Supporting Document 3-1

Air Quality and Odour Effects Assessment Report

Eastern Ontario Waste Handling Facility Future Development Environmental Assessment

GFL Environmental Inc.

Moose Creek, Ontario

June 1, 2023

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Executive Summary

Two (2) alternative methods have been proposed for the expansion of the Eastern Ontario Waste Handling Facility (EOWHF) as described in detail in the Conceptual Design Report (CDR) prepared by HDR. The site layout options proposed for each alternative method are provided in **Figure 1-1** and **Figure 1-2**. The primary differences between these alternative methods are the orientation and fill progression of the various stages.

This report provides a comparison of the potential impact on local air quality, including odour, in the Off-site Study Area from each of the proposed alternative methods. The results of the Emission Summary and Dispersion Modelling (ESDM) report prepared to assess the impacts of each alternative method, as well as the Air Quality and Odour Existing Conditions Report prepared for the facility, have been used in this report to compare the relative impacts of each alternative method.

The ESDM report was prepared in compliance with the Ontario Ministry of the Environment, Conservation and Park (MECP) Procedure for Preparing an Emission Inventory and Dispersion Modelling Report to assess the potential impacts of each alternative method and determine the compliance status of each contaminant of concern using advanced air dispersion modelling software.

The facility-wide emissions of all contaminants of concern were modelled according to the standards published in the Air Dispersion Modelling Guide for Ontario (ADMGO) to determine the worst-case ground-level concentrations at receptors within the Off-site Study Area. The results of the dispersion modelling runs for each alternative method were compared against the relevant MECP ground-level Point of Impingement (POI) standards, Jurisdictional Screening Levels (JSL) and, or de-minimis criteria. A complete listing of the sources and contaminants of concern evaluated are provided in the ESDM report attached in Appendix A.

From an air quality and odour perspective, the Alternative Method 2 has a very slight advantage over Alternative Method 1. For Alternative Method 1, concentrations of a few contaminants of concern exceeded provincial or federal ambient air quality criteria, standards or guidelines slightly more than for Alternative Method 2. The difference was small but discernable.

The facility’s existing commitments for mitigation and monitoring programs are to be carried forward and implemented for the proposed alternative methods including the Fugitive Dust Management Plan, seasonal dustfall monitoring, LFG collection system and seasonal monitoring of gas collection systems.

On-going odour mitigation measures and best practices used at the facility are summarized below:

Waste that is brought to the site with a strong odour is placed at the toe of the working face and covered immediately with other garbage or soil cover. The application of cover soils at the end of the working day also controls odour.

GFL carries out a consistent landfill surface scan program to identify and repair leaks in the landfill cover to maximize LFG capture. Any leaks in the cover detected as a result of these regular inspections will be repaired to reduce fugitive emission of LFG. The LFG collection system will be installed immediately following the filling of the first two cells and will be connected to the existing on-site LFG to Energy facility. The LFG connection system will be progressively expanded as site development occurs. The low permeability final cover will be constructed progressively and will also serve to minimize the emission of LFG-related odours.

GFL will continue to strive to keep odours to a minimum through the continued utilization of the following additional measures:

- Negative air pressure in the composting facility;
- Exterior biofilter system for the compost facility;
- Daily cover used on tipping face;
- Odour control misting systems;
- Avoidance of processing of leaf and yard waste material when southerly winds are occurring;
- A full scale weather station to gauge wind direction and velocity; and
- Monitoring of weather conditions that may increase potential for odours with certain activities.

These mitigation activities are expected to significantly reduce emissions from the facility and the monitoring activities are expected to provide sufficient indications of the effectiveness of the mitigation activities.

Annual greenhouse gas (GHG) emissions from the facility are expected to increase compared to existing conditions due to the increase in LFG quantities.

Acronyms, Units and Glossary

Acronyms

Acronym	Definition
CDR	Conceptual Design Report
EAA	Environmental Assessment Act
EOWHF	Eastern Ontario Waste Handling Facility
GFL	GFL Environmental Inc.
GHG	Greenhouse Gas
HDR	HDR Corporation
MECP	Ministry of Environment, Conservation and Parks
OES	Ontario Electronic Stewardship
ToR	Terms of Reference
AAQC	Ambient Air Quality Criteria
ACB	Air Contaminants Benchmarks
ADMGO	Air Dispersion Modeling Guideline for Ontario, MECP Guideline A-11
JSL	Jurisdictional Screening Level
POI	Point of impingement
ESDM	Emission Summary and Dispersion Modelling report

Units

Unit	Definition
km	kilometre
m	metre
ug/m^3	Micrograms per cubic metre
OU/m^3	Odour units per cubic metre

Glossary

Term	Definition
Approval	Permission granted by an authorized individual or organization for an undertaking to proceed. This may be in the form of program approval, certificate of approval or provisional certificate of approval
Capacity (Disposal Volume)	The total volume of air space available for disposal of waste at a landfill site for a particular design (typically in m^3); includes both waste and daily cover materials, but excludes the final cover.

Glossary

Term	Definition
Composting	The controlled microbial decomposition of organic matter, such as food and yard wastes, in the presence of oxygen, into finished compost (humus), a soil-like material. Humus can be used in vegetable and flower gardens, hedges, etc.
Composting facility	A facility designed to compost organic matter either in the presence of oxygen (aerobic) or absence of oxygen (anaerobic).
Environment	As defined by the Environmental Assessment Act, environment means: • air, land or water; • plant and animal life, including human life; • the social, economic and cultural conditions that influence the life of humans or a community; • any building, structure, machine or other device or thing made by humans; • any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from human activities; or • any part or combination of the foregoing and the interrelationships between any two or more of them (ecosystem approach).
Environmental Assessment	A systematic planning process that is conducted in accordance with applicable laws or regulations aimed at assessing the effects of a proposed undertaking on the environment
Evaluation criteria	Evaluation criteria are considerations or factors taken into account in assessing the advantages and disadvantages of various alternatives being considered
Greenhouse gas	Any of the gases whose absorption of solar radiation is responsible for the greenhouse effect, including carbon dioxide, methane, ozone, and the fluorocarbons.
Indicators	Indicators are specific characteristics of the evaluation criteria that can be measured or determined in some way, as opposed to the actual criteria, which are fairly general
Landfill gas	The gases produced from the wastes disposed in a landfill; the main constituents are typically carbon dioxide and methane, with small amounts of other organic and odour-causing compounds
Landfill site	An approved engineered site/facility used for the final disposal of waste. Landfills are waste disposal sites where waste is spread in layers, compacted to the smallest practical volume, and typically covered by soil.
Methane gas	A colourless, odourless highly combustible gas often produced by the decomposition of decomposable waste at a landfill site. Methane is explosive in concentrations between 5% and 15% volume in air.
Mitigation	Measures taken to reduce adverse impacts on the environment.
Proponent	A person who: • carries out or proposes to carry out an undertaking; or • is the owner or person having charge, management or control of an undertaking.
Receptor	The person, plant or wildlife species that may be affected due to exposure to a contaminant.
Terms of Reference	A terms of reference is a document that sets out detailed requirements for the preparation of an Environmental Assessment.

Glossary

Term	Definition
Undertaking	Is defined in the Environmental Assessment Act as follows: • An enterprise or activity or a proposal, plan or program in respect of an enterprise or activity by or on behalf of Her Majesty in right of Ontario, by a public body or public bodies or by a municipality or municipalities; • A major commercial or business enterprise or activity or a proposal, plan or program in respect of a major commercial or business enterprise or activity of a person or persons other than a person or persons referred to in clause (1) that is designated by the regulations; or • An enterprise or activity or a proposal, plan or program in respect of an enterprise or activity of a person or persons, other than a person or persons referred to in clause (a), if an agreement is entered into under section 3.0.1 in respect of the enterprise, activity, proposal, plan or program ("enterprise").
Waste	Refuse from places of human or animal habitation; unwanted materials left over from a manufacturing process.

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1 Introduction

Ramboll Canada Inc. was contracted by GFL Environmental Inc. (GFL) to conduct an assessment of the effects of the future development of the Eastern Ontario Waste Handling Facility (EOWHF) on air quality and odour as part of the EOWHF Future Development Environmental Assessment (EA).

The EA is being carried out in accordance with the requirements of the *Environmental Assessment Act* (EAA) and Terms of Reference (ToR), which was approved by the Ministry of Environment, Conservation and Parks (MECP) on January 14, 2021.

The environment was divided into environmental aspects, components and evaluation criteria as listed in **Table 1-1**. Existing conditions reports and effects assessment reports have been prepared to address the environmental components.

Table 1-1. Environmental Aspects, Components and Evaluation Criteria

Environmental Aspect	Environmental Component	Evaluation Criteria
Natural Environment	Atmospheric Environment	• Air Quality • Noise • Odour
	Geology and Hydrogeology	• Groundwater Quality • Groundwater Quantity
	Surface Water Environment	• Surface Water Quality • Surface Water Quantity
	Ecological Environment	• Terrestrial Ecosystems • Aquatic Ecosystems
Socio-Economic Environment	Economic	• Economic Effects on / Benefits to Local Community
	Social	• Effects on Local Community • Visual Impact of Facility
Cultural Environment	Cultural Environment	• Cultural Heritage Resources • Archaeological Resources
Built Environment	Transportation	• Effects from Truck Transportation along Access Roads
	Current and Planned Future Land Use	• Effects on Current and Planned Future Land Uses
	Aggregate Extraction and Agricultural	• Aggregate Resources • Effects on Agricultural Land

This Air Quality and Odour Effects Assessment Report assesses the effects of the EOWHF Future Development Project on the air quality and odour portion of the Atmospheric Environment. The effects of the Project on noise are assessed in a separate report.

The purpose of the proposed undertaking is to provide approximately 15.1 million cubic metres (m^3) of additional landfill disposal capacity at the existing EOWHF over a 20-year planning period, with operations anticipated to begin in 2025 and closure anticipated in 2045. The undertaking will enable GFL to continue to provide essential disposal services for residual non-hazardous solid waste to their customers once the landfill reaches its currently approved disposal capacity and continue to provide economic support to the local community over the long term. No changes to the approved fill rates or site access routes are proposed.

Two alternative methods for carrying out the undertaking were identified in the approved ToR and are developed to a preliminary conceptual design level in the Conceptual Design Report (CDR). Both alternative methods provide a landfill volume of approximately 15.1 million m^3 based on the approved fill rate of 755,000 tonnes per year over a 20-year planning period. Studies completed for the EOWHF have indicated that, based on the underlying soils, the design alternatives are limited to varying lateral configurations with a consistent height. Both alternative methods will continue to use established operating procedures currently in place at the EOWHF and would maximize the use of existing site infrastructure.

Alternative Method 1 (**Figure 1-1**) consists of implementing the future development through five stages: one stage adjacent to and north of the existing landfill (Stage 5); and four stages oriented east-west within the future development lands (Stages 6 through 9). Stages 6 through 8 will be identical in size, while Stages 5 and 9 will be smaller. A stormwater management system will be constructed consisting of conveyance ditches around the perimeter of each stage and a retention pond located northwest of Stage 8. The existing pond located northeast of Stage 5 will be modified to attenuate peak flows if required.

Alternative Method 2 (**Figure 1-2**) consists of implementing the future development through four stages: one stage adjacent to and north of the existing landfill (Stage 5); and three stages oriented north-south within the future development lands (Stages 6 through 8). Stages 6 and 7 will be identical in size, while Stages 5 and 8 will be smaller. A stormwater management system will be constructed consisting of conveyance ditches around the perimeter of each stage and a retention pond located north of Stages 6 and 7. The existing pond located northeast of Stage 5 will be modified to attenuate peak flows if required.

For both alternative methods, the design of the stages will be consistent with the existing landfill design. Visual screening will be constructed along the north and east perimeters and a portion of the south perimeter consisting of earthen berms and/or vegetation plantings. A new road entrance will be constructed from Laflèche Road, which will include a new scale facility.

The purpose of this Effects Assessment Report is to present the potential environmental effects of the alternative methods on air quality and odour impacts, a comparison of the net effects of each alternative method, the selection of a preferred alternative, an assessment of the environmental effects of the preferred alternative, commitments and monitoring, and approvals. The results from this study will be documented in an EA Study Report in accordance with the approved ToR, which will be submitted to the MECP for review.

Figure 1-1. Alternative Method 1

Figure 1-2. Alternative Method 2

2 Effects Assessment Methods

Using the evaluation criteria, indicators, rationale and data sources from the approved ToR and the existing conditions from the Air Quality and Odour Existing Conditions Report, the effects assessment is carried out as follows:

- predict the potential environmental effects for each alternative method (Section 3);
- identify the preferred alternative based on a comparative evaluation of the potential environmental effects of each alternative method (Section 4); and
- conduct an effects assessment on the preferred alternative, including the identification of mitigation measures and monitoring programs (Sections 4 and 5).

2.1 Predict Potential Environmental Effects for Alternative Methods

The potential environmental effects for each alternative method are identified based on the application of the evaluation criteria, indicators and data sources in the approved ToR and based on the maximum allowable waste receipt level for the EOWHF landfill. The potential effects can be positive or negative, direct or indirect, and short- or long-term. Mitigation measures are identified to minimize or mitigate the potential effects and then the net effects are evaluated taking into consideration the application of mitigation measures.

2.1.1 Study Areas

The existing EOWHF is located within the Township of North Stormont, approximately 5 km north-northwest of the village of Moose Creek, Ontario, and 5 km east of the Municipality of Casselman, Ontario, on the western half of Lot 16 and Lots 17 and 18, Concession 10, Township of North Stormont, United Counties of Stormont, Dundas and Glengarry, near the intersection of Highway 417 and Highway 138. The municipal street address for the facility is 17125 Laflèche Road, Moose Creek, Ontario. The lands to the east of the existing EOWHF being considered for the future development include the eastern half of Lot 16, Lots 14 and 15, and the majority of Lot 13 of Concession 10. The existing EOWHF encompasses a site area of 189 hectares, while the lands to the east of the existing EOWHF being considered for future development include approximately 240 hectares.

The study areas include the existing site as well as potentially affected surrounding areas. The on-site and off-site study areas identified for the EA in the approved ToR are as follows (**Figure 2-1**):

- On-site Study Area – the existing EOWHF, and the future development area comprising the eastern half of Lot 16, Lots 14 and 15, and the majority of Lot 13 of Concession 10 east of the EOWHF; and
- Off-site Study Area – the lands in the vicinity of the future development extending approximately 1 km from the On-site Study Area.

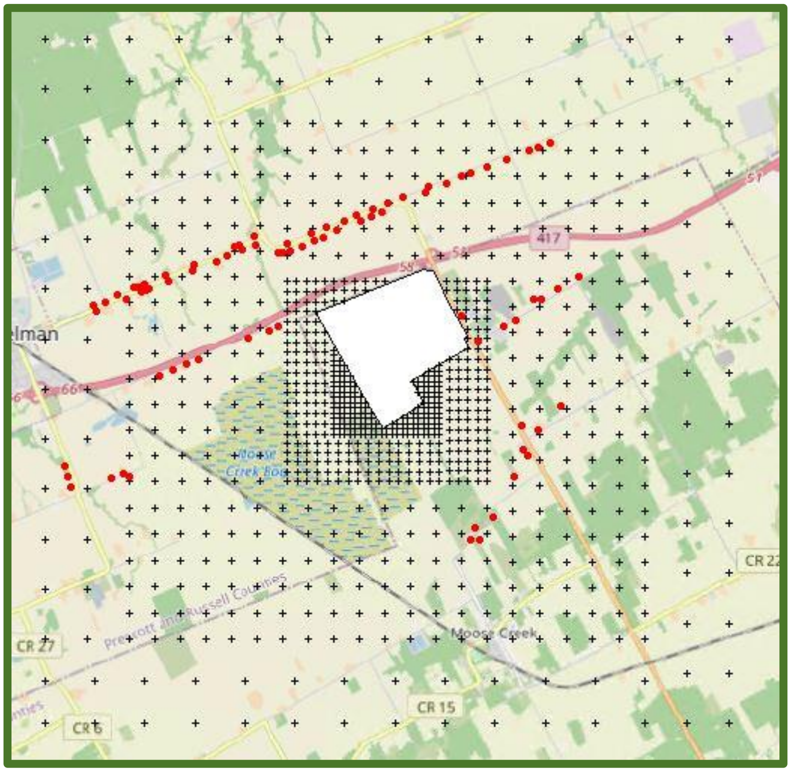
Figure 2-1. On-site and Off-site Study Areas as defined in the ToR

Air and odour emissions can have significant impacts beyond 1 km from the site. For the air quality and odour effects assessment, the Off-site Study Area was modified to include an area extending approximately 4 km from the On-site Study Area (i.e., the Extended Off-site Study Area, shown on **Figure 2-2**).

The area surrounding the EOWHF comprises mostly agricultural lands as well as portions of the Trans-Canada Highway (Highway 417), Highway 138, and a number of businesses including Champion Mushrooms, Calco Soils Inc., Moose Creek Tire Recycling Inc., A.L. Blair Construction Ltd., Agro Culture, Supreme Seeds, and Casselman Performance.

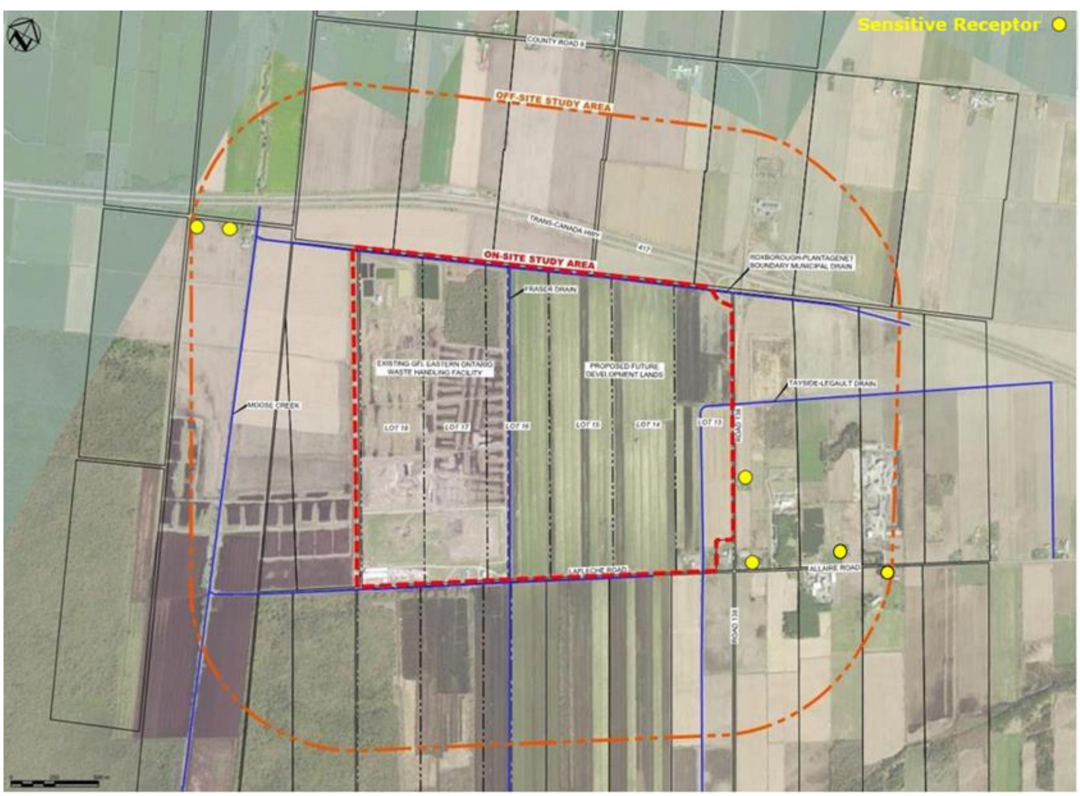
There are six (6) residences located within the Off-Site Study Area, as shown on **Figure 2-3**. There are a total of 81 residences within the Extended Off-site Study Area. Air and odour impacts are specifically assessed at these residential locations, which have been referred to as sensitive receptors for this report.

Figure 2-2. Air Quality and Odour Study Areas



Off-site Study Area | On-site Study Area | Sensitive Receptor | Modelling Grid Point

Figure 2-3. Sensitive Receptor Locations within the General Off-site Study Area



2.1.2 Evaluation Criteria, Indicators and Data Sources

The evaluation criteria, rationale, indicators and data sources used for the Air Quality and Odour effects assessment as per the approved ToR are provided in **Table 2-1**.

Table 2-1. Evaluation Criteria, Indicators and Data Sources for Air Quality and Odour

Evaluation Criteria	Rationale	Indicators	Data Sources
Natural Environment			
Air Quality	Waste disposal site and associated operations can emit contaminants that can degrade air quality. Construction and operation activities at a waste disposal site can also lead to increased levels of particulates (dust) in the air.	• Predicted maximum off-site point of impingement air concentrations of emitted contaminants ofconcern • Number of off-site receptors potentially affected (residential properties, public facilities, businesses/farms, institutions)	• Approved meteorological data • Applicable MECP guidelines, technical standards and models • Aerial photographic mapping and fieldreconnaissance • Previously completed Emission Summary and Dispersion Modelling Reports • Off-site receptors confirmed on recent mapping • Available background ambient air data • Proposed facility characteristics • Landfill design and operation data • Published terrain data • Published air emission factors
Odour	Waste disposal site and associated operations can emit contaminants that generate odorous emissions.	• Predicted maximum off-site odour concentrations (OU/m^3) • Number of off-site receptors potentially affected (residential properties, public facilities, businesses/farms, institutions)	• Approved meteorological data • Applicable MECP guidelines, technical standards and models • Aerial photographic mapping and fieldreconnaissance • Previously completed Emission Summary and Dispersion Modelling Reports • Off-site receptors confirmed on recent mapping • Proposed facility characteristics • Landfill design and operation data • Published terrain data • Published air emission factors

2.1.3 Key Design Considerations and Assumptions

The alternative methods of carrying out the undertaking are described in detail in the CDR. Regarding the alternative methods, the key design considerations and assumptions as they relate to air quality and odour are described below.

Summary of Existing Conditions

The existing activities within the on-site study area involve the operations of the EOWHF as it is currently approved, and agricultural operations (a sod or turf farm and crop farming) on the future development lands.

In general terms, air emissions result from a number of processes and activities that occur on the site. These include:

- Odour and dust emitted from receiving, placing, and compacting of solid waste;
- Landfill Gas (LFG) consisting of volatile contaminants and odour, generated from decomposition of waste within the landfill;
- Combustion gases and particulate matter from combustion of LFG in flares and in stationary engines driving electrical generators;
- Odour from an organic composting facility;
- Dust from on-site haul roads, various material handling activities, and construction activities;
- Tailpipe emissions from mobile equipment including the waste delivery truck fleet, material handling equipment, and construction equipment; and
- Dust from agricultural activities.

Leachate from the landfill is collected, treated in aeration ponds, treated in the leachate treatment building, and stored in effluent holding ponds until discharge. These sources are expected to emit contaminants, including odour, in negligible quantities under normal aerobic conditions and have been considered negligible for this assessment.

An Air Quality and Odour Existing Conditions Report (Ramboll, 2022) was prepared to quantify the air quality and odour conditions within the Off-Site Study Area that result from existing operations or currently approved operations. This study identified over 180 contaminants of concern that may be emitted from the existing operations and estimated maximum concentrations of each contaminant within the study area. This report has since been updated to reflect changes to the air dispersion modelling for the odour emissions from compost curing windrows and leaf and yard waste stockpiles based on comments originally received from MECP on February 13, 2023.

The cumulative air contaminant impacts in the Off-Site Study Area are dependent on both the direct impact of emissions from the EOWHF, and regional background air pollutant concentrations. Regional background concentrations result from other sources of pollutant emissions in the region, as well as long-range transport from other areas. The MECP monitors and records ambient air concentrations of key pollutants at numerous monitoring stations across the province. Monitored concentration data was used to estimate the cumulative air contaminant impacts in the Off-Site Study Area.

For the existing conditions, the maximum predicted contaminant concentrations were compared to provincial and federal ambient air quality criteria, air standards, guidelines, and screening levels. Of the over 180 contaminants identified, four (4) were predicted to exceed criteria, standards, or guidelines.

Concentrations of total suspended particulate matter (SPM) and particulate matter less than 10 µm (PM_{10}) or dust were predicted to exceed ambient air criteria and standards on the facility boundary, adjacent to facility haul roads. Concentrations of nitrogen dioxide (NO_2), emitted from combustion sources, exceeded the Canadian Ambient Air Quality Standard (CAAQS) at the facility boundary. In both cases, concentrations fell below the criteria or standards a short distance beyond the boundary, and concentrations did not exceed criteria or standards at any sensitive receptors (residences). Odour was predicted to exceed the provincial guideline of 1 odour unit at a sensitive receptor. The highest odour impact at a sensitive receptor reached 1.47 odour units southeast of the facility at the intersection of Sandringham Road and Hwy 138.

Design Considerations and Assumptions

Based on the design concepts of the CDR, there are many design considerations affecting air quality and odour that do not differ between Alternative Methods 1 and 2. These include:

- The rate that solid waste is received/landfilled (755,000 tonnes/year), the total amount of waste landfilled (15.1 million m^3), and the expanded landfill life (20 years) will not differ between alternative methods. This means that the LFG generation rate will not differ between alternative methods at any given point in time;
- Current practices for LFG capture and combustion will continue for both alternative methods;
- Current odour and dust mitigation practices (e.g., daily cover, watering, etc.) will continue for both alternative methods;
- Existing infrastructure (LFG combustion facility, access roads, service buildings) will be unchanged for both alternative methods; and
- Composting processes and volumes at the facility will be unchanged for both alternative methods.

The key difference between the two alternative methods is the configuration of the landfill stages.

- Alternative Method 1 consists of implementing the future development through five stages: one stage adjacent to and north of the existing landfill (Stage 5); and four stages oriented east-west within the future development lands (Stages 6 through 9). Stages 6 through 8 will be identical in size, while Stages 5 and 9 will be smaller. Landfilling will progress sequentially from Stage 5 through Stage 9.
- Alternative Method 2 consists of implementing the future development through four stages: one stage adjacent to and north of the existing landfill (Stage 5); and three stages oriented north-south within the future development lands (Stages 6 through 8). Stages 6 and 7 will be identical in size, while Stages 5 and 8 will be smaller. Landfilling will progress sequentially from Stage 5 through Stage 8.

