May 13, 2016

Project 0100480050

Mr. John Carpenter
Mr. Keith Lund
Stericycle Environmental Solutions, Inc.
1701 East Alexander Avenue
Tacoma, WA 98421

Sent via e-mail: john.carpenter@stericycle.com
Sent via e-mail: keith.lund@stericycle.com

Subject: **Soil Vapor Sampling**
Stericycle Tacoma Facility
Tacoma, Washington

Dear Mr. Carpenter:

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler), prepared this letter for Stericycle Environmental Solutions, Inc. (Stericycle), to summarize findings of the soil vapor intrusion study performed at the Stericycle Tacoma Facility located at 1701 East Alexander Avenue in Tacoma, Washington (the Facility). Amec Foster Wheeler installed six soil vapor probes in the area north of the stabilization building at the Facility (Figure 1) to collect representative soil vapor samples and determine whether vapor would pose a risk to on-site workers in the future.

1.0 BACKGROUND

The Facility is a hazardous waste treatment, storage, and disposal facility (TSDF) operated by Stericycle. The Facility operates under Resource Conservation and Recovery Act (RCRA) Part B Permit No. WAD 020 257 945, which was issued to the Facility in 1999 jointly by the U.S. Environmental Protection Agency (EPA) and the Washington State Department of Ecology (Ecology).

The Facility lies within the Port of Tacoma Industrial Park, which was constructed on former tidal marsh land. There is a long history of filling activities that elevated the tidal marsh, making it the relatively flat, filled-in property of today. Various wastes were used as fill, including auto fluff, lime waste, wood waste, waste oil, and dredge material (Geomatrix, 2005). The constituents of concern (COCs) for the Facility are predominantly associated with the individual waste materials used as fill at the site over the years. Specifically, the COCs are primarily associated with the auto fluff (polychlorinated biphenyls, metals, phthalates, and hydrocarbons) and lime waste, or the former waste oil pond on Parcel A. Large quantities of at least one of these waste types cover approximately two-thirds of the Facility property, with the exception of the northern portion of the Facility, which has been filled primarily with wood waste.

2.0 SAMPLE COLLECTION

Soil vapor sampling methodology followed protocols generally consistent with the Washington State Department of Ecology Guidance for Evaluating Soil Vapor Intrusion in Washington State (Ecology, 2009 and Ecology 2015), the April 2012 Advisory – Active Soil Gas Investigations (California Environmental Protection Agency, et al., 2012), and the Ecology approved Soil Vapor Sampling Plan (Amec Foster Wheeler, 2015).

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Cascade Drilling advanced six soil borings through 15 feet of preload material in the area north of the stabilization building, using a Geoprobe rig and direct push samplers (Figure 1). The samplers were configured with 5-foot-long, 2-inch-diameter acetate liners. Borings were completed to approximately 20 feet below the top of preload material, approximately 5 feet into the artificial fill. Soil lithology was logged from 15 feet to 20 feet below ground surface (bgs) at each location by an Amec Foster Wheeler geologist using ASTM Method D2488-93, Standard Practice for Description and Identification of Soil (Visual-Manual Procedure). Amec Foster Wheeler prepared the lithologic logs for each boring based on visual observations (Attachment A).

Once the desired depth had been reached (approximately 15 feet to 20 feet bgs, and 5 feet into the artificial fill material), the vapor probe was installed. It consisted of a new, disposable, 1/4-inch outside diameter Teflon® (rigid wall) tubing, fitted with a perforated probe placed between 1.5 feet and 4 feet bgs, depending on the elevation of the water table. Dry bentonite was placed in the bottom of borings to reduce the likelihood of water intrusion where a high water table was present. A filter pack of approximately 12 inches of Colorado 10/20 sand was placed on top of the dry bentonite. The bottom of the Teflon tubing was placed midway through the filter pack sand. A 6-inch lift of dry bentonite was placed between the filter pack sand and the bentonite grout. Following installation of the filter pack, and 6-inch lift of dry bentonite, the boring was then sealed with bentonite grout. A valve was fitted to the aboveground end of the Teflon tubing and was kept closed prior to purging and sampling. The sample points were then allowed to equilibrate with the subsurface soil conditions for at least two hours prior to collecting samples.

Amec Foster Wheeler collected soil vapor samples from four of the borings (SV-2, SV-3, SV-4, and SV-5) (Figure 1). Soil vapor samples from borings SV-1 and SV-6 were not completed due to groundwater intrusion during purging. A blind duplicate soil vapor sample was collected at SV-4 and labeled SV-DUP-1-042116. All soil vapor samples were collected using laboratory-supplied, 1-liter Summa vacuum canisters with regulators that allow the canisters to fill with air sample over a period of approximately four minutes. An ambient air sample, identified as AA-1-042116, was collected near SV-1 over a two-hour period.

The aboveground sampling train was leak-checked using a shut-in test prior to purging and sampling. The soil vapor probe was purged and leak-checked using helium as a tracer compound. Three volumes of air were purged through the probe and associated tubing. All samples passed a shut-in test and leak test, and at least three well volumes were purged before sampling. Each boring was screened prior to sample collection during sample purging for volatile organic compounds (VOCs), oxygen, carbon dioxide, and methane. The field readings for methane during purging were higher than anticipated.

All soil vapor samples and the ambient air sample were analyzed for VOCs using EPA Method TO-15. The soil vapor samples from borings SV-2 and SV-3 were also analyzed for methane by Method ASTM D-1946 to confirm the methane readings taken in the field. The soil vapor sample from SV-2 was analyzed for helium by Method ASTM D-1946, as a leak detection control test. The samples were submitted to Eurofins Air Toxics, located in Folsom, California, under standard chain-of-custody procedures.

3.0 WORK PLAN DEVIATIONS

The following deviations from the soil vapor sampling plan (Amec Foster Wheeler, 2015) occurred during sampling:

- Two of the five soil vapor probes samples (SV-1 and SV-6) were not completed due to groundwater intrusion during purging.
- Methane was analyzed in the laboratory for two of the vapor samples to confirm high methane readings in the field.

4.0 ANALYTICAL RESULTS

Detected COCs are presented in Table 1, and complete laboratory reports for soil vapor samples are included in Attachment B. Analytical results were compared to Model Toxics Control Act (MTCA) Method C (industrial) screening levels for sub slab vapor from Table B-1 from the Draft Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action (Ecology, 2015). The analytical data were reviewed for completeness, accuracy, and conformance to holding times. The analytical data were found to be of acceptable quality for this investigation. A data validation memo is located in Attachment B. The VOC concentrations in the ambient air sample were too low to impact the soil vapor results. Results are discussed below.

Benzene was detected at concentrations exceeding the screening level of 107 micrograms per cubic meter (µg/m^3) at borings SV-2 through SV-5. The benzene concentrations ranged from 130 µg/m^3 (SV-3) to 310 µg/m^3 (SV-2 and the field duplicate collected from SV-4). Benzene was the only compound detected at concentrations greater than the Method C (industrial) screening level.

Soil vapor samples from borings SV-2 and SV-3 were analyzed for methane due to the high field readings and the methane concentrations were 75 and 67 percent, respectively. This is 1,313 to 1,470 times the lower explosive limit (LEL) of 5.1 percent.

Helium was not detected in the soil vapor sample collected at SV-2, thus confirming that no leaks were present during soil vapor sampling.

5.0 ENGINEERING CONCERNS

A draft lab pack building drawing set was provided to Amec Foster Wheeler and Dalton Olmsted & Fugelvand, Inc. (DOF), by the construction design engineers (Sitts & Hill Engineers, Inc. [Sitts & Hill]) for help in modelling potential indoor air concerns. Sitts & Hill were also provided a summary of the soil vapor data and draft lithologic logs to provide additional geotechnical context and use in construction planning. Sitts & Hill confirmed that the woodwaste noted in the lithologic logs was consistent with the lithology used as the basis for the geotechnical design.

In order to assess potential indoor air impacts from the benzene concentrations detected in the soil vapor samples, Amec Foster Wheeler ran EPA's VISL model using the highest detected benzene concentration. Since methane concentrations greatly exceed the LEL in soil gas, it was assumed mitigation would be necessary to address explosion hazards.

Results of the model for benzene in commercial building use showed a potential indoor air concentration of 9.3 μg/m^3 and a cancer risk of 5.9E-06. (Backup calculations are provided in Appendix B.) That cancer risk is higher than Ecology guidance for indoor air and the potential indoor air concentration for benzene is higher than the MTCA Method C Air screening level in CLARC of 3.2 μg/m^3.Given the above results for methane and benzene, Stericycle requested that Amec Foster Wheeler perform an initial evaluation of options for installation of a vapor barrier to be incorporated with building construction. For construction of new buildings, there are five basic components that can be utilized for vapor intrusion mitigation construction:

1. Permeable sub-slab support material (e.g., gravel),
2. A sealed vapor barrier,
3. Venting all sub-slab areas below occupied spaces,
4. Properly-sized sub-slab and riser piping, and
5. If an active system is specified, a properly-sized blower to maintain sufficient negative pressure beneath the slab.

Items 1 and 2 are the minimum items necessary for a simple vapor barrier system. A simple vapor barrier would likely be sufficient to mitigate the effect of benzene in the soil vapor on indoor air, especially given the planned use for the building (waste handling). However, given the concentrations of methane were well above the LEL, a vapor barrier system should include a way to prevent methane concentrations from building up to concentrations above the LEL and pooling against the vapor barrier under the building slab. Installation of items 3 and 4 above would create a vapor barrier system with passive venting to help mitigate the methane concentrations. Designing the passive system to allow for future addition of a blower (and associated controls) would ensure that if passive venting is insufficient, a blower could be added at a later date to implement Item 5.

6.0 CONCLUSIONS

Benzene was the only analyte detected at concentrations exceeding the sub-slab Method C (industrial) screening levels and VISL modeled values are above applicable screening levels for indoor air.

Methane concentrations in soil vapor were detected in the range of 67 to 75 percent, which is well above the LEL and could be a potential explosion hazard should vapors leak into the building at that concentration. In addition, per Ecology's Policy 300 – Site Discovery – Reporting Releases document (Ecology, 2004), Ecology must be notified in writing within 90 days of discovery of a release of hazardous substance concentrations exceeding 10 percent of the LEL (0.51 percent). Since methane concentrations were 67 to 75 percent, Ecology should be notified. This letter could be forwarded by a responsible party at Stericycle to serve as the notification to Ecology based on the guidelines provided in WAC 173-340-300(2).

Initial mitigation design to protect indoor air should include a vapor barrier with passive vent piping, and the system should allow for addition of a blower and controls if it is confirmed after building construction that active venting is necessary.

7.0 REFERENCES

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler), 2015, Proposed Soil Vapor Sampling Plan, Stericycle Tacoma Facility, Tacoma, Washington, September.

California Environmental Protection Agency, Department of Toxic Substances Control, the Los Angeles Regional Water Quality Control Board, and the San Francisco Regional Water Quality Control Board 2012, Advisory – Active Soil Gas Investigations, April.

Geomatrix Consultants, Inc. (Geomatrix), 2005, Draft Feasibility Study Work Plan, Philip Services Corporation, Tacoma Facility, August.

Washington State Department of Ecology (Ecology), 2004, Policy 300 Site Discovery–Reporting Releases, June 10.

Ecology, 2009, Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action, Publication No. 09-09-047, October.

Ecology, 2015, Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action, Table B-1, April.

Sincerely yours,
Amec Foster Wheeler Environment & Infrastructure, Inc.

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JB:lpm
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Enclosures:

Table 1	Analytical Results for Soil Vapor Samples
Figure 1	Soil Vapor Sampling Locations
Attachment A	Boring Logs
Attachment B	Data Validation Memo, Laboratory Data Packages, and Backup Calculations

cc: William Beck, Stericycle
Tasya Gray, DOF

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TABLE

TABLE 1

ANALYTICAL RESULTS FOR SOIL VAPOR SAMPLES [1,2]

1701 East Alexander Avenue
Tacoma, Washington

Analyte	Screening Criteria		Soil Vapor Samples					Ambient Air [5]
	Method B	Method C	SV-2 (3.5')	SV-3 (3.0')	SV-4 (2.0')	SV-4 DUP	SV-5 (3.0')	AA-1
Volatile Organic Compounds[3] (µg/m3)								
1,2,4-Trimethylbenzene	107	233	**57**	< 18	**27**	**32**	**50**	< 0.77
1,3,5-Trimethylbenzene	NE	NE	**22**	< 18	**21**	**24**	< 20	< 0.77
2-Propanol	NE	NE	< 39	< 37	< 39	< 38	< 40	**2.1**
2,2,4-Trimethylpentane	NE	NE	**1,000**	**7,800 J**	**3,900**	**4,400**	**1,500**	< 3.6
4-Ethyltoluene	NE	NE	**58**	< 18	**64**	**78**	**57**	< 0.77
Acetone	NE	NE	< 94	**110 J**	< 94	< 92	< 96	**9.2**
Benzene	11	107	**310**	**130 J**	**280**	**310**	**300**	< 0.50
cis-1,2-Dichloroethene	NE	NE	< 16	< 15	< 16	**17**	< 16	< 0.62
Cumene	6,095	13,333	**64**	**26 J**	**48**	**54**	**120**	< 0.77
Cyclohexane	NE	NE	**250**	**790 J**	**470**	**530**	**450**	< 0.54
Ethanol	NE	NE	< 30	< 28	< 30	< 29	< 30	**5.9**
Ethyl Benzene	15,238	33,333	**19**	**67 J**	**280**	**330**	**91**	< 0.68
Freon 12	46	3,333	< 20	< 18	< 20	< 19	< 20	**2.5**
Freon 11	320	23,333	< 22	< 21	< 22	< 22	< 23	**1.4**
Heptane	NE	NE	**1,100**	**1600 J**	**1,400**	**1,600**	**1,800**	< 0.64
Hexane	10,667	23,333	**2,000**	**3800 J**	**4,200**	**4,800**	**2,000**	< 0.55
Methylene Chloride	250	83,333	< 140	< 130	< 140	< 130	< 140	**2.6**
m,p-Xylene	1,524	3,333	**120**	**26 J**	**190**	**220**	**130**	< 0.68
o-Xylene	1,524	3,333	**180**	**24 J**	**110**	**140**	**84**	< 0.68
Propylbenzene	NE	NE	**34**	< 18	**22**	**27**	**39**	< 0.77
Styrene	15,238	33,333	< 17	< 16	**24**	**25**	< 17	< 0.66
Toluene	76,190	166,667	< 15	**59 J**	**190**	**210**	**480**	**2.2**
Trichloroethene5	12	210	< 21	< 20	**24**	< 21	< 22	< 0.84
Gases[4] (percent)								
Methane	NE	NE	**75%**	**67%**	NA	NA	NA	NA

Notes

1. Detected compounds are presented in this table with detected values shown in **bold**. For a full list of analyzed compounds please refer to the laboratory report presented in Attachment B.
2. Cells shaded orange indicate exceedances above Method C screening levels.
3. Samples analyzed using EPA Method TO-15.
4. Samples analyzed using Modified ASTM D-1946.
5. Ambient air sample not compared to screening levels.

