichloropropene	ug/L	<1.0	1.0	<1.0	1.0	9244956
Dibromomethane	ug/L	<0.90	0.90	<0.90	0.90	9244956

RDL = Reportable Detection Limit
(1) Detection limits raised due to matrix interference.

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Maxxam Job #: B8A3997
Report Date: 2018/11/30

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR VOC + VPH IN WATER (WATER)

Maxxam ID		UV9078		UV9080		
Sampling Date		2018/11/27 14:45		2018/11/27 14:45		
COC Number		K021377		K021377		
	UNITS	MW18-12	RDL	MW18-A	RDL	QC Batch
Dichlorodifluoromethane	ug/L	<2.0	2.0	<2.0	2.0	9244956
Dichloromethane	ug/L	2.8	2.0	3.1	2.0	9244956
Ethylbenzene	ug/L	<0.40	0.40	<0.40	0.40	9244956
Styrene	ug/L	<0.50	0.50	<0.50	0.50	9244956
Tetrachloroethene	ug/L	<0.50	0.50	<0.50	0.50	9244956
Toluene	ug/L	<0.40	0.40	<0.40	0.40	9244956
trans-1,2-dichloroethene	ug/L	<1.0	1.0	<1.0	1.0	9244956
trans-1,3-dichloropropene	ug/L	<1.0	1.0	<1.0	1.0	9244956
Trichloroethene	ug/L	<0.50	0.50	<0.50	0.50	9244956
Trichlorofluoromethane	ug/L	<4.0	4.0	<4.0	4.0	9244956
Vinyl chloride	ug/L	<0.50	0.50	<0.50	0.50	9244956
m & p-Xylene	ug/L	<0.40	0.40	<0.40	0.40	9244956
o-Xylene	ug/L	<0.40	0.40	<0.40	0.40	9244956
Xylenes (Total)	ug/L	<0.40	0.40	<0.40	0.40	9244956
Surrogate Recovery (%)						
1,4-Difluorobenzene (sur.)	%	99		100		9244956
4-Bromofluorobenzene (sur.)	%	93		95		9244956
D4-1,2-Dichloroethane (sur.)	%	104		108		9244956
RDL = Reportable Detection Limit						

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Maxxam Job #: B8A3997
Report Date: 2018/11/30

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	7.3°C

CSR DISSOLVED METALS IN WATER WITH CV HG (WATER) Comments

Sample UV9079 [MW18-14] Elements by CRC ICPMS (dissolved): RDL raised due to concentration over linear range, sample dilution required.

Results relate only to the items tested.

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Maxxam Job #: B8A3997
Report Date: 2018/11/30

QUALITY ASSURANCE REPORT

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9244956	1,4-Difluorobenzene (sur.)	2018/11/30	99	50 - 140	98	50 - 140	98	%		
9244956	4-Bromofluorobenzene (sur.)	2018/11/30	110	50 - 140	101	50 - 140	91	%		
9244956	D4-1,2-Dichloroethane (sur.)	2018/11/30	106	50 - 140	105	50 - 140	103	%		
9245003	1,4-Difluorobenzene (sur.)	2018/11/28	102	50 - 140	102	50 - 140	101	%		
9245003	4-Bromofluorobenzene (sur.)	2018/11/28	93	50 - 140	96	50 - 140	96	%		
9245003	D4-1,2-Dichloroethane (sur.)	2018/11/28	95	50 - 140	92	50 - 140	93	%		
9245190	D10-ANTHRACENE (sur.)	2018/11/29	100	50 - 140	96	50 - 140	100	%		
9245190	D8-ACENAPHTHYLENE (sur.)	2018/11/29	99	50 - 140	96	50 - 140	96	%		
9245190	D8-NAPHTHALENE (sur.)	2018/11/29	85	50 - 140	81	50 - 140	77	%		
9245190	TERPHENYL-D14 (sur.)	2018/11/29	95	50 - 140	92	50 - 140	94	%		
9245243	O-TERPHENYL (sur.)	2018/11/28	99	60 - 140	99	60 - 140	99	%		
9244420	Dissolved Aluminum (Al)	2018/11/29	94	80 - 120	100	80 - 120	<3.0	ug/L	2.5	20
9244420	Dissolved Antimony (Sb)	2018/11/29	95	80 - 120	99	80 - 120	<0.50	ug/L	NC	20
9244420	Dissolved Arsenic (As)	2018/11/29	98	80 - 120	100	80 - 120	<0.10	ug/L	4.2	20
9244420	Dissolved Barium (Ba)	2018/11/29	92	80 - 120	100	80 - 120	<1.0	ug/L	0.40	20
9244420	Dissolved Beryllium (Be)	2018/11/29	90	80 - 120	94	80 - 120	<0.10	ug/L	NC	20
9244420	Dissolved Bismuth (Bi)	2018/11/29	91	80 - 120	101	80 - 120	<1.0	ug/L	NC	20
9244420	Dissolved Boron (B)	2018/11/29	85	80 - 120	94	80 - 120	<50	ug/L	NC	20
9244420	Dissolved Cadmium (Cd)	2018/11/29	94	80 - 120	97	80 - 120	<0.010	ug/L	NC	20
9244420	Dissolved Chromium (Cr)	2018/11/29	94	80 - 120	100	80 - 120	<1.0	ug/L	1.1	20
9244420	Dissolved Cobalt (Co)	2018/11/29	93	80 - 120	99	80 - 120	<0.20	ug/L	1.9	20
9244420	Dissolved Copper (Cu)	2018/11/29	91	80 - 120	99	80 - 120	<0.20	ug/L	NC	20
9244420	Dissolved Iron (Fe)	2018/11/29	NC	80 - 120	103	80 - 120	<5.0	ug/L	0.21	20
9244420	Dissolved Lead (Pb)	2018/11/29	96	80 - 120	104	80 - 120	<0.20	ug/L	NC	20
9244420	Dissolved Lithium (Li)	2018/11/29	89	80 - 120	95	80 - 120	<2.0	ug/L	NC	20
9244420	Dissolved Manganese (Mn)	2018/11/29	NC	80 - 120	100	80 - 120	<1.0	ug/L	1.8	20
9244420	Dissolved Molybdenum (Mo)	2018/11/29	98	80 - 120	100	80 - 120	<1.0	ug/L	2.3	20
9244420	Dissolved Nickel (Ni)	2018/11/29	93	80 - 120	100	80 - 120	<1.0	ug/L	3.4	20
9244420	Dissolved Selenium (Se)	2018/11/29	92	80 - 120	99	80 - 120	<0.10	ug/L	0.68	20
9244420	Dissolved Silicon (Si)	2018/11/29	NC	80 - 120	103	80 - 120	<100	ug/L	2.1	20
9244420	Dissolved Silver (Ag)	2018/11/29	83	80 - 120	95	80 - 120	<0.020	ug/L	NC	20

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Maxxam Job #: B8A3997
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QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9244420	Dissolved Strontium (Sr)	2018/11/29	NC	80 - 120	100	80 - 120	<1.0	ug/L	0.68	20
9244420	Dissolved Thallium (Tl)	2018/11/29	80	80 - 120	104	80 - 120	<0.010	ug/L	NC	20
9244420	Dissolved Tin (Sn)	2018/11/29	95	80 - 120	98	80 - 120	<5.0	ug/L	NC	20
9244420	Dissolved Titanium (Ti)	2018/11/29	96	80 - 120	99	80 - 120	<5.0	ug/L	NC	20
9244420	Dissolved Uranium (U)	2018/11/29	98	80 - 120	105	80 - 120	<0.10	ug/L	NC	20
9244420	Dissolved Vanadium (V)	2018/11/29	96	80 - 120	98	80 - 120	<5.0	ug/L	NC	20
9244420	Dissolved Zinc (Zn)	2018/11/29	97	80 - 120	102	80 - 120	<5.0	ug/L	NC	20
9244420	Dissolved Zirconium (Zr)	2018/11/29	96	80 - 120	98	80 - 120	<0.10	ug/L	17	20
9244449	Dissolved Mercury (Hg)	2018/11/28	92	80 - 120	88	80 - 120	<0.0020	ug/L	NC	20
9244956	1,1,1,2-tetrachloroethane	2018/11/30	104	50 - 140	117	60 - 130	<0.50	ug/L		
9244956	1,1,1-trichloroethane	2018/11/30	102	50 - 140	114	60 - 130	<0.50	ug/L		
9244956	1,1,2,2-tetrachloroethane	2018/11/30	112	50 - 140	126	60 - 130	<0.50	ug/L		
9244956	1,1,2Trichloro-1,2,2Trifluoroethane	2018/11/30	103	50 - 140	114	60 - 130	<2.0	ug/L		
9244956	1,1,2-trichloroethane	2018/11/30	112	50 - 140	123	60 - 130	<0.50	ug/L		
9244956	1,1-dichloroethane	2018/11/30	106	50 - 140	119	60 - 130	<0.50	ug/L		
9244956	1,1-dichloroethene	2018/11/30	102	50 - 140	113	60 - 130	<0.50	ug/L		
9244956	1,2-dibromoethane	2018/11/30	116	50 - 140	124	60 - 130	<0.20	ug/L		
9244956	1,2-dichlorobenzene	2018/11/30	114	50 - 140	128	60 - 130	<0.50	ug/L		
9244956	1,2-dichloroethane	2018/11/30	111	50 - 140	120	60 - 130	<0.50	ug/L		
9244956	1,2-dichloropropane	2018/11/30	112	50 - 140	122	60 - 130	<0.50	ug/L		
9244956	1,3-Butadiene	2018/11/30	81	50 - 140	94	60 - 130	<0.50	ug/L		
9244956	1,3-dichlorobenzene	2018/11/30	108	50 - 140	124	60 - 130	<0.50	ug/L		
9244956	1,4-dichlorobenzene	2018/11/30	110	50 - 140	126	60 - 130	<0.50	ug/L		
9244956	Benzene	2018/11/30	105	50 - 140	117	60 - 130	<0.40	ug/L		
9244956	Bromobenzene	2018/11/30	109	50 - 140	122	60 - 130	<2.0	ug/L		
9244956	Bromodichloromethane	2018/11/30	106	50 - 140	117	60 - 130	<1.0	ug/L	0.74	30
9244956	Bromoform	2018/11/30	106	50 - 140	120	60 - 130	<1.0	ug/L	NC	30
9244956	Bromomethane	2018/11/30	106	50 - 140	115	60 - 130	<1.0	ug/L		
9244956	Carbon tetrachloride	2018/11/30	101	50 - 140	113	60 - 130	<0.50	ug/L		
9244956	Chlorobenzene	2018/11/30	103	50 - 140	116	60 - 130	<0.50	ug/L		
9244956	Chlorodibromomethane	2018/11/30	108	50 - 140	117	60 - 130	<1.0	ug/L	NC	30

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QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9244956	Chloroethane	2018/11/30	88	50 - 140	94	60 - 130	<1.0	ug/L		
9244956	Chloroform	2018/11/30	102	50 - 140	113	60 - 130	<1.0	ug/L	2.9	30
9244956	Chloromethane	2018/11/30	115	50 - 140	128	60 - 130	<1.0	ug/L		
9244956	cis-1,2-dichloroethene	2018/11/30	105	50 - 140	115	60 - 130	<1.0	ug/L		
9244956	cis-1,3-dichloropropene	2018/11/30	100	50 - 140	106	50 - 140	<1.0	ug/L		
9244956	Dibromomethane	2018/11/30	112	50 - 140	119	60 - 130	<0.90	ug/L		
9244956	Dichlorodifluoromethane	2018/11/30	117	50 - 140	136 (1)	60 - 130	<2.0	ug/L		
9244956	Dichloromethane	2018/11/30	109	50 - 140	115	60 - 130	<2.0	ug/L		
9244956	Ethylbenzene	2018/11/30	107	50 - 140	113	60 - 130	<0.40	ug/L		
9244956	m & p-Xylene	2018/11/30	112	50 - 140	121	60 - 130	<0.40	ug/L		
9244956	o-Xylene	2018/11/30	113	50 - 140	121	60 - 130	<0.40	ug/L		
9244956	Styrene	2018/11/30	91	50 - 140	104	60 - 130	<0.50	ug/L		
9244956	Tetrachloroethene	2018/11/30	102	50 - 140	111	60 - 130	<0.50	ug/L		
9244956	Toluene	2018/11/30	105	50 - 140	116	60 - 130	<0.40	ug/L		
9244956	trans-1,2-dichloroethene	2018/11/30	100	50 - 140	108	60 - 130	<1.0	ug/L		
9244956	trans-1,3-dichloropropene	2018/11/30	101	50 - 140	108	50 - 140	<1.0	ug/L		
9244956	Trichloroethene	2018/11/30	102	50 - 140	112	60 - 130	<0.50	ug/L		
9244956	Trichlorofluoromethane	2018/11/30	102	50 - 140	114	60 - 130	<4.0	ug/L		
9244956	VH C6-C10	2018/11/30			102	60 - 130	<300	ug/L		
9244956	Vinyl chloride	2018/11/30	101	50 - 140	112	60 - 130	<0.50	ug/L		
9244956	Xylenes (Total)	2018/11/30					<0.40	ug/L		
9245003	2-Butanone (MEK)	2018/11/28	103	50 - 140	103	50 - 140	<50	ug/L	NC	30
9245003	4-Methyl-2-pentanone (MIBK)	2018/11/28	93	50 - 140	99	50 - 140	<10	ug/L	NC	30
9245190	1-Methylnaphthalene	2018/11/29	105	50 - 140	98	50 - 140	<0.050	ug/L	NC	40
9245190	2-Methylnaphthalene	2018/11/29	101	50 - 140	93	50 - 140	<0.10	ug/L	NC	40
9245190	Acenaphthene	2018/11/29	99	50 - 140	92	50 - 140	<0.050	ug/L	NC	40
9245190	Acenaphthylene	2018/11/29	105	50 - 140	98	50 - 140	<0.050	ug/L	NC	40
9245190	Acridine	2018/11/29	108	50 - 140	104	50 - 140	<0.050	ug/L	NC	40
9245190	Anthracene	2018/11/29	104	50 - 140	97	50 - 140	<0.010	ug/L	1.2	40
9245190	Benzo(a)anthracene	2018/11/29	92	50 - 140	88	50 - 140	<0.010	ug/L	NC	40
9245190	Benzo(a)pyrene	2018/11/29	103	50 - 140	98	50 - 140	<0.0050	ug/L	NC	40

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QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9245190	Benzo(b&j)fluoranthene	2018/11/29	103	50 - 140	97	50 - 140	<0.030	ug/L	NC	40
9245190	Benzo(g,h,i)perylene	2018/11/29	114	50 - 140	111	50 - 140	<0.050	ug/L	NC	40
9245190	Benzo(k)fluoranthene	2018/11/29	104	50 - 140	99	50 - 140	<0.050	ug/L	NC	40
9245190	Chrysene	2018/11/29	94	50 - 140	89	50 - 140	<0.020	ug/L	NC	40
9245190	Dibenz(a,h)anthracene	2018/11/29	102	50 - 140	98	50 - 140	<0.0030	ug/L	NC	40
9245190	Fluoranthene	2018/11/29	97	50 - 140	90	50 - 140	<0.020	ug/L	NC	40
9245190	Fluorene	2018/11/29	97	50 - 140	91	50 - 140	<0.050	ug/L	NC	40
9245190	Indeno(1,2,3-cd)pyrene	2018/11/29	102	50 - 140	100	50 - 140	<0.050	ug/L	NC	40
9245190	Naphthalene	2018/11/29	106	50 - 140	98	50 - 140	<0.10	ug/L	NC	40
9245190	Phenanthrene	2018/11/29	103	50 - 140	95	50 - 140	<0.050	ug/L	NC	40
9245190	Pyrene	2018/11/29	98	50 - 140	91	50 - 140	<0.020	ug/L	NC	40
9245190	Quinoline	2018/11/29	115	50 - 140	109	50 - 140	<0.020	ug/L	NC	40
9245243	EPH (C10-C19)	2018/11/28	106	60 - 140	102	70 - 130	<0.20	mg/L	NC	30
9245243	EPH (C19-C32)	2018/11/28	119	60 - 140	116	70 - 130	<0.20	mg/L	NC	30

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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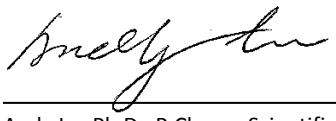
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Maxxam Job #: B8A3997
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KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Andy Lu, Ph.D., P.Chem., Scientific Specialist



Jose Cueva, Supervisor, Organics-VOC & HC

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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K021377

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CHAIN OF CUSTODY RECORD

BBY FCD-00077/07
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Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #: B61898	☑ Regular TAT 5 days (Most analyses)
Contact Name: Nicole MacDonald	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: 13634-20	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☐ 2 Days
Phone: (604) 430-0671	Phone:	Site #:	☐ 1 Day ☐ 3 Days
Email: nmacdonald@keystoneenviro.com	Email: smcbride@keystoneenviro.com	Sampled By: Stewart McBride	Date Required:

Regulatory Criteria	Special Instructions	Rush Confirmation #:
☐ BC CSR Soil ☑ BC CSR Water	☐ Return Cooler	
☐ ~~YK CSR Soil~~ ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)	
☐ CCME (Specify) ☐ Other (Specify)		
☐ Drinking Water ☐ BC Water Quality		

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	VOC / BTEX/ VPH	VOC / BTEX / F1	LEPH/HEPH/PAH	F2 - F4	Dissolved Metals Preserved?	Dissolved Mercury Preserved?	Field Preserved? (Total Metals)	Field Preserved? (Total Mercury)	Chloride / Fluoride	TSS / TDS	pH / Conductivity	Nitrite / Nitrate	# OF CONTAINERS SUBMITTED
	Analysis Requested				BTEX/VPH	BTEX / F1	PAH	EPH	Dissolved Metals Filtered?	Dissolved Mercury Filtered?	Total Metals	Total Mercury	Chloride / Fluoride	TSS / TDS	pH / Conductivity	Nitrite / Nitrate	
1	MW18-12	2018/11/27	14:45	water	X		X		X	X							6
2	MW18-14		15:35				X		X	X							4
3	~~MW18-15~~						X		X	X							
4	MW18-A		(c)14:45		X		X		X	X							6
5																	
6																	
7																	
8																	
9																	
10																	

HOLD - DO NOT ANALYZE

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
N/A		8, 9, 5

COOLING MEDIA PRESENT Y (N)

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
~~Stewart McBride~~	2018/11/27	17:37	SHAN JAKOB JOY	2018/11/27	17:40

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgement and acceptance of our terms which are available for viewing at

COC-1027 Keystone
28-7

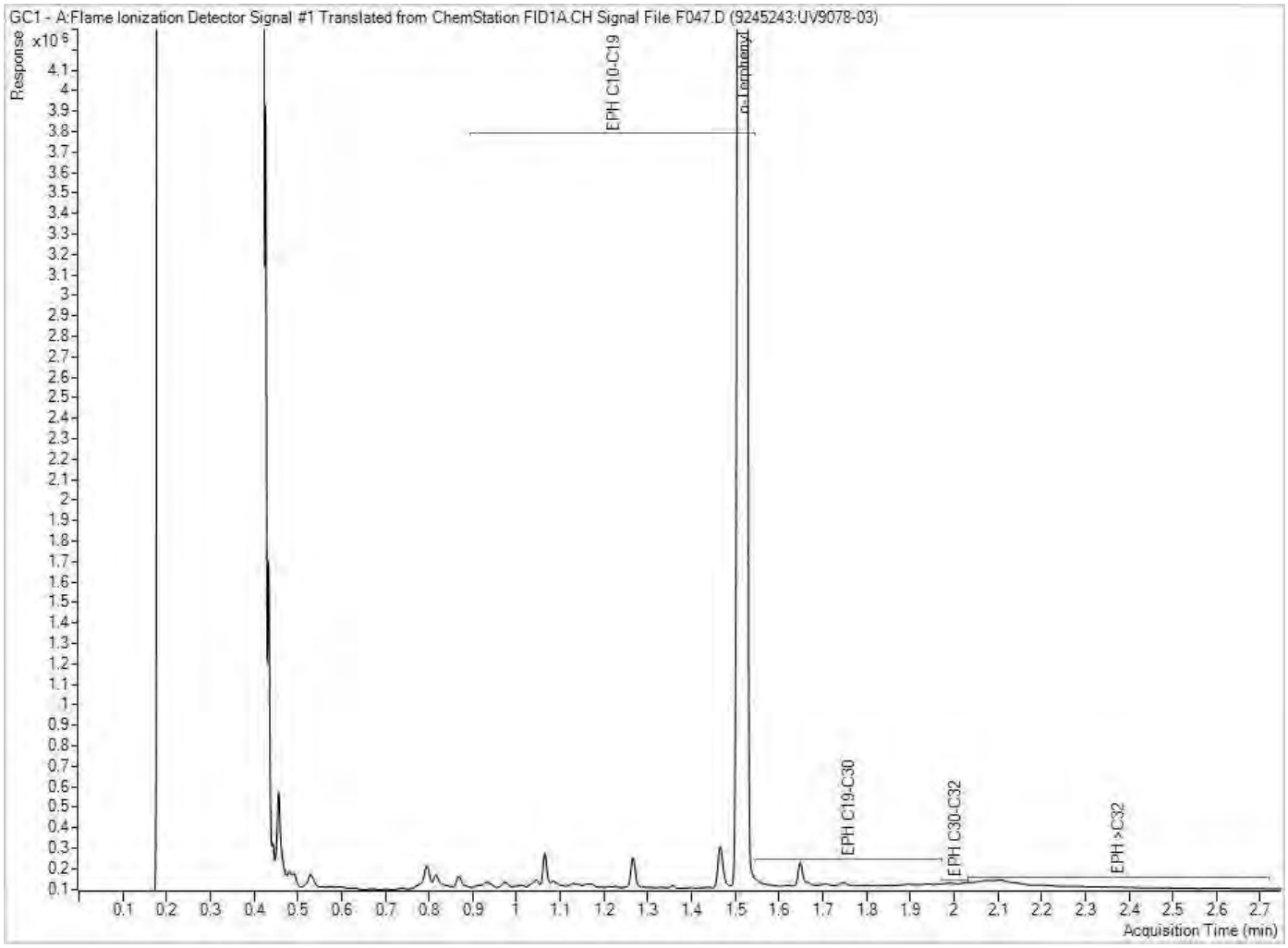
B8A3997_COC

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Maxxam Job #: B8A3997
Report Date: 2018/11/30
Maxxam Sample: UV9078

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-12

EPH in Water when PAH required Chromatogram



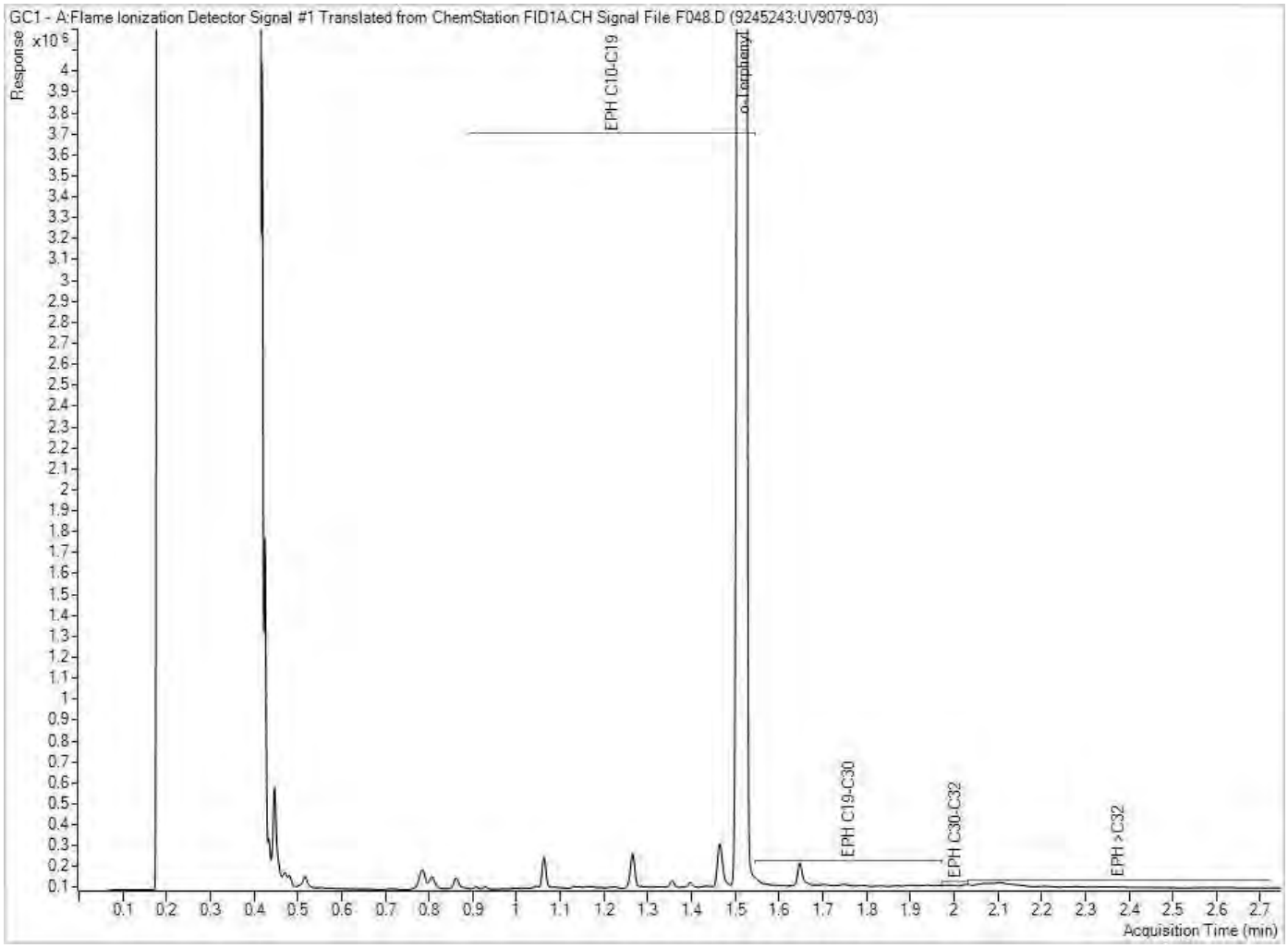
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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Maxxam Job #: B8A3997
Report Date: 2018/11/30
Maxxam Sample: UV9079

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-14

EPH in Water when PAH required Chromatogram



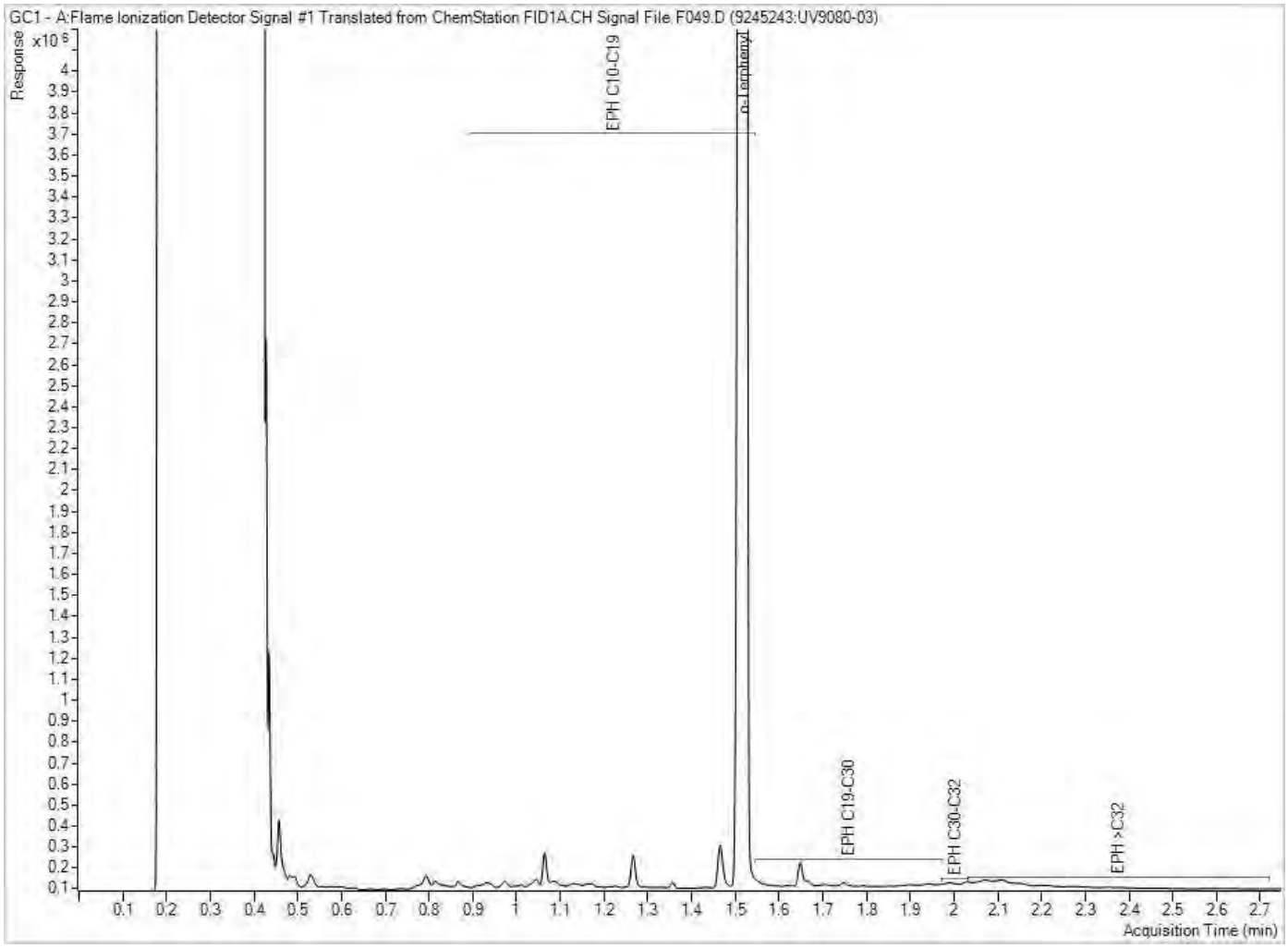
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