The consequence of this difference in configuration is that, at any point in time, the locations of air and odour emissions from the active landfilling activities, landfill cell construction activities, and on-site haul roads will differ between the alternative methods. While total LFG emission rate will not differ between the alternative methods, the locations of LFG emissions will differ.

Stormwater control systems will differ between alternative methods, but these systems have negligible effects on air quality and odour.

Table 2-2. Comparison of Alternatives Methods

Contaminant	Averaging Period	Criteria			Monitored Background Concentration	Alternative Method 1						Alternative Method 2					
						Modelled Concentration		Total Concentration		Percent of Criteria		Modelled Concentration		Total Concentration		Percent of Criteria	
		Conc.	Source	Basis		POI	Sensitive Receptor	POI	Sensitive Receptor	POI	Sensitive Receptor	POI	Sensitive Receptor	POI	Sensitive Receptor	POI	Sensitive Receptor
		(µg/m³)			(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)			(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)		
Nitrogen dioxide (NO_2)	Annual	32	CAAQS (2020)		10	5.6	0.8	16	11	49.5%	34.4%	5.6	0.9	16	11	49.5%	34.6%
	Annual	23	CAAQS (2025)		10	5.6	0.8	16	11	70.1%	48.8%	5.6	0.9	16	11	70.1%	49.0%
	24-hour	200	AAQC	Health	27	45	8	72	35	35.8%	17.5%	45	10	72	37	35.8%	18.3%
	1-hour	113	CAAQS (2020)		25	96	30	122	55	107.9%	48.6%	91	33	116	58	102.9%	51.6%
	1-hour	79	CAAQS (2025)		25	96	29.6	122	55	154.1%	69.4%	91	33.0	116	58	147.0%	73.8%
	1-hour	400	AAQC	Health	25	178	49	203	74	50.7%	18.5%	148	70	173	96	43.2%	23.9%
Fine particulate matter ($PM_{2.5}$)	Annual	8.8	AAQC and CAAQS (2020)	Health	5.2	1.9	0.4	7	6	81.3%	63.8%	1.9	0.4	7	6	81.0%	64.4%
	24-hour	27	AAQC and CAAQS (2020)	Health	11	7.3	2.3	18	13	67.7%	49.2%	6.2	2.6	17	14	63.8%	50.2%
Sulphur dioxide (SO2)	Annual	13.1	CAAQS (2020)		0.34	0.3	0.04	1	0.4	4.9%	2.9%	0.3	0.04	1	0.4	4.9%	2.9%
	Annual	10.5	CAAQS (2025)		0.34	0.3	0.04	1	0.4	6.2%	3.7%	0.3	0.04	1	0.4	6.2%	3.7%
	Annual	10.5	AAQC	Vegetation	0.34	0.3	0.04	1	0.4	6.2%	3.7%	0.3	0.04	1	0.4	6.2%	3.7%
	1-hour	183	CAAQS (2020)		0.79	4.6	1.4	5	2	3.0%	1.2%	4.6	1.4	5	2	3.0%	1.2%
	1-hour	170	CAAQS (2025)		0.79	4.6	1.4	5	2	3.2%	1.3%	4.6	1.4	5	2	3.2%	1.3%
	1-hour	105	AAQC	Health	0.79	4.7	1.6	6	2	5.3%	2.2%	4.7	1.6	6	2	5.3%	2.2%
Carbon monoxide (CO)	1-hour	36,200	AAQC	Health	0.28	1,550	419	1550	420	4.3%	1.2%	1,280	602	1280	602	3.5%	1.7%
1,3-butadiene	Annual	2	AAQC	Health	0.037	0.001	0.001	0	0	1.9%	1.9%	0.001	0.001	0	0	1.9%	1.9%
Benzene	Annual	0.45	AAQC	Health	0.388	0.028	0.012	0	0	92.4%	89.0%	0.026	0.014	0	0	92.1%	89.4%

Table 2-3. Summary of Exceedances of Compounds of Concern

	Alternative 1		Alternative 2	
	Scenario 1A	**Scenario 1B**	**Scenario 2A**	**Scenario 2B**
Nitrogen Dioxide (NO_2) 1hr CAAQS				
Standard exceeded at POI?	Yes	Yes	Yes	Yes
Location of Max POI	Western property line, near south corner.	North Property boundary, near Stage 9 activities	Western property line, near south corner.	Western property line, near south corner.
Standard exceeded at Sensitive Receptor?	No	No	No	No
Location of Max impacted Sensitive Receptor	On Hwy 138, across from site	On Hwy 138, across from site	On Hwy 138, across from site	On Hwy 138, across from site
Suspended Particulate Matter 24h Air Standard				
Standard exceeded at POI?	Yes	Yes	Yes	Yes
Location of Max POI	Property boundary along Lafleche Road, near east corner of site	Property boundary along Laflèche Road at entry gate to site	Property boundary along LaFleche Road at entry gate to site	Property boundary along Laflèche Road at entry gate to site
Standard exceeded at Sensitive Receptor?	No	No	No	No
Location of Max impacted Sensitive Receptor	On Allaire Road, close to southeast corner of site	On Hwy 138, across from site	On Hwy 138, across from site	On Hwy 138, across from site
Particulate Matter <10µm (PM10) 24h AAQC				
Interim criteria exceeded at POI?	Yes	Yes	Yes	Yes
Location of Max POI	Property boundary along Lafleche Road, near east corner of site	Property boundary along LaFleche Road at entry gate to site	Property boundary at adjacent property on Lafleche Road, near southeast corner of site	Property boundary along Hwy 138, across from site
Interim criteria exceeded at Sensitive Receptor?	No	No	No	Yes
Location of Max impacted Sensitive Receptor	On Allaire Road, close to southeast corner of site	On Hwy 138, across from site	On Hwy 138, across from site	On Hwy 138, across from site
Odour				
Guideline exceeded at Sensitive Receptor?	Yes	Yes	Yes	Yes
Location of Max impacted Sensitive Receptor	Allaire Road at Hwy 138	Sandringham Road at Hwy 138	On Hwy 138, across from site	Sandringham Road at Hwy 138
Number of sensitive receptors with maximum impact exceeding guideline	6	7	6	7
Maximum frequency guideline is exceeded at a sensitive receptor (hours in the 43,800 hour model period, % of time)	474 (1.1% of the time)	384 (0.9% of the time)	638 (1.5% of the time)	414 (0.9% of the time)

Nitrogen Dioxide (NO_2)

Nitrogen dioxide is a product of combustion and is emitted from the LFG Utilization Facility (engines and flares) as well as from mobile sources (trucks, material handling equipment, construction equipment) on the EOWHF. High NO_2 concentrations are predicted at the western boundary of the On-Site Study Area due to compost material handling equipment. Near end of life (i.e., Scenarios 1B and 2B) high NO_2 concentrations are predicted at the northern on-site property line due to landfilling/construction activities in the final cells. In all cases, the concentration falls off quickly with distance from the property line.

Maximum NO_2 concentrations are predicted to exceed the current 1-hour CAAQS (2020) at the on-site property line by 8 and 3%, respectively for Alternative Methods 1 and 2, but will not exceed the CAAQS at a sensitive receptor. The concentration falls off quickly with distance from the on-site property line. The future 1-hour CAAQS (2025) is more stringent, and concentrations are predicted to exceed the new objective by 54% and 47% for Alternative Methods 1 and 2, respectively. Again, the maximum concentration is at the on-site property line, but concentrations fall off quickly with distance from the on-site property line, and do not exceed the CAAQS at any sensitive receptor. The sensitive receptor exposed to the highest NO_2 concentration in all four scenarios is located east of the facility, along Highway 138. This sensitive receptor location was vacated in Summer 2022 and will be demolished prior to the implementation of the future development landfill.

The 1-hour CAAQS for NO_2, is defined with the statistical form of “the 3 year average of the annual 98th percentile of the daily-maximum 1-hour average concentrations”. Due to this statistical form, the frequency that the CAAQS is exceeded cannot be reported.

Fine Particulate Matter <10 µm diameter (PM_{10})

Particulate matter <10 µm diameter (PM_{10}) is emitted in exhaust from combustion sources (engines, flares), and as dust from roads, and material handling activities. The highest concentrations occur on the south and eastern property boundaries, adjacent to the paved haul road. Dust from on-site haul roads is the major contributor to the PM_{10} concentration at these locations.

Table 2 of the ESDM report shows that the EOWHF’s contribution to ambient air concentration exceeds the interim AAQC for PM_{10}, with a maximum 24-hour concentration that is 250% and 184% of this criterion for Alternative Methods 1 and 2, respectively. The concentration falls off quickly with distance from the on-site property line. For Alternative Method 1, the EOWHF’s contribution does not exceed the AAQC at any sensitive receptors. However, for Alternative Method 2, the concentration reaches 135% of the AAQC at a sensitive receptor. The sensitive receptor exposed to this highest PM_{10} concentration is located east of the facility, along Highway 138. This sensitive receptor location was vacated in Summer 2022 and will be demolished prior to the implementation of the future development landfill.

There is no monitored ambient air quality data available to describe regional background concentration of PM_{10}, so cumulative ambient air concentration cannot be quantified for comparison to AAQC. Background concentrations will not be negligible and will be at least as high as that of $PM_{2.5}$ (a subset of PM_{10}), so cumulative concentrations may approach or exceed the AAQC at other sensitive receptors.

Suspended Particulate Matter (SPM)

Table 2 of the ESDM report shows that the maximum concentration of total suspended particulate matter (SPM) exceeds the MECP air standard, with a maximum 24-hour concentration that is 188% and 156% of the standard for Alternative Methods 1 and 2, respectively. The air standard for SPM is based on visibility effects. The highest concentration occurs on the property boundary along Laflèche Road, adjacent to the paved on-site haul road. Dust from on-site haul roads is the major contributor to the SPM concentration at this location. The concentration falls off quickly with distance from the property line.

The SPM does not exceed the air standard at any sensitive receptor. At sensitive receptors, the SPM concentration reaches 71% and 99% of the standard for Alternative Methods 1 and 2, respectively. The locations of the sensitive receptor exposed to the highest SPM concentration is given in **Table 2-3** for each scenario. It is notable that to assess compliance with Ontario Regulation 419/05, dust from the haul road would not be included, and the air standard would not be exceeded.

Odour

There are several contaminants emitted from the EOWHF that have odour-effects based air standards or guidelines. Table 2 of the ESDM report indicates that concentrations of these contaminants do not exceed the standards or guidelines at any location.

There is no air standard or formal guideline for odour; however, a guideline value of 1 odour unit per cubic metre (OU/m³ or generally referred to as OU) at a sensitive receptor is often used for assessment purposes. Similar to contaminants with odour-effects based air standards, odour is evaluated on a 10-minute average, and the 99.5th percentile concentration at a sensitive receptor is compared to the guideline.

Table 2 of the ESDM report shows that the highest 99.5th percentile concentration at a sensitive receptor is 1.64 OU/m³ and 1.85 OU/m³ for Alternative Methods 1 and 2, respectively. For Alternative Method 1 Scenario A, the sensitive receptor exposed to the highest odour concentration is located at Allaire Road and Hwy 138. For Alternative Method 1 Scenario B and Alternative Method 2 Scenario B, the sensitive receptor exposed to the highest odour concentration is located southeast of the facility at the intersection of Sandringham Road and Hwy 138. Finally, for Alternative Method 2 Scenario A, the highest odour concentration is located directly east of the facility on Hwy 138.

It is notable that odour is not linear, and a difference of less than a factor of 2 is not expected to be distinguishable by most people. That is, there is no significant difference between the values of 1.64 and 1.85 odour units reported for the two alternative methods. The maximum odour values tend to occur during calm meteorological periods with low winds, which generally occur during the nighttime hours when most people are sleeping.

2.2 Comparative Evaluation and Identification of the Preferred Alternative

The two alternative methods are comparatively assessed and evaluated using the criteria and indicators to determine the preferred alternative. The differences in the potential environmental effects remaining following the implementation of potential mitigation/management measures (i.e., net effects) are used to identify and compare the advantages and disadvantages of each alternative method.

The net environmental effects are utilized in a comparison of the two alternative methods to one another at the criteria and indicator level for each discipline. The following two--step method was applied to carry out the comparative evaluation for Air Quality and Odour.

1. Identify the predicted net effect(s) associated with each alternative for each indicator and assign a preference rating (i.e., Preferred, Not Preferred, No Substantial Difference); and
2. Rate each alternative at the criteria level (i.e., Preferred, Not Preferred, No Substantial Difference) based on the identified preference rating for each indicator and provide a rationale.

2.3 Effects Assessment of the Preferred Alternative

An assessment of the environmental effects of the preferred alternative is carried out considering the same criteria, indicators and data sources, taking into account potential mitigation/management measures and cumulative effects. The effects assessment of the preferred alternative will be presented in the EA Study Report.

3 Net Effects Assessment

The results of the net effects assessment for each alternative method are provided in Sections 3.1 and 3.2.

In both alternative methods, final landfilling activities will occur in the north east area of the site. However, the closest sensitive receptor to the facility is near the southeast corner of the site. As a result, in order to ensure that maximum impacts were identified, two scenarios were considered for each alternative method: Scenarios A and B.

Scenario A involves active landfilling and cell construction in the southeast corner of the site, so that these sources are assessed while closest to the sensitive receptor. Due to the difference in configuration and sequential progression through the stages, the year that these activities occur in this area differ between the alternative methods.

Scenario B involves active landfilling and cell construction in the northeast corner of the site and represents operation near closure when LFG emissions are at their maximum. For both alternative methods this aligns with the final activity year.

Scenario conditions are summarized below:

Alternative Method 1		*Alternative Method 2*	
Scenario A	**Scenario B**	**Scenario A**	**Scenario B**
South-east area	North-east area	South-east area	North-east area
Stage 6 (Cells 9 and 10)	Stage 9 (Cells 1 and 2)	Stage 8 (Cells 1 and 2)	Stage 8 (Cells 5 and 6)
2032 activity year	2045 activity year	2043 activity year	2045 activity year

Emission rates and resulting concentrations of contaminants of concern in the study area were quantified for each of the four scenarios. The methodology was consistent with the revised Air Quality and Odour Existing Conditions Report, which incorporates updates to the compost curing windrows and leaf and yard stockpiles based on MECP comments originally received on February 13, 2023. Results are documented in the Emission Summary and Dispersion Modelling (ESDM) Report included in Appendix A. Table 2 of that report summarizes the highest concentration that occurs for each alternative method.

The ESDM report identifies the maximum impacts resulting from the EOWHF. Cumulative impacts are the sum of the EOWHF contribution and the background concentration, as identified through regional ambient air monitoring of contaminants of concern for which regional air monitoring data is available. Monitored background concentrations were identified in the Air Quality and Odour Existing Conditions Report. Cumulative impact of the compounds of concern (COCs) for which regional air monitoring is available are given in **Table 2-2**.

Table 2-2 and Table 2 in the ESDM report indicate that, similar to the Existing Conditions, Alternative Methods 1 and 2 both result in exceedance of air quality criteria, air standards, or guidelines for four (4) contaminants of concern: nitrogen dioxide, suspended particulate matter, particulate matter <10 µm, and odour.

For these four contaminants, the location of maximum POI concentration, and the location of the sensitive receptor exposed to the highest concentration are given in **Table 2-3**.

3.1 Alternative Method 1

The net effects assessment for Alternative Method 1 is presented in **Table 3-1**.

Table 3-1. Net Effects Assessment – Alternative Method 1

Evaluation Criteria	Indicator	Key Design Considerations and Assumptions	Potential Effects	Mitigation Measures	Net Effects
Air Quality	Predicted maximum off-site point of impingement (POI) concentrations of emitted contaminants of concern	• Key design considerations are related to the orientation and fill progression of Stages 6 to 9. • Solid waste received/landfilled at 755,000 tonnes/year • 15.1 million m³ of solid waste landfilled over 20-year life • Current practices for landfill gas emission mitigation and use (daily and interim cover, impermeable cover, capture systems and combustion) will continue • Current dust mitigation practices (e.g., paving, watering, etc.) will continue • Existing infrastructure (LFG combustion facility, access roads, service buildings) will be unchanged • Composting processes and volumes at the facility will be unchanged • Landfill working face and construction emissions assessed at two (2) separate locations and future activity years to ensure worst case effects were identified ○ Scenario 1A assessed active landfilling and cell construction in SE corner (Stage 6, Cells 9 and 10). ○ Scenario 1B assessed active landfilling and cell construction near end of life in NE corner (Stage 9, Cells 1 and 2). • The facility's existing Fugitive Dust Management Plan is	• The off-site ground-level concentrations of over 180 contaminants of concern were estimated within the study area and compared against provincial and federal ambient air quality criteria, standards, guidelines and screening levels and the results indicate that all were within the relevant standards with the exceptions of: Nitrogen Dioxide, Suspended Particulate Matter (SPM) and Fine Particulate Matter (PM_{10}). • Nitrogen dioxide concentrations are predicted to exceed the 2025 CAAQS by 54%. Exceedances are at the site boundary and fall to below the standard within 55 m of the boundary. Concentrations at sensitive receptors (residences) do not exceed the standard. • Suspended Particulate Matter (dust) concentrations are predicted to exceed the O.Reg.419/05 Air Standard by 88%. Exceedances are at the site boundary and fall to below the standard within 350 m of the boundary. High concentrations are mainly associated with road dust from on-site haul roads. Concentrations at sensitive receptors (residences) do not exceed the standard.	No additional mitigation measures beyond those currently applied at the existing facility were included in the assessment	• Nitrogen dioxide concentrations are predicted to exceed the 2025 CAAQS by 54%. Exceedances are at the site boundary and fall to below the standard within 55 m of the boundary. Concentrations at sensitive receptors (residences) do not exceed the standard. • Suspended Particulate Matter (dust) concentrations are predicted to exceed the O.Reg.419/05 Air Standard by 88%. Exceedances are at the site boundary and fall to below the standard within 350 m of the boundary. Concentrations at sensitive receptors (residences) do not exceed the standard. • Fine particulate matter concentrations are predicted to exceed the Ontario AAQC by 150%. Exceedances are at the site boundary and fall to below the standard within 450 m of the boundary. Concentrations at sensitive receptors (residences) do not exceed the standard.

Table 3-1. Net Effects Assessment – Alternative Method 1

Evaluation Criteria	Indicator	Key Design Considerations and Assumptions	Potential Effects	Mitigation Measures	Net Effects
		expected to be effectively implemented for all current and future operations in order to manage and mitigate the potential fugitive dust emissions from the site's transportation and operational sources.	• Fine particulate matter concentrations are predicted to exceed the Ontario AAQC by 150%. Exceedances are at the site boundary and fall to below the standard within 450 m of the boundary. High concentrations are mainly associated with road dust from on-site haul roads. Concentrations at sensitive receptors (residences) do not exceed the AAQC.		
	Number of off-site receptors potentially affected	• AERMOD dispersion modelling was used to predict the ground-level concentrations of contaminants at receptors within the Off-site Study Area. • A total of 81 individual receptors (residential and commercial properties) were identified within the model to represent the nearest and most potentially-affected receptors. • The EOWHF's existing Fugitive Dust Management Plan is expected to be effectively implemented for all current and future operations in order to manage and mitigate the potential fugitive dust emissions from the site's transportation and operational sources.	• The off-site ground-level concentrations of over 180 contaminants of concern were estimated within the Off-site Study Area and compared against provincial and federal ambient air quality criteria, standards, guidelines and screening levels and the results indicate that all were within the relevant standards with the exceptions of: NO_2; SPM; and PM_{10}. • Concentrations at sensitive receptors (residences) do not exceed the standards.	No additional mitigation measures are expected to be necessary beyond those currently applied at the existing facility.	• The ground-level concentrations of contaminants of concern within the Off-site Study Area were all within the relevant standards with the exceptions of: NO_2; SPM; and PM_{10}. • Concentrations at sensitive receptors (residences) do not exceed the standards.
Odour	Predicted maximum off-site odour concentrations (OU/m^3)	• Key design considerations are related to the orientation and fill progression of Stages 6 to 9. • Solid waste received/landfilled at 755,000 tonnes/year	• The concentrations of odour at sensitive receptors were estimated within the study area and compared against a guideline of 1 odour unit that	No additional mitigation measures beyond those currently applied at the existing facility were included in the assessment.	• The highest concentration predicted at a sensitive receptor is 1.64 odour units. This is a 12% increase over existing conditions and would be considered an

Table 3-1. Net Effects Assessment – Alternative Method 1

Evaluation Criteria	Indicator	Key Design Considerations and Assumptions	Potential Effects	Mitigation Measures	Net Effects

		• 15.1 million m³ of solid waste landfilled over 20-year life
		• Current practices for landfill gas emission mitigation and use (daily and interim cover, impermeable cover, capture systems and combustion) will continue
		• Existing infrastructure (LFG combustion facility, access roads, service buildings) will be unchanged
		• Composting processes and volumes at the facility will be unchanged
		• Landfill working face and construction emissions assessed at two (2) separate locations and future activity years to ensure worst case effects were identified
		  • Scenario 1A assessed active landfilling and cell construction in SE corner (Stage 6, Cells 9 and 10).
		  • Scenario 1B assessed active landfilling and cell construction near end of life in NE corner (Stage 9, Cells 1 and 2).
			is commonly applied in Ontario
			• Scenario A presents the worst-case condition for Alternative Method 1 with regard to odour.
			• The highest concentration predicted at a sensitive receptor is 1.64 OU/m³, which is a 12% increase over existing conditions.
			• The most frequently impacted sensitive receptor was exposed to concentration above 1 odour unit about 1.1% of the time.
					imperceptible increase.
					• Six (6) sensitive receptors within the study area have maximum concentrations over 1 odour unit. The most frequently impacted sensitive receptor was exposed to concentration above 1 odour unit about 1.1% of the time.

	Number of off-site receptors potentially affected	• AERMOD dispersion modelling was used to predict the ground-level concentrations of contaminants at the receptors identified within the Off-site Study Area. • A total of 81 individual receptors (residential and commercial properties) were identified within the model to represent the nearest and most potentially-affected receptor.	• Six (6) sensitive receptors within the Off-site Study Area are predicted to experience maximum concentrations above 1 OU/m³. • The most frequently impacted sensitive receptor will be exposed to a concentration above 1 OU/m³ approximately 1.1% of the time. • The sensitive receptor exposed to the highest odour	• No additional mitigation measures are expected to be necessary beyond those currently applied at the existing facility. • Since odour is not linear, a difference of less than a factor of 2 is not expected to be	• Six (6) sensitive receptors within the Off-site Study Area are predicted to experience maximum concentrations above 1 OU/m³. • The most frequently impacted sensitive receptor will be exposed to a concentration above 1 OU/m³ approximately 1.1% of the time.

Table 3-1. Net Effects Assessment – Alternative Method 1

Evaluation Criteria	Indicator	Key Design Considerations and Assumptions	Potential Effects	Mitigation Measures	Net Effects
		• The EOWHF's existing odour management practices are expected to be effectively implemented for all current and future operations in order to manage and mitigate the potential odorous emissions from the future development.	concentration is located east of the facility at the intersection of Allaire Road and Hwy 138. • The highest concentration predicted at a sensitive receptor is 1.64 OU/m³, which is a 12% increase over existing conditions.	distinguishable by most people. • The maximum odour values tend to occur during calm meteorological periods with low winds, which generally occur during the nighttime hours.	• The sensitive receptor exposed to the highest odour concentration is located east of the facility at the intersection of Allaire Road and Hwy 138. • The highest concentration predicted at a sensitive receptor is 1.64 OU/m³, which is a 12% increase over existing conditions.

3.2 Alternative Method 2

The net effects assessment for Alternative Method 2 is presented in **Table 3-2**.

