




COMMUNICATION UPDATE

TO:	Mayor and Members Board of Health
DATE:	September 15, 2023
SUBJECT:	Air Monitoring On-Site Assessment at Green for Life Stoney Creek Regional Facility (City Wide)
WARD(S) AFFECTED:	Ward 9
SUBMITTED BY:	Dr. Elizabeth Richardson, MD, MHSc, FRCPC Medical Officer of Health Public Health Services
SIGNATURE:	

This communication provides the Board of Health with an update concerning the Ministry of Environment Conservation and Parks' (Ministry) actions including an air monitoring onsite assessment at the Green For Life Environmental Stoney Creek Regional Facility (Facility) located at 65 Green Mountain Road West in Stoney Creek (Ward 9) to address public complaints concerning air quality and odours from the Facility on nearby residences.

Summary

As Council is aware, there have been significant community concerns regarding odour from the Green For Life Facility in Stoney Creek. Public Health Services has connected with the Ministry about actions taken, including air quality monitoring.

All air quality measurements provided to date to Public Health Services were below Ministry standards and no violations were found during the August 2023 monitoring survey period. However, odour detected and measured suggests hydrogen sulfide (H₂S) as the most likely source emanating from the leachate pond and the Facility.

There is no imminent public health hazard related to the levels of hydrogen sulfide coming from the site. However, human beings developed a significant aversion to hydrogen sulfide from an evolutionary point of view because the odour warns that food is rotting and can make them ill if eaten. In this case, while air quality standards are not exceeded, the odour can continue to cause stress and impact enjoyment of property and quality of life, including feeling unwell with headaches and nausea.

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OUR Culture: Collective Ownership, Steadfast Integrity, Courageous Change, Sensational Service, Engaged Empowered Employees.

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Recognizing the impacts of the odour detected and measured in the vicinity of the Facility, Public Health Services continues to work with the Ministry as they focus on the Facility taking all available steps to mitigate the odour impacts from the landfill site. The Ministry is continuing to perform air monitoring in areas adjacent to the Facility in the early morning and late evening hours. Public Health Services will review and assess future reported results and will update Council as these assessments are available.

Background

In response to residents' odour complaints and concerns regarding potential contaminants and impacts from odour, Public Health Services staff met with Ministry staff on September 6, 2023 to discuss their findings from the air monitoring on-site and around the Facility in Stoney Creek, Ontario conducted in August 2023.

The Technical Support Section of the West Central Region of the Ministry completed an air monitoring assessment in the vicinity of the Facility over ten different days from August 8 to 29, 2023. The Ministry measured the following compounds: benzene, trichloroethylene, toluene, tetrachloroethylene, chlorobenzene, ethylbenzene, styrene, 1,2,4-trimethylbenzene, naphthalene, Particulate Matter 10 (PM₁₀), Particulate Matter 2.5 (PM_{2.5}), hydrogen sulfide (H₂S), nitrogen oxides (NO_x), carbon monoxide (CO), Total Reduced Sulphur, and sulfur dioxide (SO₂).

Additionally, to further address the odour concerns, the Technical Support Section used a St. Croix Sensory Nasal Ranger (Nasal Ranger) for the measurement and quantification of odour strength in the ambient air.

The data was reviewed by the Ministry's Air Quality Analysts and compared to regulatory air quality guidelines and limits. The Ministry's findings were also independently reviewed by Public Health Services' Environmental Health Consultant.

Odours described as garbage, leachate, musty, natural gas, sweet, sour, wet diaper and urine were identified by Ministry staff. Over the ten days of the survey, odours were noted on five sampling days but only one day had odours that were quantifiable by the nasal ranger which was August 28, 2023. Over the course of all sampling days, the data collection suggests that the leachate pond and the Facility as a likely source of odours.

Most sampling days did not detect any of the 16 compounds listed above. Out of the ten sampling days, toluene, 1,3-dimethylbenzene, hydrogen sulfide (H₂S), and Total Reduced Sulfur were detected on August 28, 2023 at the dog park where the Facility was a likely source. On August 28, the measured concentrations of toluene and 1,3-dimethylbenzene were well below their respective standards (100 to 1000 times below the odour threshold) and unlikely to be the source of the odour. Although both Total Reduced Sulfur and hydrogen sulfide (H₂S) were below their respective 10-minute

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Ambient Air Quality Criteria of $13\mu\text{g}/\text{m}^3$, a measurable concentration of hydrogen sulfide (H_2S) was detected and most likely the source of the odour.

Hydrogen sulfide (H_2S) is a colourless gas with a characteristic odour of rotten eggs that is unpleasant to smell and can be generated in landfills. Often, people can smell hydrogen sulfide (H_2S) at low concentrations in air ranging from 0.0005 to 0.3 parts per million (ppm)¹ varying from person to person depending on individual sensitivities, age, health status, and the conditions under which the odour is measured.²

Exposure to low concentrations of hydrogen sulfide (H_2S) may cause headaches, tiredness, and nausea.¹ Inhaling a disagreeable odour usually causes tightening of the facial muscles, a usual response when handling something very disagreeable. Tightening facial muscles over a period of time leads to a tension headache, which for some also leads to nausea. The production of headaches and nausea are common for those not used to the disagreeable odour. The Ministry has recognized this and has chosen an airborne limit which will satisfy many people but not all. Even at the Ministry exposure limits, those most sensitive to the odour will still perceive it and may suffer headaches. It is important to point out that hydrogen sulfide (H_2S) has not been known to cause cancer.³

¹ Agency for Toxic Substances and Disease Registry (ATSDR). 2016. Hydrogen Sulfide Fact Sheet. Available from: <https://www.atsdr.cdc.gov/toxfags/tfacts114.pdf>

² Bay of Plenty Regional Council Environmental Publication 2012/06. 2012. A review of odour properties of H_2S - Odour Threshold Investigation 2012. Available from: https://www.boprc.govt.nz/media/275614/a_review_of_odour_properties_of_h2s_-_odour_threshold_investigation_2012.pdf

³ Canadian Centre for Occupational Health and Safety (CCOHS), 2023. Hydrogen Sulfide. Available from: https://www.ccohs.ca/oshanswers/chemicals/chem_profiles/hydrogen_sulfide.html

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Consistent with information shared by council regarding community lived experience with the odour impacting the quality of life^{4,5,6,7} of residents within the vicinity of the Facility, research confirms that exposure to a strongly disagreeable odour can trigger an individual's stress response.⁸ This supports the importance of the Ministry using all available routes to reduce odour emissions from the Facility.

The Ministry is performing additional air monitoring to address the community's concerns regarding increased odours during the evening and early morning hours. Public Health will continue to review and assess these results and will update Council once the results are received and assessed.

Should you require further information about this Communication Update, please do not hesitate to contact Matthew Lawson, Manager, Health Hazards and Vector Borne Diseases Program at Ext. 5823 or matthew.lawson@hamilton.ca.