City of Vancouver - FOI 2023-228 - Page 718 of 1003

Maxxam Job #: B8A3997
Report Date: 2018/11/30
Maxxam Sample: UV9080

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-A

EPH in Water when PAH required Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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Your Project #: 13639-2C
Your C.O.C. #: K021473

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/12/03
Report #: R2659318
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8A3995
Received: 2018/11/27, 17:40

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Hardness (calculated as CaCO3)	6	N/A	2018/11/29	BBY WI-00033	Auto Calc
Mercury (Dissolved) by CVAF	6	N/A	2018/12/03	BBY7SOP-00015	BCMOE BCLM Oct2013 m
EPH in Water when PAH required	6	2018/11/28	2018/11/28	BBY8SOP-00029	BCMOE BCLM Mar 2017
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	6	N/A	2018/11/29	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	6	N/A	2018/11/28	BBY7SOP-00002	EPA 6020b R2 m
PAH in Water by GC/MS (SIM)	6	2018/11/28	2018/11/29	BBY8SOP-00021	BCMOE BCLM Jul2017m
Total LMW, HMW, Total PAH Calc (1)	1	N/A	2018/11/29	BBY WI-00033	Auto Calc
Total LMW, HMW, Total PAH Calc (1)	5	N/A	2018/11/30	BBY WI-00033	Auto Calc
Filter and HNO3 Preserve for Metals	6	N/A	2018/11/28	BBY7 WI-00004	BCMOE Reqs 08/14
EPH less PAH in Water by GC/FID (2)	1	N/A	2018/11/29	BBY WI-00033	Auto Calc
EPH less PAH in Water by GC/FID (2)	5	N/A	2018/11/30	BBY WI-00033	Auto Calc
Extra VOCs in Water by HS GC/MS	4	N/A	2018/11/28	BBY8SOP-00040	BCMOE BCLM Jul 2017m
VOCs, VH, F1, LH in Water by HS GC/MS	4	N/A	2018/11/30	BBY8SOP-00009/11/12	BCMOE BCLM Jul 2017
Volatile HC-BTEX (3)	4	N/A	2018/11/30	BBY WI-00033	Auto Calc

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope

City of Vancouver - FOI 2023-228 - Page 720 of 1003

Your Project #: 13639-2C
Your C.O.C. #: K021473

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/12/03
Report #: R2659318
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8A3995
Received: 2018/11/27, 17:40

dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Total PAHs in Water include: Quinoline, Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Acridine, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b&j)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, and Benzo(g,h,i)perylene.
(2) LEPH = EPH (C10 to C19) - (Acenaphthene + Acridine + Anthracene + Fluorene + Naphthalene + Phenanthrene)
HEPH = EPH (C19 to C32) - (Benzo(a)anthracene + Benzo(a)pyrene + Fluoranthene + Pyrene)
(3) VPH = VH - (Benzene + Toluene + Ethylbenzene + m & p-Xylene + o-Xylene + Styrene)

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Gail Pedersen, Project Manager –Environmental Customer Service
Email: gpedersen@maxxam.ca
Phone# (604) 734 7276

==========

This report has been generated and distributed using a secure automated process.
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam Job #: B8A3995
Report Date: 2018/12/03

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UV9067	UV9068	UV9069	UV9070	UV9071	UV9072	
Sampling Date		2018/11/27 11:25	2018/11/27 12:26	2018/11/27 13:36	2018/11/27 10:25	2018/11/27 09:25	2018/11/27 08:35	
COC Number		K021473	K021473	K021473	K021473	K021473	K021473	
	UNITS	**MW18-2**	**MW18-3**	**MW18-5**	**MW18-6**	**MW18-9**	**MW18-10**	**QC Batch**
Calculated Parameters								
Filter and HNO3 Preservation	N/A	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	ONSITE

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Maxxam Job #: B8A3995
Report Date: 2018/12/03

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		UV9067	UV9068	UV9069	UV9071		
Sampling Date		2018/11/27 11:25	2018/11/27 12:26	2018/11/27 13:36	2018/11/27 09:25		
COC Number		K021473	K021473	K021473	K021473		
	UNITS	MW18-2	MW18-3	MW18-5	MW18-9	RDL	QC Batch
Volatiles							
2-Butanone (MEK)	ug/L	<50	<50	<50	<50	50	9245003
4-Methyl-2-pentanone (MIBK)	ug/L	<10	<10	<10	<10	10	9245003
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	101	102	102	102		9245003
4-Bromofluorobenzene (sur.)	%	95	95	94	97		9245003
D4-1,2-Dichloroethane (sur.)	%	91	96	91	92		9245003
RDL = Reportable Detection Limit							

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City of Vancouver - FOI 2023-228 - Page 723 of 1003

Maxxam Job #: B8A3995
Report Date: 2018/12/03

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

LEPH & HEPH WITH CSR/CCME PAH IN WATER (WATER)

Maxxam ID		UV9067	UV9068	UV9069	UV9070	UV9071	UV9072		
Sampling Date		2018/11/27 11:25	2018/11/27 12:26	2018/11/27 13:36	2018/11/27 10:25	2018/11/27 09:25	2018/11/27 08:35		
COC Number		K021473	K021473	K021473	K021473	K021473	K021473		
	UNITS	MW18-2	MW18-3	MW18-5	MW18-6	MW18-9	MW18-10	RDL	QC Batch
Calculated Parameters									
Low Molecular Weight PAH`s	ug/L	<0.10	<0.10	<0.10	1.5	<0.10	<0.10	0.10	9244673
High Molecular Weight PAH`s	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	9244673
Total PAH	ug/L	<0.10	<0.10	<0.10	1.5	<0.10	<0.10	0.10	9244673
Polycyclic Aromatics									
Quinoline	ug/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	9245190
Naphthalene	ug/L	<0.10	<0.10	<0.10	0.24	<0.10	<0.10	0.10	9245190
1-Methylnaphthalene	ug/L	<0.050	<0.050	<0.050	0.64	<0.050	0.081	0.050	9245190
2-Methylnaphthalene	ug/L	<0.10	<0.10	<0.10	0.50	<0.10	<0.10	0.10	9245190
Acenaphthylene	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	9245190
Acenaphthene	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	9245190
Fluorene	ug/L	<0.050	<0.050	<0.050	0.082	<0.050	<0.050	0.050	9245190
Phenanthrene	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	9245190
Anthracene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	9245190
Acridine	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	9245190
Fluoranthene	ug/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	9245190
Pyrene	ug/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	9245190
Benzo(a)anthracene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	9245190
Chrysene	ug/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	9245190
Benzo(b&j)fluoranthene	ug/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.030	9245190
Benzo(k)fluoranthene	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	9245190
Benzo(a)pyrene	ug/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9245190
Indeno(1,2,3-cd)pyrene	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	9245190
Dibenz(a,h)anthracene	ug/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0030	9245190
Benzo(g,h,i)perylene	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	9245190
Calculated Parameters									
LEPH (C10-C19 less PAH)	mg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	9244674
HEPH (C19-C32 less PAH)	mg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	9244674
Ext. Pet. Hydrocarbon									
EPH (C10-C19)	mg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	9245243
EPH (C19-C32)	mg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	9245243
Surrogate Recovery (%)									
O-TERPHENYL (sur.)	%	98	98	97	101	100	101		9245243

RDL = Reportable Detection Limit

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Maxxam Job #: B8A3995
Report Date: 2018/12/03

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

LEPH & HEPH WITH CSR/CCME PAH IN WATER (WATER)

Maxxam ID		UV9067	UV9068	UV9069	UV9070	UV9071	UV9072		
Sampling Date		2018/11/27 11:25	2018/11/27 12:26	2018/11/27 13:36	2018/11/27 10:25	2018/11/27 09:25	2018/11/27 08:35		
COC Number		K021473	K021473	K021473	K021473	K021473	K021473		
	UNITS	**MW18-2**	**MW18-3**	**MW18-5**	**MW18-6**	**MW18-9**	**MW18-10**	**RDL**	**QC Batch**
D10-ANTHRACENE (sur.)	%	100	95	97	102	97	99		9245190
D8-ACENAPHTHYLENE (sur.)	%	95	93	95	101	95	97		9245190
D8-NAPHTHALENE (sur.)	%	72	68	77	78	75	79		9245190
TERPHENYL-D14 (sur.)	%	91	88	88	95	91	92		9245190
RDL = Reportable Detection Limit									

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Maxxam Job #: B8A3995
Report Date: 2018/12/03

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

CSR DISSOLVED METALS IN WATER WITH CV HG (WATER)

Maxxam ID		UV9067			UV9067			UV9068	UV9069		
Sampling Date		2018/11/27 11:25			2018/11/27 11:25			2018/11/27 12:26	2018/11/27 13:36		
COC Number		K021473			K021473			K021473	K021473		
	UNITS	MW18-2	RDL	QC Batch	MW18-2 Lab-Dup	RDL	QC Batch	MW18-3	MW18-5	RDL	QC Batch
Calculated Parameters											
Dissolved Hardness (CaCO3)	mg/L	77.8	0.50	9244561				77.5	176	0.50	9244561
Elements											
Dissolved Mercury (Hg)	ug/L	<0.0020	0.0020	9250775				<0.0020	<0.0020	0.0020	9250775
Dissolved Metals by ICPMS											
Dissolved Aluminum (Al)	ug/L	77.3	3.0	9245329	85.1	3.0	9245329	15.9	36.5	3.0	9245329
Dissolved Antimony (Sb)	ug/L	1.08	0.50	9245329	1.09	0.50	9245329	1.12	<0.50	0.50	9245329
Dissolved Arsenic (As)	ug/L	11.1	0.10	9245329	11.0	0.10	9245329	11.0	2.05	0.10	9245329
Dissolved Barium (Ba)	ug/L	17.7	1.0	9245329	17.5	1.0	9245329	17.0	87.6	1.0	9245329
Dissolved Beryllium (Be)	ug/L	<0.10	0.10	9245329	<0.10	0.10	9245329	<0.10	<0.10	0.10	9245329
Dissolved Bismuth (Bi)	ug/L	<1.0	1.0	9245329	<1.0	1.0	9245329	<1.0	<1.0	1.0	9245329
Dissolved Boron (B)	ug/L	63	50	9245329	61	50	9245329	65	<50	50	9245329
Dissolved Cadmium (Cd)	ug/L	<0.010	0.010	9245329	<0.010	0.010	9245329	<0.010	0.127	0.010	9245329
Dissolved Chromium (Cr)	ug/L	<1.0	1.0	9245329	<1.0	1.0	9245329	<1.0	<1.0	1.0	9245329
Dissolved Cobalt (Co)	ug/L	<0.20	0.20	9245329	<0.20	0.20	9245329	<0.20	9.15	0.20	9245329
Dissolved Copper (Cu)	ug/L	2.91	0.20	9245329	2.81	0.20	9245329	2.86	<0.20	0.20	9245329
Dissolved Iron (Fe)	ug/L	48.6	5.0	9245329	54.9	5.0	9245329	<5.0	65700	5.0	9245329
Dissolved Lead (Pb)	ug/L	<0.20	0.20	9245329	<0.20	0.20	9245329	<0.20	<0.20	0.20	9245329
Dissolved Lithium (Li)	ug/L	<2.0	2.0	9245329	<2.0	2.0	9245329	<2.0	<2.0	2.0	9245329
Dissolved Manganese (Mn)	ug/L	22.7	1.0	9245329	22.7	1.0	9245329	22.6	5640	1.0	9245329
Dissolved Molybdenum (Mo)	ug/L	27.6	1.0	9245329	27.5	1.0	9245329	28.3	<1.0	1.0	9245329
Dissolved Nickel (Ni)	ug/L	<1.0	1.0	9245329	<1.0	1.0	9245329	<1.0	5.4	1.0	9245329
Dissolved Selenium (Se)	ug/L	4.19	0.10	9245329	4.16	0.10	9245329	4.49	0.34	0.10	9245329
Dissolved Silicon (Si)	ug/L	5670	100	9245329	5630	100	9245329	5440	6700	100	9245329
Dissolved Silver (Ag)	ug/L	<0.020	0.020	9245329	<0.020	0.020	9245329	<0.020	<0.020	0.020	9245329
Dissolved Strontium (Sr)	ug/L	187	1.0	9245329	188	1.0	9245329	187	491	1.0	9245329
Dissolved Thallium (Tl)	ug/L	<0.010	0.010	9245329	<0.010	0.010	9245329	<0.010	0.073	0.010	9245329
Dissolved Tin (Sn)	ug/L	<5.0	5.0	9245329	<5.0	5.0	9245329	<5.0	<5.0	5.0	9245329
Dissolved Titanium (Ti)	ug/L	<5.0	5.0	9245329	<5.0	5.0	9245329	<5.0	<5.0	5.0	9245329
Dissolved Uranium (U)	ug/L	4.99	0.10	9245329	5.01	0.10	9245329	4.90	0.22	0.10	9245329
Dissolved Vanadium (V)	ug/L	26.9	5.0	9245329	26.5	5.0	9245329	26.5	<5.0	5.0	9245329
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	9245329	<5.0	5.0	9245329	<5.0	<5.0	5.0	9245329

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

City of Vancouver - FOI 2023-228 - Page 726 of 1003

Maxxam Job #: B8A3995
Report Date: 2018/12/03

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

CSR DISSOLVED METALS IN WATER WITH CV HG (WATER)

Maxxam ID		UV9067			UV9067			UV9068	UV9069		
Sampling Date		2018/11/27 11:25			2018/11/27 11:25			2018/11/27 12:26	2018/11/27 13:36		
COC Number		K021473			K021473			K021473	K021473		
	UNITS	**MW18-2**	**RDL**	**QC Batch**	**MW18-2 Lab-Dup**	**RDL**	**QC Batch**	**MW18-3**	**MW18-5**	**RDL**	**QC Batch**
Dissolved Zirconium (Zr)	ug/L	<0.10	0.10	9245329	<0.10	0.10	9245329	<0.10	0.38	0.10	9245329
Dissolved Calcium (Ca)	mg/L	24.9	0.050	9244671				24.8	48.0	0.050	9244671
Dissolved Magnesium (Mg)	mg/L	3.83	0.050	9244671				3.77	13.7	0.050	9244671
Dissolved Potassium (K)	mg/L	4.61	0.050	9244671				4.54	2.14	0.050	9244671
Dissolved Sulphur (S)	mg/L	29.6	3.0	9244671				28.7	<3.0	3.0	9244671

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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City of Vancouver - FOI 2023-228 - Page 727 of 1003

Maxxam Job #: B8A3995
Report Date: 2018/12/03

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

CSR DISSOLVED METALS IN WATER WITH CV HG (WATER)

Maxxam ID		UV9070			UV9070			UV9071		
Sampling Date		2018/11/27 10:25			2018/11/27 10:25			2018/11/27 09:25		
COC Number		K021473			K021473			K021473		
	UNITS	MW18-6	RDL	QC Batch	MW18-6 Lab-Dup	RDL	QC Batch	MW18-9	RDL	QC Batch
Calculated Parameters										
Dissolved Hardness (CaCO3)	mg/L	386	0.50	9244561				745	0.50	9244561
Elements										
Dissolved Mercury (Hg)	ug/L	<0.0020	0.0020	9250775	<0.0020	0.0020	9250775	<0.0020	0.0020	9250881
Dissolved Metals by ICPMS										
Dissolved Aluminum (Al)	ug/L	4.7	3.0	9245329				7.3	3.0	9245329
Dissolved Antimony (Sb)	ug/L	<0.50	0.50	9245329				<0.50	0.50	9245329
Dissolved Arsenic (As)	ug/L	1.59	0.10	9245329				3.29	0.10	9245329
Dissolved Barium (Ba)	ug/L	59.3	1.0	9245329				105	1.0	9245329
Dissolved Beryllium (Be)	ug/L	<0.10	0.10	9245329				<0.10	0.10	9245329
Dissolved Bismuth (Bi)	ug/L	<1.0	1.0	9245329				<1.0	1.0	9245329
Dissolved Boron (B)	ug/L	70	50	9245329				<50	50	9245329
Dissolved Cadmium (Cd)	ug/L	0.111	0.010	9245329				0.144	0.010	9245329
Dissolved Chromium (Cr)	ug/L	<1.0	1.0	9245329				<1.0	1.0	9245329
Dissolved Cobalt (Co)	ug/L	4.25	0.20	9245329				2.98	0.20	9245329
Dissolved Copper (Cu)	ug/L	1.57	0.20	9245329				1.15	0.20	9245329
Dissolved Iron (Fe)	ug/L	102	5.0	9245329				21.9	5.0	9245329
Dissolved Lead (Pb)	ug/L	<0.20	0.20	9245329				<0.20	0.20	9245329
Dissolved Lithium (Li)	ug/L	3.3	2.0	9245329				4.3	2.0	9245329
Dissolved Manganese (Mn)	ug/L	3320	1.0	9245329				1220	1.0	9245329
Dissolved Molybdenum (Mo)	ug/L	2.2	1.0	9245329				3.7	1.0	9245329
Dissolved Nickel (Ni)	ug/L	7.2	1.0	9245329				8.1	1.0	9245329
Dissolved Selenium (Se)	ug/L	1.00	0.10	9245329				0.38	0.10	9245329
Dissolved Silicon (Si)	ug/L	12200	100	9245329				11300	100	9245329
Dissolved Silver (Ag)	ug/L	<0.020	0.020	9245329				<0.020	0.020	9245329
Dissolved Strontium (Sr)	ug/L	719	1.0	9245329				1110	1.0	9245329
Dissolved Thallium (Tl)	ug/L	0.027	0.010	9245329				0.063	0.010	9245329
Dissolved Tin (Sn)	ug/L	<5.0	5.0	9245329				<5.0	5.0	9245329
Dissolved Titanium (Ti)	ug/L	<5.0	5.0	9245329				<5.0	5.0	9245329
Dissolved Uranium (U)	ug/L	2.22	0.10	9245329				6.13	0.10	9245329
Dissolved Vanadium (V)	ug/L	<5.0	5.0	9245329				<5.0	5.0	9245329
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	9245329				<5.0	5.0	9245329

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8A3995
Report Date: 2018/12/03

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

CSR DISSOLVED METALS IN WATER WITH CV HG (WATER)

Maxxam ID		UV9070			UV9070			UV9071		
Sampling Date		2018/11/27 10:25			2018/11/27 10:25			2018/11/27 09:25		
COC Number		K021473			K021473			K021473		
	UNITS	**MW18-6**	**RDL**	**QC Batch**	**MW18-6 Lab-Dup**	**RDL**	**QC Batch**	**MW18-9**	**RDL**	**QC Batch**
Dissolved Zirconium (Zr)	ug/L	<0.10	0.10	9245329				0.24	0.10	9245329
Dissolved Calcium (Ca)	mg/L	117	0.050	9244671				201	0.050	9244671
Dissolved Magnesium (Mg)	mg/L	22.8	0.050	9244671				59.1	0.050	9244671
Dissolved Potassium (K)	mg/L	5.85	0.050	9244671				11.3	0.050	9244671
Dissolved Sulphur (S)	mg/L	60.0	3.0	9244671				22.0	3.0	9244671

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8A3995
Report Date: 2018/12/03

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

CSR DISSOLVED METALS IN WATER WITH CV HG (WATER)

Maxxam ID		UV9072		
Sampling Date		2018/11/27 08:35		
COC Number		K021473		
	UNITS	MW18-10	RDL	QC Batch
Calculated Parameters				
Dissolved Hardness (CaCO3)	mg/L	117	0.50	9244561
Elements				
Dissolved Mercury (Hg)	ug/L	<0.0020	0.0020	9250775
Dissolved Metals by ICPMS				
Dissolved Aluminum (Al)	ug/L	63.1	3.0	9245329
Dissolved Antimony (Sb)	ug/L	<0.50	0.50	9245329
Dissolved Arsenic (As)	ug/L	0.74	0.10	9245329
Dissolved Barium (Ba)	ug/L	22.7	1.0	9245329
Dissolved Beryllium (Be)	ug/L	<0.10	0.10	9245329
Dissolved Bismuth (Bi)	ug/L	<1.0	1.0	9245329
Dissolved Boron (B)	ug/L	<50	50	9245329
Dissolved Cadmium (Cd)	ug/L	0.044	0.010	9245329
Dissolved Chromium (Cr)	ug/L	3.2	1.0	9245329
Dissolved Cobalt (Co)	ug/L	1.93	0.20	9245329
Dissolved Copper (Cu)	ug/L	3.07	0.20	9245329
Dissolved Iron (Fe)	ug/L	18.6	5.0	9245329
Dissolved Lead (Pb)	ug/L	<0.20	0.20	9245329
Dissolved Lithium (Li)	ug/L	2.5	2.0	9245329
Dissolved Manganese (Mn)	ug/L	948	1.0	9245329
Dissolved Molybdenum (Mo)	ug/L	1.9	1.0	9245329
Dissolved Nickel (Ni)	ug/L	1.1	1.0	9245329
Dissolved Selenium (Se)	ug/L	<0.10	0.10	9245329
Dissolved Silicon (Si)	ug/L	8690	100	9245329
Dissolved Silver (Ag)	ug/L	<0.020	0.020	9245329
Dissolved Strontium (Sr)	ug/L	289	1.0	9245329
Dissolved Thallium (Tl)	ug/L	<0.010	0.010	9245329
Dissolved Tin (Sn)	ug/L	<5.0	5.0	9245329
Dissolved Titanium (Ti)	ug/L	<5.0	5.0	9245329
Dissolved Uranium (U)	ug/L	0.47	0.10	9245329
Dissolved Vanadium (V)	ug/L	<5.0	5.0	9245329
Dissolved Zinc (Zn)	ug/L	23.3	5.0	9245329
Dissolved Zirconium (Zr)	ug/L	<0.10	0.10	9245329
RDL = Reportable Detection Limit				

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Maxxam Job #: B8A3995
Report Date: 2018/12/03

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

CSR DISSOLVED METALS IN WATER WITH CV HG (WATER)

Maxxam ID		UV9072		
Sampling Date		2018/11/27 08:35		
COC Number		K021473		
	UNITS	**MW18-10**	**RDL**	**QC Batch**
Dissolved Calcium (Ca)	mg/L	36.5	0.050	9244671
Dissolved Magnesium (Mg)	mg/L	6.32	0.050	9244671
Dissolved Potassium (K)	mg/L	4.62	0.050	9244671
Dissolved Sulphur (S)	mg/L	7.0	3.0	9244671
RDL = Reportable Detection Limit				

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Maxxam Job #: B8A3995
Report Date: 2018/12/03

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

CSR VOC + VPH IN WATER (WATER)

Maxxam ID		UV9067	UV9068	UV9069	UV9071		
Sampling Date		2018/11/27 11:25	2018/11/27 12:26	2018/11/27 13:36	2018/11/27 09:25		
COC Number		K021473	K021473	K021473	K021473		
	UNITS	MW18-2	MW18-3	MW18-5	MW18-9	RDL	QC Batch
Calculated Parameters							
VPH (VHW6 to 10 - BTEX)	ug/L	<300	<300	<300	<300	300	9244676
Volatiles							
VH C6-C10	ug/L	<300	<300	<300	<300	300	9244956
1,1,1,2-tetrachloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	9244956
1,1,1-trichloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	9244956
1,1,2,2-tetrachloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	9244956
1,1,2Trichloro-1,2,2Trifluoroethane	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	9244956
1,1,2-trichloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	9244956
1,1-dichloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	9244956
1,1-dichloroethene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	9244956
1,2-dibromoethane	ug/L	<0.20	<0.20	<0.20	<0.20	0.20	9244956
1,2-dichlorobenzene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	9244956
1,2-dichloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	9244956
1,2-dichloropropane	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	9244956
1,3-Butadiene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	9244956
1,3-dichlorobenzene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	9244956
1,4-dichlorobenzene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	9244956
Benzene	ug/L	<0.40	<0.40	<0.40	<0.40	0.40	9244956
Bromobenzene	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	9244956
Bromodichloromethane	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	9244956
Bromoform	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	9244956
Bromomethane	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	9244956
Carbon tetrachloride	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	9244956
Chlorobenzene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	9244956
Chlorodibromomethane	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	9244956
Chloroethane	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	9244956
Chloroform	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	9244956
Chloromethane	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	9244956
cis-1,2-dichloroethene	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	9244956
cis-1,3-dichloropropene	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	9244956
Dibromomethane	ug/L	<0.90	<0.90	<0.90	<0.90	0.90	9244956
Dichlorodifluoromethane	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	9244956
RDL = Reportable Detection Limit							

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Maxxam Job #: B8A3995
Report Date: 2018/12/03

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

CSR VOC + VPH IN WATER (WATER)

Maxxam ID		UV9067	UV9068	UV9069	UV9071		
Sampling Date		2018/11/27 11:25	2018/11/27 12:26	2018/11/27 13:36	2018/11/27 09:25		
COC Number		K021473	K021473	K021473	K021473		
	UNITS	MW18-2	MW18-3	MW18-5	MW18-9	RDL	QC Batch
Dichloromethane	ug/L	<2.0	<2.0	<2.0	2.4	2.0	9244956
Ethylbenzene	ug/L	<0.40	<0.40	<0.40	<0.40	0.40	9244956
Styrene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	9244956
Tetrachloroethene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	9244956
Toluene	ug/L	<0.40	<0.40	<0.40	<0.40	0.40	9244956
trans-1,2-dichloroethene	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	9244956
trans-1,3-dichloropropene	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	9244956
Trichloroethene	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	9244956
Trichlorofluoromethane	ug/L	<4.0	<4.0	<4.0	<4.0	4.0	9244956
Vinyl chloride	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	9244956
m & p-Xylene	ug/L	<0.40	<0.40	<0.40	<0.40	0.40	9244956
o-Xylene	ug/L	<0.40	<0.40	<0.40	<0.40	0.40	9244956
Xylenes (Total)	ug/L	<0.40	<0.40	<0.40	<0.40	0.40	9244956
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	100	99	100	100		9244956
4-Bromofluorobenzene (sur.)	%	92	90	91	90		9244956
D4-1,2-Dichloroethane (sur.)	%	108	104	108	107		9244956
RDL = Reportable Detection Limit							

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Maxxam Job #: B8A3995
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KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	7.3°C

Results relate only to the items tested.