Abbreviations

µg/m3 = micrograms per cubic meter
DUP = field duplicate
J = estimated value
EPA = U.S. Environmental Protection Agency
NA = not analyzed
NE = no regulatory limit established

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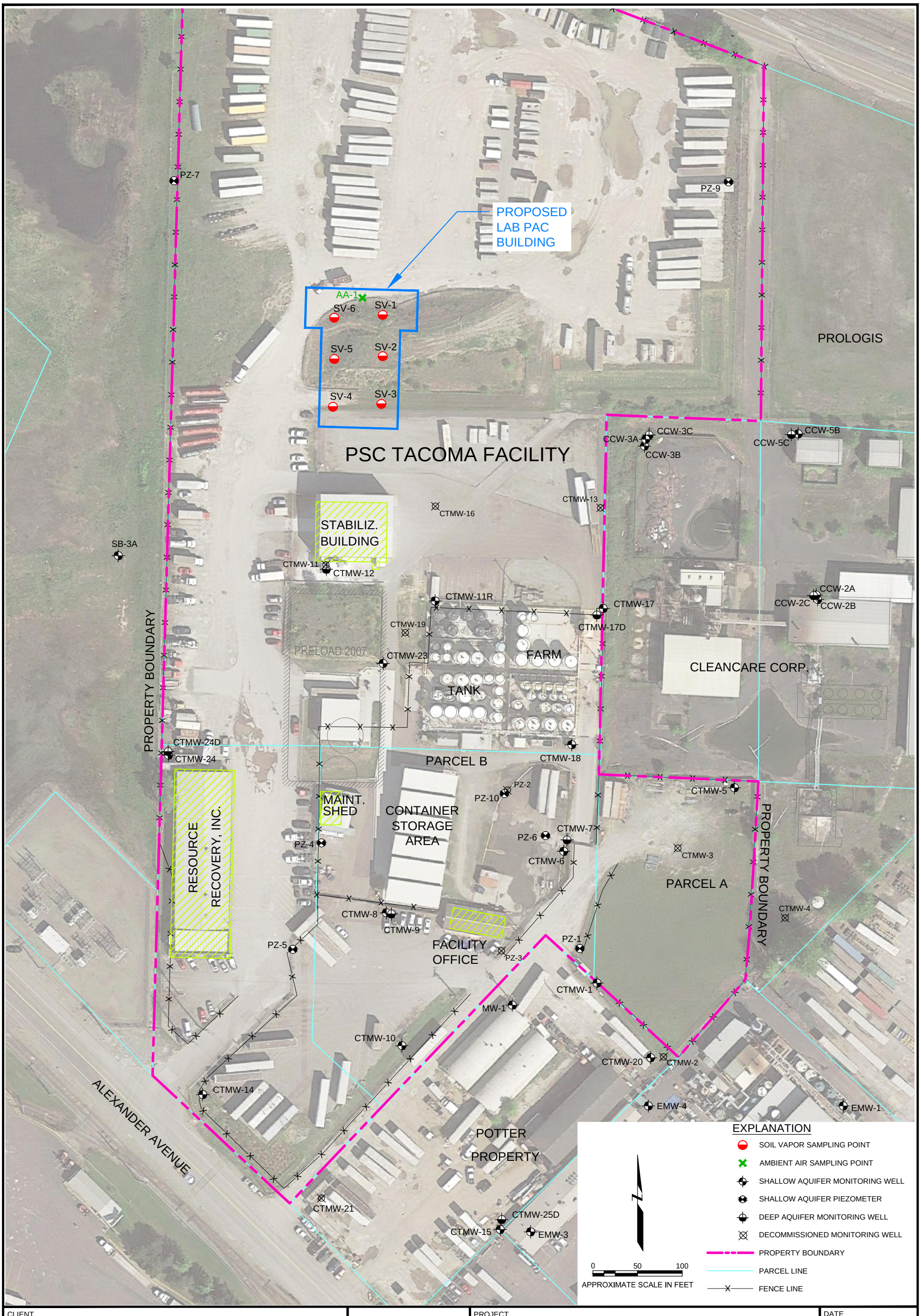
FIGURE



CLIENT

STERICYCLE
Tacoma, Washington

Amec Foster Wheeler
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600 University Street, Suite 600
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amec foster wheeler

PROJECT

CONTAINER MANAGEMENT
AREA IMPROVEMENTS

TITLE

SOIL VAPOR
SAMPLING LOCATIONS

DATE
APRIL 2016

SCALE
AS SHOWN

PROJECT NO.
10048

FIGURE
1

DRAWN BY: APS CHECKED BY: JB

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ATTACHMENT A

Boring Logs

PROJECT: Stericycle Tacoma 1701 East Alexander Avenue Tacoma, WA	**Log of Well No. SV-1**
BORING LOCATION: Preload Pile North of Stabilization Building	GROUND SURFACE ELEVATION AND DATUM: N/A
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 4/21/16 / DATE FINISHED: 4/21/16
DRILLING METHOD: Direct push	TOTAL DEPTH (ft.): 20.0 / SCREEN INTERVAL (ft.): N/A
DRILLING EQUIPMENT: Geoprobe 7730 DT	DEPTH TO WATER: FIRST N/A, COMPL. N/A / CASING: N/A
SAMPLING METHOD: 5-foot-continuous-core system [5' x 2 .25"]	LOGGED BY: S. Welter
HAMMER WEIGHT: N/A / DROP: N/A	RESPONSIBLE PROFESSIONAL: J. Bellamy / REG. NO. 3003

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: N/A	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
0					Preload Material, No Logging	
1						
2						Borehole 2 1/4`` Diameter
3						
4						
5						
6						
7						
8						
9						Halliburton Quick Grout, Bentonite Grout
10						
11						1/4`` Teflon Tubing
12						
13						
14						
15					Preload Sluff	
16				71	POORLY-GRADED SAND (SP): dark gray (10YR 4/1), moist, 90% coarse to fine sand, 10 % fines.	
17						
18				217		Cetco Crumbles #8, Dry Bentonite
19				7400	SILT with SAND (ML): dark brown (10YR 3/3), moist, 90% fines, 10% fine sand, low plasticity, fill material, strong odor, abundant organic material (roots and wood debris) and auto fluff.	Probe screen 1/4`` diameter
20					Bottom of Boring at 20 feet.	Colorado Silica 10/20 Sand
21						
22						
23						
24						
25						

OAKWELLV (REV. 3/2015)

PROJECT: Stericycle Tacoma 1701 East Alexander Avenue Tacoma, WA	**Log of Well No. SV-2**
BORING LOCATION: Preload Pile North of Stabilization Building	GROUND SURFACE ELEVATION AND DATUM: N/A
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 4/21/16 / DATE FINISHED: 4/21/16
DRILLING METHOD: Direct push	TOTAL DEPTH (ft.): 20.0 / SCREEN INTERVAL (ft.): N/A
DRILLING EQUIPMENT: Geoprobe 7730 DT	DEPTH TO WATER: FIRST N/A, COMPL. N/A / CASING: N/A
SAMPLING METHOD: 5-foot-continuous-core system [5' x 2 .25"]	LOGGED BY: S. Welter
HAMMER WEIGHT: N/A / DROP: N/A	RESPONSIBLE PROFESSIONAL: J. Bellamy / REG. NO. 3003

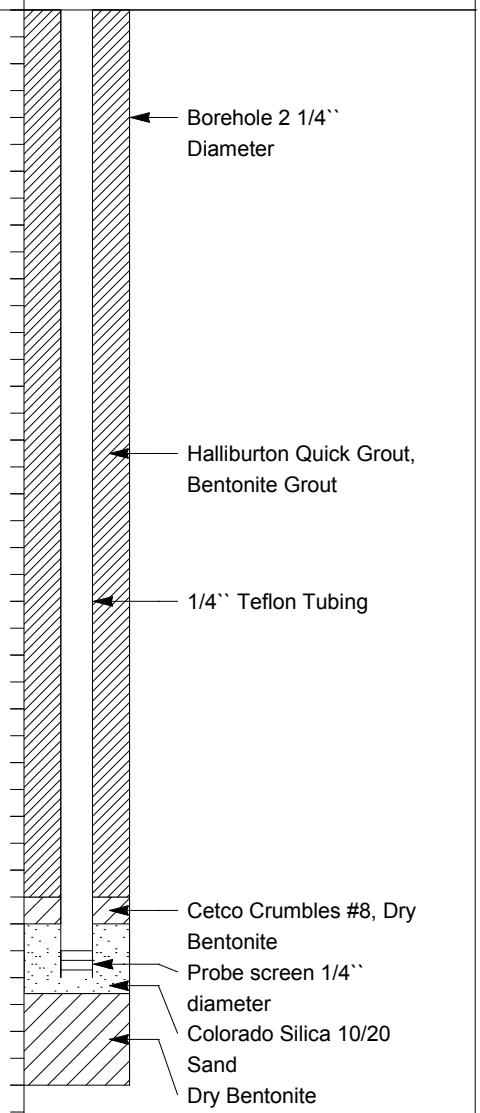
DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: N/A	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
0					Preload Material, No Logging	
1						
2						Borehole 2 1/4`` Diameter
3						
4						
5						
6						
7						
8						
9						Halliburton Quick Grout, Bentonite Grout
10						
11						1/4`` Teflon Tubing
12						
13						
14						
15					Preload Sluff	
16				58	POORLY-GRADED GRAVEL with SAND (GP): light gray (10YR 7/1), moist, 60% coarse to fine gravel, 40% coarse to fine sand, large root.	
17				115		
18					SANDY SILT (ML): gray (7.5YR 5/1), moist, 65% fines, 30% coarse to fine sand, 5% fine gravel, low plasticity.	Cetco Crumbles #8, Dry Bentonite
19				1616	POORLY-GRADED SAND (SP): dark gray (10YR 4/1), moist, 95% coarse to fine sand, 5% fines.	Probe screen 1/4`` diameter
20					SILT with SAND (ML): dark brown (10YR 3/3), moist, 90% fines, 10% fine sands, low plasticity, abundant organic material (roots and wood debris), dark brown PEAT, lime waste, red paint, and auto fluff.	Colorado Silica 10/20 Sand
21						Dry Bentonite
22						
23					Bottom of Boring at 20 feet.	
24						
25						

OAKWELLV (REV. 3/2015)

PROJECT: Stericycle Tacoma 1701 East Alexander Avenue Tacoma, WA	**Log of Well No. SV-3**
BORING LOCATION: Preload Pile North of Stabilization Building	GROUND SURFACE ELEVATION AND DATUM: N/A
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 4/21/16 / DATE FINISHED: 4/21/16
DRILLING METHOD: Direct push	TOTAL DEPTH (ft.): 20.0 / SCREEN INTERVAL (ft.): N/A
DRILLING EQUIPMENT: Geoprobe 7730 DT	DEPTH TO WATER: FIRST 19 / COMPL. N/A / CASING: N/A
SAMPLING METHOD: 5-foot-continuous-core system [5' x 2 .25"]	LOGGED BY: S. Welter
HAMMER WEIGHT: N/A / DROP: N/A	RESPONSIBLE PROFESSIONAL: J. Bellamy / REG. NO. 3003

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: N/A
0–14					Preload Material, No Logging
15–19				117	SILT with SAND (ML): dark brown (10YR 3/3), moist, 90% fines, 10% fine sands, low plasticity, abundant organic materials (roots), and auto fluff.
20					Bottom of Boring at 20 feet.

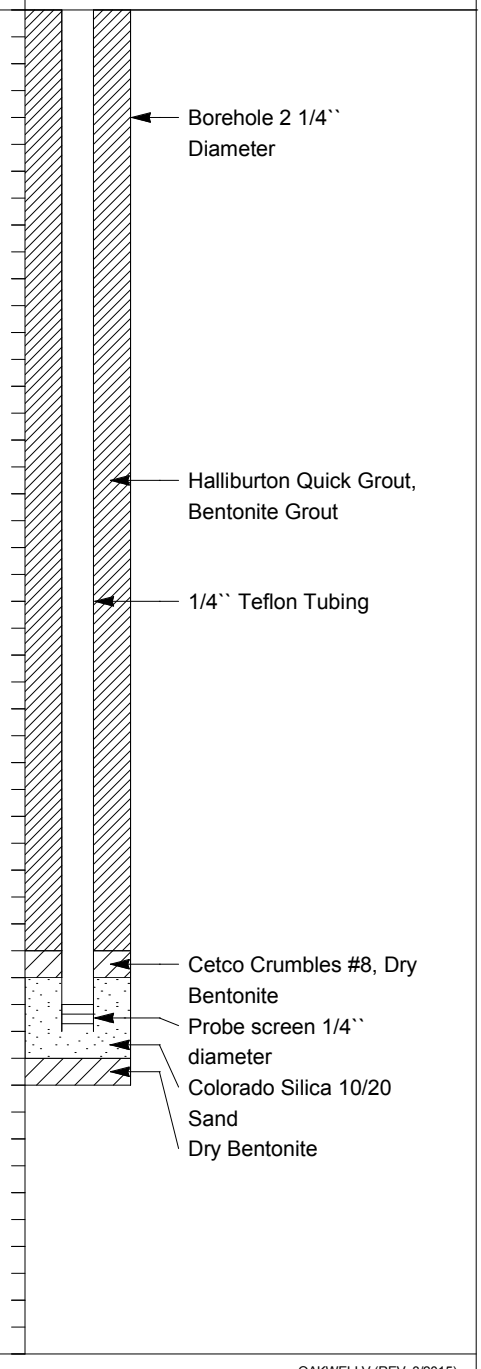
WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS



OAKWELLV (REV. 3/2015)

PROJECT: Stericycle Tacoma 1701 East Alexander Avenue Tacoma, WA	**Log of Well No. SV-4**
BORING LOCATION: Preload Pile North of Stabilization Building	GROUND SURFACE ELEVATION AND DATUM: N/A
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 4/21/16 / DATE FINISHED: 4/21/16
DRILLING METHOD: Direct push	TOTAL DEPTH (ft.): 20.0 / SCREEN INTERVAL (ft.): N/A
DRILLING EQUIPMENT: Geoprobe 7730 DT	DEPTH TO WATER: FIRST N/A, COMPL. N/A / CASING: N/A
SAMPLING METHOD: 5-foot-continuous-core system [5' x 2 .25"]	LOGGED BY: S. Welter
HAMMER WEIGHT: N/A / DROP: N/A	RESPONSIBLE PROFESSIONAL: J. Bellamy / REG. NO. 3003

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Surface Elevation: N/A	
0–14					Preload Material, No Logging	Borehole 2 1/4`` Diameter Halliburton Quick Grout, Bentonite Grout 1/4`` Teflon Tubing
15–16					Preload Sluff	
17–18				728	POORLY-GRADED SAND (SP): gray (7.5YR 5/1), moist, 90% coarse to fine sand, 10% fines.	Cetco Crumbles #8, Dry Bentonite Probe screen 1/4`` diameter Colorado Silica 10/20 Sand Dry Bentonite
19–20				1029	SILT with SAND (ML): dark brown (10YR 3/3), moist, 90% fines, 10% fine sands, low plasticity, abundant organic material (roots and wood debris), dark brown PEAT and auto fluff.	
21–25					Bottom of Boring at 20 feet.	



OAKWELLV (REV. 3/2015)

PROJECT: Stericycle Tacoma
1701 East Alexander Avenue Tacoma, WA

Log of Well No. SV-5

BORING LOCATION: Preload Pile North of Stabilization Building	GROUND SURFACE ELEVATION AND DATUM: N/A			
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 4/21/16			DATE FINISHED: 4/21/16
DRILLING METHOD: Direct push	TOTAL DEPTH (ft.): 20.0			SCREEN INTERVAL (ft.): N/A
DRILLING EQUIPMENT: Geoprobe 7730 DT	DEPTH TO WATER:	FIRST N/A	COMPL. N/A	CASING: N/A
SAMPLING METHOD: 5-foot-continuous-core system [5' x 2 .25"]	LOGGED BY: S. Welter			
HAMMER WEIGHT: N/A / DROP: N/A	RESPONSIBLE PROFESSIONAL: J. Bellamy			REG. NO. 3003

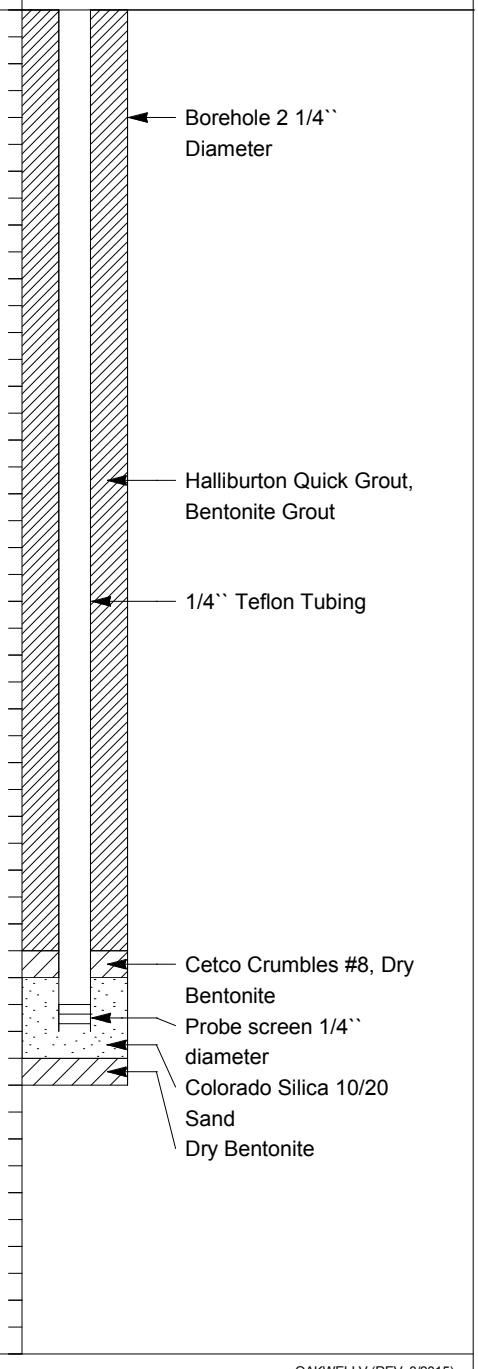
DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: N/A	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
0					Preload Material, No Logging	
1						
2						Borehole 2 1/4`` Diameter
3						
4						
5						
6						
7						
8						
9						Halliburton Quick Grout, Bentonite Grout
10						
11						1/4`` Teflon Tubing
12						
13						
14						
15					Preload Sluff	
16				77 ppb	POORLY-GRADED SAND with GRAVEL (SP): light gray (10YR 7/1), moist, 80% coarse to fine sand, 10% coarse to fine gravel, 10% fines.	
17				650 ppb		
18				705 ppb	POORLY-GRADED SAND with GRAVEL (SP): dark brown (10YR 3/3), moist, 80% coarse to fine sand, 10% coarse to fine gravel, 10% fines, with abundant organic material (wood debris, roots) and auto fluff.	Cetco Crumbles #8, Dry Bentonite
19						Probe screen 1/4`` diameter
20					Root Plug Bottom of Boring at 20 feet.	Colorado Silica 10/20 Sand Dry Bentonite
21						
22						
23						
24						
25						

OAKWELLV (REV. 3/2015)

PROJECT: Stericycle Tacoma 1701 East Alexander Avenue Tacoma, WA	**Log of Well No. SV-6**
BORING LOCATION: Preload Pile North of Stabilization Building	GROUND SURFACE ELEVATION AND DATUM: N/A
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 4/21/16 / DATE FINISHED: 4/21/16
DRILLING METHOD: Direct push	TOTAL DEPTH (ft.): 20.0 / SCREEN INTERVAL (ft.): N/A
DRILLING EQUIPMENT: Geoprobe 7730 DT	DEPTH TO WATER: FIRST N/A, COMPL. N/A / CASING: N/A
SAMPLING METHOD: 5-foot-continuous-core system [5' x 2 .25"]	LOGGED BY: S. Welter
HAMMER WEIGHT: N/A / DROP: N/A	RESPONSIBLE PROFESSIONAL: J. Bellamy / REG. NO. 3003

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: N/A
0					Preload Material, No Logging
15				162 ppb	POORLY-GRADED SAND with GRAVEL (SP): light gray (10YR 7/1), moist, 85% coarse to fine sand, 15% fine gravel.
17				420 ppb	
18					CLAYEY SAND (SC): dark brown (10YR 3/3), moist, 80% coarse to fine sands, 15% fines, 5% fine gravel, with abundant organic material (wood debris, roots, and bark), dark brown PEAT, auto fluff.
19				9860 ppb	
20					Bottom of Boring at 20 feet.

WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS



ATTACHMENT B

Data Validation Memo, Laboratory Data Package, and Backup Calculations

Memo

To:	Bill Beck, Project Manager	Project:	10048
From:	Crystal Thimsen	cc:	Duane Beery, Stericycle Project File
Tel:	(206) 342-1760		
Fax:	(206) 342-1761		
Date:	April 29, 2016		

Subject: **Summary Data Quality Review – Work Order Numbers 1604470A through 1604470D**
Stericycle Tacoma Facility
Tacoma, Washington

This memorandum presents the summary data quality review of four primary soil vapor samples and one soil vapor field duplicate collected on April 21, 2016. The sample IDs, laboratory sample numbers, and analyses conducted on each sample are listed in Table 1 (attached).

The samples were submitted to Eurofins Air Toxics, located in Folsom, California. The samples were selectively analyzed for the following:

- Volatile organic compounds (VOCs) by U.S. Environmental Protection Agency (EPA) Method TO-15; and
- Natural gas analysis by modified American Society for Testing and Materials (ASTM) D-1946.

The analytical results for these samples were reviewed in accordance with the requirements specified in EPA National Functional Guidelines (EPA, 2014 a and b), the analytical methods referenced by the laboratory, Amec Foster Wheeler Environment & Infrastructure, Inc. data review procedures, and the laboratory quality control limits. The EPA guidelines referenced above were written specifically for the Contract Laboratory Program, and have been modified for the purposes of this data quality review where they differ from the analyte-specific method requirements.

The certified laboratory reports were reviewed to assess the following: chain of custody compliance; holding time compliance; presence or absence of laboratory contamination as demonstrated by method blanks; laboratory control samples (LCS); analytical precision as the relative percent difference (RPD) between replicate sample results (i.e., field duplicates); surrogate recoveries; continuing calibration verification (CCV) samples; and reporting limits. This data quality review did not include validation of the raw analytical data.

Samples were analyzed by the methods identified in the introduction to this report, and were evaluated for the following criteria. Exceptions are noted in the summary below only when data required qualification, laboratory quality control issues that did not impact data quality are not summarized.

1. Holding Times – Acceptable
2. Blanks – Acceptable

Amec Foster Wheeler Environment & Infrastructure, Inc.
600 University Street, Suite 600
Seattle, Washington
USA 98101-4107
Tel (206) 342-1760
Fax (206) 342-1761
www.amecfw.com

3. LCS/LCSD – Acceptable except as noted:

   VOCs by TO-15: the recoveries for dibromochloromethane were 131 and 132 percent, and for bromoform were 138 and 139 percent, respectively, in the LCS/LCSD associated with work order 1604470B, greater than the control limits of 70 to 130 percent. The high recoveries equate to a possible high bias in the samples. The affected compounds were not detected in the associated sample; therefore, results are not affected by the potential high bias and are not qualified

4. Field Duplicates – Acceptable

5. Surrogate Recoveries – Acceptable except as noted:

   VOCs by TO-15: the recovery for surrogate 1,2-dichloroethane-d4 in sample SV-3-042116 was 132 percent, greater than the control limits of 70 to 130 percent. The high recovery equates to a possible high bias in the samples; therefore, detected results are qualified as estimated and flagged with a "J." Non-detected results are not affected by the potential high bias and are not qualified.

6. CCV Recoveries – Acceptable except as noted:

   VOCs by TO-15: the recoveries for dibromochloromethane, 1,2-dibromoethane, and bromoform were 136, 132, and 137 percent, respectively, in the CCV associated with work order 1604470B, greater than the control limits of 70 to 130 percent. The high recoveries equate to a possible high bias in the samples. The affected compounds were not detected in the associated sample; therefore, results are not affected by the potential high bias and are not qualified.

7. Reporting Limits and Laboratory Flags – Acceptable

   VOCs by TO-15: Samples reported in work order 1604470A were diluted due to the presence of high concentrations of either target or non-target analytes. The reporting limits were higher to reflect the necessary dilution required to overcome matrix interference.

   The 2,2,4-trimethylpentane result in sample SV-3-042116 was flagged with an "E" by the laboratory to indicate that the concentration was greater than the calibration range of the instrument. The result is qualified as estimated but was previously qualified as estimated due to high surrogate recoveries and is not qualified further.

OVERALL ASSESSMENT OF DATA

The completeness of the samples reviewed above and included in Air Toxics work orders 1604470A through 1604470D is 100 percent. Few problems were identified, and analytical performance was generally within specified limits. The data, as qualified, meet the project's data quality objectives. Data qualifiers applied to the results are summarized in Table 2 (attached).

REFERENCES

U.S. Environmental Protection Agency (EPA), 2014a, U.S. EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review: EPA 540-R-014-002, August.

EPA, 2014b, U.S. EPA National Functional Guidelines for Inorganic Superfund Data Review: EPA 540-R-013-001, August.

Attachments:

Table 1	Summary of Samples Collected and Analyses Completed for Stericycle Tacoma Soil Vapor Sampling Event
Table 2	Summary of Qualified Data for Stericycle Tacoma Soil Vapor Sampling Event

TABLE 1

SUMMARY OF SAMPLES COLLECTED AND ANALYSES COMPLETED
FOR STERICYCLE TACOMA SOIL VAPOR SAMPLING EVENT
1701 East Alexander Avenue
Tacoma, Washington

Sample Number	Laboratory Sample Number	Matrix	Sample Date	Sample Time	VOCs by EPA Method TO-15	Helium by ASTM 1996D	Methane by ASTM 1996D
SV-2-042116	1604470A-01A 1604470C-01A 1604470D-01A	Soil Vapor	4/21/2016	12:40 - 12:43	X	X	X
SV-3-042116	1604470A-03A 1604470D-03A	Soil Vapor	4/21/2016	16:24 - 16:28	X		X
SV-4-042116	1604470A-04A	Soil Vapor	4/21/2016	15:54 - 15:59	X		
SV-5-042116	1604470A-05A	Soil Vapor	4/21/2016	15:00 - 15:04	X		
SV-DUP-01-042116	1604470A-06A	Field duplicate of SV-4-042116	4/21/2016	00:00 - 00:04	X		
AA-1-042116	1604470B-02A	Ambient Air	4/21/2016	13:30 - 15:02	X		
				Total Number of Samples	6	1	2

Abbreviations
ASTM = ASTM International
EPA = Environmental Protection Agency

TABLE 2

SUMMARY OF QUALIFIED DATA FOR STERICYCLE TACOMA
SOIL VAPOR SAMPLING EVENT [1]

1701 East Alexander Avenue
Tacoma, Washington

Sample Number	Laboratory Sample Number	Analysis Method	Chemical	Concentration	Units	Laboratory Data Flag	Data Validation Qualifier	Quality Control Reason	Quality Control Result
SV-3-042116	1604470A-01A	TO-15	Acetone	110	µg/m^3	-	J	Surrogate recovery	110 J
			Hexane	3,800		-	J		3800 J
			Cyclohexane	790		-	J		790 J
			2,2,4-Trimethylpentane	7,800		E	J		7800 J
			Benzene	130		-	J		130 J
			Heptane	1,600		-	J		1600 J
			Toluene	59		-	J		59 J
			Ethyl Benzene	67		-	J		67 J
			m,p-Xylene	26		-	J		26 J
			o-Xylene	24		-	J		24 J
			Cumene	26		-	J		26 J

Notes
1. Data is for natural and field quality control samples only.

Abbreviations
µg/m^3 = micrograms per cubic meter
E = concentration exceeds calibration range of the instrument
J = estimated

TABLE 1

SUMMARY OF SAMPLES COLLECTED AND ANALYSES COMPLETED
FOR STERICYCLE TACOMA SOIL VAPOR SAMPLING EVENT
1701 East Alexander Avenue
Tacoma, Washington

Sample Number	Laboratory Sample Number	Matrix	Sample Date	Sample Time	VOCs by EPA Method TO-15	Helium by ASTM 1996D	Methane by ASTM 1996D
SV-2-042116	1604470A-01A 1604470C-01A 1604470D-01A	Soil Vapor	4/21/2016	12:40 - 12:43	X	X	X
SV-3-042116	1604470A-03A 1604470D-03A	Soil Vapor	4/21/2016	16:24 - 16:28	X		X
SV-4-042116	1604470A-04A	Soil Vapor	4/21/2016	15:54 - 15:59	X		
SV-5-042116	1604470A-05A	Soil Vapor	4/21/2016	15:00 - 15:04	X		
SV-DUP-01-042116	1604470A-06A	Field duplicate of SV-4-042116	4/21/2016	00:00 - 00:04	X		
AA-1-042116	1604470B-02A	Ambient Air	4/21/2016	13:30 - 15:02	X		
				Total Number of Samples	6	1	2

Abbreviations
ASTM = ASTM International
EPA = Environmental Protection Agency

TABLE 2

SUMMARY OF QUALIFIED DATA FOR STERICYCLE TACOMA
SOIL VAPOR SAMPLING EVENT [1]

1701 East Alexander Avenue
Tacoma, Washington

Sample Number	Laboratory Sample Number	Analysis Method	Chemical	Concentration	Units	Laboratory Data Flag	Data Validation Qualifier	Quality Control Reason	Quality Control Result
SV-3-042116	1604470A-01A	TO-15	Acetone	110	µg/m^3	-	J	Surrogate recovery	110 J
			Hexane	3,800		-	J		3800 J
			Cyclohexane	790		-	J		790 J
			2,2,4-Trimethylpentane	7,800		E	J		7800 J
			Benzene	130		-	J		130 J
			Heptane	1,600		-	J		1600 J
			Toluene	59		-	J		59 J
			Ethyl Benzene	67		-	J		67 J
			m,p-Xylene	26		-	J		26 J
			o-Xylene	24		-	J		24 J
			Cumene	26		-	J		26 J

Notes
1. Data is for natural and field quality control samples only.

Abbreviations
µg/m^3 = micrograms per cubic meter
E = concentration exceeds calibration range of the instrument
J = estimated

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4/25/2016
Ms. Jennifer Bellamy
AMEC Environmental & Infrastructure
600 University Street
Suite 600
Seattle WA 98101

Project Name: Stericycle Tacoma
Project #: 10048
Workorder #: 1604470A

Dear Ms. Jennifer Bellamy

The following report includes the data for the above referenced project for sample(s) received on 4/22/2016 at Air Toxics Ltd.

The data and associated QC analyzed by TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

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WORK ORDER #: 1604470A

Work Order Summary

CLIENT:	Ms. Jennifer Bellamy AMEC Environmental & Infrastructure 600 University Street Suite 600 Seattle, WA 98101	**BILL TO:**	Accounts Payable Stericycle Environmental Solutions, Inc. 210 West Sand Bank Road Columbia, IL 62236
PHONE:	206-342-1760	**P.O. #**	Bill to Stericycle
FAX:		**PROJECT #**	10048 Stericycle Tacoma
DATE RECEIVED:	04/22/2016	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	04/25/2016		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	SV-2-042116	TO-15	4.5 "Hg	15 psi
03A	SV-3-042116	TO-15	3.0 "Hg	15 psi
04A	SV-4-042116	TO-15	4.5 "Hg	15 psi
05A	SV-5-042116	TO-15	5.0 "Hg	15 psi
06A	SV-DUP-01-042116	TO-15	4.0 "Hg	15 psi
07A	Lab Blank	TO-15	NA	NA
08A	CCV	TO-15	NA	NA
09A	LCS	TO-15	NA	NA
09AA	LCSD	TO-15	NA	NA

CERTIFIED BY: Heidi Mayo DATE: 04/25/16

Technical Director

Certification numbers: AZ Licensure AZ0775, NJ NELAP - CA016, NY NELAP - 11291,
TX NELAP - T104704434-15-9, UT NELAP CA0093332015-6, VA NELAP - 8113, WA NELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program)
Accreditation number: CA300005, Effective date: 10/18/2015, Expiration date: 10/17/2016.
Eurofins Air Toxics Inc.. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
EPA Method TO-15
AMEC Environmental & Infrastructure
Workorder# 1604470A

Five 1 Liter Summa Canister samples were received on April 22, 2016. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

Dilution was performed on samples SV-3-042116, SV-4-042116C and SV-DUP-01-042116 due to the presence of high level target species.

Dilution was performed on sample SV-2-042116 and SV-5-042116C due to the presence of high level non-target species.

The recovery of surrogate 1,2-Dichloroethane-d4 in sample SV-3-042116 was outside laboratory control limits due to high level hydrocarbon matrix interference. The surrogate recovery is flagged.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit, LOD, or MDL value. See data page for project specific U-flag definition.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: SV-2-042116

Lab ID#: 1604470A-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	4.0	560	14	2000
Cyclohexane	4.0	74	14	250
2,2,4-Trimethylpentane	4.0	210	18	1000
Benzene	4.0	97	13	310
Heptane	4.0	270	16	1100
Ethyl Benzene	4.0	4.4	17	19
m,p-Xylene	4.0	28	17	120
o-Xylene	4.0	42	17	180
Cumene	4.0	13	19	64
Propylbenzene	4.0	6.9	19	34
4-Ethyltoluene	4.0	12	19	58
1,3,5-Trimethylbenzene	4.0	4.4	19	22
1,2,4-Trimethylbenzene	4.0	12	19	57

Client Sample ID: SV-3-042116

Lab ID#: 1604470A-03A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Acetone	37	48	89	110
Hexane	3.7	1100	13	3800
Cyclohexane	3.7	230	13	790
2,2,4-Trimethylpentane	3.7	1700 E	17	7800 E
Benzene	3.7	40	12	130
Heptane	3.7	390	15	1600
Toluene	3.7	16	14	59
Ethyl Benzene	3.7	15	16	67
m,p-Xylene	3.7	6.1	16	26
o-Xylene	3.7	5.5	16	24
Cumene	3.7	5.3	18	26

Client Sample ID: SV-4-042116

Lab ID#: 1604470A-04A

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Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: SV-4-042116

Lab ID#: 1604470A-04A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	4.0	1200	14	4200
Cyclohexane	4.0	140	14	470
2,2,4-Trimethylpentane	4.0	840	18	3900
Benzene	4.0	88	13	280
Heptane	4.0	330	16	1400
Trichloroethene	4.0	4.5	21	24
Toluene	4.0	51	15	190
Ethyl Benzene	4.0	64	17	280
m,p-Xylene	4.0	44	17	190
o-Xylene	4.0	26	17	110
Styrene	4.0	5.6	17	24
Cumene	4.0	9.7	19	48
Propylbenzene	4.0	4.4	19	22
4-Ethyltoluene	4.0	13	19	64
1,3,5-Trimethylbenzene	4.0	4.3	19	21
1,2,4-Trimethylbenzene	4.0	5.6	19	27

Client Sample ID: SV-5-042116

Lab ID#: 1604470A-05A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	4.0	580	14	2000
Cyclohexane	4.0	130	14	450
2,2,4-Trimethylpentane	4.0	330	19	1500
Benzene	4.0	96	13	300
Heptane	4.0	450	16	1800
Toluene	4.0	130	15	480
Ethyl Benzene	4.0	21	18	91
m,p-Xylene	4.0	30	18	130
o-Xylene	4.0	19	18	84
Cumene	4.0	24	20	120
Propylbenzene	4.0	7.9	20	39
4-Ethyltoluene	4.0	12	20	57

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Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: SV-5-042116

Lab ID#: 1604470A-05A

1,2,4-Trimethylbenzene	4.0	10	20	50

Client Sample ID: SV-DUP-01-042116

Lab ID#: 1604470A-06A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	3.9	1400	14	4800
cis-1,2-Dichloroethene	3.9	4.2	15	17
Cyclohexane	3.9	150	13	530
2,2,4-Trimethylpentane	3.9	940	18	4400
Benzene	3.9	97	12	310
Heptane	3.9	380	16	1600
Toluene	3.9	56	15	210
Ethyl Benzene	3.9	76	17	330
m,p-Xylene	3.9	51	17	220
o-Xylene	3.9	31	17	140
Styrene	3.9	6.0	16	25
Cumene	3.9	11	19	54
Propylbenzene	3.9	5.4	19	27
4-Ethyltoluene	3.9	16	19	78
1,3,5-Trimethylbenzene	3.9	4.8	19	24
1,2,4-Trimethylbenzene	3.9	6.6	19	32

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Client Sample ID: SV-2-042116

