Report No. 51207

Report:

Clean Harbors Environmental Services Inc.
Lambton Facility
Ambient Air Monitoring 2022

Date: January 09, 2023



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Revision History

Version	Date	Summary Changes/Purpose of Revision
0	January-09-2023	Draft to client for review.
1	February 9, 2023	Revision to section 4.3.1 text to include nickel; insertion of clearer figure 1

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1. INTRODUCTION

Clean Harbors Environmental Services Inc. (Clean Harbors) has been conducting an annual ambient air fenceline monitoring program spanning more than twenty (20) years at its Lambton Facility (the Facility) near Corunna, Ontario. The objective of the program is to ensure that potential contaminant releases from the Facility's ongoing operations are within accepted regulatory and guideline limits. The monitoring program includes a series of measurements for a number of speciated vapor and particulate constituents in accordance with the monitoring plan prepared by ORTECH in 2015 (the 2015 Plan) [1]. A copy of the 2015 monitoring plan is attached to this report in APPENDIX A for reference.

This report provides a brief overview of monitoring activities and presents the results of the 2022 monitoring program and follows the requirements of an annual report for non-continuous monitoring in accordance with the Operations Manual for Air Quality Monitoring in Ontario (the Manual)[2].

2. MAP SHOWING THE LOCATION OF EMITTING SOURCES, PROPERTY BOUNDARIES, MAJOR STRUCTURES AND MONITORING STATIONS

The required map is provided in Figure 1.

As the south site is located some distance away a second figure, Figure 2 is provided to show the location of the monitoring stations in relation to the site.

Finally, Figure 3 shows the location of the Moore Line monitoring station, run by the Bluewater Association for Safety, Environment, and Sustainability (BASES); formerly the Sarnia Lambton Environmental Association (SLEA), which provides the meteorological data for the monitoring program.

The North Site is situated on the Facility's north berm.

The South Site is situated on a third-party host's property. Due to restrictions about equipment placement required by the host, the monitors are required to be set-up in close proximity to an on-site building and agricultural field. This means that the setback distances required by the Manual were not able to be achieved.

Photos of the monitoring locations during the 2022 monitoring program are provided in Table 1 and Table 2 for the North and South sites, respectively. The monitoring locations were consistent with the 2015 Plan and the same as in previous years' monitoring done under the same plan.

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Figure 1 – Site Plan

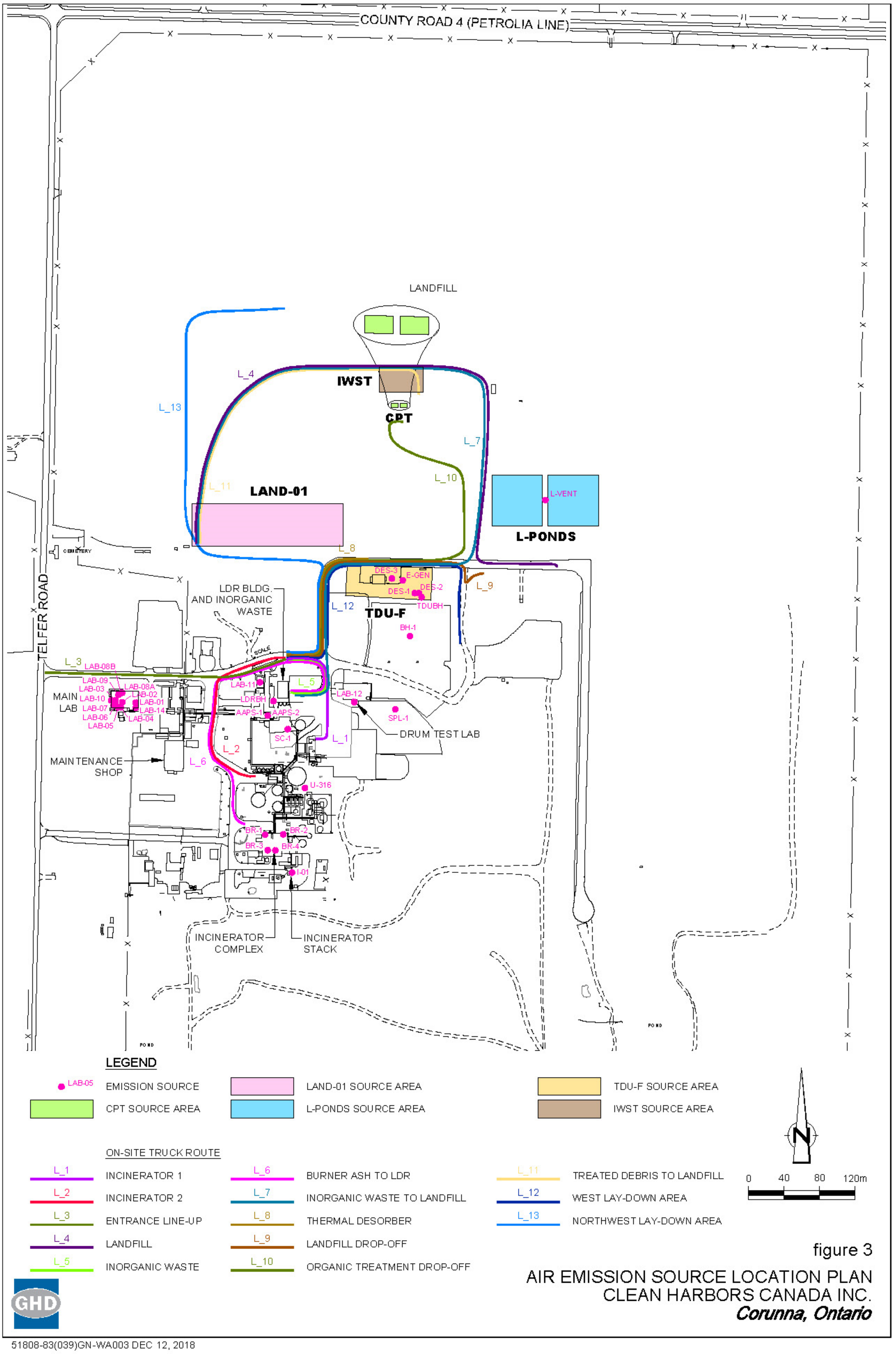


Figure 2 - Monitoring Locations

Figure 3 - Location of Moore Line Monitoring Station

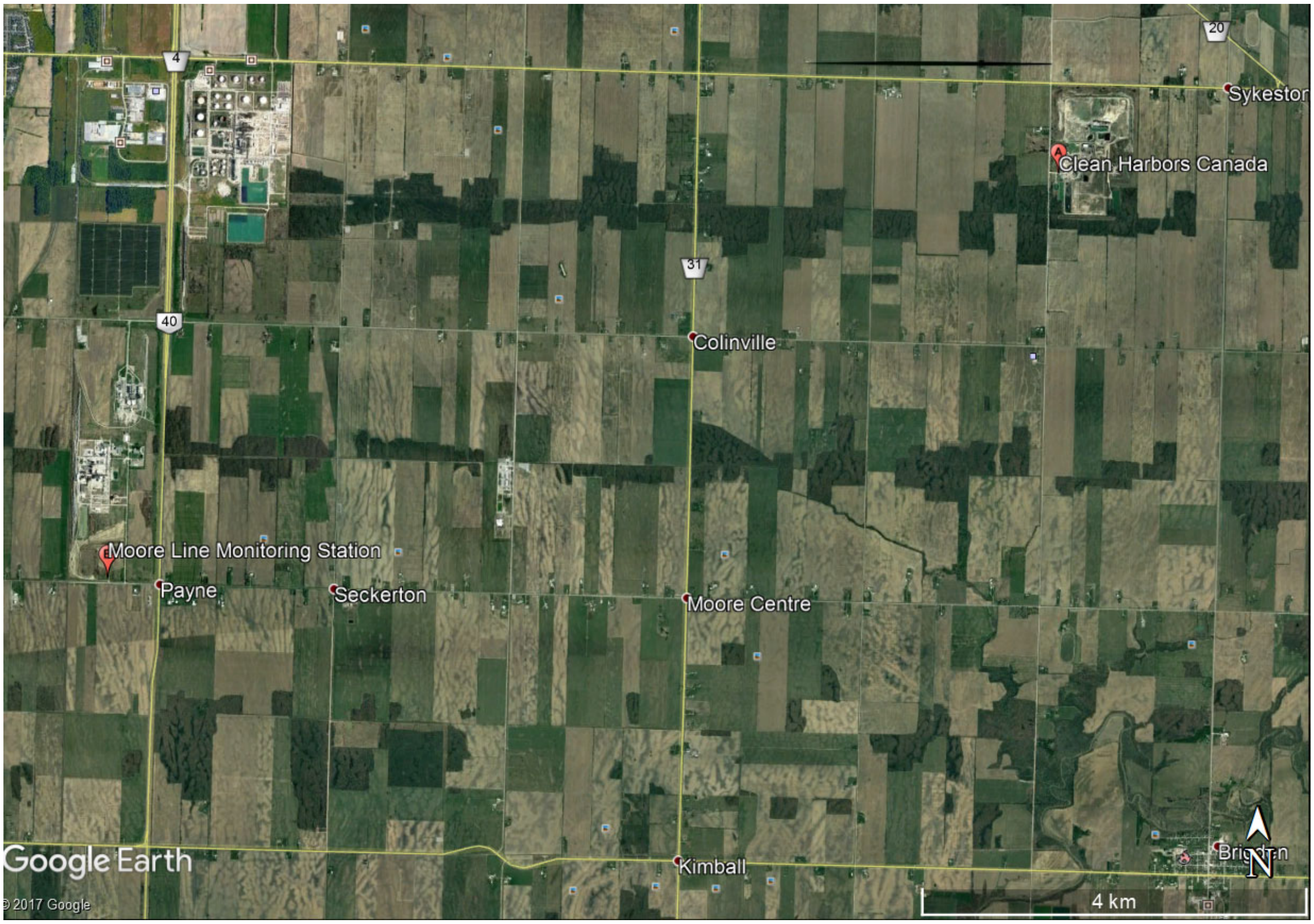


Table 1 – Photos of North Monitoring Site (Taken May 2022)

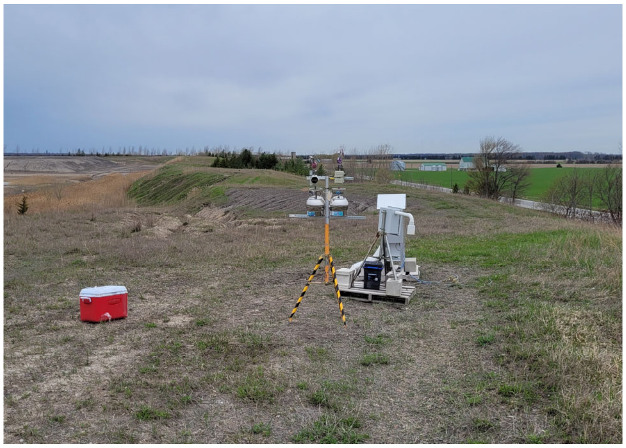
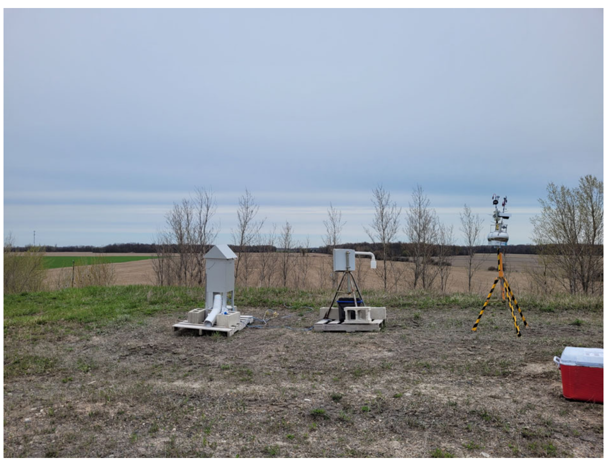
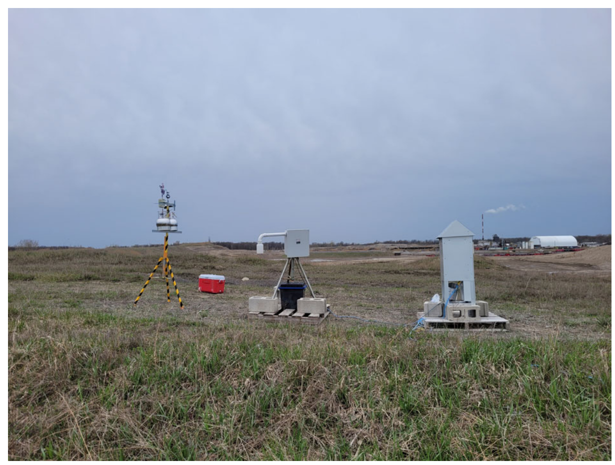
From East Looking West	From West Looking East
	
From South Looking North	**From North Looking South**
	

Table 2 – Photos of South Monitoring Site (Taken May 2022)

From East Looking West	From West Looking East
	
From South Looking North	**From North Looking South**
	

3. SUMMARY OF OVERALL OPERATIONS

This section summarizes overall monitoring operations for the 2022 monitoring program including a summary of parameters monitored, laboratory service providers, equipment and model information, sampling dates, calibrations, and a summary of issues and remedial actions.

Copies of all field records taken during the program are included electronically in APPENDIX D.

3.1 Summary of Parameters Monitored

The parameters monitored were consistent with the 2015 plan with the exception that contaminants proposed for removal therein were still included in the program.

The list of the compounds, by type (VOC, particulates and metals, and carbonyls) included in the 2022 monitoring program are found in Table 3, Table 4, and Table 5, respectively. A summary of the methods used for the monitoring is provided in Table 6.

Table 3 - Volatile Organic Compounds (VOCs)

Compound	CAS No.	Compound	CAS No.
Carbon Tetrachloride	56-23-5	Ethyl Benzene	100-41-4
Isopropyl Alcohol	67-63-0	Styrene	100-42-5
Acetone	67-64-1	1,4-Dichlorobenzene	106-46-7
Chloroform	67-66-3	1,2-Dibromoethane	106-93-4
Benzene	71-43-2	1,2-Dichloroethane	107-06-2
1,1,1-Trichloroethane	71-55-6	2-Propenenitrile	107-13-1
Vinyl Chloride	75-01-4	2-Methyl Pentane	107-83-5
Dichloromethane	75-09-2	MIBK	108-10-1
1,1-Dichloroethane	75-34-3	m/p-Xylene	108-38-3/106-42-3
1,1-Dichloroethene	75-35-4	1,3,5-Trimethylbenzene	108-67-8
Chlorodifluoromethane	75-45-6	Toluene	108-88-3
Trichlorofluoromethane	75-69-4	Chlorobenzene	108-90-7
Dichlorodifluoromethane	75-71-8	Hexane	110-54-3
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	Cyclohexane	110-82-7
2-Methyl Butane	78-78-4	Nonane	111-84-2
1,2-Dichloropropane	78-87-5	1,2,4-Trichlorobenzene	120-82-1
MEK	78-93-3	Tetrachloroethene	127-18-4
Trichloroethene	79-01-6	Ethyl Acetate	141-78-6
Naphthalene	91-20-3	Heptane	142-82-5
o-Xylene	95-47-6	1,2-Dichloroethene (Cis)	156-59-2
1,2-Dichlorobenzene	95-50-1	1,2-Dichloroethene (Trans)	156-60-5
1,2,4-Trimethylbenzene	95-63-6	1,2,3-Trimethylbenzene	526-73-8
3-Methyl Pentane	96-14-0	3-Methyl Hexane	589-34-4
p-Cymene	99-87-6	o-Ethyl Toluene	611-14-3

Table 4 - Total Suspended Particulate (TSP) and Metals

Parameter	CAS No.
Total Suspended Particulate (TSP)	Not available
Lead	7439-92-1
Manganese	7439-96-5
Nickel	7440-02-0
Thallium	7440-28-0
Tin	7440-31-5
Antimony	7440-36-0
Arsenic	7440-38-2
Barium	7440-39-3
Beryllium	7440-41-4
Cadmium	7440-43-9
Chromium	7440-47-3
Cobalt	7440-48-4
Copper	7440-50-8
Vanadium	7440-62-2
Zinc	7440-66-6
Selenium	7782-49-2
Iron	15438-31-0
Particulate and Vapor Mercury	Not available

Table 5 - Carbonyls

Parameter	CAS No.
Formaldehyde	50-00-0
Acetone	67-64-1
Acetaldehyde	75-07-0
Benzaldehyde	100-52-7
Acrolein	107-02-08
Glutaraldehyde	111-30-8
Propionaldehyde (Propanal)	123-38-6
n-Butyraldehyde (n-Butanal)	123-72-3

Table 6 – Summary of Analytical Methods Used in Monitoring

Parameter	Sample Media	Analytical Method	Standard Method
VOC	6L evacuated canisters	GC/MSD	US EPA TO-15a
TSP	Quartz filters	Gravimetric	US EPA IO2-1
Metals and Particulate Mercury	Quartz filters	ICP MS	US EPA 6010B
		CVAA	US EPA 7471A
Carbonyls	Lp DNHP cartridge	HPLC	US EPA TO-11a and IP-6A
Mercury Vapour	Carulite tubes	Acid Extraction CVAA	US EPA 7470 and OSHA ID-140

3.2 Laboratory Service Providers

ALS Environmental – Waterloo Laboratory (ALS) was the selected analytical laboratory for VOC analysis. ALS is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for TO-15 VOC analysis.