Table 3-2. Net Effects Assessment – Alternative Method 2

Evaluation Criteria	Indicator	Key Design Considerations and Assumptions	Potential Effects	Mitigation Measures	Net Effects

Air Quality	Predicted maximum off-site point of impingement (POI) concentrations of emitted contaminants of concern	• Key design considerations are related to the orientation and fill progression of Stages 6 to 8.
		• Solid waste received/landfilled at 755,000 tonnes/year
		• 15.1 million m³ of solid waste landfilled over 20-year life
		• Current practices for landfill gas emission mitigation and use (daily and interim cover, impermeable cover, capture systems and combustion) will continue
		• Current dust mitigation practices (e.g., paving, watering, etc.) will continue
		• Existing infrastructure (LFG combustion facility, access roads, service buildings) will be unchanged
		• Composting processes and volumes at the facility will be unchanged
		• Landfill working face and construction emissions assessed at two (2) separate locations and future activity years to ensure worst case effects were identified
		  ○ Scenario 2A assessed active landfilling and cell construction in SE corner (Stage 8, Cells 1 and 2).
		  ○ Scenario 2B assessed active landfilling and cell construction near end of life in NE corner (Stage 8, Cells 5 and 6).
		• The facility's existing Fugitive Dust Management Plan is expected to be effectively implemented for all current and future operations in order to manage and mitigate the
			• The off-site ground-level concentrations of over 180 contaminants of concern were estimated within the study area and compared against provincial and federal ambient air quality criteria, standards, guidelines and screening levels and the results indicate that all were within the relevant standards with the exceptions of: Nitrogen Dioxide, Suspended Particulate Matter (SPM) and Fine Particulate Matter (PM_{10}).
			• Nitrogen dioxide concentrations are predicted to exceed the 2025 CAAQS by 47%. Exceedances are at the site boundary and fall to below the standard within 10 m of the boundary. Concentrations at sensitive receptors (residences) do not exceed the standard.
			• Suspended Particulate Matter (dust) concentrations are predicted to exceed the O.Reg.419/05 Air Standard by 56%. Exceedances are at the site boundary and fall to below the standard within 150 m of the boundary. High concentrations are mainly associated with road dust from on-site haul roads. Concentrations at sensitive receptors (residences) do not
				No additional mitigation measures beyond those currently applied at the existing facility were included in the assessment	• Nitrogen dioxide concentrations are predicted to exceed the 2025 CAAQS by 47%. Exceedances are at the site boundary and fall to below the standard within 10 m of the boundary. Concentrations at sensitive receptors (residences) do not exceed the standard.
					• Suspended Particulate Matter (dust) concentrations are predicted to exceed the O.Reg.419/05 Air Standard by 56%. Exceedances are at the site boundary and fall to below the standard within 150 m of the boundary. Concentrations at sensitive receptors (residences) do not exceed the standard.
					• Fine particulate matter concentrations are predicted to exceed the Ontario AAQC by 84%. Exceedances are at the site boundary and fall to below the standard within 250 m of the boundary. Concentrations exceed the AAQC by 35% at only one sensitive receptor. At this receptor the concentration exceeds the standard only 1 hour in the 43,800 hour modelling period, or 0.002% of the time. This sensitive receptor location was vacated in Summer 2022 and will be demolished prior

Table 3-2. Net Effects Assessment – Alternative Method 2

Evaluation Criteria	Indicator	Key Design Considerations and Assumptions	Potential Effects	Mitigation Measures	Net Effects
		potential fugitive dust emissions from the site's transportation and operational sources.	exceed the standard. • Fine particulate matter concentrations are predicted to exceed the Ontario AAQC by 84%. Exceedances are at the site boundary and fall to below the standard within 250 m of the boundary. High concentrations are mainly associated with road dust from on-site haul roads. Concentrations exceed the AAQC by 35% at only one sensitive receptor, located east of the future development, along Highway 138. The concentration at this receptor was predicted to exceed the standard infrequently, only 1 hour in the 43,800 hour modelling period, or 0.002% of the time. This sensitive receptor location was vacated in Summer 2022 and will be demolished prior to the implementation of the future development landfill. Concentrations at other sensitive receptors do not exceed the AAQC.		to the implementation of the future development landfill. Concentrations at other sensitive receptors do not exceed the AAQC.
	Number of off-site receptor potentially affected	• AERMOD dispersion modelling was used to predict the ground-level concentrations of contaminants at receptors within the Off-site Study Area. • A total of 81 individual receptors (residential and commercial	• The off-site ground-level concentrations of over 180 contaminants of concern were estimated within the study area and compared against provincial and federal ambient air quality criteria,	• No additional mitigation measures are expected to be necessary beyond those currently applied at the existing facility.	• The ground-level concentrations of contaminants of concern within the Off-site Study Area were all within the relevant standards with the

Table 3-2. Net Effects Assessment – Alternative Method 2

Evaluation Criteria	Indicator	Key Design Considerations and Assumptions	Potential Effects	Mitigation Measures	Net Effects
		properties) were identified within the model to represent the nearest and most potentially-affected receptors. • The EOWHF's existing Fugitive Dust Management Plan is expected to be effectively implemented for all current and future operations in order to manage and mitigate the potential fugitive dust emissions from the site's transportation and operational sources.	standards, guidelines and screening levels and the results indicate that all were within the relevant standards with the exceptions of: NO_2; SPM; and PM_{10}. • Concentrations at sensitive receptors (residences) do not exceed the standards with the exception of PM_{10}, which exceeded the AAQC by 35% at only one sensitive receptor, located east of the future development, along Highway 138. This sensitive receptor location was vacated in Summer 2022 and will be demolished prior to the implementation of the future development landfill.		exceptions of: NO_2; SPM; and PM_{10}. • Concentrations at sensitive receptors (residences) do not exceed the standards with the exception of PM_{10}, which exceeded the AAQC by 35% at only one sensitive receptor, located east of the future development, along Highway 138. The concentration at this receptor was predicted to exceed the standard 0.002% of the time. This sensitive receptor location was vacated in Summer 2022 and will be demolished prior to the implementation of the future development landfill.
Odour	Predicted maximum off-siteodour concentrations (OU/m^3)	• Key design considerations are related to the orientation and fill progression of Stages 6 to 8. • Solid waste received/landfilled at 755,000 tonnes/year) • 15.1 million m^3 of solid waste landfilled over 20-year life • Current practices for landfill gas emission mitigation and use (daily and interim cover, impermeable cover, capture systems and combustion) will continue • Existing infrastructure (LFG combustion facility, access roads, service buildings) will be unchanged • Composting processes and volumes at the facility will be unchanged • Landfill working face and	• The concentrations of odour at sensitive receptors were estimated within the study area and compared against a guideline of 1 odour unit that is commonly applied in Ontario • Scenario A presents the worst-case condition for Alternative Method 2 with regard to odour. • The highest concentration predicted at a sensitive receptor is 1.85 odour units. The most frequently impacted sensitive receptor was exposed to concentration above 1 odour unit about 1.5% of the time.	No additional mitigation measures beyond those currently applied at the existing facility were included in the assessment	• The highest concentration predicted at a sensitive receptor is 1.85 odour units. This is a 26% increase over existing conditions, yet would be considered an imperceptible increase. • The most frequently impacted sensitive receptor was exposed to concentration above 1 odour unit about 1.5% of the time.

Table 3-2. Net Effects Assessment – Alternative Method 2

Evaluation Criteria	Indicator	Key Design Considerations and Assumptions	Potential Effects	Mitigation Measures	Net Effects
		construction emissions assessed at two (2) separate locations and future activity years to ensure worst case effects were identified o Scenario 2A assessed active landfilling and cell construction in SE corner (Stage 8, Cells 1 and 2). o Scenario 2B assessed active landfilling and cell construction near end of life in NE corner (Stage 8, Cells 5 and 6).			
	Number of off-site receptors potentially affected	• AERMOD dispersion modelling was used to predict the ground-level concentrations of contaminants at the receptors identified within the off-site study area. • A total of 81 individual receptors (residential and commercial properties) were identified within the model to represent the nearest and most potentially-affected receptor. • The EOWHF's existing odour management practices are expected to be effectively implemented for all current and future operations in order to manage and mitigate the potential odorous emissions from the future development.	• Six (6) sensitive receptors within the Off-site Study Area are predicted to experience maximum concentrations above 1 OU/m^3. • The most frequently impacted sensitive receptor will be exposed to a concentration above 1 OU/m^3 approximately 1.5% of the time. • The sensitive receptor exposed to the highest odour concentration is located east of the facility on Hwy 138 across from the EOWHF. • The highest concentration predicted at a sensitive receptor is 1.85 OU/m^3, which is a 26% increase over existing conditions.	• No additional mitigation measures are expected to be necessary beyond those currently applied at the existing facility. • Since odour is not linear, a difference of less than a factor of 2 is not expected to be distinguishable by most people. • The maximum odour values tend to occur during calm meteorological periods with low winds, which generally occur during the nighttime hours.	• Six (6) sensitive receptors within the Off-site Study Area are predicted to experience maximum concentrations above 1 OU/m^3. • The most frequently impacted sensitive receptor will be exposed to a concentration above 1 OU/m^3 approximately 1.5% of the time. • The sensitive receptor exposed to the highest odour concentration is located southeast of the facility on Hwy 138 across from the EOWHF. • The highest concentration predicted at a sensitive receptor is 1.85 OU/m^3, which is a 26% increase over existing conditions.

4 Comparative Evaluation of Net Effects and Identification of the Preferred Alternative

A comparative evaluation of the net effects of each alternative method and the identification of a preferred alternative are carried out in accordance with the methods described in Section 2.2. The results of the comparative evaluation are provided below.

4.1 Comparative Evaluation Results

The results of the comparative evaluation for air quality and odour are provided in **Table 4-1**.

Table 4-1. Comparative Evaluation of Net Effects for Air Quality and Odour

Evaluation Criteria	Indicators	Net Effects of Alternative Methods: Alternative Method 1	Net Effects of Alternative Methods: Alternative Method 2
Air Quality	Predicted maximum off-site point of impingement concentrations (µg/m^3) of compounds of concern.	• The off-site ground-level concentrations of over 180 contaminants of concern were estimated within the study area and compared against provincial and federal ambient air quality criteria, standards, guidelines and screening levels and the results indicate that all were within the relevant standards with the exceptions of: Nitrogen Dioxide, Suspended Particulate Matter (SPM) and Fine Particulate Matter (PM_{10}). • Nitrogen dioxide concentrations are predicted to exceed the 2025 CAAQS by 54%. Exceedances are at the site boundary and fall to below the standard within 55 m of the boundary. Concentrations at sensitive receptors (residences) do not exceed the standard. • Suspended Particulate Matter (dust) concentrations are predicted to exceed the O.Reg.419/05 Air Standard by 88%. Exceedances are at the site boundary and fall to below the standard within 350 m of the boundary. High concentrations are mainly associated with road dust from on-site haul roads. Concentrations at sensitive receptors (residences) do not exceed the standard. • Fine particulate matter concentrations are predicted to exceed the Ontario AAQC by 150%. Exceedances are at the site boundary and fall to below the standard within 450 m of the boundary. High concentrations are mainly associated with road dust from on-site haul roads. Concentrations at sensitive receptors (residences) do not exceed the AAQC. **Not Preferred**	• The off-site ground-level concentrations of over 180 contaminants of concern were estimated within the study area and compared against provincial and federal ambient air quality criteria, standards, guidelines and screening levels and the results indicate that all were within the relevant standards with the exceptions of: Nitrogen Dioxide, Suspended Particulate Matter (SPM) and Fine Particulate Matter (PM_{10}). • Nitrogen dioxide concentrations are predicted to exceed the 2025 CAAQS by 47%. Exceedances are at the site boundary and fall to below the standard within 10 m of the boundary. Concentrations at sensitive receptors (residences) do not exceed the standard. • Suspended Particulate Matter (dust) concentrations are predicted to exceed the O.Reg.419/05 Air Standard by 56%. Exceedances are at the site boundary and fall to below the standard within 150 m of the boundary. High concentrations are mainly associated with road dust from on-site haul roads. Concentrations at sensitive receptors (residences) do not exceed the standard. • Fine particulate matter concentrations are predicted to exceed the Ontario AAQC by 84%. Exceedances are at the site boundary and fall to below the standard within 250 m of the boundary. High concentrations are mainly associated with road dust from on-site haul roads. Concentrations exceed the AAQC by 35% at only one sensitive receptor. At this receptor the concentration was predicted to exceed the standard infrequently, only 1 hour in the 43,800 hour modelling period, or 0.002% of the time. Concentrations at other sensitive receptors do not exceed the AAQC. **Preferred**

Table 4-1. Comparative Evaluation of Net Effects for Air Quality and Odour

Evaluation Criteria	Indicators	Net Effects of Alternative Methods	
		Alternative Method 1	Alternative Method 2
	Number of off-site receptors potentially affected (residential properties, public facilities, businesses/farms, institutions)	There are no public facilities or institutions within the study area. Concentrations of compounds of concern did not exceed provincial or federal ambient air quality criteria, standards or guidelines at any sensitive receptor (residence). Concentrations may exceed these criteria or standards on agricultural land bordering the site, though concentration drops off quickly with distance from the site boundary. **No Substantial Difference**	There are no public facilities or institutions within the study area. Concentrations of compounds of concern exceed provincial or federal ambient air quality criteria, standards or guidelines at only one sensitive receptor (residence), and concentration exceeded the AAQC at this location infrequently, only 0.002% of the time. Concentrations may exceed these criteria or standards on agricultural land bordering the site, though concentration drops off quickly with distance from the site boundary. **No Substantial Difference**
Odour	Predicted maximum off-site point of impingement concentrations (OU/m^3) of odour.	• The off-site ground-level concentrations of odour were estimated within the study area and compared against a guideline of 1 odour unit that is commonly applied in Ontario • Odour concentrations are predicted to exceed the guideline of 1 odour unit at sensitive receptors (residences). The highest concentration predicted at a sensitive receptor is 1.64 odour units. Six (6) sensitive receptors within the study area have maximum concentrations over 1 odour unit. The most frequently impacted sensitive receptor was exposed to concentration above 1 odour unit about 1.1% of the time. **No Substantial Difference** (odour quantification is non-linear, and differences less than a factor of 2 are not significant. There is no significant difference between 1.64 and 1.85 odour units.)	• The off-site ground-level concentrations of odour were estimated within the study area and compared against a guideline of 1 odour unit that is commonly applied in Ontario • Odour concentrations are predicted to exceed the guideline of 1 odour unit at sensitive receptors (residences). The highest concentration predicted at a sensitive receptor is 1.85 odour units. Six (6) sensitive receptors within the study area have maximum concentrations over 1 odour unit. The most frequently impacted sensitive receptor was exposed to concentration above 1 odour unit about 1.5% of the time. **No Substantial Difference** (odour quantification is non-linear, and differences less than a factor of 2 are not significant. There is no significant difference between 1.64 and 1.85 odour units.)
	Number of off-site receptors potentially affected (residential properties, public facilities, businesses/farms, institutions)	There are no public facilities or institutions within the study area. Six (6) sensitive receptors (residences) were exposed to odour concentration exceeding 1 odour unit. **No Substantial Difference**	There are no public facilities or institutions within the study area. Six (6) sensitive receptors (residences) were exposed to odour concentration exceeding 1 odour unit. **No Substantial Difference**

Table 4-1. Comparative Evaluation of Net Effects for Air Quality and Odour

Evaluation Criteria	Indicators	Net Effects of Alternative Methods	
		Alternative Method 1	Alternative Method 2
	Criteria Rating & Rationale	• Alternative Method 2 is slightly preferred on the basis of the air quality compounds of concern. While impacts of the two alternatives are very similar, Alternative Method 1 has slightly higher impacts of NO_2, SPM, and PM_{10}. • While there is a difference in odour impacts between Alternative Method 1 and 2, odour quantification is non linear and a difference of less than a factor of two is not significant. Odour levels of 1.64 and 1.85 odour units are not significant and are unlikely to be distinguishable to most people.	

4.2 Climate Change Considerations

The facility's impact on climate change is mainly linked to the fugitive emissions of LFG as it is mostly methane and carbon dioxide, as well as to the carbon dioxide emissions from the combustion of the LFG (~75% of LFG is collected).

Annual GHG emissions from the facility are expected to increase compared to existing conditions due to the increase in LFG quantities in both Alternative Method 1 and 2. In both Alternative Methods 1 and 2, the facility will receive and landfill solid waste at the same rate and the same total quantity. Therefore, in comparing GHG emissions from LFG in Alternative Methods 1 and 2, GHGs will be emitted at the same rate and the same total quantity over the life of the expanded facility. That is, GHG emissions from LFG are predicted to be the same for the two alternatives and greater than the existing conditions. **Table 4-2** provides the estimated annual emission rate of GHGs from the facility for LFG fugitive and combustion emissions using global warming potential (GWP) for carbon dioxide and methane emissions to estimate the equivalent carbon emissions for the maximum LFG generation year.[1]

Historical LFG generation estimates and actual LFG collection data for the existing EOWHF landfill suggests an average collection efficiency in the order of 84% over the past four years. At closure, there is the potential for the average collection efficiency to increase to 95%. **Table 4-3** presents a comparison of methane emissions from LFG collection at 75% collection efficiency and 95% collection efficiency during the maximum LFG generation year.

[1] https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/quantification-guidance/global-warming-potentials.html

Table 4-2. Green House Gas Releases from LFG (Maximum Projected Emissions)

GHG Species	GWP (kg CO_2e / kg X)	Existing Conditions		Existing Conditions + Expansion		Change (%)
		Annual Emissions (Tonne / year)	Annual Emissions (Tonne CO_2e/ year)	Annual Emissions (Tonne / year)	Annual Emissions (Tonne CO_2e/ year)	
Carbon Dioxide (CO_2)	1	126,109	126,109	198,314	198,314	57%
Methane (CH_4)	28	6,429	180,005	10,110	283,068	57%
Nitrous Oxide (N_2O)	265	Negligible	Negligible	Negligible	Negligible	-
Total CO_2e		-	306,114	-	481,382	57%

Table 4-3. Comparison of LFG Collection Efficiency for Existing Conditions + Expansion (Maximum Projected Emissions)

Maximum LFG Generated (m^3/year)	LFG Collection Efficiency (%)	LFG Collected (m^3/year)	Methane Concentration in LFG (%)	Methane Collected (m^3/year)	Methane Combusted (Tonne/ year)	Methane Combusted (Tonne CO_2e/ year)	Mass of CO_2 Created from Methane Combustion (Tonne/year)	GHG Reduction by Combustion (Tonne CO_2e/ year)
123,100,000	75%	92,325,000	50%	46,162,500	30,329	849,205	86,324	762,881
123,100,000	95%	116,945,000	50%	58,472,500	38,416	1,075,660	109,344	966,317

To a much lesser extent, there are also GHG emissions from the use of fuel on-site for equipment, vehicles, and stationary combustion. This includes emissions from diesel-fired equipment used for landfilling activities (Landfilling Activities – Diesel Emissions) and for compost handling (Compost Handling – Diesel Emissions), from tailpipe emissions from diesel-fired truck use on on-site roads (Truck Traffic – Diesel Emissions), and from natural gas use for comforting heating equipment (Comfort Heating – Natural Gas Emissions). The emissions for each source do not differ between the alternatives and scenarios except for the emissions from diesel-fired truck use on on-site roads.. This difference is caused by the variation in road lengths in each scenario which changes the distance travelled by the trucks. Table 4-4 summarizes the expected annual GHG emissions for each source and total GHG emissions for each Alternative and Scenario. Note that this is not meant to be an extensive inventory of GHG emissions but an overview of main GHG emitting sources to provide context to the net effects of the expansion project.

Table 4-5 presents an estimate of total GHG emissions, LFG releases and non-LFG releases, for the maximum LFG generation year. The non-LFG GHG releases contribute <3% of the total GHG releases in all alternatives and scenarios. Therefore, from a climate change perspective, there is no preference between Alternative Methods 1 and 2 as the increase in total GHG emissions is predicted to be very similar.

Table 4-4. Non-LFG Green House Gas Releases

Emission Source	Annual GHG Emissions (Tonne CO_2e/year)			
	Alternative 1 Scenario A	Alternative 1 Scenario B	Alternative 2 Scenario A	Alternative 2 Scenario B
Landfilling Activities – Diesel Emissions	2,917	2,917	2,917	2,917
Compost Handling – Diesel Emissions	3,916	3,916	3,916	3,916
Truck Traffic – Diesel Emissions	118	250	150	233
Comfort Heating – Natural Gas Emissions	791	791	791	791
All Sources – Total Emissions	**7,742**	**7,874**	**7,775**	**7,857**

Table 4-5. Estimate of Total GHG Emissions for Existing Conditions + Expansion (Maximum Projected Emissions)

GHG Releases	Maximum Projected Annual GHG Emissions (Tonne CO_2e/year)			
	Alternative 1 Scenario A	Alternative 1 Scenario B	Alternative 2 Scenario A	Alternative 2 Scenario B
LFG GHG Releases	481,382			
Non-LFG GHG Releases	7,742	7,874	7,775	7,857
Total GHG Releases	**489,124**	**489,256**	**489,157**	**489,239**
Percent of Non-LFG GHGs (%)	2%	2%	2%	2%

In 2021, Ontario's total GHG emissions were approximately 150,600,000 tonnes CO_2e with approximately 5,000,000 tonnes CO_2e generated from the solid waste sector. [2] Note that the provincial solid waste GHG emissions include emissions from municipal solid waste landfills, wood waste landfills and municipal solid waste composting and not other potential sources related to the industry.[2] The maximum predicted total GHGs for the facility expansion would contribute approximately 9.8% of Ontario's solid waste related GHG emissions and approximately 0.3% of the total GHG emissions from Ontario.

By comparison, the EA recently completed for the Waste Connections of Canada Ridge Landfill in Chatham, Ontario indicated that the landfill emitted approximately 391,000 tonnes CO_2e in 2020 and the emissions were projected to increase to approximately 762,000 tonnes CO_2e in 2042. The Ridge Landfill, which is one of the largest in Ontario, would account for over 15% of the landfill related GHG emissions in the province.

In 2021, Canada's total GHG emissions were approximately 670,000,000 tonnes CO_2e, with approximately 21,000,000 tonnes CO_2e generated from the waste sector.[3] The maximum predicted total GHGs for the facility expansion would contribute approximately 2% of Canada's waste related GHG emissions and approximately 0.01% of the total GHG emissions from the country.

Both alternative methods provide the same level of mitigation in the form of the proposed LFG collection and combustion systems. The existing gas collection system will be expanded to include the landfill expansion areas.

4.3 Advantages and Disadvantages of the Preferred Alternative

The differences in net effects are used to identify and compare the advantages and disadvantages of each alternative method.

From an air quality and odour perspective, the Alternative Method 2 has a very slight advantage over Alternative Method 1. For Alternative Method 1, concentrations of a few contaminants of concern exceeded provincial or federal ambient air quality criteria, standards or guidelines slightly more than for Alternative Method 2. The difference was small but discernable.

5 Commitments and Monitoring

To confirm that the commitments related to air quality and odour are carried out, and that the proposed mitigation measures address the predicted effects for air quality and odour, monitoring is proposed for construction, operations and maintenance of the EOWHF landfill. Monitoring for compliance will be undertaken to confirm that the project complies with the commitments and mitigation measures identified in the effects assessment.

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[2] https://data-donnees.ec.gc.ca/data/substances/monitor/canada-s-official-greenhouse-gas-inventory/B-Economic-Sector/EN_Annex12_GHG_Econ_Prov_Terr.xlsx

[3] https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/sources-sinks-executive-summary-2023.html

The commitments associated with air quality and odour are listed in Section 5.1. The proposed environmental effects monitoring is provided in Section 5.2. Compliance monitoring for air quality and odour is described in Section 5.3.

5.1 Air Quality and Odour Commitments

5.1.1 Particulate Matter Emissions Mitigation

The existing Fugitive Dust Management Plan is to be carried forward and implemented for the proposed undertaking in order to limit the generation and releases of fugitive dust from construction, operation and maintenance of the entire site.

The implementation of this plan across the proposed new developments is expected to effectively reduce emissions of fugitive dust from the site to manageable levels.

5.1.2 Landfill Gas Emissions Monitoring

The existing LFG collection system is to be expanded and installed as cell development progresses. The gas collected is to be combusted in either the IC engine generators or flare stacks (primarily the enclosed flare stacks with minor quantities going to the siloxane flare stack as necessary).

Combustible LFG concentrations in the subsurface are collected at locations around the perimeter of the facility monthly during the winter months (i.e., January, February and March) and once during the summer (typically August). Combustible gas concentrations are measured using calibrated portable gas probes capable of measuring ppm level concentrations. The results of this testing are then compared against the MECP's O.Reg. 232/98 guideline for combustible gas (i.e., methane) concentrations in the subsurface at the property line of the landfill of < 2.5% by volume, or < 25,000 ppmv.

This is intended to ensure that the gas collection system is operating as designed and minimize emissions of LFG from the site.

5.1.3 Odour Monitoring

Under normal operating conditions, no odour related effects are anticipated. The site currently maintains a detailed log of any odour-related complaints received from members of the surrounding community that are related to the facility's operations. This procedure will be continued in order to identify and track any potential issues, record any mitigation measures implemented and follow-up with the complainant.

5.1.4 Odour Management Plan

The following existing procedures will be carried forward from the existing facility Odour Management Plan and implemented to minimize the release of odorous emissions from the landfilling operations:

- Waste that is brought to the site with a strong odour will be placed at the toe of the working face and covered immediately with other garbage or soil cover;
- Cover soils will be applied to the working area at the end of the working day; and

- Landfill surface scans will be conducted on a regular basis to identify leaks in the final capping infrastructure. Leaks will be repaired as soon as possible and follow-up scans will verify the repairs were successful.

5.2 Environmental Effects Monitoring for Air Quality and Odour

Monitoring plans are developed as part of the detailed effects assessments carried out for the Preferred Alternative to confirm:

- the net effects are as predicted;
- unanticipated negative effects are addressed; and
- the effectiveness of the proposed mitigation measures.

Table 5-1 summarizes the environmental effects monitoring for the Preferred Alternative.

5.3 Air Quality and Odour Compliance Monitoring

Compliance monitoring will be undertaken to confirm that the construction, operation and maintenance of the project are carried out in accordance with the mitigation measures and commitments identified in the effects assessment. Compliance monitoring is summarized in **Table 5-1**. The results of compliance monitoring, including details of the effectiveness of mitigation measures and fulfillment of commitments, will be provided to the MECP.

Table 5-1. Environmental Effects and Compliance Monitoring for the Preferred Alternative

Evaluation Criteria	Potential Effect	Commitment for Mitigation	Commitment for Monitoring	Compliance Monitoring
Air Quality	• The off-site ground-level concentrationsof over 180 contaminants of concern were estimated within the study area and compared against provincial and federal ambient air quality criteria, standards, guidelines and screening levels and the results indicate that all were within the relevant standards with the exceptions of: Nitrogen Dioxide, Suspended Particulate Matter (SPM) and Fine Particulate Matter (PM_{10}). • Nitrogen dioxide concentrations are predicted to exceed the 2025 CAAQS by 47%. Exceedances are at the site boundary and fall to below the standard within 10 m of the boundary. Concentrations at sensitive receptors (residences) do not exceed the standard. • Suspended Particulate Matter (dust) concentrations are predicted to exceed the O.Reg.419/05 Air Standard by 56%. Exceedances are at the site boundary and fall to below the standard within 150 m of the boundary. High concentrations are mainly associated with road dust from on-site haul roads. Concentrations at sensitive receptors (residences) do not exceed the standard. • Fine particulate matter concentrations are predicted to exceed the Ontario AAQC by 84%. Exceedances are at the site boundary and fall to below the standard within 250 m of the boundary. High concentrations are mainly associated with road dust from on-site haul roads. Concentrations exceed the AAQC by 35% at only one sensitive receptor. At this receptor the concentration was predicted to exceed the standard infrequently, only 1 hour in the 43,800 hour modelling period, or 0.002% of the time. Concentrations at other sensitive receptors do not exceed the AAQC	• No additional mitigation measures are expected to be necessary beyond those currently applied at the existing facility (e.g., Fugitive Dust Management Plan, LFG management).	• On-going seasonal dustfall monitoring as per the existing ECA requirements.	• Annually during construction and operation as part of the current monitoring program.