Lab ID#: 1604470A-01A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p042309**	**Date of Collection:**	**4/21/16 12:43:00 PM**
Dil. Factor:	**7.92**	**Date of Analysis:**	**4/23/16 01:15 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	4.0	Not Detected	20	Not Detected
Freon 114	4.0	Not Detected	28	Not Detected
Chloromethane	40	Not Detected	82	Not Detected
Vinyl Chloride	4.0	Not Detected	10	Not Detected
1,3-Butadiene	4.0	Not Detected	8.8	Not Detected
Bromomethane	40	Not Detected	150	Not Detected
Chloroethane	16	Not Detected	42	Not Detected
Freon 11	4.0	Not Detected	22	Not Detected
Ethanol	16	Not Detected	30	Not Detected
Freon 113	4.0	Not Detected	30	Not Detected
1,1-Dichloroethene	4.0	Not Detected	16	Not Detected
Acetone	40	Not Detected	94	Not Detected
2-Propanol	16	Not Detected	39	Not Detected
Carbon Disulfide	16	Not Detected	49	Not Detected
3-Chloropropene	16	Not Detected	50	Not Detected
Methylene Chloride	40	Not Detected	140	Not Detected
Methyl tert-butyl ether	4.0	Not Detected	14	Not Detected
trans-1,2-Dichloroethene	4.0	Not Detected	16	Not Detected
Hexane	4.0	560	14	2000
1,1-Dichloroethane	4.0	Not Detected	16	Not Detected
2-Butanone (Methyl Ethyl Ketone)	16	Not Detected	47	Not Detected
cis-1,2-Dichloroethene	4.0	Not Detected	16	Not Detected
Tetrahydrofuran	4.0	Not Detected	12	Not Detected
Chloroform	4.0	Not Detected	19	Not Detected
1,1,1-Trichloroethane	4.0	Not Detected	22	Not Detected
Cyclohexane	4.0	74	14	250
Carbon Tetrachloride	4.0	Not Detected	25	Not Detected
2,2,4-Trimethylpentane	4.0	210	18	1000
Benzene	4.0	97	13	310
1,2-Dichloroethane	4.0	Not Detected	16	Not Detected
Heptane	4.0	270	16	1100
Trichloroethene	4.0	Not Detected	21	Not Detected
1,2-Dichloropropane	4.0	Not Detected	18	Not Detected
1,4-Dioxane	16	Not Detected	57	Not Detected
Bromodichloromethane	4.0	Not Detected	26	Not Detected
cis-1,3-Dichloropropene	4.0	Not Detected	18	Not Detected
4-Methyl-2-pentanone	4.0	Not Detected	16	Not Detected
Toluene	4.0	Not Detected	15	Not Detected
trans-1,3-Dichloropropene	4.0	Not Detected	18	Not Detected
1,1,2-Trichloroethane	4.0	Not Detected	22	Not Detected
Tetrachloroethene	4.0	Not Detected	27	Not Detected
2-Hexanone	16	Not Detected	65	Not Detected

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Client Sample ID: SV-2-042116

Lab ID#: 1604470A-01A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p042309**	**Date of Collection:**	**4/21/16 12:43:00 PM**
Dil. Factor:	**7.92**	**Date of Analysis:**	**4/23/16 01:15 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	4.0	Not Detected	34	Not Detected
1,2-Dibromoethane (EDB)	4.0	Not Detected	30	Not Detected
Chlorobenzene	4.0	Not Detected	18	Not Detected
Ethyl Benzene	4.0	4.4	17	19
m,p-Xylene	4.0	28	17	120
o-Xylene	4.0	42	17	180
Styrene	4.0	Not Detected	17	Not Detected
Bromoform	4.0	Not Detected	41	Not Detected
Cumene	4.0	13	19	64
1,1,2,2-Tetrachloroethane	4.0	Not Detected	27	Not Detected
Propylbenzene	4.0	6.9	19	34
4-Ethyltoluene	4.0	12	19	58
1,3,5-Trimethylbenzene	4.0	4.4	19	22
1,2,4-Trimethylbenzene	4.0	12	19	57
1,3-Dichlorobenzene	4.0	Not Detected	24	Not Detected
1,4-Dichlorobenzene	4.0	Not Detected	24	Not Detected
alpha-Chlorotoluene	4.0	Not Detected	20	Not Detected
1,2-Dichlorobenzene	4.0	Not Detected	24	Not Detected
1,2,4-Trichlorobenzene	16	Not Detected	120	Not Detected
Hexachlorobutadiene	16	Not Detected	170	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	101	70-130
1,2-Dichloroethane-d4	104	70-130
4-Bromofluorobenzene	98	70-130

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Client Sample ID: SV-3-042116

Lab ID#: 1604470A-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p042310**	**Date of Collection:**	**4/21/16 4:28:00 PM**
Dil. Factor:	**7.48**	**Date of Analysis:**	**4/23/16 01:39 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	3.7	Not Detected	18	Not Detected
Freon 114	3.7	Not Detected	26	Not Detected
Chloromethane	37	Not Detected	77	Not Detected
Vinyl Chloride	3.7	Not Detected	9.6	Not Detected
1,3-Butadiene	3.7	Not Detected	8.3	Not Detected
Bromomethane	37	Not Detected	140	Not Detected
Chloroethane	15	Not Detected	39	Not Detected
Freon 11	3.7	Not Detected	21	Not Detected
Ethanol	15	Not Detected	28	Not Detected
Freon 113	3.7	Not Detected	29	Not Detected
1,1-Dichloroethene	3.7	Not Detected	15	Not Detected
Acetone	37	48	89	110
2-Propanol	15	Not Detected	37	Not Detected
Carbon Disulfide	15	Not Detected	46	Not Detected
3-Chloropropene	15	Not Detected	47	Not Detected
Methylene Chloride	37	Not Detected	130	Not Detected
Methyl tert-butyl ether	3.7	Not Detected	13	Not Detected
trans-1,2-Dichloroethene	3.7	Not Detected	15	Not Detected
Hexane	3.7	1100	13	3800
1,1-Dichloroethane	3.7	Not Detected	15	Not Detected
2-Butanone (Methyl Ethyl Ketone)	15	Not Detected	44	Not Detected
cis-1,2-Dichloroethene	3.7	Not Detected	15	Not Detected
Tetrahydrofuran	3.7	Not Detected	11	Not Detected
Chloroform	3.7	Not Detected	18	Not Detected
1,1,1-Trichloroethane	3.7	Not Detected	20	Not Detected
Cyclohexane	3.7	230	13	790
Carbon Tetrachloride	3.7	Not Detected	24	Not Detected
2,2,4-Trimethylpentane	3.7	1700 E	17	7800 E
Benzene	3.7	40	12	130
1,2-Dichloroethane	3.7	Not Detected	15	Not Detected
Heptane	3.7	390	15	1600
Trichloroethene	3.7	Not Detected	20	Not Detected
1,2-Dichloropropane	3.7	Not Detected	17	Not Detected
1,4-Dioxane	15	Not Detected	54	Not Detected
Bromodichloromethane	3.7	Not Detected	25	Not Detected
cis-1,3-Dichloropropene	3.7	Not Detected	17	Not Detected
4-Methyl-2-pentanone	3.7	Not Detected	15	Not Detected
Toluene	3.7	16	14	59
trans-1,3-Dichloropropene	3.7	Not Detected	17	Not Detected
1,1,2-Trichloroethane	3.7	Not Detected	20	Not Detected
Tetrachloroethene	3.7	Not Detected	25	Not Detected
2-Hexanone	15	Not Detected	61	Not Detected

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Client Sample ID: SV-3-042116

Lab ID#: 1604470A-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p042310**	**Date of Collection:**	**4/21/16 4:28:00 PM**
Dil. Factor:	**7.48**	**Date of Analysis:**	**4/23/16 01:39 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	3.7	Not Detected	32	Not Detected
1,2-Dibromoethane (EDB)	3.7	Not Detected	29	Not Detected
Chlorobenzene	3.7	Not Detected	17	Not Detected
Ethyl Benzene	3.7	15	16	67
m,p-Xylene	3.7	6.1	16	26
o-Xylene	3.7	5.5	16	24
Styrene	3.7	Not Detected	16	Not Detected
Bromoform	3.7	Not Detected	39	Not Detected
Cumene	3.7	5.3	18	26
1,1,2,2-Tetrachloroethane	3.7	Not Detected	26	Not Detected
Propylbenzene	3.7	Not Detected	18	Not Detected
4-Ethyltoluene	3.7	Not Detected	18	Not Detected
1,3,5-Trimethylbenzene	3.7	Not Detected	18	Not Detected
1,2,4-Trimethylbenzene	3.7	Not Detected	18	Not Detected
1,3-Dichlorobenzene	3.7	Not Detected	22	Not Detected
1,4-Dichlorobenzene	3.7	Not Detected	22	Not Detected
alpha-Chlorotoluene	3.7	Not Detected	19	Not Detected
1,2-Dichlorobenzene	3.7	Not Detected	22	Not Detected
1,2,4-Trichlorobenzene	15	Not Detected	110	Not Detected
Hexachlorobutadiene	15	Not Detected	160	Not Detected

E = Exceeds instrument calibration range.
Q = Exceeds Quality Control limits.

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
1,2-Dichloroethane-d4	132 Q	70-130
4-Bromofluorobenzene	98	70-130

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Client Sample ID: SV-4-042116

Lab ID#: 1604470A-04A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p042311**	**Date of Collection:**	**4/21/16 3:59:00 PM**
Dil. Factor:	**7.92**	**Date of Analysis:**	**4/23/16 02:03 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	4.0	Not Detected	20	Not Detected
Freon 114	4.0	Not Detected	28	Not Detected
Chloromethane	40	Not Detected	82	Not Detected
Vinyl Chloride	4.0	Not Detected	10	Not Detected
1,3-Butadiene	4.0	Not Detected	8.8	Not Detected
Bromomethane	40	Not Detected	150	Not Detected
Chloroethane	16	Not Detected	42	Not Detected
Freon 11	4.0	Not Detected	22	Not Detected
Ethanol	16	Not Detected	30	Not Detected
Freon 113	4.0	Not Detected	30	Not Detected
1,1-Dichloroethene	4.0	Not Detected	16	Not Detected
Acetone	40	Not Detected	94	Not Detected
2-Propanol	16	Not Detected	39	Not Detected
Carbon Disulfide	16	Not Detected	49	Not Detected
3-Chloropropene	16	Not Detected	50	Not Detected
Methylene Chloride	40	Not Detected	140	Not Detected
Methyl tert-butyl ether	4.0	Not Detected	14	Not Detected
trans-1,2-Dichloroethene	4.0	Not Detected	16	Not Detected
Hexane	4.0	1200	14	4200
1,1-Dichloroethane	4.0	Not Detected	16	Not Detected
2-Butanone (Methyl Ethyl Ketone)	16	Not Detected	47	Not Detected
cis-1,2-Dichloroethene	4.0	Not Detected	16	Not Detected
Tetrahydrofuran	4.0	Not Detected	12	Not Detected
Chloroform	4.0	Not Detected	19	Not Detected
1,1,1-Trichloroethane	4.0	Not Detected	22	Not Detected
Cyclohexane	4.0	140	14	470
Carbon Tetrachloride	4.0	Not Detected	25	Not Detected
2,2,4-Trimethylpentane	4.0	840	18	3900
Benzene	4.0	88	13	280
1,2-Dichloroethane	4.0	Not Detected	16	Not Detected
Heptane	4.0	330	16	1400
Trichloroethene	4.0	4.5	21	24
1,2-Dichloropropane	4.0	Not Detected	18	Not Detected
1,4-Dioxane	16	Not Detected	57	Not Detected
Bromodichloromethane	4.0	Not Detected	26	Not Detected
cis-1,3-Dichloropropene	4.0	Not Detected	18	Not Detected
4-Methyl-2-pentanone	4.0	Not Detected	16	Not Detected
Toluene	4.0	51	15	190
trans-1,3-Dichloropropene	4.0	Not Detected	18	Not Detected
1,1,2-Trichloroethane	4.0	Not Detected	22	Not Detected
Tetrachloroethene	4.0	Not Detected	27	Not Detected
2-Hexanone	16	Not Detected	65	Not Detected

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Client Sample ID: SV-4-042116

Lab ID#: 1604470A-04A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p042311**	**Date of Collection:**	**4/21/16 3:59:00 PM**
Dil. Factor:	**7.92**	**Date of Analysis:**	**4/23/16 02:03 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	4.0	Not Detected	34	Not Detected
1,2-Dibromoethane (EDB)	4.0	Not Detected	30	Not Detected
Chlorobenzene	4.0	Not Detected	18	Not Detected
Ethyl Benzene	4.0	64	17	280
m,p-Xylene	4.0	44	17	190
o-Xylene	4.0	26	17	110
Styrene	4.0	5.6	17	24
Bromoform	4.0	Not Detected	41	Not Detected
Cumene	4.0	9.7	19	48
1,1,2,2-Tetrachloroethane	4.0	Not Detected	27	Not Detected
Propylbenzene	4.0	4.4	19	22
4-Ethyltoluene	4.0	13	19	64
1,3,5-Trimethylbenzene	4.0	4.3	19	21
1,2,4-Trimethylbenzene	4.0	5.6	19	27
1,3-Dichlorobenzene	4.0	Not Detected	24	Not Detected
1,4-Dichlorobenzene	4.0	Not Detected	24	Not Detected
alpha-Chlorotoluene	4.0	Not Detected	20	Not Detected
1,2-Dichlorobenzene	4.0	Not Detected	24	Not Detected
1,2,4-Trichlorobenzene	16	Not Detected	120	Not Detected
Hexachlorobutadiene	16	Not Detected	170	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
1,2-Dichloroethane-d4	116	70-130
4-Bromofluorobenzene	102	70-130

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Client Sample ID: SV-5-042116

Lab ID#: 1604470A-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p042312**	**Date of Collection:**	**4/21/16 3:04:00 PM**
Dil. Factor:	**8.08**	**Date of Analysis:**	**4/23/16 02:28 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	4.0	Not Detected	20	Not Detected
Freon 114	4.0	Not Detected	28	Not Detected
Chloromethane	40	Not Detected	83	Not Detected
Vinyl Chloride	4.0	Not Detected	10	Not Detected
1,3-Butadiene	4.0	Not Detected	8.9	Not Detected
Bromomethane	40	Not Detected	160	Not Detected
Chloroethane	16	Not Detected	43	Not Detected
Freon 11	4.0	Not Detected	23	Not Detected
Ethanol	16	Not Detected	30	Not Detected
Freon 113	4.0	Not Detected	31	Not Detected
1,1-Dichloroethene	4.0	Not Detected	16	Not Detected
Acetone	40	Not Detected	96	Not Detected
2-Propanol	16	Not Detected	40	Not Detected
Carbon Disulfide	16	Not Detected	50	Not Detected
3-Chloropropene	16	Not Detected	50	Not Detected
Methylene Chloride	40	Not Detected	140	Not Detected
Methyl tert-butyl ether	4.0	Not Detected	14	Not Detected
trans-1,2-Dichloroethene	4.0	Not Detected	16	Not Detected
Hexane	4.0	580	14	2000
1,1-Dichloroethane	4.0	Not Detected	16	Not Detected
2-Butanone (Methyl Ethyl Ketone)	16	Not Detected	48	Not Detected
cis-1,2-Dichloroethene	4.0	Not Detected	16	Not Detected
Tetrahydrofuran	4.0	Not Detected	12	Not Detected
Chloroform	4.0	Not Detected	20	Not Detected
1,1,1-Trichloroethane	4.0	Not Detected	22	Not Detected
Cyclohexane	4.0	130	14	450
Carbon Tetrachloride	4.0	Not Detected	25	Not Detected
2,2,4-Trimethylpentane	4.0	330	19	1500
Benzene	4.0	96	13	300
1,2-Dichloroethane	4.0	Not Detected	16	Not Detected
Heptane	4.0	450	16	1800
Trichloroethene	4.0	Not Detected	22	Not Detected
1,2-Dichloropropane	4.0	Not Detected	19	Not Detected
1,4-Dioxane	16	Not Detected	58	Not Detected
Bromodichloromethane	4.0	Not Detected	27	Not Detected
cis-1,3-Dichloropropene	4.0	Not Detected	18	Not Detected
4-Methyl-2-pentanone	4.0	Not Detected	16	Not Detected
Toluene	4.0	130	15	480
trans-1,3-Dichloropropene	4.0	Not Detected	18	Not Detected
1,1,2-Trichloroethane	4.0	Not Detected	22	Not Detected
Tetrachloroethene	4.0	Not Detected	27	Not Detected
2-Hexanone	16	Not Detected	66	Not Detected

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Client Sample ID: SV-5-042116

Lab ID#: 1604470A-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p042312**	**Date of Collection:**	**4/21/16 3:04:00 PM**
Dil. Factor:	**8.08**	**Date of Analysis:**	**4/23/16 02:28 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	4.0	Not Detected	34	Not Detected
1,2-Dibromoethane (EDB)	4.0	Not Detected	31	Not Detected
Chlorobenzene	4.0	Not Detected	18	Not Detected
Ethyl Benzene	4.0	21	18	91
m,p-Xylene	4.0	30	18	130
o-Xylene	4.0	19	18	84
Styrene	4.0	Not Detected	17	Not Detected
Bromoform	4.0	Not Detected	42	Not Detected
Cumene	4.0	24	20	120
1,1,2,2-Tetrachloroethane	4.0	Not Detected	28	Not Detected
Propylbenzene	4.0	7.9	20	39
4-Ethyltoluene	4.0	12	20	57
1,3,5-Trimethylbenzene	4.0	Not Detected	20	Not Detected
1,2,4-Trimethylbenzene	4.0	10	20	50
1,3-Dichlorobenzene	4.0	Not Detected	24	Not Detected
1,4-Dichlorobenzene	4.0	Not Detected	24	Not Detected
alpha-Chlorotoluene	4.0	Not Detected	21	Not Detected
1,2-Dichlorobenzene	4.0	Not Detected	24	Not Detected
1,2,4-Trichlorobenzene	16	Not Detected	120	Not Detected
Hexachlorobutadiene	16	Not Detected	170	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
1,2-Dichloroethane-d4	103	70-130
4-Bromofluorobenzene	98	70-130

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Client Sample ID: SV-DUP-01-042116