Bureau Veritas Laboratories (BV Labs) was the selected analytical laboratory for TSP & metals, mercury, and carbonyl analysis. BV Labs is accredited by the Standards Control Council of Canada (SCC) for analysis gravimetric analysis of particulates, ICP analysis of metals, and analysis of mercury by CVAAS. BV Labs is accredited by the US National Environmental Laboratory Accreditation program (NELAP) through the Louisiana Environmental Lab Accreditation Program (LELAP) for analysis of carbonyls.

3.3 Equipment and Model Information

Information for the sampling equipment for VOCs, TSP & metals, and carbonyls is provided in the following sections.

3.3.1 Equipment for VOC Monitoring

VOCs are monitored using a 6L evacuated canister and pre-calibrated flow controller provided by the accredited laboratory for method TO-15 sampling. The canister and flow controller were cleaned by the lab. The flow controller provided is typically an ENTECH CS1200 mechanical flow controller.

The 24-hour sample is taken using a timed solenoid valve. Three models of timed valves were used in the 2022 program:

- ENTECH TM1200 Sample Timer
- NUTECH 2701 Sample Timer
- Enclosed Timer & Valve unit assembled by ORTECH

Timed valves enable unmanned opening of the can for midnight-to-midnight sampling. Due to problems encountered with valve reliability in the 2021 program, ORTECH planned to deployed 2 sampling timers and canisters at each site per event so that a back-up sample would be taken in the event of an equipment malfunction. In practice ORTECH was not able to obtain enough cans to deploy a back-up at each site for each event, some events were sampled with a single can only.

3.3.2 Equipment for TSP & Metals Monitoring

TSP & metals (including particulate mercury) are monitored using hi-volume (hi-vol) samplers. The samplers used for the 2022 were Tisch Environmental model TE-5170 MFC; which is a mass-flow controlled unit. The TE-5170s were equipped with chart recorders, and flow was verified on site each visit by taking an initial chart reading. An electrical split outlet was applied to the TE-5170 timers to allow Mercury and Carbonyl sampling equipment to be controlled by the hi-vol timers.

Particulates are sampled on quartz filters provided by the analytical laboratory.

3.3.3 Equipment for Mercury and Carbonyl Monitoring

Mercury and carbonyls are sampled using the same apparatus, which consists of a pump with two inlets, an adjustable rotameter to control the flow through each inlet, associated pluming and a weatherproof enclosure.

Sample cartridges are attached directly to the inlet using a piece of rubber tubing as a connector. In this way, ambient air is drawn directly into the sampler without any upstream plumbing. As the sampler is not intended to be run in cold weather and does not have upstream piping that could experience condensation, apparatus does not include an inlet heater.

The sampling apparatus does not include a timer. A timed sample is taken by leaving the sampler in the 'ON' position and connecting it to the split outlet connected to the hi-vol sampler timer (i.e. the mercury and carbonyl sampler shares the hi-volume sampler's timer).

Mercury samples are collected on SKC 226-17-1A sorbent tubes provided by the analytical lab.

Carbonyl samples are collected on Sep-Pak DNPH-Silica sorbent cartridges provide by the analytical lab. A new Sep-Pak WAT054420 ozone scrubber was also used upstream of each carbonyl cartridge for each sampling event.

3.4 Sampling Frequency and Schedule

A series of concurrent 24-hour (midnight to midnight – eastern standard time) samples were taken at two (2) monitoring locations based on the twelve-day National Air Pollutant Surveillance (NAPS) cycle. The number of samples collected varied by the type of compound as shown in Table 7. In accordance with the 2015 monitoring plan, twelve (12) VOC, TSP & metals samples were scheduled, as well as three (3) sets of mercury and carbonyl samples.

Table 7 – Planned Measurement Frequencies

Constituent	Frequency and Schedule
VOCs/TSP/Metals	12 sample days on the 12 day NAPS cycle beginning May 5, 2022.
Carbonyls and Mercury	Three sample days distributed over the period of May to September. Taken on a day when VOCs/TSP/Metal samples were collected

Table 8 – Actual Sampling Dates and Groups Sampled during Monitoring Program

Sampling Date	VOC	Particulate and Metals	Carbonyls and Mercury	NOTES
May 5, 2022	✓	✓	-	
May 17, 2022	✓	✓	-	
May 29, 2022	✓	✓	-	
June 10, 2022	✓	✓ (North Blank)	✓ (North Blank - lost)	Blank carbonyl sampler was lost.
June 22, 2022	✓	✓	-	
July 4, 2022	✓	✓ (South Blank)	✓ (South Blank)	
July 16, 2022	✓	✓	-	
July 28, 2022	✓	✓	-	
August 9, 2022	✓	✓ (North Blank)	Discarded	Upon collecting samples, it was noted the South carbonyl cartridge had problems with its installation. Carbonyl samplers were discarded, and the set was rerun on August 21.
August 21, 2022	✓	✓	✓ (North Blank)	
September 2, 2022	✓	✓	-	
September 14, 2022	✓	✓	-	

The monitoring plan contains detailed information on the sample collection methodology used for the program. During the 2022 monitoring program, the following deviations from the monitoring plan were made:

- The 2022 monitoring program included the full historical list of VOCs and Carbonyls rather than the plan's proposed list which would have removed of several VOCs and Carbonyls from the program.
- The analytical laboratory did not report isopropyl alcohol due to suspected interference from isopropyl alcohol used as a disinfectant resulting in false positives. Refer to e-mail from the lab included in APPENDIX C.
- Results for TSP, metals and particulate mercury, carbonyl, and mercury basis are provided as total mass. These results are converted to concentrations using sample volumes calculated from field instrument records.
- Due to multiple reliability issues in 2021, ORTECH setup VOC samples in duplicate for 2022, ensuring that a sample would still be taken if one of the timers did not function properly.

3.5 Calibrations

Flow controllers for VOC sampling are provided pre-calibrated by the analytical laboratory.

ORTECH's Hi-vol samplers were calibrated prior to the start of the sampling program using an NIST traceable calibration orifice rented from a third party, using a flow audit spreadsheet provided by that third party. The audit confirmed that the mass flow controller settings approximately equated to 40 CFM. Flow was assumed to be 40 CFM based on the chart recorder readings, until calibrations were repeated on August 10th.

Only July 16th the field technician had to adjust the mass flow controller at the South site to keep the reading at around 40 CFM on the chart recorder. As a result of this adjustment, ORTECH recalibrated both the North and South sites on August 10th. The delay was due to the need to rent a NIST traceable orifice from a third-party. The August calibrations used the manufacturer's recommended calibration spreadsheet to determine a chart recorder reading vs. flow correlation. This correlation was used to calculate all subsequent flow rates for the hi-vols.

Carbonyl and mercury sampler rotameters were calibrated using an NIST traceable drycal flow meter. The North site carbonyl rotameter was replaced on July 12th and calibrated on August 10th using an NIST traceable drycal flow meter.

Sample volumes for the mercury and carbonyl samples were calculated using the calibration curve and the rotameter reading taken in the field.

3.6 Summary of Issues and Remedial Actions

Chart recorder flow reading drift was noted at the South Site hi-vol on July 16th. The mass flow controller was adjusted and a subsequent recalibration occurred on August 10th.

The North site and South site both experienced issues with rotameter balls sticking in the mercury / carbonyl samplers. The south site mercury rotameter was able to be cleaned to restore function. The North site carbonyl rotameter was replaced on July 12th and calibrated on August 20th.

The South carbonyl blank sample cartridge taken on June 10th was misplaced by the technician, so this sample was lost. Sample handling, storage, and shipping procedures were reviewed with the staff member in question.

The South site carbonyl sample cartridge and ozone scrubber for August 9th were deployed in an inverted orientation such that the ozone scrubber would not be effective. This sample set (both North and South) were not sent for analysis and instead carbonyl sampling was repeated on August 21st. Carbonyl sampling procedures were reviewed with the staff member in question.

0 in Hg VOC can readings were recorded after some events and may have been a result of slow leaks in canister timers not caught during field leak checks. ORTECH replaced and retightened timer to attempt to resolve the issue.

3.7 Summary of Audits and Audit Outcomes

The 2022 program was not audited by the MECP.

4. INTERPRETATION OF RESULTS

4.1 Meteorological Data

Localized wind speed, direction and rainfall data were obtained from the Bluewater Association for Safety, Environment, and Sustainability (BASES); formerly the Sarnia Lambton Environmental Association (SLEA), Moore Line monitoring and meteorological station located near the corner of Moore Line and Highway 40. These data were used to document the weather conditions during each sampling period and confirm the extent of downwind site positioning/source alignment.

The location of the Moore Line monitoring station with respect to the Facility is shown in Figure 3.

The 24-hour average meteorological conditions that occurred during the selected monitoring days are summarized in Table 9 and Figure 4. Specific information for each hour of each monitoring day is provided electronically in APPENDIX D.

The desired wind direction is for the wind to be blowing from the southwest to southeast quadrant, which results in the monitoring instruments aligning upwind and downwind of operations. For the 2022 monitoring program, there were four days where this wind direction occurred for a significant (12 or more) number of hours:

- May 29 .... 21hours
- July 4 .... 19 hours
- July 16 .... 18 hours
- September 2........ 24 hours

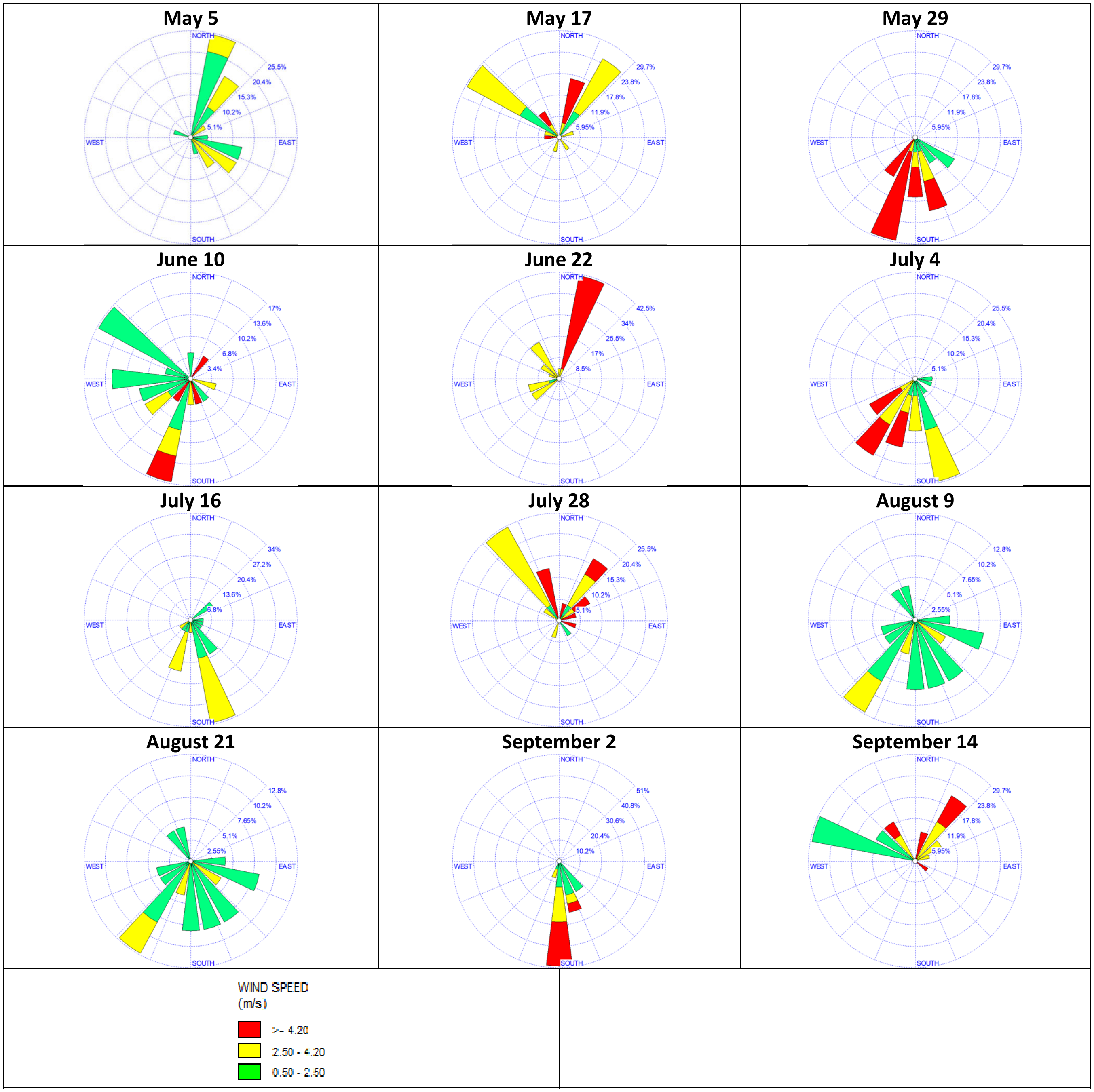
Daily mean temperatures ranged from 10 to 25°C and daily average wind speeds ranged from 6 to 15 kph. Rainfall was measured on two sampling days. Wind roses for the specific monitoring days (i.e., 24-hour frequencies) are shown in Figure 4.

Table 9 - Summary of 24-Hour Meteorological Data for Individual Monitoring Days

Sample Date	Prevailing Wind Direction	Average Wind Speed (km/h)	Relative Humidity (%)	Average Temperature (°C)	Pressure (mbar)	Total Rainfall (mm)	SE-SW Quadrant (Hours)
May 05	ENE	8.5	77	10.19	1019	0	3
May 17	NNW	12.2	73	11.35	1014	0	2
May 29	S	15.1	76	20.44	1015	0	21
June 10	WSW	9	74	17.44	1011	2	8
June 22	NW	15	63	25.24	1013	0	0
July 04	S	11	60	24.63	1018	0	19
July 16	SSE	8	72	22.80	1016	0	18
July 28	W	14.2	67	24.19	1009	0	1
August 09	N	12	84	19.13	1017	0	2
August 21	S	5.6	95	20.67	1014	7	10
September 02	S	10	77	22.13	1018	0	24
September 14	NW	11	84	18.58	1017	0	0

Notes: Ranges based on hourly averaged data of the nearby BASES Moore Line (10 m) meteorological station over the 24-hour intervals which coincided with the individual sample periods Prevailing wind direction is the closest direction to the resultant wind vector for the day as computed by WRPLOT View software. *"The resultant vector is the dominant direction or mean direction of the vectors. This is calculated by computing the vector resultant or vector sum of the unit vectors that represent the various directions in the data. The magnitude of the resultant vector represents the mean resultant vector length." Wind speed is an arithmetic average.*

Figure 4 – Wind Roses for Sampling Periods (24-hrs, midnight to midnight)



4.2 Data Validation and Editing

This section discusses the validity of the samples taken with respect to the criteria in sections 2.4.2 and Table 7 of the Manual.