Table 5-1. Environmental Effects and Compliance Monitoring for the Preferred Alternative

Evaluation Criteria	Potential Effect	Commitment for Mitigation	Commitment for Monitoring	Compliance Monitoring
Odour	• The off-site ground-level concentrations of odour were estimated within the study area and compared against a guideline of 1 odour unit that is commonly applied in Ontario • Odour concentrations are predicted to exceed the guideline of 1 odour unit at sensitive receptors (residences). The highest concentration predicted at a sensitive receptor is 1.85 odour units. Six (6) sensitive receptors within the study area have maximum concentrations over 1 odour unit. The most frequently impacted sensitive receptor was exposed to concentration above 1 odour unit about 1.5% of the time.	• No additional mitigation measures are expected to be necessary beyond those currently applied at the existing facility (e.g., Odour Management Plan).	• Maintain log of any odour-related complaints and follow up actions. • Continue to report on public complaints and responses regarding odour on an annual basis. • A surface landfill gas emission survey of the completed areas with final cover is conducted at least two times a year (summer and winter), to provide an indication of the performance of the final cover and the existing LFG collection and control system, and to identify areas of the Site which require upgraded or additional gas collection and control facilities. • Vacuum, temperature, gas composition and flow rate shall be monitored within the collection system and at the blower/flare Station. • As each phase of the landfill is constructed, LFG monitors will be progressively installed within the landfill buffer approximately every 200 metres around the landfill perimeter and will be conducted monthly during the winter and once in the summer.	• Annually during construction and operation as part of the current monitoring program.

6 Air Quality and Odour Approvals

There are no additional approvals anticipated under the *Environmental Protection Act* for air quality and odour other than EA requirements.

7 References

HDR

2022 Conceptual Design Report. Eastern Ontario Waste Handling Facility Landfill Expansion. HDR. April 2022.

Ontario Ministry of the Environment, Conservation and Parks

1998 Ontario Regulation 232/98: Ministry of the Environment Landfill Standards, May 1998.

2009 Ontario Regulation 419/05: Air Pollution – Local Air Quality, December 22, 2009.

2017 Guideline A-11 - Air Dispersion Modelling Guideline for Ontario, Version 3.0, March 2017, PIBs # 5165e03

2018 Procedure for Preparing and Emission Inventory and Dispersion Modelling Report, Version 4.0, February 2018

2018 Jurisdictional Screening Level (JSL) List, A Screening Tool for Ontario Regulation 419: Air Pollution – Local Air Quality, April 2018, PIBS #: 6547e, Version 2.0.

2020 Ambient Air Quality Criteria (AAQC), May 2020

Ramboll Canada Inc.

2022 Air Quality and Odour Existing Conditions Report. Eastern Ontario Waste Handling Facility Expansion Environmental Assessment. Ramboll Canada Inc. June 2022,

2022 Air Quality and Odour Emission Summary and Dispersion Modelling (ESDM). Eastern Ontario Waste Handling Facility Expansion Environmental Assessment. Ramboll Canada Inc. June 2022.

Appendix A. Emission Summary and Dispersion Modelling Report

Prepared for

GFL Environmental Inc.

Moose Creek, Ontario

Document type

Emission Summary and Dispersion Modelling Report

Date

June 2023

EMISSION SUMMARY AND DISPERSION MODELLING REPORT

EASTERN ONTARIO WASTE HANDLING FACILITY FUTURE DEVELOPMENT ENVIRONMENTAL ASSESSMENT

RAMBOLL

Project name	**GFL: EOWHF Effects Assessment Report**
Project no.	**324000731**
Recipient	**GFL Environmental Inc.**
Document type	**Emission Summary and Dispersion Modelling Report**
Version	**2**
Date	**June 7, 2023**
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Description	**Eastern Ontario Waste Handling Facility: Emission Summary and Dispersion Modelling Report**

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VERSION CONTROL

Emission Summary and Dispersion Modelling Report

GFL Environmental Inc., Eastern Ontario Waste Handling Facility

Rev.	Date	Description	Authors
-	June 2022	Emission Summary and Dispersion Modelling Report to support Effects Assessment Report	PEG
1	June 2023	Revisions to ESDM report based on comments originally received from MECP on February 13, 2023	DMD

EXECUTIVE SUMMARY

GFL Environmental Inc. (GFL) operates the Eastern Ontario Waste Handling Facility (EOWHF) at 17125 Laflèche Road, North Stormont, Ontario. The EOWHF includes a landfill, a landfill gas to energy facility, and an organics composting facility. The facility is located approximately 5 km north-northwest from Moose Creek, Ontario and 5 km east of Casselman, Ontario.

GFL is undertaking an Environmental Assessment for additional landfill capacity as part of future development of the EOWHF. GFL contracted Ramboll Canada Inc. to prepare an Air Quality and Odour Effects Assessment Report to support the Environmental Assessment.

The proposed future development EOWHF landfill is projected to reach its end of life in year 2046. The purpose of this Emission Summary and Dispersion Modelling (ESDM) report is to document air and odour impacts of the proposed EOWHF future development and will feed into and support the Air Quality and Odour Effects Assessment Report.

This ESDM report has been prepared mainly in accordance with the "Procedure for Preparing an Emission Summary and Dispersion Modelling Report", published by the Ministry of the Environment, Conservation and Parks (MECP) in March 2018 (the "ESDM Guidance"). However, because this report is intended to support an Environmental Assessment, additional emission sources and contaminants that are not normally considered in an ESDM report have been included to provide a more comprehensive analysis. These sources include fugitive dust from roadways and material handling, and tailpipe emissions from onsite vehicles.

Facility Description

The approved existing EOWHF encompasses a site area of 189 hectares which includes the following waste management related activities and services:

- 112 hectare landfill site;
- waste water (leachate) treatment facility;
- landfill gas (LFG) utilization facility;
- composting facility;
- waste transfer and processing station;
- small vehicle waste drop off;
- enclosed flare and natural gas fired comfort heating equipment;
- Resource Productivity & Recovery Authority (RPRA) – Scrap Tires Collector; and
- supporting facilities (office, vehicle maintenance building).

The facility boundary and site layout are illustrated in Figures B1 through B5, Appendix B.

Landfill

The facility receives up to 755,000 tonnes per year, or 3,100 tonnes per day, of waste including:

- Municipal solid waste;
- Construction & Demolition Waste;
- Institutional, Commercial & Industrial Waste; and
- Specified Risk Material.

GFL has undertaken and received approval for the EA Terms of Reference (ToR) for the proposed future development of the EOWHF1. The following two alternative methods for the future development were identified in the ToR, both of which have a predicted end of life in year 2045:

- <u>Alternative 1</u> consists of implementing the future development through five stages: one stage adjacent to and north of the existing landfill (Stage 5); and four stages oriented east-west within the future development lands (Stages 6 through 9). Stages 6 through 8 will be identical in size, while Stages 5 and 9 will be smaller. Landfilling will progress sequentially from Stage 5 through Stage 9.

- Alternative 2 consists of implementing the future development through four stages: one stage adjacent to and north of the existing landfill (Stage 5); and three stages oriented north-south within the future development lands (Stages 6 through 8). Stages 6 and 7 will be identical in size, while Stages 5 and 8 will be smaller. Landfilling will progress sequentially from Stage 5 through Stage 8.

Landfill gas (LFG) is generated by the decomposition of organic and inorganic waste materials within the cells. LFG is roughly 50% methane, with the remainder mainly carbon dioxide and nitrogen gas, with trace but significant quantities of a long list of other contaminants. As a result of the trace contaminants, LFG is odorous.

LFG Utilization

LFG is captured and collected through a complex network of LFG wells and collection ductwork embedded within the cells. LFG is drawn from the wells, through an underground collection network to the Landfill Gas Utilization Facility. The collection system is estimated to have a capture efficiency of 75%, in that 75% of LFG generated within the cells is captured and conveyed to the LFG Utilization Facility, while the remaining 25% will be emitted from the surface of landfill cells.

At the LFG Utilization Facility, LFG is used to fuel four (4) Jenbacher reciprocating engines, each coupled to a 1 MW generator. Siloxanes are removed from the LFG fueling the engines by passing the stream through a two-bed adsorption filter, and combusted with additional LFG in an enclosed flare (Flare 3).

The remaining LFG that is not processed in the reciprocating engines or the siloxane flare, is combusted in one of two enclosed flares, identified as Flares 1 and 2. These flares are sized to provide redundancy, and have the capacity to combust all LFG if the engines are not operating for any reason. Under normal conditions when engines are operating near capacity, Flares 1 and 2 will operate well below rated capacity.

Compost Plant

Organic waste is composted in a bunker system within two closed buildings. Raw organic waste is dumped directly onto the tipping floor of the buildings through truck doors. Additional bulking agent (wood chips, shredded leaf and yard waste) is stockpiled outdoors, shredded and added as needed to obtain the required mix of materials. The compost buildings are maintained under negative pressure, and the total exhaust from the buildings is treated in a biofilter for odour control. On completion of composting, the material is transferred by conveyor to trucks for transfer to the remote curing windrows.

Compost from the plant is initially screened and placed into windrows for curing on the Windrow Curing Pad, where the windrows are turned about once per week, weather permitting. On completion of curing, the material is considered finished compost, and is screened, stockpiled, and shipped off-site.

Assessment

Emission estimates have been developed for all sources at the facility, based on emission factors, measurements, or published literature. Some sources at the facility have been considered negligible.

Section 20 of O.Reg. 419/05 applies to the facility. As a result, off property concentrations of contaminants were estimated using the AERMOD dispersion model (version 19191), and site-specific meteorological data following the methods prescribed in the Air Dispersion Modelling Guideline for Ontario (ADMGO). Contaminant concentrations were predicted at Point of Impingement (POI) and at sensitive receptors (residences) around the facility. Resulting concentrations are compared to the standards, guidelines and screening levels provided in the MECP's Air Contaminants Benchmarks (ACB) list, Version 2, dated April 2018 in Table 1, Emission Summary Table.

The table indicates that predicted concentrations of all contaminants comply with the applicable limits, with the exceptions noted below.

The maximum concentration of suspended particulate matter (SPM) exceeds the applicable air standard, with a maximum 24-hour concentration that is 188% of the limit. The highest concentration occurs on the property boundary along Lafleche Road, near the east corner of the site. Dust from the adjacent haul is the major contributor to the SPM concentration at this location. The concentrations fall off quickly with distance from the property line. At sensitive receptors, SPM concentration does not exceed 99% of the limit. It is notable that to assess compliance with Ontario Regulation 419/05, dust from the haul road would not be included, and the air standard would not be exceeded.

Two constituents of LFG exceeds screening levels or de minimus concentrations on the western property line. Concentration of these compounds fall off quickly with distance from the property line, and these levels are not exceeded at any sensitive receptor. Exceeding a screening level or the de minimus concentration does not necessarily indicate that a health risk threshold has been exceeded. Under normal circumstances any application for an Environmental Compliance Approval would include a maximum ground level concentration acceptability request for these contaminants, which would trigger evaluation of the risk associated with the modelled concentrations.

Odour, quantified in odour units per cubic metre (ou/m^3) is compared to a guideline of 1 ou/m^3 that is often applied in Ontario. Similar to contaminants with 10-minute average standards, odour is evaluated on a 10-minute average, and the 99.5th percentile concentration at a sensitive receptor is compared to the guideline. The highest concentration at a sensitive receptor reaches 1.85 ou/m^3 or 185% of the guideline (Alternative Method 2 Scenario A). The sensitive receptor exposed to the highest odour concentration is located east of the facility on Hwy 138. The dispersion model predicts odour concentration will exceed a level of 1 ou/m^3 at a sensitive receptor about 638 times in the five year modelling period (10-minute occurrence) or 1.5% of the time.

Table E1. Emission Summary Table

Contaminant	Criteria					Alternative 1 Worst Case				Alternative 2 Worst Case			
						Modelled Concentration [μg/m^3]		Percent of Criteria [%]		Modelled Concentration [μg/m^3]		Percent of Criteria [%]	
	Avg. Period [hr]	Limit [μg/m^3]	Limiting Effect	ACB Source[1]	Category[2]	POI	Sensitive Receptor	POI	Sensitive Receptor	POI	Sensitive Receptor	POI	Sensitive Receptor
Nitrogen Oxides (as NO_2)	24 hr	200	Health	Standard	B1	45.0	8.32	22%	4%	45.0	9.9	22%	5%
	1 hr	400	Health	Standard	B1	178	48.6	44%	12%	148	70.3	37%	18%
Nitrogen Dioxide	24 hr	200	Health	AAQC	n/a	45.0	8.32	22%	4%	45	9.89	22%	5%
	1 hr	400	Health	AAQC	n/a	178	48.6	44%	12%	148	70.3	37%	18%
	1-hr	113	n/a	CAAQS	n/a	96.4	29.6	85%	26%	91	33.0	80%	29%
	Annual	32	n/a	CAAQS	n/a	5.65	0.83	18%	3%	5.63	0.88	18%	3%
Suspended particulate matter	24 hr	120	Visibility	Standard	B1	226	85.4	188%	71%	187	119	156%	99%
Particulate matter (< 10 μm dia.)	24 hr	50	Health	AAQC	n/a	125	42.6	250%	85%	92	67.4	184%	135%
Particulate matter (< 2.5 μm dia.)	24 hr	27	Health	AAQC	n/a	7.27	2.29	27%	8%	6.22	2.57	23%	10%
	annual	8.8	Health	AAQC	n/a	1.91	0.377	22%	4%	1.89	0.43	21%	5%
Carbon Monoxide	0.5 hr	6000	Health	Standard	B1	1860	503	31%	8%	1535	722	26%	12%
	1 hr	36,200	Health	AAQC	n/a	1550	419	4%	1%	1280	602	4%	2%
	8 hr	15,700	Health	AAQC	n/a	866	234	6%	1%	715	336	5%	2%
Sulfur Dioxide	10 min	178	Health	AAQC	n/a	7.80	2.61	4%	1%	7.80	2.61	4%	1%
	1 hr	100	Health & Veg.	Standard	B1	4.73	1.58	5%	2%	4.73	1.58	5%	2%
	annual	10	Health & Veg.	Standard	B1	0.301	0.040	3%	<1%	0.301	0.040	3%	<1%
	1 hr	173	n/a	CAAQS	n/a	4.63	1.39	3%	<1%	4.63	1.39	3%	<1%
Hydrogen Chloride	24 hr	20	Health	Standard	B1	2.33	0.330	12%	2%	2.33	0.330	12%	2%
Odour[3] (units: ou/s, or ou/m^3)	10 min	1	---	Guideline	---	n/a	1.64	n/a	164%	n/a	1.85	n/a	185%
LFG Contaminants													
LFG Unit Emission Run	1 hr					93.7	45.9			62.6	35.0		
	24 hr					35.9	14.7			25.2	12.1		
	annual					4.53	1.59			3.36	1.85		
	10 min					155	75.7			103	57.8		
1,1,2,2-Tetrachloroethane	24 hr	0.1	Health	SL-JSL	B2	0.106	0.048	106%	48%	0.094	0.045	94%	45%
1,1,2-Trichloroethane	24 hr	0.3	Health	SL-JSL	B2	0.025	0.011	8%	4%	0.022	0.011	7%	4%
1,2-Dichloroethane (Ethylene dichloride)	24 hr	2	Health	Standard	B1	0.019	0.008	<1%	<1%	0.017	0.008	<1%	<1%
	Annual	0.4	Health	AAQC	n/a	0.002	0.001	<1%	<1%	0.002	0.001	<1%	<1%
1,2-Dichloroethene	24 hr	105	Health	Guideline	B1	1.301	0.593	1%	<1%	1.161	0.556	1%	<1%
1,3-Butadiene (Vinyl ethylene)	Annual	2	Health	Standard	B1	0.001	0.001	<1%	<1%	0.001	0.001	<1%	<1%
	24 hr	10	Health	AAQC	n/a	0.011	0.005	<1%	<1%	0.009	0.005	<1%	<1%
2-Ethyltoluene	24 hr	0.5	Health	SL-JSL	B2	0.046	0.021	9%	4%	0.041	0.020	8%	4%
Acetaldehyde	24 hr	500	Health	Standard	B1	0.004	0.002	<1%	<1%	0.004	0.002	<1%	<1%
	0.5 hr	500	Health	Standard	B1	0.013	0.006	<1%	<1%	0.011	0.006	<1%	<1%
Benzene	Annual	0.45	Health	Standard	B1	0.028	0.012	6%	3%	0.026	0.014	6%	3%

Contaminant	Criteria					Alternative 1 Worst Case				Alternative 2 Worst Case			
						Modelled Concentration [µg/m³]		Percent of Criteria [%]		Modelled Concentration [µg/m³]		Percent of Criteria [%]	
	Avg. Period [hr]	Limit [µg/m³]	Limiting Effect	ACB Source[1]	Category[2]	POI	Sensitive Receptor	POI	Sensitive Receptor	POI	Sensitive Receptor	POI	Sensitive Receptor
	24 hr	2.3	Health	AAQC	n/a	0.221	0.101	10%	4%	0.197	0.094	9%	4%
Benzyl chloride	24 hr	0.1	Health	SL-JSL	B2	0.003	0.001	3%	1%	0.002	0.001	2%	1%
cis-2-Pentene	24 hr	0.5	Health	SL-JSL	B2	0.004	0.002	<1%	<1%	0.004	0.002	<1%	<1%
Dibromochloromethane	24 hr	0.2	Health	SL-JSL	B2	0.004	0.002	2%	<1%	0.003	0.002	2%	<1%
Formaldehyde	24 hr	65	Health	Standard	B1	0.000	0.000	<1%	<1%	0.000	0.000	<1%	<1%
Isoprene (2-Methyl-1,3-butadiene)	24 hr	0.1	Health	SL-JSL	B2	0.001	0.001	1%	<1%	0.001	0.001	1%	<1%
Naphthalene	24 hr	22.5	Health	Guideline	B1	0.016	0.007	<1%	<1%	0.014	0.007	<1%	<1%
	10 min	50	Odour	Guideline	B1	0.000	0.034	<1%	<1%	0.000	0.033	<1%	<1%
p-Cymene (1-Methyl-4-Isopropylbenzene)	24 hr	50	Health	SL-JSL	B2	0.566	0.258	1%	<1%	0.505	0.242	1%	<1%
Trichloroethylene (Trichloroethene)	24 hr	12	Health	Standard	B1	0.128	0.058	1%	<1%	0.114	0.055	<1%	<1%
	Annual	2.3	Health	AAQC	n/a	0.016	0.007	<1%	<1%	0.015	0.008	<1%	<1%
Trichloromethane (Chloroform)	24 hr	1	Health	Standard	B1	0.010	0.005	<1%	<1%	0.009	0.004	<1%	<1%
	Annual	0.2	Health	AAQC	n/a	0.001	0.001	<1%	<1%	0.001	0.001	<1%	<1%
Vinyl chloride (Chloroethene)	24 hr	1	Health	Standard	B1	0.104	0.048	10%	5%	0.093	0.045	9%	4%
	Annual	0.2	Health	AAQC	n/a	0.013	0.006	7%	3%	0.012	0.007	6%	3%
Total Reduced Sulphur Compounds	24 hr	7	Health	Guideline	B1	1.951	0.890	28%	13%	1.741	0.834	25%	12%
	10 min	13	Odour	Guideline	B1		4.115	<1%	32%		3.991	<1%	31%
1-Methylcyclohexene	24 hr	0.1	de minimus	Table B-2A	n/a	0.003	0.001	3%	1%	0.002	0.001	2%	1%
2,4-Dimethylhexane	24 hr	0.1	de minimus	Table B-2A	n/a	0.030	0.014	30%	14%	0.027	0.013	27%	13%
2,5-Dimethylhexane	24 hr	0.1	de minimus	Table B-2A	n/a	0.022	0.010	22%	10%	0.020	0.010	20%	10%
2-Ethyl-1-butene	24 hr	0.1	de minimus	Table B-2A	n/a	0.002	0.001	2%	<1%	0.002	0.001	2%	<1%
3,6-Dimethyloctane	24 hr	0.1	de minimus	Table B-2A	n/a	0.131	0.060	131%	60%	0.117	0.056	117%	56%
cis-1,4-Dimethylcyclohexane	24 hr	0.1	de minimus	Table B-2A	n/a	0.033	0.015	33%	15%	0.029	0.014	29%	14%
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	24 hr	0.1	de minimus	Table B-2A	n/a	0.033	0.015	33%	15%	0.029	0.014	29%	14%
trans-1,4-Dimethylcyclohexane	24 hr	0.1	de minimus	Table B-2A	n/a	0.027	0.012	27%	12%	0.024	0.012	24%	12%
cis-2-Heptene	24 hr	0.1	de minimus	Table B-2A	n/a	0.003	0.001	3%	1%	0.003	0.001	3%	1%
cis-2-Octene	24 hr	0.1	de minimus	Table B-2A	n/a	0.029	0.013	29%	13%	0.026	0.012	26%	12%
cis-3-Methyl-2-pentene	24 hr	0.1	de minimus	Table B-2A	n/a	0.002	0.001	2%	<1%	0.002	0.001	2%	<1%
Isopropyl mercaptan	24 hr	0.1	de minimus	Table B-2A	n/a	0.016	0.007	16%	7%	0.014	0.007	14%	7%
trans-1,2-Dimethylcyclohexane	24 hr	0.1	de minimus	Table B-2A	n/a	0.053	0.024	53%	24%	0.048	0.023	48%	23%
trans-1,4-Dimethylcyclohexane	24 hr	0.1	de minimus	Table B-2A	n/a	0.027	0.012	27%	12%	0.024	0.012	24%	12%
trans-2-Octene	24 hr	0.1	de minimus	Table B-2A	n/a	0.032	0.015	32%	15%	0.028	0.014	28%	14%
trans-3-Methyl-2-pentene	24 hr	0.1	de minimus	Table B-2A	n/a	0.002	0.001	2%	<1%	0.001	0.001	1%	<1%
Trichlorofluoromethane (Freon 11)	24 hr	0.1	de minimus	Table B-2A	n/a	0.040	0.018	40%	18%	0.036	0.017	36%	17%
Siloxanes Siloxanes Unit Emission Run	24 hr					11.9	5.04			8.98	3.79		
Trimethylsilanol	24 hr	32.5	Health	SL-JSL	B2	0.307	0.139	<1%	<1%	0.307	0.130	<1%	<1%

Contaminant	Criteria					Alternative 1 Worst Case				Alternative 2 Worst Case			
						Modelled Concentration [µg/m³]		Percent of Criteria [%]		Modelled Concentration [µg/m³]		Percent of Criteria [%]	
	Avg. Period [hr]	Limit [µg/m³]	Limiting Effect	ACB Source[1]	Category[2]	POI	Sensitive Receptor	POI	Sensitive Receptor	POI	Sensitive Receptor	POI	Sensitive Receptor
Trimethylsilyl Fluoride	24 hr	0.1	de minimus	Table B-2A	n/a	0.016	0.007	16%	7%	0.016	0.007	16%	7%
Methoxytrimethylsilane	24 hr	0.1	de minimus	Table B-2A	n/a	0.010	0.005	10%	5%	0.010	0.004	10%	4%
Ethoxytrimethylsilane	24 hr	0.1	de minimus	Table B-2A	n/a	0.006	0.003	6%	3%	0.006	0.003	6%	3%
Propoxytrimethylsilane	24 hr	0.1	de minimus	Table B-2A	n/a	0.005	0.002	5%	2%	0.005	0.002	5%	2%
Isopropoxytrimethylsilane	24 hr	0.1	de minimus	Table B-2A	n/a	0.005	0.002	5%	2%	0.005	0.002	5%	2%
Butoxytrimethylsilane	24 hr	0.1	de minimus	Table B-2A	n/a	0.003	0.001	3%	1%	0.003	0.001	3%	1%
1-methylbutoxytrimethylsilane	24 hr	0.1	de minimus	Table B-2A	n/a	0.006	0.003	6%	3%	0.006	0.002	6%	2%

Notes:
1) ACB Source: "S" - Standard (for Section 20), "G" - Guideline (for Section 20), "SL-JSL" - Screening Level (SL) set by the MECP based on a review of toxicity information and/or other jurisdictional level
2) Category: "B1" - Benchmark 1 , "B2" - Benchmark 2.
3) The 1-hr air dispersion modelling output units were adjusted in AERMOD to reflect the expected peak 10-min average values using the MECP recommended standard conversion factor of 1.65

EMISSION SUMMARY AND DISPERSION MODELLING REPORT CHECKLIST

Company Name: GFL Environmental Inc.

Company Address: 17125 Laflèche Road,
North Stormont, Ontario, K0C 1W0

Location of Facility: 17125 Laflèche Road,
North Stormont, Ontario, K0C 1W0

The attached Emission Summary and Dispersion Modeling Report was prepared in accordance with s.26 of O. Reg.419/05 and the guidance in the Ministry of Environment, Conservation and Parks (MECP) documents "Procedure for Preparing an Emission Summary and Dispersion Modelling Report" dated March 2018 and "Air Dispersion Modelling Guideline for Ontario" (ADMGO) dated February 2017 and the minimum required information identified in the check-list on the following page has been submitted.

Company Contact

Name: Greg van Loenen

Title: Environmental Compliance Officer, GFL Environmental Inc.

Phone Number: (613) 538-2776 ext. 2223

Signature: Greg vL

Date: June 7, 2023

Technical Contact

Name: Deanne Durward, P.Eng.

Representing: Ramboll Canada Inc.