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Maxxam Job #: B8A3995
Report Date: 2018/12/03

QUALITY ASSURANCE REPORT

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9244956	1,4-Difluorobenzene (sur.)	2018/11/30	99	50 - 140	98	50 - 140	98	%		
9244956	4-Bromofluorobenzene (sur.)	2018/11/30	110	50 - 140	101	50 - 140	91	%		
9244956	D4-1,2-Dichloroethane (sur.)	2018/11/30	106	50 - 140	105	50 - 140	103	%		
9245003	1,4-Difluorobenzene (sur.)	2018/11/28	102	50 - 140	102	50 - 140	101	%		
9245003	4-Bromofluorobenzene (sur.)	2018/11/28	93	50 - 140	96	50 - 140	96	%		
9245003	D4-1,2-Dichloroethane (sur.)	2018/11/28	95	50 - 140	92	50 - 140	93	%		
9245190	D10-ANTHRACENE (sur.)	2018/11/29	100	50 - 140	96	50 - 140	100	%		
9245190	D8-ACENAPHTHYLENE (sur.)	2018/11/29	99	50 - 140	96	50 - 140	96	%		
9245190	D8-NAPHTHALENE (sur.)	2018/11/29	85	50 - 140	81	50 - 140	77	%		
9245190	TERPHENYL-D14 (sur.)	2018/11/29	95	50 - 140	92	50 - 140	94	%		
9245243	O-TERPHENYL (sur.)	2018/11/28	99	60 - 140	99	60 - 140	99	%		
9244956	1,1,1,2-tetrachloroethane	2018/11/30	104	50 - 140	117	60 - 130	<0.50	ug/L		
9244956	1,1,1-trichloroethane	2018/11/30	102	50 - 140	114	60 - 130	<0.50	ug/L		
9244956	1,1,2,2-tetrachloroethane	2018/11/30	112	50 - 140	126	60 - 130	<0.50	ug/L		
9244956	1,1,2Trichloro-1,2,2Trifluoroethane	2018/11/30	103	50 - 140	114	60 - 130	<2.0	ug/L		
9244956	1,1,2-trichloroethane	2018/11/30	112	50 - 140	123	60 - 130	<0.50	ug/L		
9244956	1,1-dichloroethane	2018/11/30	106	50 - 140	119	60 - 130	<0.50	ug/L		
9244956	1,1-dichloroethene	2018/11/30	102	50 - 140	113	60 - 130	<0.50	ug/L		
9244956	1,2-dibromoethane	2018/11/30	116	50 - 140	124	60 - 130	<0.20	ug/L		
9244956	1,2-dichlorobenzene	2018/11/30	114	50 - 140	128	60 - 130	<0.50	ug/L		
9244956	1,2-dichloroethane	2018/11/30	111	50 - 140	120	60 - 130	<0.50	ug/L		
9244956	1,2-dichloropropane	2018/11/30	112	50 - 140	122	60 - 130	<0.50	ug/L		
9244956	1,3-Butadiene	2018/11/30	81	50 - 140	94	60 - 130	<0.50	ug/L		
9244956	1,3-dichlorobenzene	2018/11/30	108	50 - 140	124	60 - 130	<0.50	ug/L		
9244956	1,4-dichlorobenzene	2018/11/30	110	50 - 140	126	60 - 130	<0.50	ug/L		
9244956	Benzene	2018/11/30	105	50 - 140	117	60 - 130	<0.40	ug/L		
9244956	Bromobenzene	2018/11/30	109	50 - 140	122	60 - 130	<2.0	ug/L		
9244956	Bromodichloromethane	2018/11/30	106	50 - 140	117	60 - 130	<1.0	ug/L	0.74	30
9244956	Bromoform	2018/11/30	106	50 - 140	120	60 - 130	<1.0	ug/L	NC	30
9244956	Bromomethane	2018/11/30	106	50 - 140	115	60 - 130	<1.0	ug/L		
9244956	Carbon tetrachloride	2018/11/30	101	50 - 140	113	60 - 130	<0.50	ug/L		

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Maxxam Job #: B8A3995
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QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9244956	Chlorobenzene	2018/11/30	103	50 - 140	116	60 - 130	<0.50	ug/L		
9244956	Chlorodibromomethane	2018/11/30	108	50 - 140	117	60 - 130	<1.0	ug/L	NC	30
9244956	Chloroethane	2018/11/30	88	50 - 140	94	60 - 130	<1.0	ug/L		
9244956	Chloroform	2018/11/30	102	50 - 140	113	60 - 130	<1.0	ug/L	2.9	30
9244956	Chloromethane	2018/11/30	115	50 - 140	128	60 - 130	<1.0	ug/L		
9244956	cis-1,2-dichloroethene	2018/11/30	105	50 - 140	115	60 - 130	<1.0	ug/L		
9244956	cis-1,3-dichloropropene	2018/11/30	100	50 - 140	106	50 - 140	<1.0	ug/L		
9244956	Dibromomethane	2018/11/30	112	50 - 140	119	60 - 130	<0.90	ug/L		
9244956	Dichlorodifluoromethane	2018/11/30	117	50 - 140	136 (1)	60 - 130	<2.0	ug/L		
9244956	Dichloromethane	2018/11/30	109	50 - 140	115	60 - 130	<2.0	ug/L		
9244956	Ethylbenzene	2018/11/30	107	50 - 140	113	60 - 130	<0.40	ug/L		
9244956	m & p-Xylene	2018/11/30	112	50 - 140	121	60 - 130	<0.40	ug/L		
9244956	o-Xylene	2018/11/30	113	50 - 140	121	60 - 130	<0.40	ug/L		
9244956	Styrene	2018/11/30	91	50 - 140	104	60 - 130	<0.50	ug/L		
9244956	Tetrachloroethene	2018/11/30	102	50 - 140	111	60 - 130	<0.50	ug/L		
9244956	Toluene	2018/11/30	105	50 - 140	116	60 - 130	<0.40	ug/L		
9244956	trans-1,2-dichloroethene	2018/11/30	100	50 - 140	108	60 - 130	<1.0	ug/L		
9244956	trans-1,3-dichloropropene	2018/11/30	101	50 - 140	108	50 - 140	<1.0	ug/L		
9244956	Trichloroethene	2018/11/30	102	50 - 140	112	60 - 130	<0.50	ug/L		
9244956	Trichlorofluoromethane	2018/11/30	102	50 - 140	114	60 - 130	<4.0	ug/L		
9244956	VH C6-C10	2018/11/30			102	60 - 130	<300	ug/L		
9244956	Vinyl chloride	2018/11/30	101	50 - 140	112	60 - 130	<0.50	ug/L		
9244956	Xylenes (Total)	2018/11/30					<0.40	ug/L		
9245003	2-Butanone (MEK)	2018/11/28	103	50 - 140	103	50 - 140	<50	ug/L	NC	30
9245003	4-Methyl-2-pentanone (MIBK)	2018/11/28	93	50 - 140	99	50 - 140	<10	ug/L	NC	30
9245190	1-Methylnaphthalene	2018/11/29	105	50 - 140	98	50 - 140	<0.050	ug/L	NC	40
9245190	2-Methylnaphthalene	2018/11/29	101	50 - 140	93	50 - 140	<0.10	ug/L	NC	40
9245190	Acenaphthene	2018/11/29	99	50 - 140	92	50 - 140	<0.050	ug/L	NC	40
9245190	Acenaphthylene	2018/11/29	105	50 - 140	98	50 - 140	<0.050	ug/L	NC	40
9245190	Acridine	2018/11/29	108	50 - 140	104	50 - 140	<0.050	ug/L	NC	40
9245190	Anthracene	2018/11/29	104	50 - 140	97	50 - 140	<0.010	ug/L	1.2	40

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Maxxam Job #: B8A3995
Report Date: 2018/12/03

QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9245190	Benzo(a)anthracene	2018/11/29	92	50 - 140	88	50 - 140	<0.010	ug/L	NC	40
9245190	Benzo(a)pyrene	2018/11/29	103	50 - 140	98	50 - 140	<0.0050	ug/L	NC	40
9245190	Benzo(b&j)fluoranthene	2018/11/29	103	50 - 140	97	50 - 140	<0.030	ug/L	NC	40
9245190	Benzo(g,h,i)perylene	2018/11/29	114	50 - 140	111	50 - 140	<0.050	ug/L	NC	40
9245190	Benzo(k)fluoranthene	2018/11/29	104	50 - 140	99	50 - 140	<0.050	ug/L	NC	40
9245190	Chrysene	2018/11/29	94	50 - 140	89	50 - 140	<0.020	ug/L	NC	40
9245190	Dibenz(a,h)anthracene	2018/11/29	102	50 - 140	98	50 - 140	<0.0030	ug/L	NC	40
9245190	Fluoranthene	2018/11/29	97	50 - 140	90	50 - 140	<0.020	ug/L	NC	40
9245190	Fluorene	2018/11/29	97	50 - 140	91	50 - 140	<0.050	ug/L	NC	40
9245190	Indeno(1,2,3-cd)pyrene	2018/11/29	102	50 - 140	100	50 - 140	<0.050	ug/L	NC	40
9245190	Naphthalene	2018/11/29	106	50 - 140	98	50 - 140	<0.10	ug/L	NC	40
9245190	Phenanthrene	2018/11/29	103	50 - 140	95	50 - 140	<0.050	ug/L	NC	40
9245190	Pyrene	2018/11/29	98	50 - 140	91	50 - 140	<0.020	ug/L	NC	40
9245190	Quinoline	2018/11/29	115	50 - 140	109	50 - 140	<0.020	ug/L	NC	40
9245243	EPH (C10-C19)	2018/11/28	106	60 - 140	102	70 - 130	<0.20	mg/L	NC	30
9245243	EPH (C19-C32)	2018/11/28	119	60 - 140	116	70 - 130	<0.20	mg/L	NC	30
9245329	Dissolved Aluminum (Al)	2018/11/28	102	80 - 120	101	80 - 120	<3.0	ug/L	9.7	20
9245329	Dissolved Antimony (Sb)	2018/11/28	98	80 - 120	98	80 - 120	<0.50	ug/L	0.57	20
9245329	Dissolved Arsenic (As)	2018/11/28	101	80 - 120	101	80 - 120	<0.10	ug/L	NC	20
9245329	Dissolved Barium (Ba)	2018/11/28	96	80 - 120	98	80 - 120	<1.0	ug/L	NC	20
9245329	Dissolved Beryllium (Be)	2018/11/28	94	80 - 120	96	80 - 120	<0.10	ug/L	NC	20
9245329	Dissolved Bismuth (Bi)	2018/11/28	95	80 - 120	99	80 - 120	<1.0	ug/L	NC	20
9245329	Dissolved Boron (B)	2018/11/28	92	80 - 120	95	80 - 120	<50	ug/L	4.3	20
9245329	Dissolved Cadmium (Cd)	2018/11/28	98	80 - 120	99	80 - 120	<0.010	ug/L	NC	20
9245329	Dissolved Chromium (Cr)	2018/11/28	95	80 - 120	99	80 - 120	<1.0	ug/L	NC	20
9245329	Dissolved Cobalt (Co)	2018/11/28	94	80 - 120	98	80 - 120	<0.20	ug/L	NC	20
9245329	Dissolved Copper (Cu)	2018/11/28	91	80 - 120	97	80 - 120	<0.20	ug/L	NC	20
9245329	Dissolved Iron (Fe)	2018/11/28	100	80 - 120	98	80 - 120	<5.0	ug/L	12	20
9245329	Dissolved Lead (Pb)	2018/11/28	98	80 - 120	101	80 - 120	<0.20	ug/L	NC	20
9245329	Dissolved Lithium (Li)	2018/11/28	95	80 - 120	99	80 - 120	<2.0	ug/L	NC	20
9245329	Dissolved Manganese (Mn)	2018/11/28	94	80 - 120	100	80 - 120	<1.0	ug/L	0.022	20

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Maxxam Job #: B8A3995
Report Date: 2018/12/03

QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9245329	Dissolved Molybdenum (Mo)	2018/11/28	NC	80 - 120	101	80 - 120	<1.0	ug/L	0.66	20
9245329	Dissolved Nickel (Ni)	2018/11/28	94	80 - 120	98	80 - 120	<1.0	ug/L	NC	20
9245329	Dissolved Selenium (Se)	2018/11/28	96	80 - 120	97	80 - 120	<0.10	ug/L	0.64	20
9245329	Dissolved Silicon (Si)	2018/11/28	NC	80 - 120	97	80 - 120	<100	ug/L	0.75	20
9245329	Dissolved Silver (Ag)	2018/11/28	95	80 - 120	98	80 - 120	<0.020	ug/L	NC	20
9245329	Dissolved Strontium (Sr)	2018/11/28	NC	80 - 120	100	80 - 120	<1.0	ug/L	0.42	20
9245329	Dissolved Thallium (Tl)	2018/11/28	101	80 - 120	100	80 - 120	<0.010	ug/L	NC	20
9245329	Dissolved Tin (Sn)	2018/11/28	98	80 - 120	97	80 - 120	<5.0	ug/L	NC	20
9245329	Dissolved Titanium (Ti)	2018/11/28	100	80 - 120	103	80 - 120	<5.0	ug/L	NC	20
9245329	Dissolved Uranium (U)	2018/11/28	100	80 - 120	100	80 - 120	<0.10	ug/L	0.37	20
9245329	Dissolved Vanadium (V)	2018/11/28	96	80 - 120	99	80 - 120	<5.0	ug/L	1.5	20
9245329	Dissolved Zinc (Zn)	2018/11/28	95	80 - 120	99	80 - 120	<5.0	ug/L	NC	20
9245329	Dissolved Zirconium (Zr)	2018/11/28	99	80 - 120	99	80 - 120	<0.10	ug/L	NC	20
9250775	Dissolved Mercury (Hg)	2018/12/03	81	80 - 120	98	80 - 120	<0.0020	ug/L	NC	20
9250881	Dissolved Mercury (Hg)	2018/12/03	92	80 - 120	90	80 - 120	<0.0020	ug/L	NC	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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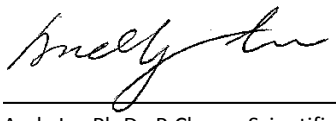
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Maxxam Job #: B8A3995
Report Date: 2018/12/03

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Andy Lu, Ph.D., P.Chem., Scientific Specialist



Jose Cueva, Supervisor, Organics-VOC & HC

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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City of Vancouver - FOI 2023-228 - Page 739 of 1003

KU2147 3

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A Bureau Veritas Group Company

CHAIN OF CUSTODY RECORD

BBY FCD-00077/07
Page 1 of 1

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #: B61898	☑ Regular TAT 5 days (Most analyses)
Contact Name: Nicole MacDonald	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: 13639-2C	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☐ 2 Days
Phone: (604) 430-0671	Phone:	Site #:	☐ 1 Day ☐ 3 Days
Email: nmacdonald@keystoneenviro.com	Email: smcbride@keystoneenviro.com	Sampled By: Stewart McBride	Date Required:

Regulatory Criteria	Special Instructions
☐ BC CSR Soil ☑ BC CSR Water	☐ Return Cooler
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)
☐ CCME (Specify) ☐ Other (Specify)	
☐ Drinking Water ☐ BC Water Quality	

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	BTEX / VPH	BTEX / F1	PAH	EPH	Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Chloride	TSS	pH	Nitrite	# OF CONTAINERS SUBMITTED
1	MW18-2	2018/11/27	11:25	Water	X		X		X	X							6
2	MW18-3		12:26		X		X		X	X							6
3	MW18-5		13:30		X		X		X	X							6
4	MW18-6		10:25				X		X	X							4
5	MW18-9		09:25		X		X		X	X							6
6	MW18-10		08:35				X		X	X							4
7																	
8																	
9																	
10																	

HOLD - DO NOT ANALYZE

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
N/A		8, 9, 5

COOLING MEDIA PRESENT (Y) / N

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Stewart McBride	2018/11/27	17:37	SHAN JALOB JOY	2018/11/27	17:40

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgement and acceptance of our terms which are available for viewing at:

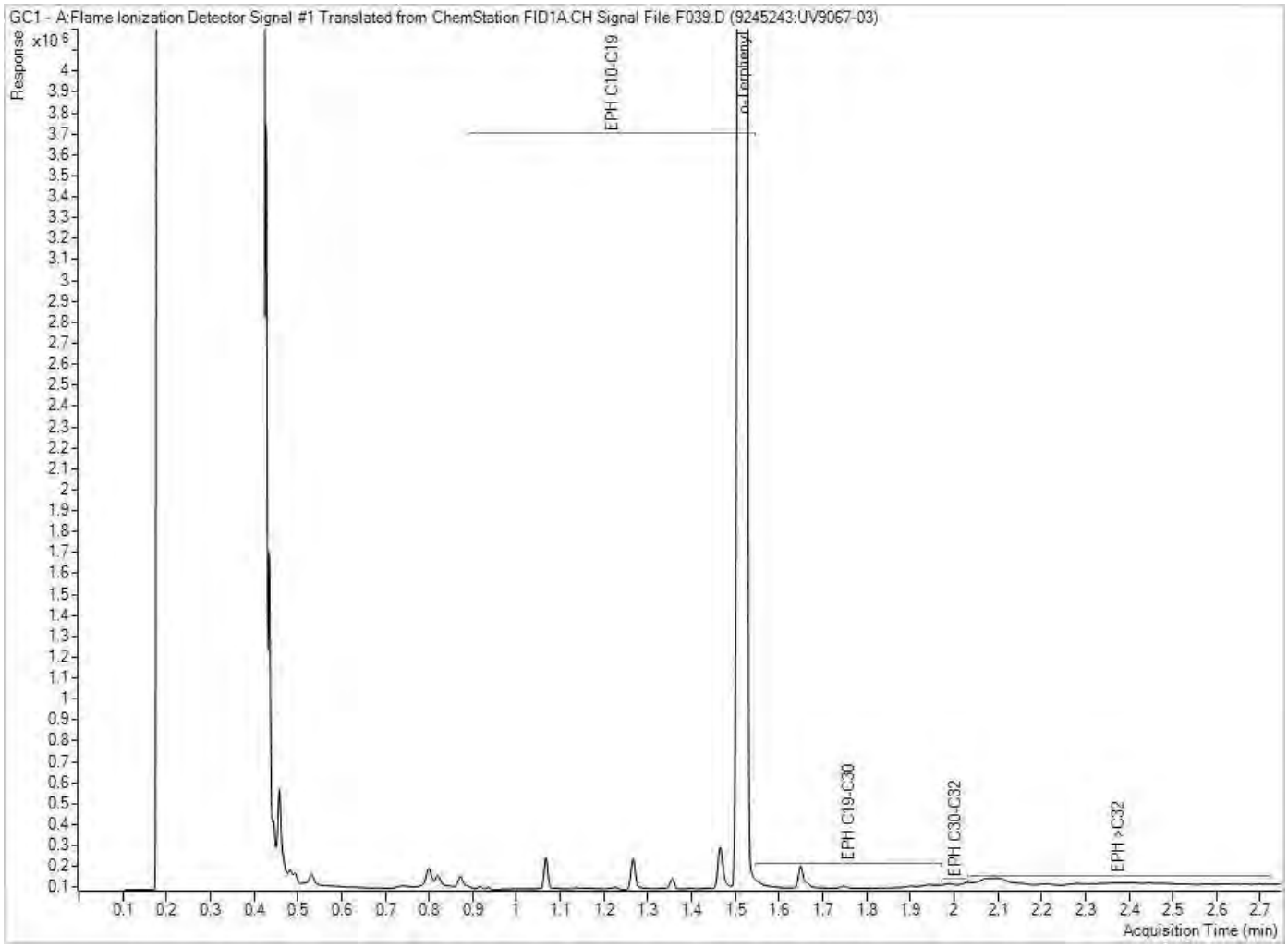
COC-1027 Keystone
287

B8A3995_COC

Maxxam Job #: B8A3995
Report Date: 2018/12/03
Maxxam Sample: UV9067

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Client ID: MW18-2

EPH in Water when PAH required Chromatogram



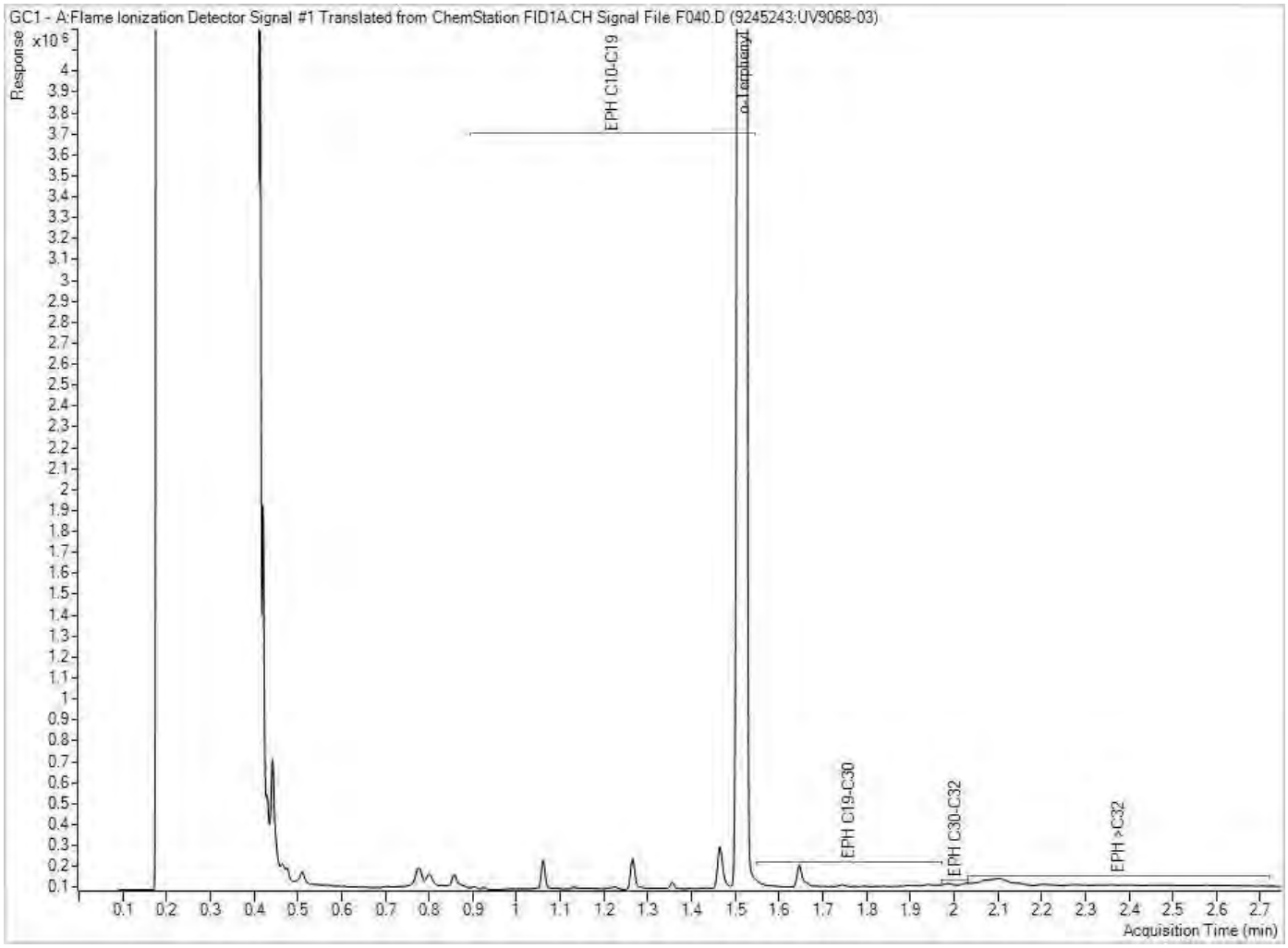
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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Maxxam Job #: B8A3995
Report Date: 2018/12/03
Maxxam Sample: UV9068

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Client ID: MW18-3

EPH in Water when PAH required Chromatogram



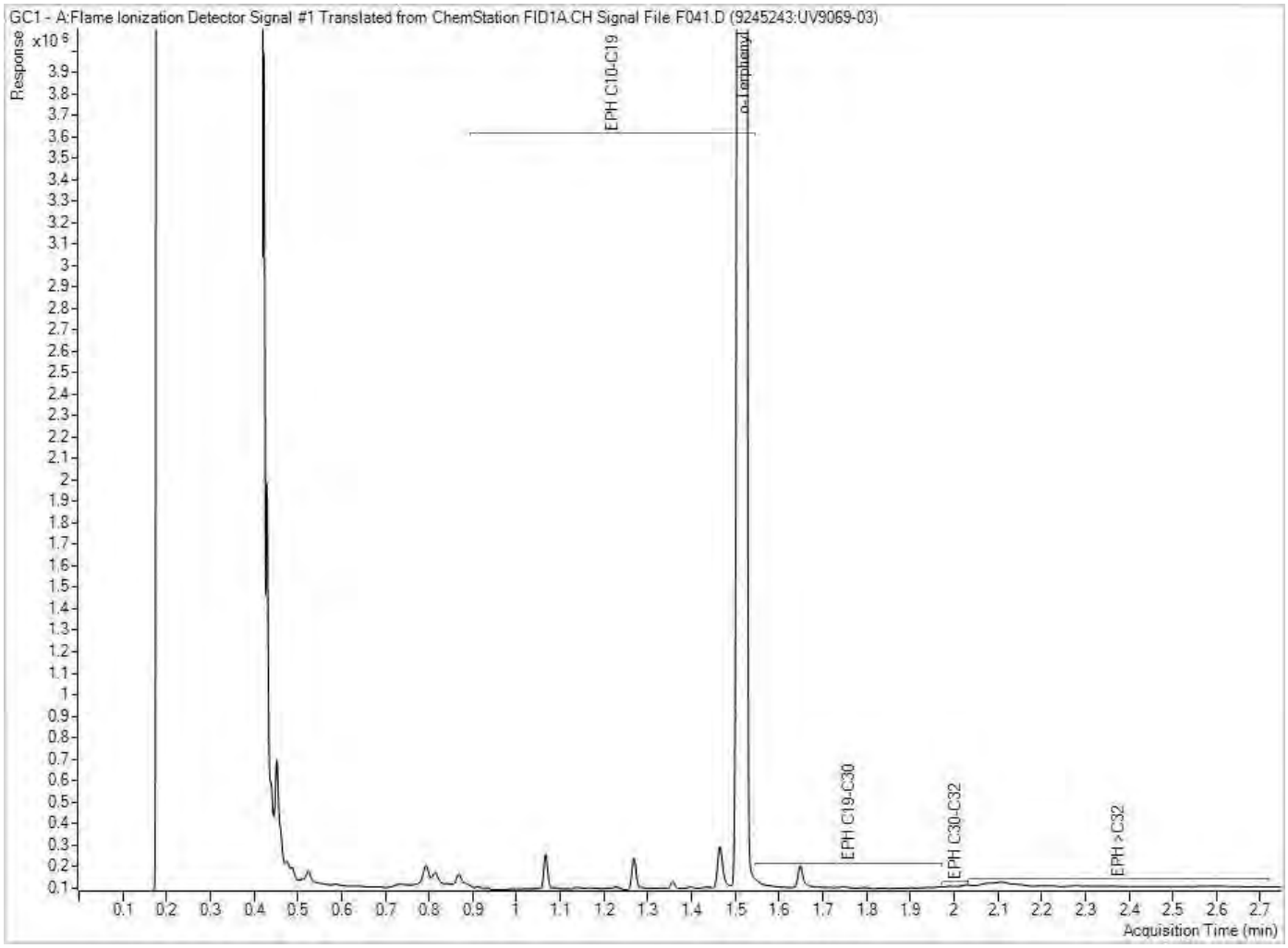
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Maxxam Job #: B8A3995
Report Date: 2018/12/03
Maxxam Sample: UV9069

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Client ID: MW18-5

EPH in Water when PAH required Chromatogram



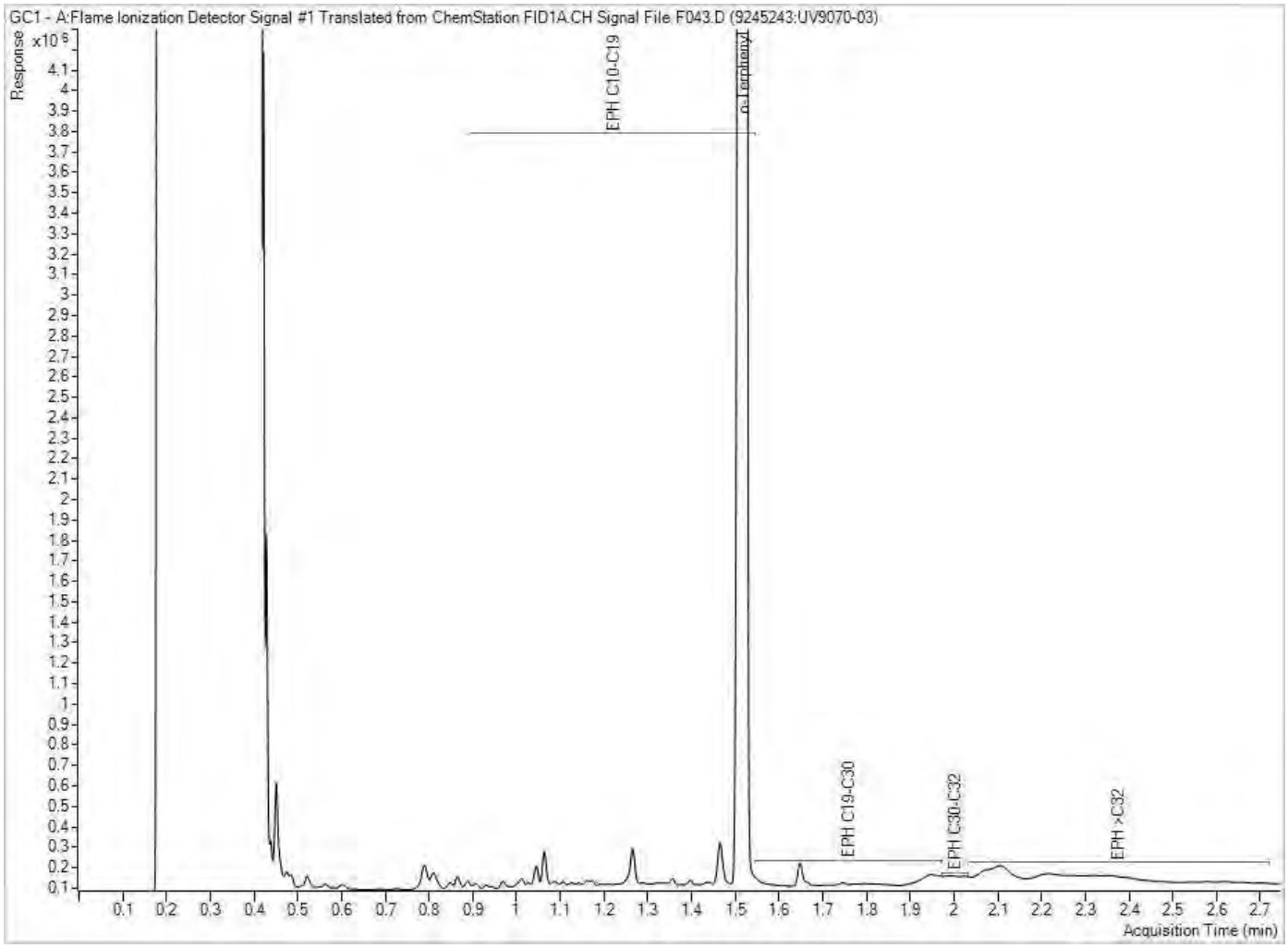
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Maxxam Job #: B8A3995
Report Date: 2018/12/03
Maxxam Sample: UV9070

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Client ID: MW18-6

EPH in Water when PAH required Chromatogram



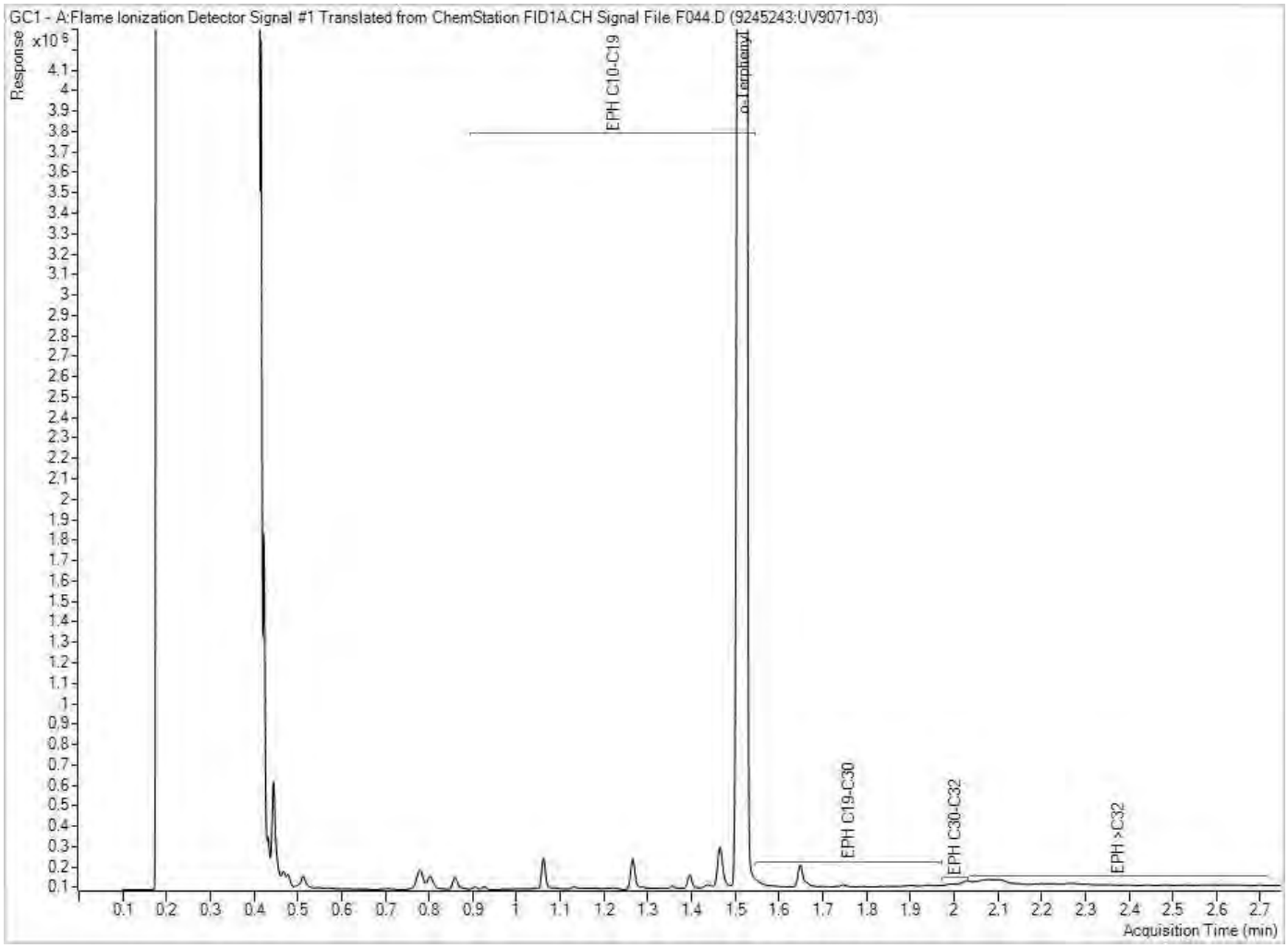
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Maxxam Job #: B8A3995
Report Date: 2018/12/03
Maxxam Sample: UV9071