APPENDICES AND SCHEDULES ATTACHED

Appendix "A" to Board of Health Communication Update: (2023-09-15) Green For Life Environmental August 2023 Air Monitoring On-Site Assessment Survey, Stoney Creek, Ontario (Ministry of the Environment, Conservation and Parks)

⁴ Aatamila M., Verkasalo P. K., Korhonen M. J., Suominen A. L., Hirvonen M. R., Viluksela M. K., et al. 2011 Odour annoyance and physical symptoms among residents living near waste treatment centres Environ Res 111 1 164 -170 Available from: <https://pubmed.ncbi.nlm.nih.gov/21130986/>

⁵ Baldacci S., Maio S., Martini F., Silvi P., Sarno G., Cerrai S., et al. 2015 Odor annoyance perception and health effects in an Italian general population sample Eur Respir J PA1115 Available from: https://erj.ersjournals.com/content/46/suppl_59/PA1115

⁶ Blanes-Vidal V. 2015 Air pollution from biodegradable wastes and non-specific health symptoms among residents: Direct or annoyance-mediated associations? Chemosphere 120 371 -377 Available from: <https://pubmed.ncbi.nlm.nih.gov/25192839/>

⁷ Hooiveld M., van Dijk C. E., van der Sman-De Beer F., Smit L. A. M., Vogelaar M., Wouters I. M., et al. 2015 Odour annoyance in the neighbourhood of livestock farming – Perceived health and health care seeking behaviour Ann Agric Environ Med 22 1 55 -61 Available from: <https://pubmed.ncbi.nlm.nih.gov/25780829/>

⁸ Hirasawa Y., Shirasu M., Okamoto M., and Touhara K. 2019 Subjective unpleasantness of malodors induces a stress response Psychoneuroendocrinology 106 206 -215 Available from: <https://www.sciencedirect.com/science/article/abs/pii/S0306453018312125>

Ministry of the Environment,
Conservation and Parks
Drinking Water and Environmental
Compliance Division
West Central Region

Ministère de l'Environnement de la
Protection de la nature et des Parcs
Division de la conformité en matière
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September 1, 2023

MEMORANDUM

RE: **GFL Environmental August 2023 Air Monitoring On-Site
Assessment Survey, Stoney Creek, Ontario**

At the request of the Hamilton District Office of the Ontario Ministry of the Environment, Conservation and Parks, the Technical Support Section of West Central Region (WCR) conducted an odour and HAPSITE assessment of the Green for Life (GFL) Environmental Stoney Creek Regional Facility (the Facility) in Stoney Creek, Ontario in August 2023.

Complaints had been received from nearby locations regarding odour impacts on their properties. The purpose of the monitoring survey was to address the complaints and identify the air-quality impacts from the Facility on the nearby residences. In August 2023 Technical Support Section (TSS) was onsite over ten (10) sampling days/ events. The results collected during these sampling days are presented in this memo.

Summary of Activities

The Technical Support Section deployed their mobile monitoring vehicle equipped with the Inficon HAPSITE ER Chemical Identification System (HAPSITE), a portable Gas Chromatography/Mass Spectrometer (GC/MS) unit for the measurement of volatile organic compounds (VOC). The HAPSITE is a discrete sampling system that draws a known volume of air (250 mL) into the GC/MS over 2 minutes, followed by analysis for approximately ten minutes. Once the analysis is complete, another discrete sample is taken. The HAPSITE was calibrated to identify and quantify the suite of compounds listed below:

- Benzene
- Trichloroethylene
- Toluene
- Tetrachloroethylene

- Chlorobenzene
- Ethylbenzene
- Styrene
- 1,2,4-trimethylbenzene
- Naphthalene

The measured concentrations measured by the HAPSITE are over a 2-minute period and are therefore not directly comparable to many standards since they use different averaging periods. However, they can still be compared against for reference purposes to gain an understanding of the approximate range of concentrations being measured compared to these standards.

Other compounds (PM₁₀, PM_{2.5}, H₂S, NO_x, CO, TRS and SO₂) were also measured continuously.

The Technical Support Section used a St. Croix Sensory Nasal Ranger (Nasal Ranger) for the measurement and quantification of odour strength in the ambient air. The Nasal Ranger measures and quantifies odour strength via the "Dilution-to-Threshold" (D/T) ratio in ambient air. All odour measurements were reported in D/T, which is a measure of the number of dilutions needed to make the odorous ambient air "not-detectable". During the odour assessment, staff recorded the D/T ratio from the Nasal Ranger and described the odour at each sampling location. The D/T ratios used by the nasal ranger are as follows ranging from least odorous to most odorous: No odour, <2, 2, 4, 7, 15, 30 and 60. Results are presented in ranges. A D/T<2 means an odour was detected by the technician without equipment but was not quantifiable by the nasal ranger.

Staff were trained before the start of the odour assessment. The pre-calibration involves determining an individual's olfactory sensitivity by using several odour pens, which contain different amounts of a standard odourant, n-butanol. The combination of standard presentation methods and statistical analysis makes this test a reliable method of measuring individual olfactory sensitivity. Individuals who have a hypersensitive odour threshold or conversely individuals who have an underwhelming odour threshold would not qualify to use the Nasal Ranger with any accuracy.

Data from the on-site meteorological tower STN29247 was used to determine wind data.

The GFL Facility and surrounding area are shown in Figure 1.

Survey Results

Survey locations, HAPSITE measurements, wind roses generated from station STN29247 for each of the sampling days are shown in the Figures 2-11. General conclusions and observations are summarized in this section.

Most sampling days did not detect any of the HAPSITE compounds (list of compounds listed in the previous section) or other compounds (PM₁₀, PM_{2.5}, H₂S, NO_x, CO, TRS and SO₂).

August 8, 2023 (15:15 – 17:30)

HAPSITE compounds and other compounds were not detected on this sampling day. The technician detected a slight odour at 15:30 but could not be quantified using the nasal ranger (D/T<2). Winds were also blowing from the west where the leachate pond was upwind and a probable source. The technician did not detect odours from other sampling locations including those downwind of the GFL Facility.

August 9, 2023 (9:00 – 10:00)

HAPSITE compounds and other compounds were not detected on this sampling day. No odours were detected by the technician. Winds were blowing from the west where the GFL Facility was upwind of one sampling location.

August 10, 2023 (8:45 – 10:15)

HAPSITE compounds and other compounds were not detected on this sampling day. No odours were detected by the technician. Winds were blowing from the south to southwest where the Facility was upwind of most sampling locations.

August 16, 2023 (13:42 – 16:49)

HAPSITE compounds and other compounds were not detected on this sampling day. No odours were detected by the technician. Winds were generally blowing from the southwest where the Facility was upwind of a few sampling locations.

August 17, 2023 (14:00 – 16:21)

HAPSITE compounds and other compounds were not detected on this sampling day. No odours were detected by the technician. Winds were generally blowing from the south-southwest where the Facility and leachate pond was upwind of most sampling locations.

August 21, 2023 (12:30 – 14:55)

HAPSITE compounds and other compounds were not detected on this sampling day. No odours were detected by the technician. Winds were generally blowing from the northeast where the Facility was upwind.

August 24, 2023 (11:30 – 15:18)

HAPSITE compounds and other compounds were not detected on this sampling day. The technician detected a wet diaper/ urine/ portable toilet odour at a sampling location somewhat downwind of the leachate pond which may have been an odour source. The odour could not be quantified using the nasal ranger (D/T<2). Winds were generally blowing from the northwest to north where the sampling points were downwind of residential, the leachate pond and the GFL Facility.