Phone Number: (289) 290-0607

Signature:

Date: June 7, 2023

EMISSION SUMMARY AND DISPERSION MODELLING REPORT CHECKLIST

	Required Information	Submitted	Explanation/Reference
	Executive Summary and Emission Summary Table		
	Overview of ESDM Report	☒Yes	Executive Summary
	Emission Summary Table	☒Yes	Executive Summary
1.0	**Introduction and Facility Description**		
1.1	Purpose and Scope of ESDM Report (when report only represents a portion of facility)	☒Yes	Section 1.0
1.2	Description of Processes and NAICS code(s)	☒Yes	Section 1.0
1.3	Description of Products and Raw Materials	☒Yes	Section 1.0
1.4	Process Flow Diagram	☒Yes	Appendix B, Figure B6
1.5	Operating Schedule	☒Yes	Section 1.0
2.0	**Initial Identification of Sources and Contaminants**		
2.1	Sources and Contaminants Identification Table	☒Yes	Section 2, Table A1
3.0	**Assessment of the Significance of Contaminants and Sources**		
3.1	Identification of Negligible Contaminants and Sources	☒Yes	Section 3
3.2	Rationale for Assessment	☒Yes	Section 3
4.0	**Operating Conditions, Emission Estimating and Data Quality**		
4.1	Description of operating conditions, for each significant contaminant that results in the maximum POI concentration for that contaminant	☒Yes	Section 4.1
4.2	Explanation of Method used to calculate the emission rate for each contaminant	☒Yes	Section 4.2, Appendix E
4.3	Sample calculation for each method	☒Yes	Appendix E
4.4	Assessment of Data Quality for each emission rate	☒Yes	Appendix A, Table A2
5.0	**Source Summary Table and Property Plan**		
5.1	Source Summary Table – Sorted by source	☒Yes	Appendix A, Table A2
5.2	Source Summary Table – Sorted by contaminant	☐Yes	n/a
5.3	Site Plan (scalable)	☒Yes	Appendix B, Figures B1 - B5
5.4	A scalable roof layout indicating discharge locations and air intakes	☒Yes	Appendix B, Figures B1 - B5
6.0	**Dispersion Modelling**		
6.1	Dispersion Modelling Input Summary Table	☒Yes	Appendix D
6.2	Land Use Zoning Designation Plan	☐Yes	n/a
6.3	Dispersion Modelling Input and Output Files	☒Yes	Appendix D
7.0	**Emission Summary Table and Conclusions**		
7.1	Emission Summary Table	☒Yes	Appendix A, Table A3
7.2	Assessment of Contaminants with no MOECC POI Limits	☐Yes	N/A
7.3	Assessment Values (if contaminants with Annual Standards are emitted – see Technical Bulletin - Methodology For Using "Assessment Values" For Contaminants With Annual Air Standards under O. Reg. 419/05)	☒Yes	Appendix A, Table A3
7.4	Conclusions	☒Yes	Section 7

1. INTRODUCTION AND FACILITY DESCRIPTION

GFL Environmental Inc. (GFL) operates the Eastern Ontario Waste Handling Facility (EOWHF) at 17125 Laflèche Road, North Stormont, Ontario. The EOWHF includes a landfill, a landfill gas to energy facility, and an organics composting facility. The facility is located approximately 5 km north-northwest from Moose Creek, Ontario and 5 km east of Casselman, Ontario.

1.1 Purpose and Scope of ESDM Report

GFL is undertaking an Environmental Assessment for additional landfill capacity as part of future development of the EOWHF. GFL contracted Ramboll Canada Inc. to prepare an Air Quality and Odour Effect Assessment Report to support the Environmental Assessment.

The existing EOWHF landfill is projected to reach its currently approved capacity in 2025, and the proposed additional capacity would extend the life of the facility by about 20 years. The purpose of this Emission Summary and Dispersion Modelling (ESDM) report is to document air and odour impacts of the EOWHF with this future development. This report will feed into and support the Air Quality and Odour Effects Assessment Report.

The generation of LFG is an important factor in the assessment of air quality around a landfill. The LFG generation rate for the proposed EOWHF future development will peak just after the landfill reaches its predicted end-of-life, which is predicted to occur around 2046. After closure of the landfill, LFG generation will fall off slowly with time.

This ESDM report has been prepared mainly in accordance with the "Procedure for Preparing an Emission Summary and Dispersion Modelling Report", published by the Ministry of the Environment, Conservation and Parks (MECP) in March 2018 (the "ESDM Guidance"). The report includes all air emissions from the subject facility, upgrades currently underway and planned, and considers activities during landfilling for multiple scenarios for each Alternative Method planned.

GFL is planning to relocate compost curing and storage pad areas. It is currently anticipated that the new compost pads will be constructed and operational during the life of the future development. Therefore, for the purpose of this report, the pads have been included in this area as part of the effects assessment.

However, because this report is intended to support an Environmental Assessment, additional emission sources and contaminants that are not normally considered in an ESDM report have been included to provide a more comprehensive analysis. These sources include fugitive dust from roadways and material handling, and tailpipe emissions from onsite vehicles.

1.2 Description of Current Process and NAICS Code

The EOWHF is described by the North American Industrial Classification system (NAICS) code 562210, "Waste treatment and disposal".

The approved existing EOWHF encompasses a site area of 189 hectares which includes the following waste management related activities and services:

- 112 hectare landfill site;
- Waste water (leachate) treatment facility;
- Landfill gas (LFG) utilization facility;
- Composting facility;
- Waste transfer and processing station;

- Small vehicle waste drop off;
- Enclosed flare and natural gas fired comfort heating equipment;
- Resource Productivity & Recovery Authority (RPRA) – Scrap Tires Collector; and
- Supporting facilities (office, vehicle maintenance building).

1.2.1 Landfill Activities

The facility receives up to 755,000 tonnes per year, or 3,100 tonnes per day, of waste including:

- Municipal solid waste;
- Construction & Demolition Waste;
- Institutional, Commercial & Industrial Waste; and
- Specified Risk Material.

GFL has undertaken and received approval for the EA Terms of Reference (ToR) for the proposed future development of the EOWHF1. The following two alternative methods for the future development were identified in the ToR:

- Alternative 1 consists of implementing the future development through five stages: one stage adjacent to and north of the existing landfill (Stage 5); and four stages oriented east-west within the future development lands (Stages 6 through 9). Stages 6 through 8 will be identical in size, while Stages 5 and 9 will be smaller. Landfilling will progress sequentially from Stage 5 through Stage 9.

- Alternative 2 consists of implementing the future development through four stages: one stage adjacent to and north of the existing landfill (Stage 5); and three stages oriented north-south within the future development lands (Stages 6 through 8). Stages 6 and 7 will be identical in size, while Stages 5 and 8 will be smaller. Landfilling will progress sequentially from Stage 5 through Stage 8.

The conceptual designs for the two alternatives each provide 15.1 million m^3 of landfill disposal capacity and differ primarily in their geometry and footprint. The disposal capacity for both alternatives will be consumed at a rate of approximately 755,000 m^3 per year over the 20-year planning period. Approximately 755,000 m^3 of landfill capacity corresponds to 755,000 tonnes (t) of received waste.

Truck loads of waste are scaled at entrance to the property on Laflèche Road. The trucks then travel over a network of paved and unpaved on-site haul roads, and waste is dumped on the active cells. The trucks leave by return route. The waste is spread and compacted on the active cells continuously through the day. At the end of each day, all exposed waste is covered by a 0.15 m layer of cover materials as allowed by the facility's ECA (waste). This daily cover reduces wind-blown trash, birds and pests, and odour emissions.

When cells reach capacity, the cells are covered with a thicker layer (0.3 m) of materials as allowed by the facility's ECA (waste) as intermediate cover. Eventually, the cells are covered by another layer, including a geosynthetic membrane as final cover. Final cover is intended to provide an impervious barrier to limit leachate generation and reduce emissions of landfill gas (LFG) generated within the landfill as waste materials decompose over time.

As cells are being filled, the next cells to be filled are developed. Development includes construction of temporary and permanent drainage features and berms, excavation to the base elevation of initial landfilling, construction of a Leachate Collection System within the excavation, and possibly extension/construction of facility roads to access the cells. Transition of landfilling activities to new cells includes removal of temporary berms.

The facility maintains a fleet of mobile equipment for spreading and compacting waste, hauling, spreading, compacting cover, and excavating/constructing cells.

Air emissions from the landfill activities include suspended particulate matter (SPM, or dust) from material handling and on-site roads, tailpipe emissions from onsite traffic and mobile equipment, and fugitive landfill gas (LFG) not captured in the LFG Collection System.

All leachate generated on site is collected and treated by the leachate management system as allowed by the facility's ECA (Amended ECA No. 2592-B83KSN, dated March 27, 2019 including:

- The leachate collection system at the cells, consisting of buried pipe network and collecting ditches;
- Leachate holding ponds;
- The leachate treatment facility; and
- Leachate holding / aeration pond.

1.2.2 **Landfill Gas Collection and Utilization**

Landfill gas (LFG) is generated by the decomposition of organic and inorganic waste materials within the cells. LFG is roughly 50% methane, with the remainder mainly carbon dioxide and nitrogen gas, with trace but significant quantities of a long list of other contaminants. As a result of the trace contaminants, LFG is odorous.

LFG is captured and collected through a complex network of LFG wells and collection ductwork embedded within the cells. LFG is drawn from the wells, through an underground collection network to the Landfill Gas Utilization Facility.

The wells and collection ductwork/pipes are maintained under negative pressure to eliminate potential of leakage of LFG to atmosphere. However, capture within the cells is not 100% effective due to leakage in cover, around wells and other cover penetrations, or at the perimeter. The collection system is estimated to have a capture efficiency of 75%, in that 75% of LFG generated within the cells is captured and conveyed to the LFG Utilization Facility, while the remaining 25% will be emitted from the surface of landfill cells.

At the LFG Utilization Facility, LFG is used to fuel four (4) Jenbacher reciprocating engines, each coupled to a 1 MW generator. Electricity generated by the gensets is stepped up and supplied to the local utility grid. The engines can each combust about 0.16 m^3/s of LFG at rated output.

LFG contains trace amounts of siloxanes (organic compounds containing silicon), which can decompose and lead to build-up of potentially damaging silicon deposits on the internal surfaces of the internal combustion engines. Siloxanes are removed from the LFG fueling the engines by passing the stream through a two-bed adsorption filter. The media in the beds is designed to selectively adsorb siloxanes, which can then be removed by heating the bed. During desorption the bed is purged with high temperature air, and the resulting siloxane containing air stream is combusted with additional LFG in an enclosed flare. This siloxane flare combusts LFG at about 0.028 m^3/s when engines are operating at rated capacity.

The remaining LFG that is not processed in the reciprocating engines or the siloxane flare, is combusted in one of two enclosed flares, identified as Flares 1 and 2. Flares 1 and 2 are rated to combust up to 1.2 and 2.1 m^3/s of LFG, respectively. Note that these flares are sized to provide redundancy, and have the capacity to combust all LFG if the engines are not operating for any reason. Under normal conditions when engines are operating near capacity, Flares 1 and 2 will operate well below rated capacity.

Emissions from the engines and flares will include products of combustion, as well as small quantities of the constituents of LFG that are not fully combusted.

1.2.3 Compost Facility

The composting facility is located at the Southwestern corner of the landfill property, where organic waste is composted in a bunker system within two closed buildings. Raw organic waste is dumped directly onto the tipping floor of the buildings through truck doors. A limited quantity of additional bulking agent (wood chips, shredded leaf and yard waste) is stored in partially enclosed structures adjacent to the buildings and is moved to the tipping floor by loader as needed to obtain the required mix of materials. All doors are kept closed to the extent practical. On completion of composting, the material is transferred by conveyor to trucks for transfer to the remote curing windrows.

The compost buildings are maintained under negative pressure, and the total exhaust from the buildings is treated in a biofilter for odour control. The open-top style, wood-based biofilter is configured in three 28 m x 28 m zones or beds supplied through a common plenum. Three fans route exhaust from the compost buildings to the common plenum.

Leaf and yard waste is used as a bulking agent for the composting process. It is received and stored outdoors on the leaf and yard waste storage pad. The material is shredded and transported to short-term covered storage close to the enclosed compost plant. The outdoor leaf and yard storage area of about 115 m x 310 m, is located south of the compost plant. Typically, there are about six stockpiles on the pad, each measuring about 140 m x 8 m x 4 m (height), separated by 9 m. Figure B5 shows the location of the leaf and yard waste storage pad and the typical locations of the stockpiles.

Compost from the plant is initially screened and placed into windrows for curing on the compost curing pad, an area of about 150 m x 250 m south of the compost plant. The windrows are turned about once per week, weather permitting. Typically, there are about 12 windrows on the pad, each measuring about 75 m x 4.5 m x 2 m (height), separated by 1 m. Figure B5 shows the location of the compost curing pad and the typical locations of the windrows.

On completion of curing, the material is considered finished compost, and is moved to the Finished Compost Pad (about 120 m x 230 m) for final screening, stockpiling and shipment off-site. The material may be transferred to the Bagging Operation area (110 m x 180 m) for bagging or packaging, prior to shipment off-site.

Air emissions from the composting facility are mainly odour from the biofilter, from leaf and yard waste storage, and from curing.

1.3 Process Flow Diagram

A process flow diagram showing the major processes is included in Appendix B, Figure B6.

1.4 Operating Schedule

The EOWHF normally accepts waste at the site, and highway trucks onsite would be limited to:

Monday to Friday 7:00 am to 6:00 pm;
Saturday 7:00 am to 5:00 pm
Sunday Normally Closed*

Onsite activities and the normal hours of operation for mobile equipment extend beyond the waste receiving hours to allow for site preparation and soil covering activities. The hours of mobile equipment operation are:

Monday to Friday 6:30 am to 6:30 pm
Saturday 6:30 am to 5:30 pm
Sunday Closed*

* Although the site is normally closed on Sundays and statutory holidays, exceptions are occasionally made when municipal contracts for waste collection are carried out on holidays.

The LFG Utilization Facility (engines and flares) and the Composting Plant operate and emit to atmosphere 24 hours per day, 7 days per week. Similarly, fugitive emissions associated with the landfill surface, compost curing, and outdoor storage of compost raw materials will continue 24 hours per day, 7 days per week.

2. INITIAL IDENTIFICATION OF SOURCES AND CONTAMINANTS

All sources and contaminants at the facility are identified in Table A1, Sources and Contaminants Identification table (See Appendix A).

3. ASSESSMENT OF THE SIGNIFICANCE OF SOURCES AND CONTAMINANTS

3.1 Identification of Negligible Sources and Contaminants

Some sources/contaminants at the facility have been deemed insignificant, and these sources/contaminants are listed in Appendix C. A brief rationale for each insignificant source/contaminant is given below.

3.1.1 Screening with an Emissions Threshold

Contaminants emitted in negligible quantities were screened out using an emission threshold as described in Section 7.1.2 of the ESDM guidance document.

For the purposes of defining the emission threshold:

- The Ministry limit used was either the benchmark in the ACB List or, in the absence of a benchmark, the de minimus concentrations given in Table B-2A of the ESDM guidance document.
- The dispersion factor used corresponded to Rural land use, at 250 m distance, from Table B1 of the ESDM guidance document.

The thresholds and a comparison of emission rates to the threshold is provided in Appendix C. A total of 149 contaminants were determined to be emitted in negligible quantities by this method.

3.1.2 Sources that are Insignificant Compared to Total Emissions

Sources that, in combination, represent less than 5% of total emissions of a contaminant have been considered negligible sources in accordance with Section 7.2.2 of the ESDM guidance document.

The siloxane flare (Flare 3) combusts about 1% of the total amount of LFG combusted at the facility. Therefore, this source was considered to emit negligible quantities of products of combustion.

The engines (Gen1 to Gen4) and siloxane flare (Flare 3) combined represent less than 5% of total LFG emitted, as indicated in the following table. Therefore, these sources were considered to emit negligible quantities of the constituents of LFG.

Source	**LFG Emission or Use Rate** (m^3/s)	**Control Efficiency** (%)	**LFG Emitted to Atmosphere** (m^3/s)	**Percent of Total** (%)
Fugitive LFG Emissions (Stg1 to Stg4)	0.62	0	0.62	94%
Engines (Gen1 to Gen 4)	0.64	98%	0.013	1.9%
Siloxane Flare (Flare3)	0.03	98%	0.0006	0.1%
Flare 1	0.43	98%	0.009	1.3%
Flare 2	0.77	98%	0.0153	2.3%
Total			0.66	100%

Road dust from paved and unpaved roads, and dust from material handling associated with the working face are the dominant sources of particulate matter emitted from the site. Particulate matter from compost material handling (raw materials, windrowing, packaging) has been deemed negligible due to the nature of materials (moisture levels) and very low volumes compared to landfilling activities.

Siloxanes are trace components of LFG that contain silicon. The compounds can cause abrasive deposits within engines, which lead to premature failure. LFG that fuels the engines (Gen1 to Gen4) is passed through a siloxane filter to remove siloxanes prior to the engines. As a result, the engines have been considered a negligible source of siloxane emissions.

3.1.3 **Negligible Sources**

Maintenance welding is occasionally performed in the fleet maintenance building, and has been considered negligible in accordance with Table B-3B of the ESDM guidance document. The building is located about 15m from the property boundary, and about 1.3km from the closest sensitive receptor (residence).

Several of the site buildings have natural gas or propane fired comfort heating systems. These systems have aggregate capacity far less than 20 GJ/hour, and all individual units are rated at far less than 10GJ/hour. These systems have been considered negligible in accordance with Table B-3B of the ESDM guidance document.

Leachate from the landfill is collected, treated in aeration ponds, treated in the leachate treatment building, and stored in effluent holding ponds until discharge. These sources are expected to emit contaminants, including odour, in negligible quantities under normal aerobic conditions, and have been considered negligible for this analysis.

Finished compost has minor, earthy odour and has been deemed a negligible source of odour in comparison to other sources at the facility. Sources associated with finished compost (screening, stockpiling, and packaging) have been deemed negligible.

4. OPERATING CONDITIONS, EMISSIONS ESTIMATES, AND DATA QUALITY

4.1 Operating Conditions for Maximum POI Concentration

For the purposes of emission calculations and dispersion modelling, all activities and production processes were assumed to be operating simultaneously, at peak acceptance or processing rates.

Alternatives 1 and 2 were assessed individually. In addition, two scenarios were considered for each alternative as described in further detail in Section 4.2 below. The two scenarios represent operations at a) the point in time when active sources are located closest to sensitive receptors, and b) near end of life when LFG generation rate is at maximum.

The LFG Utilization Facility (engines and flares) and the Composting Plant operate and emit to atmosphere 24 hours per day, 7 days per week. Similarly, fugitive emissions associated with the landfill surface, compost curing, and outdoor storage of compost raw materials will continue 24 hours per day, 7 days per week. Accordingly, these sources were modelled as emitting constantly and continuously 24 hours per day, 7 days per week.

On-site activities (trucking, material handling, construction) emit only during operating hours. Accordingly, these sources were modelled as emitting at maximum hourly emissions rates from 7:00am to 6:00pm Monday to Friday, 7:00am to 5:00pm Saturday, and not emitting on Sunday.

4.2 Emission Estimates

Detailed emission rate calculations for all contaminants are included in Appendix E, Tables E1 to E15. The methodology used for each type of source is summarized in the following sections.

For both Alternatives 1 and 2, the general progression of landfilling is in a west to east direction. There exist a number of sensitive receptors located in close proximity to the south-east (SE) corner of the proposed property boundary for the future development. However, the maximum LFG quantity location is expected to be in the north-east (NE) corner of the proposed property boundary for the future development due to the end of life location being the same for both alternatives.

Since there existed the possibility that modelling the NE corner alone would not sufficiently capture maximum impacts at the sensitive receptors in the SE corner - due to significant variations in distance to working face, haul road length, and LFG quantities with time and stage/cell location - it was decided that for all contaminants, an assessment was required at two (2) landfill activity locations for each alternative. This resulted in developing the following four (4) scenarios that have been modelled and assessed for all contaminants.

Alternative Method 1		***Alternative Method 2***	
Scenario A	**Scenario B**	**Scenario A**	**Scenario B**
South-east area	North-east area	South-east area	North-east area
Stage 6 (Cells 9 and 10)	Stage 9 (Cells 1 and 2)	Stage 8 (Cells 1 and 2)	Stage 8 (Cells 5 and 6)
2032 activity year	2045 activity year	2043 activity year	2045 activity year

Each of the four scenarios has its own set of summary tables provided in the Appendices and each scenario A and B have been colour coded as indicated above to delineate them.

4.2.1 Landfill Gas (LFG) Generation

Landfill gas is generated from decomposition of materials within the landfill. The maximum rate of LFG generation will occur when the landfill is completely filled, estimated as 2046.

The quantity of LFG generated was estimated using the US EPA "LandGEM – Landfill Gas Emissions Model", version 3.02. Waste acceptance rates were set equal to EOWHF annual receipts for years 2000 to predicted 2025, and set to 755,000 tonnes/year (near maximum approved) for years 2025 until closure in 2045. This results in a maximum LFG generation rate occurring immediately after closure (i.e., in 2046). The results should be conservative, in that the model does not account for trends or regulatory measures that have reduced, and will continue to reduce, the organic content of municipal waste in Ontario.

The LFG collection system is assumed to collect approximately 75% of the LFG generated, and convey it to the LFG Utilization Facility where it is combusted in engines or flares. The remainder (25%) is emitted as fugitive emission from the surface of the landfill.

The quantity of LFG generated, and distribution of the LFG is documented in Table E1.

4.2.2 LFG Fugitive Emissions

Fugitive emissions of LFG were assumed to be emitted uniformly and constantly over the total areas of Stages of the landfill.

LFG is mainly methane and CO_2, with trace concentrations of a long list of compounds. Speciation of the LFG emissions was based on US EPA AP-42, chapter 2.4, Municipal Solid Waste Landfills (2008), Table 2.4-1. Default Concentrations for LFG Constituents for Landfills with Waste in Place on or After 1992.

LFG also includes trace amounts of siloxanes (compounds containing silicon). Concentrations of the siloxanes were based on previous measurements of siloxanes in LFG at the EOWHF.

Fugitive emission rates of LFG constituents are documented in Table E2.

4.2.3 LFG Combustion

At the LFG Utilization Facility, LFG is combusted in engines (Gen1 to Gen4) to generate electricity, or in enclosed flares. Preferentially, the engines are operated at capacity to maximize electricity generated. The siloxane flare (Flare 3) will also operate near capacity since it is linked to engine operation. The remainder of the LFG will be combusted in enclosed Flares 1 to 3, and was assumed to be distributed between the two, proportional to rated capacity.

The distribution of LFG to engines and flares at the time of maximum LFG generation is documented in Table E1.

Generator Engines

Emissions from LFG fuelled engines (Gen1 to Gen4) were estimated based on emission factors and information in US EPA AP-42, chapter 2.4, Municipal Solid Waste Landfills (1998).

Emissions of nitrogen oxides, carbon monoxide, and particulate matter were based on emission factors given in Table 2.4-4 of AP-42. Notes to the table indicate that all particulate matter can be assumed to be $PM_{2.5}$. The emission factor given for NO_2 was used as a factor for nitrogen oxides (NOx).

Emissions of sulphur dioxide (SO_2) were based on the assumption that all sulphur in the LFG fuel would be oxidized during combustion and emitted as SO_2. Emissions of hydrogen chloride (HCl) were based on the assumption that all chlorine in the LFG fuel would react and be emitted as HCl.

The engines are expected to reduce emissions of LFG with a control efficiency of 98%. Residual LFG emissions from the engines were deemed negligible (see Section 3.2.2).

Emission rates of products of combustion from the engines are documented in Table E4.

Siloxane Flare (Flare 3)

Siloxanes are filtered from the LFG fuel for the engines, and the purge gas from the filters is combusted with additional LFG in the enclosed siloxane flare (Flare 3).

Products of combustion from Flare 3 were assumed negligible as they represent less than 1% of combustion (see Section 3.1.2).

Siloxanes were assumed to be incombustible, and the emission rate was based on emission of 100% of the siloxane content in the LFG used to fuel the engines and the LFG combusted in Flare 3.

Emission rates of siloxanes are documented in Table E5.

Flares 1 and 2

Emissions from the LFG flares (Flares 1 and 2) were estimated based on emission factors and information in US EPA AP-42, chapter 2.4, Municipal Solid Waste Landfills (1998).

Emissions of nitrogen oxides, carbon monoxide, and particulate matter were based on emission factors given in Table 2.4-4 of AP-42. Notes to the table indicate that all particulate matter can be assumed to be $PM_{2.5}$. The emission factor given for NO_2 was used as a factor for nitrogen oxides (NOx).

Emissions of sulphur dioxide (SO_2) were based on the assumption that all sulphur in the LFG fuel would be oxidized and emitted as SO_2. Emissions of hydrogen chloride (HCl) were based on the assumption that all chlorine in the LFG fuel would react and be emitted as HCl.

Emission rates of products of combustion from the flares are documented in Table E4.

The flares are expected to reduce most emissions of LFG constituents with a control efficiency of 98%. However, emissions of incombustible constituents (e.g., mercury, siloxanes) will not be reduced, and a control efficiency of 0% was applied to these contaminants.

Emissions rates of constituents of LFG from the flares are documented in Table E3.

4.2.4 Mobile Equipment Combustion

Mobile equipment operating on the site includes heavy duty diesel highway trucks traveling on-site haul roads, and non-road diesel equipment used for material handling. Products of combustion from the engines were estimated based on US EPA emission factors.

On-site Haul Roads

Highway trucks will travel a total round-trip distance of just under 6 km on-site during filling of final cells of the landfill. The trucks travel a combination of paved roads (source ID Paved_Road) and unpaved roads (source ID Unpaved_Road).

Emission rates for products of combustion were based on emission factors from the US EPA MOVES2014b emission model, for the national (USA) fleet heavy duty diesel trucks in 2021 calendar year. Emission factors for NOx, CO, PM_{10} and $PM_{2.5}$ were extracted from the model. All particulate matter was assumed to be PM_{10}.

Truck traffic on haul roads is limited to 11 hours per day, and was assumed to be uniformly distributed through the day (i.e., 18.2 trucks per hour). Emission rates were calculated as 1-hour average values, for use in modelling emissions only 11 hours per day.

Details of emission factors and emission estimates for truck exhaust on haul roads are documented in Table E8.

Nonroad Mobile Equipment

Nonroad equipment at the facility includes diesel fired equipment such as bulldozers, compactors, excavators, wheel loaders, rock trucks, grinders, and screeners.

The equipment activities are concentrated in two general areas. Equipment associated with municipal waste handling and construction of the next landfill cells are generally operating near the working face of the landfill (source ID Working Face). Equipment associated with composting operates in the area of the compost plant and material stockpiles (source ID Compost_NRoad).

Emission rates for products of combustion were based on US EPA Nonroad Diesel Engine Standards. As this report is predicting emissions for the 2025 calendar year, all nonroad equipment was assumed to meet Tier 4 standards (i.e. model year 2010 or later). Load factors for each type of equipment were based on the US EPA NONROAD emission model, as documented in "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling (NR-005d)".

Mobile activities are limited to 12 hours per day, and were assumed to be uniformly distributed through the day. Emission rates were calculated as 1-hour average values, for use in modelling emissions only 12 hours per day.

The inventory of equipment, emission factors, and estimated emission rates are documented in Table E6 for each area.

4.2.5 Working Face Dust

Dust associated with the working face of the landfill is generated by dumping and handling of waste and cover, spreading and compaction of waste, and spreading of daily cover. Dust associated with construction of the next cells to be filled is generated by excavation and handling of fill materials. Normally construction is near or adjacent to the working face. No construction will occur during filling of the final two cells of the landfill, but to ensure worst case emissions are identified, dust from construction was assumed to be generated, and emitted in the same location as the working face activities.