Lab ID#: 1604470A-06A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p042313**	**Date of Collection:**	**4/21/16 12:05:00 AM**
Dil. Factor:	**7.77**	**Date of Analysis:**	**4/23/16 02:52 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	3.9	Not Detected	19	Not Detected
Freon 114	3.9	Not Detected	27	Not Detected
Chloromethane	39	Not Detected	80	Not Detected
Vinyl Chloride	3.9	Not Detected	9.9	Not Detected
1,3-Butadiene	3.9	Not Detected	8.6	Not Detected
Bromomethane	39	Not Detected	150	Not Detected
Chloroethane	16	Not Detected	41	Not Detected
Freon 11	3.9	Not Detected	22	Not Detected
Ethanol	16	Not Detected	29	Not Detected
Freon 113	3.9	Not Detected	30	Not Detected
1,1-Dichloroethene	3.9	Not Detected	15	Not Detected
Acetone	39	Not Detected	92	Not Detected
2-Propanol	16	Not Detected	38	Not Detected
Carbon Disulfide	16	Not Detected	48	Not Detected
3-Chloropropene	16	Not Detected	49	Not Detected
Methylene Chloride	39	Not Detected	130	Not Detected
Methyl tert-butyl ether	3.9	Not Detected	14	Not Detected
trans-1,2-Dichloroethene	3.9	Not Detected	15	Not Detected
Hexane	3.9	1400	14	4800
1,1-Dichloroethane	3.9	Not Detected	16	Not Detected
2-Butanone (Methyl Ethyl Ketone)	16	Not Detected	46	Not Detected
cis-1,2-Dichloroethene	3.9	4.2	15	17
Tetrahydrofuran	3.9	Not Detected	11	Not Detected
Chloroform	3.9	Not Detected	19	Not Detected
1,1,1-Trichloroethane	3.9	Not Detected	21	Not Detected
Cyclohexane	3.9	150	13	530
Carbon Tetrachloride	3.9	Not Detected	24	Not Detected
2,2,4-Trimethylpentane	3.9	940	18	4400
Benzene	3.9	97	12	310
1,2-Dichloroethane	3.9	Not Detected	16	Not Detected
Heptane	3.9	380	16	1600
Trichloroethene	3.9	Not Detected	21	Not Detected
1,2-Dichloropropane	3.9	Not Detected	18	Not Detected
1,4-Dioxane	16	Not Detected	56	Not Detected
Bromodichloromethane	3.9	Not Detected	26	Not Detected
cis-1,3-Dichloropropene	3.9	Not Detected	18	Not Detected
4-Methyl-2-pentanone	3.9	Not Detected	16	Not Detected
Toluene	3.9	56	15	210
trans-1,3-Dichloropropene	3.9	Not Detected	18	Not Detected
1,1,2-Trichloroethane	3.9	Not Detected	21	Not Detected
Tetrachloroethene	3.9	Not Detected	26	Not Detected
2-Hexanone	16	Not Detected	64	Not Detected

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Client Sample ID: SV-DUP-01-042116

Lab ID#: 1604470A-06A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p042313**	**Date of Collection:**	**4/21/16 12:05:00 AM**
Dil. Factor:	**7.77**	**Date of Analysis:**	**4/23/16 02:52 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	3.9	Not Detected	33	Not Detected
1,2-Dibromoethane (EDB)	3.9	Not Detected	30	Not Detected
Chlorobenzene	3.9	Not Detected	18	Not Detected
Ethyl Benzene	3.9	76	17	330
m,p-Xylene	3.9	51	17	220
o-Xylene	3.9	31	17	140
Styrene	3.9	6.0	16	25
Bromoform	3.9	Not Detected	40	Not Detected
Cumene	3.9	11	19	54
1,1,2,2-Tetrachloroethane	3.9	Not Detected	27	Not Detected
Propylbenzene	3.9	5.4	19	27
4-Ethyltoluene	3.9	16	19	78
1,3,5-Trimethylbenzene	3.9	4.8	19	24
1,2,4-Trimethylbenzene	3.9	6.6	19	32
1,3-Dichlorobenzene	3.9	Not Detected	23	Not Detected
1,4-Dichlorobenzene	3.9	Not Detected	23	Not Detected
alpha-Chlorotoluene	3.9	Not Detected	20	Not Detected
1,2-Dichlorobenzene	3.9	Not Detected	23	Not Detected
1,2,4-Trichlorobenzene	16	Not Detected	120	Not Detected
Hexachlorobutadiene	16	Not Detected	160	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
1,2-Dichloroethane-d4	114	70-130
4-Bromofluorobenzene	103	70-130

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Client Sample ID: Lab Blank

Lab ID#: 1604470A-07A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p042308**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/23/16 12:18 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.50	Not Detected	2.5	Not Detected
Freon 114	0.50	Not Detected	3.5	Not Detected
Chloromethane	5.0	Not Detected	10	Not Detected
Vinyl Chloride	0.50	Not Detected	1.3	Not Detected
1,3-Butadiene	0.50	Not Detected	1.1	Not Detected
Bromomethane	5.0	Not Detected	19	Not Detected
Chloroethane	2.0	Not Detected	5.3	Not Detected
Freon 11	0.50	Not Detected	2.8	Not Detected
Ethanol	2.0	Not Detected	3.8	Not Detected
Freon 113	0.50	Not Detected	3.8	Not Detected
1,1-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Acetone	5.0	Not Detected	12	Not Detected
2-Propanol	2.0	Not Detected	4.9	Not Detected
Carbon Disulfide	2.0	Not Detected	6.2	Not Detected
3-Chloropropene	2.0	Not Detected	6.3	Not Detected
Methylene Chloride	5.0	Not Detected	17	Not Detected
Methyl tert-butyl ether	0.50	Not Detected	1.8	Not Detected
trans-1,2-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Hexane	0.50	Not Detected	1.8	Not Detected
1,1-Dichloroethane	0.50	Not Detected	2.0	Not Detected
2-Butanone (Methyl Ethyl Ketone)	2.0	Not Detected	5.9	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Tetrahydrofuran	0.50	Not Detected	1.5	Not Detected
Chloroform	0.50	Not Detected	2.4	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected	2.7	Not Detected
Cyclohexane	0.50	Not Detected	1.7	Not Detected
Carbon Tetrachloride	0.50	Not Detected	3.1	Not Detected
2,2,4-Trimethylpentane	0.50	Not Detected	2.3	Not Detected
Benzene	0.50	Not Detected	1.6	Not Detected
1,2-Dichloroethane	0.50	Not Detected	2.0	Not Detected
Heptane	0.50	Not Detected	2.0	Not Detected
Trichloroethene	0.50	Not Detected	2.7	Not Detected
1,2-Dichloropropane	0.50	Not Detected	2.3	Not Detected
1,4-Dioxane	2.0	Not Detected	7.2	Not Detected
Bromodichloromethane	0.50	Not Detected	3.4	Not Detected
cis-1,3-Dichloropropene	0.50	Not Detected	2.3	Not Detected
4-Methyl-2-pentanone	0.50	Not Detected	2.0	Not Detected
Toluene	0.50	Not Detected	1.9	Not Detected
trans-1,3-Dichloropropene	0.50	Not Detected	2.3	Not Detected
1,1,2-Trichloroethane	0.50	Not Detected	2.7	Not Detected
Tetrachloroethene	0.50	Not Detected	3.4	Not Detected
2-Hexanone	2.0	Not Detected	8.2	Not Detected

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Client Sample ID: Lab Blank

Lab ID#: 1604470A-07A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p042308**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/23/16 12:18 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	0.50	Not Detected	4.2	Not Detected
1,2-Dibromoethane (EDB)	0.50	Not Detected	3.8	Not Detected
Chlorobenzene	0.50	Not Detected	2.3	Not Detected
Ethyl Benzene	0.50	Not Detected	2.2	Not Detected
m,p-Xylene	0.50	Not Detected	2.2	Not Detected
o-Xylene	0.50	Not Detected	2.2	Not Detected
Styrene	0.50	Not Detected	2.1	Not Detected
Bromoform	0.50	Not Detected	5.2	Not Detected
Cumene	0.50	Not Detected	2.4	Not Detected
1,1,2,2-Tetrachloroethane	0.50	Not Detected	3.4	Not Detected
Propylbenzene	0.50	Not Detected	2.4	Not Detected
4-Ethyltoluene	0.50	Not Detected	2.4	Not Detected
1,3,5-Trimethylbenzene	0.50	Not Detected	2.4	Not Detected
1,2,4-Trimethylbenzene	0.50	Not Detected	2.4	Not Detected
1,3-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
1,4-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
alpha-Chlorotoluene	0.50	Not Detected	2.6	Not Detected
1,2-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
1,2,4-Trichlorobenzene	2.0	Not Detected	15	Not Detected
Hexachlorobutadiene	2.0	Not Detected	21	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	101	70-130
1,2-Dichloroethane-d4	97	70-130
4-Bromofluorobenzene	98	70-130

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Client Sample ID: CCV

Lab ID#: 1604470A-08A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p042303**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/23/16 09:05 AM**	

Compound	%Recovery
Freon 12	99
Freon 114	97
Chloromethane	122
Vinyl Chloride	122
1,3-Butadiene	84
Bromomethane	100
Chloroethane	102
Freon 11	98
Ethanol	110
Freon 113	103
1,1-Dichloroethene	101
Acetone	100
2-Propanol	96
Carbon Disulfide	96
3-Chloropropene	100
Methylene Chloride	97
Methyl tert-butyl ether	98
trans-1,2-Dichloroethene	102
Hexane	101
1,1-Dichloroethane	98
2-Butanone (Methyl Ethyl Ketone)	98
cis-1,2-Dichloroethene	104
Tetrahydrofuran	96
Chloroform	102
1,1,1-Trichloroethane	98
Cyclohexane	100
Carbon Tetrachloride	97
2,2,4-Trimethylpentane	101
Benzene	92
1,2-Dichloroethane	99
Heptane	94
Trichloroethene	95
1,2-Dichloropropane	94
1,4-Dioxane	98
Bromodichloromethane	97
cis-1,3-Dichloropropene	96
4-Methyl-2-pentanone	98
Toluene	95
trans-1,3-Dichloropropene	98
1,1,2-Trichloroethane	98
Tetrachloroethene	100
2-Hexanone	98

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Client Sample ID: CCV

Lab ID#: 1604470A-08A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p042303**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/23/16 09:05 AM**	

Compound	%Recovery
Dibromochloromethane	97
1,2-Dibromoethane (EDB)	100
Chlorobenzene	96
Ethyl Benzene	98
m,p-Xylene	99
o-Xylene	102
Styrene	103
Bromoform	103
Cumene	101
1,1,2,2-Tetrachloroethane	98
Propylbenzene	97
4-Ethyltoluene	102
1,3,5-Trimethylbenzene	99
1,2,4-Trimethylbenzene	99
1,3-Dichlorobenzene	99
1,4-Dichlorobenzene	97
alpha-Chlorotoluene	96
1,2-Dichlorobenzene	98
1,2,4-Trichlorobenzene	77
Hexachlorobutadiene	77

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	98	70-130
1,2-Dichloroethane-d4	103	70-130
4-Bromofluorobenzene	102	70-130

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Client Sample ID: LCS

Lab ID#: 1604470A-09A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p042304**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/23/16 09:42 AM**	

Compound	%Recovery	Method Limits
Freon 12	97	70-130
Freon 114	98	70-130
Chloromethane	119	70-130
Vinyl Chloride	119	70-130
1,3-Butadiene	82	70-130
Bromomethane	98	70-130
Chloroethane	104	70-130
Freon 11	98	70-130
Ethanol	103	70-130
Freon 113	98	70-130
1,1-Dichloroethene	98	70-130
Acetone	96	70-130
2-Propanol	98	70-130
Carbon Disulfide	82	70-130
3-Chloropropene	97	70-130
Methylene Chloride	94	70-130
Methyl tert-butyl ether	94	70-130
trans-1,2-Dichloroethene	99	70-130
Hexane	97	70-130
1,1-Dichloroethane	94	70-130
2-Butanone (Methyl Ethyl Ketone)	93	70-130
cis-1,2-Dichloroethene	102	70-130
Tetrahydrofuran	91	70-130
Chloroform	95	70-130
1,1,1-Trichloroethane	94	70-130
Cyclohexane	96	70-130
Carbon Tetrachloride	91	70-130
2,2,4-Trimethylpentane	94	70-130
Benzene	91	70-130
1,2-Dichloroethane	94	70-130
Heptane	91	70-130
Trichloroethene	93	70-130
1,2-Dichloropropane	94	70-130
1,4-Dioxane	92	70-130
Bromodichloromethane	98	70-130
cis-1,3-Dichloropropene	88	70-130
4-Methyl-2-pentanone	93	70-130
Toluene	93	70-130
trans-1,3-Dichloropropene	94	70-130
1,1,2-Trichloroethane	96	70-130
Tetrachloroethene	98	70-130
2-Hexanone	97	70-130

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Client Sample ID: LCS

Lab ID#: 1604470A-09A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p042304**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/23/16 09:42 AM**	

Compound	%Recovery	Method Limits
Dibromochloromethane	98	70-130
1,2-Dibromoethane (EDB)	99	70-130
Chlorobenzene	96	70-130
Ethyl Benzene	95	70-130
m,p-Xylene	98	70-130
o-Xylene	101	70-130
Styrene	102	70-130
Bromoform	103	70-130
Cumene	98	70-130
1,1,2,2-Tetrachloroethane	97	70-130
Propylbenzene	97	70-130
4-Ethyltoluene	99	70-130
1,3,5-Trimethylbenzene	96	70-130
1,2,4-Trimethylbenzene	98	70-130
1,3-Dichlorobenzene	97	70-130
1,4-Dichlorobenzene	94	70-130
alpha-Chlorotoluene	98	70-130
1,2-Dichlorobenzene	97	70-130
1,2,4-Trichlorobenzene	90	70-130
Hexachlorobutadiene	89	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
1,2-Dichloroethane-d4	100	70-130
4-Bromofluorobenzene	102	70-130

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Client Sample ID: LCSD

Lab ID#: 1604470A-09AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p042305**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/23/16 10:17 AM**	

Compound	%Recovery	Method Limits
Freon 12	99	70-130
Freon 114	102	70-130
Chloromethane	120	70-130
Vinyl Chloride	121	70-130
1,3-Butadiene	84	70-130
Bromomethane	100	70-130
Chloroethane	105	70-130
Freon 11	99	70-130
Ethanol	108	70-130
Freon 113	98	70-130
1,1-Dichloroethene	97	70-130
Acetone	93	70-130
2-Propanol	101	70-130
Carbon Disulfide	83	70-130
3-Chloropropene	94	70-130
Methylene Chloride	94	70-130
Methyl tert-butyl ether	96	70-130
trans-1,2-Dichloroethene	101	70-130
Hexane	98	70-130
1,1-Dichloroethane	94	70-130
2-Butanone (Methyl Ethyl Ketone)	94	70-130
cis-1,2-Dichloroethene	99	70-130
Tetrahydrofuran	92	70-130
Chloroform	96	70-130
1,1,1-Trichloroethane	94	70-130
Cyclohexane	96	70-130
Carbon Tetrachloride	94	70-130
2,2,4-Trimethylpentane	96	70-130
Benzene	91	70-130
1,2-Dichloroethane	96	70-130
Heptane	93	70-130
Trichloroethene	93	70-130
1,2-Dichloropropane	94	70-130
1,4-Dioxane	91	70-130
Bromodichloromethane	98	70-130
cis-1,3-Dichloropropene	89	70-130
4-Methyl-2-pentanone	96	70-130
Toluene	94	70-130
trans-1,3-Dichloropropene	93	70-130
1,1,2-Trichloroethane	96	70-130
Tetrachloroethene	100	70-130
2-Hexanone	96	70-130

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Client Sample ID: LCSD

Lab ID#: 1604470A-09AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p042305**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/23/16 10:17 AM**	

Compound	%Recovery	Method Limits
Dibromochloromethane	96	70-130
1,2-Dibromoethane (EDB)	97	70-130
Chlorobenzene	95	70-130
Ethyl Benzene	94	70-130
m,p-Xylene	94	70-130
o-Xylene	99	70-130
Styrene	100	70-130
Bromoform	103	70-130
Cumene	97	70-130
1,1,2,2-Tetrachloroethane	95	70-130
Propylbenzene	96	70-130
4-Ethyltoluene	97	70-130
1,3,5-Trimethylbenzene	94	70-130
1,2,4-Trimethylbenzene	98	70-130
1,3-Dichlorobenzene	96	70-130
1,4-Dichlorobenzene	93	70-130
alpha-Chlorotoluene	97	70-130
1,2-Dichlorobenzene	96	70-130
1,2,4-Trichlorobenzene	98	70-130
Hexachlorobutadiene	97	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
1,2-Dichloroethane-d4	102	70-130
4-Bromofluorobenzene	104	70-130

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4/25/2016
Ms. Jennifer Bellamy
AMEC Environmental & Infrastructure
600 University Street
Suite 600
Seattle WA 98101

Project Name: Stericycle Tacoma
Project #: 10048
Workorder #: 1604470B

Dear Ms. Jennifer Bellamy

The following report includes the data for the above referenced project for sample(s) received on 4/22/2016 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

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WORK ORDER #: 1604470B

Work Order Summary

CLIENT:	Ms. Jennifer Bellamy AMEC Environmental & Infrastructure 600 University Street Suite 600 Seattle, WA 98101	**BILL TO:**	Mr. Bill Beck Stericycle Environmental Solutions, Inc. 18000 72nd Ave. S Suite 217 Kent, WA 98032
PHONE:	206-342-1760	**P.O. #**	Bill to Stericycle
FAX:		**PROJECT #**	10048 Stericycle Tacoma
DATE RECEIVED:	04/22/2016	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	04/25/2016		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
02A	AA-1-042116	Modified TO-15	4.3 "Hg	4.9 psi
03A	Lab Blank	Modified TO-15	NA	NA
04A	CCV	Modified TO-15	NA	NA
05A	LCS	Modified TO-15	NA	NA
05AA	LCSD	Modified TO-15	NA	NA

CERTIFIED BY: Heidi Mayo DATE: 04/25/16

Technical Director

Certification numbers: AZ Licensure AZ0775, NJ NELAP - CA016, NY NELAP - 11291,
TX NELAP - T104704434-15-9, UT NELAP CA0093332015-6, VA NELAP - 8113, WA NELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program)
Accreditation number: CA300005, Effective date: 10/18/2015, Expiration date: 10/17/2016.
Eurofins Air Toxics Inc.. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Modified TO-15
AMEC Environmental & Infrastructure
Workorder# 1604470B

One 6 Liter Summa Canister sample was received on April 22, 2016. The laboratory performed analysis via modified EPA Method TO-15 using GC/MS in the full scan mode.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the ATL modifications.