The complete annual program in accordance with the monitoring plan on the 12-day NAPS cycle results in twelve (12) samples per year for VOCs, TSP, and metals, and three (3) mercury and carbonyl samples per year, generally between May and September. This number of samples is not sufficient to provide a valid annual average in accordance with the requirements of the Manual. Averages presented in this report should be interpreted as averages for the monitoring period rather than the whole year.

A comparison of the total number of samples required by the plan and the number of valid samples taken in 2022 is provided as Table 10. As shown, 100% data validity was maintained.

Table 10 - Planned Samples and Valid Samples

Compound Group	Number of Samples Per Plan Schedule	2022 Program Actual Number of Valid Samples	%Valid
VOCs	12 North 12 South	12 North 12 South	100
TSP and Metals	12 North 12 South	12 North 12 South	100
Mercury	3 North 3 South	3 North 3 South	100
Carbonyls	3 North 3 South	3 South 3 South	100

Specific data validation and editing considerations are provided in Table 11, Table 12, and Table 13.

Table 11 - Data Editing and Validation for TSP, Metals, and Mercury using Hi-Vol Samplers

Criteria	Requirements	Comments	Edit Actions / Data Invalidated
Station Siting	Continues to meet requirements of the Manual	South site does not meet setback requirements due to restrictions imposed by property owner. This has been consistent for the past several monitoring years.	None.
24-hour sample duration	Between 21.6 – 26.4 Hours	All samples met this criterion.	None.
24-hour sample volume	Between 1468 m^3 – 1794 m^3 10% tolerance around design flow of 1631m^3	All samples met this criterion.	None.
Other	E.g. torn filters, observations on site that may impact data validity, data outliers	Sample NTSP-02 had some material from the filter noted as sticking to the hi-vol gasket upon collection.	Results for NTSP-02 is likely to be underestimated; however it was decided not to invalidate the result as it was not anomalous.

Table 12 - Data Validation and Editing for VOCs by Evacuated Canister

Criteria	Requirements	Comments	Edit Actions / Data Invalidated
Vacuum Pressures	Initial pressure -29 in Hg +/- 3 in Hg. Final pressure between -5 and -10 in Hg.	Some cans were collected with pressures out of the accepted range as follows: SVOC-01 May 5: 0 in Hg NVOC-04 June 10: 0 in Hg SVOC-04 June 10: -17 in Hg NVOC-05 June 22: 0 in Hg SVOC-07 July 16: -4 in Hg SVOC-11 September 2: 0 in Hg SVOC-12 September 14: 0 in Hg	None. Readings of 0 are potentially the result of a leaking canister timer. These results may have stopped sampling or experienced reduced flow before a full 24-hours had elapsed. It was decided to leave these results in the data set as they were not anomalous.
Other	E.g. observations on site that may impact data validity, data outliers, issues with flow controllers or timers	Strong gasoline odour was noted at the south site during SVOC-01 deployment.	SVOC-01 was noted to have higher concentrations for a number of hydrocarbons which could possibly be attributed to the odour observed on site; however, the results were conservatively considered to be valid.

Table 13 - Mercury and Carbonyls By Active Sampling

Criteria	Requirements	Comments	Edit Actions / Data Invalidated
24-hour sample volume	Total volume within +/- 10% of design volumes of 1.44 m^3 for carbonyls and 0.1 m^3 for mercury.	All samples met this criterion.	None.
Other	E.g. observations on site that may impact data validity, data outliers, issues with equipment	For all carbonyl samples lab noted that dilution was needed for formaldehyde and acetaldehyde due to background interference resulting in higher detection limits. Lab noted that samples NC-06 and SC-06 were received late and ice packs included during shipping had melted.	None.

4.3 Assessment of Field Blanks

This section discusses the assessment of field blanks.

4.3.1 TSP & Metals

Field blank results for TSP & metals are provided in Table 14.

Field blanks for particulate were all below detection limits. For sample NBTSP-04 the lab noted that a negative result was observed.

Of the metals, Barium, Chromium, Iron, Manganese, Nickel and Zinc were present in some or all of the field blanks; however, blank results for these compounds were still below the maximums observed in actual samples.

No samples were invalidated as a result of field blank results for TSP & Metals.

Table 14 - TSP & Metals Field Blank Results

	ID	NBTSP-04	SBTSP-06	NBTSP-09
	DATE	2022-06-10	2022-07-04	2022-08-09
Compound	Units			
Particulate	mg	<5.0 (1)	<5.0	<5.0
Particulate Mercury	ug	<0.02	<0.02	<0.02
Antimony (Sb)	ug	<0.45	<0.45	<0.45
Arsenic (As)	ug	<0.45	<0.45	<0.45
Barium (Ba)	ug	3.5	4.4	1.6
Beryllium (Be)	ug	<0.27	<0.27	<0.27
Cadmium (Cd)	ug	<0.090	<0.090	<0.090
Chromium (Cr)	ug	2.4	1.7	1.3
Cobalt (Co)	ug	<0.27	<0.27	<0.27
Copper (Cu)	ug	1.8	0.28	<0.27
Iron (Fe)	ug	14	11	<11
Lead (Pb)	ug	<0.27	<0.27	<0.27
Manganese (Mn)	ug	<0.45	<0.45	0.77
Nickel (Ni)	ug	<0.45	<0.45	0.68
Selenium (Se)	ug	<0.90	<0.90	<0.90
Thallium (Tl)	ug	<0.090	<0.090	<0.090
Tin (Sn)	ug	<0.27	<0.27	<0.27
Vanadium (V)	ug	<0.27	<0.27	<0.27
Zinc (Zn)	ug	<4.5	5.0	<4.5

Note (1): This result was observed to be negative.

4.3.2 Vapor Mercury

Vapor (acid extractable) mercury field blank results are provided in Table 15.

Vapor (acid extractable) mercury was detected in all field blank mercury samplers. The field blank results close to the hits detected in the actual vapor mercury samples taken, which could indicate that results detected were false positives or resulted from or were increased by an unidentified source of contamination. Regardless, vapor mercury results were conservatively considered valid.

Table 15 - Vapor Mercury Field Blank Results

	ID	NBM-04	SBM-06	NBM-09
	DATE	2022-06-10	2022-07-04	2022-08-09
Compound	Units			
Acid Extractable Mercury (Hg)	ug	0.0041	0.0039	0.0037

4.3.3 Carbonyls

Carbonyl field blank results are provided in Table 16.

The July 4 carbonyl blank was lost before it could be shipped to the lab for analysis, thus there is no blank data for that date.

All other field blanks for carbonyls were below detectable limits.

No carbonyl results were invalidated as a result of field blank results.

Table 16 - Carbonyl Field Blank Results

	ID	NBC_04	SBC-06	NBC-10
	DATE	2022-07-04	2022-07-04	2022-08-21
Compound	Units			
Formaldehyde (Methanal)	µg/Tot.	-	<2	<2
Acetaldehyde (Ethanal)	µg/Tot.	-	<2	<2
Acetone (2-Propanone)	µg/Tot.	-	<2	<2
Acrolein	µg/Tot.	-	<2	<2
Propionaldehyde (Propanal)	µg/Tot.	-	<2	<2
n-Butyraldehyde (n-Butanal)	µg/Tot.	-	<2	<2
Benzaldehyde	µg/Tot.	-	<2	<2
Methyl Ethyl Ketone (2-Butanone)	µg/Tot.	-	<2	<2
Methacrolein (2-methyl-2-propenal)	µg/Tot.	-	<2	<2
Glutaraldehyde	µg/Tot.	-	<2	<2

5. RESULTS AND DISCUSSION

The concurrent north and south twenty-four-hour sampling commenced at 0000 hours on May 5, 2022 and ended on 2400 hours on September 14, 2022. The sampling schedule followed the NAPS schedule. A summary of the sample dates and which compound groups were included on each day is identified in Table 8.

5.1 Summary Statistics

This section provides the summary statistics required by the Manual, with the exception of number of valid results and % valid data which are presented in Section 4.2.

For computing statistics, compounds that were not detected were considered to have a value of half the detection limit. If a detection limit provided by the lab in mass units, it was adjusted by the sample volume to provide an equivalent value in µg/m^3.

Tabulated summaries of the measured results are indicated in the report text with all individual measured values and calculated sample volumes provided in the appendices.

The maximum observed concentrations for target compounds were compared with available 24-hour standards and guidelines on the MECP's Air Contaminants Benchmark List (ACB) [4]. If no standard or guideline was available, the 24-hour Ontario Ambient Air Criteria (AAQC) [5] for that contaminant was used to compare, if available. ACB standards, guideline, or MECP AAQC are collectively referred to in this report as Limits. A summary of the applicable 24-hour limits is presented in Table 17.

5.2 VOCs

Summary statistics for VOCs are presented in Table 18.

All VOCs had a maximum measured concentration less than any applicable 24-hour limits.

2-ethyl toluene was not detected in any samples during the monitoring period, but due to its high method detection limit relative to the 24-hour limit, has the highest reported maximum concentration as a % of the applicable limit at 0.49 µg/m^3 (98% of the 0.5 µg/m^3 limit). Chloroform, 2-propenenitrile, vinyl chloride, 1,2-dibromomethane, and 1,2-dichloroethane were also not detected but had similarly significant reported maximums with respect to the applicable 24-hour limits due to high relative method detection limits.

Benzene was the detected compound observed at the highest percentage of an applicable limit with a maximum concentration of 1.02 $\mu g/m^3$ (44% of the 2.3 $\mu g/m^3$ limit) on September 14th at the North monitor under predominantly WNW to NE winds. Benzene was detected at the South monitor at a concentration of 0.89 $\mu g/m^3$ (39% of the 2.3 $\mu g/m^3$ limit) that day. Benzene was detected in 42% of the samples analyzed.

Aside from benzene, the detected VOC measured at the highest percentage of a 24-hour limit was Naphthalene at a concentration of 3 $\mu g/m^3$ (13.3% of the 24-hour limit of 22.5 $\mu g/m^3$).

Twenty-Seven (27) of the forty-eight (48) VOC compounds had reported maximum concentrations less than 1% of their applicable 24-hour limits at both monitoring sites.

Three (3) compounds did not have an applicable 24-hour limit.

Isopropyl alcohol was not able to be assessed as the lab was unable to report results for this compound.

Sample SVOC-01A was noted to have elevated results for several hydrocarbons. In the field notes for this sample day the technician noted a strong gasoline odour near the sample site. It is possible that these results were impacted by a source other than the Facility. Contaminants with levels higher than the period average on this day included:

- 2-methyl butane
- toluene
- m/p-xylene
- 2-methyl pentane
- Hexane
- 3-methyl pentane
- 3-methyl hexane
- o-xylene
- 1,2,4-trimethyl benzene

Levels of these contaminants on that day were all still less than 2% of any applicable limits.

5.3 Particulate and Metal Component Concentrations

A summary of the measured Total Suspended Particulate (TSP) and associated elemental concentrations is shown in Table 19. Note that for TSP only, the mean is calculated as a geometric mean rather than an arithmetic mean in accordance with the Manual.

TSP concentrations reported at the North monitor were similar to those of the South monitor throughout the 2022 monitoring program. The South monitor had the highest recorded concentrations at 38 µg/m^3 (32% of the 24-hour limit of 120 µg/m^3) which occurred on June 22 and July 4. Those days also had the highest readings for the North monitor which were 37 and 30 µg/m^3, respectively. Winds were from the NNW on the 22nd and from the S on July 4.

As shown in Table 19 and Appendix B, two of the elemental constituents of TSP (thallium, and beryllium) were consistently non-detectable at both monitoring sites. Barium, Copper, Iron, Manganese, and Zinc were consistently detected in the samples. Nickel, Lead, Tin, Chromium, Vanadium, Arsenic, and Selenium were often present in detectable concentrations (67% of samples or higher); while Cadmium, Antimony, and Cobalt were present at detectable concentrations in a few samples (50% or less).

Iron was present at the highest percentage of an applicable limit at a maximum of 0.63 µg/m^3 (10.5% of the 24-hour limit of 4 µg/m^3). Note that the comparison for elemental iron in these data against the standard level of metallic iron was conservative since only a fraction of the measured element could be expected to comprise metallic iron (i.e., particulate iron is likely to exist in other forms such as oxides, salts, silicates, etc.).

Of the remaining detected metals, only Cadmium, Nickel, and Lead were present in concentrations greater than 1% of any applicable limits.

5.4 Carbonyl Concentrations

The measured speciated carbonyl concentrations are summarized in Table 20. Individual daily levels are shown in Appendix B. Formaldehyde was the only carbonyl compound detected during the 2022 monitoring program. Formaldehyde was detected in one sample collected at the South site on July 4th at a concentration of 13.3 µg/m^3 on July 4 under S winds. Formaldehyde was not detected at above reportable limits at the North site on that day. The wind direction at the time would indicate an off-site source.

Additionally, the detection limits for acrolein were higher than the MECP limit for that compound so when reported at ½ MDL for a non-detect exceedances of 1.31 µg/m^3 (328% of the 24-hour limit of 0.4 µg/m3) at the South Site and 1.27 µg/m3 (316% of the 24-hour limit of 0.4 µg/m3) at the North Site. ORTECH recommends further discussion with the MECP to determine if there is a need for a more refined approach to handling non-detects of this compound or if this compound could be excluded from the study as the Clean Harbors had previously indicated that it is not listed as a potential contaminant in the Emissions Summary and Dispersion Modelling (ESDM) report for the Facility.

5.5 Mercury Concentrations

Both particulate and vapour phase mercury components were measured as shown in Table 21, with individual daily results in Appendix B.

Vapour phase mercury detected in all three (3) samples at the North site and all three (3) samples at the South site. Particulate mercury was detected in all three (3) samples at the North site and one (1) sample at the South site.

The “total” mercury value was calculated by adding the particulate mercury captured on the particulate filter and the acid extractable (Vapour phase) mercury captured in the carulite tube for each mercury sample day. A detection limit is not applicable for total mercury as it is an aggregated concentration. Total mercury was considered ‘detected’ if either of the constituent phases was detected.

The combined results at the maximum concentration represented only a small percentage (2.3%) of the total mercury 24-hour limit.