August 25, 2023 (10:38 – 16:05)

HAPSITE compounds and other compounds were not detected on this sampling day. Garbage, leachate, musty and natural gas odours were detected by the technician at a single location south where the leachate pond was upwind and a probable source. The odour could not be quantified using the nasal ranger ($D/T < 2$). Odours were not detected at other samples south of the GFL Facility. Winds were generally blowing from the north and northwest where the Facility was upwind.

August 28, 2023 (12:33 – 15:03)

Figures can be found at the end of the memo. However, Figure 10 has been included in this since measurable concentrations were detected on this day.

Odour Survey

An odour survey was conducted from 12:43 to 15:18:

- Location 1 (dog park) - D/T ratios as high as $7 < D/T < 15$ were observed with odours that can be described as garbage, leachate, sweet, sour and sulphur smelling.
- Location 2 (Mellenby St.) – D/T ratios < 2 were observed with odours that can be described as garbage, leachate, sour and sulphur smelling
- Location 4 (Lemonyne Pl.) - D/T ratios < 2 were observed with odours that can be described as garbage and sour smelling
- Location 6 (Model Home Parking Lot) - D/T ratios up to $2 < D/T < 4$ were detected with odours that can be described as garbage, sour, leachate smelling.

Winds were blowing from the northeast where the GFL facility is upwind and a potential odour source. The results of the odour survey are summarized in Table 1 below.

Contaminant Survey

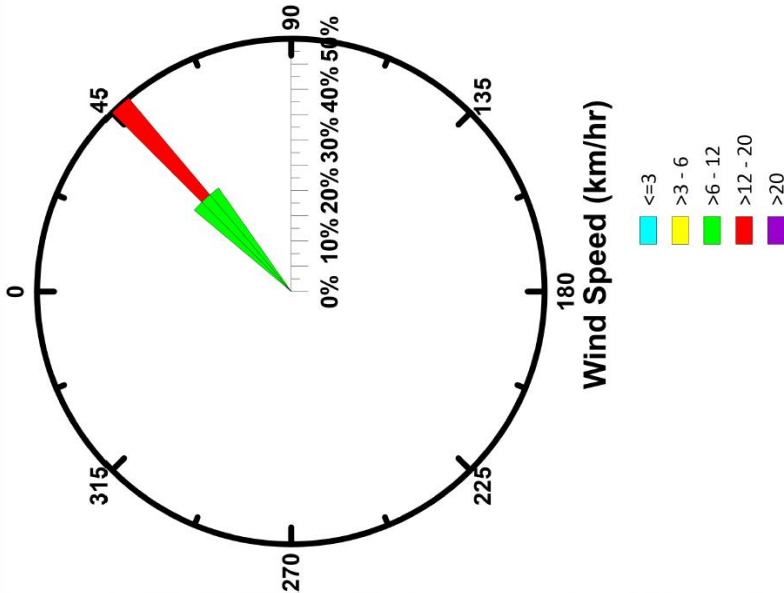
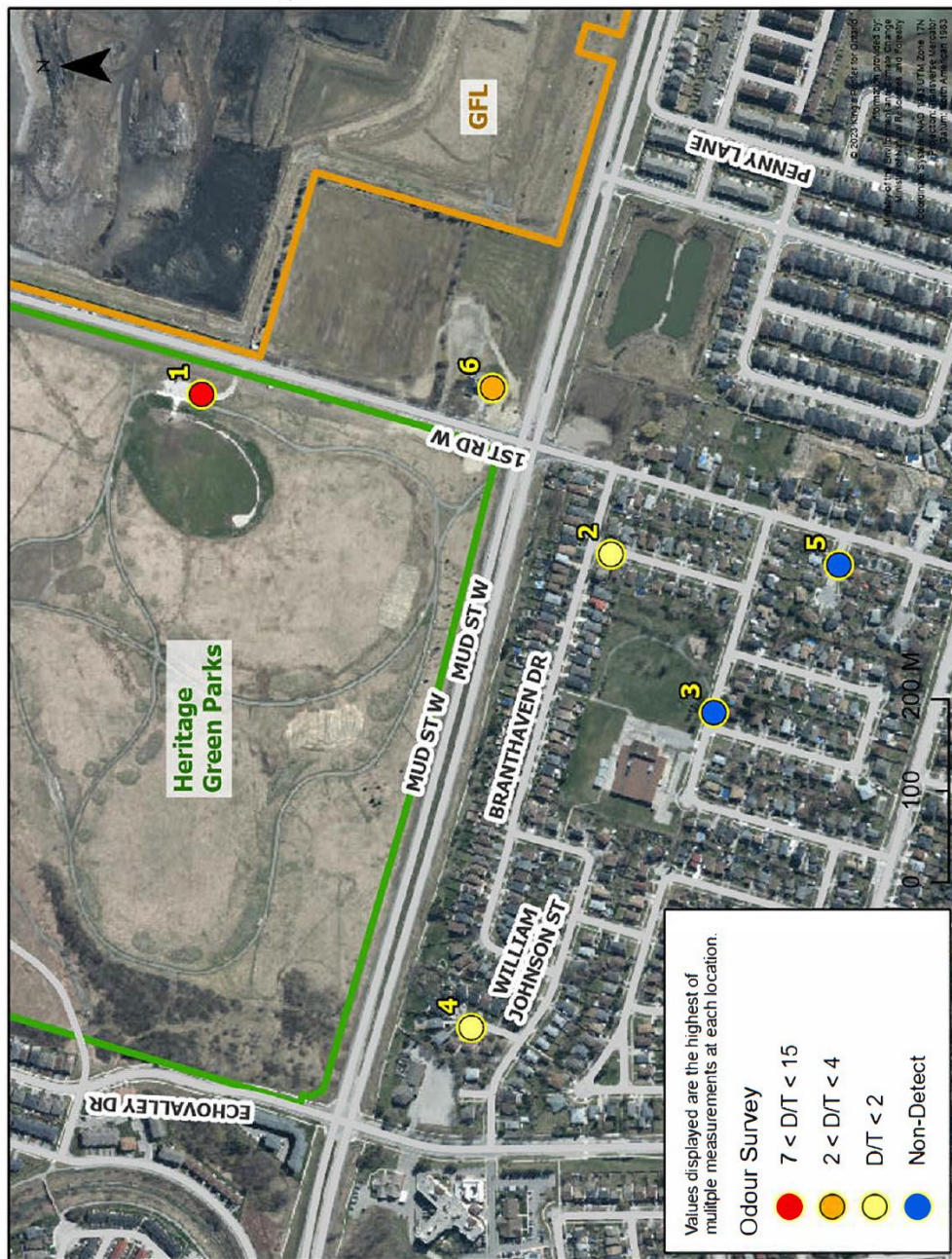
The measured concentrations measured by the HAPSITE are over a 2-minute period and are therefore not directly comparable to many standards since they use different averaging periods. However, they can still be compared against for reference purposes to gain an understanding of the approximate range of concentrations being measured compared to these standards.

Detectable concentrations of toluene, 1,3-dimethylbenzene and hydrogen sulphide were measured from approximately 12:30 to 13:15 at Location 1 (dog park). Table 2 below summarizes the measured concentrations and compares against Emergency Screening Values (ESV) used during emergency response, worker safety standards and Ontario Ambient Air Quality Criteria (AAQC). Measured concentrations of toluene and 1,3-dimethylbenzene were well below all the standards they were compared against.