Requirement	***TO-15***	***ATL Modifications***
Initial Calibration	</=30% RSD with 2 compounds allowed out to < 40% RSD	</=30% RSD with 4 compounds allowed out to < 40% RSD
Blank and standards	Zero Air	UHP Nitrogen provides a higher purity gas matrix than zero air

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

All Quality Control Limit exceedances and affected sample results are noted by flags. Each flag is defined at the bottom of this Case Narrative and on each Sample Result Summary page. Target compound non-detects in the samples that are associated with high bias in CCV analyses have not been flagged.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit, LOD, or MDL value. See data page for project specific U-flag definition.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: AA-1-042116

Lab ID#: 1604470B-02A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.16	0.50	0.77	2.5
Freon 11	0.16	0.24	0.88	1.4
Ethanol	0.78	3.1	1.5	5.9
Acetone	0.78	3.8	1.8	9.2
2-Propanol	0.78	0.85	1.9	2.1
Methylene Chloride	0.31	0.76	1.1	2.6
Toluene	0.16	0.59	0.59	2.2

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Client Sample ID: AA-1-042116

Lab ID#: 1604470B-02A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**20042219**	**Date of Collection:**	**4/21/16 1:30:00 PM**
Dil. Factor:	**1.56**	**Date of Analysis:**	**4/23/16 06:43 AM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.16	0.50	0.77	2.5
Freon 114	0.16	Not Detected	1.1	Not Detected
Chloromethane	0.78	Not Detected	1.6	Not Detected
Vinyl Chloride	0.16	Not Detected	0.40	Not Detected
1,3-Butadiene	0.16	Not Detected	0.34	Not Detected
Bromomethane	0.78	Not Detected	3.0	Not Detected
Chloroethane	0.78	Not Detected	2.0	Not Detected
Freon 11	0.16	0.24	0.88	1.4
Ethanol	0.78	3.1	1.5	5.9
Freon 113	0.16	Not Detected	1.2	Not Detected
1,1-Dichloroethene	0.16	Not Detected	0.62	Not Detected
Acetone	0.78	3.8	1.8	9.2
2-Propanol	0.78	0.85	1.9	2.1
Carbon Disulfide	0.78	Not Detected	2.4	Not Detected
3-Chloropropene	0.78	Not Detected	2.4	Not Detected
Methylene Chloride	0.31	0.76	1.1	2.6
Methyl tert-butyl ether	0.16	Not Detected	0.56	Not Detected
trans-1,2-Dichloroethene	0.16	Not Detected	0.62	Not Detected
Hexane	0.16	Not Detected	0.55	Not Detected
1,1-Dichloroethane	0.16	Not Detected	0.63	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.78	Not Detected	2.3	Not Detected
cis-1,2-Dichloroethene	0.16	Not Detected	0.62	Not Detected
Tetrahydrofuran	0.78	Not Detected	2.3	Not Detected
Chloroform	0.16	Not Detected	0.76	Not Detected
1,1,1-Trichloroethane	0.16	Not Detected	0.85	Not Detected
Cyclohexane	0.16	Not Detected	0.54	Not Detected
Carbon Tetrachloride	0.16	Not Detected	0.98	Not Detected
2,2,4-Trimethylpentane	0.78	Not Detected	3.6	Not Detected
Benzene	0.16	Not Detected	0.50	Not Detected
1,2-Dichloroethane	0.16	Not Detected	0.63	Not Detected
Heptane	0.16	Not Detected	0.64	Not Detected
Trichloroethene	0.16	Not Detected	0.84	Not Detected
1,2-Dichloropropane	0.16	Not Detected	0.72	Not Detected
1,4-Dioxane	0.16	Not Detected	0.56	Not Detected
Bromodichloromethane	0.16	Not Detected	1.0	Not Detected
cis-1,3-Dichloropropene	0.16	Not Detected	0.71	Not Detected
4-Methyl-2-pentanone	0.16	Not Detected	0.64	Not Detected
Toluene	0.16	0.59	0.59	2.2
trans-1,3-Dichloropropene	0.16	Not Detected	0.71	Not Detected
1,1,2-Trichloroethane	0.16	Not Detected	0.85	Not Detected
Tetrachloroethene	0.16	Not Detected	1.0	Not Detected
2-Hexanone	0.78	Not Detected	3.2	Not Detected

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Client Sample ID: AA-1-042116

Lab ID#: 1604470B-02A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**20042219**	**Date of Collection:**	**4/21/16 1:30:00 PM**
Dil. Factor:	**1.56**	**Date of Analysis:**	**4/23/16 06:43 AM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	0.16	Not Detected	1.3	Not Detected
1,2-Dibromoethane (EDB)	0.16	Not Detected	1.2	Not Detected
Chlorobenzene	0.16	Not Detected	0.72	Not Detected
Ethyl Benzene	0.16	Not Detected	0.68	Not Detected
m,p-Xylene	0.16	Not Detected	0.68	Not Detected
o-Xylene	0.16	Not Detected	0.68	Not Detected
Styrene	0.16	Not Detected	0.66	Not Detected
Bromoform	0.16	Not Detected	1.6	Not Detected
Cumene	0.16	Not Detected	0.77	Not Detected
1,1,2,2-Tetrachloroethane	0.16	Not Detected	1.1	Not Detected
Propylbenzene	0.16	Not Detected	0.77	Not Detected
4-Ethyltoluene	0.16	Not Detected	0.77	Not Detected
1,3,5-Trimethylbenzene	0.16	Not Detected	0.77	Not Detected
1,2,4-Trimethylbenzene	0.16	Not Detected	0.77	Not Detected
1,3-Dichlorobenzene	0.16	Not Detected	0.94	Not Detected
1,4-Dichlorobenzene	0.16	Not Detected	0.94	Not Detected
alpha-Chlorotoluene	0.16	Not Detected	0.81	Not Detected
1,2-Dichlorobenzene	0.16	Not Detected	0.94	Not Detected
1,2,4-Trichlorobenzene	0.78	Not Detected	5.8	Not Detected
Hexachlorobutadiene	0.78	Not Detected	8.3	Not Detected

Container Type: 6 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	104	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	97	70-130

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Client Sample ID: Lab Blank

Lab ID#: 1604470B-03A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**20042206**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/22/16 12:57 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.10	Not Detected	0.49	Not Detected
Freon 114	0.10	Not Detected	0.70	Not Detected
Chloromethane	0.50	Not Detected	1.0	Not Detected
Vinyl Chloride	0.10	Not Detected	0.26	Not Detected
1,3-Butadiene	0.10	Not Detected	0.22	Not Detected
Bromomethane	0.50	Not Detected	1.9	Not Detected
Chloroethane	0.50	Not Detected	1.3	Not Detected
Freon 11	0.10	Not Detected	0.56	Not Detected
Ethanol	0.50	Not Detected	0.94	Not Detected
Freon 113	0.10	Not Detected	0.77	Not Detected
1,1-Dichloroethene	0.10	Not Detected	0.40	Not Detected
Acetone	0.50	Not Detected	1.2	Not Detected
2-Propanol	0.50	Not Detected	1.2	Not Detected
Carbon Disulfide	0.50	Not Detected	1.6	Not Detected
3-Chloropropene	0.50	Not Detected	1.6	Not Detected
Methylene Chloride	0.20	Not Detected	0.69	Not Detected
Methyl tert-butyl ether	0.10	Not Detected	0.36	Not Detected
trans-1,2-Dichloroethene	0.10	Not Detected	0.40	Not Detected
Hexane	0.10	Not Detected	0.35	Not Detected
1,1-Dichloroethane	0.10	Not Detected	0.40	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.50	Not Detected	1.5	Not Detected
cis-1,2-Dichloroethene	0.10	Not Detected	0.40	Not Detected
Tetrahydrofuran	0.50	Not Detected	1.5	Not Detected
Chloroform	0.10	Not Detected	0.49	Not Detected
1,1,1-Trichloroethane	0.10	Not Detected	0.54	Not Detected
Cyclohexane	0.10	Not Detected	0.34	Not Detected
Carbon Tetrachloride	0.10	Not Detected	0.63	Not Detected
2,2,4-Trimethylpentane	0.50	Not Detected	2.3	Not Detected
Benzene	0.10	Not Detected	0.32	Not Detected
1,2-Dichloroethane	0.10	Not Detected	0.40	Not Detected
Heptane	0.10	Not Detected	0.41	Not Detected
Trichloroethene	0.10	Not Detected	0.54	Not Detected
1,2-Dichloropropane	0.10	Not Detected	0.46	Not Detected
1,4-Dioxane	0.10	Not Detected	0.36	Not Detected
Bromodichloromethane	0.10	Not Detected	0.67	Not Detected
cis-1,3-Dichloropropene	0.10	Not Detected	0.45	Not Detected
4-Methyl-2-pentanone	0.10	Not Detected	0.41	Not Detected
Toluene	0.10	Not Detected	0.38	Not Detected
trans-1,3-Dichloropropene	0.10	Not Detected	0.45	Not Detected
1,1,2-Trichloroethane	0.10	Not Detected	0.54	Not Detected
Tetrachloroethene	0.10	Not Detected	0.68	Not Detected
2-Hexanone	0.50	Not Detected	2.0	Not Detected

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Client Sample ID: Lab Blank

Lab ID#: 1604470B-03A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**20042206**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/22/16 12:57 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	0.10	Not Detected	0.85	Not Detected
1,2-Dibromoethane (EDB)	0.10	Not Detected	0.77	Not Detected
Chlorobenzene	0.10	Not Detected	0.46	Not Detected
Ethyl Benzene	0.10	Not Detected	0.43	Not Detected
m,p-Xylene	0.10	Not Detected	0.43	Not Detected
o-Xylene	0.10	Not Detected	0.43	Not Detected
Styrene	0.10	Not Detected	0.42	Not Detected
Bromoform	0.10	Not Detected	1.0	Not Detected
Cumene	0.10	Not Detected	0.49	Not Detected
1,1,2,2-Tetrachloroethane	0.10	Not Detected	0.69	Not Detected
Propylbenzene	0.10	Not Detected	0.49	Not Detected
4-Ethyltoluene	0.10	Not Detected	0.49	Not Detected
1,3,5-Trimethylbenzene	0.10	Not Detected	0.49	Not Detected
1,2,4-Trimethylbenzene	0.10	Not Detected	0.49	Not Detected
1,3-Dichlorobenzene	0.10	Not Detected	0.60	Not Detected
1,4-Dichlorobenzene	0.10	Not Detected	0.60	Not Detected
alpha-Chlorotoluene	0.10	Not Detected	0.52	Not Detected
1,2-Dichlorobenzene	0.10	Not Detected	0.60	Not Detected
1,2,4-Trichlorobenzene	0.50	Not Detected	3.7	Not Detected
Hexachlorobutadiene	0.50	Not Detected	5.3	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	106	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	96	70-130

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Client Sample ID: CCV

Lab ID#: 1604470B-04A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**20042202**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/22/16 09:08 AM**	

Compound	%Recovery
Freon 12	110
Freon 114	111
Chloromethane	107
Vinyl Chloride	111
1,3-Butadiene	107
Bromomethane	102
Chloroethane	116
Freon 11	111
Ethanol	115
Freon 113	113
1,1-Dichloroethene	108
Acetone	109
2-Propanol	101
Carbon Disulfide	116
3-Chloropropene	104
Methylene Chloride	110
Methyl tert-butyl ether	113
trans-1,2-Dichloroethene	110
Hexane	112
1,1-Dichloroethane	111
2-Butanone (Methyl Ethyl Ketone)	113
cis-1,2-Dichloroethene	113
Tetrahydrofuran	113
Chloroform	111
1,1,1-Trichloroethane	111
Cyclohexane	115
Carbon Tetrachloride	122
2,2,4-Trimethylpentane	114
Benzene	119
1,2-Dichloroethane	117
Heptane	122
Trichloroethene	117
1,2-Dichloropropane	118
1,4-Dioxane	126
Bromodichloromethane	124
cis-1,3-Dichloropropene	118
4-Methyl-2-pentanone	118
Toluene	116
trans-1,3-Dichloropropene	122
1,1,2-Trichloroethane	121
Tetrachloroethene	129
2-Hexanone	118

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Client Sample ID: CCV

Lab ID#: 1604470B-04A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**20042202**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/22/16 09:08 AM**	

Compound	%Recovery
Dibromochloromethane	136 Q
1,2-Dibromoethane (EDB)	132 Q
Chlorobenzene	121
Ethyl Benzene	127
m,p-Xylene	121
o-Xylene	122
Styrene	124
Bromoform	137 Q
Cumene	127
1,1,2,2-Tetrachloroethane	125
Propylbenzene	112
4-Ethyltoluene	106
1,3,5-Trimethylbenzene	110
1,2,4-Trimethylbenzene	108
1,3-Dichlorobenzene	106
1,4-Dichlorobenzene	106
alpha-Chlorotoluene	116
1,2-Dichlorobenzene	105
1,2,4-Trichlorobenzene	104
Hexachlorobutadiene	106

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	90	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	101	70-130

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Client Sample ID: LCS

Lab ID#: 1604470B-05A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**20042203**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/22/16 10:39 AM**	

Compound	%Recovery	Method Limits
Freon 12	112	70-130
Freon 114	114	70-130
Chloromethane	106	70-130
Vinyl Chloride	112	70-130
1,3-Butadiene	105	70-130
Bromomethane	109	70-130
Chloroethane	115	70-130
Freon 11	115	70-130
Ethanol	115	70-130
Freon 113	115	70-130
1,1-Dichloroethene	111	70-130
Acetone	111	70-130
2-Propanol	103	70-130
Carbon Disulfide	100	70-130
3-Chloropropene	98	70-130
Methylene Chloride	111	70-130
Methyl tert-butyl ether	109	70-130
trans-1,2-Dichloroethene	115	70-130
Hexane	113	70-130
1,1-Dichloroethane	108	70-130
2-Butanone (Methyl Ethyl Ketone)	113	70-130
cis-1,2-Dichloroethene	109	70-130
Tetrahydrofuran	110	70-130
Chloroform	112	70-130
1,1,1-Trichloroethane	109	70-130
Cyclohexane	116	70-130
Carbon Tetrachloride	127	70-130
2,2,4-Trimethylpentane	120	70-130
Benzene	121	70-130
1,2-Dichloroethane	119	70-130
Heptane	120	70-130
Trichloroethene	118	70-130
1,2-Dichloropropane	117	70-130
1,4-Dioxane	122	70-130
Bromodichloromethane	126	70-130
cis-1,3-Dichloropropene	111	70-130
4-Methyl-2-pentanone	124	70-130
Toluene	118	70-130
trans-1,3-Dichloropropene	120	70-130
1,1,2-Trichloroethane	118	70-130
Tetrachloroethene	126	70-130
2-Hexanone	116	70-130

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Client Sample ID: LCS

Lab ID#: 1604470B-05A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**20042203**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/22/16 10:39 AM**	

Compound	%Recovery	Method Limits
Dibromochloromethane	131 Q	70-130
1,2-Dibromoethane (EDB)	129	70-130
Chlorobenzene	119	70-130
Ethyl Benzene	123	70-130
m,p-Xylene	120	70-130
o-Xylene	121	70-130
Styrene	127	70-130
Bromoform	138 Q	70-130
Cumene	126	70-130
1,1,2,2-Tetrachloroethane	124	70-130
Propylbenzene	112	70-130
4-Ethyltoluene	104	70-130
1,3,5-Trimethylbenzene	117	70-130
1,2,4-Trimethylbenzene	114	70-130
1,3-Dichlorobenzene	109	70-130
1,4-Dichlorobenzene	108	70-130
alpha-Chlorotoluene	119	70-130
1,2-Dichlorobenzene	108	70-130
1,2,4-Trichlorobenzene	104	70-130
Hexachlorobutadiene	100	70-130

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	94	70-130
Toluene-d8	107	70-130
4-Bromofluorobenzene	106	70-130

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Client Sample ID: LCSD

Lab ID#: 1604470B-05AA

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**20042204**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/22/16 11:22 AM**	

Compound	%Recovery	Method Limits
Freon 12	109	70-130
Freon 114	116	70-130
Chloromethane	106	70-130
Vinyl Chloride	110	70-130
1,3-Butadiene	103	70-130
Bromomethane	109	70-130
Chloroethane	115	70-130
Freon 11	115	70-130
Ethanol	116	70-130
Freon 113	114	70-130
1,1-Dichloroethene	113	70-130
Acetone	112	70-130
2-Propanol	106	70-130
Carbon Disulfide	100	70-130
3-Chloropropene	98	70-130
Methylene Chloride	110	70-130
Methyl tert-butyl ether	111	70-130
trans-1,2-Dichloroethene	113	70-130
Hexane	115	70-130
1,1-Dichloroethane	109	70-130
2-Butanone (Methyl Ethyl Ketone)	116	70-130
cis-1,2-Dichloroethene	110	70-130
Tetrahydrofuran	114	70-130
Chloroform	112	70-130
1,1,1-Trichloroethane	112	70-130
Cyclohexane	118	70-130
Carbon Tetrachloride	128	70-130
2,2,4-Trimethylpentane	118	70-130
Benzene	119	70-130
1,2-Dichloroethane	118	70-130
Heptane	120	70-130
Trichloroethene	118	70-130
1,2-Dichloropropane	118	70-130
1,4-Dioxane	121	70-130
Bromodichloromethane	121	70-130
cis-1,3-Dichloropropene	112	70-130
4-Methyl-2-pentanone	125	70-130
Toluene	119	70-130
trans-1,3-Dichloropropene	118	70-130
1,1,2-Trichloroethane	117	70-130
Tetrachloroethene	124	70-130
2-Hexanone	116	70-130

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Client Sample ID: LCSD

Lab ID#: 1604470B-05AA

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**20042204**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/22/16 11:22 AM**	

Compound	%Recovery	Method Limits
Dibromochloromethane	132 Q	70-130
1,2-Dibromoethane (EDB)	125	70-130
Chlorobenzene	117	70-130
Ethyl Benzene	122	70-130
m,p-Xylene	118	70-130
o-Xylene	121	70-130
Styrene	125	70-130
Bromoform	139 Q	70-130
Cumene	124	70-130
1,1,2,2-Tetrachloroethane	122	70-130
Propylbenzene	112	70-130
4-Ethyltoluene	103	70-130
1,3,5-Trimethylbenzene	119	70-130
1,2,4-Trimethylbenzene	117	70-130
1,3-Dichlorobenzene	109	70-130
1,4-Dichlorobenzene	108	70-130
alpha-Chlorotoluene	118	70-130
1,2-Dichlorobenzene	108	70-130
1,2,4-Trichlorobenzene	114	70-130
Hexachlorobutadiene	108	70-130

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	91	70-130
Toluene-d8	105	70-130
4-Bromofluorobenzene	101	70-130

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4/23/2016
Ms. Jennifer Bellamy
AMEC Environmental & Infrastructure
600 University Street
Suite 600
Seattle WA 98101

Project Name: Stericycle Tacoma
Project #: 10048
Workorder #: 1604470C

Dear Ms. Jennifer Bellamy

The following report includes the data for the above referenced project for sample(s) received on 4/22/2016 at Air Toxics Ltd.