Table 17 - Summary of Available 24-hour Limits for Target Compounds

Compound	CAS NO.	Limit (µg/m³)	Limiting Effect	Reference	Notes
Carbon Tetrachloride	56-23-5	2.4	(health)	Standard	
Isopropyl Alcohol	67-63-0	7,300	(health)	Standard	
Acetone	67-64-1	11,880	(health)	Standard	
Chloroform	67-66-3	1	(health)	Standard	
Benzene	71-43-2	2.3	(health)	AAQC	
1,1,1-Trichloroethane	71-55-6	115,000	(health)	Standard	
Vinyl Chloride	75-01-4	1	(health)	Standard	
Dichloromethane	75-09-2	220	(health)	Standard	
1,1-Dichloroethane	75-34-3	165	(health)	Standard	
1,1-Dichloroethene	75-35-4	10	(health)	Standard	
Chlorodifluoromethane	75-45-6	350,000	(health)	Guideline	
Trichlorofluoromethane	75-69-4	6,000	(health)	Guideline	
Dichlorodifluoromethane	75-71-8	500,000	(health)	Guideline	
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	800,000	(health)	Standard	
2-Methyl Butane	78-78-4	35500	(health)	SL-JSL	
1,2-Dichloropropane	78-87-5	2,400	Odour	Guideline	
MEK	78-93-3	1,000	(health)	Standard	
Trichloroethene	79-01-6	12	(health)	Standard	
Naphthalene	91-20-3	22.5	(health)	Guideline	
o-Xylene	95-47-6	730	(health)	Standard (xylenes)	
1,2-Dichlorobenzene	95-50-1		NA		
1,2,4-Trimethylbenzene	95-63-6	220	(health)	Standard	
3-Methyl Pentane	96-14-0	1750	Health	SL-JSL	
p-Cymene	99-87-6	50	Health	SL-JSL	
Ethyl Benzene	100-41-4	1,000	(health)	AAQC	
Styrene	100-42-5	400	(health)	Standard	
1,4-Dichlorobenzene	106-46-7	95	(health)	Standard	
1,2-Dibromoethane	106-93-4	3	(health)	Guideline	
1,2-Dichloroethane	107-06-2	2	(health)	Standard	
2-Propenenitrile	107-13-1	0.6	(health)	Standard	
2-Methyl Pentane	107-83-5	1750	Health	SL-JSL	
MIBK	108-10-1	1,200	(odour)	Guideline	
m/p-Xylene	108-38-3/106-42-3	730	(health)	Standard (xylenes)	
1,3,5-Trimethylbenzene	108-67-8	220	Health	Standard	
Toluene	108-88-3	2,000	Odour	Guideline	
Chlorobenzene	108-90-7		NA		
Hexane	110-54-3	7,500	(health)	Schd 3	
Cyclohexane	110-82-7	6,100	(health)	Schd 3	
Nonane	111-84-2	5250	Health	SL-JSL	
1,2,4-Trichlorobenzene	120-82-1	400	Health	Guideline	
Tetrachloroethene	127-18-4	360	Health	Standard	
Ethyl Acetate	141-78-6		NA		
Heptane	142-82-5	11,000	Health	Standard	
1,2-Dichloroethene (Cis)	156-59-2	105	Health	Guideline	
1,2-Dichloroethene (Trans)	156-60-5	105	Health	Guideline	
1,2,3-Trimethylbenzene	526-73-8	220	Health	Standard	
3-Methyl Hexane	589-34-4	1535	Health	SL-JSL	
2-Ethyl Toluene	611-14-3	0.5	Health	SL-JSL	
Total Suspended Particulate <44 microns	-	120	Visibility	Standard	

Compound	CAS NO.	Limit ($\mu g/m^3$)	Limiting Effect	Reference	Notes
Lead	7439-92-1	0.5	Health	Standard	
Manganese	7439-96-5	0.4	Health	Standard	
Nickel	7440-02-0	0.2	Health	AAQC	As suspended particulate matter
Thallium	7440-28-0	0.5	Health	SL-JSL	
Tin	7440-31-5	10	Health	Standard	
Antimony	7440-36-0	25	Health	Standard	
Arsenic	7440-38-2	0.3	Health	Guideline	
Barium	7440-39-3	10	Health	Guideline	
Beryllium	7440-41-4		NA		
Cadmium	7440-43-9	0.025	Health	Standard	
Chromium	7440-47-3	0.5	Health	Standard	
Cobalt	7440-48-4	0.1	Health	Guideline	
Copper	7440-50-8	50	Health	Standard	
Vanadium	7440-62-2	2	Health	Standard	
Zinc	7440-66-6	120	Particulate	Standard	
Selenium	7782-49-2	10	Health	Guideline	
Iron	15438-31-0	4	Health	Standard	For metallic Iron
Formaldehyde	50-00-0	65	Health	Standard	
Acetone	67-64-1	11,880	Health	Standard	
Acetaldehyde	75-07-0	500	Health	Standard	
Benzaldehyde	100-52-7	2	Health	SL-JSL	
Acrolein	1070-20-8		NA		
Glutaraldehyde	111-30-8	14	Health	Guideline	
Propionaldehyde (Propanal)	123-38-6		NA		
n-Butyraldehyde (n-Butanal)	123-72-3		NA		
Particulate Mercury	-		Assessed as total mercury		
Vapour Mercury	7439-97-6				
Total Mercury	-	2	Health	Standard	

Note: Standard, Guideline, and SL-JSL refer to standards, guidelines, and screening limits presented in the ACB.

Table 18 - VOC Summary

Compound	CAS No.	24-hr Limit µg/m³	Average MDL µg/m³	South				North				South Sample Max as % of 24-hr Limit	North Sample Max as % of 24-hr Limit
				%> MDL	Mean	Min	Max	%> MDL	Mean	Min	Max		
Carbon Tetrachloride	56-23-5	2.4	0.75	0%	0.60	0.10	0.65	0%	0.64	0.63	0.65	27%	27%
Isopropyl Alcohol	67-63-0	7,300											
Acetone	67-64-1	11,880	1.70	100%	9.72	3.00	14.50	100%	9.73	4.99	15.40	0.12%	0.13%
Chloroform	67-66-3	1	0.59	0%	0.46	0.10	0.49	0%	0.49	0.49	0.49	49.0%	49.0%
Benzene	71-43-2	2.3	0.42	42%	0.35	0.16	0.89	42%	0.34	0.16	1.02	39%	44%
1,1,1-Trichloroethane	71-55-6	115,000	1.10	0%	0.55	0.55	0.55	0%	0.55	0.55	0.55	0.0%	0.0%
Vinyl Chloride	75-01-4	1	0.51	0%	0.26	0.26	0.26	0%	0.26	0.26	0.26	25.5%	25.5%
Dichloromethane	75-09-2	220	0.45	17%	1.44	0.10	13.10	0%	0.35	0.35	0.35	5.95%	0.2%
1,1-Dichloroethane	75-34-3	165	0.51	0%	0.38	0.10	0.41	0%	0.41	0.41	0.41	0.2%	0.2%
1,1-Dichloroethene	75-35-4	10	0.50	0%	0.37	0.10	0.40	0%	0.40	0.40	0.40	4.0%	4.0%
Chlorodifluoromethane	75-45-6	350,000	0.46	42%	0.58	0.10	0.99	42%	0.60	0.36	1.20	0.0%	0.0%
Trichlorofluoromethane	75-69-4	6,000	1.10	42%	0.97	0.55	2.58	42%	0.86	0.55	1.35	0.0%	0.0%
Dichlorodifluoromethane	75-71-8	500,000	0.60	100%	1.97	0.40	2.47	100%	2.10	1.40	2.57	0.0%	0.0%
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	800,000	1.50	0%	0.75	0.75	0.77	0%	0.75	0.75	0.77	0.0%	0.0%
2-Methyl Butane	78-78-4	35,500	1.80	100%	3.32	1.24	17.70	92%	1.32	0.30	2.66	0.0%	0.0%
1,2-Dichloropropane	78-87-5	2,400	0.56	0%	0.43	0.10	0.46	0%	0.46	0.45	0.46	0.0%	0.0%
MEK	78-93-3	1,000	0.59	100%	2.59	0.77	16.10	83%	2.76	0.30	14.90	1.61%	1.49%
Trichloroethene	79-01-6	12	1.10	0%	0.55	0.54	0.55	0%	0.55	0.54	0.55	4.6%	4.6%
Naphthalene	91-20-3	22.5	2.60	8%	0.57	0.26	2.94	25%	0.84	0.26	2.99	13.1%	13.3%
o-Xylene	95-47-6	730	0.87	33%	0.67	0.22	3.90	33%	0.42	0.22	0.87	0.5%	0.1%
1,2-Dichlorobenzene	95-50-1	NA	0.70	0%	0.56	0.10	0.60	0%	0.60	0.60	0.60	NA	NA
1,2,4-Trimethylbenzene	95-63-6	220	0.98	17%	0.75	0.49	3.06	0%	0.49	0.49	0.50	1.39%	0.2%
3-Methyl Pentane	96-14-0	1,750	0.70	8%	0.82	0.35	6.02	0%	0.35	0.35	0.35	0.34%	0.0%
p-Cymene	99-87-6	50	1.10	0%	0.55	0.55	0.55	0%	0.55	0.55	0.55	1.1%	1.1%
Ethyl Benzene	100-41-4	1,000	0.54	25%	0.49	0.22	2.65	25%	0.41	0.22	1.56	0.3%	0.2%
Styrene	100-42-5	400	0.85	17%	0.60	0.43	1.87	8%	0.54	0.43	1.83	0.5%	0.5%
1,4-Dichlorobenzene	106-46-7	95	0.70	0%	0.56	0.10	0.60	0%	0.60	0.60	0.60	0.6%	0.6%
1,2-Dibromoethane	106-93-4	3	0.85	0%	0.70	0.10	0.77	0%	0.75	0.75	0.77	25.7%	25.7%
1,2-Dichloroethane	107-06-2	2	0.51	0%	0.38	0.10	0.41	0%	0.41	0.41	0.41	20.3%	20.3%
2-Propenenitrile	107-13-1	0.60	0.32	0%	0.21	0.10	0.22	0%	0.22	0.22	0.22	35.8%	35.8%
2-Methyl Pentane	107-83-5	1,750	0.70	42%	1.41	0.35	10.50	0%	0.35	0.35	0.35	0.60%	0.02%
MIBK	108-10-1	1,200	0.82	0%	0.41	0.41	0.41	0%	0.41	0.41	0.41	0.0%	0.03%
m/p-Xylene	108-38-3/106-42-3	730	1.70	50%	2.03	0.44	11.60	33%	1.03	0.44	2.74	1.59%	0.4%
1,3,5-Trimethylbenzene	108-67-8	220	0.98	0%	0.49	0.49	0.50	0%	0.49	0.49	0.50	0.2%	0.2%
Toluene	108-88-3	2,000	0.75	100%	4.36	0.83	12.30	92%	2.08	0.38	4.18	0.62%	0.21%
Chlorobenzene	108-90-7	NA	0.56	0%	0.43	0.10	0.46	0%	0.46	0.46	0.46	NA	NA
Hexane	110-54-3	7,500	0.70	33%	1.11	0.35	7.76	8%	0.41	0.35	1.09	0.1%	0.0%
Cyclohexane	110-82-7	6,100	0.45	8%	0.34	0.32	0.35	8%	0.39	0.35	0.93	0.0%	0.0%
Nonane	111-84-2	5,250	1.00	8%	0.55	0.50	1.10	0%	0.50	0.50	0.50	0.0%	0.0%
1,2,4-Trichlorobenzene	120-82-1	400	1.50	8%	0.88	0.74	2.30	8%	0.89	0.74	2.40	0.6%	0.6%

Compound	CAS No.	24-hr Limit µg/m³	Average MDL µg/m³	South				North				South Sample Max as % of 24-hr Limit	North Sample Max as % of 24-hr Limit
				%> MDL	Mean	Min	Max	%> MDL	Mean	Min	Max		
Tetrachloroethene	127-18-4	360	1.50	0%	0.71	0.68	0.80	8%	0.99	0.68	4.27	0.2%	1.2%
Ethyl Acetate	141-78-6	NA	0.46	0%	0.34	0.10	0.36	8%	0.41	0.36	0.94	NA	NA
Heptane	142-82-5	11,000	0.82	8%	0.62	0.41	2.91	0%	0.41	0.41	0.41	0.0%	0.0%
1,2-Dichloroethene (Cis)	156-59-2	105	0.50	8%	0.41	0.10	0.87	0%	0.40	0.40	0.40	0.8%	0.4%
1,2-Dichloroethene (Trans)	156-60-5	105	0.50	0%	0.37	0.10	0.40	0%	0.40	0.40	0.48	0.4%	0.5%
1,2,3-Trimethylbenzene	526-73-8	220	0.98	0%	0.49	0.49	0.49	0%	0.49	0.49	0.49	0.2%	0.2%
3-Methyl Hexane	589-34-4	1,535	0.82	8%	0.81	0.41	5.24	0%	0.41	0.41	0.41	0.34%	0.03%
2-Ethyl Toluene	611-14-3	0.50	0.98	0%	0.49	0.49	0.49	0%	0.49	0.49	0.49	98.0%	98.0%

na = no applicable limit

Table 19 - TSP & Metals Summary

Compound	CAS No.	24-hr Limit µg/m³	Average MDL µg/m³	South				North				South Sample Max as % of 24-hr Limit	North Sample Max as % of 24-hr Limit
				%> MDL	Mean	Min	Max	%> MDL	Mean	Min	Max		
Total Suspended Particulate	NA-TSP	120	3.14E+00	100%	17	8.88	37.53	100%	18	8.78	36.85	31.3%	30.7%
Lead	7439-92-1	0.50	4.53E-04	82%	1.4E-03	5.3E-04	2.1E-03	92%	4.3E-03	9.3E-04	1.5E-02	0.8%	3.1%
Manganese	7439-96-5	0.40	3.40E-04	100%	7.5E-03	1.6E-03	1.9E-02	100%	8.2E-03	2.4E-03	2.6E-02	4.7%	6.5%
Nickel	7440-02-0	0.2	5.48E-04	82%	9.3E-04	5.1E-04	2.1E-03	85%	1.3E-03	6.2E-04	3.1E-03	1.0%	1.5%
Thallium	7440-28-0	0.50	5.66E-05	0%	2.8E-05	2.8E-05	3.1E-05	0%	2.8E-05	2.8E-05	3.0E-05	0.0%	0.0%
Tin	7440-31-5	10	1.18E-03	82%	9.3E-04	2.0E-04	3.1E-03	85%	8.6E-04	2.4E-04	3.2E-03	0.0%	0.0%
Antimony	7440-36-0	25	1.27E-03	36%	8.0E-04	1.4E-04	3.1E-03	31%	7.2E-04	1.4E-04	3.2E-03	0.0%	0.0%
Arsenic	7440-38-2	0.30	8.59E-04	73%	8.4E-04	1.5E-04	1.9E-03	77%	8.4E-04	1.5E-04	1.9E-03	0.6%	0.6%
Barium	7440-39-3	10	3.40E-04	100%	5.4E-03	1.8E-03	1.9E-02	100%	5.8E-03	1.5E-03	2.3E-02	0.2%	0.2%
Beryllium	7440-41-4	NA	2.45E-04	0%	1.3E-04	8.3E-05	3.1E-04	0%	1.2E-04	8.3E-05	3.2E-04	3.1%	3.2%
Cadmium	7440-43-9	0.025	2.55E-04	45%	1.6E-04	2.8E-05	6.3E-04	54%	1.9E-04	2.8E-05	6.3E-04	2.5%	2.5%
Chromium	7440-47-3	0.5	7.55E-04	82%	1.5E-03	9.6E-04	2.3E-03	85%	1.8E-03	9.9E-04	4.4E-03	0.5%	0.9%
Cobalt	7440-48-4	0.10	3.49E-04	18%	2.0E-04	8.3E-05	6.3E-04	23%	2.7E-04	8.3E-05	7.4E-04	0.6%	0.7%
Copper	7440-50-8	50	6.61E-04	100%	4.9E-02	1.4E-02	1.0E-01	100%	3.3E-02	5.9E-03	5.8E-02	0.2%	0.1%
Vanadium	7440-62-2	2.0	6.61E-04	82%	1.3E-03	9.2E-05	4.4E-03	85%	1.0E-03	2.5E-04	2.4E-03	0.2%	0.1%
Zinc	7440-66-6	120	2.88E-03	100%	1.4E-02	6.8E-03	3.4E-02	100%	1.8E-02	8.5E-03	5.4E-02	0.0%	0.0%
Selenium	7782-49-2	10	1.51E-03	64%	1.3E-03	2.8E-04	3.1E-03	62%	1.4E-03	2.8E-04	3.2E-03	0.0%	0.0%
Iron	15438-31-0	4.0	1.10E-02	100%	2.1E-01	4.2E-02	4.6E-01	100%	1.9E-01	6.3E-02	4.2E-01	11.4%	10.5%

Means for Total Suspended Particulate are geometric. All other means are arithmetic.
nd = below method detection limit
na = no applicable limit

Table 20 - Carbonyls Summary

Compound	CAS No.	24-hr Limit µg/m³	Average MDL µg/m³	South				North				South Sample Max as % of 24-hr Limit	North Sample Max as % of 24-hr Limit
				%> MDL	Mean	Min	Max	%> MDL	Mean	Min	Max		
Formaldehyde	50-00-0	65	5.01E+00	33%	7.4E+00	3.5E+00	1.3E+01	0%	1.8E+00	7.1E-01	3.2E+00	20.4%	4.9%
Acetone	67-64-1	11,880	1.38E+00	0%	7.0E-01	6.9E-01	7.1E-01	0%	6.8E-01	6.3E-01	7.1E-01	0.0%	0.0%
Acetaldehyde	75-07-0	500	4.78E+00	0%	3.2E+00	7.0E-01	5.5E+00	0%	1.5E+00	7.0E-01	3.2E+00	1.1%	0.6%
Benzaldehyde	100-52-7	2.0	1.38E+00	0%	7.0E-01	6.9E-01	7.1E-01	0%	6.8E-01	6.3E-01	7.1E-01	35.3%	35.4%
Acrolein	1070-20-8	0.40	1.38E+00	0%	7.0E-01	6.90E-01	7.06E-01	0%	6.81E-01	6.35E-01	7.09E-01	176.4%	177.2%
Glutaraldehyde	111-30-8	14	1.38E+00	0%	7.0E-01	6.9E-01	7.1E-01	0%	6.8E-01	6.3E-01	7.1E-01	5.0%	5.1%
Propionaldehyde (Propanal)	123-38-6	NA	1.38E+00	0%	7.0E-01	6.9E-01	7.1E-01	0%	6.8E-01	6.3E-01	7.1E-01	NA	NA
n-Butyraldehyde (n-Butanal)	123-72-3	NA	1.38E+00	0%	7.0E-01	6.9E-01	7.1E-01	0%	6.8E-01	6.3E-01	7.1E-01	NA	NA

na = no applicable limit

Table 21 - Mercury Summary

Compound	CAS No.	24-hr Limit µg/m³	Average MDL µg/m³	South				North				South Sample Max as % of 24-hr Limit	North Sample Max as % of 24-hr Limit
				%> MDL	Mean	Min	Max	%> MDL	Mean	Min	Max		
Particulate Mercury	NA-HG-TSP	NA	1.27E-05	33%	1.1E-05	6.3E-06	1.9E-05	100%	2.7E-04	5.2E-05	6.8E-04	NA	NA
Vapour Mercury	7439-97-6	NA	2.07E-02	100%	3.2E-02	2.7E-03	4.7E-02	100%	4.2E-02	4.0E-02	4.5E-02	NA	NA
Total Mercury	NA-THG	2	NA	NA	3.2E-02	2.7E-03	4.7E-02	NA	4.2E-02	4.0E-02	4.5E-02	2.3%	2.3%

na = no applicable limit

6. SUMMARY AND EVALUATION OF EXCEEDANCES

For the 2022 monitoring program, no exceedances were measured. Acrolein is reported at higher than the MECP limit for that compound; however, Acrolein was not detected in any of the analyzed samples and the reported exceedance is due to the high detection limit relative to the MECP limit.