A hydrogen sulphide (H_2S) concentration of 0.0084ppm or $11.61 \mu g/m^3$ was measured. This was well below the worker safety standards and was close to (but still below) the 10-min (odour-based) AAQC of $13 \mu g/m^3$. Total reduced sulphur (TRS) measured a maximum 10-min average of 5ppb, or $12 \mu g/m^3$ (assuming an equal mixture of the sulphur compounds listed under the AAQC) which was below the 10-min (odour-based) AAQC of $13 \mu g/m^3$. The concentrations of both hydrogen sulphide and TRS were below their respective odour-based AAQCs. Since they are measured continuously, both H_2S and TRS can be compared directly to the 10-min criteria.

Winds were blowing from the northeast where the GFL facility is upwind and a potential odour source. The results of the HAPSITE survey are summarized in Table 2 below.

Figure 10 - GFL Environmental August 2023
Air Monitoring On-Site Assessment Survey - Aug 28, 2023



Date	Time (Location)	Name	HAPSITE Comments:	Other compounds (PM, H ₂ S, Nox, CO or SO ₂)	Odours observations	General Comments
28-Aug-23	12:33	1	Toluene: 8.7 ug/m3 1-3-dimethylbenzene: 3.6 ug/m3	Slightly elevated H2S	Yes	Odour Survey Conducted. Odours detected
	12:55		No Compounds Detected	Measured H2S concentrations as high as 8.4 ppb	Yes	
	13:12		No Compounds Detected		No	
	13:28	2	No Compounds Detected		Yes	
	13:47	3	No Compounds Detected		No	
	14:05	4	No Compounds Detected		Yes	
14:22	5	No Compounds Detected		No		
14:47	6	No Compounds Detected		No		
15:03					Yes	

Table 1 – Odour Survey – August 28, 2023

Sample Number	Sampling Time	Location	D/T	Descriptors
1A	12:43	Dog Park	7 < D/T < 15	Garbage, Leachate, Sweet, Sour, Sulphur
1B	13:01		2 < D/T < 4	Garbage, Leachate, Sour
1C	13:12		4 < D/T < 7	Garbage, Leachate, Sour, Sulphur
1D	13:20		D/T < 2	Garbage, Leachate, Sour
2A	13:28	Mellenby St.	Non-Detect	
2B	13:45		Non-Detect	
2C	13:52		D/T < 2	Garbage, Leachate, Sour, Sulphur
3A	14:05	John Murray St.	Non-Detect	
3B	14:15		Non-Detect	
4A	14:20	Lemonyne Pl.	D/T < 2	Garbage, Sour
4B	14:35		Non-Detect	
5A	14:45	Fuller Ct.	Non-Detect	
5B	15:00		Non-Detect	
6A	15:03		2 < D/T < 4	Garbage, Sour, Leachate
6B	15:18	Model Home Parking Lot	Non-Detect	
Notes:				
Weather Conditions: Mostly Sunny				
Precipitation: None				
Winds blowing from: NE				
Wind speed: Moderate (5-15mph)				
Temperature: 22C				
Relative Humidity: 60%				
Barometric Pressure: 760 mmHg				
General Comments: Arrived on scene around 12:40pm. Drove around Facility. No odour detected upwind on Green Mountain Road West.				
Winds were coming from the NE				
Odour was stronger closer to the Facility. In general, the odour was present throughout sampling at difference levels.				

Table 2 – Summary of VOC Measurements on August 28, 2023

Summary of VOC Measurements on Aug 28, 2023

Contaminant	Sample 1 (12:30 - 13:15)		Ontario Ambient Air Quality Criteria		Emergency Response Emergency Screening Value Thresholds			Ontario Worker Safety Standards		US Department of Labour Occupational Safety and Health Administration (OSHA) Standards		
	µg/m3	µg/m3	µg/m3	µg/m3	1-hr ESV	8-hr ESV	Odour Threshold	Occupational Exposure Limits for Ontario Workplaces	Occupational Exposure Limits for Ontario Workplaces Short-Term Exposure Limit (STEL) ^b	Permissible Exposure Limit (PEL) for General Industry	Acceptable Ceiling Concentration ^b	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift
	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3	ppm	ppm	ppm	ppm	ppm
Toluene	8.70	2000 (24-hr Odour)	793090	7336	2.33E-03	396545	7336	20	---	200	300	500 (10-min)
1,3-dimethylbenzene (m&p-Xylene)	3.60	3000 (10-min Odour)	130000	350	8.36E-04	65000	350	100	150	100	---	---
Hydrogen Sulphide ^e	11.61	13 (10-min Odour)	---	---	8.40E-03	---	---	10	15	---	20	50 (10-min once)
Total Reduced Sulphur ^f	12.01	13 (10-min Odour)	---	---	4.97E-03	---	---	---	---	---	---	---

NOTE:

A - Time-weighted average (TWA) - the time-weighted average concentration of a hazardous substance in the air averaged over an 8-hour workday and a 40-hour workweek to which it is believed that workers may be repeatedly exposed, day after day, for a working lifetime without adverse effects.

B - STEL: maximum airborne concentration of a biological or chemical agent to which a worker may be exposed,

C - TWA is the employee's average airborne exposure in any 8-hour work shift of a 40-hour work week which shall not be exceeded. The 8-hour TWA PEL is the level of exposure established as the highest level of exposure an employee may be exposed to without incurring the risk of adverse health effects

D - Acceptable ceiling concentrations. An employee's exposure to a substance listed in Table Z-2 shall not exceed at any time during an 8-hour shift the acceptable ceiling concentration limit given for the substance in the table, except for a time period, and up to a concentration not exceeding the maximum duration and concentration allowed in the column under "acceptable maximum peak above the acceptable ceiling concentration for an 8-hour shift."

E - Maximum rolling 10-min concentration between 12:33-15:19. Conversion of TRS from ppm to ug/m3 assumed an equal distribution of the compounds listed in the AAQC (dimethyl disulphide, dimethyl sulphide, hydrogen sulphide and mercaptans)

F - Contaminants from the HAPSITE are measured over a 2-min period and are therefore not directly comparable to criteria listed in this table. Hydrogen Sulphide and Total Reduced Sulphur are measured continuously and can be compared to 10-min criteria.

August 29, 2023 (11:40 – 14:30)