The data and associated QC analyzed by Modified ASTM D-1946 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

eurofins | Air Toxics

WORK ORDER #: 1604470C

Work Order Summary

CLIENT:	Ms. Jennifer Bellamy AMEC Environmental & Infrastructure 600 University Street Suite 600 Seattle, WA 98101	**BILL TO:**	Accounts Payable Stericycle Environmental Solutions, Inc. 210 West Sand Bank Road Columbia, IL 62236
PHONE:	206-342-1760	**P.O. #**	Bill to Stericycle
FAX:		**PROJECT #**	10048 Stericycle Tacoma
DATE RECEIVED:	04/22/2016	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	04/23/2016		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	SV-2-042116	Modified ASTM D-1946	4.5 "Hg	15 psi
02A	Lab Blank	Modified ASTM D-1946	NA	NA
03A	LCS	Modified ASTM D-1946	NA	NA
03AA	LCSD	Modified ASTM D-1946	NA	NA

CERTIFIED BY: Heidi Hayes DATE: 04/23/16

Technical Director

Certification numbers: AZ Licensure AZ0775, NJ NELAP - CA016, NY NELAP - 11291,
TX NELAP - T104704434-15-9, UT NELAP CA0093332015-6, VA NELAP - 8113, WA NELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program)
Accreditation number: CA300005, Effective date: 10/18/2015, Expiration date: 10/17/2016.
Eurofins Air Toxics Inc.. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Modified ASTM D-1946
AMEC Environmental & Infrastructure
Workorder# 1604470C

One 1 Liter Summa Canister sample was received on April 22, 2016. The laboratory performed analysis via Modified ASTM Method D-1946 for Helium in air using GC/TCD. The method involves direct injection of 1.0 mL of sample.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the ATL modifications.

Requirement	***ASTM D-1946***	***ATL Modifications***
Calibration	A single point calibration is performed using a reference standard closely matching the composition of the unknown.	A minimum of 5-point calibration curve is performed. Quantitation is based on average Response Factor.
Reference Standard	The composition of any reference standard must be known to within 0.01 mol % for any component.	The standards used by ATL are blended to a >/= 95% accuracy.
Sample Injection Volume	Components whose concentrations are in excess of 5 % should not be analyzed by using sample volumes greater than 0.5 mL.	The sample container is connected directly to a fixed volume sample loop of 1.0 mL on the GC. Linear range is defined by the calibration curve. Bags are loaded by vacuum.
Normalization	Normalize the mole percent values by multiplying each value by 100 and dividing by the sum of the original values. The sum of the original values should not differ from 100% by more than 1.0%.	Results are not normalized. The sum of the reported values can differ from 100% by as much as 15%, either due to analytical variability or an unusual sample matrix.
Precision	Precision requirements established at each concentration level.	Duplicates should agree within 25% RPD for detections > 5 X's the RL.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

There were no analytical discrepancies.

Definition of Data Qualifying Flags

Seven qualifiers may have been used on the data analysis sheets and indicate as follows:
B - Compound present in laboratory blank greater than reporting limit.
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the detection limit.
M - Reported value may be biased due to apparent matrix interferences.
File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

Client Sample ID: SV-2-042116

Lab ID#: 1604470C-01A

No Detections Were Found.

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Client Sample ID: SV-2-042116

Lab ID#: 1604470C-01A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**10042227c**	**Date of Collection: 4/21/16 12:43:00 PM**	
Dil. Factor:	**2.38**	**Date of Analysis: 4/22/16 07:11 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Helium	0.12	Not Detected

Container Type: 1 Liter Summa Canister

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Client Sample ID: Lab Blank

Lab ID#: 1604470C-02A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**10042205c**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/21/16 10:48 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Helium	0.050	Not Detected

Container Type: NA - Not Applicable

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Client Sample ID: LCS

Lab ID#: 1604470C-03A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**10042202c**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/21/16 09:26 PM**	

Compound	%Recovery	Method Limits
Helium	102	85-115

Container Type: NA - Not Applicable

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Client Sample ID: LCSD

Lab ID#: 1604470C-03AA

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**10042230c**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/22/16 08:23 PM**	

Compound	%Recovery	Method Limits
Helium	106	85-115

Container Type: NA - Not Applicable

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4/23/2016
Ms. Jennifer Bellamy
AMEC Environmental & Infrastructure
600 University Street
Suite 600
Seattle WA 98101

Project Name: Stericycle Tacoma
Project #: 10048
Workorder #: 1604470D

Dear Ms. Jennifer Bellamy

The following report includes the data for the above referenced project for sample(s) received on 4/22/2016 at Air Toxics Ltd.

The data and associated QC analyzed by Modified ASTM D-1946 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

eurofins | Air Toxics

WORK ORDER #: 1604470D

Work Order Summary

CLIENT:	Ms. Jennifer Bellamy AMEC Environmental & Infrastructure 600 University Street Suite 600 Seattle, WA 98101	**BILL TO:**	Accounts Payable Stericycle Environmental Solutions, Inc. 210 West Sand Bank Road Columbia, IL 62236
PHONE:	206-342-1760	**P.O. #**	Bill to Stericycle
FAX:		**PROJECT #**	10048 Stericycle Tacoma
DATE RECEIVED:	04/22/2016	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	04/23/2016		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	SV-2-042116	Modified ASTM D-1946	4.5 "Hg	15 psi
03A	SV-3-042116	Modified ASTM D-1946	3.0 "Hg	15 psi
04A	Lab Blank	Modified ASTM D-1946	NA	NA
04B	Lab Blank	Modified ASTM D-1946	NA	NA
05A	LCS	Modified ASTM D-1946	NA	NA
05AA	LCSD	Modified ASTM D-1946	NA	NA
05B	LCS	Modified ASTM D-1946	NA	NA

CERTIFIED BY: Heidi Mayo DATE: 04/23/16

Technical Director

Certification numbers: AZ Licensure AZ0775, NJ NELAP - CA016, NY NELAP - 11291,
TX NELAP - T104704434-15-9, UT NELAP CA0093332015-6, VA NELAP - 8113, WA NELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program)
Accreditation number: CA300005, Effective date: 10/18/2015, Expiration date: 10/17/2016.
Eurofins Air Toxics Inc.. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
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LABORATORY NARRATIVE
Modified ASTM D-1946
AMEC Environmental & Infrastructure
Workorder# 1604470D

Two 1 Liter Summa Canister samples were received on April 22, 2016. The laboratory performed analysis via Modified ASTM Method D-1946 for Methane in air using GC/FID. The method involves direct injection of 1.0 mL of sample.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the ATL modifications.

Requirement	***ASTM D-1946***	***ATL Modifications***
Calibration	A single point calibration is performed using a reference standard closely matching the composition of the unknown.	A minimum of 5-point calibration curve is performed. Quantitation is based on average Response Factor.
Reference Standard	The composition of any reference standard must be known to within 0.01 mol % for any component.	The standards used by ATL are blended to a >/= 95% accuracy.
Sample Injection Volume	Components whose concentrations are in excess of 5 % should not be analyzed by using sample volumes greater than 0.5 mL.	The sample container is connected directly to a fixed volume sample loop of 1.0 mL on the GC. Linear range is defined by the calibration curve. Bags are loaded by vacuum.
Normalization	Normalize the mole percent values by multiplying each value by 100 and dividing by the sum of the original values. The sum of the original values should not differ from 100% by more than 1.0%.	Results are not normalized. The sum of the reported values can differ from 100% by as much as 15%, either due to analytical variability or an unusual sample matrix.
Precision	Precision requirements established at each concentration level.	Duplicates should agree within 25% RPD for detections > 5 X's the RL.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

There were no analytical discrepancies.

Definition of Data Qualifying Flags

Seven qualifiers may have been used on the data analysis sheets and indicate as follows:
B - Compound present in laboratory blank greater than reporting limit.
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the detection limit.
M - Reported value may be biased due to apparent matrix interferences.
File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

Client Sample ID: SV-2-042116

Lab ID#: 1604470D-01A

Compound	Rpt. Limit (%)	Amount (%)
Methane	0.00024	75

Client Sample ID: SV-3-042116

Lab ID#: 1604470D-03A

Compound	Rpt. Limit (%)	Amount (%)
Methane	0.00022	67

eurofins | Air Toxics

Client Sample ID: SV-2-042116

Lab ID#: 1604470D-01A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**10042227a**	**Date of Collection: 4/21/16 12:43:00 PM**	
Dil. Factor:	**2.38**	**Date of Analysis: 4/22/16 07:11 PM**	

Compound	Rpt. Limit (%)	Amount (%)
Methane	0.00024	75

Container Type: 1 Liter Summa Canister

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Client Sample ID: SV-3-042116

Lab ID#: 1604470D-03A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**10042306**	**Date of Collection: 4/21/16 4:28:00 PM**	
Dil. Factor:	**2.24**	**Date of Analysis: 4/23/16 10:16 AM**	

Compound	Rpt. Limit (%)	Amount (%)
Methane	0.00022	67

Container Type: 1 Liter Summa Canister

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Client Sample ID: Lab Blank

Lab ID#: 1604470D-04A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**10042204**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/21/16 10:21 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Methane	0.00010	Not Detected

Container Type: NA - Not Applicable

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Client Sample ID: Lab Blank

Lab ID#: 1604470D-04B

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**10042304**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/23/16 09:17 AM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Methane	0.00010	Not Detected

Container Type: NA - Not Applicable

eurofins | Air Toxics

Client Sample ID: LCS

Lab ID#: 1604470D-05A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**10042202**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/21/16 09:26 PM**	

Compound	%Recovery	Method Limits
Methane	97	85-115

Container Type: NA - Not Applicable

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Client Sample ID: LCSD

Lab ID#: 1604470D-05AA

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**10042230**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/22/16 08:23 PM**	

Compound	%Recovery	Method Limits
Methane	100	85-115

Container Type: NA - Not Applicable

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Client Sample ID: LCS

Lab ID#: 1604470D-05B

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**10042302**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/23/16 08:22 AM**	

Compound	%Recovery	Method Limits
Methane	96	85-115

Container Type: NA - Not Applicable

OSWER VAPOR INTRUSION ASSESSMENT

Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.45, November 2015 RSLs

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Commercial	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR_SG	1.00E-06	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ_SG	1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)

CAS	Chemical Name	Site Sub-slab or Exterior Soil Gas Concentration Csg (ug/m^3)	Calculated Indoor Air Concentration Cia (ug/m^3)	VI Carcinogenic Risk CR	VI Hazard HQ	Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$)	IUR Source*	Reference Concentration RfC (mg/m^3)	RFC Source*	Mutagenic Indicator i
75-07-0	Acetaldehyde		--	--	--	2.20E-06	I	9.00E-03	I	
67-64-1	Acetone		--	--	--			3.10E+01	A	
75-05-8	Acetonitrile		--	--	--			6.00E-02	I	
107-02-8	Acrolein		--	--	--			2.00E-05	I	
79-10-7	Acrylic Acid		--	--	--			1.00E-03	I	
107-13-1	Acrylonitrile		--	--	--	6.80E-05	I	2.00E-03	I	
309-00-2	Aldrin		--	--	--	4.90E-03	I			
107-18-6	Allyl Alcohol		--	--	--			1.00E-04	X	
107-05-1	Allyl Chloride		--	--	--	6.00E-06	CA	1.00E-03	I	
7664-41-7	Ammonia		--	--	--			1.00E-01	I	
75-85-4	Amyl Alcohol, tert-		--	--	--			3.00E-03	X	
12674-11-2	Aroclor 1016		--	--	--	2.00E-05	S			
11104-28-2	Aroclor 1221		--	--	--	5.70E-04	S			
11141-16-5	Aroclor 1232		--	--	--	5.70E-04	S			
53469-21-9	Aroclor 1242		--	--	--	5.70E-04	S			
12672-29-6	Aroclor 1248		--	--	--	5.70E-04	S			
11097-69-1	Aroclor 1254		--	--	--	5.70E-04	S			
11096-82-5	Aroclor 1260		--	--	--	5.70E-04	S			
103-33-3	Azobenzene		--	--	--	3.10E-05	I			
56-55-3	Benz[a]anthracene		--	--	--	1.10E-04	CA			Mut
71-43-2	Benzene	3.1E+02	9.30E+00	**5.9E-06**	7.1E-02	7.80E-06	I	3.00E-02	I	
100-44-7	Benzyl Chloride		--	--	--	4.90E-05	CA	1.00E-03	P	
92-52-4	Biphenyl, 1,1'-		--	--	--			4.00E-04	X	
111-44-4	Bis(2-chloroethyl)ether		--	--	--	3.30E-04	I			
542-88-1	Bis(chloromethyl)ether		--	--	--	6.20E-02	I			
10294-34-5	Boron Trichloride		--	--	--			2.00E-02	P	
7637-07-2	Boron Trifluoride		--	--	--			1.30E-02	CA	
107-04-0	Bromo-2-chloroethane, 1-		--	--	--	6.00E-04	X			
108-86-1	Bromobenzene		--	--	--			6.00E-02	I	
74-97-5	Bromochloromethane		--	--	--			4.00E-02	X	
75-27-4	Bromodichloromethane		--	--	--	3.70E-05	CA			
75-25-2	Bromoform		--	--	--	1.10E-06	I			
74-83-9	Bromomethane		--	--	--			5.00E-03	I	
106-99-0	Butadiene, 1,3-		--	--	--	3.00E-05	I	2.00E-03	I	
78-92-2	Butyl alcohol, sec-		--	--	--			3.00E+01	P	
75-15-0	Carbon Disulfide		--	--	--			7.00E-01	I	
56-23-5	Carbon Tetrachloride		--	--	--	6.00E-06	I	1.00E-01	I	
463-58-1	Carbonyl Sulfide		--	--	--			1.00E-01	P	
12789-03-6	Chlordane		--	--	--	1.00E-04	I	7.00E-04	I	
7782-50-5	Chlorine		--	--	--			1.50E-04	A	
10049-04-4	Chlorine Dioxide		--	--	--			2.00E-04	I	
75-68-3	Chloro-1,1-difluoroethane, 1-		--	--	--			5.00E+01	I	
126-99-8	Chloro-1,3-butadiene, 2-		--	--	--	3.00E-04	I	2.00E-02	I	
108-90-7	Chlorobenzene		--	--	--			5.00E-02	P	
98-56-6	Chlorobenzotrifluoride, 4-		--	--	--			3.00E-01	P	
75-45-6	Chlorodifluoromethane		--	--	--			5.00E+01	I	
67-66-3	Chloroform		--	--	--	2.30E-05	I	9.80E-02	A	
74-87-3	Chloromethane		--	--	--			9.00E-02	I	
107-30-2	Chloromethyl Methyl Ether		--	--	--	6.90E-04	CA			
76-06-2	Chloropicrin		--	--	--			4.00E-04	CA	
8007-45-2	Coke Oven Emissions		--	--	--	6.20E-04	I			Mut
98-82-8	Cumene	1.2E+02	3.60E+00	No IUR	2.1E-03			4.00E-01	I	
57-12-5	Cyanide (CN-)		--	--	--			8.00E-04	S	
110-82-7	Cyclohexane	7.9E+02	2.37E+01	No IUR	9.0E-04			6.00E+00	I	
108-94-1	Cyclohexanone		--	--	--			7.00E-01	P	
110-83-8	Cyclohexene		--	--	--			1.00E+00	X	
72-55-9	DDE, p,p'-		--	--	--	9.70E-05	CA			