7. EVALUATION OF EFFECTS ON MONITORING RESULTS BY ABATEMENT ACTIONS

ORTECH is not aware of any abatement activities that may have had an impact on monitored results during the 2022 monitoring program.

8. COMPARISON TO HISTORICAL VALUES

A comparison of the 2022 monitoring program summary statistics across both sites and the values observed in the 2020 – 2021 monitoring programs is presented in Table 22.

Vapour phase mercury and the metals chromium, nickel, tin, vanadium, arsenic, selenium, cadmium, antimony, and cobalt were detected in more samples than typically seen in the last three years. Vapor phase mercury was detected in only three (3) samples in the last three years, but was detected in all six (6) samples analyzed in 2022. The rest of the metals were not detected at all in the preceeding three years, with the exception of Nickel, which was detected in 1-4 samples per site in 2020 and 2021. In 2022 many of these metals were consistently detected at both sites with 10 detects per site, while the least detected (cobalt) was still detected in 5 samples total for both sites.

Graphical trends for benzene and TSP, two of significant contaminants included in the monitoring program are shown in Figure 5 and Figure 6 respectively. Note that on the graph for benzene, the flat portions at 0.32 µg/m^3 are non-detects reported at ½ MDL.

Total benzene concentrations were generally lower than historically seen, with the exception of the last sample taken on September 14th which had the highest measured concentrations in the three-year period.

Average TSP concentrations were lower than in 2020 or 2021 by approximately 15%. Additionally, the TSP maximum concentration was considerably lower than in 2020 or 2021, with a maximum of 38 µg/m^3 this year compared to 110 µg/m^3 in 2020 and 70 µg/m^3 in 2021.

Table 22 - Comparison of Current Year Statistics to Historical Values

Compound	CAS	MECP Limit (µg/m³)	Historical (2020-2021) % detected	Current Year % detected	Difference in % detected Historical (2020-2021) to Current Year	Historical Mean (µg/m³)	Current Year Mean (µg/m³)	% Difference in mean Historical (2020-2021) to Current Year	Historical Maximum (µg/m³)	Current Year Maximum (µg/m³)	% Difference in maximum Historical (2020-2021) to Current Year
1,1,1-Trichloroethane	71-55-6	115000	0%	0%	0%	5.50E-01	5.49E-01	0%	5.50E-01	5.50E-01	0%
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	800000	4%	0%	-4%	7.81E-01	7.53E-01	-4%	1.60E+00	7.65E-01	-52%
1,1-Dichloroethane	75-34-3	165	0%	0%	0%	4.05E-01	3.92E-01	-3%	4.05E-01	4.05E-01	0%
1,1-Dichloroethene	75-35-4	10	0%	0%	0%	3.95E-01	3.83E-01	-3%	3.95E-01	3.95E-01	0%
1,2,3-Trimethylbenzene	526-73-8	220	0%	0%	0%	4.90E-01	4.90E-01	0%	4.90E-01	4.90E-01	0%
1,2,4-Trichlorobenzene	120-82-1	400	2%	8%	6%	7.84E-01	8.82E-01	13%	2.50E+00	2.40E+00	-4%
1,2,4-Trimethylbenzene	95-63-6	220	29%	8%	-21%	7.13E-01	6.20E-01	-13%	1.83E+00	3.06E+00	67%
1,2-Dibromoethane	106-93-4	3	0%	0%	0%	7.50E-01	7.26E-01	-3%	7.50E-01	7.70E-01	3%
1,2-Dichlorobenzene	95-50-1	NA	0%	0%	0%	6.00E-01	5.79E-01	-3%	6.00E-01	6.00E-01	0%
1,2-Dichloroethane	107-06-2	2	0%	0%	0%	4.05E-01	3.92E-01	-3%	4.05E-01	4.05E-01	0%
1,2-Dichloroethene (Cis)	156-59-2	105	0%	4%	4%	3.95E-01	4.03E-01	2%	3.95E-01	8.70E-01	120%
1,2-Dichloroethene (Trans)	156-60-5	105	0%	0%	0%	3.95E-01	3.86E-01	-2%	3.95E-01	4.75E-01	20%
1,2-Dichloropropane	78-87-5	2400	0%	0%	0%	4.60E-01	4.43E-01	-4%	4.60E-01	4.60E-01	0%
1,3,5-Trimethylbenzene	108-67-8	220	0%	0%	0%	4.90E-01	4.93E-01	1%	4.90E-01	5.00E-01	2%
1,4-Dichlorobenzene	106-46-7	95	0%	0%	0%	6.00E-01	5.79E-01	-3%	6.00E-01	6.00E-01	0%
2-Ethyl Toluene	611-14-3	0.5	0%	0%	0%	4.90E-01	4.90E-01	0%	4.90E-01	4.90E-01	0%
2-Methyl Butane	78-78-4	35500	94%	96%	2%	2.06E+00	2.32E+00	13%	5.67E+00	1.77E+01	212%
2-Methyl Pentane	107-83-5	1750	25%	21%	-4%	5.30E-01	8.81E-01	66%	1.39E+00	1.05E+01	655%
2-Propenenitrile	107-13-1	0.6	0%	0%	0%	2.15E-01	2.10E-01	-2%	2.15E-01	2.15E-01	0%
3-Methyl Hexane	589-34-4	1535	6%	4%	-2%	4.43E-01	6.11E-01	38%	1.21E+00	5.24E+00	333%
3-Methyl Pentane	96-14-0	1750	15%	4%	-11%	4.39E-01	5.86E-01	34%	1.39E+00	6.02E+00	333%
Acetaldehyde	75-07-0	500	0%	0%	0%	7.84E-01	2.39E+00	205%	1.31E+00	5.52E+00	321%
Acetone	67-64-1	11880	79%	80%	1%	9.70E+00	7.92E+00	-18%	2.73E+01	1.54E+01	-44%
Acrolein	107-02-8	0.4	0%	0%	0%	7.84E-01	6.89E-01	-12%	1.31E+00	7.09E-01	-46%
Antimony	7440-36-0	25	0%	33%	33%	3.67E-03	7.55E-04	-79%	4.84E-03	3.16E-03	-35%
Arsenic	7440-38-2	0.3	0%	75%	75%	2.24E-03	8.42E-04	-62%	2.98E-03	1.90E-03	-36%
Barium	7440-39-3	10	98%	100%	2%	4.19E-03	5.63E-03	34%	1.42E-02	2.35E-02	65%
Benzaldehyde	100-52-7	2	0%	0%	0%	7.84E-01	6.89E-01	-12%	1.31E+00	7.09E-01	-46%
Benzene	71-43-2	2.3	23%	42%	19%	4.31E-01	3.46E-01	-20%	8.60E-01	1.02E+00	19%
Beryllium	7440-41-7	0.01	0%	0%	0%	3.67E-04	1.23E-04	-67%	4.84E-04	3.16E-04	-35%
Cadmium	7440-43-9	0.025	0%	50%	50%	7.50E-04	1.76E-04	-77%	1.00E-03	6.32E-04	-37%
Carbon Tetrachloride	56-23-5	2.4	4%	0%	-4%	6.87E-01	6.19E-01	-10%	1.60E+00	6.50E-01	-59%
Chlorobenzene	108-90-7	NA	0%	0%	0%	4.60E-01	4.45E-01	-3%	4.60E-01	4.60E-01	0%
Chlorodifluoromethane	75-45-6	350000	71%	42%	-29%	8.35E-01	5.90E-01	-29%	1.60E+00	1.20E+00	-25%
Chloroform	67-66-3	1	0%	0%	0%	4.90E-01	4.74E-01	-3%	4.90E-01	4.90E-01	0%
Chromium	7440-47-3	0.5	0%	83%	83%	1.87E-03	1.65E-03	-12%	2.49E-03	4.45E-03	78%
Cobalt	7440-48-4	0.1	2%	21%	19%	7.89E-04	2.39E-04	-70%	2.53E-03	7.40E-04	-71%
Copper	7440-50-8	50	100%	100%	0%	4.38E-02	4.05E-02	-8%	2.14E-01	1.01E-01	-53%

Compound	CAS	MECP Limit (µg/m³)	Historical (2020-2021) % detected	Current Year % detected	Difference in % detected Historical (2020-2021) to Current Year	Historical Mean (µg/m³)	Current Year Mean (µg/m³)	% Difference in mean Historical (2020-2021) to Current Year	Historical Maximum (µg/m³)	Current Year Maximum (µg/m³)	% Difference in maximum Historical (2020-2021) to Current Year
Cyclohexane	110-82-7	6100	10%	8%	-1%	4.21E-01	3.68E-01	-13%	1.87E+00	9.30E-01	-50%
Dichlorodifluoromethane	75-71-8	500000	100%	100%	0%	2.25E+00	2.03E+00	-10%	3.40E+00	2.57E+00	-24%
Dichloromethane	75-09-2	220	31%	8%	-22%	1.00E+00	8.92E-01	-11%	2.01E+01	1.31E+01	-35%
Ethyl Acetate	141-78-6	NA	19%	4%	-15%	5.43E-01	3.73E-01	-31%	2.36E+00	9.40E-01	-60%
Ethyl Benzene	100-41-4	1000	17%	25%	8%	6.10E-01	4.49E-01	-26%	3.61E+00	2.65E+00	-27%
Formaldehyde	50-00-0	65	7%	17%	10%	6.45E+00	4.60E+00	-29%	6.42E+01	1.32E+01	-79%
Glutaraldehyde	111-30-8	14	0%	0%	0%	7.84E-01	6.89E-01	-12%	1.31E+00	7.09E-01	-46%
Heptane	142-82-5	11000	12%	4%	-7%	4.77E-01	5.14E-01	8%	1.41E+00	2.91E+00	106%
Hexane	110-54-3	7500	33%	21%	-12%	6.51E-01	7.60E-01	17%	3.74E+00	7.76E+00	107%
Iron	15438-31-0	4	98%	100%	2%	2.80E-01	2.02E-01	-28%	1.43E+00	4.57E-01	-68%
Isopropyl Alcohol	67-63-0	7300									
Lead	7439-92-1	0.5	40%	88%	48%	2.23E-03	2.97E-03	33%	8.45E-03	1.54E-02	83%
m/p-Xylene	108-38-3/106-42-3	730	26%	42%	15%	1.74E+00	1.53E+00	-12%	1.24E+01	1.16E+01	-6%
Manganese	7439-96-5	0.4	98%	100%	2%	8.21E-03	7.88E-03	-4%	4.10E-02	2.59E-02	-37%
MEK	78-93-3	1000	98%	92%	-6%	1.81E+00	2.67E+00	48%	5.96E+00	1.61E+01	170%
MIBK	108-10-1	1200	6%	0%	-6%	4.49E-01	4.10E-01	-9%	1.29E+00	4.10E-01	-68%
Naphthalene	91-20-3	22.5	2%	17%	15%	1.33E+00	7.05E-01	-47%	3.00E+00	2.99E+00	0%
n-Butyraldehyde (n-Butanal)	123-72-3	NA	0%	0%	0%	7.84E-01	6.89E-01	-12%	1.31E+00	7.09E-01	-46%
Nickel	7440-02-0	0.2	18%	83%	65%	1.43E-03	1.11E-03	-23%	4.05E-03	3.08E-03	-24%
Nonane	111-84-2	5250	4%	4%	0%	5.33E-01	5.25E-01	-1%	1.40E+00	1.10E+00	-21%
o-Xylene	95-47-6	730	17%	33%	16%	6.15E-01	5.43E-01	-12%	3.66E+00	3.90E+00	7%
Particulate Mercury	NA-HG-TSP	NA	64%	67%	2%	3.84E-05	1.42E-04	268%	2.16E-04	6.79E-04	215%
p-Cymene	99-87-6	50	0%	0%	0%	5.50E-01	5.50E-01	0%	5.50E-01	5.50E-01	0%
Propionaldehyde (Propanal)	123-38-6	NA	0%	0%	0%	7.84E-01	6.89E-01	-12%	1.31E+00	7.09E-01	-46%
Selenium	7782-49-2	10	0%	63%	63%	3.67E-03	1.36E-03	-63%	4.84E-03	3.16E-03	-35%
Styrene	100-42-5	400	8%	13%	5%	4.93E-01	5.72E-01	16%	2.39E+00	1.87E+00	-22%
Tetrachloroethene	127-18-4	360	10%	4%	-5%	9.29E-01	8.50E-01	-9%	4.60E+00	4.27E+00	-7%
Thallium	7440-28-0	0.5	0%	0%	0%	3.67E-03	2.83E-05	-99%	4.84E-03	3.07E-05	-99%
Tin	7440-31-5	10	0%	83%	83%	3.67E-03	8.90E-04	-76%	4.84E-03	3.16E-03	-35%
Toluene	108-88-3	2000	96%	96%	0%	3.34E+00	3.22E+00	-4%	1.89E+01	1.23E+01	-35%
Total Mercury	NA-THG	2	71%	100%	29%	1.69E-02	3.71E-02	120%	3.33E-02	4.70E-02	41%
Total Suspended Particulate	NA-TSP	120	100%	100%	0%	2.05E+01	1.75E+01	-15%	1.10E+02	3.75E+01	-66%
Trichloroethene	79-01-6	12	0%	0%	0%	5.50E-01	5.48E-01	0%	5.50E-01	5.50E-01	0%
Trichlorofluoromethane	75-69-4	6000	69%	42%	-28%	1.14E+00	9.13E-01	-20%	2.20E+00	2.58E+00	17%
Vanadium	7440-62-2	2	0%	83%	83%	1.87E-03	1.12E-03	-40%	2.49E-03	4.40E-03	77%
Vapour Mercury	7439-97-6	NA	29%	100%	71%	1.68E-02	3.69E-02	119%	3.33E-02	4.70E-02	41%
Vinyl Chloride	75-01-4	1	0%	0%	0%	2.55E-01	2.55E-01	0%	2.55E-01	2.55E-01	0%
Zinc	7440-66-6	120	100%	100%	0%	1.56E-02	1.59E-02	2%	3.60E-02	5.44E-02	51%

Means for Total Suspended Particulate are geometric. All other means are arithmetic.