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Client ID: MW18-9

EPH in Water when PAH required Chromatogram



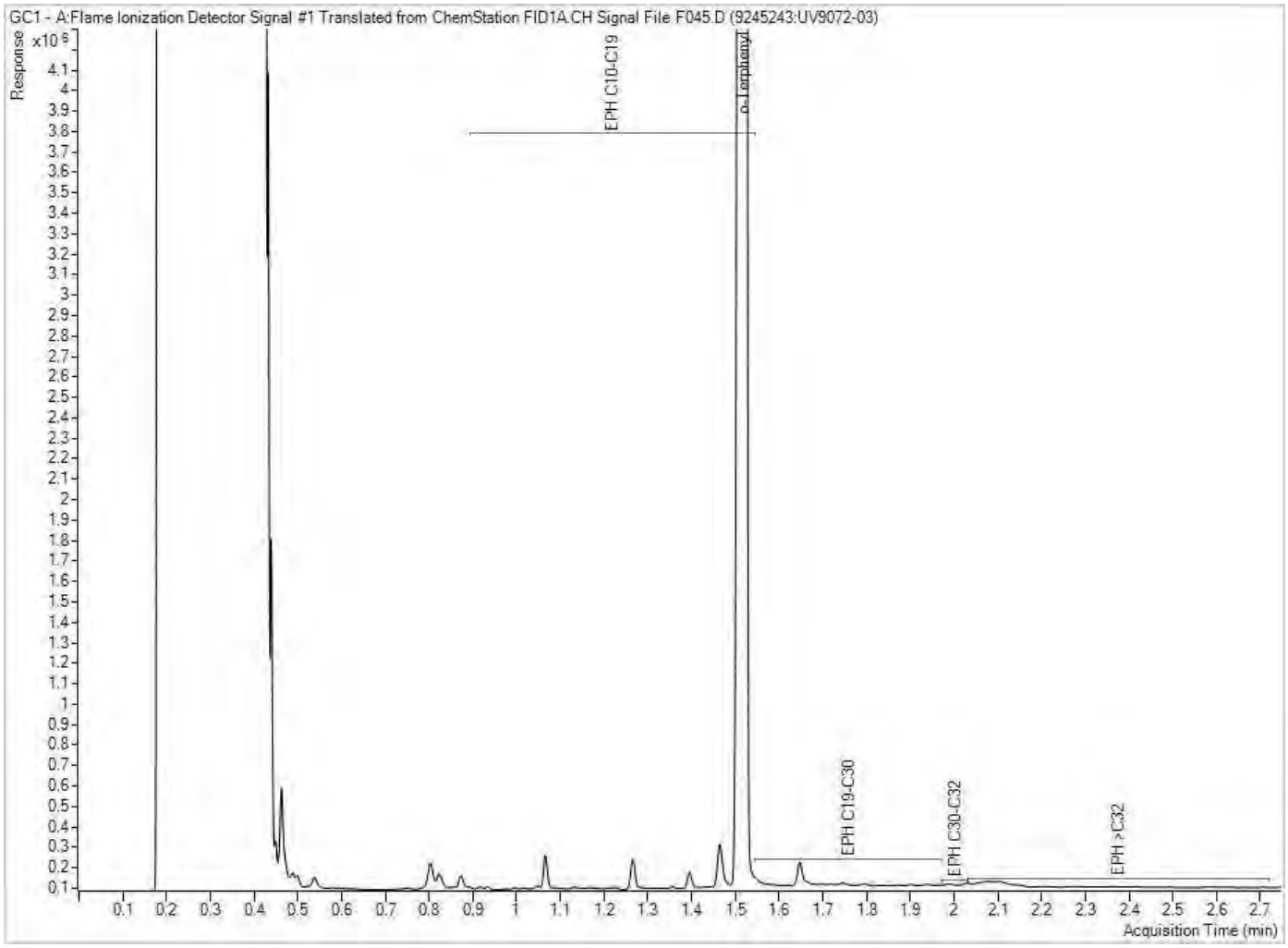
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Maxxam Job #: B8A3995
Report Date: 2018/12/03
Maxxam Sample: UV9072

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Client ID: MW18-10

EPH in Water when PAH required Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

City of Vancouver - FOI 2023-228 - Page 746 of 1003

Your Project #: 13639-2D
Your C.O.C. #: K021376

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/12/04
Report #: R2659584
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8A4415
Received: 2018/11/28, 16:31

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Hardness (calculated as CaCO3)	2	N/A	2018/11/29	BBY WI-00033	Auto Calc
Mercury (Dissolved) by CVAF	2	N/A	2018/12/03	BBY7SOP-00015	BCMOE BCLM Oct2013 m
EPH in Water when PAH required	2	2018/11/29	2018/11/29	BBY8SOP-00029	BCMOE BCLM Mar 2017
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	2	N/A	2018/11/29	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	2	N/A	2018/11/29	BBY7SOP-00002	EPA 6020b R2 m
PAH in Water by GC/MS (SIM)	1	2018/11/29	2018/11/29	BBY8SOP-00021	BCMOE BCLM Jul2017m
PAH in Water by GC/MS (SIM)	1	2018/11/29	2018/11/30	BBY8SOP-00021	BCMOE BCLM Jul2017m
Total LMW, HMW, Total PAH Calc (1)	1	N/A	2018/11/30	BBY WI-00033	Auto Calc
Total LMW, HMW, Total PAH Calc (1)	1	N/A	2018/12/03	BBY WI-00033	Auto Calc
Filter and HNO3 Preserve for Metals	2	N/A	2018/11/28	BBY7 WI-00004	BCMOE Reqs 08/14
EPH less PAH in Water by GC/FID (2)	1	N/A	2018/11/30	BBY WI-00033	Auto Calc
EPH less PAH in Water by GC/FID (2)	1	N/A	2018/12/03	BBY WI-00033	Auto Calc
Extra VOCs in Water by HS GC/MS	2	N/A	2018/12/03	BBY8SOP-00040	BCMOE BCLM Jul 2017m
VOCs, VH, F1, LH in Water by HS GC/MS	2	N/A	2018/12/01	BBY8SOP-00009/11/12	BCMOE BCLM Jul 2017
Volatile HC-BTEX (3)	2	N/A	2018/12/01	BBY WI-00033	Auto Calc

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your Project #: 13639-2D
Your C.O.C. #: K021376

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/12/04
Report #: R2659584
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8A4415
Received: 2018/11/28, 16:31

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Total PAHs in Water include: Quinoline, Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Acridine, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b&j)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, and Benzo(g,h,i)perylene.
(2) LEPH = EPH (C10 to C19) - (Acenaphthene + Acridine + Anthracene + Fluorene + Naphthalene + Phenanthrene)
HEPH = EPH (C19 to C32) - (Benzo(a)anthracene + Benzo(a)pyrene + Fluoranthene + Pyrene)
(3) VPH = VH - (Benzene + Toluene + Ethylbenzene + m & p-Xylene + o-Xylene + Styrene)

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Gail Pedersen, Project Manager –Environmental Customer Service
Email: gpedersen@maxxam.ca
Phone# (604) 734 7276

==========

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City of Vancouver - FOI 2023-228 - Page 748 of 1003

Maxxam Job #: B8A4415
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UW1101	UW1102	
Sampling Date		2018/11/28 09:20	2018/11/28 08:10	
COC Number		K021376	K021376	
	UNITS	**MW18-15**	**MW18-16**	**QC Batch**
Calculated Parameters				
Filter and HNO3 Preservation	N/A	FIELD	FIELD	ONSITE

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

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Maxxam Job #: B8A4415
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		UW1101	UW1101	UW1102		
Sampling Date		2018/11/28 09:20	2018/11/28 09:20	2018/11/28 08:10		
COC Number		K021376	K021376	K021376		
	UNITS	MW18-15	MW18-15 Lab-Dup	MW18-16	RDL	QC Batch
Volatiles						
2-Butanone (MEK)	ug/L	<50	<50	<50	50	9250627
4-Methyl-2-pentanone (MIBK)	ug/L	<10	<10	<10	10	9250627
Surrogate Recovery (%)						
1,4-Difluorobenzene (sur.)	%	100	93	103		9250627
4-Bromofluorobenzene (sur.)	%	99	99	96		9250627
D4-1,2-Dichloroethane (sur.)	%	96	90	95		9250627

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8A4415
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

LEPH & HEPH WITH CSR/CCME PAH IN WATER (WATER)

Maxxam ID		UW1101	UW1102		
Sampling Date		2018/11/28 09:20	2018/11/28 08:10		
COC Number		K021376	K021376		
	UNITS	MW18-15	MW18-16	RDL	QC Batch
Calculated Parameters					
Low Molecular Weight PAH`s	ug/L	<0.10	<0.10	0.10	9244673
High Molecular Weight PAH`s	ug/L	<0.050	<0.050	0.050	9244673
Total PAH	ug/L	<0.10	<0.10	0.10	9244673
Polycyclic Aromatics					
Quinoline	ug/L	<0.020	<0.020	0.020	9246169
Naphthalene	ug/L	<0.10	<0.10	0.10	9246169
1-Methylnaphthalene	ug/L	<0.050	<0.050	0.050	9246169
2-Methylnaphthalene	ug/L	<0.10	<0.10	0.10	9246169
Acenaphthylene	ug/L	<0.050	<0.050	0.050	9246169
Acenaphthene	ug/L	<0.050	<0.050	0.050	9246169
Fluorene	ug/L	<0.050	<0.050	0.050	9246169
Phenanthrene	ug/L	<0.050	<0.050	0.050	9246169
Anthracene	ug/L	<0.010	<0.010	0.010	9246169
Acridine	ug/L	<0.050	<0.050	0.050	9246169
Fluoranthene	ug/L	<0.020	<0.020	0.020	9246169
Pyrene	ug/L	<0.020	<0.020	0.020	9246169
Benzo(a)anthracene	ug/L	<0.010	<0.010	0.010	9246169
Chrysene	ug/L	<0.020	<0.020	0.020	9246169
Benzo(b&j)fluoranthene	ug/L	<0.030	<0.030	0.030	9246169
Benzo(k)fluoranthene	ug/L	<0.050	<0.050	0.050	9246169
Benzo(a)pyrene	ug/L	<0.0050	0.0093	0.0050	9246169
Indeno(1,2,3-cd)pyrene	ug/L	<0.050	<0.050	0.050	9246169
Dibenz(a,h)anthracene	ug/L	<0.0030	<0.0030	0.0030	9246169
Benzo(g,h,i)perylene	ug/L	<0.050	<0.050	0.050	9246169
Calculated Parameters					
LEPH (C10-C19 less PAH)	mg/L	<0.20	<0.20	0.20	9244674
HEPH (C19-C32 less PAH)	mg/L	<0.20	<0.20	0.20	9244674
Ext. Pet. Hydrocarbon					
EPH (C10-C19)	mg/L	<0.20	<0.20	0.20	9246194
EPH (C19-C32)	mg/L	<0.20	<0.20	0.20	9246194
Surrogate Recovery (%)					
O-TERPHENYL (sur.)	%	103	100		9246194
RDL = Reportable Detection Limit					

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Maxxam Job #: B8A4415
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

LEPH & HEPH WITH CSR/CCME PAH IN WATER (WATER)

Maxxam ID		UW1101	UW1102		
Sampling Date		2018/11/28 09:20	2018/11/28 08:10		
COC Number		K021376	K021376		
	UNITS	MW18-15	MW18-16	RDL	QC Batch
D10-ANTHRACENE (sur.)	%	102	98		9246169
D8-ACENAPHTHYLENE (sur.)	%	100	96		9246169
D8-NAPHTHALENE (sur.)	%	90	85		9246169
TERPHENYL-D14 (sur.)	%	90	87		9246169
RDL = Reportable Detection Limit					

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Maxxam Job #: B8A4415
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR DISSOLVED METALS IN WATER WITH CV HG (WATER)

Maxxam ID		UW1101			UW1101			UW1102		
Sampling Date		2018/11/28 09:20			2018/11/28 09:20			2018/11/28 08:10		
COC Number		K021376			K021376			K021376		
	UNITS	MW18-15	RDL	QC Batch	MW18-15 Lab-Dup	RDL	QC Batch	MW18-16	RDL	QC Batch
Calculated Parameters										
Dissolved Hardness (CaCO3)	mg/L	91.4	0.50	9244561				606	0.50	9244561
Elements										
Dissolved Mercury (Hg)	ug/L	<0.0020	0.0020	9251227				0.0023	0.0020	9251227
Dissolved Metals by ICPMS										
Dissolved Aluminum (Al)	ug/L	13.8	3.0	9245990	13.9	3.0	9245990	53.2	6.0	9245990
Dissolved Antimony (Sb)	ug/L	<0.50	0.50	9245990	<0.50	0.50	9245990	<1.0	1.0	9245990
Dissolved Arsenic (As)	ug/L	0.29	0.10	9245990	0.28	0.10	9245990	1.38	0.20	9245990
Dissolved Barium (Ba)	ug/L	15.3	1.0	9245990	15.0	1.0	9245990	111	2.0	9245990
Dissolved Beryllium (Be)	ug/L	<0.10	0.10	9245990	<0.10	0.10	9245990	<0.20	0.20	9245990
Dissolved Bismuth (Bi)	ug/L	<1.0	1.0	9245990	<1.0	1.0	9245990	<2.0	2.0	9245990
Dissolved Boron (B)	ug/L	<50	50	9245990	<50	50	9245990	146	100	9245990
Dissolved Cadmium (Cd)	ug/L	0.110	0.010	9245990	0.114	0.010	9245990	0.088	0.020	9245990
Dissolved Chromium (Cr)	ug/L	<1.0	1.0	9245990	<1.0	1.0	9245990	<2.0	2.0	9245990
Dissolved Cobalt (Co)	ug/L	1.99	0.20	9245990	2.05	0.20	9245990	10.0	0.40	9245990
Dissolved Copper (Cu)	ug/L	1.01	0.20	9245990	1.10	0.20	9245990	1.40	0.40	9245990
Dissolved Iron (Fe)	ug/L	6.0	5.0	9245990	6.2	5.0	9245990	3980	10	9245990
Dissolved Lead (Pb)	ug/L	<0.20	0.20	9245990	<0.20	0.20	9245990	<0.40	0.40	9245990
Dissolved Lithium (Li)	ug/L	<2.0	2.0	9245990	<2.0	2.0	9245990	8.7	4.0	9245990
Dissolved Manganese (Mn)	ug/L	190	1.0	9245990	194	1.0	9245990	2520	2.0	9245990
Dissolved Molybdenum (Mo)	ug/L	<1.0	1.0	9245990	<1.0	1.0	9245990	<2.0	2.0	9245990
Dissolved Nickel (Ni)	ug/L	7.3	1.0	9245990	7.7	1.0	9245990	15.5	2.0	9245990
Dissolved Selenium (Se)	ug/L	0.14	0.10	9245990	0.12	0.10	9245990	1.49	0.20	9245990
Dissolved Silicon (Si)	ug/L	8710	100	9245990	8710	100	9245990	7900	200	9245990
Dissolved Silver (Ag)	ug/L	<0.020	0.020	9245990	<0.020	0.020	9245990	<0.040	0.040	9245990
Dissolved Strontium (Sr)	ug/L	178	1.0	9245990	181	1.0	9245990	684	2.0	9245990
Dissolved Thallium (Tl)	ug/L	0.018	0.010	9245990	0.019	0.010	9245990	0.110	0.020	9245990
Dissolved Tin (Sn)	ug/L	<5.0	5.0	9245990	<5.0	5.0	9245990	<10	10	9245990
Dissolved Titanium (Ti)	ug/L	<5.0	5.0	9245990	<5.0	5.0	9245990	<10	10	9245990
Dissolved Uranium (U)	ug/L	<0.10	0.10	9245990	<0.10	0.10	9245990	5.10	0.20	9245990
Dissolved Vanadium (V)	ug/L	<5.0	5.0	9245990	<5.0	5.0	9245990	<10	10	9245990
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	9245990	<5.0	5.0	9245990	<10	10	9245990

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8A4415
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR DISSOLVED METALS IN WATER WITH CV HG (WATER)

Maxxam ID		UW1101			UW1101			UW1102		
Sampling Date		2018/11/28 09:20			2018/11/28 09:20			2018/11/28 08:10		
COC Number		K021376			K021376			K021376		
	UNITS	**MW18-15**	**RDL**	**QC Batch**	**MW18-15 Lab-Dup**	**RDL**	**QC Batch**	**MW18-16**	**RDL**	**QC Batch**
Dissolved Zirconium (Zr)	ug/L	<0.10	0.10	9245990	<0.10	0.10	9245990	0.66	0.20	9245990
Dissolved Calcium (Ca)	mg/L	28.2	0.050	9244671				203	0.10	9244671
Dissolved Magnesium (Mg)	mg/L	5.12	0.050	9244671				24.0	0.10	9244671
Dissolved Potassium (K)	mg/L	1.32	0.050	9244671				9.71	0.10	9244671
Dissolved Sulphur (S)	mg/L	6.1	3.0	9244671				81.7	6.0	9244671

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8A4415
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR VOC + VPH IN WATER (WATER)

Maxxam ID		UW1101	UW1102		
Sampling Date		2018/11/28 09:20	2018/11/28 08:10		
COC Number		K021376	K021376		
	UNITS	MW18-15	MW18-16	RDL	QC Batch
Calculated Parameters					
VPH (VHW6 to 10 - BTEX)	ug/L	<300	<300	300	9244676
Volatiles					
VH C6-C10	ug/L	<300	<300	300	9247002
1,1,1,2-tetrachloroethane	ug/L	<0.50	<0.50	0.50	9247002
1,1,1-trichloroethane	ug/L	<0.50	<0.50	0.50	9247002
1,1,2,2-tetrachloroethane	ug/L	<0.50	<0.50	0.50	9247002
1,1,2Trichloro-1,2,2Trifluoroethane	ug/L	<2.0	<2.0	2.0	9247002
1,1,2-trichloroethane	ug/L	<0.50	<0.50	0.50	9247002
1,1-dichloroethane	ug/L	<0.50	<0.50	0.50	9247002
1,1-dichloroethene	ug/L	<0.50	<0.50	0.50	9247002
1,2-dibromoethane	ug/L	<0.20	<0.20	0.20	9247002
1,2-dichlorobenzene	ug/L	<0.50	<0.50	0.50	9247002
1,2-dichloroethane	ug/L	<0.50	<0.50	0.50	9247002
1,2-dichloropropane	ug/L	<0.50	<0.50	0.50	9247002
1,3-Butadiene	ug/L	<0.50	<0.50	0.50	9247002
1,3-dichlorobenzene	ug/L	<0.50	<0.50	0.50	9247002
1,4-dichlorobenzene	ug/L	<0.50	<0.50	0.50	9247002
Benzene	ug/L	<0.40	<0.40	0.40	9247002
Bromobenzene	ug/L	<2.0	<2.0	2.0	9247002
Bromodichloromethane	ug/L	<1.0	<1.0	1.0	9247002
Bromoform	ug/L	<1.0	<1.0	1.0	9247002
Bromomethane	ug/L	<1.0	<1.0	1.0	9247002
Carbon tetrachloride	ug/L	<0.50	<0.50	0.50	9247002
Chlorobenzene	ug/L	<0.50	<0.50	0.50	9247002
Chlorodibromomethane	ug/L	<1.0	<1.0	1.0	9247002
Chloroethane	ug/L	<1.0	<1.0	1.0	9247002
Chloroform	ug/L	<1.0	<1.0	1.0	9247002
Chloromethane	ug/L	<1.0	<1.0	1.0	9247002
cis-1,2-dichloroethene	ug/L	<1.0	<1.0	1.0	9247002
cis-1,3-dichloropropene	ug/L	<1.0	<1.0	1.0	9247002
Dibromomethane	ug/L	<0.90	<0.90	0.90	9247002
Dichlorodifluoromethane	ug/L	<2.0	<2.0	2.0	9247002
RDL = Reportable Detection Limit					

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KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR VOC + VPH IN WATER (WATER)

Maxxam ID		UW1101	UW1102		
Sampling Date		2018/11/28 09:20	2018/11/28 08:10		
COC Number		K021376	K021376		
	UNITS	MW18-15	MW18-16	RDL	QC Batch
Dichloromethane	ug/L	<2.0	<2.0	2.0	9247002
Ethylbenzene	ug/L	<0.40	<0.40	0.40	9247002
Styrene	ug/L	<0.50	<0.50	0.50	9247002
Tetrachloroethene	ug/L	<0.50	<0.50	0.50	9247002
Toluene	ug/L	<0.40	<0.40	0.40	9247002
trans-1,2-dichloroethene	ug/L	<1.0	<1.0	1.0	9247002
trans-1,3-dichloropropene	ug/L	<1.0	<1.0	1.0	9247002
Trichloroethene	ug/L	<0.50	<0.50	0.50	9247002
Trichlorofluoromethane	ug/L	<4.0	<4.0	4.0	9247002
Vinyl chloride	ug/L	<0.50	<0.50	0.50	9247002
m & p-Xylene	ug/L	<0.40	<0.40	0.40	9247002
o-Xylene	ug/L	<0.40	<0.40	0.40	9247002
Xylenes (Total)	ug/L	<0.40	<0.40	0.40	9247002
Surrogate Recovery (%)					
1,4-Difluorobenzene (sur.)	%	98	98		9247002
4-Bromofluorobenzene (sur.)	%	89	92		9247002
D4-1,2-Dichloroethane (sur.)	%	115	119		9247002
RDL = Reportable Detection Limit					

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KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	6.7°C

CSR DISSOLVED METALS IN WATER WITH CV HG (WATER) Comments

Sample UW1102 [MW18-16] Elements by CRC ICPMS (dissolved): RDL raised due to concentration over linear range, sample dilution required.

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

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Maxxam Job #: B8A4415
Report Date: 2018/12/04

QUALITY ASSURANCE REPORT

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9246169	D10-ANTHRACENE (sur.)	2018/11/29	98	50 - 140	97	50 - 140	96	%		
9246169	D8-ACENAPHTHYLENE (sur.)	2018/11/29	98	50 - 140	95	50 - 140	94	%		
9246169	D8-NAPHTHALENE (sur.)	2018/11/29	86	50 - 140	86	50 - 140	85	%		
9246169	TERPHENYL-D14 (sur.)	2018/11/29	91	50 - 140	86	50 - 140	86	%		
9246194	O-TERPHENYL (sur.)	2018/11/29	99	60 - 140	97	60 - 140	101	%		
9247002	1,4-Difluorobenzene (sur.)	2018/11/30	99	50 - 140	99	50 - 140	98	%		
9247002	4-Bromofluorobenzene (sur.)	2018/11/30	108	50 - 140	107	50 - 140	94	%		
9247002	D4-1,2-Dichloroethane (sur.)	2018/11/30	110	50 - 140	109	50 - 140	110	%		
9250627	1,4-Difluorobenzene (sur.)	2018/12/03	98	50 - 140	100	50 - 140	96	%		
9250627	4-Bromofluorobenzene (sur.)	2018/12/03	99	50 - 140	97	50 - 140	98	%		
9250627	D4-1,2-Dichloroethane (sur.)	2018/12/03	95	50 - 140	90	50 - 140	93	%		
9245990	Dissolved Aluminum (Al)	2018/11/29	100	80 - 120	103	80 - 120	<3.0	ug/L	0.12	20
9245990	Dissolved Antimony (Sb)	2018/11/29	100	80 - 120	103	80 - 120	<0.50	ug/L	NC	20
9245990	Dissolved Arsenic (As)	2018/11/29	98	80 - 120	100	80 - 120	<0.10	ug/L	0.49	20
9245990	Dissolved Barium (Ba)	2018/11/29	96	80 - 120	101	80 - 120	<1.0	ug/L	1.9	20
9245990	Dissolved Beryllium (Be)	2018/11/29	90	80 - 120	92	80 - 120	<0.10	ug/L	NC	20
9245990	Dissolved Bismuth (Bi)	2018/11/29	99	80 - 120	104	80 - 120	<1.0	ug/L	NC	20
9245990	Dissolved Boron (B)	2018/11/29	89	80 - 120	91	80 - 120	<50	ug/L	NC	20
9245990	Dissolved Cadmium (Cd)	2018/11/29	100	80 - 120	102	80 - 120	<0.010	ug/L	3.3	20
9245990	Dissolved Chromium (Cr)	2018/11/29	100	80 - 120	103	80 - 120	<1.0	ug/L	NC	20
9245990	Dissolved Cobalt (Co)	2018/11/29	100	80 - 120	104	80 - 120	<0.20	ug/L	2.7	20
9245990	Dissolved Copper (Cu)	2018/11/29	99	80 - 120	104	80 - 120	<0.20	ug/L	8.1	20
9245990	Dissolved Iron (Fe)	2018/11/29	99	80 - 120	103	80 - 120	<5.0	ug/L	2.7	20
9245990	Dissolved Lead (Pb)	2018/11/29	100	80 - 120	104	80 - 120	<0.20	ug/L	NC	20
9245990	Dissolved Lithium (Li)	2018/11/29	89	80 - 120	93	80 - 120	<2.0	ug/L	NC	20
9245990	Dissolved Manganese (Mn)	2018/11/29	NC	80 - 120	105	80 - 120	<1.0	ug/L	1.9	20
9245990	Dissolved Molybdenum (Mo)	2018/11/29	104	80 - 120	102	80 - 120	<1.0	ug/L	NC	20
9245990	Dissolved Nickel (Ni)	2018/11/29	102	80 - 120	104	80 - 120	<1.0	ug/L	5.1	20
9245990	Dissolved Selenium (Se)	2018/11/29	97	80 - 120	97	80 - 120	<0.10	ug/L	13	20
9245990	Dissolved Silicon (Si)	2018/11/29	NC	80 - 120	102	80 - 120	<100	ug/L	0.048	20
9245990	Dissolved Silver (Ag)	2018/11/29	98	80 - 120	101	80 - 120	<0.020	ug/L	NC	20

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QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9245990	Dissolved Strontium (Sr)	2018/11/29	NC	80 - 120	98	80 - 120	<1.0	ug/L	1.4	20
9245990	Dissolved Thallium (Tl)	2018/11/29	98	80 - 120	103	80 - 120	<0.010	ug/L	4.9	20
9245990	Dissolved Tin (Sn)	2018/11/29	98	80 - 120	101	80 - 120	<5.0	ug/L	NC	20
9245990	Dissolved Titanium (Ti)	2018/11/29	98	80 - 120	103	80 - 120	<5.0	ug/L	NC	20
9245990	Dissolved Uranium (U)	2018/11/29	102	80 - 120	103	80 - 120	<0.10	ug/L	NC	20
9245990	Dissolved Vanadium (V)	2018/11/29	100	80 - 120	103	80 - 120	<5.0	ug/L	NC	20
9245990	Dissolved Zinc (Zn)	2018/11/29	103	80 - 120	108	80 - 120	<5.0	ug/L	NC	20
9245990	Dissolved Zirconium (Zr)	2018/11/29	99	80 - 120	100	80 - 120	<0.10	ug/L	NC	20
9246169	1-Methylnaphthalene	2018/11/29	96	50 - 140	101	50 - 140	<0.050	ug/L	3.2	40
9246169	2-Methylnaphthalene	2018/11/29	93	50 - 140	99	50 - 140	<0.10	ug/L	1.7	40
9246169	Acenaphthene	2018/11/29	101	50 - 140	98	50 - 140	<0.050	ug/L	NC	40
9246169	Acenaphthylene	2018/11/29	100	50 - 140	99	50 - 140	<0.050	ug/L	NC	40
9246169	Acridine	2018/11/29	100	50 - 140	106	50 - 140	<0.050	ug/L	NC	40
9246169	Anthracene	2018/11/29	63	50 - 140	98	50 - 140	<0.010	ug/L	NC	40
9246169	Benzo(a)anthracene	2018/11/29	96	50 - 140	96	50 - 140	<0.010	ug/L	NC	40
9246169	Benzo(a)pyrene	2018/11/29	99	50 - 140	100	50 - 140	<0.0050	ug/L	NC	40
9246169	Benzo(b&j)fluoranthene	2018/11/29	97	50 - 140	100	50 - 140	<0.030	ug/L	NC	40
9246169	Benzo(g,h,i)perylene	2018/11/29	112	50 - 140	116	50 - 140	<0.050	ug/L	NC	40
9246169	Benzo(k)fluoranthene	2018/11/29	100	50 - 140	104	50 - 140	<0.050	ug/L	NC	40
9246169	Chrysene	2018/11/29	96	50 - 140	96	50 - 140	<0.020	ug/L	NC	40
9246169	Dibenz(a,h)anthracene	2018/11/29	111	50 - 140	112	50 - 140	<0.0030	ug/L	NC	40
9246169	Fluoranthene	2018/11/29	91	50 - 140	87	50 - 140	<0.020	ug/L	NC	40
9246169	Fluorene	2018/11/29	98	50 - 140	98	50 - 140	<0.050	ug/L	NC	40
9246169	Indeno(1,2,3-cd)pyrene	2018/11/29	106	50 - 140	109	50 - 140	<0.050	ug/L	NC	40
9246169	Naphthalene	2018/11/29	91	50 - 140	99	50 - 140	<0.10	ug/L	1.2	40
9246169	Phenanthrene	2018/11/29	93	50 - 140	97	50 - 140	<0.050	ug/L	NC	40
9246169	Pyrene	2018/11/29	89	50 - 140	86	50 - 140	<0.020	ug/L	NC	40
9246169	Quinoline	2018/11/29	117	50 - 140	119	50 - 140	<0.020	ug/L	NC	40
9246194	EPH (C10-C19)	2018/11/29	121	60 - 140	95	70 - 130	<0.20	mg/L	11	30
9246194	EPH (C19-C32)	2018/11/29	108	60 - 140	104	70 - 130	<0.20	mg/L	NC	30
9247002	1,1,1,2-tetrachloroethane	2018/11/30	118	50 - 140	114	60 - 130	<0.50	ug/L	NC	30