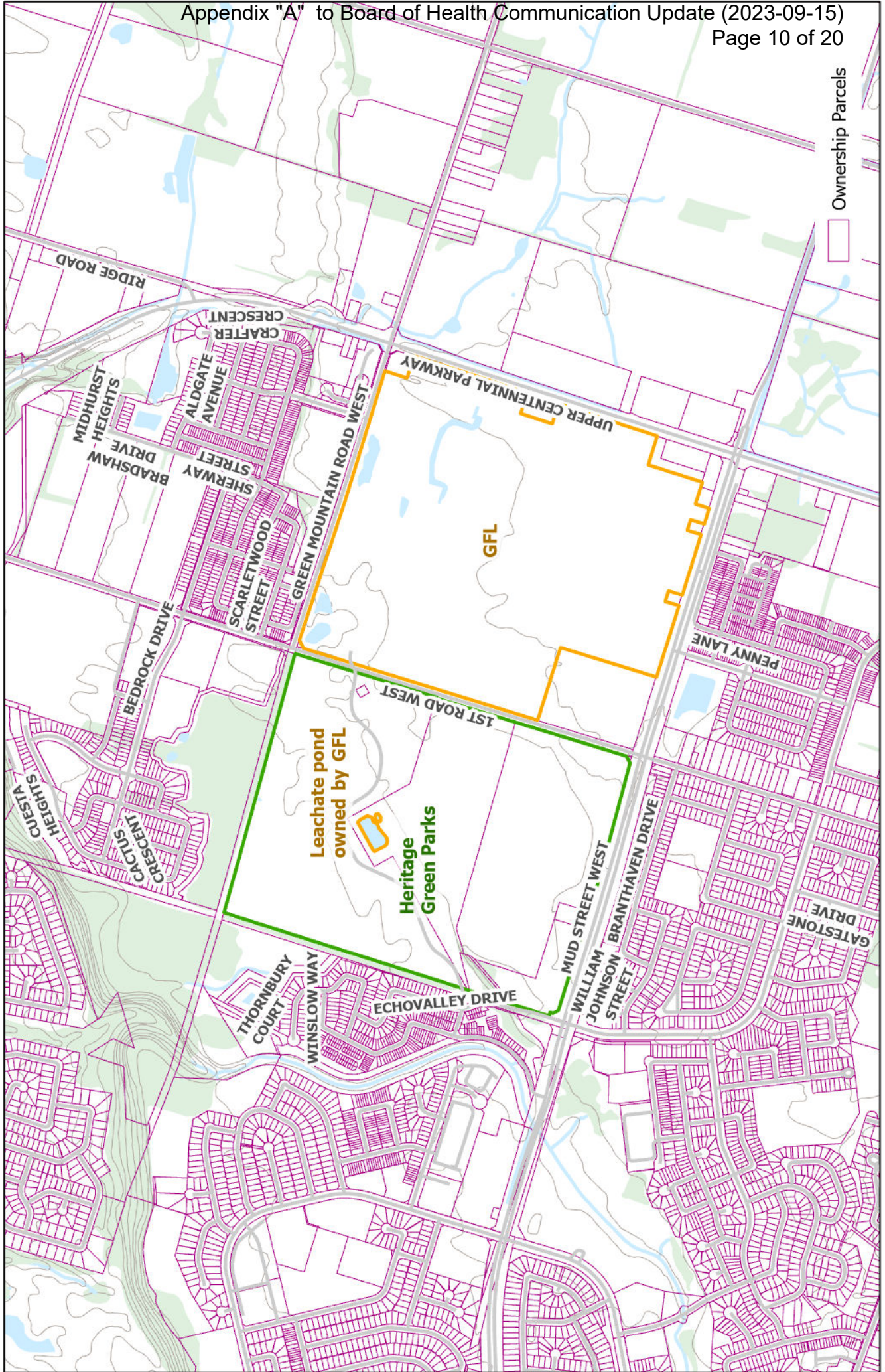
HAPSITE compounds and other compounds were not detected on this sampling day. Sweet, sour and garbage odours were detected by the technician while onsite from various locations. The odours could not be quantified using the nasal ranger ($D/T < 2$). Winds were generally blowing from the southwest where the leachate pond was somewhat upwind and a potential odour source.

Conclusion

The WCR Technical Support Section completed an air monitoring assessment in the vicinity of the GFL Stoney Creek Regional Facility over ten (10) different days in August 2023. Odours described as garbage, leachate, musty, natural gas, sweet, sour, wet diaper and urine were identified. Over the ten (10) days of the surveys, odours were noted on five (5) sampling days but only one (1) day had odours that were quantifiable by the nasal ranger. This day was on August 28, 2023, the nasal ranger identified a D/T ratio as high as $7 < D/T < 15$. Over the course of all sampling days, the survey suggests that the leachate pond and the GFL facility as a likely source of odours.

Most sampling days did not detect HAPSITE compounds or any other compounds. Out of the ten sampling days, toluene, 1,3-dimethylbenzene, hydrogen sulphide and TRS were detected on August 28, 2023 at the dog park where the GFL facility was a likely source. Although not directly comparable, the measured concentrations of toluene and 1,3-dimethylbenzene were below their respective standards. Hydrogen sulphide and TRS were below their respective 10-min AAQCs.

Figures

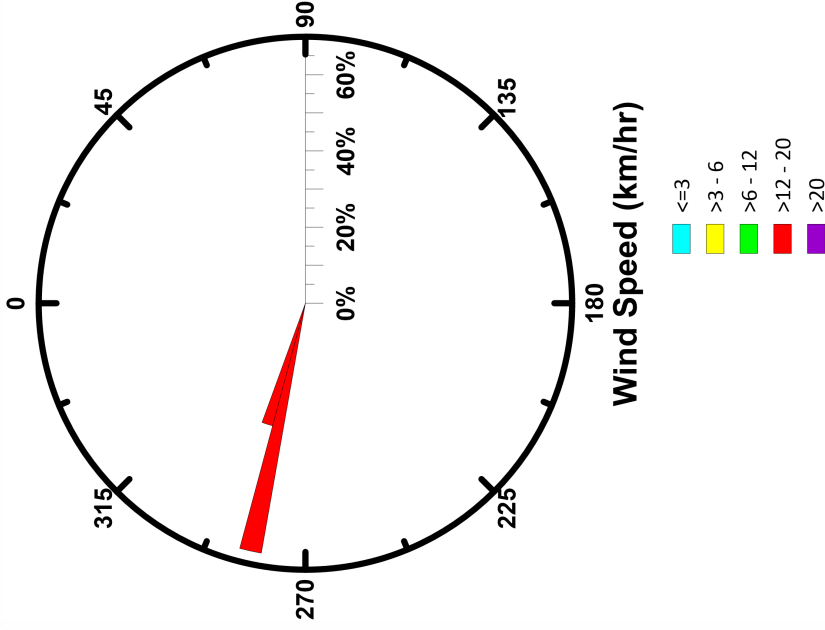
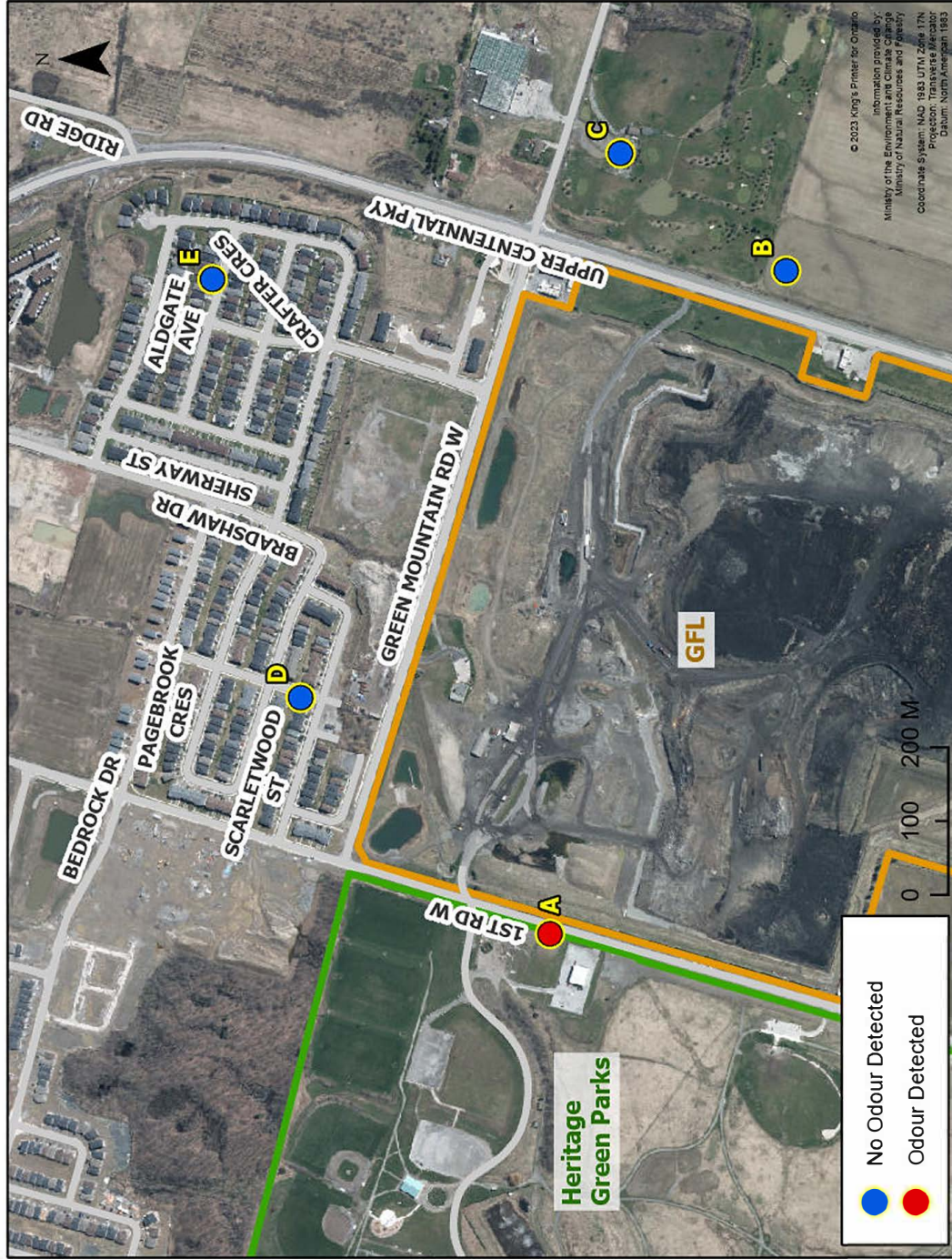