Figure 5 - Benzene Trends

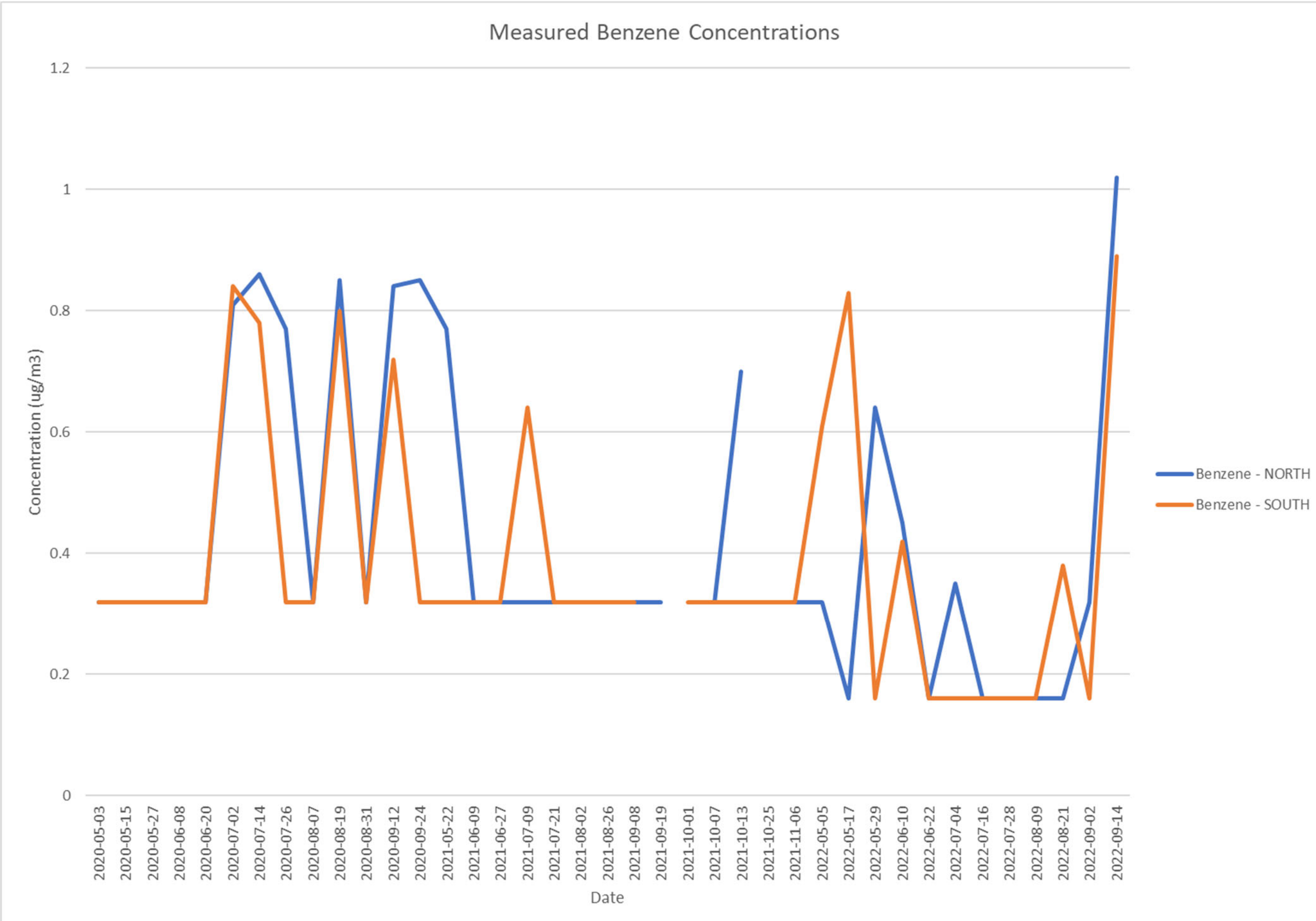
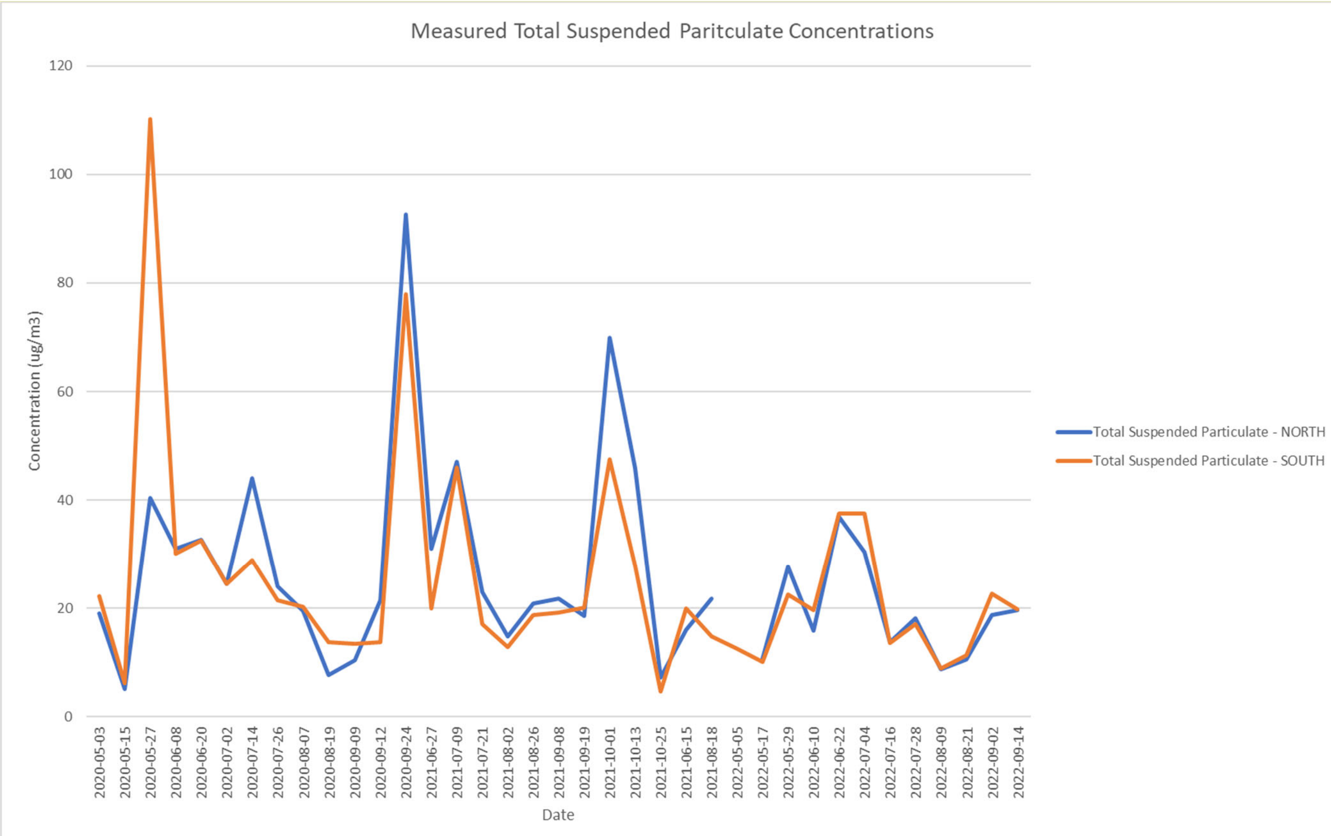


Figure 6 – Total Suspended Particulate Trends



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APPENDIX A – Copy of Monitoring Plan

Report No. 50881-1

Report:

Clean Harbors Environmental Services Inc.
Lambton Facility
Ambient Air Monitoring Plan

Date: December 11, 2015

Report:

Clean Harbors Environmental Services Inc.
Lambton Facility
Ambient Air Monitoring Plan

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Report No.: 50881-1
10 pages

Revision History

Version	Date	Summary Changes/Purpose of Revision
1	December 11, 2015	original

Table of Contents

INTRODUCTION

Clean Harbors has conducted various ambient air monitoring programs at their Telfer Road facility since the 1990's. The current Air Monitoring Plan was approved by the Ontario Ministry of Environment and Climate Change (MOECC) and initiated in June 2011 (ORTECH – P5061-2, June 21, 2011). This Plan was reviewed by the MOECC in August 2015, resulting in a number of suggested changes to the program. As solicited by Clean Harbors, this plan outlines the general methods to conduct the monitoring requirements and recommendations from Clean Harbors and the MOECC.

The monitoring plan includes the following proposed changes:

- Relocation of the north monitoring site;
- Update of the target VOC list; and
- Update of the aldehyde and ketone (Carbonyls) target list.

The primary emphasis of this monitoring program is directed toward potential fugitive emission releases from the landfill and other low-level facility sources. The target substances were selected to characterize the property line concentrations related to these emissions and include:

- An extensive group of speciated volatile organic compounds (VOCs);
- Total suspended particulate matter (TSP) and metals;
- Vapour and particulate mercury (Mercury); and
- Specific aldehyde and ketone constituents (Carbonyls).

1. Proposed Approach

1.1 General Synopsis of Approach

The primary objective of the ambient air monitoring program is to measure specific airborne target compounds at or near the facility perimeter by established procedures to verify that concentrations are within accepted regulatory limits.

Concurrent 24-hour sampling will be conducted at two fixed locations. The north site will be located at the north perimeter on top of the berm with the south site at some distance from the southerly fence line.

The measured data will be provided to Clean Harbors as soon as possible after each sample day and a study report will be prepared annually upon completion of all measurement sets.

1.2 Monitoring Locations

The north and south fixed monitoring locations are shown on the map in Figure 1. The current north site is within the perimeter fencing of the north property line (Petrolia Line) at the base of the sloped berm which is adjacent to the exposed waste landfill area. It was recommended by the MOECC that this site be moved to the top of the berm approximately 150 metres east of the present location (see Figure 1). This new location will mitigate all possible obstructions between the monitoring site and the facility, with the emphasis directed toward measuring maximum potential constituent levels from the active landfill operations under southerly wind regimes. The south site will remain at its present location and is south of the facility on a property at the corner of Telfer Road and Rokeby Line. The locale is upwind of all facility operations under southerly quadrant wind conditions and is sited to minimize possible particulate contributions from the adjacent gravel road (Telfer Road). The monitoring position of both the north and south locations will be fixed throughout the survey period.

Figure 1
North and South Sampling Locations

1.3 Sample Storage & Transportation

Before and after sample collection, the sample media and canisters will be stored at the ORTECH laboratory in an appropriate, clean, temperature controlled environment. Exposed sample media and canisters will be packed in protective cases (with ice packs if required) and shipped via courier to the analytical laboratory within three days of exposure. Chain of custody records will be maintained for all samples.

1.4 Sample Collection and Analysis

In order to maintain consistency with previous monitoring at the facility, essentially the same measurement methods will be used for concurrent monitoring as shown below in Table 1.

Table 1
Measurement Methods

Parameter	Sample Media	Analytical Method	Standard Method
VOC	6L evacuated canisters	GC/MSD	US EPA TO-15a
TSP	Glass-fibre filters	Gravimetric	US EPA IO2-1
Metals and Particulate Mercury	Glass-fibre filters	ICP MS	US EPA 6010B
		CVAA	US EPA 7471A
Carbonyls	Lp DNHP cartridge	HPLC	US EPA TO-11a and IP-6A
Mercury Vapour	Carulite tubes	Acid Extraction CVAA	US EPA 7470 and OSHA ID-140

VOC - Twenty-four hour whole air upwind and downwind samples will be collected into stainless steel electropolished 6 L evacuated canisters at a constant flow rate following EPA method TO-15. The canisters and flow controllers will be provided, cleaned, proofed and analyzed by a CALA accredited laboratory.

Proofing consists of taking one canister and its associated sampling train and flow controller from each batch of cleaned canisters and performing an analysis to ensure that the cleaning process was adequate. The sampling trains and flow controllers will be leak checked and the flow verified before shipping from the laboratory. Each canister will be inspected for damage upon receipt from the laboratory and after a period of acclimatization, the operator will record the “as received” vacuum reading (should be ≥ -29 inches Hg). Prior to sampling, the vacuum will be checked again, and if significantly different (i.e., not within 3 inches Hg) the canister will not be used and will be returned to the laboratory. The precleaned stainless steel sampling train consists of a ¼ inch sampling inlet, a 2 micron sintered steel particulate filter, a critical orifice (designed for 24-hour sampling), a flow controller and a vacuum gauge. Each sampling train has a unique identification number that will be recorded. The critical orifice and flow controller will accurately maintain a constant flow despite changes in vacuum over a range of -30 to -5 inches Hg in a 24-hour period. Prior to the scheduled sampling period the canisters will be removed from their respective protective containers and positioned such that the sampling inlet is approximately 1.5 meters above ground. Initial and final canister vacuum readings will be recorded for each sample along with ambient temperature and pressure. Final readings should be between -5 and -8 inches Hg to ensure a valid sample.

The extensive list of target compounds is found in Table 2. As some of the compounds are not found on the typical laboratory T0-15 list offered by commercial laboratories, the lab must procure custom certified calibration gas standards and develop methods for these additional compounds. Clean Harbors conducted a comprehensive review of their latest Emission Summary and Dispersion Modelling (ESDM) report with respect to the compound list and it is recommended that the thirteen highlighted compounds be removed from the target list, with the following rational. For seven of the compounds, the total point of impingement (POI) concentrations (modelled and fugitive) were less than 1% of their respective POI standards: Chlorodifluoromethane, 2-Methyl Butane, 3-Methyl Pentane, p-Cymene, 2-Methyl Pentane, Nonane and 3-Methyl Hexane. The following six compounds were not found on the latest ESDM compound list: 1,1,2-Trichloro-1,2,2-Trifluoroethane, 1,2,Dichlorobenzene, Chlorobenzene, Ethyl Acetate, 1,2,3,-Trimethylbenzene and o-Ethyl Toluene. The remainder of the compounds is covered by the standard EPA TO-15 list with the addition of naphthalene and 2-Propenenitrile.

Table 2
VOC Compound List

Compound	CAS No.	Compound	CAS No.
Carbon Tetrachloride	56-23-5	Ethyl Benzene	100-41-4
Isopropyl Alcohol	67-63-0	Styrene	100-42-5
Acetone	67-64-1	1,4-Dichlorobenzene	106-46-7
Chloroform	67-66-3	1,2-Dibromoethane	106-93-4
Benzene	71-43-2	1,2-Dichloroethane	107-06-2
1,1,1-Trichloroethane	71-55-6	2-Propenenitrile	107-13-1
Vinyl Chloride	75-01-4	2-Methyl Pentane	107-83-5
Dichloromethane	75-09-2	MIBK	108-10-1
1,1-Dichloroethane	75-34-3	m/p-Xylene	108-38-3/106-42-3
1,1-Dichloroethene	75-35-4	1,3,5-Trimethylbenzene	108-67-8
Chlorodifluoromethane	75-45-6	Toluene	108-88-3
Trichlorofluoromethane	75-69-4	Chlorobenzene	108-90-7
Dichlorodifluoromethane	75-71-8	Hexane	110-54-3
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	Cyclohexane	110-82-7
2-Methyl Butane	78-78-4	Nonane	111-84-2
1,2-Dichloropropane	78-87-5	1,2,4-Trichlorobenzene	120-82-1
MEK	78-93-3	Tetrachloroethene	127-18-4
Trichloroethene	79-01-6	Ethyl Acetate	141-78-6
Naphthalene	91-20-3	Heptane	142-82-5
o-Xylene	95-47-6	1,2-Dichloroethene (Cis)	156-59-2
1,2-Dichlorobenzene	95-50-1	1,2-Dichloroethene (Trans)	156-60-5
1,2,4-Trimethylbenzene	95-63-6	1,2,3-Trimethylbenzene	526-73-8
3-Methyl Pentane	96-14-0	3-Methyl Hexane	589-34-4
p-Cymene	99-87-6	o-Ethyl Toluene	611-14-3

TSP/Metals - Total suspended particulate matter will be measured for 24-hour periods by sampling on preweighed glass fibre filters using conventional high-volume sampling units and operated according to standard techniques. These samplers will be calibrated on a quarterly basis utilizing calibration equipment that is certified against a reference or transfer standard traceable to a recognized national primary standard. At each sample interval, performance checks will be conducted to ensure that the flows are within ±10% of the required flow (40 CFM). TSP will be determined gravimetrically and subsequent filter particulate analysis by a CALA accredited laboratory will be done using inductively coupled plasma emission spectroscopy with mass spectrometric detection (ICP-MS) for 17 trace elements (Table 3). A portion of the filter after extraction will also be analyzed by cold vapour atomic absorption spectroscopy (CVAA) for particulate mercury, as understood to be required by MOECC, in general accordance with published standard methods. The target list of TSP and metals will remain unchanged from the June 21, 2011 Monitoring Plan.