Estimates of particulate matter emission rates were based on emission factors for material handling activities from US EPA AP-42 Chapters U 13.2.4, Aggregate Handling and Storage Piles, and 11.9 Western Surface Coal Mining.

Estimates were based on handling 3,100 tonnes/day of waste and 310 tonnes/day of cover material (10:1 waste to cover ratio). Volume of construction materials (clay) moved and handled were crudely estimated at about 1,630 tonnes/day.

Working face and construction activities are limited to 12 hours per day, and were assumed to be uniformly distributed through the day. Emission rates were calculated as 1-hour average values, for use in modelling emissions only 12 hours per day.

As indicated in section 4.2, four (4) scenarios in total have been assessed for dust emissions from the working face, two for each Alternative.

The emission factors and estimated emission rates for working face and construction activities are documented in Table E9. All emissions were assigned to emission source ID Working Face.

4.2.6 **Road Dust**

Highway trucks travelling on-site haul roads generate dust emissions. Emission rates were based on US EPA AP-42 Chapter 13.2.1 Paved Roads for paved road segments (source ID Paved_Road) and Chapter 13.2.2 Unpaved Roads for unpaved road segments (source ID Unpaved_Road).

Estimates were based on average vehicle weight of 25 tonnes (35 tonnes loaded, 15 tonnes empty, 20 tonnes net payload) and a maximum of 200 trucks per day (round trip), corresponding to maximum waste acceptance rate of 4,000 tonnes/day. Total haul route length is about 5.8 km, round trip.

Highway truck traffic is limited to 11 hours per day, and was assumed to be uniformly distributed through the day (i.e. 18.2 trucks per hour). Emission rates were calculated as 1-hour average values, for use in modelling emissions only 12 hours per day.

As indicated in section 4.2, four (4) scenarios in total have been assessed for dust emissions from the truck haul routes, two for each Alternative.

The emission factors and estimated emission rates for paved and unpaved segments are documented in Table E7.

4.2.7 **Landfill Odour**

Odour results from fugitive emission of LFG from the landfill surface, and exposed or partially covered waste at the working face of the landfill.

LFG Odour

The odour emission rate associated with fugitive LFG was estimated based on an emission factor of 10,000 ou/m^3 of LFG, given in the Interim Guide to Estimate and Assess Landfill Air Impacts (MOE 1992).

The resulting odour was assumed to be emitted uniformly over the total area of all landfill stages for both Alternatives 1 and 2, scenarios A and B.

The estimate calculation is documented in Table E12.

Working Face Odour

The odour emission rate from the working face was based on average odour flux (emission rate per m^2) from literature reported values for tipping or the active face of municipal landfills. The geometric mean of the reported values was 7 ou/s/m^2.

On any given day, exposed waste is limited to an area of approximately 3,200 m^2, resulting in an odour emission rate of about 22,500 ou/s (source ID Working Face).

As indicated in section 4.2, four (4) scenarios in total have been assessed for odour emissions from the working face, two for each Alternative.

References and calculations are provided in Table E12.

4.2.8 Compost Odour

Odour associated with composting operations at EOWHF is emitted from the compost plant, the compost curing windrows, and from stockpiles of leaf and yard waste used as feedstock.

Since the compost operations are not expected to change in the future development, these sources and associated maximum emission rates remained identical for each of the four scenarios that have been modelled and assessed.

Compost Plant Biofilter

The composting process is conducted within closed buildings that are maintained under negative pressure. The total exhaust from the buildings is treated in a biofilter for odour control. The open-top style, wood-based biofilter is configured in three 28 m x 28 m zones or beds (source IDs BF1 to BF3) supplied through a common plenum. Three fans route exhaust from the compost buildings to the common plenum.

Odour emission from the biofilter was measured during a compliance source test program in 2010 (Envirosolve Report No. E10004) which yielded an emission rate of 905 ou/s. An expansion of the plant in 2012 essentially doubled the capacity of the facility. Assuming that odour generated is proportional to production rate, and that odour removal efficiency remains constant, the biofilter odour emission rate after expansion would be 905 x 2 = 1,810 ou/s. Measurements and the estimated emission rate are documented in Table E13.

Curing Windrows

Measurements of odour flux from windrow surfaces were made by Consumaj Inc. in March 2019 (winter conditions) and June 2019 (summer conditions). Fall and spring conditions were interpolated from the measured odour fluxes and used to model emissions from the windrows with seasonal variability.

During each measurement program, measurements were made on three windrows of different age: freshly built, about 1 week, and about 3 months old. Emission rate from the windrows is dependent on windrow age. For windrow ages between 1 week and 3 months, odour flux was linearly interpolated from the 1 week and 3 month measurements.

There is a 1 m separation between each windrow. The footprint of each of the 12 windrows including the 1 m separation between them was combined and used as the modelled area for the assessment (source ID CURING).

The measurements, calculations and the estimated emission rate are documented in Table E14.

Leaf and Yard Waste Odour

Leaf and yard waste is received and stored in stockpiles on the leaf and yard waste storage pad, sometimes for extended periods. There are low levels of odour emitted from undisturbed surfaces of the piles, and higher levels emitted from freshly disturbed surfaces as material is removed from the stockpile.

Measurements of odour flux from pile surfaces were made by Consumaj Inc. in March 2019 (winter conditions) and June 2019 (summer conditions). During each measurement program, measurements were made on undisturbed material, and freshly exposed face. Fall and spring conditions were interpolated from the measured odour fluxes and used to model emissions from the stockpiles with seasonal variability.

There is a 9 m separation between each stockpile. Each footprint of each of the six stockpiles were used in the assessment (source IDs LFYD_1 to LFYD_6).

The measurements, calculations and the estimated emission rate are documented in Table E15.

5. SOURCE SUMMARY TABLE AND SITE PLAN

The Source Summary is given in Table A2, Appendix A.

The property boundary, site layout, and source locations are found in Figures B1 through B5, Appendix B.

6. DISPERSION MODELLING

Atmospheric dispersion modelling was used to predict the concentrations of air and odour beyond the facility boundary. The modelling was conducted in accordance with the Air Dispersion Modelling Guideline for Ontario (ADMGO), Version 3, February 2017.

The US EPA's AERMOD atmospheric dispersion model (version 19191), an approved model under O.Reg. 419/05, was used to predict ground level concentrations beyond the facility boundary.

The facility has an approval for use of site-specific meteorological data under s.13(1) of O.Reg.419/05. A site-specific dataset (2015 to 2019), preprocessed with AERMET version 19191, was provided by the MECP in November 2020. This dataset was used for modelling of air and odour.

Terrain data obtained from the MECP website was incorporated into the model. Fence line receptors and a multi-tier receptor grid were applied in accordance with the ADMGO. Property line coordinates are given in Appendix D.

Locations of modelled sources are provided in Figures D1 through D5, Appendix D.

The filled landfill areas are essentially hills of roughly 10 m in height, but the standard terrain data files do not reflect these filled heights. To reflect a ground-based release at the actual height of discharge, area sources located on top of the stages were assigned a base elevation 10 m above the file values for elevation, and a release height of 0 m.

The inputs to the models are summarized in Tables D1 to D5, given in Appendix D. Sources associated with roads and mobile equipment were modelled as emitting during operating hours only (7:00am to 6:00pm weekdays, and 7:00am to 5:00pm Saturday). All other sources were modelled as emitting constantly, 24 hours per day, 365 days per year.

Additional discrete receptors were placed at 81 sensitive locations (residences) close to the facility. These sensitive receptors are shown in Figure D6, Appendix D, and are consistent with the receptor locations used in previous assessments of the facility. Coordinates of the receptors are provided in Table D6, Appendix D.

The model was run for 1 hour, 24 hour, and/or annual averaging periods corresponding to the averaging period of the applicable MECP limit, or for the applicable Ontario Ambient Air Quality Criteria (AAQC). Concentrations for other averaging periods were calculated using the averaging time conversion factors given in Section 4.4 of the ADMGO.

Meteorological anomalies were eliminated following the procedure specified in Section 6.5 of the ADMGO. That is, for hourly averages, the 8 hours per year that result in the highest concentrations were discarded, and for 24 hour averages, the 1 day per year that results in the highest concentration was discarded.

For odour, the model was run for a 1 hour averaging period. Concentrations for a 10-minute averaging period were calculated using the averaging time conversion factor (1.65) given in Section 4.4 of the ADMGO. The factor was incorporated into the model so that all off-property odour concentrations in this report have been presented as 10-minute average values. The model was also configured to provide the 99.5th percentile odour concentration.

For all model runs, the maximum daily emission rates were modelled as occurring every day of the year. That is, any 24-hour average result reflects the maximum daily emission rate over a day with the worst weather condition, and any annual result reflects the maximum daily emission rate maintained over a whole year. As a result, no additional model runs were needed to address the Daily Assessment Values (DAV) or Annual Assessment Values (AAV) for annual limits, as per MECP Technical Bulletin "Using assessment values for contaminants with annual air standards", and no comparison to the assessment values was needed.

Model outputs are also included in Appendix D.

AAQC and CAAQS Modelling

Ambient air quality can be compared to Ontario's Ambient Air Quality Criteria (AAQC), or to the Canadian Ambient Air Quality Standards (CAAQS), which are objectives developed by the Canadian Council of Ministers of the Environment (CCME). These limits are appropriate for assessment of cumulative ambient contaminant concentrations that result from facility impacts, other local sources, and background concentrations (e.g., long-range transport).

This ESDM report does not include an assessment of ambient air background concentration, so results should not be compared directly to the AAQC or CAAQS. However, several of these limits have different statistical forms or averaging periods than typical MECP air standards. To support future comparison to the AAQC and CAAQS, facility impacts were extracted from the model in these statistical forms. For example, the additional statistical forms and averaging periods include:

Contaminant	Limit and Period	Statistical Form
Particulate Matter – Fine ($PM_{2.5}$)	AAQC, CAAQS 24-hour	3-year average of the annual 98th percentile of the daily 24-hour average concentrations
	AAQC, CAAQS Annual	3-year average of the annual average of the daily 24-hour concentrations
Particulate Matter – Inhalable (PM_{10})	AAQC 24-hour	Maximum 24-hour average concentration
Nitrogen Dioxide (NO_2)	CAAQS 1-hour	3-year average of the annual 98th percentile of the daily-maximum 1-hour average concentrations.
	CAAQS Annual	Arithmetic average over a single calendar year of all 1-hour average concentrations.
Sulphur Dioxide (SO_2)	AAQC 10-minute	Maximum 10-minute average concentration
	CAAQS 1-hour	3-year average of the annual 99th percentile of the daily-maximum 1-hour average concentrations.

7. EMISSION SUMMARY TABLE AND CONCLUSIONS

For each of the four scenarios modelled, the maximum off-property contaminant concentrations predicted by the dispersion modelling are compared to MECP limits in Table 2 below and again in more details for each scenario in Tables A3, "Emission Summary Table", given in Appendix A. In addition, the highest concentration that occurs at a sensitive receptor (i.e., residence) is also presented and compared to the limits.

The maximum concentrations were compared to the standards, guidelines, and screening levels given in the MECP's Air Contaminants Benchmarks (ACB) list, Version 2, dated April 2018. For those contaminants without an ACB, concentrations were compared to the de minimus concentration, below which they can be deemed insignificant as per Table B-2A of the ESDM guidance document.

Multiple reduced sulphur compounds are emitted from the facility, so emissions were compared to the limit for Total Reduced Sulphur (TRS) and not to the limits for individual reduced sulphur compounds, in accordance with O.Reg. 419/05.

The table also provides the facility impact in the statistical forms required for comparison to AAQC and CAAQS. To support future comparison to the AAQC and CAAQS, facility impacts were extracted from the model in these statistical forms, but the concentrations presented in Table A3 do not include background concentration, and should not be directly compared to the AAQC and CAAQS.

Table 2. Comparison of Alternatives

Contaminant	Criteria					Alternative 1 Worst Case				Alternative 2 Worst Case			
						Modelled Concentration [µg/m^3]		Percent of Criteria [%]		Modelled Concentration [µg/m^3]		Percent of Criteria [%]	
	Avg. Period [hr]	Limit [µg/m^3]	Limiting Effect	ACB Source[1]	Category[2]	POI	Sensitive Receptor	POI	Sensitive Receptor	POI	Sensitive Receptor	POI	Sensitive Receptor
Nitrogen Oxides (as NO_2)	24 hr	200	Health	Standard	B1	45.0	8.32	22%	4%	45.0	9.9	22%	5%
	1 hr	400	Health	Standard	B1	178	48.6	44%	12%	148	70.3	37%	18%
Nitrogen Dioxide	24 hr	200	Health	AAQC	n/a	45.0	8.32	22%	4%	45	9.89	22%	5%
	1 hr	400	Health	AAQC	n/a	178	48.6	44%	12%	148	70.3	37%	18%
	1-hr	113	n/a	CAAQS	n/a	96.4	29.6	85%	26%	91	33.0	80%	29%
	Annual	32	n/a	CAAQS	n/a	5.65	0.83	18%	3%	5.63	0.88	18%	3%
Suspended particulate matter	24 hr	120	Visibility	Standard	B1	226	85.4	188%	71%	187	119	156%	99%
Particulate matter (< 10 µm dia.)	24 hr	50	Health	AAQC	n/a	125	42.6	250%	85%	92	67.4	184%	135%
Particulate matter (< 2.5 µm dia.)	24 hr	27	Health	AAQC	n/a	7.27	2.29	27%	8%	6.22	2.57	23%	10%
	annual	8.8	Health	AAQC	n/a	1.91	0.377	22%	4%	1.89	0.43	21%	5%
Carbon Monoxide	0.5 hr	6000	Health	Standard	B1	1860	503	31%	8%	1535	722	26%	12%
	1 hr	36,200	Health	AAQC	n/a	1550	419	4%	1%	1280	602	4%	2%
	8 hr	15,700	Health	AAQC	n/a	866	234	6%	1%	715	336	5%	2%
Sulfur Dioxide	10 min	178	Health	AAQC	n/a	7.80	2.61	4%	1%	7.80	2.61	4%	1%
	1 hr	100	Health & Veg.	Standard	B1	4.73	1.58	5%	2%	4.73	1.58	5%	2%
	annual	10	Health & Veg.	Standard	B1	0.301	0.040	3%	<1%	0.301	0.040	3%	<1%
	1 hr	173	n/a	CAAQS	n/a	4.63	1.39	3%	<1%	4.63	1.39	3%	<1%
Hydrogen Chloride	24 hr	20	Health	Standard	B1	2.33	0.330	12%	2%	2.33	0.330	12%	2%
Odour[3] (units: ou/s, or ou/m^3)	10 min	1	---	Guideline	---	n/a	1.64	n/a	164%	n/a	1.85	n/a	185%
LFG Contaminants													
LFG Unit Emission Run	1 hr					93.7	45.9			62.6	35.0		
	24 hr					35.9	14.7			25.2	12.1		
	annual					4.53	1.59			3.36	1.85		
	10 min					155	75.7			103	57.8		
1,1,2,2-Tetrachloroethane	24 hr	0.1	Health	SL-JSL	B2	0.106	0.048	106%	48%	0.094	0.045	94%	45%
1,1,2-Trichloroethane	24 hr	0.3	Health	SL-JSL	B2	0.025	0.011	8%	4%	0.022	0.011	7%	4%
1,2-Dichloroethane (Ethylene dichloride)	24 hr	2	Health	Standard	B1	0.019	0.008	<1%	<1%	0.017	0.008	<1%	<1%
	Annual	0.4	Health	AAQC	n/a	0.002	0.001	<1%	<1%	0.002	0.001	<1%	<1%
1,2-Dichloroethene	24 hr	105	Health	Guideline	B1	1.301	0.593	1%	<1%	1.161	0.556	1%	<1%
1,3-Butadiene (Vinyl ethylene)	Annual	2	Health	Standard	B1	0.001	0.001	<1%	<1%	0.001	0.001	<1%	<1%
	24 hr	10	Health	AAQC	n/a	0.011	0.005	<1%	<1%	0.009	0.005	<1%	<1%
2-Ethyltoluene	24 hr	0.5	Health	SL-JSL	B2	0.046	0.021	9%	4%	0.041	0.020	8%	4%
Acetaldehyde	24 hr	500	Health	Standard	B1	0.004	0.002	<1%	<1%	0.004	0.002	<1%	<1%

Contaminant	Criteria					Alternative 1 Worst Case				Alternative 2 Worst Case			
						Modelled Concentration [µg/m³]		Percent of Criteria [%]		Modelled Concentration [µg/m³]		Percent of Criteria [%]	
	Avg. Period [hr]	Limit [µg/m³]	Limiting Effect	ACB Source[1]	Category[2]	POI	Sensitive Receptor	POI	Sensitive Receptor	POI	Sensitive Receptor	POI	Sensitive Receptor
	0.5 hr	500	Health	Standard	B1	0.013	0.006	<1%	<1%	0.011	0.006	<1%	<1%
Benzene	Annual	0.45	Health	Standard	B1	0.028	0.012	6%	3%	0.026	0.014	6%	3%
	24 hr	2.3	Health	AAQC	n/a	0.221	0.101	10%	4%	0.197	0.094	9%	4%
Benzyl chloride	24 hr	0.1	Health	SL-JSL	B2	0.003	0.001	3%	1%	0.002	0.001	2%	1%
cis-2-Pentene	24 hr	0.5	Health	SL-JSL	B2	0.004	0.002	<1%	<1%	0.004	0.002	<1%	<1%
Dibromochloromethane	24 hr	0.2	Health	SL-JSL	B2	0.004	0.002	2%	<1%	0.003	0.002	2%	<1%
Formaldehyde	24 hr	65	Health	Standard	B1	0.000	0.000	<1%	<1%	0.000	0.000	<1%	<1%
Isoprene (2-Methyl-1,3-butadiene)	24 hr	0.1	Health	SL-JSL	B2	0.001	0.001	1%	<1%	0.001	0.001	1%	<1%
Naphthalene	24 hr	22.5	Health	Guideline	B1	0.016	0.007	<1%	<1%	0.014	0.007	<1%	<1%
	10 min	50	Odour	Guideline	B1	0.000	0.034	<1%	<1%	0.000	0.033	<1%	<1%
p-Cymene (1-Methyl-4-Isopropylbenzene)	24 hr	50	Health	SL-JSL	B2	0.566	0.258	1%	<1%	0.505	0.242	1%	<1%
Trichloroethylene (Trichloroethene)	24 hr	12	Health	Standard	B1	0.128	0.058	1%	<1%	0.114	0.055	<1%	<1%
	Annual	2.3	Health	AAQC	n/a	0.016	0.007	<1%	<1%	0.015	0.008	<1%	<1%
Trichloromethane (Chloroform)	24 hr	1	Health	Standard	B1	0.010	0.005	<1%	<1%	0.009	0.004	<1%	<1%
	Annual	0.2	Health	AAQC	n/a	0.001	0.001	<1%	<1%	0.001	0.001	<1%	<1%
Vinyl chloride (Chloroethene)	24 hr	1	Health	Standard	B1	0.104	0.048	10%	5%	0.093	0.045	9%	4%
	Annual	0.2	Health	AAQC	n/a	0.013	0.006	7%	3%	0.012	0.007	6%	3%
Total Reduced Sulphur Compounds	24 hr	7	Health	Guideline	B1	1.951	0.890	28%	13%	1.741	0.834	25%	12%
	10 min	13	Odour	Guideline	B1		4.115	<1%	32%		3.991	<1%	31%
1-Methylcyclohexene	24 hr	0.1	de minimus	Table B-2A	n/a	0.003	0.001	3%	1%	0.002	0.001	2%	1%
2,4-Dimethylhexane	24 hr	0.1	de minimus	Table B-2A	n/a	0.030	0.014	30%	14%	0.027	0.013	27%	13%
2,5-Dimethylhexane	24 hr	0.1	de minimus	Table B-2A	n/a	0.022	0.010	22%	10%	0.020	0.010	20%	10%
2-Ethyl-1-butene	24 hr	0.1	de minimus	Table B-2A	n/a	0.002	0.001	2%	<1%	0.002	0.001	2%	<1%
3,6-Dimethyloctane	24 hr	0.1	de minimus	Table B-2A	n/a	0.131	0.060	131%	60%	0.117	0.056	117%	56%
cis-1,4-Dimethylcyclohexane	24 hr	0.1	de minimus	Table B-2A	n/a	0.033	0.015	33%	15%	0.029	0.014	29%	14%
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	24 hr	0.1	de minimus	Table B-2A	n/a	0.033	0.015	33%	15%	0.029	0.014	29%	14%
trans-1,4-Dimethylcyclohexane	24 hr	0.1	de minimus	Table B-2A	n/a	0.027	0.012	27%	12%	0.024	0.012	24%	12%
cis-2-Heptene	24 hr	0.1	de minimus	Table B-2A	n/a	0.003	0.001	3%	1%	0.003	0.001	3%	1%
cis-2-Octene	24 hr	0.1	de minimus	Table B-2A	n/a	0.029	0.013	29%	13%	0.026	0.012	26%	12%
cis-3-Methyl-2-pentene	24 hr	0.1	de minimus	Table B-2A	n/a	0.002	0.001	2%	<1%	0.002	0.001	2%	<1%
Isopropyl mercaptan	24 hr	0.1	de minimus	Table B-2A	n/a	0.016	0.007	16%	7%	0.014	0.007	14%	7%
trans-1,2-Dimethylcyclohexane	24 hr	0.1	de minimus	Table B-2A	n/a	0.053	0.024	53%	24%	0.048	0.023	48%	23%
trans-1,4-Dimethylcyclohexane	24 hr	0.1	de minimus	Table B-2A	n/a	0.027	0.012	27%	12%	0.024	0.012	24%	12%
trans-2-Octene	24 hr	0.1	de minimus	Table B-2A	n/a	0.032	0.015	32%	15%	0.028	0.014	28%	14%

Contaminant	Criteria					Alternative 1 Worst Case				Alternative 2 Worst Case			
						Modelled Concentration [µg/m³]		Percent of Criteria [%]		Modelled Concentration [µg/m³]		Percent of Criteria [%]	
	Avg. Period [hr]	Limit [µg/m³]	Limiting Effect	ACB Source[1]	Category[2]	POI	Sensitive Receptor	POI	Sensitive Receptor	POI	Sensitive Receptor	POI	Sensitive Receptor
trans-3-Methyl-2-pentene	24 hr	0.1	de minimus	Table B-2A	n/a	0.002	0.001	2%	<1%	0.001	0.001	1%	<1%
Trichlorofluoromethane (Freon 11)	24 hr	0.1	de minimus	Table B-2A	n/a	0.040	0.018	40%	18%	0.036	0.017	36%	17%
Siloxanes Siloxanes Unit Emission Run	24 hr					11.9	5.04			8.98	3.79		
Trimethylsilanol	24 hr	32.5	Health	SL-JSL	B2	0.307	0.139	<1%	<1%	0.307	0.130	<1%	<1%
Trimethylsilyl Fluoride	24 hr	0.1	de minimus	Table B-2A	n/a	0.016	0.007	16%	7%	0.016	0.007	16%	7%
Methoxytrimethylsilane	24 hr	0.1	de minimus	Table B-2A	n/a	0.010	0.005	10%	5%	0.010	0.004	10%	4%
Ethoxytrimethylsilane	24 hr	0.1	de minimus	Table B-2A	n/a	0.006	0.003	6%	3%	0.006	0.003	6%	3%
Propoxytrimethylsilane	24 hr	0.1	de minimus	Table B-2A	n/a	0.005	0.002	5%	2%	0.005	0.002	5%	2%
Isopropoxytrimethylsilane	24 hr	0.1	de minimus	Table B-2A	n/a	0.005	0.002	5%	2%	0.005	0.002	5%	2%
Butoxytrimethylsilane	24 hr	0.1	de minimus	Table B-2A	n/a	0.003	0.001	3%	1%	0.003	0.001	3%	1%
1-methylbutoxytrimethylsilane	24 hr	0.1	de minimus	Table B-2A	n/a	0.006	0.003	6%	3%	0.006	0.002	6%	2%

Notes:
1) ACB Source: "S" - Standard (for Section 20), "G" - Guideline (for Section 20), "SL-JSL" - Screening Level (SL) set by the MECP based on a review of toxicity information and/or other jurisdictional level
2) Category: "B1" - Benchmark 1 , "B2" - Benchmark 2.
3) The 1-hr air dispersion modelling output units were adjusted in AERMOD to reflect the expected peak 10-min average values using the MECP recommended standard conversion factor of 1.65

Table 2 indicates that, at sensitive receptors, concentrations of all contaminants are below the applicable limits, screening levels, or de minimus concentrations with the exception of fine particulate matter (PM-10) which is 135% of the AAQC. The contaminant with the highest relative impact at a sensitive receptor, total suspended particulate matter or SPM, reaches as high as 99% of the air standard.

However, at the Point of Impingement (POI), the concentration of suspended particulate matter (SPM) exceeds the applicable air standard, with a maximum 24-hour concentration that is 188% of the limit. The high concentrations occur on the property boundary along Lafleche Road, near the east corner of the site. Dust from the adjacent haul road is the major contributor to the SPM concentration at this location. The concentration falls off with distance from the property line, as can be seen in the graphical model output given in Appendix D.

1,1,2,2-tetrachloroethane, which is a constituent of LFG, exceeds a screening level on the western property line. 3,6-dimethyloctane, which is also a constituent of LFG, has no ACB limit, but exceeds the de minimus concentration on the western property line. Concentration of these compounds fall off quickly with distance from the property line, and these levels are not exceeded at any sensitive receptor. Exceeding a screening level or the de minimus concentration does not necessarily indicate that a health risk threshold has been exceeded. Under normal circumstances any application for an Environmental Compliance Approval would include a maximum ground level concentration acceptability request for these contaminants, which would trigger evaluation of the risk associated with the modelled concentrations.