Information provided by:
Ministry of the Environment and Climate Change
Ministry of Natural Resources and Forestry
Coordinate System: NAD 1983 UTM Zone 17N
Projection: Transverse Mercator
Datum: North American 1983

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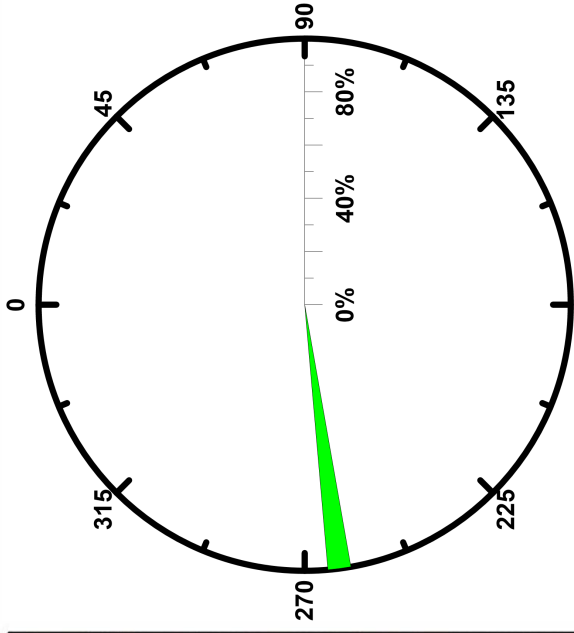
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Figure 2 - GFL Environmental August 2023 Air Monitoring On-Site Assessment Survey - Aug 8, 2023



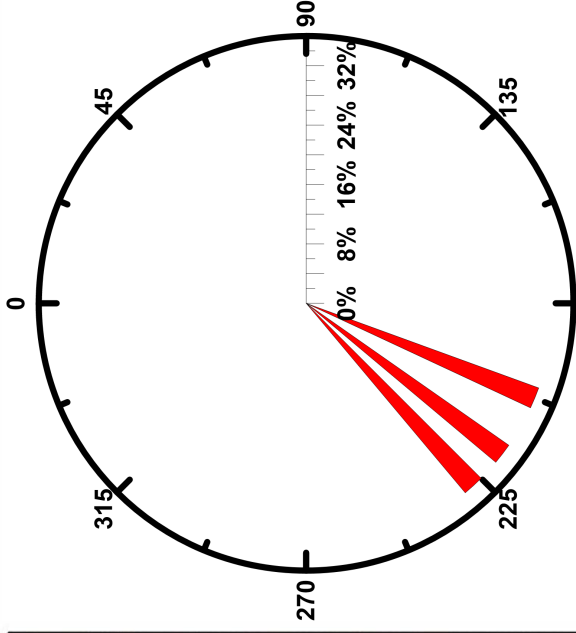
Date	Time (Location)	Name	HAPSITE Comments:	Other compounds (PM, H ₂ S, Nox, CO or SO ₂)	Odours observations	General Comments
08-Aug-23	15:15	A	No Compounds Detected		There was a slight odour coming from the leachate ponds at 15:30	
	15:30					
	15:48					
	16:05	B				
	16:21					
	16:38	C				
	16:54					
	17:15					
	17:30	E				

Figure 3 - GFL Environmental August 2023 Air Monitoring On-Site Assessment Survey - Aug 9, 2023



Date	Time (Location)	Name	HAPSITE Comments:	Other compounds (PM, H ₂ S, Nox, CO or SO ₂)	Odours observations	General Comments
09-Aug-23	9:00	A	No compounds detected	-	No offensive odours	-
	9:20					
	9:30	B				
	9:45					
	10:00	C				

Figure 4 - GFL Environmental August 2023 Air Monitoring On-Site Assessment Survey - Aug 10, 2023



Wind Speed (km/hr)

- <=3
- >3 - 6
- >6 - 12
- >12 - 20
- >20

Date	Time (Location)	Name	HAPSITE Comments:	Other compounds (PM, H ₂ S, Nox, CO or SO ₂)	Odours observations	General Comments
10-Aug-23	8:45	A	No compounds detected	-	No offensive odours	-
	9:00	B				
	9:20	C				
	9:40	D				
	10:00	E				
	10:15	F				

Figure 5 - GFL Environmental August 2023 Air Monitoring On-Site Assessment Survey - Aug 16, 2023