OSWER VAPOR INTRUSION ASSESSMENT

Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.45, November 2015 RSLs

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Commercial	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR_SG	1.00E-06	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ_SG	1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)

CAS	Chemical Name	Site Sub-slab or Exterior Soil Gas Concentration Csg (ug/m^3)	Calculated Indoor Air Concentration Cia (ug/m^3)	VI Carcinogenic Risk CR	VI Hazard HQ	Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$)	IUR Source*	Reference Concentration RfC (mg/m^3)	RFC Source*	Mutagenic Indicator i
96-12-8	Dibromo-3-chloropropane, 1,2-		--	--	--	6.00E-03	P	2.00E-04	I	Mut
106-93-4	Dibromoethane, 1,2-		--	--	--	6.00E-04	I	9.00E-03	I	
74-95-3	Dibromomethane (Methylene Bromide)		--	--	--			4.00E-03	X	
764-41-0	Dichloro-2-butene, 1,4-		--	--	--	4.20E-03	P			
1476-11-5	Dichloro-2-butene, cis-1,4-		--	--	--	4.20E-03	P			
110-57-6	Dichloro-2-butene, trans-1,4-		--	--	--	4.20E-03	P			
95-50-1	Dichlorobenzene, 1,2-		--	--	--			2.00E-01	H	
106-46-7	Dichlorobenzene, 1,4-		--	--	--	1.10E-05	CA	8.00E-01	I	
75-71-8	Dichlorodifluoromethane		--	--	--			1.00E-01	X	
75-34-3	Dichloroethane, 1,1-		--	--	--	1.60E-06	CA			
107-06-2	Dichloroethane, 1,2-		--	--	--	2.60E-05	I	7.00E-03	P	
75-35-4	Dichloroethylene, 1,1-		--	--	--			2.00E-01	I	
78-87-5	Dichloropropane, 1,2-		--	--	--	1.00E-05	CA	4.00E-03	I	
542-75-6	Dichloropropene, 1,3-		--	--	--	4.00E-06	I	2.00E-02	I	
77-73-6	Dicyclopentadiene		--	--	--			3.00E-04	X	
75-37-6	Difluoroethane, 1,1-		--	--	--			4.00E+01	I	
94-58-6	Dihydrosafrole		--	--	--	1.30E-05	CA			
108-20-3	Diisopropyl Ether		--	--	--			7.00E-01	P	
68-12-2	Dimethylformamide		--	--	--			3.00E-02	I	
57-14-7	Dimethylhydrazine, 1,1-		--	--	--			2.00E-06	X	
540-73-8	Dimethylhydrazine, 1,2-		--	--	--	1.60E-01	CA			
513-37-1	Dimethylvinylchloride		--	--	--	1.30E-05	CA			
123-91-1	Dioxane, 1,4-		--	--	--	5.00E-06	I	3.00E-02	I	
106-89-8	Epichlorohydrin		--	--	--	1.20E-06	I	1.00E-03	I	
106-88-7	Epoxybutane, 1,2-		--	--	--			2.00E-02	I	
111-15-9	Ethoxyethanol Acetate, 2-		--	--	--			6.00E-02	P	
110-80-5	Ethoxyethanol, 2-		--	--	--			2.00E-01	I	
141-78-6	Ethyl Acetate		--	--	--			7.00E-02	P	
140-88-5	Ethyl Acrylate		--	--	--			8.00E-03	P	
75-00-3	Ethyl Chloride (Chloroethane)		--	--	--			1.00E+01	I	
97-63-2	Ethyl Methacrylate		--	--	--			3.00E-01	P	
100-41-4	Ethylbenzene	3.3E+02	9.90E+00	**2.0E-06**	2.3E-03	2.50E-06	CA	1.00E+00	I	
75-21-8	Ethylene Oxide		--	--	--	8.80E-05	CA	3.00E-02	CA	
151-56-4	Ethyleneimine		--	--	--	1.90E-02	CA			
50-00-0	Formaldehyde		--	--	--	1.30E-05	I	9.80E-03	A	
64-18-6	Formic Acid		--	--	--			3.00E-04	X	
98-01-1	Furfural		--	--	--			5.00E-02	H	
765-34-4	Glycidyl		--	--	--			1.00E-03	H	
76-44-8	Heptachlor		--	--	--	1.30E-03	I			
1024-57-3	Heptachlor Epoxide		--	--	--	2.60E-03	I			
39635-31-9	Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189)		--	--	--	1.10E-03	E	1.30E-03	E	
118-74-1	Hexachlorobenzene		--	--	--	4.60E-04	I			
38380-08-4	Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156)		--	--	--	1.10E-03	E	1.30E-03	E	
69782-90-7	Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157)		--	--	--	1.10E-03	E	1.30E-03	E	
52663-72-6	Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167)		--	--	--	1.10E-03	E	1.30E-03	E	
32774-16-6	Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169)		--	--	--	1.10E+00	E	1.30E-06	E	
87-68-3	Hexachlorobutadiene		--	--	--	2.20E-05	I			
77-47-4	Hexachlorocyclopentadiene		--	--	--			2.00E-04	I	
67-72-1	Hexachloroethane		--	--	--	1.10E-05	CA	3.00E-02	I	
822-06-0	Hexamethylene Diisocyanate, 1,6-		--	--	--			1.00E-05	I	
110-54-3	Hexane, N-		--	--	--			7.00E-01	I	
591-78-6	Hexanone, 2-		--	--	--			3.00E-02	I	
302-01-2	Hydrazine		--	--	--	4.90E-03	I	3.00E-05	P	
7647-01-0	Hydrogen Chloride		--	--	--			2.00E-02	I	
74-90-8	Hydrogen Cyanide		--	--	--			8.00E-04	I	
7664-39-3	Hydrogen Fluoride		--	--	--			1.40E-02	CA	
7783-06-4	Hydrogen Sulfide		--	--	--			2.00E-03	I	

OSWER VAPOR INTRUSION ASSESSMENT

Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.45, November 2015 RSLs

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67-63-0	Isopropanol		--	--	--			2.00E-01	P	
7439-97-6	Mercury (elemental)		--	--	--			3.00E-04	I	
126-98-7	Methacrylonitrile		--	--	--			3.00E-02	P	
67-56-1	Methanol		--	--	--			2.00E+01	I	
110-49-6	Methoxyethanol Acetate, 2-		--	--	--			1.00E-03	P	
109-86-4	Methoxyethanol, 2-		--	--	--			2.00E-02	I	
96-33-3	Methyl Acrylate		--	--	--			2.00E-02	P	
78-93-3	Methyl Ethyl Ketone (2-Butanone)		--	--	--			5.00E+00	I	
60-34-4	Methyl Hydrazine		--	--	--	1.00E-03	X	2.00E-05	X	
108-10-1	Methyl Isobutyl Ketone (4-methyl-2-pentanone)		--	--	--			3.00E+00	I	
624-83-9	Methyl Isocyanate		--	--	--			1.00E-03	CA	
80-62-6	Methyl Methacrylate		--	--	--			7.00E-01	I	
25013-15-4	Methyl Styrene (Mixed Isomers)		--	--	--			4.00E-02	H	
1634-04-4	Methyl tert-Butyl Ether (MTBE)		--	--	--	2.60E-07	CA	3.00E+00	I	
75-09-2	Methylene Chloride		--	--	--	1.00E-08	I	6.00E-01	I	Mut
2385-85-5	Mirex		--	--	--	5.10E-03	CA			
64742-95-6	Naphtha, High Flash Aromatic (HFAN)		--	--	--			1.00E-01	P	
91-20-3	Naphthalene		--	--	--	3.40E-05	CA	3.00E-03	I	
13463-39-3	Nickel Carbonyl		--	--	--	2.60E-04	CA	1.40E-05	CA	
98-95-3	Nitrobenzene		--	--	--	4.00E-05	I	9.00E-03	I	
75-52-5	Nitromethane		--	--	--	8.80E-06	P	5.00E-03	P	
79-46-9	Nitropropane, 2-		--	--	--	2.70E-03	H	2.00E-02	I	
62-75-9	Nitrosodimethylamine, N-		--	--	--	1.40E-02	I	4.00E-05	X	Mut
924-16-3	Nitroso-di-N-butylamine, N-		--	--	--	1.60E-03	I			
10595-95-6	Nitrosomethylethylamine, N-		--	--	--	6.30E-03	CA			
111-84-2	Nonane, n-		--	--	--			2.00E-02	P	
32598-14-4	Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105)		--	--	--	1.10E-03	E	1.30E-03	E	
74472-37-0	Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114)		--	--	--	1.10E-03	E	1.30E-03	E	
31508-00-6	Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118)		--	--	--	1.10E-03	E	1.30E-03	E	
65510-44-3	Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123)		--	--	--	1.10E-03	E	1.30E-03	E	
57465-28-8	Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126)		--	--	--	3.80E+00	E	4.00E-07	E	
109-66-0	Pentane, n-		--	--	--			1.00E+00	P	
75-44-5	Phosgene		--	--	--			3.00E-04	I	
7803-51-2	Phosphine		--	--	--			3.00E-04	I	
123-38-6	Propionaldehyde		--	--	--			8.00E-03	I	
103-65-1	Propyl benzene	3.9E+01	1.17E+00	No IUR	2.7E-04			1.00E+00	X	
115-07-1	Propylene		--	--	--			3.00E+00	CA	
107-98-2	Propylene Glycol Monomethyl Ether		--	--	--			2.00E+00	I	
75-56-9	Propylene Oxide		--	--	--	3.70E-06	I	3.00E-02	I	
100-42-5	Styrene	2.5E+01	7.50E-01	No IUR	1.7E-04			1.00E+00	I	
7446-11-9	Sulfur Trioxide		--	--	--			1.00E-03	CA	
1746-01-6	TCDD, 2,3,7,8-		--	--	--	3.80E+01	CA	4.00E-08	CA	
70362-50-4	Tetrachlorobiphenyl, 3,4,4',5- (PCB 81)		--	--	--	1.10E-02	E	1.30E-04	E	
630-20-6	Tetrachloroethane, 1,1,1,2-		--	--	--	7.40E-06	I			
79-34-5	Tetrachloroethane, 1,1,2,2-		--	--	--	5.80E-05	CA			
127-18-4	Tetrachloroethylene		--	--	--	2.60E-07	I	4.00E-02	I	
811-97-2	Tetrafluoroethane, 1,1,1,2-		--	--	--			8.00E+01	I	
109-99-9	Tetrahydrofuran		--	--	--			2.00E+00	I	
7550-45-0	Titanium Tetrachloride		--	--	--			1.00E-04	A	
108-88-3	Toluene	4.8E+02	1.44E+01	No IUR	6.6E-04			5.00E+00	I	
76-13-1	Trichloro-1,2,2-trifluoroethane, 1,1,2-		--	--	--			3.00E+01	H	
120-82-1	Trichlorobenzene, 1,2,4-		--	--	--			2.00E-03	P	
71-55-6	Trichloroethane, 1,1,1-		--	--	--			5.00E+00	I	
79-00-5	Trichloroethane, 1,1,2-		--	--	--	1.60E-05	I	2.00E-04	X	
79-01-6	Trichloroethylene	2.4E+01	7.20E-01	2.4E-07	8.2E-02	see note	I	2.00E-03	I	TCE
96-18-4	Trichloropropane, 1,2,3-		--	--	--			3.00E-04	I	Mut
96-19-5	Trichloropropene, 1,2,3-		--	--	--			3.00E-04	P	

OSWER VAPOR INTRUSION ASSESSMENT

Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.45, November 2015 RSLs

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Commercial	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR_SG	1.00E-06	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ_SG	1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)

CAS	Chemical Name	Site Sub-slab or Exterior Soil Gas Concentration Csg (ug/m^3)	Calculated Indoor Air Concentration Cia (ug/m^3)	VI Carcinogenic Risk CR	VI Hazard HQ	Inhalation Unit Risk IUR (ug/m^3)$^{-1}$	IUR Source*	Reference Concentration RfC (mg/m^3)	RFC Source*	Mutagenic Indicator i
121-44-8	Triethylamine		--	--	--			7.00E-03	I	
420-46-2	Trifluoroethane, 1,1,1-		--	--	--			2.00E+01	P	
526-73-8	Trimethylbenzene, 1,2,3-		--	--	--			5.00E-03	P	
95-63-6	Trimethylbenzene, 1,2,4-	5.7E+01	1.71E+00	No IUR	5.6E-02			7.00E-03	P	
126-72-7	Tris(2,3-dibromopropyl)phosphate		--	--	--	6.60E-04	CA			
108-05-4	Vinyl Acetate		--	--	--			2.00E-01	I	
593-60-2	Vinyl Bromide		--	--	--	3.20E-05	H	3.00E-03	I	
75-01-4	Vinyl Chloride		--	--	--	4.40E-06	I	1.00E-01	I	VC
108-38-3	Xylene, m-	2.2E+02	6.60E+00	No IUR	1.5E-02			1.00E-01	S	
95-47-6	Xylene, o-	1.8E+02	5.40E+00	No IUR	1.2E-02			1.00E-01	S	
106-42-3	Xylene, P-		--	--	--			1.00E-01	S	
1330-20-7	Xylenes		--	--	--			1.00E-01	I	

Notes:

(1) **Inhalation Pathway Exposure Parameters (RME):**

Exposure Scenario	Units	Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario) Symbol	Selected (based on scenario) Value
Averaging time for carcinogens	(yrs)	ATc_R_SG	70	ATc_C_SG	70	ATc_SG	70
Averaging time for non-carcinogens	(yrs)	ATnc_R_SG	26	ATnc_C_SG	25	ATnc_SG	25
Exposure duration	(yrs)	ED_R_SG	26	ED_C_SG	25	ED_SG	25
Exposure frequency	(days/yr)	EF_R_SG	350	EF_C_SG	250	EF_SG	250
Exposure time	(hr/day)	ET_R_SG	24	ET_C_SG	8	ET_SG	8

(2) **Generic Attenuation Factors:**

Source Medium of Vapors	Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario) Symbol	Selected (based on scenario) Value
Groundwater (-)	AFgw_R_SG	0.001	AFgw_C_SG	0.001	AFgw_SG	0.001
Sub-Slab and Exterior Soil Gas (-)	AFss_R_SG	0.03	AFss_C_SG	0.03	AFss_SG	0.03

(3) **Formulas**

Cia, target = MIN(Cia,c; Cia,nc)

Cia,c (ug/m3) = TCR x ATc x (365 days/yr) x (24 hrs/day) / (ED x EF x ET x IUR)

Cia,nc (ug/m3) = THQ x ATnc x (365 days/yr) x (24 hrs/day) x RfC x (1000 ug/mg) / (ED x EF x ET)

(4) **Special Case Chemicals**

Trichloroethylene	Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario) Symbol	Selected (based on scenario) Value
	mIURTCE_R_SG	1.00E-06	mIURTCE_C_SG	0.00E+00	mIURTCE_SG	0.00E+00
	IURTCE_R_SG	3.10E-06	IURTCE_C_SG	4.10E-06	IURTCE_SG	4.10E-06

Mutagenic Chemicals — The exposure durations and age-dependent adjustment factors for mutagenic-mode-of-action are listed in the table below:

Note: This section applies to trichloroethylene and other mutagenic chemicals, but not to vinyl chloride.

Age Cohort	Exposure Duration	Age-dependent adjustment factor
0 - 2 years	2	10
2 - 6 years	4	3
6 - 16 years	10	3
16 - 26 years	10	1

Mutagenic-mode-of-action (MMOA) adjustment factor 25 This factor is used in the equations for mutagenic chemicals.

Vinyl Chloride — See the Navigation Guide equation for Cia,c for vinyl chloride.

Notation:

I = IRIS: EPA Integrated Risk Information System (IRIS). Available online at http://www.epa.gov/iris/subst/index.html

OSWER VAPOR INTRUSION ASSESSMENT

Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.45, November 2015 RSLs

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Commercial	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR_SG	1.00E-06	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ_SG	1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)

CAS	Chemical Name	Site Sub-slab or Exterior Soil Gas Concentration	Calculated Indoor Air Concentration	VI Carcinogenic Risk	VI Hazard	Inhalation Unit Risk	IUR Source*	Reference Concentration	RFC Source*	Mutagenic Indicator
		Csg	Cia	CR	HQ	IUR		RfC		
		(ug/m^3)	(ug/m^3)			(ug/m^3)$^{-1}$		(mg/m^3)		i

P = PPRTV. EPA Provisional Peer Reviewed Toxicity Values (PPRTVs). Available online at http://hhpprtv.ornl.gov/pprtv.shtml

A = Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs). Available online at: http://www.atsdr.cdc.gov/mrls/index.html

CA = California Environmental Protection Agency/Office of Environmental Health Hazard Assessment assessments. Available online at: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp

H = HEAST. EPA Superfund Health Effects Assessment Summary Tables (HEAST) database. Available online at: http://epa-heast.ornl.gov/heast.shtml

S = See RSL User Guide, Section 5

X = PPRTV Appendix

Mut = Chemical acts according to the mutagenic-mode-of-action, special exposure parameters apply (see footnote (4) above).

VC = Special exposure equation for vinyl chloride applies (see Navigation Guide for equation).

TCE = Special mutagenic and non-mutagenic IURs for trichloroethylene apply (see footnote (4) above).

Yellow highlighting indicates site-specific parameters that may be edited by the user

Blue highlighting indicates exposure factors that are based on Risk Assessment Guidance for Superfund (RAGS) or EPA vapor intrusion guidance, which generally should not be changed.

Pink highlighting indicates VI carcinogenic risk greater than the target risk for carcinogens (TCR) or VI Hazard greater than or equal to the target hazard quotient for non-carcinogens (THQ).