Contaminants with odour-effects based limits do not exceed any of those limits, as indicated in Table A3. For such contaminants, the MECP's Technical Bulletin "Methodology for Modeling Assessments of Contaminants with 10 Minute Average Standards and Guidelines under O. Reg. 419/05" applies. This Bulletin states "For a facility that emits a contaminant with a 10-minute odour-based standard or guideline, and for assessment purposes only, it is considered acceptable if the modelling shows that at a location of a human receptor the standard or guideline is exceeded less than 0.5% of the time, which corresponds to approximately 44 hours per year." As a result, concentration for comparison to these limits was reported at sensitive receptors only. However, the peak concentration rather than the 99.5th percentile is reported, which is conservative.

Odour, quantified in odour units per cubic metre (ou/m^3) is compared to a guideline of 1 ou/m^3 that is often applied in Ontario. Similar to contaminants with 10-minute average standards, odour is evaluated on a 10-minute average, and the 99.5th percentile concentration at a sensitive receptor is compared to the limit. This concentration reaches 1.85 ou/m^3 or 185% of the limit at a sensitive receptor (Alternative 2 Scenario A). The sensitive receptor exposed to the highest odour concentration is located east of the facility on Hwy 138. The odour concentration is predicted to exceed a level of 1 ou/m^3 at a sensitive receptor about 638 times in the five year modelling period or 1.5% of the time.

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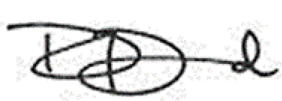

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APPENDIX A:
TABLES

Appendix A: Tables
Alternative 1 Scenario A

Table A1. Sources and Contaminants Identification Table - Alternative 1 Scenario A

Source Information			Expected Contaminants	Significant (Yes or No?)	Modelled (Yes or No)?	Rationale For Source/Contaminant Insignificance
Source ID	Source Description or Title	General Location				
STG1 to STG6	Landfill surface, Stages 1 to 6	Landfill	LFG	Yes	Yes	
			Odour	Yes	Yes	
Paved_Road	Truck traffic on paved roads on site	Landfill	Products of Combustion	Yes	Yes	
			Dust	Yes	Yes	
Unpaved_Road	Truck traffic on unpaved roads on site	Landfill	Products of Combustion	Yes	Yes	
			Dust	Yes	Yes	
Working Face	Landfill working face activities and nearby construction activities	Landfill	Products of Combustion	Yes	Yes	
			Dust	Yes	Yes	
Compost_NRoad	Mobile Equipment at Compost Facility	Compost Facility	Products of Combustion	Yes	Yes	
			Dust	No	No	Negligible compared to aggregate emissions
Leachate	Leachate treatment systems - treatment facility and holding ponds	Landfill	Odour	No	No	Negligible compared to aggregate emissions
GEN1 to GEN4	Reciprocating Engines – LFG Fueled	LFG Utilization Facility	Products of Combustion	Yes	Yes	
			Siloxanes	Yes	Yes	
			uncombusted LFG	No	No	< 5% of aggregate emissions
Flare 1	Enclosed LFG Flare 1	LFG Utilization Facility	Products of Combustion	Yes	Yes	
			Siloxanes	Yes	Yes	
			uncombusted LFG	Yes	Yes	
Flare 2	Enclosed LFG Flare 2	LFG Utilization Facility	Products of Combustion	Yes	Yes	
			Siloxanes	Yes	Yes	
			uncombusted LFG	Yes	Yes	
Siloxane Flare	Enclosed Siloxane/LFG Flare	LFG Utilization Facility	Products of Combustion	No	No	<5% of aggregate emissions
			Siloxanes	Yes	Yes	
			uncombusted LFG	No	No	<5% of aggregate emissions
BF1 to BF3	Biofilter - Exhaust from composting facility (Cells 1 to 3)	Compost Facility	Odour	Yes	Yes	
Finished Compost	Finished compost screening, stockiling, and packaging	Compost Facility	Odour	No	No	Negligible odour levels
Curing	Compost Curing Windrows (Windrows 1 to 12)	Compost Facility	Odour	Yes	Yes	
LFYD_1 to LFYD_6	Leaf & Yard Waste Stockpiles (Stockpiles 1 to 6)	Compost Facility	Odour	Yes	Yes	
Farm	Sod Farm	Agriculture area	Products of Combustion	No	No	Negligible compared to aggregate emissions
			Dust	Yes	Yes	
Welding	Maintenance Welding Station	Maintenance	Welding Fume	No	No	Table B-3B of MECP Document[1].
Heating	Comfort Heating	Offices and other small buildings	Products of Combustion	No	No	Table B-3B of MECP Document[1].

LFG - Landfill Gas

[1] MECP, "Procedure for Preparing an Emission Summary and Dispersion Modelling Report", Version 4.1, dated March 2018.

Table A2. Source Summary Table - Alternative 1 Scenario A

Source ID	Source Description	Source Data (per each unit)					Contaminant	CAS Number	Emission Rate [g/s] (or ou/s for Odour)	Avg. Period [hr]	Emis. Est. Tech.[1]	Data Qual.[2]	% of Overall Emissions [%]
		Flow Rate [m^3/s]	Exit Gas Temp. [°C]	Inner Dia. [m]	Height Above Grade [m]	Height Above Roof [m]							
GEN1 to GEN4	Reciprocating Engines – LFG Fueled - Aggregate emissions of all 4 engines	1.4 (each)	509	0.25	5.6	3.0	Nitrogen Oxides	10102-44-0	1.28E+00	1 & 24 hr	EF	ADQ	59%
							Suspended particulate matter	N/A	2.46E-01	24 hr	EF	ADQ	7.0%
							Particulate matter (< 10 μm dia.)	N/A	2.46E-01	24 hr	EF	ADQ	13%
							Particulate matter (< 2.5 μm dia.)	N/A	2.46E-01	24 hr	EF	ADQ	35%
							Carbon Monoxide	630-08-0	2.40E+00	1/2 hr	EF	ADQ	16%
							Sulfur Dioxide	2025884	6.83E-02	1 & 24 hr	MB	ADQ	28%
							Hydrogen Chloride	7647-01-0	6.59E-02	24 hr	MB	ADQ	28%
Flare 1	Enclosed LFG Flare 1	82.8	871	3.05	12.2	-	Nitrogen Oxides	10102-44-0	1.87E-01	1 & 24 hr	EF	ADQ	9%
							Suspended particulate matter	N/A	7.78E-02	24 hr	EF	ADQ	2.2%
							Particulate matter (< 10 μm dia.)	N/A	7.78E-02	24 hr	EF	ADQ	4%
							Particulate matter (< 2.5 μm dia.)	N/A	7.78E-02	24 hr	EF	ADQ	11%
							Carbon Monoxide	630-08-0	3.46E+00	1/2 hr	EF	ADQ	23%
							Sulfur Dioxide	2025884	6.15E-02	1 & 24 hr	MB	ADQ	26%
							Hydrogen Chloride	7647-01-0	5.94E-02	24 hr	MB	ADQ	26%
							1,1,2,2-Tetrachloroethane	79-34-5	4.23E-05	24 hr	EF	MDQ	1%
							1,1,2-Trichloroethane	79-00-5	9.94E-06	24 hr	EF	MDQ	1%
							1,2-Dichloroethane (Ethylene dichloride)	107-06-2	7.42E-06	24 hr	EF	ADQ	1%
							1,2-Dichloroethene	540-59-0	5.21E-04	24 hr	EF	MDQ	1%
							1,3-Butadiene (Vinyl ethylene)	106-99-0	4.23E-06	Annual	EF	MDQ	1%
							2-Ethyltoluene	611-14-3	1.83E-05	24 hr	EF	MDQ	1%
							Acetaldehyde	75-07-0	1.61E-06	24 hr, 1/2 hr	EF	MDQ	1%
							Benzene	71-43-2	8.84E-05	Annual	EF	ADQ	1%
							Benzyl chloride	100-44-7	1.08E-06	24 hr	EF	ADQ	1%
							cis-2-Pentene	627-20-3	1.58E-06	24 hr	EF	MDQ	1%
							Dibromochloromethane	124-48-1	1.48E-06	24 hr	EF	MDQ	1%
							Dimethyl sulfide	75-18-3	1.66E-04	10 min	EF	ADQ	1%
							Formaldehyde	50-00-0	1.66E-07	24 hr	EF	MDQ	1%
							Hydrogen sulfide	7783-06-4	5.14E-04	24 hr, 10 min	EF	ADQ	1%
							Isoprene (2-Methyl-1,3-butadiene)	78-79-5	5.30E-07	24 hr	EF	MDQ	1%
							Naphthalene	91-20-3	6.47E-06	24 hr, 10 min	EF	MDQ	1%
							p-Cymene (1-Methyl-4-Isopropylbenzene)	99-87-6	2.27E-04	24 hr	EF	MDQ	1%
							Trichloroethylene (Trichloroethene)	79-01-6	5.13E-05	24 hr	EF	ADQ	1%
							Trichloromethane (Chloroform)	67-66-3	3.99E-06	24 hr	EF	ADQ	1%
							Vinyl chloride (Chloroethene)	75-01-4	4.19E-05	24 hr	EF	ADQ	1%
							Total Reduced Sulphur Compounds	NA	7.81E-04	24 hr, 10 min	MB	MDQ	1%
							1-Methylcyclohexene	591-49-1	1.03E-06	24 hr	EF	MDQ	1%
							1-Propanethiol (n-Propyl mercaptan)	107-03-9	4.49E-06	24 hr	EF	MDQ	1%
							2,4-Dimethylhexane	589-43-5	1.20E-05	24 hr	EF	MDQ	1%
							2,5-Dimethylhexane	592-13-2	8.94E-06	24 hr	EF	MDQ	1%
							2-Ethyl-1-butene	760-21-4	7.02E-07	24 hr	EF	MDQ	1%
							2-Methyl-1-propanethiol (Isobutyl mercaptan)	513-44-0	7.23E-06	24 hr	EF	MDQ	1%
							2-Methyl-2-propanethiol (tert- Butylmercaptan)	513-35-9	1.38E-05	24 hr	EF	MDQ	1%
							3,6-Dimethyloctane	15869-94-0	5.27E-05	24 hr	EF	MDQ	1%
							cis-1,4-Dimethylcyclohexane	624-29-3	1.31E-05	24 hr	EF	MDQ	1%
							cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	1.31E-05	24 hr	EF	MDQ	1%
							cis-2-Heptene	6443-92-1	1.13E-06	24 hr	EF	MDQ	1%
							cis-2-Octene	2097322	1.16E-05	24 hr	EF	MDQ	1%
							cis-3-Methyl-2-pentene	922-62-3	7.10E-07	24 hr	EF	MDQ	1%
							Ethyl mercaptan (Ethanediol)	75-08-01	5.80E-06	24 hr	EF	ADQ	1%
							Isopropyl mercaptan	75-33-2	6.28E-06	24 hr	EF	ADQ	1%

Table A2. Source Summary Table - Alternative 1 Scenario A

Source ID	Source Description	Source Data (per each unit) Flow Rate [m^3/s]	Exit Gas Temp. [°C]	Inner Dia. [m]	Height Above Grade [m]	Height Above Roof [m]	Contaminant	CAS Number	Emission Rate [g/s] (or ou/s for Odour)	Avg. Period [hr]	Emis. Est. Tech.[1]	Data Qual.[2]	% of Overall Emissions [%]
							Methanethiol (Methyl mercaptan)	74-93-1	3.11E-05	24 hr	EF	ADQ	1%
							trans-1,2-Dimethylcyclohexane	6876-23-9	2.14E-05	24 hr	EF	MDQ	1%
							trans-1,4-Dimethylcyclohexane	2207047	1.08E-05	24 hr	EF	MDQ	1%
							trans-2-Octene	13389-42-9	1.28E-05	24 hr	EF	MDQ	1%
							trans-3-Methyl-2-pentene	616-12-6	6.15E-07	24 hr	EF	MDQ	1%
							Trichlorofluoromethane (Freon 11)	91315-61-6	1.61E-05	24 hr	EF	MDQ	1%
							Trimethylsilanol	1066-40-6	3.69E-03	24 hr	EF	ADQ	14%
							Trimethylsilyl Fluoride	420-56-4	1.91E-04	24 hr	EF	ADQ	14%
							Methoxytrimethylsilane	1825-61-2	1.23E-04	24 hr	EF	ADQ	14%
							Ethoxytrimethylsilane	1825-62-3	7.11E-05	24 hr	EF	ADQ	14%
							Propoxytrimethylsilane	1825-63-4	5.53E-05	24 hr	EF	ADQ	14%
							Isopropoxytrimethylsilane	1825-64-5	6.34E-05	24 hr	EF	ADQ	14%
							Butoxytrimethylsilane	1825-65-6	3.15E-05	24 hr	EF	ADQ	14%
							1-methylbutoxytrimethylsilane	1825-67-8	6.73E-05	24 hr	EF	ADQ	14%
Flare 2	Enclosed LFG Flare 2	140	871	3.66	15.2	-	Nitrogen Oxides	10102-44-0	3.37E-01	1 & 24 hr	EF	ADQ	15%
							Suspended particulate matter	N/A	1.40E-01	24 hr	EF	ADQ	4%
							Particulate matter (< 10 µm dia.)	N/A	1.40E-01	24 hr	EF	ADQ	8%
							Particulate matter (< 2.5 µm dia.)	N/A	1.40E-01	24 hr	EF	ADQ	20%
							Carbon Monoxide	630-08-0	6.23E+00	1/2 hr	EF	ADQ	41%
							Sulfur Dioxide	2025884	1.11E-01	1 & 24 hr	MB	ADQ	46%
							Hydrogen Chloride	7647-01-0	1.07E-01	24 hr	MB	ADQ	46%
							1,1,2,2-Tetrachloroethane	79-34-5	7.62E-05	24 hr	EF	MDQ	3%
							1,1,2-Trichloroethane	79-00-5	1.79E-05	24 hr	EF	MDQ	3%
							1,2-Dichloroethane (Ethylene dichloride)	107-06-2	1.34E-05	24 hr	EF	ADQ	3%
							1,2-Dichloroethene	540-59-0	9.38E-04	24 hr	EF	MDQ	3%
							1,3-Butadiene (Vinyl ethylene)	106-99-0	7.62E-06	Annual	EF	MDQ	3%
							2-Ethyltoluene	611-14-3	3.30E-05	24 hr	EF	MDQ	3%
							Acetaldehyde	75-07-0	2.89E-06	24 hr, 1/2 hr	EF	MDQ	3%
							Benzene	71-43-2	1.59E-04	Annual	EF	ADQ	3%
							Benzyl chloride	100-44-7	1.94E-06	24 hr	EF	ADQ	3%
							cis-2-Pentene	627-20-3	2.85E-06	24 hr	EF	MDQ	3%
							Dibromochloromethane	124-48-1	2.67E-06	24 hr	EF	MDQ	3%
							Dimethyl sulfide	75-18-3	2.99E-04	10 min	EF	ADQ	3%
							Formaldehyde	50-00-0	2.98E-07	24 hr	EF	MDQ	3%
							Hydrogen sulfide	7783-06-4	9.26E-04	24 hr, 10 min	EF	ADQ	3%
							Isoprene (2-Methyl-1,3-butadiene)	78-79-5	9.54E-07	24 hr	EF	MDQ	3%
							Naphthalene	91-20-3	1.16E-05	24 hr, 10 min	EF	MDQ	3%
							p-Cymene (1-Methyl-4-Isopropylbenzene)	99-87-6	4.08E-04	24 hr	EF	MDQ	3%
							Trichloroethylene (Trichloroethene)	79-01-6	9.23E-05	24 hr	EF	ADQ	3%
							Trichloromethane (Chloroform)	67-66-3	7.17E-06	24 hr	EF	ADQ	3%
							Vinyl chloride (Chloroethene)	75-01-4	7.53E-05	24 hr	EF	ADQ	3%
							Total Reduced Sulphur Compounds	NA	1.41E-03	24 hr, 10 min	MB	MDQ	3%
							1-Methylcyclohexene	591-49-1	1.85E-06	24 hr	EF	MDQ	3%
							1-Propanethiol (n-Propyl mercaptan)	107-03-9	8.08E-06	24 hr	EF	MDQ	3%
							2,4-Dimethylhexane	589-43-5	2.15E-05	24 hr	EF	MDQ	3%
							2,5-Dimethylhexane	592-13-2	1.61E-05	24 hr	EF	MDQ	3%
							2-Ethyl-1-butene	760-21-4	1.26E-06	24 hr	EF	MDQ	3%
							2-Methyl-1-propanethiol (Isobutyl mercaptan)	513-44-0	1.30E-05	24 hr	EF	MDQ	3%
							2-Methyl-2-propanethiol (tert- Butylmercaptan)	513-35-9	2.49E-05	24 hr	EF	MDQ	3%
							3,6-Dimethyloctane	15869-94-0	9.48E-05	24 hr	EF	MDQ	3%
							cis-1,4-Dimethylcyclohexane	624-29-3	2.36E-05	24 hr	EF	MDQ	3%
							cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	2.36E-05	24 hr	EF	MDQ	3%
							cis-2-Heptene	6443-92-1	2.04E-06	24 hr	EF	MDQ	3%
							cis-2-Octene	2097322	2.10E-05	24 hr	EF	MDQ	3%
							cis-3-Methyl-2-pentene	922-62-3	1.28E-06	24 hr	EF	MDQ	3%

Table A2. Source Summary Table - Alternative 1 Scenario A

Source ID	Source Description	Source Data (per each unit) Flow Rate [m^3/s]	Exit Gas Temp. [°C]	Inner Dia. [m]	Height Above Grade [m]	Height Above Roof [m]	Contaminant	CAS Number	Emission Rate [g/s] (or ou/s for Odour)	Avg. Period [hr]	Emis. Est. Tech.[1]	Data Qual.[2]	% of Overall Emissions [%]
							Ethyl mercaptan (Ethanediol)	75-08-01	1.04E-05	24 hr	EF	ADQ	3%
							Isopropyl mercaptan	75-33-2	1.13E-05	24 hr	EF	ADQ	3%
							Methanethiol (Methyl mercaptan)	74-93-1	5.59E-05	24 hr	EF	ADQ	3%
							trans-1,2-Dimethylcyclohexane	6876-23-9	3.85E-05	24 hr	EF	MDQ	3%
							trans-1,4-Dimethylcyclohexane	2207047	1.95E-05	24 hr	EF	MDQ	3%
							trans-2-Octene	13389-42-9	2.30E-05	24 hr	EF	MDQ	3%
							trans-3-Methyl-2-pentene	616-12-6	1.11E-06	24 hr	EF	MDQ	3%
							Trichlorofluoromethane (Freon 11)	91315-61-6	2.89E-05	24 hr	EF	MDQ	3%
							Trimethylsilanol	1066-40-6	6.63E-03	24 hr	EF	ADQ	26%
							Trimethylsilyl Fluoride	420-56-4	3.44E-04	24 hr	EF	ADQ	26%
							Methoxytrimethylsilane	1825-61-2	2.21E-04	24 hr	EF	ADQ	26%
							Ethoxytrimethylsilane	1825-62-3	1.28E-04	24 hr	EF	ADQ	26%
							Propoxytrimethylsilane	1825-63-4	9.96E-05	24 hr	EF	ADQ	26%
							Isopropoxytrimethylsilane	1825-64-5	1.14E-04	24 hr	EF	ADQ	26%
							Butoxytrimethylsilane	1825-65-6	5.67E-05	24 hr	EF	ADQ	26%
							1-methylbutoxytrimethylsilane	1825-67-8	1.21E-04	24 hr	EF	ADQ	26%
Siloxane Flare	Enclosed Siloxane/LFG Flare	1.23	871	0.77	9.17	-	Trimethylsilanol	1066-40-6	7.34E-03	24 hr	EF	ADQ	28%
							Trimethylsilyl Fluoride	420-56-4	3.81E-04	24 hr	EF	ADQ	28%
							Methoxytrimethylsilane	1825-61-2	2.45E-04	24 hr	EF	ADQ	28%
							Ethoxytrimethylsilane	1825-62-3	1.42E-04	24 hr	EF	ADQ	28%
							Propoxytrimethylsilane	1825-63-4	1.10E-04	24 hr	EF	ADQ	28%
							Isopropoxytrimethylsilane	1825-64-5	1.26E-04	24 hr	EF	ADQ	28%
							Butoxytrimethylsilane	1825-65-6	6.28E-05	24 hr	EF	ADQ	28%
							1-methylbutoxytrimethylsilane	1825-67-8	1.34E-04	24 hr	EF	ADQ	28%
BF1 to BF3	Biofilter - Exhaust from composting facility (Cells 1 to 3)	N/A	N/A	N/A	N/A	N/A	odour	N/A	9.05E+02	10 min	EC	MDQ	1%
Curing	Compost Curing Windrows (Windrows 1 to 12)	N/A	N/A	N/A	N/A	N/A	odour	N/A	3.99E+04 (Max season)	10 min	EC	MDQ	47%
LFYD_1 to LFYD_6	Leaf & Yard Waste Stockpiles (Stockpiles 1 to 6)	N/A	N/A	N/A	N/A	N/A	odour	N/A	1.36E+04 (Max season)	10 min	EC	MDQ	16%

Table A2. Source Summary Table - Alternative 1 Scenario A

Source ID	Source Description	Source Data (per each unit) Flow Rate [m^3/s]	Exit Gas Temp. [°C]	Inner Dia. [m]	Height Above Grade [m]	Height Above Roof [m]	Contaminant	CAS Number	Emission Rate [g/s] (or ou/s for Odour)	Avg. Period [hr]	Emis. Est. Tech.[1]	Data Qual.[2]	% of Overall Emissions [%]
STG1 to STG6	Landfill surface - Stages 1 to 6 - Aggregate fugitive emissions from all six stages	N/A	N/A	N/A	N/A	N/A	Carbon Monoxide	630-08-0	2.15E-02	1/2 hr	EF	MDQ	0%
							1,1,2,2-Tetrachloroethane	79-34-5	2.83E-03	24 hr	EF	MDQ	96%
							1,1,2-Trichloroethane	79-00-5	6.64E-04	24 hr	EF	MDQ	96%
							1,2-Dichloroethane (Ethylene dichloride)	107-06-2	4.96E-04	24 hr	EF	ADQ	96%
							1,2-Dichloroethene	540-59-0	3.48E-02	24 hr	EF	MDQ	96%
							1,3-Butadiene (Vinyl ethylene)	106-99-0	2.83E-04	Annual	EF	MDQ	96%
							2-Ethyltoluene	611-14-3	1.22E-03	24 hr	EF	MDQ	96%
							Acetaldehyde	75-07-0	1.07E-04	24 hr, 1/2 hr	EF	MDQ	96%
							Benzene	71-43-2	5.90E-03	Annual	EF	ADQ	96%
							Benzyl chloride	100-44-7	7.22E-05	24 hr	EF	ADQ	96%
							cis-2-Pentene	627-20-3	1.06E-04	24 hr	EF	MDQ	96%
							Dibromochloromethane	124-48-1	9.91E-05	24 hr	EF	MDQ	96%
							Dimethyl sulfide	75-18-3	1.11E-02	10 min	EF	ADQ	96%
							Formaldehyde	50-00-0	1.11E-05	24 hr	EF	MDQ	96%
							Hydrogen sulfide	7783-06-4	3.44E-02	24 hr, 10 min	EF	ADQ	96%
							Isoprene (2-Methyl-1,3-butadiene)	78-79-5	3.54E-05	24 hr	EF	MDQ	96%
							Naphthalene	91-20-3	4.32E-04	24 hr, 10 min	EF	MDQ	96%
							p-Cymene (1-Methyl-4-Isopropylbenzene)	99-87-6	1.51E-02	24 hr	EF	MDQ	96%
							Trichloroethylene (Trichloroethene)	79-01-6	3.43E-03	24 hr	EF	ADQ	96%
							Trichloromethane (Chloroform)	67-66-3	2.66E-04	24 hr	EF	ADQ	96%
							Vinyl chloride (Chloroethene)	75-01-4	2.80E-03	24 hr	EF	ADQ	96%
							Total Reduced Sulphur Compounds	NA	5.22E-02	24 hr, 10 min	MB	MDQ	96%
							1-Methylcyclohexene	591-49-1	6.88E-05	24 hr	EF	MDQ	96%
							1-Propanethiol (n-Propyl mercaptan)	107-03-9	3.00E-04	24 hr	EF	MDQ	96%
							2,4-Dimethylhexane	589-43-5	7.99E-04	24 hr	EF	MDQ	96%
							2,5-Dimethylhexane	592-13-2	5.97E-04	24 hr	EF	MDQ	96%
							2-Ethyl-1-butene	760-21-4	4.69E-05	24 hr	EF	MDQ	96%
							2-Methyl-1-propanethiol (Isobutyl mercaptan)	513-44-0	4.83E-04	24 hr	EF	MDQ	96%
							2-Methyl-2-propanethiol (tert- Butylmercaptan)	513-35-9	9.23E-04	24 hr	EF	MDQ	96%
							3,6-Dimethyloctane	15869-94-0	3.52E-03	24 hr	EF	MDQ	96%
							cis-1,4-Dimethylcyclohexane	624-29-3	8.77E-04	24 hr	EF	MDQ	96%
							cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	8.77E-04	24 hr	EF	MDQ	96%
							cis-2-Heptene	6443-92-1	7.58E-05	24 hr	EF	MDQ	96%
							cis-2-Octene	2097322	7.78E-04	24 hr	EF	MDQ	96%
							cis-3-Methyl-2-pentene	922-62-3	4.75E-05	24 hr	EF	MDQ	96%
							Ethyl mercaptan (Ethanediol)	75-08-01	3.88E-04	24 hr	EF	ADQ	96%
							Isopropyl mercaptan	75-33-2	4.20E-04	24 hr	EF	ADQ	96%
							Methanethiol (Methyl mercaptan)	74-93-1	2.08E-03	24 hr	EF	ADQ	96%
							trans-1,2-Dimethylcyclohexane	6876-23-9	1.43E-03	24 hr	EF	MDQ	96%
							trans-1,4-Dimethylcyclohexane	2207047	7.25E-04	24 hr	EF	MDQ	96%
							trans-2-Octene	13389-42-9	8.52E-04	24 hr	EF	MDQ	96%
							trans-3-Methyl-2-pentene	616-12-6	4.11E-05	24 hr	EF	MDQ	96%
							Trichlorofluoromethane (Freon 11)	91315-61-6	1.07E-03	24 hr	EF	MDQ	96%
							Trimethylsilanol	1066-40-6	8.11E-03	24 hr	EF	ADQ	31%
							Trimethylsilyl Fluoride	420-56-4	4.21E-04	24 hr	EF	ADQ	31%
							Methoxytrimethylsilane	1825-61-2	2.71E-04	24 hr	EF	ADQ	31%
							Ethoxytrimethylsilane	1825-62-3	1.56E-04	24 hr	EF	ADQ	31%
							Propoxytrimethylsilane	1825-63-4	1.22E-04	24 hr	EF	ADQ	31%
							Isopropoxytrimethylsilane	1825-64-5	1.39E-04	24 hr	EF	ADQ	31%
							Butoxytrimethylsilane	1825-65-6	6.94E-05	24 hr	EF	ADQ	31%
							1-methylbutoxytrimethylsilane	1825-67-8	1.48E-04	24 hr	EF	ADQ	31%
							odour	N/A	7.71E+03	10 min	EC	MDQ	9%

Table A2. Source Summary Table - Alternative 1 Scenario A

Source ID	Source Description	Source Data (per each unit)					Contaminant	CAS Number	Emission Rate [g/s] (or ou/s for Odour)	Avg. Period [hr]	Emis. Est. Tech.[1]	Data Qual.[2]	% of Overall Emissions [%]
		Flow Rate [m^3/s]	Exit Gas Temp. [°C]	Inner Dia. [m]	Height Above Grade [m]	Height Above Roof [m]							
Paved_Road	Truck traffic on paved roads on site	N/A	N/A	N/A	N/A	N/A	Nitrogen Oxides	10102-44-0	2.20E-02	1 hr	EF	ADQ	1.0%
							Suspended particulate matter	N/A	1.60E+00	1 hr	EF	ADQ	45.60%
							Particulate matter (< 10 µm dia.)	N/A	3.21E-01	1 hr	EF	ADQ	17.31%
							Particulate matter (< 2.5 µm dia.)	N/A	7.92E-02	1 hr	EF	ADQ	11.32%
							Carbon Monoxide	630-08-0	6.90E-03	1/2 hr	EF	ADQ	0.0%
Working Face	Landfill working face activities and nearby construction activities	N/A	N/A	N/A	N/A	N/A	Nitrogen Oxides	10102-44-0	1.54E-01	1 hr	EF	ADQ	7%
							Suspended particulate matter	N/A	1.43E+00	1 hr	EF	ADQ	40.9%
							Particulate matter (< 10 µm dia.)	N/A	1.06E+00	1 hr	EF	ADQ	57.1%
							Particulate matter (< 2.5 µm dia.)	N/A	1.51E-01	1 hr	EF	ADQ	21.6%
							Carbon Monoxide	630-08-0	1.35E+00	1/2 hr	EF	ADQ	8.9%
							odour	N/A	2.25E+04	10 min	EC	MDQ	27%
Compost_NRoad	Mobile Equipment at Compost Facility	N/A	N/A	N/A	N/A	N/A	Nitrogen Oxides	10102-44-0	2.06E-01	1 hr	EF	ADQ	9.4%
							Suspended particulate matter	N/A	1.03E-02	1 hr	EF	ADQ	0.3%
							Particulate matter (< 10 µm dia.)	N/A	1.03E-02	1 hr	EF	ADQ	0.6%
							Particulate matter (< 2.5 µm dia.)	N/A	5.00E-03	1 hr	EF	ADQ	0.7%
							Carbon Monoxide	630-08-0	1.79E+00	1/2 hr	EF	ADQ	12%

Note:

[1]Emission Estimating Technique: "V-ST" - Validated Source Test, "ST" - Source Test, "EF" - Emission Factor, "MB" - Mass Balance, "EC" - Engineering Calculation

[2]Emissions Data Quality: "HDQ" - Highest; "AADQ" - Above Average; "ADQ" - Average; and "MDQ" - Marginal

[3]Landfill Gas profiles were obtained from AP 42. The amount of total reduced sulfur was calculated per procedure described in O. Reg. 516/07.