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Maxxam Job #: B8A4415
Report Date: 2018/12/04

QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9247002	1,1,1-trichloroethane	2018/11/30	117	50 - 140	109	60 - 130	<0.50	ug/L	NC	30
9247002	1,1,2,2-tetrachloroethane	2018/11/30	129	50 - 140	128	60 - 130	<0.50	ug/L	NC	30
9247002	1,1,2Trichloro-1,2,2Trifluoroethane	2018/11/30	119	50 - 140	110	60 - 130	<2.0	ug/L	NC	30
9247002	1,1,2-trichloroethane	2018/11/30	126	50 - 140	124	60 - 130	<0.50	ug/L	NC	30
9247002	1,1-dichloroethane	2018/11/30	120	50 - 140	112	60 - 130	<0.50	ug/L	NC	30
9247002	1,1-dichloroethene	2018/11/30	117	50 - 140	108	60 - 130	<0.50	ug/L	NC	30
9247002	1,2-dibromoethane	2018/11/30	128	50 - 140	126	60 - 130	<0.20	ug/L	NC	30
9247002	1,2-dichlorobenzene	2018/11/30	130	50 - 140	124	60 - 130	<0.50	ug/L	NC	30
9247002	1,2-dichloroethane	2018/11/30	124	50 - 140	120	60 - 130	<0.50	ug/L	NC	30
9247002	1,2-dichloropropane	2018/11/30	126	50 - 140	120	60 - 130	<0.50	ug/L	NC	30
9247002	1,3-Butadiene	2018/11/30	95	50 - 140	88	60 - 130	<0.50	ug/L		
9247002	1,3-dichlorobenzene	2018/11/30	127	50 - 140	118	60 - 130	<0.50	ug/L	NC	30
9247002	1,4-dichlorobenzene	2018/11/30	130	50 - 140	121	60 - 130	<0.50	ug/L	NC	30
9247002	Benzene	2018/11/30	118	50 - 140	112	60 - 130	<0.40	ug/L	NC	30
9247002	Bromobenzene	2018/11/30	121	50 - 140	116	60 - 130	<2.0	ug/L		
9247002	Bromodichloromethane	2018/11/30	120	50 - 140	116	60 - 130	<1.0	ug/L	NC	30
9247002	Bromoform	2018/11/30	124	50 - 140	130	60 - 130	<1.0	ug/L	NC	30
9247002	Bromomethane	2018/11/30	118	50 - 140	110	60 - 130	<1.0	ug/L	NC	30
9247002	Carbon tetrachloride	2018/11/30	117	50 - 140	108	60 - 130	<0.50	ug/L	NC	30
9247002	Chlorobenzene	2018/11/30	114	50 - 140	112	60 - 130	<0.50	ug/L	NC	30
9247002	Chlorodibromomethane	2018/11/30	119	50 - 140	117	60 - 130	<1.0	ug/L	NC	30
9247002	Chloroethane	2018/11/30	104	50 - 140	84	60 - 130	<1.0	ug/L	NC	30
9247002	Chloroform	2018/11/30	117	50 - 140	110	60 - 130	<1.0	ug/L	NC	30
9247002	Chloromethane	2018/11/30	129	50 - 140	117	60 - 130	<1.0	ug/L	NC	30
9247002	cis-1,2-dichloroethene	2018/11/30	117	50 - 140	111	60 - 130	<1.0	ug/L	NC	30
9247002	cis-1,3-dichloropropene	2018/11/30	104	50 - 140	103	50 - 140	<1.0	ug/L	NC	30
9247002	Dibromomethane	2018/11/30	125	50 - 140	121	60 - 130	<0.90	ug/L		
9247002	Dichlorodifluoromethane	2018/11/30	133	50 - 140	123	60 - 130	<2.0	ug/L	NC	30
9247002	Dichloromethane	2018/11/30	120	50 - 140	114	60 - 130	<2.0	ug/L	NC	30
9247002	Ethylbenzene	2018/11/30	112	50 - 140	108	60 - 130	<0.40	ug/L	NC	30
9247002	m & p-Xylene	2018/11/30	121	50 - 140	115	60 - 130	<0.40	ug/L	NC	30

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Maxxam Job #: B8A4415
Report Date: 2018/12/04

QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9247002	o-Xylene	2018/11/30	119	50 - 140	115	60 - 130	<0.40	ug/L	NC	30
9247002	Styrene	2018/11/30	101	50 - 140	100	60 - 130	<0.50	ug/L	NC	30
9247002	Tetrachloroethene	2018/11/30	117	50 - 140	108	60 - 130	<0.50	ug/L	NC	30
9247002	Toluene	2018/11/30	114	50 - 140	111	60 - 130	<0.40	ug/L	NC	30
9247002	trans-1,2-dichloroethene	2018/11/30	114	50 - 140	104	60 - 130	<1.0	ug/L	NC	30
9247002	trans-1,3-dichloropropene	2018/11/30	104	50 - 140	105	50 - 140	<1.0	ug/L	NC	30
9247002	Trichloroethene	2018/11/30	117	50 - 140	107	60 - 130	<0.50	ug/L	NC	30
9247002	Trichlorofluoromethane	2018/11/30	118	50 - 140	79	60 - 130	<4.0	ug/L	NC	30
9247002	VH C6-C10	2018/11/30			104	60 - 130	<300	ug/L	NC	30
9247002	Vinyl chloride	2018/11/30	115	50 - 140	104	60 - 130	<0.50	ug/L	NC	30
9247002	Xylenes (Total)	2018/11/30					<0.40	ug/L	NC	30
9250627	2-Butanone (MEK)	2018/12/03	123	50 - 140	113	50 - 140	<50	ug/L	NC	30
9250627	4-Methyl-2-pentanone (MIBK)	2018/12/03	125	50 - 140	112	50 - 140	<10	ug/L	NC	30
9251227	Dissolved Mercury (Hg)	2018/12/03	85	80 - 120	90	80 - 120	<0.0020	ug/L	NC	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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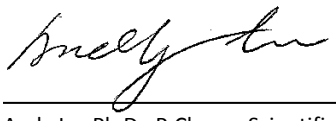
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Maxxam Job #: B8A4415
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Andy Lu, Ph.D., P.Chem., Scientific Specialist



Jose Cueva, Supervisor, Organics-VOC & HC

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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K021376

Maxxam
A Bureau Veritas Group Company

CHAIN OF CUSTODY RECORD

BBY FCD-00077/07
Page 1 of 1

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #: B61898	☑ Regular TAT 5 days (Most analyses)
Contact Name: Nicole MacDonald	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: 13639-210	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☐ 2 Days
Phone: (604) 430-0671	Phone:	Site #:	☐ 1 Day ☐ 3 Days
Email: nmacdonald@keystoneenviro.com	Email: smcbride@keystoneenviro.com	Sampled By: Stewart McBride	Date Required:

Regulatory Criteria	Special Instructions
☐ BC CSR Soil ☑ BC CSR Water	☐ Return Cooler
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)
☐ CCME (Specify) ☐ Other (Specify)	
☐ Drinking Water ☐ BC Water Quality	

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested: VOC / BTEXS / VPH - MTBE; VOC / BTEX / F1; LEPH/HEPH/PAH; F2 - F4 TEH; Preserved?; Preserved?; Field Preserved?; Field Preserved?; Sulphate; COD; Alkalinity; Ammonia; BTEXS / VPH; BTEX / F1; PAH; EPH; Filtered?; Filtered?; Dissolved Metals; Dissolved Mercury; Total Metals; Total Mercury; Chloride; Fluoride; TDS; BOD; Conductivity; Nitrate; pH; Nitrite; # OF CONTAINERS SUBMITTED; HOLD - DO NOT ANALYZE

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# OF CONTAINERS SUBMITTED
1	MW18-15	2018/11/28	09:20	water	6
2	MW18-16	↓	08:10	↓	6
3					
4					
5					
6					
7					
8					
9					
10					

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
N/A		6.7.7

COOLING MEDIA PRESENT ☐ Y / ☐ N

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Stewart McBride	2018/11/28	16:28	Pedro Tack	2018/11/28	16:31

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms which are available for viewing at

COC-1027 Keystone 378

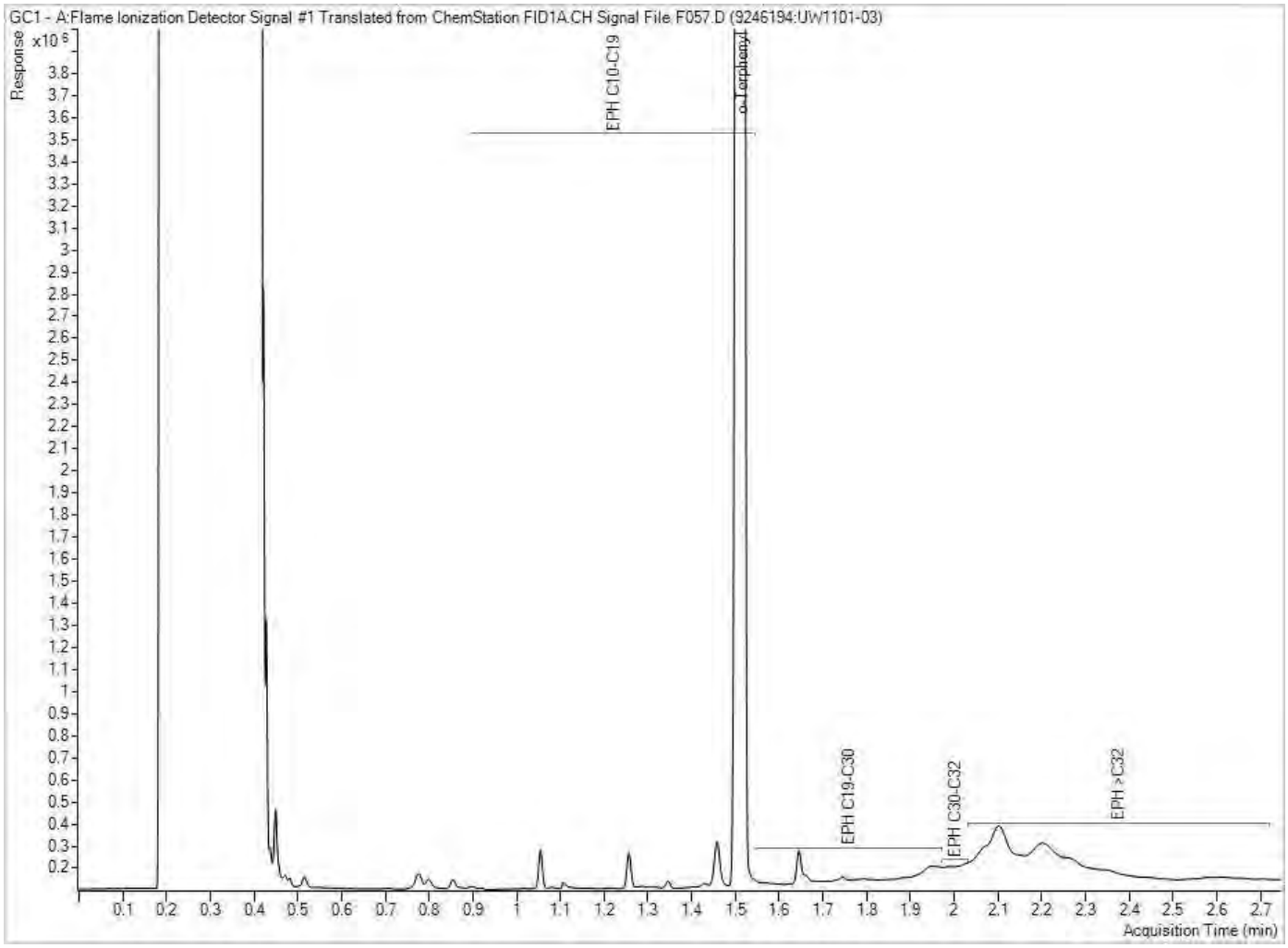
B8A4415_COC

City of Vancouver - FOI 2023-228 - Page 763 of 1003

Maxxam Job #: B8A4415
Report Date: 2018/12/04
Maxxam Sample: UW1101

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-15

EPH in Water when PAH required Chromatogram



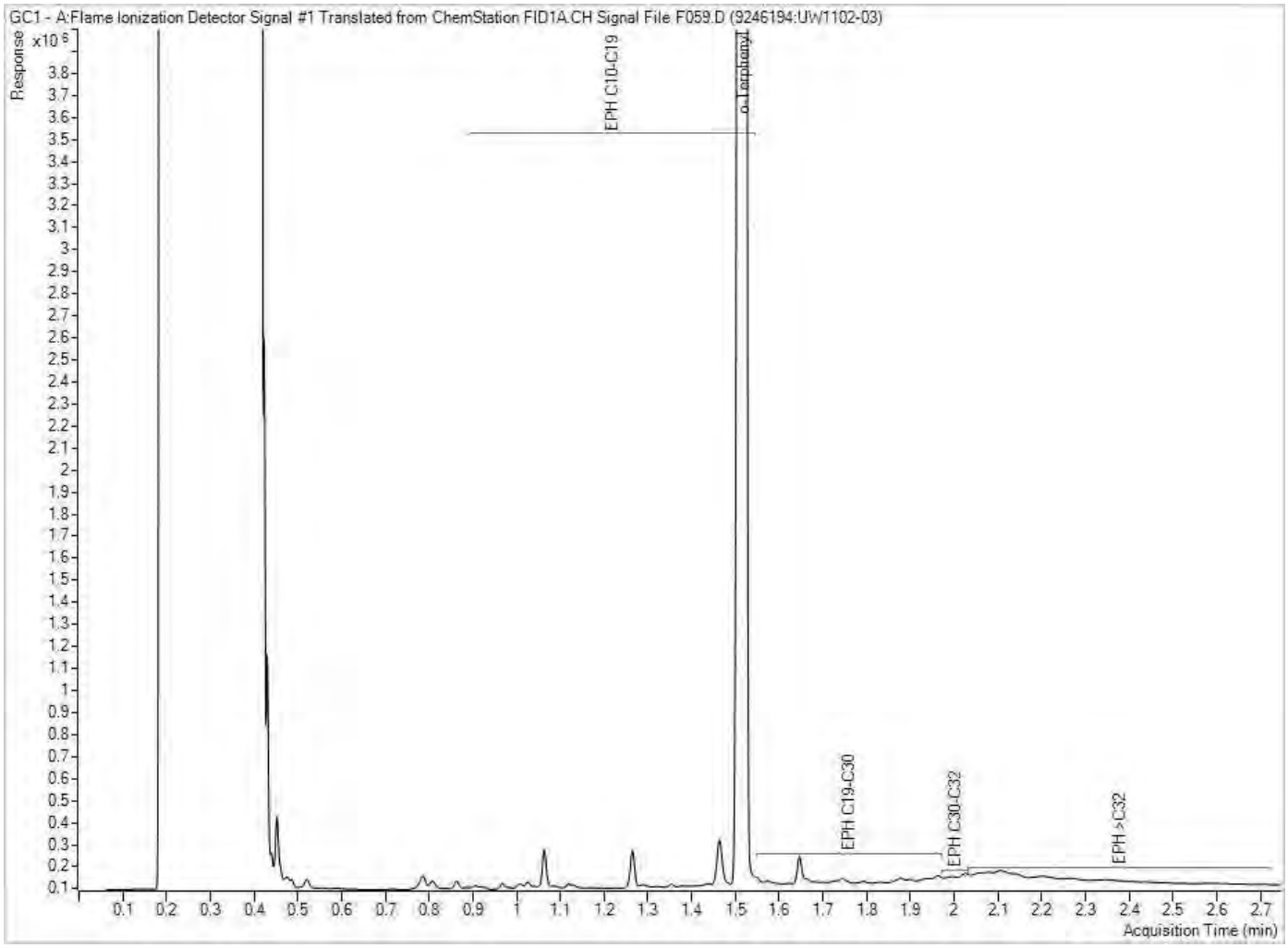
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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Maxxam Job #: B8A4415
Report Date: 2018/12/04
Maxxam Sample: UW1102

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Client ID: MW18-16

EPH in Water when PAH required Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

City of Vancouver - FOI 2023-228 - Page 765 of 1003

Your Project #: 13639-2C
Your C.O.C. #: k021504

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/12/17
Report #: R2664918
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8A9208
Received: 2018/12/14, 11:10

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Hardness (calculated as CaCO3)	2	N/A	2018/12/17	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	2	N/A	2018/12/15	BBY7SOP-00002	EPA 6020b R2 m
Filter and HNO3 Preserve for Metals	2	N/A	2018/12/14	BBY7 WI-00004	BCMOE Reqs 08/14

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Gail Pedersen, Project Manager – Environmental Customer Service
Email: gpedersen@maxxam.ca

Your Project #: 13639-2C
Your C.O.C. #: k021504

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/12/17
Report #: R2664918
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8A9208
Received: 2018/12/14, 11:10
Phone# (604) 734 7276

==========

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Maxxam Job #: B8A9208
Report Date: 2018/12/17

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UY6235	UY6236	
Sampling Date		2018/12/14 10:00	2018/12/14 08:51	
COC Number		k021504	k021504	
	UNITS	**MW18-2**	**MW18-3**	**QC Batch**
Calculated Parameters				
Filter and HNO3 Preservation	N/A	FIELD	FIELD	ONSITE

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City of Vancouver - FOI 2023-228 - Page 768 of 1003

Maxxam Job #: B8A9208
Report Date: 2018/12/17

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

CSR DISSOLVED METALS (NO CV-HG) IN WATER

Maxxam ID		UY6235	UY6236		
Sampling Date		2018/12/14 10:00	2018/12/14 08:51		
COC Number		k021504	k021504		
	UNITS	MW18-2	MW18-3	RDL	QC Batch
Calculated Parameters					
Dissolved Hardness (CaCO3)	mg/L	86.8	152	0.50	9266239
Dissolved Metals by ICPMS					
Dissolved Vanadium (V)	ug/L	12.2	8.1	5.0	9266062
RDL = Reportable Detection Limit					

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B8A9208
Report Date: 2018/12/17

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	8.3°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

City of Vancouver - FOI 2023-228 - Page 770 of 1003

Maxxam Job #: B8A9208
Report Date: 2018/12/17

QUALITY ASSURANCE REPORT

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9266062	Dissolved Vanadium (V)	2018/12/15	91	80 - 120	100	80 - 120	<5.0	ug/L	NC	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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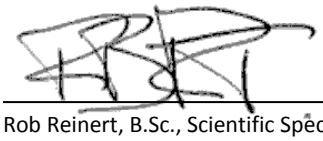
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Maxxam Job #: B8A9208
Report Date: 2018/12/17

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Rob Reinert, B.Sc., Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

City of Vancouver - FOI 2023-228 - Page 772 of 1003

K021504

Maxxam
A Bureau Veritas Group Company

CHAIN OF CUSTODY RECORD

BBY FCD-00077/07
Page 1 of 1

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #: BG1898	☐ Regular TAT 5 days (Most analyses)
Contact Name: Nicole MacDonald	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: 13639-2C	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☑ 2 Days
Phone: (604) 430-0671	Phone:	Site #:	☐ 1 Day ☐ 3 Days
Email: nmacdonald@keystoneenviro.com	Email: smcbride@keystoneenviro.com	Sampled By: Stewart McBride	Date Required:

Regulatory Criteria	Special Instructions	Rush Confirmation #:
☐ BC CSR Soil ☑ BC CSR Water ☐ YK CSR Soil ☐ YK CSR Water ☐ CCME (Specify) ☐ Other (Specify) ☐ Drinking Water ☐ BC Water Quality	☐ Return Cooler ☐ Ship Sample Bottles (Please Specify)	

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	BTEXS / VPH	VOC / BTEX / F1	PAH	EPH	Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Chloride	TSS	pH	Nitrite	Dissolved Vanadium	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE
1	MW18-2	2018/12/14	10:00	Water													X	1	
2	MW18-3	"	08:51	"													X	1	
3	~~FB~~																		
4																			
5																			
6																			
7																			
8																			
9																			
10																			

LABORATORY USE ONLY		
CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
N	N	6, 9, 10

COOLING MEDIA PRESENT (Y) / N

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Stewart McBride	2018/12/14	11:10	BRITTANY BURLONE	2018/12/14	11:10

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms which are available for viewing at

B8A9208_COC

COC-1027 Keystone

1255

Your Project #: 13639-2D
Your C.O.C. #: k021446

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/12/18
Report #: R2665695
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8A9205
Received: 2018/12/14, 11:10

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/MTBE LH, VH, F1 SIM/MS	1	N/A	2018/12/14	BBY8SOP-00010/11/12	BCMOE BCLM Jul 2017
PAH in Water by GC/MS (SIM)	1	2018/12/17	2018/12/17	BBY8SOP-00021	BCMOE BCLM Jul2017m
Volatile HC-BTEX (1)	1	N/A	2018/12/15	BBY WI-00033	Auto Calc

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) VPH = VH - (Benzene + Toluene + Ethylbenzene + m & p-Xylene + o-Xylene + Styrene)

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Gail Pedersen, Project Manager – Environmental Customer Service

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your Project #: 13639-2D
Your C.O.C. #: k021446

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/12/18
Report #: R2665695
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8A9205
Received: 2018/12/14, 11:10
Email: gpedersen@maxxam.ca
Phone# (604) 734 7276
==========

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City of Vancouver - FOI 2023-228 - Page 775 of 1003

Maxxam Job #: B8A9205
Report Date: 2018/12/18

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

SEMIVOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		UY6224		
Sampling Date		2018/12/14 10:53		
COC Number		k021446		
	UNITS	**MW18-14**	**RDL**	**QC Batch**
Polycyclic Aromatics				
Benzo(a)pyrene	ug/L	<0.0050	0.0050	9267745
Surrogate Recovery (%)				
D10-ANTHRACENE (sur.)	%	93		9267745
D8-ACENAPHTHYLENE (sur.)	%	89		9267745
D8-NAPHTHALENE (sur.)	%	86		9267745
TERPHENYL-D14 (sur.)	%	96		9267745
RDL = Reportable Detection Limit				

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City of Vancouver - FOI 2023-228 - Page 776 of 1003

Maxxam Job #: B8A9205
Report Date: 2018/12/18

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

CSR BTEX/VPH IN WATER (WATER)

Maxxam ID		UY6224		
Sampling Date		2018/12/14 10:53		
COC Number		k021446		
	UNITS	**MW18-14**	**RDL**	**QC Batch**
Calculated Parameters				
VPH (VHW6 to 10 - BTEX)	ug/L	<300	300	9266334
Volatiles				
Methyl-tert-butylether (MTBE)	ug/L	<4.0	4.0	9266429
Benzene	ug/L	<0.40	0.40	9266429
Toluene	ug/L	<0.40	0.40	9266429
Ethylbenzene	ug/L	<0.40	0.40	9266429
m & p-Xylene	ug/L	<0.40	0.40	9266429
o-Xylene	ug/L	<0.40	0.40	9266429
Styrene	ug/L	<0.40	0.40	9266429
Xylenes (Total)	ug/L	<0.40	0.40	9266429
VH C6-C10	ug/L	<300	300	9266429
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	103		9266429
4-Bromofluorobenzene (sur.)	%	101		9266429
D4-1,2-Dichloroethane (sur.)	%	106		9266429
RDL = Reportable Detection Limit				

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Maxxam Job #: B8A9205
Report Date: 2018/12/18

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	8.3°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

City of Vancouver - FOI 2023-228 - Page 778 of 1003

Maxxam Job #: B8A9205
Report Date: 2018/12/18

QUALITY ASSURANCE REPORT

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9266429	1,4-Difluorobenzene (sur.)	2018/12/14	97	70 - 130	103	70 - 130	109	%		
9266429	4-Bromofluorobenzene (sur.)	2018/12/14	100	70 - 130	98	70 - 130	97	%		
9266429	D4-1,2-Dichloroethane (sur.)	2018/12/14	97	70 - 130	94	70 - 130	107	%		
9267745	D10-ANTHRACENE (sur.)	2018/12/17	91	50 - 140	93	50 - 140	92	%		
9267745	D8-ACENAPHTHYLENE (sur.)	2018/12/17	88	50 - 140	88	50 - 140	87	%		
9267745	D8-NAPHTHALENE (sur.)	2018/12/17	85	50 - 140	88	50 - 140	86	%		
9267745	TERPHENYL-D14 (sur.)	2018/12/17	103	50 - 140	105	50 - 140	97	%		
9266429	Benzene	2018/12/14	103	70 - 130	93	70 - 130	<0.40	ug/L	2.8	30
9266429	Ethylbenzene	2018/12/14	105	70 - 130	98	70 - 130	<0.40	ug/L	0.78	30
9266429	m & p-Xylene	2018/12/14	98	70 - 130	94	70 - 130	<0.40	ug/L	1.3	30
9266429	Methyl-tert-butylether (MTBE)	2018/12/14	108	70 - 130	100	70 - 130	<4.0	ug/L	NC	30
9266429	o-Xylene	2018/12/14	101	70 - 130	96	70 - 130	<0.40	ug/L	0.67	30
9266429	Styrene	2018/12/14	101	70 - 130	94	70 - 130	<0.40	ug/L	NC	30
9266429	Toluene	2018/12/14	95	70 - 130	91	70 - 130	<0.40	ug/L	0.52	30
9266429	VH C6-C10	2018/12/14			99	70 - 130	<300	ug/L	11	30
9266429	Xylenes (Total)	2018/12/14					<0.40	ug/L	1.0	30
9267745	Benzo(a)pyrene	2018/12/17	93	50 - 140	95	50 - 140	<0.0050	ug/L	NC	40

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

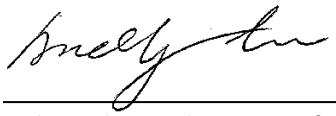
Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B8A9205
Report Date: 2018/12/18

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Andy Lu, Ph.D., P.Chem., Scientific Specialist

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City of Vancouver - FOI 2023-228 - Page 780 of 1003

K 021446

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CHAIN OF CUSTODY RECORD

BBY FCD-00077/07

Page 1 of 1

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #: B61898	☐ Regular TAT 5 days (Most analyses)
Contact Name: Nicole MacDonald	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: 13639-20	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☑ 2 Days
Phone: (604) 430-0671	Phone:	Site #:	☐ 1 Day ☐ 3 Days
Email: nmacdonald@keystoneenviro.com	Email: smcbride@keystoneenviro.com	Sampled By: Stewart McBride	Date Required:

Regulatory Criteria	Special Instructions
☐ BC CSR Soil ☑ BC CSR Water	☐ Return Cooler
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)
☐ CCME (Specify) ☐ Other (Specify)	
☐ Drinking Water ☐ BC Water Quality	

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Rush Confirmation #:

LABORATORY USE ONLY

Custody Seal Y / N		Cooler Temperatures
Present	Intact	
N	N	6, 9, 10

Cooling Media Present: Y / N

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	BTEXS / VPH	VOC / BTEX / F1	PAH	EPH	Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Chloride	TSS	pH	Nitrite	Benzo(a)pyrene	# of Containers Submitted	Hold - Do Not Analyze	Comments
1	MW18-14	2018/12/14	10:53	Water	X												X	4		
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Analysis Requested: MTBE; VOC / BTEXS / VPH; VOC / BTEX / F1; LEPH/HEPH/PAH; F2 - F4; TEH; Preserved?; Filtered?; Preserved?; Filtered?; Field Preserved?; Field Preserved?; Sulphate; Fluoride; COD; BOD; TDS; Alkalinity; Conductivity; Ammonia; Nitrate; Nitrite

Relinquished By: (Signature/Print)	Date: (YYYY/MM/DD)	Time: (HH:MM)	Received By: (Signature/Print)	Date: (YYYY/MM/DD)	Time: (HH:MM)
Stewart McBride	2018/12/14	11:16	BRITTANY BURLONE	2018/12/14	11:10

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms which are available for viewing

B8A9205_COC

COC-1027 Keystone

1256

City of Vancouver - FOI 2023-228 - Page 781 of 1003

Your Project #: 13639-2D
Your C.O.C. #: k021177

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/12/21
Report #: R2667568
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8B0362
Received: 2018/12/19, 11:10

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
PAH in Water by GC/MS (SIM)	1	2018/12/20	2018/12/21	BBY8SOP-00021	BCMOE BCLM Jul2017m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Gail Pedersen, Project Manager – Environmental Customer Service
Email: gpedersen@maxxam.ca
Phone# (604) 734 7276

==========

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City of Vancouver - FOI 2023-228 - Page 782 of 1003