Table 3
TSP and Metals

Parameter	CAS No.
Total Suspended Particulate (TSP)	Not available
Antimony	7440-36-0
Arsenic	7440-38-2
Barium	7440-39-3
Beryllium	7440-41-4
Cadmium	7440-43-9
Chromium	7440-47-3
Cobalt	7440-48-4
Copper	7440-50-8
Iron	15438-31-0
Lead	7439-92-1
Manganese	7439-96-5
Nickel	7440-02-0
Selenium	7782-49-2
Thallium	7440-28-0
Tin	7440-31-5
Vanadium	7440-62-2
Zinc	7440-66-6

Carbonyls – Speciated aldehyde and ketone compounds (Table 4) will be measured, as in past years, by sampling for 24-hours on SepPak (Lp DNHP) cartridges with subsequent analysis by high performance liquid chromatography (HPLC) with ultraviolet (UV) detection following US EPA Compendium Method T0-11a and US EPA Analytical Method IP-6A. The sampling units, consisting of diaphragm pumps, flow controllers and timers within protective enclosures, will be operated at an approximately 1 L/min flowrate to achieve approximately 1.5 m^3 total air volume through the DNHP-coated adsorbents (i.e., low pressure drop 2,4-Dinitrophenylhydrazine cartridges). The flows will be checked before and after each sample interval using NIST-traceable flow standards (i.e. BIOS Dry Cal). Analyses will be conducted by a CALA accredited laboratory and results will be compared with the associated 24-hour Standards and AAQC for the applicable species.

The list of carbonyl compounds was compared by Clean Harbors to their latest ESDM and it is recommended that the seven highlighted parameters be deleted from the target list leaving Formaldehyde as the single compound on the list. Five of these compounds (Acetaldehyde, Acrolein, Glutaraldehyde, Propionaldehyde and n-Butyraldehyde) are not emitted by Clean Harbors according to their ESDM report and Acetone is already included in the VOC target list. Benzaldehyde's total POI concentration (modelled and fugitive) was less than 1% of its respective POI standard.

TABLE 4
Carbonyls

Parameter	CAS No.
Formaldehyde	50-00-0
Acetone	67-64-1
Acetaldehyde	75-07-0
Benzaldehyde	100-52-7
Acrolein	107-02-08
Glutaraldehyde	111-30-8
Propionaldehyde (Propanal)	123-38-6
n-Butyraldehyde (n-Butanal)	123-72-3

Mercury - Mercury vapour will be collected, as in past years, for 24-hour periods onto adsorbent sample tubes based generally on OSHA Method ID-140 and analyzed following US EPA Method 7470. The carulite adsorbent tubes (6 mm diameter and 80 mm length), containing Hydrar (i.e., similar to hopcalite material composition), will use the same sampling apparatus as the carbonyls and will be similarly checked for proper flows before and after each sample period. The flow rates will be maintained at approximately 70 mL/min to collect total sample volumes of about 0.1 m^3. The samples will be analyzed by a CALA accredited laboratory utilizing cold vapour atomic absorption (CVAA) spectroscopy with ultraviolet (UV) detection. The particulate mercury result, determined by extraction, will be combined with the vapour phase mercury level for comparison with the applicable standards and AAQC.

1.5 Meteorological Measurements

Localized wind speed, direction and rainfall data will be obtained from the nearby Sarnia-Lambton Environmental Association (SLEA) monitoring and meteorological station (Moore Line). These data will be used to document the weather conditions during each sampling period and confirm the extent of downwind site positioning/source alignment.

1.6 Measurement Frequency and Scheduling

All samples will be collected over a twenty-four hour period from midnight to midnight (eastern standard time) initiated on the twelve day NAPS cycle. Measurement frequency and scheduling are shown in Table 5.

Table 5
Measurement Frequencies

Constituent	Frequency and Schedule
VOCs/TSP/Metals	12 sample days on the 12 day NAPS cycle beginning May 12, 2016
Formaldehyde and Mercury	One sample day per month for June, July and August taken on a day when VOCs/TSP/Metal samples are collected

2. Quality Assurance

To maintain an appropriate level of quality assurance with regard to the monitoring, various quality assurance practices will be incorporated into the sampling and analysis methods, as routinely done, in an effort to enhance the measurement validity. These will include all pertinent items from the applicable methods as well as the MOECC's Operations Manual for Air Quality Monitoring in Ontario (March 2008).

2.1 Quality Assurance Program

ORTECH personnel, trained and proficient in these methods, will be responsible for the collection of samples and will follow applicable Standard Operating Procedures and/or instrument manuals. Table 6 lists the various QA/QC measures.

Table 6
QA/QC Measures

Activity	Measure
Sampling Apparatus	• Calibration of equipment at appropriate intervals • Flow checks before and after each sample interval (±10% criterion)
Sample Collection	• All sample periods will start at midnight • Collection at 1.5 to 2.0 meters above ground (2.5 meters for TSP/Metals) • All samples will be collected simultaneously • Field blank collection media (20% of samples) will be utilized that are handled and analyzed in the same manner as regular samples (without air flow) to assess any detectable contamination. Field blanks are not applicable for VOCs collected in canisters • Provision for MOE to conduct audits
Sample Control	• Precautionary measures will be followed during the collection/storage/transfer of samples prior to analysis to maintain sample integrity, along with proper sample identification, and recording procedures • Storage in climate controlled, organic solvent free environment • Shipment to lab via courier in protective cases within 3 days of exposure
Sample Analysis	• Use of CALA accredited laboratories • Documented methods and procedures
Record Keeping	• All sampling media/canisters will have unique identification numbers • Use of field Sampling Logs to record: sample canister I.D., sample train I.D., operator's name and signature, sample location, date and time, sample start and stop times, analysis requirement, sample flows, weather observations, and other information or observations (odours, nearby activities with potential impact, etc.) • Chain of Custody forms for sample tracking (sample placement, collection times, sample identification numbers)

3. Reporting

Analytical results will be reported as soon as possible to Clean Harbors and will include all applicable QA/QC and meteorological information. These data will be summarized in tables and compared to applicable air quality standards and AAQC.

An annual summary report will be prepared after the final set of monitoring data is received from the contract laboratory. Unless otherwise required, the report will include a description of the measurement procedures along with specific data and summarized tabulations such as:

- A summary of the various measurement results collected each sampling location;
- Summaries of the meteorological data, including wind speed and direction, acquired for each sample interval;
- Comparison of the various constituents to applicable twenty-four hour air quality standards or AAQC; and
- Electronic copy of time stamped (Eastern Standard) constituent measurements and meteorological data.

All data (uncensored, but flagged as appropriate) will be made available in electronic format and will include any recorded local meteorological data.

4. Annual Program Review

The MOECC and Clean Harbors will review the results of the sampling program each year and, based upon this review of the data, the program will be re-evaluated for the following year. This review will include the measurement frequency and scheduling as well as the target compound list and sampling locations. This program may change in the future as the understanding of the monitoring data and the proposed landfill expansion evolves. Any proposed modifications to the air monitoring program will be submitted to the Regional Director of the MOECC for approval prior to implementation.

Rod Brooks
Sarnia Manager

APPENDIX B– Data for 24-hour Samples

Table B-1 - 24-hr VOC Data

Substance Name	CAS#	NVOC-01 A	SVOC-01 A	NVOC-02 B	SVOC-02 A	NVOC-03A	SVOC-03A	NVOC 04	SVOC 04 A	NVOC-05	SVOC-05	NVOC-06 A
	Location	NORTH	SOUTH	NORTH	SOUTH	NORTH	SOUTH	NORTH	SOUTH	NORTH	SOUTH	NORTH
	Date Sampled	May 5, 2022	May 5, 2022	May 17, 2022	May 17, 2022	May 29, 2022	May 29, 2022	June 10, 2022	June 10, 2022	June 22, 2022	June 22, 2022	July 4, 2022
Carbon Tetrachloride	56-23-5	0.65	0.10	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Isopropyl Alcohol	67-63-0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Acetone	67-64-1	5.6	3.0	5.0	7.6	9.5	8.3	9.3	12.4	15.4	14.5	14.7
Chloroform	67-66-3	0.49	0.10	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
Benzene	71-43-2	0.32	0.61	0.16	0.83	0.64	0.16	0.45	0.42	0.16	0.16	0.35
1,1,1-Trichloroethane	71-55-6	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Vinyl Chloride	75-01-4	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
Dichloromethane	75-09-2	0.35	0.10	0.35	0.97	0.35	0.35	0.35	0.35	0.35	0.35	0.35
1,1-Dichloroethane	75-34-3	0.41	0.10	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
1,1-Dichloroethene	75-35-4	0.40	0.10	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Chlorodifluoromethane	75-45-6	0.36	0.10	0.92	0.85	1.20	0.99	0.36	0.36	0.36	0.36	0.36
Trichlorofluoromethane	75-69-4	0.6	0.6	1.2	1.2	1.4	1.4	1.3	2.6	1.3	1.2	0.6
Dichlorodifluoromethane	75-71-8	1.9	0.4	2.2	2.2	2.3	2.0	2.5	2.5	2.6	2.5	2.2
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2-Methyl Butane	78-78-4	0.30	17.70	1.53	1.50	1.68	1.50	1.24	3.13	1.30	1.71	1.39
1,2-Dichloropropane	78-87-5	0.46	0.10	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
MEK	78-93-3	0.30	1.35	0.30	16.10	2.03	0.77	0.94	1.18	1.83	1.50	3.27
Trichloroethene	79-01-6	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Naphthalene	91-20-3	1.30	1.30	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.94
o-Xylene	95-47-6	0.44	3.90	0.22	0.96	0.87	0.22	0.22	0.22	0.22	0.22	0.22
1,2-Dichlorobenzene	95-50-1	0.60	0.10	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
1,2,4-Trimethylbenzene	95-63-6	0.5	3.1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
3-Methyl Pentane	96-14-0	0.35	6.02	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
p-Cymene	99-87-6	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Ethyl Benzene	100-41-4	0.44	0.74	0.22	2.65	1.56	0.22	0.22	0.22	0.22	0.22	0.22
Styrene	100-42-5	0.43	0.43	0.43	1.11	0.43	0.43	0.43	0.43	0.43	0.43	0.43
1,4-Dichlorobenzene	106-46-7	0.60	0.10	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
1,2-Dibromoethane	106-93-4	0.75	0.10	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
1,2-Dichloroethane	107-06-2	0.41	0.10	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
2-Propenenitrile	107-13-1	0.22	0.10	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
2-Methyl Pentane	107-83-5	0.35	10.50	0.35	0.35	0.35	0.35	0.35	1.23	0.35	0.35	0.35
MIBK	108-10-1	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
m/p-Xylene	108-38-3/106-42-3	0.9	11.6	0.4	5.2	2.7	0.4	0.4	1.4	0.4	0.4	1.2
1,3,5-Trimethylbenzene	108-67-8	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
Toluene	108-88-3	0.4	12.2	0.5	12.2	3.8	0.8	1.8	3.0	1.5	1.9	4.2
Chlorobenzene	108-90-7	0.46	0.10	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
Hexane	110-54-3	0.35	7.76	0.35	0.35	0.35	0.35	1.09	1.16	0.35	0.74	0.35
Cyclohexane	110-82-7	0.35	0.32	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
Nonane	111-84-2	0.50	1.10	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
1,2,4-Trichlorobenzene	120-82-1	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Tetrachloroethene	127-18-4	0.70	0.80	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	4.27
Ethyl Acetate	141-78-6	0.36	0.10	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
Heptane	142-82-5	0.41	2.91	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
1,2-Dichloroethene (Cis)	156-59-2	0.40	0.10	0.40	0.87	0.40	0.40	0.40	0.40	0.40	0.40	0.40
1,2-Dichloroethene (Trans)	156-60-5	0.40	0.10	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
1,2,3-Trimethylbenzene	526-73-8	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
3-Methyl Hexane	589-34-4	0.41	5.24	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
2-Ethyl Toluene	611-14-3	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49

Non-detects reported as half of the detection limit.

Substance Name	CAS#	NVOC-07A	SVOC-07A	NVOC-08 A	SVOC-08 A	NVOC-09A	SVOC-09A	NVOC-10A	SVOC-10A	NVOC-11A	SVOC-11	NVOC-12A	SVOC-12A
	Location	NORTH	SOUTH	NORTH	SOUTH	NORTH	SOUTH	NORTH	SOUTH	NORTH	SOUTH	NORTH	SOUTH
	Date Sampled	July 16, 2022	July 16, 2022	July 28, 2022	July 28, 2022	August 9, 2022	August 9, 2022	August 21, 2022	August 21, 2022	September 2, 2022	September 2, 2022	September 14, 2022	September 14, 2022
Carbon Tetrachloride	56-23-5	0.65	0.65	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Isopropyl Alcohol	67-63-0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Acetone	67-64-1	11.4	11.2	8.6	10.0	7.8	7.4	9.5	10.0	10.0	10.7	10.0	12.1
Chloroform	67-66-3	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
Benzene	71-43-2	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.38	0.32	0.16	1.02	0.89
1,1,1-Trichloroethane	71-55-6	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Vinyl Chloride	75-01-4	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
Dichloromethane	75-09-2	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	13.10
1,1-Dichloroethane	75-34-3	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
1,1-Dichloroethene	75-35-4	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Chlorodifluoromethane	75-45-6	0.78	0.92	0.43	0.43	0.92	0.92	0.85	0.92	0.36	0.39	0.36	0.36
Trichlorofluoromethane	75-69-4	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	1.3	1.3
Dichlorodifluoromethane	75-71-8	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.3	1.4	1.5
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	0.75	0.75	0.77	0.77	0.77	0.77	0.75	0.75	0.75	0.75	0.75	0.75
2-Methyl Butane	78-78-4	1.48	2.95	1.18	1.24	0.65	1.71	2.66	2.71	0.62	1.80	1.77	1.92
1,2-Dichloropropane	78-87-5	0.46	0.46	0.46	0.46	0.46	0.46	0.45	0.45	0.45	0.45	0.45	0.45
MEK	78-93-3	1.65	1.89	0.94	1.18	14.90	1.53	1.71	1.30	4.07	1.12	1.15	2.12
Trichloroethene	79-01-6	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.55	0.55	0.55	0.55
Naphthalene	91-20-3	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	2.78	0.26	2.99	2.94
o-Xylene	95-47-6	0.22	0.52	0.22	0.22	0.69	0.22	0.22	0.22	0.61	0.22	0.87	0.96
1,2-Dichlorobenzene	95-50-1	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
1,2,4-Trimethylbenzene	95-63-6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.0
3-Methyl Pentane	96-14-0	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
p-Cymene	99-87-6	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Ethyl Benzene	100-41-4	0.22	0.52	0.22	0.22	0.69	0.22	0.22	0.22	0.52	0.22	0.22	0.22
Styrene	100-42-5	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	1.83	1.87
1,4-Dichlorobenzene	106-46-7	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
1,2-Dibromoethane	106-93-4	0.75	0.75	0.77	0.77	0.77	0.77	0.75	0.75	0.75	0.75	0.75	0.75
1,2-Dichloroethane	107-06-2	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
2-Propenenitrile	107-13-1	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
2-Methyl Pentane	107-83-5	0.35	0.99	0.35	0.35	0.35	0.35	0.35	0.85	0.35	0.35	0.35	0.92
MIBK	108-10-1	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
m/p-Xylene	108-38-3/106-42-3	0.4	1.5	0.4	1.0	2.5	0.4	0.4	1.1	2.0	0.4	0.4	0.4
1,3,5-Trimethylbenzene	108-67-8	0.49	0.49	0.49	0.49	0.49	0.49	0.50	0.50	0.50	0.50	0.50	0.50
Toluene	108-88-3	1.4	2.9	1.9	1.0	2.8	1.3	1.9	1.9	3.1	1.4	1.9	12.3
Chlorobenzene	108-90-7	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
Hexane	110-54-3	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
Cyclohexane	110-82-7	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.93	0.35
Nonane	111-84-2	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
1,2,4-Trichlorobenzene	120-82-1	0.75	0.75	0.74	0.74	0.74	0.74	0.75	0.75	0.75	0.75	2.40	2.30
Tetrachloroethene	127-18-4	0.70	0.70	0.68	0.68	0.68	0.68	0.70	0.70	0.70	0.70	0.70	0.70
Ethyl Acetate	141-78-6	0.36	0.36	0.94	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
Heptane	142-82-5	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
1,2-Dichloroethene (Cis)	156-59-2	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
1,2-Dichloroethene (Trans)	156-60-5	0.40	0.40	0.40	0.40	0.40	0.40	0.48	0.40	0.40	0.40	0.40	0.40
1,2,3-Trimethylbenzene	526-73-8	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
3-Methyl Hexane	589-34-4	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
2-Ethyl Toluene	611-14-3	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49

Non-detects reported as half of the detection limit.