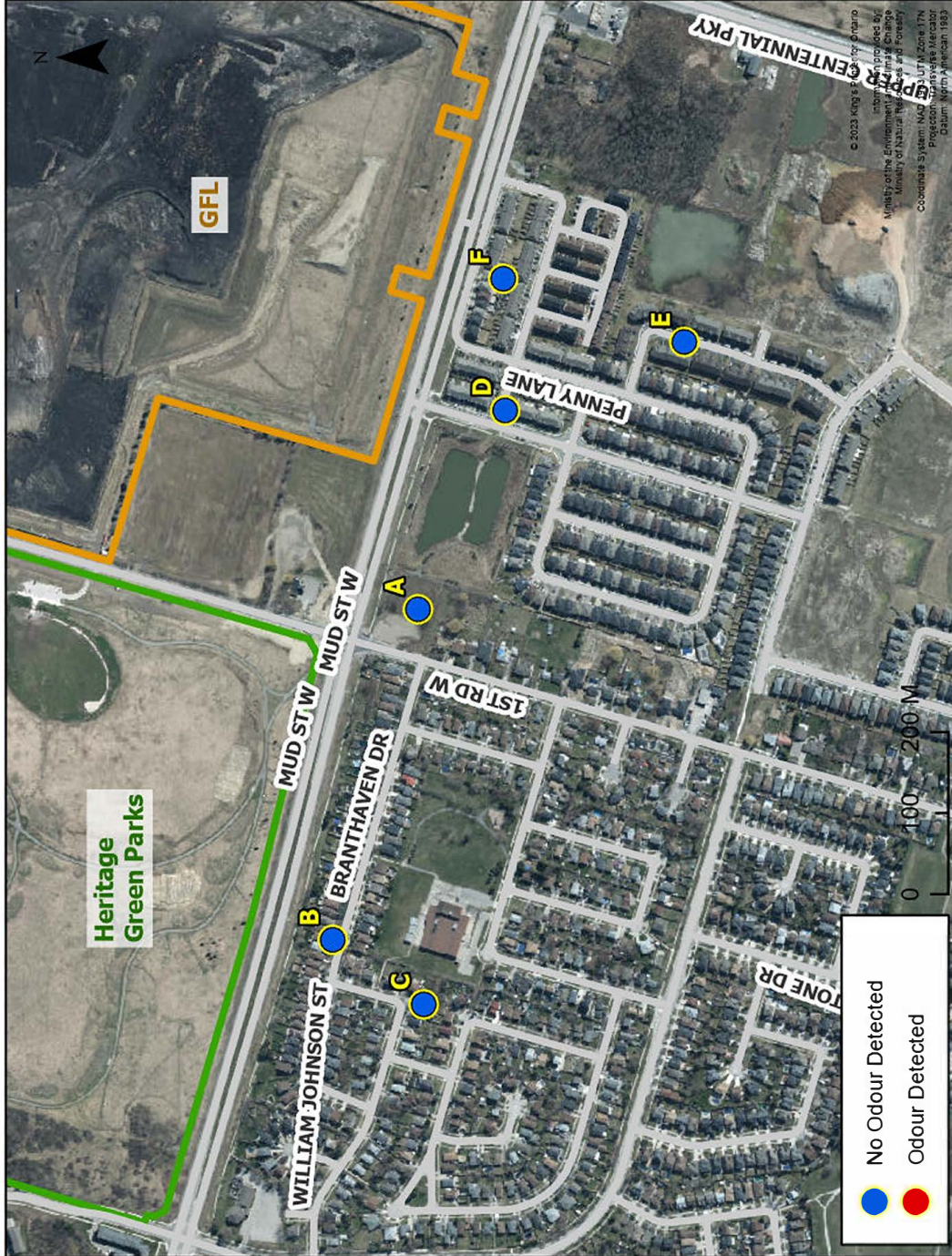
Date	Time (Location)	Name	HAPSITE Comments:	Other compounds (PM, H ₂ S, Nox, CO or SO ₂)	Odours observations	General Comments
16-Aug-23	13:42	A	No compounds detected			
	13:58	B				
	14:21	C				
	14:38	D				
	14:54	E				
	15:12	F				
	15:30	G				
16:02						
16:49						

Figure 6 - GFL Environmental August 2023 Air Monitoring On-Site Assessment Survey - Aug 17, 2023



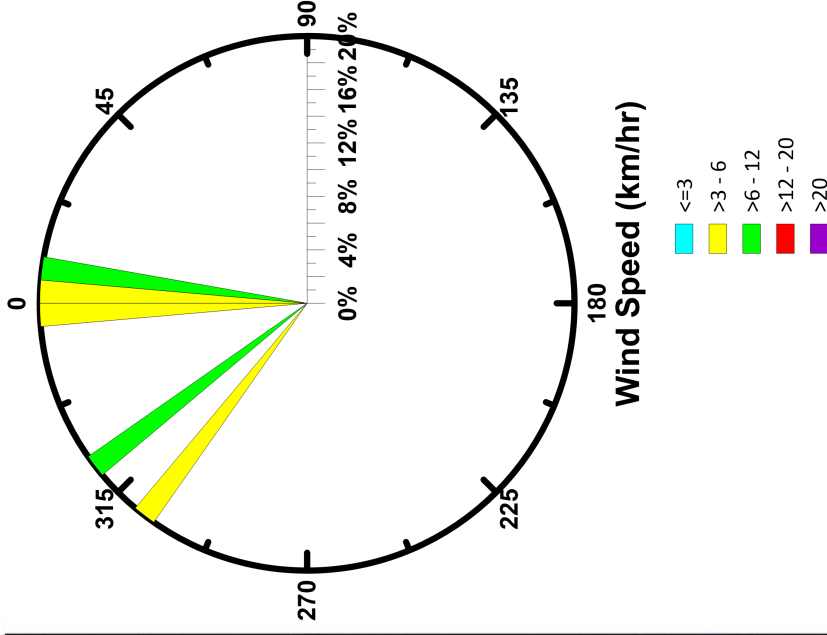
Date	Time (Location)	Name	HAPSITE Comments:	Other compounds (PM, H ₂ S, Nox, CO or SO ₂)	Odours observations	General Comments
17-Aug-23	14:00	A	No compounds detected			
	14:20	B				
	14:40	C				
	14:58	D				
	15:15	E				
	15:30	F				
	16:05	G				

Figure 7 - GFL Environmental August 2023 Air Monitoring On-Site Assessment Survey - Aug 21, 2023



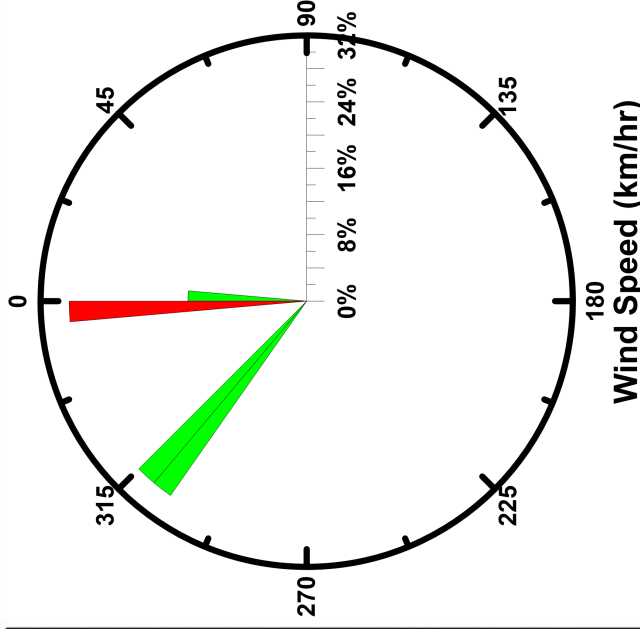
Date	Time (Location)	Name	HAPSITE Comments:	Other compounds (PM, H ₂ S, Nox, CO or SO ₂)	Odours observations	General Comments	
21-Aug-23	12:30	A	No compounds detected	-	-	-	
	12:50						
	13:08						
	13:24	B					
	13:45						C
	14:00						
14:18	D						
14:35		E					
14:55	F						