Your Project #: 13639-2D
Your C.O.C. #: k021177

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/12/21
Report #: R2667568
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8B0362
Received: 2018/12/19, 11:10

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City of Vancouver - FOI 2023-228 - Page 783 of 1003

Maxxam Job #: B8B0362
Report Date: 2018/12/21

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

SEMIVOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		UZ2004		
Sampling Date		2018/12/19 11:00		
COC Number		k021177		
	UNITS	**MW18-14**	**RDL**	**QC Batch**
Polycyclic Aromatics				
Benzo(a)pyrene	ug/L	<0.0050	0.0050	9272381
Surrogate Recovery (%)				
D10-ANTHRACENE (sur.)	%	93		9272381
D8-ACENAPHTHYLENE (sur.)	%	99		9272381
D8-NAPHTHALENE (sur.)	%	86		9272381
TERPHENYL-D14 (sur.)	%	105		9272381
RDL = Reportable Detection Limit				

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

City of Vancouver - FOI 2023-228 - Page 784 of 1003

Maxxam Job #: B8B0362
Report Date: 2018/12/21

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	7.0°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

City of Vancouver - FOI 2023-228 - Page 785 of 1003

Maxxam Job #: B8B0362
Report Date: 2018/12/21

QUALITY ASSURANCE REPORT

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9272381	D10-ANTHRACENE (sur.)	2018/12/21	91	50 - 140	94	50 - 140	93	%		
9272381	D8-ACENAPHTHYLENE (sur.)	2018/12/21	97	50 - 140	101	50 - 140	99	%		
9272381	D8-NAPHTHALENE (sur.)	2018/12/21	77	50 - 140	89	50 - 140	81	%		
9272381	TERPHENYL-D14 (sur.)	2018/12/21	102	50 - 140	109	50 - 140	105	%		
9272381	Benzo(a)pyrene	2018/12/21	89	50 - 140	92	50 - 140	<0.0050	ug/L	NC	40

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

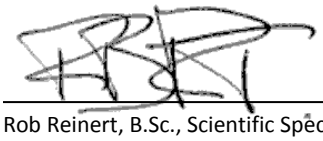
City of Vancouver - FOI 2023-228 - Page 786 of 1003

Maxxam Job #: B8B0362
Report Date: 2018/12/21

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Rob Reinert, B.Sc., Scientific Specialist

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Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

City of Vancouver - FOI 2023-228 - Page 787 of 1003

KU21111

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A Bureau Veritas Group Company

CHAIN OF CUSTODY RECORD

BBY FCD-00077/07

Page 1 of 1

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #: B61898	☐ Regular TAT 5 days (Most analyses)
Contact Name: Nicole MacDonald	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: B639-20	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☐ 2 Days
Phone: (604) 430-0671	Phone:	Site #:	☐ 1 Day ☑ 3 Days
Email: nmacdonald@keystoneenviro.com	Email: smcbride@keystoneenviro.com	Sampled By: Stewart McBride	Date Required:

Regulatory Criteria	Special Instructions
☐ BC CSR Soil ☑ BC CSR Water	☐ Return Cooler
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)
☐ CCME (Specify) ☐ Other (Specify)	
☐ Drinking Water ☐ BC Water Quality	

Rush Confirmation #:

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	BTEX/VPH	BTEX/F1	PAH	EPH	Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Chloride	TSS	pH	Nitrite	X Benzo(a)pyrene	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE
1	MW18-14	2018/12/19	~~11:10~~ 11:30	Water													X	2	
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Analysis Requested: MTBE; VOC/BTEX/VPH; VOC/BTEX/F1; LEPH/HEPH/PAH; F2-F4; TEH; Preserved?; Filtered?; Dissolved Metals; Preserved?; Filtered?; Dissolved Mercury; Field Preserved?; Total Metals; Field Preserved?; Total Mercury; Sulphate; Fluoride; COD; BOD; TDS; Chloride; Alkalinity; Conductivity; Ammonia; Nitrate; Nitrite; pH; TSS

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
N	N	7.6.8

COOLING MEDIA PRESENT (Y) / N

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Stewart McBride	2018/12/19	11:10	BRITTANY BURLONE	2018/12/19	11:10

B8B0362_COC

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COC-1027 Keystone

1497

Your Project #: 13639-2C
Your C.O.C. #: k020975

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/12/21
Report #: R2667516
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8B0365
Received: 2018/12/19, 11:10

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Hardness (calculated as CaCO3)	2	N/A	2018/12/21	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	2	N/A	2018/12/21	BBY7SOP-00002	EPA 6020b R2 m
Filter and HNO3 Preserve for Metals	2	N/A	2018/12/19	BBY7 WI-00004	BCMOE Reqs 08/14

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Gail Pedersen, Project Manager – Environmental Customer Service
Email: gpedersen@maxxam.ca

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

City of Vancouver - FOI 2023-228 - Page 789 of 1003

Your Project #: 13639-2C
Your C.O.C. #: k020975

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/12/21
Report #: R2667516
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8B0365
Received: 2018/12/19, 11:10
Phone# (604) 734 7276

==========

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City of Vancouver - FOI 2023-228 - Page 790 of 1003

Maxxam Job #: B8B0365
Report Date: 2018/12/21

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UZ2012	UZ2013	
Sampling Date		2018/12/19 09:58	2018/12/19 09:03	
COC Number		k020975	k020975	
	UNITS	**MW18-2**	**MW18-3**	**QC Batch**
Calculated Parameters				
Filter and HNO3 Preservation	N/A	FIELD	FIELD	ONSITE

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B8B0365
Report Date: 2018/12/21

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

CSR DISSOLVED METALS (NO CV-HG) IN WATER

Maxxam ID		UZ2012			UZ2012			UZ2013		
Sampling Date		2018/12/19 09:58			2018/12/19 09:58			2018/12/19 09:03		
COC Number		k020975			k020975			k020975		
	UNITS	MW18-2	RDL	QC Batch	MW18-2 Lab-Dup	RDL	QC Batch	MW18-3	RDL	QC Batch
Calculated Parameters										
Dissolved Hardness (CaCO3)	mg/L	72.2	0.50	9270527				127	0.50	9270527
Dissolved Metals by ICPMS										
Dissolved Vanadium (V)	ug/L	10.6	5.0	9272308	10.4	5.0	9272308	<5.0	5.0	9272308

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B8B0365
Report Date: 2018/12/21

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	7.0°C

Results relate only to the items tested.

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City of Vancouver - FOI 2023-228 - Page 793 of 1003

Maxxam Job #: B8B0365
Report Date: 2018/12/21

QUALITY ASSURANCE REPORT

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9272308	Dissolved Vanadium (V)	2018/12/21	102	80 - 120	101	80 - 120	<5.0	ug/L	1.1	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

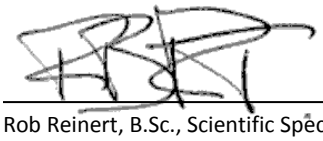
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Maxxam Job #: B8B0365
Report Date: 2018/12/21

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Rob Reinert, B.Sc., Scientific Specialist

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City of Vancouver - FOI 2023-228 - Page 795 of 1003

K 020975

Maxxam
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CHAIN OF CUSTODY RECORD

BBY FCD-00077/07
Page 1 of

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

Invoice Information		Report Information (if differs from invoice)		Project Information (where applicable)		Turnaround Time (TAT) Required
Company Name:	3763 - Keystone Environmental Ltd.	Company Name:		Quotation #:	B61898	☐ Regular TAT 5 days (Most analyses)
Contact Name:	Nicole MacDonald	Contact Name:		P.O. #/ AFE#:		PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address:	#320 - 4400 Dominion Street	Address:		Project #:	13639-2C	Rush TAT (Surcharges will be applied)
	Burnaby, BC PC: V5G 4G3		PC:	Site Location:		☐ Same Day ☐ 2 Days
Phone:	(604) 430-0671	Phone:		Site #:		☐ 1 Day ☑ 3 Days
Email:	nmacdonald@keystoneenviro.com	Email:	smcbride@keystoneenviro.com	Sampled By:	Stewart McBride	Date Required:

Regulatory Criteria		Special Instructions
☐ BC CSR Soil	☑ BC CSR Water	☐ Return Cooler
☐ YK CSR Soil	☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)
☐ CCME (Specify)	☐ Other (Specify)	
☐ Drinking Water	☐ BC Water Quality	

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	BTEXS / VPH	BTEX / F1	PAH	EPH	Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Chloride	TSS	pH	Nitrite	Dissolved Vanadium				# OF CONTAINERS SUBMITTED
1	MW18-2	2018/12/19	09:58	Water													X				1
2	MW18-3	2018/12/19	09:03	Water													X				1
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					

Analysis Requested: MTBE; VOC / BTEXS / VPH; VOC / BTEX / F1; LEPH/HEPH/PAH; F2 - F4; TEH; Preserved?; Filtered?; Preserved?; Filtered?; Field Preserved?; Field Preserved?; Sulphate; Fluoride; COD; BOD; TDS; Alkalinity; Conductivity; Ammonia; Nitrate; Dissolved Vanadium

HOLD - DO NOT ANALYZE

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
N	N	7, 6, 8

COOLING MEDIA PRESENT (Y) / N

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Stewart McBride	2018/12/19	11:10	BRITTANY BURLONE	2018/12/19	11:10

B8B0365_COC

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COC-1027 Keystone

Your Project #: 13639-2C
Your C.O.C. #: 571441-10-01

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/12/04
Report #: R2659710
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8A4803
Received: 2018/11/29, 15:05

Sample Matrix: Air
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
VOCs by TD – Complete List Calc (ug/m3)	6	N/A	2018/12/04	BBY WI-00033	Auto Calc
VOCs by TD Tube – Complete List (ug)	4	N/A	2018/11/29	BBY8SOP-00058	BCMOE BCLM Jun2009 m
VOCs by TD Tube – Complete List (ug)	2	N/A	2018/11/30	BBY8SOP-00058	BCMOE BCLM Jun2009 m
Duration	6	N/A	2018/12/04	N/A	Field Data
Flow Rate (L/min)	6	N/A	2018/12/04	N/A	Field Data
Volatile HC-BTEX Calculation for Air (1)	6	N/A	2018/12/03	BBY WI-00033	Auto Calc

Remarks:

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) VPH = VH - (Benzene + Toluene + Ethylbenzene + m & p-Xylene + o-Xylene + Styrene + n-Hexane + n-Decane)

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your Project #: 13639-2C
Your C.O.C. #: 571441-10-01

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/12/04
Report #: R2659710
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8A4803
Received: 2018/11/29, 15:05

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Gail Pedersen, Project Manager –Environmental Customer Service
Email: gpedersen@maxxam.ca
Phone# (604) 734 7276
==========
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City of Vancouver - FOI 2023-228 - Page 798 of 1003

Maxxam Job #: B8A4803
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

VOC/VPH PLUS PACKAGE IN AIR BY TD (AIR)

Maxxam ID		UW2943	UW2944	UW2945	UW2946	UW2947		
Sampling Date		2018/11/29 10:55	2018/11/29 09:46	2018/11/29 08:55	2018/11/29 10:18	2018/11/29 08:17		
COC Number		571441-10-01	571441-10-01	571441-10-01	571441-10-01	571441-10-01		
	UNITS	SV18-2	SV18-3	SV18-5	SV18-6	SV18-9	RDL	QC Batch
Field Parameters								
Duration	min	20	40	20	20	20	N/A	ONSITE
Flow Rate	L/min	0.2	0.1	0.2	0.2	0.2	N/A	ONSITE
Calculated Parameters								
1,1,1,2-tetrachloroethane	ug/m3	<0.38	<0.38	<0.38	<0.38	<0.38	0.38	9247536
1,1,1-trichloroethane	ug/m3	<50	<50	<50	<50	<50	50	9247536
1,1,2,2-tetrachloroethane	ug/m3	<2.5	<2.5	<2.5	<2.5	<2.5	2.5	9247536
1,1,2-trichloroethane	ug/m3	<0.13	<0.13	<0.13	<0.13	<0.13	0.13	9247536
1,1-dichloroethane	ug/m3	<2.5	<2.5	<2.5	<2.5	<2.5	2.5	9247536
1,1-dichloroethene	ug/m3	<2.5	<2.5	<2.5	<2.5	<2.5	2.5	9247536
1,2,3-trichlorobenzene	ug/m3	<2.5	<2.5	<2.5	<2.5	<2.5	2.5	9247536
1,2,3-trichloropropane	ug/m3	<0.13	<0.13	<0.13	<0.13	<0.13	0.13	9247536
1,2,3-Trimethylbenzene	ug/m3	<2.5	<2.5	<2.5	<2.5	<2.5	2.5	9247536
1,2,4-trichlorobenzene	ug/m3	<1.3	<1.3	<1.3	<1.3	<1.3	1.3	9247536
1,2,4-trimethylbenzene	ug/m3	2.1	<0.50	<0.50	<0.50	7.5	0.50	9247536
1,2-dibromo-3-chloropropane	ug/m3	<0.25	<0.25	<0.25	<0.25	<0.25	0.25	9247536
1,2-dibromoethane	ug/m3	<0.13	<0.13	<0.13	<0.13	<0.13	0.13	9247536
1,2-dichlorobenzene	ug/m3	<2.5	<2.5	<2.5	<2.5	<2.5	2.5	9247536
1,2-dichloroethane	ug/m3	<0.50	<0.50	<0.50	<0.50	2.6	0.50	9247536
1,2-dichloropropane	ug/m3	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	9247536
1,3,5-trimethylbenzene	ug/m3	0.73	<0.50	<0.50	<0.50	3.0	0.50	9247536
1,3-Butadiene	ug/m3	2.0	<0.50	<0.50	<0.50	12	0.50	9247536
1,3-dichlorobenzene	ug/m3	<2.5	<2.5	<2.5	<2.5	<2.5	2.5	9247536
1,3-dichloropropane	ug/m3	<0.38	<0.38	<0.38	<0.38	<0.38	0.38	9247536
1,4-dichlorobenzene	ug/m3	<2.5	<2.5	<2.5	<2.5	<2.5	2.5	9247536
2-Butanone (MEK)	ug/m3	<130	<130	<130	<130	<130	130	9247536
2-chlorophenol	ug/m3	<2.5	<2.5	<2.5	<2.5	<2.5	2.5	9247536
2-chlorotoluene	ug/m3	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	9247536
2-Hexanone	ug/m3	<2.5	<2.5	<2.5	<2.5	<2.5	2.5	9247536
4-chlorotoluene	ug/m3	<2.5	<2.5	<2.5	<2.5	<2.5	2.5	9247536
Acetone	ug/m3	<5.0	<5.0	<5.0	<5.0	<5.0	5.0	9247536
Benzene	ug/m3	5.2	<0.38	<0.38	<0.38	43	0.38	9247536

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B8A4803
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

VOC/VPH PLUS PACKAGE IN AIR BY TD (AIR)

Maxxam ID		UW2943	UW2944	UW2945	UW2946	UW2947		
Sampling Date		2018/11/29 10:55	2018/11/29 09:46	2018/11/29 08:55	2018/11/29 10:18	2018/11/29 08:17		
COC Number		571441-10-01	571441-10-01	571441-10-01	571441-10-01	571441-10-01		
	UNITS	SV18-2	SV18-3	SV18-5	SV18-6	SV18-9	RDL	QC Batch
Bromobenzene	ug/m3	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	9247536
Bromodichloromethane	ug/m3	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	9247536
Bromoform	ug/m3	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	9247536
Bromomethane	ug/m3	<1.3	<1.3	<1.3	<1.3	<1.3	1.3	9247536
C6-C13 Hydrocarbons (VHv)	ug/m3	980	<130	<130	<130	3000	130	9247536
C6-C13 Hydrocarbons (VPHv)	ug/m3	890	<130	<130	<130	2600	130	9247536
Carbon tetrachloride	ug/m3	<0.25	<0.25	<0.25	<0.25	<0.25	0.25	9247536
Chlorobenzene	ug/m3	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	9247536
Chloroethane	ug/m3	<130	<130	<130	<130	<130	130	9247536
Chloroform	ug/m3	0.90	<0.50	<0.50	<0.50	<0.50	0.50	9247536
Chloromethane	ug/m3	<5.0	<5.0	<5.0	<5.0	<5.0	5.0	9247536
cis-1,2-dichloroethene	ug/m3	<2.5	<2.5	<2.5	<2.5	<2.5	2.5	9247536
cis-1,3-dichloropropene	ug/m3	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	9247536
Dibromochloromethane	ug/m3	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	9247536
Dibromomethane	ug/m3	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	9247536
Dichlorodifluoromethane	ug/m3	<5.0	<5.0	<5.0	<5.0	<5.0	5.0	9247536
Dichloromethane	ug/m3	<13	<13	<13	<13	<13	13	9247536
Ethyl acetate	ug/m3	<2.5	<2.5	<2.5	<2.5	<2.5	2.5	9247536
Ethylbenzene	ug/m3	<50	<50	<50	<50	<50	50	9247536
Hexachloro-1,3-butadiene	ug/m3	<0.25	<0.25	<0.25	<0.25	<0.25	0.25	9247536
Isopropylbenzene	ug/m3	<0.50	<0.50	<0.50	<0.50	0.95	0.50	9247536
Methyl Isobutyl Ketone	ug/m3	<50	<50	<50	<50	<50	50	9247536
Methylcyclohexane	ug/m3	<50	<50	<50	<50	<50	50	9247536
Methyl-tert-butylether (MTBE)	ug/m3	<100	<100	<100	<100	<100	100	9247536
Naphthalene	ug/m3	<0.75	<0.75	<0.75	<0.75	<0.75	0.75	9247536
n-Butylbenzene	ug/m3	<2.5	<2.5	<2.5	<2.5	<2.5	2.5	9247536
n-Decane	ug/m3	<25	<25	<25	<25	<25	25	9247536
n-Hexane	ug/m3	81	<25	<25	<25	110	25	9247536
n-Propylbenzene	ug/m3	<2.5	<2.5	<2.5	<2.5	<2.5	2.5	9247536
p-Isopropyltoluene	ug/m3	40	<2.5	<2.5	<2.5	33	2.5	9247536
sec-Butylbenzene	ug/m3	<2.5	<2.5	<2.5	<2.5	<2.5	2.5	9247536
Styrene	ug/m3	<50	<50	<50	<50	<50	50	9247536
tert-Butylbenzene	ug/m3	<2.5	<2.5	<2.5	<2.5	<2.5	2.5	9247536

RDL = Reportable Detection Limit

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Maxxam Job #: B8A4803
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

VOC/VPH PLUS PACKAGE IN AIR BY TD (AIR)

Maxxam ID		UW2943	UW2944	UW2945	UW2946	UW2947		
Sampling Date		2018/11/29 10:55	2018/11/29 09:46	2018/11/29 08:55	2018/11/29 10:18	2018/11/29 08:17		
COC Number		571441-10-01	571441-10-01	571441-10-01	571441-10-01	571441-10-01		
	UNITS	SV18-2	SV18-3	SV18-5	SV18-6	SV18-9	RDL	QC Batch
Tetrachloroethene	ug/m3	63	<2.5	<2.5	<2.5	280	2.5	9247536
Toluene	ug/m3	<50	<50	<50	<50	120	50	9247536
trans-1,2-dichloroethene	ug/m3	<2.5	<2.5	<2.5	<2.5	<2.5	2.5	9247536
trans-1,3-dichloropropene	ug/m3	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	9247536
Trichloroethene	ug/m3	<0.25	<0.25	<0.25	<0.25	<0.25	0.25	9247536
Trichlorofluoromethane	ug/m3	<25	<25	<25	<25	<25	25	9247536
Vinyl chloride	ug/m3	<0.25	<0.25	<0.25	<0.25	<0.25	0.25	9247536
m & p-Xylene	ug/m3	5.3	<2.5	<2.5	<2.5	37	2.5	9247536
o-Xylene	ug/m3	<2.5	<2.5	<2.5	<2.5	13	2.5	9247536
Xylenes (Total)	ug/m3	5.3	<2.5	<2.5	<2.5	50	2.5	9247536
C6-C13 Hydrocarbons (VPHv)	ug	3.6	<0.50	<0.50	<0.50	11	0.50	9247542
Volatiles								
1,1,1,2-tetrachloroethane	ug	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	0.0015	9243839
1,1,1-trichloroethane	ug	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	9243839
1,1,2,2-tetrachloroethane	ug	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	9243839
1,1,2-trichloroethane	ug	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	9243839
1,1-dichloroethane	ug	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	9243839
1,1-dichloroethene	ug	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	9243839
1,2,3-trichlorobenzene	ug	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	9243839
1,2,3-trichloropropane	ug	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	9243839
1,2,3-Trimethylbenzene	ug	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	9243839
1,2,4-trichlorobenzene	ug	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9243839
1,2,4-trimethylbenzene	ug	0.0084	<0.0020	<0.0020	<0.0020	0.030	0.0020	9243839
1,2-dibromo-3-chloropropane	ug	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	9243839
1,2-dibromoethane	ug	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	9243839
1,2-dichlorobenzene	ug	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	9243839
1,2-dichloroethane	ug	<0.0020	<0.0020	<0.0020	<0.0020	0.010 (1)	0.0020	9243839
1,2-dichloropropane	ug	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	9243839
1,3,5-trimethylbenzene	ug	0.0029	<0.0020	<0.0020	<0.0020	0.012	0.0020	9243839
1,3-Butadiene	ug	0.0078	<0.0020	<0.0020	<0.0020	0.047	0.0020	9243839
1,3-dichlorobenzene	ug	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	9243839
1,3-dichloropropane	ug	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	0.0015	9243839

RDL = Reportable Detection Limit
(1) Tentatively identified result and may be potentially biased high due to matrix interference.

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Maxxam Job #: B8A4803
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

VOC/VPH PLUS PACKAGE IN AIR BY TD (AIR)

Maxxam ID		UW2943	UW2944	UW2945	UW2946	UW2947		
Sampling Date		2018/11/29 10:55	2018/11/29 09:46	2018/11/29 08:55	2018/11/29 10:18	2018/11/29 08:17		
COC Number		571441-10-01	571441-10-01	571441-10-01	571441-10-01	571441-10-01		
	UNITS	SV18-2	SV18-3	SV18-5	SV18-6	SV18-9	RDL	QC Batch
1,4-dichlorobenzene	ug	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	9243839
2-Butanone (MEK)	ug	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	9243839
2-chlorophenol	ug	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	9243839
2-chlorotoluene	ug	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	9243839
2-Hexanone	ug	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	9243839
4-chlorotoluene	ug	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	9243839
Acetone	ug	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	9243839
Benzene	ug	0.021	<0.0015	<0.0015	<0.0015	0.17	0.0015	9243839
Bromobenzene	ug	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	9243839
Bromodichloromethane	ug	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	9243839
Bromoform	ug	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	9243839
Bromomethane	ug	<0.0050 (1)	<0.0050 (1)	<0.0050 (1)	<0.0050 (1)	<0.0050 (1)	0.0050	9243839
C6-C13 Hydrocarbons (VHv)	ug	3.9	<0.50	<0.50	<0.50	12	0.50	9243839
Carbon tetrachloride	ug	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	9243839
Chlorobenzene	ug	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	9243839
Chloroethane	ug	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	9243839
Chloroform	ug	0.0036	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	9243839
Chloromethane	ug	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	9243839
cis-1,2-dichloroethene	ug	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	9243839
cis-1,3-dichloropropene	ug	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	9243839
Dibromochloromethane	ug	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	9243839
Dibromomethane	ug	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0040	9243839
Dichlorodifluoromethane	ug	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	9243839
Dichloromethane	ug	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	9243839
Ethyl acetate	ug	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	9243839
Ethylbenzene	ug	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	9243839
Hexachloro-1,3-butadiene	ug	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	9243839
Isopropylbenzene	ug	<0.0020	<0.0020	<0.0020	<0.0020	0.0038	0.0020	9243839
Methyl Isobutyl Ketone	ug	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	9243839
Methylcyclohexane	ug	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	9243839
Methyl-tert-butylether (MTBE)	ug	<0.40 (2)	<0.40 (2)	<0.40 (2)	<0.40 (2)	<0.40 (2)	0.40	9243839
Naphthalene	ug	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0030	9243839

RDL = Reportable Detection Limit
(1) CCV above acceptance criteria. Data not impacted - ND.
(2) CCV below acceptance criteria. RDL raised due to potential for low bias.

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Maxxam Job #: B8A4803
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

VOC/VPH PLUS PACKAGE IN AIR BY TD (AIR)

Maxxam ID		UW2943	UW2944	UW2945	UW2946	UW2947		
Sampling Date		2018/11/29 10:55	2018/11/29 09:46	2018/11/29 08:55	2018/11/29 10:18	2018/11/29 08:17		
COC Number		571441-10-01	571441-10-01	571441-10-01	571441-10-01	571441-10-01		
	UNITS	SV18-2	SV18-3	SV18-5	SV18-6	SV18-9	RDL	QC Batch
n-Butylbenzene	ug	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	9243839
n-Decane	ug	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	9243839
n-Hexane	ug	0.33	<0.10	<0.10	<0.10	0.45	0.10	9243839
n-Propylbenzene	ug	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	9243839
p-Isopropyltoluene	ug	0.16	<0.010	<0.010	<0.010	0.13	0.010	9243839
sec-Butylbenzene	ug	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	9243839
Styrene	ug	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	9243839
tert-Butylbenzene	ug	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	9243839
Tetrachloroethene	ug	0.25	<0.010	<0.010	<0.010	1.1	0.010	9243839
Toluene	ug	<0.20	<0.20	<0.20	<0.20	0.48	0.20	9243839
trans-1,2-dichloroethene	ug	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	9243839
trans-1,3-dichloropropene	ug	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	9243839
Trichloroethene	ug	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	9243839
Trichlorofluoromethane	ug	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	9243839
Vinyl chloride	ug	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	9243839
m & p-Xylene	ug	0.021	<0.010	<0.010	<0.010	0.15	0.010	9243839
o-Xylene	ug	<0.010	<0.010	<0.010	<0.010	0.051	0.010	9243839
Xylenes (Total)	ug	0.021	<0.010	<0.010	<0.010	0.20	0.010	9243839
RDL = Reportable Detection Limit								

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Maxxam Job #: B8A4803
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

VOC/VPH PLUS PACKAGE IN AIR BY TD (AIR)

Maxxam ID		UW2948		
Sampling Date		2018/11/29 09:46		
COC Number		571441-10-01		
	UNITS	SV18-A	RDL	QC Batch
Field Parameters				
Duration	min	40	N/A	ONSITE
Flow Rate	L/min	0.1	N/A	ONSITE
Calculated Parameters				
1,1,1,2-tetrachloroethane	ug/m3	<0.38	0.38	9247536
1,1,1-trichloroethane	ug/m3	<50	50	9247536
1,1,2,2-tetrachloroethane	ug/m3	<2.5	2.5	9247536
1,1,2-trichloroethane	ug/m3	<0.13	0.13	9247536
1,1-dichloroethane	ug/m3	<2.5	2.5	9247536
1,1-dichloroethene	ug/m3	<2.5	2.5	9247536
1,2,3-trichlorobenzene	ug/m3	<2.5	2.5	9247536
1,2,3-trichloropropane	ug/m3	<0.13	0.13	9247536
1,2,3-Trimethylbenzene	ug/m3	<2.5	2.5	9247536
1,2,4-trichlorobenzene	ug/m3	<1.3	1.3	9247536
1,2,4-trimethylbenzene	ug/m3	<0.50	0.50	9247536
1,2-dibromo-3-chloropropane	ug/m3	<0.25	0.25	9247536
1,2-dibromoethane	ug/m3	<0.13	0.13	9247536
1,2-dichlorobenzene	ug/m3	<2.5	2.5	9247536
1,2-dichloroethane	ug/m3	<0.50	0.50	9247536
1,2-dichloropropane	ug/m3	<0.50	0.50	9247536
1,3,5-trimethylbenzene	ug/m3	<0.50	0.50	9247536
1,3-Butadiene	ug/m3	<0.50	0.50	9247536
1,3-dichlorobenzene	ug/m3	<2.5	2.5	9247536
1,3-dichloropropane	ug/m3	<0.38	0.38	9247536
1,4-dichlorobenzene	ug/m3	<2.5	2.5	9247536
2-Butanone (MEK)	ug/m3	<130	130	9247536
2-chlorophenol	ug/m3	<2.5	2.5	9247536
2-chlorotoluene	ug/m3	<0.50	0.50	9247536
2-Hexanone	ug/m3	<2.5	2.5	9247536
4-chlorotoluene	ug/m3	<2.5	2.5	9247536
Acetone	ug/m3	<5.0	5.0	9247536
Benzene	ug/m3	<0.38	0.38	9247536

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B8A4803
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

VOC/VPH PLUS PACKAGE IN AIR BY TD (AIR)

Maxxam ID		UW2948		
Sampling Date		2018/11/29 09:46		
COC Number		571441-10-01		
	UNITS	SV18-A	RDL	QC Batch
Bromobenzene	ug/m3	<0.50	0.50	9247536
Bromodichloromethane	ug/m3	<0.50	0.50	9247536
Bromoform	ug/m3	<0.50	0.50	9247536
Bromomethane	ug/m3	<1.3	1.3	9247536
C6-C13 Hydrocarbons (VHv)	ug/m3	<130	130	9247536
C6-C13 Hydrocarbons (VPHv)	ug/m3	<130	130	9247536
Carbon tetrachloride	ug/m3	<0.25	0.25	9247536
Chlorobenzene	ug/m3	<0.50	0.50	9247536
Chloroethane	ug/m3	<130	130	9247536
Chloroform	ug/m3	<0.50	0.50	9247536
Chloromethane	ug/m3	<5.0	5.0	9247536
cis-1,2-dichloroethene	ug/m3	<2.5	2.5	9247536
cis-1,3-dichloropropene	ug/m3	<0.50	0.50	9247536
Dibromochloromethane	ug/m3	<0.50	0.50	9247536
Dibromomethane	ug/m3	<1.0	1.0	9247536
Dichlorodifluoromethane	ug/m3	<5.0	5.0	9247536
Dichloromethane	ug/m3	<13	13	9247536
Ethyl acetate	ug/m3	<2.5	2.5	9247536
Ethylbenzene	ug/m3	<50	50	9247536
Hexachloro-1,3-butadiene	ug/m3	<0.25	0.25	9247536
Isopropylbenzene	ug/m3	<0.50	0.50	9247536
Methyl Isobutyl Ketone	ug/m3	<50	50	9247536
Methylcyclohexane	ug/m3	<50	50	9247536
Methyl-tert-butylether (MTBE)	ug/m3	<100	100	9247536
Naphthalene	ug/m3	<0.75	0.75	9247536
n-Butylbenzene	ug/m3	<2.5	2.5	9247536
n-Decane	ug/m3	<25	25	9247536
n-Hexane	ug/m3	<25	25	9247536
n-Propylbenzene	ug/m3	<2.5	2.5	9247536
p-Isopropyltoluene	ug/m3	<2.5	2.5	9247536
sec-Butylbenzene	ug/m3	<2.5	2.5	9247536
Styrene	ug/m3	<50	50	9247536
tert-Butylbenzene	ug/m3	<2.5	2.5	9247536
RDL = Reportable Detection Limit				