NR = "not-reported" – see e-mail in APPENDIX C.

Table B-2 – 24-hr Carbonyl Data

Compound	CAS No.	NC-04	SC-04	NC-06	SC-06	NC-10	SC-10
	Sample ID	NC-04	SC-04	NC-06	SC-06	NC-10	SC-10
	Location	NORTH	SOUTH	NORTH	SOUTH	NORTH	SOUTH
	Date Sampled	June 10, 2022	June 10, 2022	July 4, 2022	July 4, 2022	August 21, 2022	August 21, 2022
	Duration (min):	24.01	23.48	23.88	23.58	23.99	24.01
	Volume (m^3)	1.57	1.42	1.43	1.43	1.41	1.45
Formaldehyde	50-00-0	3.2E+00	3.5E+00	1.4E+00	1.3E+01	7.1E-01	5.5E+00
Acetone	67-64-1	6.3E-01	7.1E-01	7.0E-01	7.0E-01	7.1E-01	6.9E-01
Acetaldehyde	75-07-0	3.2E+00	3.5E+00	7.0E-01	7.0E-01	7.1E-01	5.5E+00
Benzaldehyde	100-52-7	6.3E-01	7.1E-01	7.0E-01	7.0E-01	7.1E-01	6.9E-01
Acrolein	1070-20-8	6.3E-01	7.1E-01	7.0E-01	7.0E-01	7.1E-01	6.9E-01
Glutaraldehyde	111-30-8	6.3E-01	7.1E-01	7.0E-01	7.0E-01	7.1E-01	6.9E-01
Propionaldehyde (Propanal)	123-38-6	6.3E-01	7.1E-01	7.0E-01	7.0E-01	7.1E-01	6.9E-01
n-Butyraldehyde (n-Butanal)	123-72-3	6.3E-01	7.1E-01	7.0E-01	7.0E-01	7.1E-01	6.9E-01

Non-detects reported as half of the detection limit.

Table B-3 - 24-hr Mercury Data

Compound	CAS No.	NM-04	SM-04	NM-06	SM-06	NM-09	SM-09	NM-04	SM-04
	Vapour Mercury ID	NM-04	SM-04	NM-06	SM-06	NM-09	SM-09	NM-04	SM-04
	Particulate Mercury ID	NTSP-04	STSP-04	NTSP-06	STSP-06	NTSP-09	STSP-09	NTSP-04	STSP-04
	Location	NORTH	SOUTH	NORTH	SOUTH	NORTH	SOUTH	NORTH	SOUTH
	Date Sampled	June 10, 2022	June 10, 2022	July 4, 2022	July 4, 2022	August 9, 2022	August 9, 2022	June 10, 2022	June 10, 2022
	Duration (min):	24	23	24	24	25	24	24	23
	Vapour Mercury Volume (m3)	0.11	0.09	0.10	0.10	0.11	1.43	0.11	0.09
	Particulate Mercury Volume (m3)	1627.88	1591.94	1619.06	1598.72	1526.95	1464.68	1627.88	1591.94
Particulate Mercury	NA-HG-TSP	8.6E-05	1.9E-05	6.8E-04	6.3E-06	5.2E-05	6.8E-06	8.6E-05	1.9E-05
Vapour Mercury	7439-97-6	4.5E-02	4.7E-02	4.0E-02	4.7E-02	4.0E-02	2.7E-03	4.5E-02	4.7E-02
Total Mercury	NA-THG	4.5E-02	4.7E-02	4.1E-02	4.7E-02	4.0E-02	2.7E-03	4.5E-02	4.7E-02

Non-detects reported as half of the detection limit.

Table B-4 - 24-hr Particulate Data

	Sample ID	NTSP-01	STSP-01	NTSP-02	STSP-02	NTSP-03	STSP-03	NTSP-04	STSP-04	NTSP-05	STSP-05	NTSP-06	STSP-06	NTSP-07	STSP-07
	Location	NORTH	SOUTH	NORTH	SOUTH	NORTH	SOUTH	NORTH	SOUTH	NORTH	SOUTH	NORTH	SOUTH	NORTH	SOUTH
	Date Sampled	May 5, 2022	May 5, 2022	May 17, 2022	May 17, 2022	May 29, 2022	May 29, 2022	June 10, 2022	June 10, 2022	June 22, 2022	June 22, 2022	July 4, 2022	July 4, 2022	July 16, 2022	July 16, 2022
	Duration (hrs):	23.34	24.00	23.88	23.49	23.92	23.59	24.01	23.48	23.90	23.67	23.88	23.58	24.00	24.00
	Volume (m^3)	1582.45	1627.20	1619.06	1592.62	1621.78	1599.40	1627.88	1591.94	1620.00	1605.00	1619.06	1598.72	1627.20	1627.20
Compound	**CAS No.**														
Total Suspended Particulate (TSP)	NA-TSP	10	13	11	10	28	23	16	20	37	38	30	38	14	14
Antimony	7440-36-0	3.2E-03	3.1E-03	3.1E-03	3.1E-03	6.8E-04	3.7E-04	1.4E-04	1.4E-04	3.8E-04	3.3E-04	6.8E-04	5.1E-04	1.4E-04	1.4E-04
Arsenic	7440-38-2	1.9E-03	1.8E-03	1.9E-03	1.9E-03	1.2E-03	1.1E-03	4.2E-04	8.2E-04	5.0E-04	5.2E-04	1.2E-03	1.1E-03	5.1E-04	5.2E-04
Barium	7440-39-3	3.0E-03	2.9E-03	1.5E-03	1.8E-03	5.9E-03	3.4E-03	3.3E-03	3.8E-03	9.9E-03	8.1E-03	2.3E-02	1.9E-02	5.0E-03	6.8E-03
Beryllium	7440-41-4	3.2E-04	3.1E-04	3.1E-04	3.1E-04	8.3E-05	8.4E-05	8.3E-05	8.5E-05	8.3E-05	8.4E-05	8.3E-05	8.4E-05	8.3E-05	8.3E-05
Cadmium	7440-43-9	6.3E-04	6.1E-04	6.2E-04	6.3E-04	2.3E-04	6.9E-05	2.8E-05	2.8E-05	6.8E-05	6.9E-05	3.3E-04	6.9E-05	2.8E-05	2.8E-05
Chromium	7440-47-3	1.6E-03	1.5E-03	1.5E-03	1.6E-03	2.2E-03	1.0E-03	1.6E-03	1.6E-03	2.2E-03	2.3E-03	4.4E-03	2.0E-03	1.4E-03	1.2E-03
Cobalt	7440-48-4	6.3E-04	6.1E-04	6.2E-04	6.3E-04	7.4E-04	8.4E-05	8.3E-05	8.5E-05	2.3E-04	2.3E-04	5.9E-04	1.8E-04	8.3E-05	8.3E-05
Copper	7440-50-8	5.4E-02	1.0E-01	4.4E-02	5.9E-02	3.2E-02	5.9E-02	2.3E-02	4.1E-02	2.8E-02	3.6E-02	2.8E-02	4.9E-02	3.1E-02	4.8E-02
Iron	15438-31-0	1.1E-01	3.5E-01	9.3E-02	9.5E-02	3.0E-01	1.7E-01	1.5E-01	1.4E-01	4.2E-01	4.4E-01	4.2E-01	4.6E-01	1.2E-01	1.1E-01
Lead	7439-92-1	1.9E-03	9.2E-04	9.3E-04	9.4E-04	1.3E-02	4.2E-03	1.7E-03	9.4E-04	3.3E-03	2.0E-03	1.5E-02	2.1E-03	1.6E-03	9.8E-04
Manganese	7439-96-5	3.5E-03	5.8E-03	2.4E-03	2.9E-03	1.4E-02	4.6E-03	5.1E-03	4.8E-03	1.5E-02	1.6E-02	2.6E-02	1.9E-02	4.4E-03	4.0E-03
Nickel	7440-02-0	9.5E-04	9.2E-04	9.3E-04	9.4E-04	3.1E-03	6.3E-04	7.4E-04	6.3E-04	1.5E-03	1.3E-03	2.7E-03	1.0E-03	6.8E-04	6.0E-04
Selenium	7782-49-2	3.2E-03	3.1E-03	3.1E-03	3.1E-03	2.5E-03	1.3E-03	2.8E-04	2.8E-04	9.9E-04	8.7E-04	3.1E-03	2.7E-03	8.0E-04	8.0E-04
Thallium	7440-28-0	2.8E-05	2.8E-05	2.8E-05	2.8E-05	2.8E-05	2.8E-05	2.8E-05	2.8E-05	2.8E-05	2.8E-05	2.8E-05	2.8E-05	2.8E-05	2.8E-05
Tin	7440-31-5	3.2E-03	3.1E-03	3.1E-03	3.1E-03	8.0E-04	4.3E-04	2.5E-04	3.1E-04	4.5E-04	5.9E-04	9.9E-04	8.8E-04	3.2E-04	3.2E-04
Vanadium	7440-62-2	1.6E-03	1.5E-03	1.5E-03	3.2E-03	1.5E-03	4.6E-04	6.8E-04	6.9E-04	1.5E-03	1.8E-03	1.8E-03	1.1E-03	2.5E-04	2.0E-04
Zinc	7440-66-6	1.2E-02	3.4E-02	1.0E-02	6.8E-03	2.9E-02	9.4E-03	1.2E-02	1.1E-02	2.2E-02	1.9E-02	5.4E-02	1.6E-02	1.2E-02	9.8E-03

Non-detects reported as half of the detection limit.

Compound	CAS No.	NTSP-08	STSP-08	NTSP-09	STSP-09	NTSP-10	STSP-10	NTSP-11	STSP-11	NTSP-12	STSP-12
	Location	NORTH	SOUTH	NORTH	SOUTH	NORTH	SOUTH	NORTH	SOUTH	NORTH	SOUTH
	Date Sampled	July 28, 2022	July 28, 2022	August 9, 2022	August 9, 2022	August 21, 2022	August 21, 2022	September 2, 2022	September 2, 2022	September 14, 2022	September 14, 2022
	Duration (min):	23.92	23.59	24.58	23.69	23.99	24.01	24.02	23.62	23.90	23.45
	Volume (m^3)	1621.78	1599.40	1526.95	1464.68	1539.64	1609.80	1608.62	1604.21	1512.90	1544.52
Total Suspended Particulate (TSP)	NA-TSP	18	17	9	9	11	11	19	23	20	20
Antimony	7440-36-0	1.4E-04	6.9E-04	1.5E-04	1.5E-04	1.5E-04	1.4E-04	1.4E-04	3.1E-04	1.5E-04	1.5E-04
Arsenic	7440-38-2	4.5E-04	5.1E-04	1.5E-04	1.5E-04	5.5E-04	7.5E-04	5.6E-04	6.2E-04	5.4E-04	5.7E-04
Barium	7440-39-3	4.5E-03	4.2E-03	2.6E-03	1.8E-03	3.5E-03	2.5E-03	4.4E-03	4.1E-03	5.0E-03	4.9E-03
Beryllium	7440-41-4	8.3E-05	8.4E-05	8.8E-05	9.2E-05	8.8E-05	8.4E-05	8.4E-05	8.4E-05	8.9E-05	8.7E-05
Cadmium	7440-43-9	2.3E-04	7.5E-05	2.9E-05	3.1E-05	2.9E-05	2.8E-05	1.3E-04	5.9E-05	7.3E-05	9.1E-05
Chromium	7440-47-3	1.4E-03	1.1E-03	1.2E-03	9.6E-04	1.6E-03	1.1E-03	1.7E-03	1.5E-03	1.4E-03	1.7E-03
Cobalt	7440-48-4	8.3E-05	8.4E-05	8.8E-05	9.2E-05	8.8E-05	8.4E-05	8.4E-05	8.4E-05	8.9E-05	8.7E-05
Copper	7440-50-8	5.9E-03	1.4E-02	3.9E-02	2.4E-02	2.9E-02	6.8E-02	3.2E-02	5.9E-02	2.5E-02	4.1E-02
Iron	15438-31-0	1.7E-01	1.8E-01	7.2E-02	4.2E-02	6.3E-02	5.0E-02	2.2E-01	2.7E-01	2.0E-01	2.0E-01
Lead	7439-92-1	2.8E-03	1.6E-03	1.2E-03	5.3E-04	1.6E-03	8.1E-04	7.5E-03	1.9E-03	1.4E-03	2.1E-03
Manganese	7439-96-5	8.6E-03	7.5E-03	3.6E-03	1.6E-03	2.4E-03	2.2E-03	8.7E-03	8.1E-03	7.3E-03	1.1E-02
Nickel	7440-02-0	9.9E-04	6.3E-04	7.9E-04	5.1E-04	7.8E-04	6.8E-04	1.2E-03	9.4E-04	1.3E-03	2.1E-03
Selenium	7782-49-2	8.6E-04	6.3E-04	2.9E-04	3.1E-04	1.1E-03	8.7E-04	9.3E-04	6.0E-04	3.0E-04	8.4E-04
Thallium	7440-28-0	2.8E-05	2.8E-05	2.9E-05	3.1E-05	2.9E-05	2.8E-05	2.8E-05	2.8E-05	3.0E-05	2.9E-05
Tin	7440-31-5	4.1E-04	5.0E-04	3.2E-04	2.0E-04	3.6E-04	2.9E-04	3.6E-04	5.6E-04	2.4E-04	3.3E-04
Vanadium	7440-62-2	3.5E-04	2.6E-04	2.6E-04	9.2E-05	2.5E-04	2.7E-04	4.5E-04	4.0E-04	2.4E-03	4.4E-03
Zinc	7440-66-6	1.5E-02	1.3E-02	8.5E-03	9.6E-03	1.0E-02	9.3E-03	2.1E-02	1.6E-02	1.2E-02	1.2E-02

Non-detects reported as half of the detection limit.

APPENDIX C– Copy -of E-mail from ALS regarding Isopropyl Alcohol

Terry Lam

From: Gayle Braun <Gayle.Braun@ALSGlobal.com>
Sent: December 5, 2022 1:25 PM
To: Terry Lam
Subject: RE: [EXTERNAL] - Isopropyl Alcohol

Hi Terry, sorry, I did ask about this! We are still using it as a cleaner and do a monthly check in the lab but it is still getting positive results.
Gayle

Gayle Braun
Senior Project Manager, Environmental

C +1 519 421 6566

From: Terry Lam <TLam@ortech.ca>
Sent: Tuesday, November 29, 2022 4:40 PM
To: Gayle Braun <Gayle.Braun@ALSGlobal.com>
Subject: [EXTERNAL] - Isopropyl Alcohol

Hi Gayle,

Just wanted to confirm that Isopropyl Alcohol was still not reported for the Clean Harbors VOC cans due to interferences with cleaning products. Is this still the case?

Thanks,

Terry

Terry Lam, P. Eng.
Senior Project Manager, Ambient Monitoring
ORTECH Consulting Inc.
1133C Vanier Rd., Sarnia, ON N7S 3Y6
Phone: (519) 336-3327
e-mail: ortech@ortechsarnia.ca

APPENDIX D– Electronic Records

- Copies of field data records
- Copies of lab certificates of analysis and Chain of Custody records
- Hourly meteorological data for sampling days (Excel format)
- Appendix B Tables (Excel format)