Figure 8 - GFL Environmental August 2023 Air Monitoring On-Site Assessment Survey - Aug 24, 2023



Date	Time (Location)	Name	HAPSITE Comments:	Other compounds (PM, H ₂ S, NOx, CO or SO ₂)	Odours observations	General Comments
24-Aug-23	11:30	A	No Compounds Detected	-	Yes	Wet diaper, urine/ porta potty odour
	11:45	A				
	12:05	A				
	12:18	A	No Compounds Detected	-	No	-
	12:35	B				
	12:53	B	No Compounds Detected	-	No	-
	13:10	C				
	13:28	C				
	13:45	D	No Compounds Detected	-	No	-
	14:04	E				
	14:20	F	No Compounds Detected	-	No	-
	14:40	G				
	15:00	A	No Compounds Detected	-	Yes	Wet diaper, urine/ porta potty odour
	15:18	A				

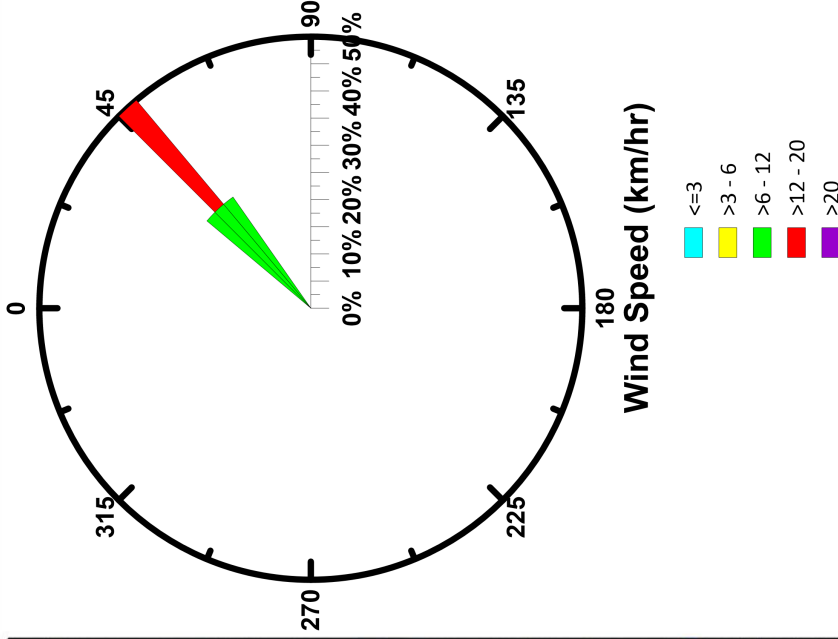
● No Odour Detected
● Odour Detected



Date	Time (Location)	Name	HAPSITE Comments:	Other compounds (PM, H ₂ S, Nox, CO or SO ₂)	Odours observations	General Comments
25-Aug-23	10:38	A	No Compounds Detected	-	No	-
	10:50	A	No Compounds Detected	-	-	-
	11:13	B	No Compounds Detected	-	Yes	Garbage, Leachate, Musty, Natural Gas Odour. Overcast / muggy conditions with moderate wind speeds - 24C
	11:26	B	No Compounds Detected	-	No	-
	14:26	C	No Compounds Detected	-	-	-
	14:42	D	No Compounds Detected	-	-	-
	14:59	E	No Compounds Detected	-	-	-
	15:16	F	No Compounds Detected	-	-	-
15:43	G	No Compounds Detected	-	-	-	
15:49	H	No Compounds Detected	-	-	-	
16:05	H	No Compounds Detected	-	-	-	

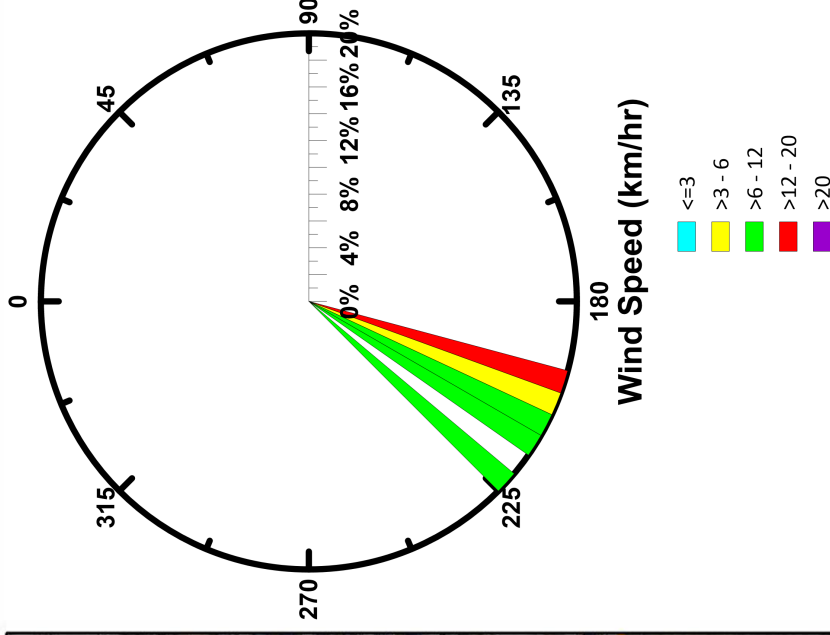
● No Odour Detected
● Odour Detected

Figure 10 - GFL Environmental August 2023 Air Monitoring On-Site Assessment Survey - Aug 28, 2023



Date	Time (Location)	Name	HAPSITE Comments:	Other compounds (PM, H ₂ S, Nox, CO or SO ₂)	Odours observations	General Comments
28-Aug-23	12:33	1	Toluene: 8.7 ug/m ³	Slightly elevated H ₂ S	Yes	Odour Survey Conducted. Odours detected.
	12:55		1-3-dimethylbenzene: 3.6 ug/m ³		Yes	
	13:12		No Compounds Detected		Yes	
	13:28	2	No Compounds Detected	-	No	
	13:47		No Compounds Detected		Yes	
	14:05		No Compounds Detected		No	
14:22	3	No Compounds Detected	-	Yes		
14:47		No Compounds Detected		No		
15:03		No Compounds Detected		Yes		

Figure 11 - GFL Environmental August 2023 Air Monitoring On-Site Assessment Survey - Aug 29, 2023



Date	Time (Location)	Name	HAPSITE Comments:	Other compounds (PM, H ₂ S, Nox, CO or SO ₂)	Odours observations	General Comments	
29-Aug-23	11:40	A	No Compounds Detected	-	No	-	
	12:00	B	No Compounds Detected	-	Yes	Sweet & Sour	
	12:15	C	No Compounds Detected	-	No	-	
	12:30	D	No Compounds Detected	-	Yes	Sweet & Sour	
	12:50	E	No Compounds Detected	-	No	-	
	13:15	F	No Compounds Detected	-	No	-	
	13:40	G	No Compounds Detected	-	Yes	Sweet & Sour	
	13:57	H	No Compounds Detected	-	No	-	
	14:13						
	14:30			No Compounds Detected	-	Yes	Garbage