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Maxxam Job #: B8A4803
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

VOC/VPH PLUS PACKAGE IN AIR BY TD (AIR)

Maxxam ID		UW2948		
Sampling Date		2018/11/29 09:46		
COC Number		571441-10-01		
	UNITS	SV18-A	RDL	QC Batch
Tetrachloroethene	ug/m3	<2.5	2.5	9247536
Toluene	ug/m3	<50	50	9247536
trans-1,2-dichloroethene	ug/m3	<2.5	2.5	9247536
trans-1,3-dichloropropene	ug/m3	<0.50	0.50	9247536
Trichloroethene	ug/m3	<0.25	0.25	9247536
Trichlorofluoromethane	ug/m3	<25	25	9247536
Vinyl chloride	ug/m3	<0.25	0.25	9247536
m & p-Xylene	ug/m3	<2.5	2.5	9247536
o-Xylene	ug/m3	<2.5	2.5	9247536
Xylenes (Total)	ug/m3	<2.5	2.5	9247536
C6-C13 Hydrocarbons (VPHv)	ug	<0.50	0.50	9247542
Volatiles				
1,1,1,2-tetrachloroethane	ug	<0.0015	0.0015	9243839
1,1,1-trichloroethane	ug	<0.20	0.20	9243839
1,1,2,2-tetrachloroethane	ug	<0.010	0.010	9243839
1,1,2-trichloroethane	ug	<0.00050	0.00050	9243839
1,1-dichloroethane	ug	<0.010	0.010	9243839
1,1-dichloroethene	ug	<0.010	0.010	9243839
1,2,3-trichlorobenzene	ug	<0.010	0.010	9243839
1,2,3-trichloropropane	ug	<0.00050	0.00050	9243839
1,2,3-Trimethylbenzene	ug	<0.010	0.010	9243839
1,2,4-trichlorobenzene	ug	<0.0050	0.0050	9243839
1,2,4-trimethylbenzene	ug	<0.0020	0.0020	9243839
1,2-dibromo-3-chloropropane	ug	<0.0010	0.0010	9243839
1,2-dibromoethane	ug	<0.00050	0.00050	9243839
1,2-dichlorobenzene	ug	<0.010	0.010	9243839
1,2-dichloroethane	ug	<0.0020	0.0020	9243839
1,2-dichloropropane	ug	<0.0020	0.0020	9243839
1,3,5-trimethylbenzene	ug	<0.0020	0.0020	9243839
1,3-Butadiene	ug	<0.0020	0.0020	9243839
1,3-dichlorobenzene	ug	<0.010	0.010	9243839
1,3-dichloropropane	ug	<0.0015	0.0015	9243839
1,4-dichlorobenzene	ug	<0.010	0.010	9243839
RDL = Reportable Detection Limit				

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Maxxam Job #: B8A4803
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

VOC/VPH PLUS PACKAGE IN AIR BY TD (AIR)

Maxxam ID		UW2948		
Sampling Date		2018/11/29 09:46		
COC Number		571441-10-01		
	UNITS	SV18-A	RDL	QC Batch
2-Butanone (MEK)	ug	<0.50	0.50	9243839
2-chlorophenol	ug	<0.010	0.010	9243839
2-chlorotoluene	ug	<0.0020	0.0020	9243839
2-Hexanone	ug	<0.010	0.010	9243839
4-chlorotoluene	ug	<0.010	0.010	9243839
Acetone	ug	<0.020	0.020	9243839
Benzene	ug	<0.0015	0.0015	9243839
Bromobenzene	ug	<0.0020	0.0020	9243839
Bromodichloromethane	ug	<0.0020	0.0020	9243839
Bromoform	ug	<0.0020	0.0020	9243839
Bromomethane	ug	<0.0050 (1)	0.0050	9243839
C6-C13 Hydrocarbons (VHv)	ug	<0.50	0.50	9243839
Carbon tetrachloride	ug	<0.0010	0.0010	9243839
Chlorobenzene	ug	<0.0020	0.0020	9243839
Chloroethane	ug	<0.50	0.50	9243839
Chloroform	ug	<0.0020	0.0020	9243839
Chloromethane	ug	<0.020	0.020	9243839
cis-1,2-dichloroethene	ug	<0.010	0.010	9243839
cis-1,3-dichloropropene	ug	<0.0020	0.0020	9243839
Dibromochloromethane	ug	<0.0020	0.0020	9243839
Dibromomethane	ug	<0.0040	0.0040	9243839
Dichlorodifluoromethane	ug	<0.020	0.020	9243839
Dichloromethane	ug	<0.050	0.050	9243839
Ethyl acetate	ug	<0.010	0.010	9243839
Ethylbenzene	ug	<0.20	0.20	9243839
Hexachloro-1,3-butadiene	ug	<0.0010	0.0010	9243839
Isopropylbenzene	ug	<0.0020	0.0020	9243839
Methyl Isobutyl Ketone	ug	<0.20	0.20	9243839
Methylcyclohexane	ug	<0.20	0.20	9243839
Methyl-tert-butylether (MTBE)	ug	<0.40 (2)	0.40	9243839
Naphthalene	ug	<0.0030	0.0030	9243839

RDL = Reportable Detection Limit
(1) CCV above acceptance criteria. Data not impacted - ND.
(2) CCV below acceptance criteria. RDL raised due to potential for low bias.

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City of Vancouver - FOI 2023-228 - Page 807 of 1003

Maxxam Job #: B8A4803
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

VOC/VPH PLUS PACKAGE IN AIR BY TD (AIR)

Maxxam ID		UW2948		
Sampling Date		2018/11/29 09:46		
COC Number		571441-10-01		
	UNITS	SV18-A	RDL	QC Batch
n-Butylbenzene	ug	<0.010	0.010	9243839
n-Decane	ug	<0.10	0.10	9243839
n-Hexane	ug	<0.10	0.10	9243839
n-Propylbenzene	ug	<0.010	0.010	9243839
p-Isopropyltoluene	ug	<0.010	0.010	9243839
sec-Butylbenzene	ug	<0.010	0.010	9243839
Styrene	ug	<0.20	0.20	9243839
tert-Butylbenzene	ug	<0.010	0.010	9243839
Tetrachloroethene	ug	<0.010	0.010	9243839
Toluene	ug	<0.20	0.20	9243839
trans-1,2-dichloroethene	ug	<0.010	0.010	9243839
trans-1,3-dichloropropene	ug	<0.0020	0.0020	9243839
Trichloroethene	ug	<0.0010	0.0010	9243839
Trichlorofluoromethane	ug	<0.10	0.10	9243839
Vinyl chloride	ug	<0.0010	0.0010	9243839
m & p-Xylene	ug	<0.010	0.010	9243839
o-Xylene	ug	<0.010	0.010	9243839
Xylenes (Total)	ug	<0.010	0.010	9243839
RDL = Reportable Detection Limit				

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City of Vancouver - FOI 2023-228 - Page 808 of 1003

Maxxam Job #: B8A4803
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	10.0°C

Results relate only to the items tested.

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City of Vancouver - FOI 2023-228 - Page 809 of 1003

Maxxam Job #: B8A4803
Report Date: 2018/12/04

QUALITY ASSURANCE REPORT

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

			Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9243839	1,1,1,2-tetrachloroethane	2018/11/27	99	60 - 140	<0.0015	ug		
9243839	1,1,1-trichloroethane	2018/11/27	97	60 - 140	<0.20	ug		
9243839	1,1,2,2-tetrachloroethane	2018/11/27	107	60 - 140	<0.010	ug		
9243839	1,1,2-trichloroethane	2018/11/27	103	60 - 140	<0.00050	ug		
9243839	1,1-dichloroethane	2018/11/27	95	60 - 140	<0.010	ug		
9243839	1,1-dichloroethene	2018/11/27	95	60 - 140	<0.010	ug		
9243839	1,2,3-trichlorobenzene	2018/11/27	104	60 - 140	<0.010	ug		
9243839	1,2,3-trichloropropane	2018/11/27	109	60 - 140	<0.00050	ug		
9243839	1,2,3-Trimethylbenzene	2018/11/27	100	60 - 140	<0.010	ug		
9243839	1,2,4-trichlorobenzene	2018/11/27	109	60 - 140	<0.0050	ug		
9243839	1,2,4-trimethylbenzene	2018/11/29	102	60 - 140	<0.0020	ug	NC	40
9243839	1,2-dibromo-3-chloropropane	2018/11/27	95	60 - 140	<0.0010	ug		
9243839	1,2-dibromoethane	2018/11/29	101	60 - 140	<0.00050	ug	NC	40
9243839	1,2-dichlorobenzene	2018/11/27	114	60 - 140	<0.010	ug		
9243839	1,2-dichloroethane	2018/11/29	98	60 - 140	<0.0020	ug	NC	40
9243839	1,2-dichloropropane	2018/11/27	102	50 - 150	<0.0020	ug		
9243839	1,3,5-trimethylbenzene	2018/11/29	101	60 - 140	<0.0020	ug	NC	40
9243839	1,3-Butadiene	2018/11/29	84	50 - 150	<0.0020	ug	NC	40
9243839	1,3-dichlorobenzene	2018/11/27	113	60 - 140	<0.010	ug		
9243839	1,3-dichloropropane	2018/11/27	101	50 - 150	<0.0015	ug		
9243839	1,4-dichlorobenzene	2018/11/27	105	60 - 140	<0.010	ug		
9243839	2-Butanone (MEK)	2018/11/27	99	60 - 140	<0.50	ug		
9243839	2-chlorophenol	2018/11/27			<0.010	ug		
9243839	2-chlorotoluene	2018/11/27	105	60 - 140	<0.0020	ug		
9243839	2-Hexanone	2018/11/27	118	60 - 140	<0.010	ug		
9243839	4-chlorotoluene	2018/11/27	115	60 - 140	<0.010	ug		
9243839	Acetone	2018/11/27	97	60 - 140	<0.020	ug		
9243839	Benzene	2018/11/29	104	60 - 140	<0.0015	ug	15	40
9243839	Bromobenzene	2018/11/27	108	60 - 140	<0.0020	ug		
9243839	Bromodichloromethane	2018/11/27	98	60 - 140	<0.0020	ug		
9243839	Bromoform	2018/11/27	99	60 - 140	<0.0020	ug		

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QUALITY ASSURANCE REPORT(CONT'D)

			Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9243839	Bromomethane	2018/11/27	53	50 - 150	<0.0050	ug		
9243839	C6-C13 Hydrocarbons (VHv)	2018/11/29	112	60 - 140	<0.50	ug	15	40
9243839	Carbon tetrachloride	2018/11/27	94	60 - 140	<0.0010	ug		
9243839	Chlorobenzene	2018/11/27	99	60 - 140	<0.0020	ug		
9243839	Chloroethane	2018/11/27	89	50 - 150	<0.50	ug		
9243839	Chloroform	2018/11/27	95	60 - 140	<0.0020	ug		
9243839	Chloromethane	2018/11/27	73	50 - 150	<0.020	ug		
9243839	cis-1,2-dichloroethene	2018/11/27	100	60 - 140	<0.010	ug		
9243839	cis-1,3-dichloropropene	2018/11/27	100	50 - 150	<0.0020	ug		
9243839	Dibromochloromethane	2018/11/27	99	60 - 140	<0.0020	ug		
9243839	Dibromomethane	2018/11/27	99	60 - 140	<0.0040	ug		
9243839	Dichlorodifluoromethane	2018/11/27	79	50 - 150	<0.020	ug		
9243839	Dichloromethane	2018/11/27	99	50 - 150	<0.050	ug		
9243839	Ethyl acetate	2018/11/27			<0.010	ug		
9243839	Ethylbenzene	2018/11/29	98	60 - 140	<0.20	ug	NC	40
9243839	Hexachloro-1,3-butadiene	2018/11/27	101	60 - 140	<0.0010	ug		
9243839	Isopropylbenzene	2018/11/29	99	60 - 140	<0.0020	ug	NC	40
9243839	m & p-Xylene	2018/11/29	98	60 - 140	<0.010	ug	4.1	40
9243839	Methyl Isobutyl Ketone	2018/11/27			<0.20	ug		
9243839	Methylcyclohexane	2018/11/29	90	60 - 140	<0.20	ug	12	40
9243839	Methyl-tert-butylether (MTBE)	2018/11/29	95	50 - 150	<0.40 (1)	ug	NC	40
9243839	Naphthalene	2018/11/29	103	60 - 140	<0.0030	ug	NC	40
9243839	n-Butylbenzene	2018/11/27	103	60 - 140	<0.010	ug		
9243839	n-Decane	2018/11/29	106	60 - 140	<0.10	ug	NC	40
9243839	n-Hexane	2018/11/29	101	60 - 140	<0.10	ug	16	40
9243839	n-Propylbenzene	2018/11/27	97	60 - 140	<0.010	ug		
9243839	o-Xylene	2018/11/29	97	60 - 140	<0.010	ug	NC	40
9243839	p-Isopropyltoluene	2018/11/27	105	60 - 140	<0.010	ug		
9243839	sec-Butylbenzene	2018/11/27	101	60 - 140	<0.010	ug		
9243839	Styrene	2018/11/29	118	60 - 140	<0.20	ug	NC	40
9243839	tert-Butylbenzene	2018/11/27	102	60 - 140	<0.010	ug		

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QUALITY ASSURANCE REPORT(CONT'D)

			Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9243839	Tetrachloroethene	2018/11/27	97	60 - 140	<0.010	ug		
9243839	Toluene	2018/11/29	99	60 - 140	<0.20	ug	NC	40
9243839	trans-1,2-dichloroethene	2018/11/27	96	60 - 140	<0.010	ug		
9243839	trans-1,3-dichloropropene	2018/11/27	104	50 - 150	<0.0020	ug		
9243839	Trichloroethene	2018/11/27	99	60 - 140	<0.0010	ug		
9243839	Trichlorofluoromethane	2018/11/27	91	50 - 150	<0.10	ug		
9243839	Vinyl chloride	2018/11/27	93	50 - 150	<0.0010	ug		
9243839	Xylenes (Total)	2018/11/29			<0.010	ug	4.1	40

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) CCV below acceptance criteria. RDL raised due to potential for low bias.

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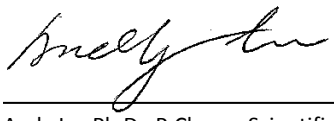
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Maxxam Job #: B8A4803
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2C
Sampler Initials: SM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Andy Lu, Ph.D., P.Chem., Scientific Specialist



Kirsten Roberts, Project Manager Assistant

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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City of Vancouver - FOI 2023-228 - Page 813 of 1003

Maxxam Analytics International Corporation o/a Maxxam Analytics
8006 Camada Way, Burnaby, British Columbia Canada V5G 1K5 Tel (604) 734 7276 Toll-free 800-563-6266 Fax (604) 731 2386 www.maxxam.ca

Page 1 of 1

B8A4803_COC

INVOICE TO:
Company Name: #3763 KEYSTONE ENVIRONMENTAL LTD
Contact Name: Nicki MacDonald
Address: SUITE 320 4400 DOMINION STREET, BURNABY BC V5G 4G3
Phone: (604) 430-0671 Fax: (604) 430-0672
Email: nmacdonald@keystoneenviro.com

Report Information
Company Name:
Contact Name:
Address:
Phone: Fax:
Email: smcbride@keystoneenviro.com

Project Information
Quotation #: ~~B80953~~ B61898
P.O. #:
Project #: 13639-2C
Project Name:
Site #:
Sampled By: Stewart McBride

Bottle Order #: 571441
Project Manager: Gail Pedersen
C#571441-10-01

Regulatory Criteria:
- [x] CSR
- [ ] CCME
- [ ] BC Water Quality
- [ ] Other

Special Instructions:

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects
Regular (Standard) TAT: (will be applied if Rush TAT is not specified) [x]
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.
Job Specific Rush TAT (if applies to entire submission)
1 DAY [ ] 2 Day [ ] 3 Day [ ] Date Required: [ ]
Rush Confirmation Number: (call lab for #)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals Field Filtered ? (Y / N)	PUMP FLOW RATE (L/MINUTE)	PUMP RUN TIME (MINUTES)	PUMP NUMBER	SV - CSAP Gas & Diesel	SV- CSAP Diesel	SV- BTEXPHCH ~~Hydrocarbons~~	SV - CSAP Drycleaning	SV - CSAP Drycleaning & Petroleum	SV - FULL VOCs	POTENTIAL HIGH CONC. (Y/N)	# of Bottles	Comments
1		SV18-2	Nov 29	10:55	Vapour		0.2	20	17-0642			X			X		1	
2		SV18-3		09:46			0.1	40	17-0672			X			X		1	
3		SV18-5		08:55			0.2	20	17-0671			X			X		1	
4		SV18-6		10:18			0.2	20	17-0672			X					1	
5		SV18-9		08:17			0.2	20	17-0641			X			X		1	
6		SV18-A		09:46			0.1	40	17-0672			X			X		1	
7																		
8																		
9																		
10																		

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Stewart McBride	18/11/29	15:03	BRITTANY BURLONE	2018/11/29	15:05	

Lab Use Only: Time Sensitive [ ] Temperature (°C) on Receipt: 10.1 0.1 0 Custody Seal Intact on Cooler? [ ] Yes [ ] No N/A

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO MAXXAM'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.MAXXAM.CA/TERMS.
* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Maxxam Yellow: Client

ice: present

Maxxam Analytics International Corporation o/a Maxxam Analytics

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Your Project #: 13639-2D
Your C.O.C. #: 571441-11-01

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/12/04
Report #: R2659672
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8A4806
Received: 2018/11/29, 15:05

Sample Matrix: Air
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
VOCs by TD – Complete List Calc (ug/m3)	3	N/A	2018/12/04	BBY WI-00033	Auto Calc
VOCs by TD Tube – Complete List (ug)	3	N/A	2018/11/30	BBY8SOP-00058	BCMOE BCLM Jun2009 m
Duration	3	N/A	2018/12/04	N/A	Field Data
Flow Rate (L/min)	3	N/A	2018/12/04	N/A	Field Data
Volatile HC-BTEX Calculation for Air (1)	3	N/A	2018/12/03	BBY WI-00033	Auto Calc

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) VPH = VH - (Benzene + Toluene + Ethylbenzene + m & p-Xylene + o-Xylene + Styrene + n-Hexane + n-Decane)

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your Project #: 13639-2D
Your C.O.C. #: 571441-11-01

Attention: Nicole MacDonald

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/12/04
Report #: R2659672
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8A4806
Received: 2018/11/29, 15:05

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Gail Pedersen, Project Manager –Environmental Customer Service
Email: gpedersen@maxxam.ca
Phone# (604) 734 7276
==========
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Maxxam Job #: B8A4806
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SMB

VOC/VPH PLUS PACKAGE IN AIR BY TD (AIR)

Maxxam ID		UW2951	UW2952	UW2953		
Sampling Date		2018/11/29 12:10	2018/11/29 11:34	2018/11/29 12:00		
COC Number		571441-11-01	571441-11-01	571441-11-01		
	UNITS	SV18-15	SV18-14	SV18-16	RDL	QC Batch
Field Parameters						
Duration	min	20	20	20	N/A	ONSITE
Flow Rate	L/min	0.2	0.2	0.2	N/A	ONSITE
Calculated Parameters						
1,1,1,2-tetrachloroethane	ug/m3	<0.38	<0.38	<0.38	0.38	9247536
1,1,1-trichloroethane	ug/m3	<50	<50	<50	50	9247536
1,1,2,2-tetrachloroethane	ug/m3	<2.5	<2.5	<2.5	2.5	9247536
1,1,2-trichloroethane	ug/m3	<0.13	<0.13	<0.13	0.13	9247536
1,1-dichloroethane	ug/m3	<2.5	<2.5	<2.5	2.5	9247536
1,1-dichloroethene	ug/m3	<2.5	<2.5	<2.5	2.5	9247536
1,2,3-trichlorobenzene	ug/m3	<2.5	<2.5	<2.5	2.5	9247536
1,2,3-trichloropropane	ug/m3	<0.13	<0.13	<0.13	0.13	9247536
1,2,3-Trimethylbenzene	ug/m3	<2.5	4.2	<2.5	2.5	9247536
1,2,4-trichlorobenzene	ug/m3	<1.3	<1.3	<1.3	1.3	9247536
1,2,4-trimethylbenzene	ug/m3	7.5	13	3.9	0.50	9247536
1,2-dibromo-3-chloropropane	ug/m3	<0.25	<0.25	<0.25	0.25	9247536
1,2-dibromoethane	ug/m3	<0.13	<0.13	<0.13	0.13	9247536
1,2-dichlorobenzene	ug/m3	<2.5	<2.5	<2.5	2.5	9247536
1,2-dichloroethane	ug/m3	<0.50	<0.50	3.5	0.50	9247536
1,2-dichloropropane	ug/m3	<0.50	<0.50	<0.50	0.50	9247536
1,3,5-trimethylbenzene	ug/m3	2.3	5.1	1.3	0.50	9247536
1,3-Butadiene	ug/m3	<0.50	0.98	2.0	0.50	9247536
1,3-dichlorobenzene	ug/m3	<2.5	<2.5	<2.5	2.5	9247536
1,3-dichloropropane	ug/m3	<0.38	<0.38	<0.38	0.38	9247536
1,4-dichlorobenzene	ug/m3	<2.5	<2.5	<2.5	2.5	9247536
2-Butanone (MEK)	ug/m3	<130	<130	<130	130	9247536
2-chlorophenol	ug/m3	<2.5	<2.5	<2.5	2.5	9247536
2-chlorotoluene	ug/m3	<0.50	<0.50	<0.50	0.50	9247536
2-Hexanone	ug/m3	<2.5	<2.5	<2.5	2.5	9247536
4-chlorotoluene	ug/m3	<2.5	<2.5	<2.5	2.5	9247536
Acetone	ug/m3	<5.0	<5.0	6.6	5.0	9247536
Benzene	ug/m3	3.6	6.3	13	0.38	9247536

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B8A4806
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SMB

VOC/VPH PLUS PACKAGE IN AIR BY TD (AIR)

Maxxam ID		UW2951	UW2952	UW2953		
Sampling Date		2018/11/29 12:10	2018/11/29 11:34	2018/11/29 12:00		
COC Number		571441-11-01	571441-11-01	571441-11-01		
	UNITS	SV18-15	SV18-14	SV18-16	RDL	QC Batch
Bromobenzene	ug/m3	<0.50	<0.50	<0.50	0.50	9247536
Bromodichloromethane	ug/m3	<0.50	<0.50	<0.50	0.50	9247536
Bromoform	ug/m3	<0.50	<0.50	<0.50	0.50	9247536
Bromomethane	ug/m3	<1.3	<1.3	<1.3	1.3	9247536
C6-C13 Hydrocarbons (VHv)	ug/m3	330	2700	2100	130	9247536
C6-C13 Hydrocarbons (VPHv)	ug/m3	310	2700	2000	130	9247536
Carbon tetrachloride	ug/m3	<0.25	<0.25	<0.25	0.25	9247536
Chlorobenzene	ug/m3	<0.50	<0.50	<0.50	0.50	9247536
Chloroethane	ug/m3	<130	<130	<130	130	9247536
Chloroform	ug/m3	15	<0.50	<0.50	0.50	9247536
Chloromethane	ug/m3	<5.0	<5.0	<5.0	5.0	9247536
cis-1,2-dichloroethene	ug/m3	<2.5	<2.5	<2.5	2.5	9247536
cis-1,3-dichloropropene	ug/m3	<0.50	<0.50	<0.50	0.50	9247536
Dibromochloromethane	ug/m3	<0.50	<0.50	<0.50	0.50	9247536
Dibromomethane	ug/m3	<1.0	<1.0	<1.0	1.0	9247536
Dichlorodifluoromethane	ug/m3	<5.0	<5.0	<5.0	5.0	9247536
Dichloromethane	ug/m3	<13	<13	<13	13	9247536
Ethyl acetate	ug/m3	<2.5	<2.5	<2.5	2.5	9247536
Ethylbenzene	ug/m3	<50	<50	<50	50	9247536
Hexachloro-1,3-butadiene	ug/m3	<0.25	<0.25	<0.25	0.25	9247536
Isopropylbenzene	ug/m3	<0.50	0.85	0.68	0.50	9247536
Methyl Isobutyl Ketone	ug/m3	<50	<50	<50	50	9247536
Methylcyclohexane	ug/m3	<50	<50	<50	50	9247536
Methyl-tert-butylether (MTBE)	ug/m3	<100	<100	<100	100	9247536
Naphthalene	ug/m3	<0.75	<0.75	<0.75	0.75	9247536
n-Butylbenzene	ug/m3	<2.5	<2.5	<2.5	2.5	9247536
n-Decane	ug/m3	<25	<25	<25	25	9247536
n-Hexane	ug/m3	<25	<25	99	25	9247536
n-Propylbenzene	ug/m3	<2.5	<2.5	<2.5	2.5	9247536
p-Isopropyltoluene	ug/m3	31	15	6.6	2.5	9247536
sec-Butylbenzene	ug/m3	<2.5	<2.5	<2.5	2.5	9247536
Styrene	ug/m3	<50	<50	<50	50	9247536
tert-Butylbenzene	ug/m3	<2.5	<2.5	<2.5	2.5	9247536
RDL = Reportable Detection Limit						

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Maxxam Job #: B8A4806
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SMB

VOC/VPH PLUS PACKAGE IN AIR BY TD (AIR)

Maxxam ID		UW2951	UW2952	UW2953		
Sampling Date		2018/11/29 12:10	2018/11/29 11:34	2018/11/29 12:00		
COC Number		571441-11-01	571441-11-01	571441-11-01		
	UNITS	SV18-15	SV18-14	SV18-16	RDL	QC Batch
Tetrachloroethene	ug/m3	130	<2.5	11	2.5	9247536
Toluene	ug/m3	<50	<50	<50	50	9247536
trans-1,2-dichloroethene	ug/m3	<2.5	<2.5	<2.5	2.5	9247536
trans-1,3-dichloropropene	ug/m3	<0.50	<0.50	<0.50	0.50	9247536
Trichloroethene	ug/m3	<0.25	<0.25	<0.25	0.25	9247536
Trichlorofluoromethane	ug/m3	<25	<25	<25	25	9247536
Vinyl chloride	ug/m3	<0.25	<0.25	<0.25	0.25	9247536
m & p-Xylene	ug/m3	18	39	17	2.5	9247536
o-Xylene	ug/m3	6.2	12	5.6	2.5	9247536
Xylenes (Total)	ug/m3	24	51	23	2.5	9247536
C6-C13 Hydrocarbons (VPHv)	ug	1.2	11	7.8	0.50	9247542
Volatiles						
1,1,1,2-tetrachloroethane	ug	<0.0015	<0.0015	<0.0015	0.0015	9248205
1,1,1-trichloroethane	ug	<0.20	<0.20	<0.20	0.20	9248205
1,1,2,2-tetrachloroethane	ug	<0.010	<0.010	<0.010	0.010	9248205
1,1,2-trichloroethane	ug	<0.00050	<0.00050	<0.00050	0.00050	9248205
1,1-dichloroethane	ug	<0.010	<0.010	<0.010	0.010	9248205
1,1-dichloroethene	ug	<0.010	<0.010	<0.010	0.010	9248205
1,2,3-trichlorobenzene	ug	<0.010	<0.010	<0.010	0.010	9248205
1,2,3-trichloropropane	ug	<0.00050	<0.00050	<0.00050	0.00050	9248205
1,2,3-Trimethylbenzene	ug	<0.010	0.017	<0.010	0.010	9248205
1,2,4-trichlorobenzene	ug	<0.0050	<0.0050	<0.0050	0.0050	9248205
1,2,4-trimethylbenzene	ug	0.030	0.052	0.016	0.0020	9248205
1,2-dibromo-3-chloropropane	ug	<0.0010	<0.0010	<0.0010	0.0010	9248205
1,2-dibromoethane	ug	<0.00050	<0.00050	<0.00050	0.00050	9248205
1,2-dichlorobenzene	ug	<0.010	<0.010	<0.010	0.010	9248205
1,2-dichloroethane	ug	<0.0020	<0.0020	0.014 (1)	0.0020	9248205
1,2-dichloropropane	ug	<0.0020	<0.0020	<0.0020	0.0020	9248205
1,3,5-trimethylbenzene	ug	0.0092	0.020	0.0052	0.0020	9248205
1,3-Butadiene	ug	<0.0020	0.0039	0.0080	0.0020	9248205
1,3-dichlorobenzene	ug	<0.010	<0.010	<0.010	0.010	9248205
1,3-dichloropropane	ug	<0.0015	<0.0015	<0.0015	0.0015	9248205

RDL = Reportable Detection Limit
(1) Tentatively identified result and may be potentially biased high due to matrix interference.

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Maxxam Job #: B8A4806
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SMB

VOC/VPH PLUS PACKAGE IN AIR BY TD (AIR)

Maxxam ID		UW2951	UW2952	UW2953		
Sampling Date		2018/11/29 12:10	2018/11/29 11:34	2018/11/29 12:00		
COC Number		571441-11-01	571441-11-01	571441-11-01		
	UNITS	SV18-15	SV18-14	SV18-16	RDL	QC Batch
1,4-dichlorobenzene	ug	<0.010	<0.010	<0.010	0.010	9248205
2-Butanone (MEK)	ug	<0.50	<0.50	<0.50	0.50	9248205
2-chlorophenol	ug	<0.010	<0.010	<0.010	0.010	9248205
2-chlorotoluene	ug	<0.0020	<0.0020	<0.0020	0.0020	9248205
2-Hexanone	ug	<0.010	<0.010	<0.010	0.010	9248205
4-chlorotoluene	ug	<0.010	<0.010	<0.010	0.010	9248205
Acetone	ug	<0.020	<0.020	0.027 (1)	0.020	9248205
Benzene	ug	0.015	0.025	0.054	0.0015	9248205
Bromobenzene	ug	<0.0020	<0.0020	<0.0020	0.0020	9248205
Bromodichloromethane	ug	<0.0020	<0.0020	<0.0020	0.0020	9248205
Bromoform	ug	<0.0020	<0.0020	<0.0020	0.0020	9248205
Bromomethane	ug	<0.0050 (2)	<0.0050 (2)	<0.0050 (2)	0.0050	9248205
C6-C13 Hydrocarbons (VHv)	ug	1.3	11	8.3	0.50	9248205
Carbon tetrachloride	ug	<0.0010	<0.0010	<0.0010	0.0010	9248205
Chlorobenzene	ug	<0.0020	<0.0020	<0.0020	0.0020	9248205
Chloroethane	ug	<0.50	<0.50	<0.50	0.50	9248205
Chloroform	ug	0.060	<0.0020	<0.0020	0.0020	9248205
Chloromethane	ug	<0.020	<0.020	<0.020	0.020	9248205
cis-1,2-dichloroethene	ug	<0.010	<0.010	<0.010	0.010	9248205
cis-1,3-dichloropropene	ug	<0.0020	<0.0020	<0.0020	0.0020	9248205
Dibromochloromethane	ug	<0.0020	<0.0020	<0.0020	0.0020	9248205
Dibromomethane	ug	<0.0040	<0.0040	<0.0040	0.0040	9248205
Dichlorodifluoromethane	ug	<0.020	<0.020	<0.020	0.020	9248205
Dichloromethane	ug	<0.050	<0.050	<0.050	0.050	9248205
Ethyl acetate	ug	<0.010	<0.010	<0.010	0.010	9248205
Ethylbenzene	ug	<0.20	<0.20	<0.20	0.20	9248205
Hexachloro-1,3-butadiene	ug	<0.0010	<0.0010	<0.0010	0.0010	9248205
Isopropylbenzene	ug	<0.0020	0.0034	0.0027	0.0020	9248205
Methyl Isobutyl Ketone	ug	<0.20	<0.20	<0.20	0.20	9248205
Methylcyclohexane	ug	<0.20	<0.20	<0.20	0.20	9248205
Methyl-tert-butylether (MTBE)	ug	<0.40 (3)	<0.40 (3)	<0.40 (3)	0.40	9248205

RDL = Reportable Detection Limit
(1) Tentatively identified result and may be potentially biased high due to matrix interference.
(2) CCV above acceptance criteria. Data not impacted - ND.
(3) CCV below acceptance criteria. RDL raised due to potential for low bias.

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Maxxam Job #: B8A4806
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SMB

VOC/VPH PLUS PACKAGE IN AIR BY TD (AIR)

Maxxam ID		UW2951	UW2952	UW2953		
Sampling Date		2018/11/29 12:10	2018/11/29 11:34	2018/11/29 12:00		
COC Number		571441-11-01	571441-11-01	571441-11-01		
	UNITS	SV18-15	SV18-14	SV18-16	RDL	QC Batch
Naphthalene	ug	<0.0030	<0.0030	<0.0030	0.0030	9248205
n-Butylbenzene	ug	<0.010	<0.010	<0.010	0.010	9248205
n-Decane	ug	<0.10	<0.10	<0.10	0.10	9248205
n-Hexane	ug	<0.10	<0.10	0.39	0.10	9248205
n-Propylbenzene	ug	<0.010	<0.010	<0.010	0.010	9248205
p-Isopropyltoluene	ug	0.13	0.060	0.026	0.010	9248205
sec-Butylbenzene	ug	<0.010	<0.010	<0.010	0.010	9248205
Styrene	ug	<0.20	<0.20	<0.20	0.20	9248205
tert-Butylbenzene	ug	<0.010	<0.010	<0.010	0.010	9248205
Tetrachloroethene	ug	0.51	<0.010	0.046	0.010	9248205
Toluene	ug	<0.20	<0.20	<0.20	0.20	9248205
trans-1,2-dichloroethene	ug	<0.010	<0.010	<0.010	0.010	9248205
trans-1,3-dichloropropene	ug	<0.0020	<0.0020	<0.0020	0.0020	9248205
Trichloroethene	ug	<0.0010	<0.0010	<0.0010	0.0010	9248205
Trichlorofluoromethane	ug	<0.10	<0.10	<0.10	0.10	9248205
Vinyl chloride	ug	<0.0010	<0.0010	<0.0010	0.0010	9248205
m & p-Xylene	ug	0.072	0.16	0.070	0.010	9248205
o-Xylene	ug	0.025	0.048	0.022	0.010	9248205
Xylenes (Total)	ug	0.096	0.21	0.092	0.010	9248205
RDL = Reportable Detection Limit						

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Maxxam Job #: B8A4806
Report Date: 2018/12/04

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SMB

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	10.0°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

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Maxxam Job #: B8A4806
Report Date: 2018/12/04

QUALITY ASSURANCE REPORT

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SMB

			Spiked Blank		Method Blank	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS
9248205	1,1,1,2-tetrachloroethane	2018/11/30	99	60 - 140	<0.0015	ug
9248205	1,1,1-trichloroethane	2018/11/30	89	60 - 140	<0.20	ug
9248205	1,1,2,2-tetrachloroethane	2018/11/30	109	60 - 140	<0.010	ug
9248205	1,1,2-trichloroethane	2018/11/30	97	60 - 140	<0.00050	ug
9248205	1,1-dichloroethane	2018/11/30	87	60 - 140	<0.010	ug
9248205	1,1-dichloroethene	2018/11/30	94	60 - 140	<0.010	ug
9248205	1,2,3-trichlorobenzene	2018/11/30	101	60 - 140	<0.010	ug
9248205	1,2,3-trichloropropane	2018/11/30	105	60 - 140	<0.00050	ug
9248205	1,2,3-Trimethylbenzene	2018/11/30	96	60 - 140	<0.010	ug
9248205	1,2,4-trichlorobenzene	2018/11/30	105	60 - 140	<0.0050	ug
9248205	1,2,4-trimethylbenzene	2018/11/30	98	60 - 140	<0.0020	ug
9248205	1,2-dibromo-3-chloropropane	2018/11/30	108	60 - 140	<0.0010	ug
9248205	1,2-dibromoethane	2018/11/30	95	60 - 140	<0.00050	ug
9248205	1,2-dichlorobenzene	2018/11/30	107	60 - 140	<0.010	ug
9248205	1,2-dichloroethane	2018/11/30	90	60 - 140	<0.0020	ug
9248205	1,2-dichloropropane	2018/11/30	95	50 - 150	<0.0020	ug
9248205	1,3,5-trimethylbenzene	2018/11/30	96	60 - 140	<0.0020	ug
9248205	1,3-Butadiene	2018/11/30	81	50 - 150	<0.0020	ug
9248205	1,3-dichlorobenzene	2018/11/30	109	60 - 140	<0.010	ug
9248205	1,3-dichloropropane	2018/11/30	94	50 - 150	<0.0015	ug
9248205	1,4-dichlorobenzene	2018/11/30	100	60 - 140	<0.010	ug
9248205	2-Butanone (MEK)	2018/11/30	79	60 - 140	<0.50	ug
9248205	2-chlorophenol	2018/11/30			<0.010	ug
9248205	2-chlorotoluene	2018/11/30	99	60 - 140	<0.0020	ug
9248205	2-Hexanone	2018/11/30	110	60 - 140	<0.010	ug
9248205	4-chlorotoluene	2018/11/30	108	60 - 140	<0.010	ug
9248205	Acetone	2018/11/30	97	60 - 140	<0.020	ug
9248205	Benzene	2018/11/30	99	60 - 140	<0.0015	ug
9248205	Bromobenzene	2018/11/30	102	60 - 140	<0.0020	ug
9248205	Bromodichloromethane	2018/11/30	92	60 - 140	<0.0020	ug
9248205	Bromoform	2018/11/30	101	60 - 140	<0.0020	ug

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

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Maxxam Job #: B8A4806
Report Date: 2018/12/04

QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SMB

			Spiked Blank		Method Blank	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS
9248205	Bromomethane	2018/11/30	67	50 - 150	<0.0050 (1)	ug
9248205	C6-C13 Hydrocarbons (VHv)	2018/11/30	112	60 - 140	<0.50	ug
9248205	Carbon tetrachloride	2018/11/30	99	60 - 140	<0.0010	ug
9248205	Chlorobenzene	2018/11/30	91	60 - 140	<0.0020	ug
9248205	Chloroethane	2018/11/30	102	50 - 150	<0.50	ug
9248205	Chloroform	2018/11/30	89	60 - 140	<0.0020	ug
9248205	Chloromethane	2018/11/30	70	50 - 150	<0.020	ug
9248205	cis-1,2-dichloroethene	2018/11/30	95	60 - 140	<0.010	ug
9248205	cis-1,3-dichloropropene	2018/11/30	84	50 - 150	<0.0020	ug
9248205	Dibromochloromethane	2018/11/30	97	60 - 140	<0.0020	ug
9248205	Dibromomethane	2018/11/30	91	60 - 140	<0.0040	ug
9248205	Dichlorodifluoromethane	2018/11/30	87	50 - 150	<0.020	ug
9248205	Dichloromethane	2018/11/30	97	50 - 150	<0.050	ug
9248205	Ethyl acetate	2018/11/30			<0.010	ug
9248205	Ethylbenzene	2018/11/30	91	60 - 140	<0.20	ug
9248205	Hexachloro-1,3-butadiene	2018/11/30	101	60 - 140	<0.0010	ug
9248205	Isopropylbenzene	2018/11/30	97	60 - 140	<0.0020	ug
9248205	m & p-Xylene	2018/11/30	90	60 - 140	<0.010	ug
9248205	Methyl Isobutyl Ketone	2018/11/30			<0.20	ug
9248205	Methylcyclohexane	2018/11/30	84	60 - 140	<0.20	ug
9248205	Methyl-tert-butylether (MTBE)	2018/11/30	59	50 - 150	<0.40 (2)	ug
9248205	Naphthalene	2018/11/30	101	60 - 140	<0.0030	ug
9248205	n-Butylbenzene	2018/11/30	101	60 - 140	<0.010	ug
9248205	n-Decane	2018/11/30	100	60 - 140	<0.10	ug
9248205	n-Hexane	2018/11/30	103	60 - 140	<0.10	ug
9248205	n-Propylbenzene	2018/11/30	92	60 - 140	<0.010	ug
9248205	o-Xylene	2018/11/30	91	60 - 140	<0.010	ug
9248205	p-Isopropyltoluene	2018/11/30	108	60 - 140	<0.010	ug
9248205	sec-Butylbenzene	2018/11/30	98	60 - 140	<0.010	ug
9248205	Styrene	2018/11/30	109	60 - 140	<0.20	ug
9248205	tert-Butylbenzene	2018/11/30	96	60 - 140	<0.010	ug

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Maxxam Job #: B8A4806
Report Date: 2018/12/04

QUALITY ASSURANCE REPORT(CONT'D)

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SMB

			Spiked Blank		Method Blank	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS
9248205	Tetrachloroethene	2018/11/30	95	60 - 140	<0.010	ug
9248205	Toluene	2018/11/30	95	60 - 140	<0.20	ug
9248205	trans-1,2-dichloroethene	2018/11/30	92	60 - 140	<0.010	ug
9248205	trans-1,3-dichloropropene	2018/11/30	85	50 - 150	<0.0020	ug
9248205	Trichloroethene	2018/11/30	93	60 - 140	<0.0010	ug
9248205	Trichlorofluoromethane	2018/11/30	97	50 - 150	<0.10	ug
9248205	Vinyl chloride	2018/11/30	91	50 - 150	<0.0010	ug
9248205	Xylenes (Total)	2018/11/30			<0.010	ug

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

(1) CCV above acceptance criteria. Data not impacted - ND.

(2) CCV below acceptance criteria. RDL raised due to potential for low bias.

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City of Vancouver - FOI 2023-228 - Page 825 of 1003

Maxxam Job #: B8A4806
Report Date: 2018/12/04

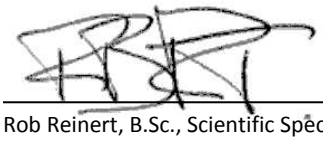
KEYSTONE ENVIRONMENTAL LTD
Client Project #: 13639-2D
Sampler Initials: SMB

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Kirsten Roberts, Project Manager Assistant



Rob Reinert, B.Sc., Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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CH

B8A4806_COC

INVOICE TO:
Company Name: #3763 KEYSTONE ENVIRONMENTAL LTD
Contact Name: Nicole MacDonald
Address: SUITE 320 4400 DOMINION STREET, BURNABY BC V5G 4G3
Phone: (604) 430-0671 Fax: (604) 430-0672
Email: nmacdonald@keystoneenviro.com

Report Information:
Company Name:
Contact Name:
Address:
Phone: File:
Email: smcbride@keystoneenviro.com

Project Information:
Quotation #: ~~B80863~~ B61898
P.O. #:
Project #: 13631-2.0
Project Name:
Site #:
Sampled By: Stewart McBride

Regulatory Criteria:
- [x] CSR
- [ ] DCME
- [ ] BC Water Quality
- [ ] Other

Special Instructions:

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

ANALYSIS REQUESTED (PLEASE BE SPECIFIC):

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals Field Filtered (Y / N)	PUMP FLOW RATE (L/MINUTE)	PUMP RUN TIME (MINUTES)	PUMP NUMBER	SV - CSAP Gas & Diesel	SV- CSAP Diesel	SV - BTEX/VPH	SV - CSAP Drycleaning	SV - CSAP Drycleaning & Petroleum	SV - FULL VOCs	POTENTIAL HIGH CONC. (Y/N)	# of Bottles	Comments
1		SV18-#15	Nov 29	12:10	Vapour		02	20	[illegible]			X			X		1	
2		SV18-14	↓	11:34	↓		02	20	↓			X			X		1	
3		SV18-16	↓	12:	↓		02	20	↓			X			X		1	
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects
Regular (Standard) TAT:
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.
Job Specific Rush TAT (if applies to entire submission)
1 DAY ☐ 2 Day ☐ 3 Day ☐ Date Required: ☐
Rush Confirmation Number: (call lab for #)

RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Stewart McBride	18/11/29	15:03	BRITTANY BURLONE	2018/11/29	15:05	

Lab Use Only: Time Sensitive ☐ | Temperature (°C) on Receipt: 10,10,10 | Custody Seal Intact on Cooler? ☐ Yes ☐ No N/A

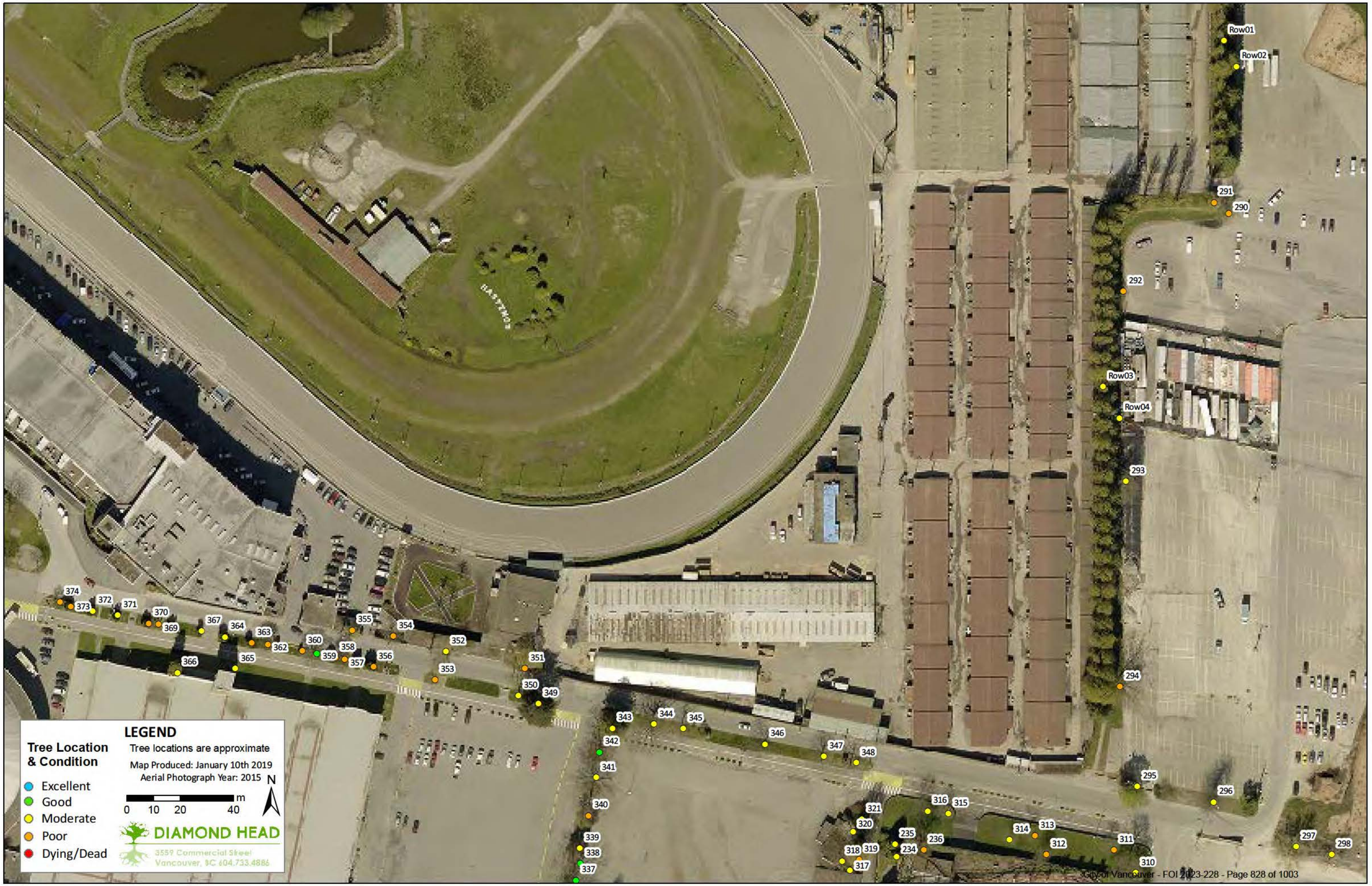
* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO MAXXAM'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.MAXXAM.CA/TERMS.
* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

Ice: present

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360

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Row01
Row02
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Row03
Row04
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LEGEND
Tree Location & Condition
Excellent
Good
Moderate
Poor
Dying/Dead
Tree locations are approximate
Map Produced: January 10th 2019
Aerial Photograph Year: 2015
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DIAMOND HEAD
3559 Commercial Street
Vancouver, BC 604.733.4886


LEGEND
Tree locations are approximate
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N
m
0 10 20 40
DIAMOND HEAD
3559 Commercial Street
Vancouver, BC 604.733.4886
Row01
Row02
Row03
Row04
Row05
Row06
Row07
Row08
Row09
Row10
Row11
Row12
Stand01

Arboricultural Inventory and Report



For:
City of Vancouver
Hastings Park, PNE Site Vancouver, BC

Submitted to:
Attn: Venus Vane
City of Vancouver,
Real Estate and Facilities Management
507 West Broadway, Suite 302
Vancouver, BC V5Z 0B4
Venus.Vane@vancouver.ca
Date: December 13th, 2018
Revised Jan 10th, 2018

Submitted by:

DIAMOND HEAD
3559 Commercial Street
Vancouver, BC 604.733.4886

SAFE CERTIFIED

The following Diamond Head Consulting staff conducted the on-site tree inventory and prepared or reviewed the report.

All general and professional liability insurance and staff credentials are provided below for reference.

Supervisor:



Max Rathburn
ISA Certified Arborist (PN-0599A)
ISA Tree Risk Assessment Qualified (TRAQ)
BC Parks Wildlife and Danger Tree Assessor

Project Staff:



Ian MacLachlan, PhD (Forestry)
ISA Certified Arborist (PN-8643A)
ISA Tree Risk Assessment Qualified (TRAQ)

Please contact us if there are any questions or concerns about the contents of this report.

Contact Information:

Phone: 604-733-4886
Fax: 604-733-4879
Email: max@diamondheadconsulting.com
Website: www.diamondheadconsulting.com

Insurance Information:

WCB:	# 657906 AQ (003)
General Liability:	Northbridge General Insurance Corporation - Policy #CBC1935506, $10,000,000
Errors and Omissions:	Lloyds Underwriters – Policy #1010615D, $1,000,000

Scope of Assignment:

Diamond Head Consulting Ltd. (DHC) was retained to complete an arboricultural assessment to aid in the future planning of the grounds throughout the PNE site. This report contains an inventory of bylaw protected trees within the study areas and summarizes management recommendations with respect to their existing health and structure as well as their current growing environment. This report is produced with the following primary limitations, detailed limitations specified in Appendix 7:

1) Our investigation is based solely on visual inspection of the trees during our last site visit. This inspection is conducted from ground level. We do not conduct aerial inspections, soil tests or below grade root examinations to assess the condition of tree root systems unless specifically contracted to do so.

2) Unless otherwise stated, tree risk assessments in this report are limited to trees with a *high* or *extreme* risk rating in their current condition, and in context of their surrounding land use at the time of assessment.

3) The scope of work is primarily determined by site boundaries and local tree-related bylaws. Only trees specified in the scope of work were assessed.

4) Beyond six months from the date of this report, the client must contact DHC to confirm its validity because site base plans and tree conditions may change beyond the original report's scope. Additional site visits and report revisions may be required after this point to ensure report accuracy for the municipality's development permit application process. Site visits and reporting required after the first submission are not included within the original proposal fee and will be charged to the client at an additional cost.

The client is responsible for:

- Reviewing this report to understand and implement all tree **risk**, removal and protection requirements related to the project.
- Understanding that we did not assess trees off the subject property and therefore cannot be held liable for actions you or your contractors may undertake in developing this property which may affect the trees on neighboring properties.
- Obtaining a tree removal permit from the relevant municipal authority prior to any tree cutting.
- Obtaining relevant permission from adjacent property owners before removing off-site trees and vegetation.
- Obtaining a timber mark if logs are being transported offsite.
- Ensuring the project is compliant with the tree permit conditions.
- Constructing and maintaining tree protection fencing.
- Ensuring an arborist is present onsite to supervise any works in or near tree protection zones.

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1.0 Introduction

1.1 Site Overview

The subject area is comprised of the main PNE fair grounds including Playland, these areas are high use when the fair or playland is in operation. It is our understanding that the other activities are hosted on the grounds throughout the year.

1.2 Proposed Land Use Changes

At this time, it is our understanding that our study will be used in the planning of future renovations. Once plans for the renovations are issued, this office can review the plans to ensure trees will be retained and protected where possible and that trees can be safely retained.

1.3 Report Objective

This report has been based on the City of Vancouver Protection of Trees Bylaw No. 9958 and the City of Vancouver Street Tree Bylaw No. 5985, which protects any City trees. Refer to Bylaw 9958 for the complete definition of protected trees, summarized below as:

- Trees with a stem diameter at breast height (DBH, measured at 1.4 m above grade) equal to or greater than 20 cm, measured for a single stem or the combined diameter of the two or three largest trunks or stems;
- Replacement trees of any size;
- All trees that are part of a hedge (counted as a group) if any single tree in the hedge has a stem diameter at breast height equal to or greater than 20 cm.

Trees on adjacent properties with a tree protection zone that extends into the subject site have also been captured in the arborist report.

This report outlines the existing condition of protected trees on and adjacent to the property, summarizes the proposed tree retention and removal, and suggests guidelines for protecting retained trees during the construction process.



Figure 1. The study area within Hastings Park and the PNE

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2.0 Process and Methods

Max Rathburn and Ian MacLachlan of DHC visited the site on November 1 – 9 2018 The following methods and standards are used throughout this report.

2.1 Tree Inventory

Trees on site and trees shared with adjacent properties were marked with a numbered tag and assessed for attributes including: species; height measured to the nearest meter; and, diameter at breast height (DBH) measured to the nearest centimeter at 1.4 m above grade. The general health and structural integrity of each tree was assessed visually and assigned to one of five categories: *excellent; good; moderate; poor; or dying/dead*. Descriptions of the health and structure rating criteria are given in Appendix 3.

Tree retention value, categorized as *high, medium, low, or nil,* was assigned to each tree or group of trees based on their health and structure rating, and potential longevity in a developed environment. Descriptions of the retention value ratings are given in Appendix 4. Recommendations for tree retention or removal were determined by taking in to account a tree's retention value rating, its location in relation to proposed building envelopes and development infrastructure.

2.2 Tree Risk Assessment

Tree risk assessments were completed following methods of the ISA Tree Risk Assessment Manual[1] published in 2013 by the International Society of Arboriculture, which is the current industry standard for assessing tree risk. This methodology assigns risk based on the likelihood of failure, the likelihood of impact and the severity of consequence if a failure occurs. Only on-site trees that had *high* or *extreme* risk ratings in their current condition and in context of their surrounding land use were identified and reported in section 3.2. Appendix 5 gives the likelihood and risk rating matrices used to categorize tree risk. DHC recommends that on-site trees be re-assessed for risk after the site conditions change (e.g. after damaging weather events, site disturbance from construction, creation of new targets during construction or in the final developed landscape).

2.3 Tree Protection

Tree protection zones were calculated for each tree according to the City of Vancouver Protection of Trees Bylaw 9958 requirements for minimum protection around a tree, but may be modified based on professional judgement of the project arborist to accommodate species specific tolerances and site specific growing conditions.

[1] Dunster, J.A., Smiley, E.T., Matheny, N. and Lilly, S. (2013). Tree Risk Assessment Manual. *International Society of Arboriculture*. Champaign, Illinois.

3.0 Findings: Tree Inventory and Risk Assessment

3.1 Tree Inventory

The tree inventory is summarized in Table 1 and the complete tree inventory is given in Appendix 1.

Trees On-site

There were 347 trees inventoried within the study area, the majority of these trees are rated to be in moderate overall health and structural, (see Appendix 1 for individual tree inventory information).

Of the Subject trees, 53 have good or excellent health and structure; they have high retention value and potential longevity in an urban landscape. These trees have high retention and amenity value and planning should try to accommodate these trees within the new landscape. A further 196 trees have moderate health and structure and have medium retention value but may require remedial work to promote their health and structural integrity if retained. Most of the moderate rated trees have issues with their growing environments, such as compacted soils or encroaching hardscape, and these issues can be remediated to ensure the long-term viability of the trees. There are 93 trees that have poor health and structure or are dying/dead and these trees have low retention value and in most cases removal and replacement is the most appropriate treatment to ensure longevity of the landscape and public safety.

Table 1: Summary of the Hastings Park-PNE tree inventory containing the number of trees categorized by retention value and the recommended number to be retained or removed. The complete tree inventory is given in Appendix 1.

Species	Dead/Dying	Poor	Moderate	Good	Excellent	Total
Alder/Cottonwood						
Alder (A. rubra)		8	7			15
Poplar (P. bal. tri)		3	4	1		8
Coniferous						
Cedar (T. occidentalis)		9	5			14
Cedar (T. plicata)		1	16	7	1	25
Cedrus (C. atlantica)		1		6		7
Cedrus (C. deodara)			1	1		2
Cypress (C. lawsoniana)			1			1
Cypress (C. pisifera)		4	7			11
Douglas-fir (P. menziesii)		2	4	6		12
Pine (P. nigra)			18			18
Pine (P. sylvestris)		2	7			9
Redwood (S. giganteum)			4	4		8
Spruce (P. sitchensis)				3		3
Yew (T. baccata)			1			1

Deciduous/broadleaf						
Ash (Fraxinus sp.)			3	3		6
Beech (F. sylvatica)			3			3
Buckeye (Aesculus sp.)	3	1	1	1		6
Cherry (P. emarginata)		1				1
Cherry (P. serrulata)		5	1			6
Cherry (Prunus sp.)			1			1
Chestnut (C. sativa)				1		1
Dogwood (C. florida)		1				1
Dogwood (C. nuttallii)			1			1
Hawthorn (Crataegus sp.)		4	2			6
Hornbeam (C. betulus)		1	1			2
Horsechestnut (A. hippocastanum)		1				1
Laburnum (L. x watereri)		4				4
Linden (Tilia sp.)			3	1		4
Locust (G. triacanthos)		4	2			6
Locust (R. pseudoacacia)		1	1			2
London Plane (P. acerifolia)			9	1		10
Maple (A. circinatum)		1				1
Maple (A. macrophyllum)	1	5	17	3		26
Maple (A. palmatum)		5	6			11
Maple (A. platanoides)		4	4	2		10
Maple (A. pseudoplatanus)		1	1			2
Maple (A. rubrum)		3	2	7		12
Maple (A. saccharinum)		2	2			4
Maple (Acer sp.)			1			1
Oak (Q. coccinea)			1			1
Oak (Q. palustris)			15	1		16
Oak (Q. robur)			2			2
Oak (Q. rubra)		2	21	4		27
Plane (P. x. acerifolia)			2			2
Plum (P. cerasifera)		4	2			6
Poplar (P. nigra)		3	3			6
Poplar (P. tremuloides)		1	3			4
Poplar (Populus sp.)		2				2
Spindlewood (Euonymous sp.)		1				1
Tulip tree (L. tulipifera)		4	11	1		16
Willow (S. babylonica)		1				1
Willow (Salix sp.)		1				1
Total	**4**	**93**	**196**	**53**	**1**	**347**