Table A3. Emission Summary Table - Alternative 1 Scenario A

Contaminant	CAS Number	Total Facility Emission Rate [g/s]	Dispersion Model Used	Max. POI Conc. [µg/m³]	Max. at Sensitive Receptor [µg/m³]	MECP Limit					Percent of POI Limit [%]	Percent of Limit at Receptor [%]
						Avg. Period [hr]	Limit µg/m³	Limiting Effect	ACB Source[1]	Category[2]		
Nitrogen Oxides (as NO_2)	10102-44-0	2.2	AERMOD	45	8.3	24 hr	200	Health	Standard	B1	22%	4%
				151	48.6	1 hr	400	Health	Standard	B1	38%	12%
Nitrogen Dioxide	10102-44-0	2.2	AERMOD	45	8.3	24 hr	200	Health	AAQC	n/a	22%	4%
				151	48.6	1 hr	400	Health	AAQC	n/a	38%	12%
				90.8	29.6	1-hr	113	n/a	CAAQS	n/a	80%	26%
				5.65	0.83	Annual	32	n/a	CAAQS	n/a	18%	3%
Suspended particulate matter	n/a	3.5	AERMOD	226	77	24 hr	120	Visibility	Standard	B1	188%	64%
Particulate matter (< 10 µm dia.)	n/a	1.9	AERMOD	125	40	24 hr	50	Health	AAQC	n/a	250%	79%
Particulate matter (< 2.5 µm dia.)	n/a	0.7	AERMOD	7.3	2.3	24 hr	27	Health	AAQC	n/a	27%	8%
				1.91	0.38	annual	8.8	Health	AAQC	n/a	22%	4%
Carbon Monoxide	630-08-0	15.3	AERMOD	1549	503	0.5 hr	6000	Health	Standard	B1	26%	8%
				1291	419	1 hr	36,200	Health	AAQC	n/a	4%	1%
				721	234	8 hr	15,700	Health	AAQC	n/a	5%	1%
Sulfur Dioxide	7446-09-5	0.2	AERMOD	7.80	2.59	10 min	178	Health	AAQC	n/a	4%	1%
				4.73	1.57	1 hr	100	Health & Veg.	Standard	B1	5%	2%
				0.297	0.040	annual	10	Health & Veg.	Standard	B1	3%	<1%
				4.63	1.35	1 hr	173	n/a	CAAQS	n/a	n/a	n/a
Hydrogen Chloride	7647-01-0	0.232	AERMOD	2.32	0.33	24 hr	20	Health	Standard	B1	12%	2%
Odour[3] (units: ou/s, or ou/m³)	n/a	84,592 (Max season)	AERMOD	n/a	1.64	10 min	1	---	Guideline	---	n/a	164%
LFG Contaminants												
LFG Unit Emission Run		1.0E+00	AERMOD	93.7	45.9	1 hr						
				35.9	14.71	24 hr						
				4.53	1.300	annual						
				155	75.7	10 min						
1,1,2,2-Tetrachloroethane	79-34-5	2.9E-03	AERMOD	0.106	0.043	24 hr	0.1	Health	SL-JSL	B2	106%	43%
1,1,2-Trichloroethane	79-00-5	6.9E-04	AERMOD	0.025	0.010	24 hr	0.3	Health	SL-JSL	B2	8%	3%
1,2-Dichloroethane (Ethylene dichloride)	107-06-2	5.2E-04	AERMOD	0.019	0.008	24 hr	2	Health	Standard	B1	<1%	<1%
				0.002	0.001	Annual	0.4	Health	AAQC	n/a	<1%	<1%
1,2-Dichloroethene	540-59-0	3.6E-02	AERMOD	1.301	0.534	24 hr	105	Health	Guideline	B1	1%	<1%
1,3-Butadiene (Vinyl ethylene)	106-99-0	2.9E-04	AERMOD	0.001	0.0004	Annual	2	Health	Standard	B1	<1%	<1%
				0.011	0.004	24 hr	10	Health	AAQC	n/a	<1%	<1%
2-Ethyltoluene	611-14-3	1.3E-03	AERMOD	0.046	0.019	24 hr	0.5	Health	SL-JSL	B2	9%	4%
Acetaldehyde	75-07-0	1.1E-04	AERMOD	0.004	0.002	24 hr	500	Health	Standard	B1	<1%	<1%
				0.013	0.006	0.5 hr	500	Health	Standard	B1	<1%	<1%
Benzene	71-43-2	6.2E-03	AERMOD	0.028	0.008	Annual	0.45	Health	Standard	B1	6%	2%
				0.221	0.091	24 hr	2.3	Health	AAQC	n/a	10%	4%
Benzyl chloride	100-44-7	7.5E-05	AERMOD	0.003	0.001	24 hr	0.1	Health	SL-JSL	B2	3%	1%
cis-2-Pentene	627-20-3	1.1E-04	AERMOD	0.004	0.002	24 hr	0.5	Health	SL-JSL	B2	<1%	<1%
Dibromochloromethane	124-48-1	1.0E-04	AERMOD	0.004	0.002	24 hr	0.2	Health	SL-JSL	B2	2%	<1%
Formaldehyde	50-00-0	1.2E-05	AERMOD	0.000	0.0002	24 hr	65	Health	Standard	B1	<1%	<1%
Isoprene (2-Methyl-1,3-butadiene)	78-79-5	3.7E-05	AERMOD	0.001	0.0005	24 hr	0.1	Health	SL-JSL	B2	1%	<1%
Naphthalene	91-20-3	4.5E-04	AERMOD	0.016	0.007	24 hr	22.5	Health	Guideline	B1	<1%	<1%
				0.000	0.034	10 min	50	Odour	Guideline	B1	---	<1%
p-Cymene (1-Methyl-4-Isopropylbenzene)	99-87-6	1.6E-02	AERMOD	0.566	0.232	24 hr	50	Health	SL-JSL	B2	1%	<1%
Trichloroethylene (Trichloroethene)	79-01-6	3.6E-03	AERMOD	0.128	0.053	24 hr	12	Health	Standard	B1	1%	<1%
				0.016	0.0046	Annual	2.3	Health	AAQC	n/a	<1%	<1%

Table A3. Emission Summary Table - Alternative 1 Scenario A

Contaminant	CAS Number	Total Facility Emission Rate [g/s]	Dispersion Model Used	Max. POI Conc. [µg/m³]	Max. at Sensitive Receptor [µg/m³]	MECP Limit					Percent of POI Limit [%]	Percent of Limit at Receptor [%]
						Avg. Period [hr]	Limit µg/m³	Limiting Effect	ACB Source[1]	Category[2]		
Trichloromethane (Chloroform)	67-66-3	2.8E-04	AERMOD	0.010	0.004	24 hr	1	Health	Standard	B1	<1%	<1%
				0.001	0.0004	Annual	0.2	Health	AAQC	n/a	<1%	<1%
Vinyl chloride (Chloroethene)	75-01-4	2.9E-03	AERMOD	0.104	0.043	24 hr	1	Health	Standard	B1	10%	4%
				0.013	0.004	Annual	0.2	Health	AAQC	n/a	7%	2%
Total Reduced Sulphur Compounds	NA	5.4E-02	AERMOD	1.951	0.800	24 hr	7	Health	Guideline	B1	28%	11%
					4.115	10 min	13	Odour	Guideline	B1	---	32%
1-Methylcyclohexene	591-49-1	7.2E-05	AERMOD	0.003	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	3%	1%
2,4-Dimethylhexane	589-43-5	8.3E-04	AERMOD	0.030	0.012	24 hr	0.1	de minimus	Table B-2A	n/a	30%	12%
2,5-Dimethylhexane	592-13-2	6.2E-04	AERMOD	0.022	0.009	24 hr	0.1	de minimus	Table B-2A	n/a	22%	9%
2-Ethyl-1-butene	760-21-4	4.9E-05	AERMOD	0.002	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	2%	<1%
3,6-Dimethyloctane	15869-94-0	3.7E-03	AERMOD	0.131	0.054	24 hr	0.1	de minimus	Table B-2A	n/a	131%	54%
cis-1,4-Dimethylcyclohexane	624-29-3	9.1E-04	AERMOD	0.033	0.013	24 hr	0.1	de minimus	Table B-2A	n/a	33%	13%
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	9.1E-04	AERMOD	0.033	0.013	24 hr	0.1	de minimus	Table B-2A	n/a	33%	13%
trans-1,4-Dimethylcyclohexane	2207047	7.5E-04	AERMOD	0.027	0.011	24 hr	0.1	de minimus	Table B-2A	n/a	27%	11%
cis-2-Heptene	6443-92-1	7.9E-05	AERMOD	0.003	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	3%	1%
cis-2-Octene	2097322	8.1E-04	AERMOD	0.029	0.012	24 hr	0.1	de minimus	Table B-2A	n/a	29%	12%
cis-3-Methyl-2-pentene	922-62-3	4.9E-05	AERMOD	0.002	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	2%	<1%
Isopropyl mercaptan	75-33-2	4.4E-04	AERMOD	0.016	0.006	24 hr	0.1	de minimus	Table B-2A	n/a	16%	6%
trans-1,2-Dimethylcyclohexane	6876-23-9	1.5E-03	AERMOD	0.053	0.022	24 hr	0.1	de minimus	Table B-2A	n/a	53%	22%
trans-1,4-Dimethylcyclohexane	2207047	7.5E-04	AERMOD	0.027	0.011	24 hr	0.1	de minimus	Table B-2A	n/a	27%	11%
trans-2-Octene	13389-42-9	8.9E-04	AERMOD	0.032	0.013	24 hr	0.1	de minimus	Table B-2A	n/a	32%	13%
trans-3-Methyl-2-pentene	616-12-6	4.3E-05	AERMOD	0.002	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	2%	<1%
Trichlorofluoromethane (Freon 11)	91315-61-6	1.1E-03	AERMOD	0.040	0.016	24 hr	0.1	de minimus	Table B-2A	n/a	40%	16%
Siloxanes												
Siloxanes Unit Emission Run		1.0E+00	AERMOD	11.9	5.04	24 hr						
Trimethylsilanol	1066-40-6	2.6E-02	AERMOD	0.307	0.130	24 hr	32.5	Health	SL-JSL	B2	<1%	0%
Trimethylsilyl Fluoride	420-56-4	1.3E-03	AERMOD	0.016	0.007	24 hr	0.1	de minimus	Table B-2A	n/a	16%	7%
Methoxytrimethylsilane	1825-61-2	8.6E-04	AERMOD	0.010	0.004	24 hr	0.1	de minimus	Table B-2A	n/a	10%	4%
Ethoxytrimethylsilane	1825-62-3	5.0E-04	AERMOD	0.006	0.003	24 hr	0.1	de minimus	Table B-2A	n/a	6%	3%
Propoxytrimethylsilane	1825-63-4	3.9E-04	AERMOD	0.005	0.002	24 hr	0.1	de minimus	Table B-2A	n/a	5%	2%
Isopropoxytrimethylsilane	1825-64-5	4.4E-04	AERMOD	0.005	0.002	24 hr	0.1	de minimus	Table B-2A	n/a	5%	2%
Butoxytrimethylsilane	1825-65-6	2.2E-04	AERMOD	0.003	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	3%	1%
1-methylbutoxytrimethylsilane	1825-67-8	4.7E-04	AERMOD	0.006	0.002	24 hr	0.1	de minimus	Table B-2A	n/a	6%	2%

Note:

[1] ACB Source: "S" - Standard (for Section 20), "G" - Guideline (for Section 20), "SL-JSL" - Screening Level (SL) set by the MECP based on a review of toxicity information and/or other jurisdictional levels (JSL)

[2] Category: "B1" - Benchmark 1 , "B2" - Benchmark 2.

[3] The 1-hr air dispersion modelling output units were adjusted in AERMOD to reflect the expected peak 10-min average values using the MECP recommended standard conversion factor of

Appendix A: Tables
Alternative 1 Scenario B

Table A1. Sources and Contaminants Identification Table - Alternative 1 Scenario B

Source Information			Expected Contaminants	Significant (Yes or No?)	Modelled (Yes or No)?	Rationale For Source/Contaminant Insignificance
Source ID	Source Description or Title	General Location				
STG1 to STG9	Landfill surface, Stages 1 to 9	Landfill	LFG	Yes	Yes	
			Odour	Yes	Yes	
Paved_Road	Truck traffic on paved roads on site	Landfill	Products of Combustion	Yes	Yes	
			Dust	Yes	Yes	
Unpaved_Road	Truck traffic on unpaved roads on site	Landfill	Products of Combustion	Yes	Yes	
			Dust	Yes	Yes	
Working Face	Landfill working face activities and nearby construction activities	Landfill	Products of Combustion	Yes	Yes	
			Dust	Yes	Yes	
Compost_NRoad	Mobile Equipment at Compost Facility	Compost Facility	Products of Combustion	Yes	Yes	
			Dust	No	No	Negligible compared to aggregate emissions
Leachate	Leachate treatment systems - treatment facility and holding ponds	Landfill	Odour	No	No	Negligible compared to aggregate emissions
GEN1 to GEN4	Reciprocating Engines – LFG Fueled	LFG Utilization Facility	Products of Combustion	Yes	Yes	
			Siloxanes	Yes	Yes	
			uncombusted LFG	No	No	< 5% of aggregate emissions
Flare 1	Enclosed LFG Flare 1	LFG Utilization Facility	Products of Combustion	Yes	Yes	
			Siloxanes	Yes	Yes	
			uncombusted LFG	Yes	Yes	
Flare 2	Enclosed LFG Flare 2	LFG Utilization Facility	Products of Combustion	Yes	Yes	
			Siloxanes	Yes	Yes	
			uncombusted LFG	Yes	Yes	
Siloxane Flare	Enclosed Siloxane/LFG Flare	LFG Utilization Facility	Products of Combustion	No	No	<5% of aggregate emissions
			Siloxanes	Yes	Yes	
			uncombusted LFG	No	No	<5% of aggregate emissions
BF1 to BF3	Biofilter - Exhaust from composting facility (Cells 1 to 3)	Compost Facility	Odour	Yes	Yes	
Finished Compost	Finished compost screening, stockiling, and packaging	Compost Facility	Odour	No	No	Negligible odour levels
Curing	Compost Curing Windrows (Windrows 1 to 12)	Compost Facility	Odour	Yes	Yes	
LFYD_1 to LFYD_6	Leaf & yard waste stockpile (Stock piles 1 to 6)	Compost Facility	Odour	Yes	Yes	
Farm	Sod Farm	Agriculture area	Products of Combustion	No	No	Negligible compared to aggregate emissions
			Dust	Yes	Yes	
Welding	Maintenance Welding Station	Maintenance	Welding Fume	No	No	Table B-3B of MECP Document[1].
Heating	Comfort Heating	Offices and other small buildings	Products of Combustion	No	No	Table B-3B of MECP Document[1].

LFG - Landfill Gas

[1] MECP, "Procedure for Preparing an Emission Summary and Dispersion Modelling Report", Version 4.1, dated March 2018.

Table A2. Source Summary Table - Alternative 1 Scenario B

Source ID	Source Description	Source Data (per each unit)					Contaminant	CAS Number	Emission Rate [g/s] (or ou/s for Odour)	Avg. Period [hr]	Emis. Est. Tech.[1]	Data Qual.[2]	% of Overall Emissions [%]
		Flow Rate [m^3/s]	Exit Gas Temp. [°C]	Inner Dia. [m]	Height Above Grade [m]	Height Above Roof [m]							
GEN1 to GEN4	Reciprocating Engines – LFG Fueled - Aggregate emissions of all 4 engines	1.4 (each)	509	0.25	5.6	3.0	Nitrogen Oxides	10102-44-0	1.28E+00	1 & 24 hr	EF	ADQ	53%
							Suspended particulate matter	N/A	2.46E-01	24 hr	EF	ADQ	4.6%
							Particulate matter (< 10 µm dia.)	N/A	2.46E-01	24 hr	EF	ADQ	11%
							Particulate matter (< 2.5 µm dia.)	N/A	2.46E-01	24 hr	EF	ADQ	28%
							Carbon Monoxide	630-08-0	2.40E+00	1/2 hr	EF	ADQ	13%
							Sulfur Dioxide	2025884	6.83E-02	1 & 24 hr	MB	ADQ	22%
							Hydrogen Chloride	7647-01-0	6.59E-02	24 hr	MB	ADQ	22%
Flare 1	Enclosed LFG Flare 1	82.8	871	3.05	12.2	-	Nitrogen Oxides	10102-44-0	2.59E-01	1 & 24 hr	EF	ADQ	11%
							Suspended particulate matter	N/A	1.07E-01	24 hr	EF	ADQ	2.0%
							Particulate matter (< 10 µm dia.)	N/A	1.07E-01	24 hr	EF	ADQ	5%
							Particulate matter (< 2.5 µm dia.)	N/A	1.07E-01	24 hr	EF	ADQ	12%
							Carbon Monoxide	630-08-0	4.78E+00	1/2 hr	EF	ADQ	25%
							Sulfur Dioxide	2025884	8.50E-02	1 & 24 hr	MB	ADQ	28%
							Hydrogen Chloride	7647-01-0	8.20E-02	24 hr	MB	ADQ	28%
							1,1,2,2-Tetrachloroethane	79-34-5	5.85E-05	24 hr	EF	MDQ	2%
							1,1,2-Trichloroethane	79-00-5	1.37E-05	24 hr	EF	MDQ	2%
							1,2-Dichloroethane (Ethylene dichloride)	107-06-2	1.02E-05	24 hr	EF	ADQ	2%
							1,2-Dichloroethene	540-59-0	7.20E-04	24 hr	EF	MDQ	2%
							1,3-Butadiene (Vinyl ethylene)	106-99-0	5.85E-06	Annual	EF	MDQ	2%
							2-Ethyltoluene	611-14-3	2.53E-05	24 hr	EF	MDQ	2%
							Acetaldehyde	75-07-0	2.22E-06	24 hr, 1/2 hr	EF	MDQ	2%
							Benzene	71-43-2	1.22E-04	Annual	EF	ADQ	2%
							Benzyl chloride	100-44-7	1.49E-06	24 hr	EF	ADQ	2%
							cis-2-Pentene	627-20-3	2.19E-06	24 hr	EF	MDQ	2%
							Dibromochloromethane	124-48-1	2.05E-06	24 hr	EF	MDQ	2%
							Dimethyl sulfide	75-18-3	2.29E-04	10 min	EF	ADQ	2%
							Formaldehyde	50-00-0	2.29E-07	24 hr	EF	MDQ	2%
							Hydrogen sulfide	7783-06-4	7.10E-04	24 hr, 10 min	EF	ADQ	2%
							Isoprene (2-Methyl-1,3-butadiene)	78-79-5	7.32E-07	24 hr	EF	MDQ	2%
							Naphthalene	91-20-3	8.93E-06	24 hr, 10 min	EF	MDQ	2%
							p-Cymene (1-Methyl-4-Isopropylbenzene)	99-87-6	3.13E-04	24 hr	EF	MDQ	2%
							Trichloroethylene (Trichloroethene)	79-01-6	7.09E-05	24 hr	EF	ADQ	2%
							Trichloromethane (Chloroform)	67-66-3	5.51E-06	24 hr	EF	ADQ	2%
							Vinyl chloride (Chloroethene)	75-01-4	5.78E-05	24 hr	EF	ADQ	2%
							Total Reduced Sulphur Compounds	NA	1.08E-03	24 hr, 10 min	MB	MDQ	2%
							1-Methylcyclohexene	591-49-1	1.42E-06	24 hr	EF	MDQ	2%
							1-Propanethiol (n-Propyl mercaptan)	107-03-9	6.20E-06	24 hr	EF	MDQ	2%
							2,4-Dimethylhexane	589-43-5	1.65E-05	24 hr	EF	MDQ	2%
							2,5-Dimethylhexane	592-13-2	1.24E-05	24 hr	EF	MDQ	2%
							2-Ethyl-1-butene	760-21-4	9.70E-07	24 hr	EF	MDQ	2%
							2-Methyl-1-propanethiol (Isobutyl mercaptan)	513-44-0	9.99E-06	24 hr	EF	MDQ	2%
							2-Methyl-2-propanethiol (tert- Butylmercaptan)	513-35-9	1.91E-05	24 hr	EF	MDQ	2%
							3,6-Dimethyloctane	15869-94-0	7.28E-05	24 hr	EF	MDQ	2%
							cis-1,4-Dimethylcyclohexane	624-29-3	1.81E-05	24 hr	EF	MDQ	2%
							cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohe	2207036	1.81E-05	24 hr	EF	MDQ	2%
							cis-2-Heptene	6443-92-1	1.57E-06	24 hr	EF	MDQ	2%
							cis-2-Octene	2097322	1.61E-05	24 hr	EF	MDQ	2%
							cis-3-Methyl-2-pentene	922-62-3	9.81E-07	24 hr	EF	MDQ	2%
							Ethyl mercaptan (Ethanediol)	75-08-01	8.01E-06	24 hr	EF	ADQ	2%
							Isopropyl mercaptan	75-33-2	8.68E-06	24 hr	EF	ADQ	2%
							Methanethiol (Methyl mercaptan)	74-93-1	4.29E-05	24 hr	EF	ADQ	2%
							trans-1,2-Dimethylcyclohexane	6876-23-9	2.95E-05	24 hr	EF	MDQ	2%
							trans-1,4-Dimethylcyclohexane	2207047	1.50E-05	24 hr	EF	MDQ	2%
							trans-2-Octene	13389-42-9	1.76E-05	24 hr	EF	MDQ	2%
							trans-3-Methyl-2-pentene	616-12-6	8.50E-07	24 hr	EF	MDQ	2%
							Trichlorofluoromethane (Freon 11)	91315-61-6	2.22E-05	24 hr	EF	MDQ	2%
							Trimethylsilanol	1066-40-6	6.00E-03	24 hr	EF	ADQ	17%

Table A2. Source Summary Table - Alternative 1 Scenario B

Source ID	Source Description	Source Data (per each unit)					Contaminant	CAS Number	Emission Rate [g/s] (or ou/s for Odour)	Avg. Period [hr]	Emis. Est. Tech.[1]	Data Qual.[2]	% of Overall Emissions [%]
		Flow Rate [m^3/s]	Exit Gas Temp. [°C]	Inner Dia. [m]	Height Above Grade [m]	Height Above Roof [m]							
							Trimethylsilyl Fluoride	420-56-4	3.11E-04	24 hr	EF	ADQ	17%
							Methoxytrimethylsilane	1825-61-2	2.00E-04	24 hr	EF	ADQ	17%
							Ethoxytrimethylsilane	1825-62-3	1.16E-04	24 hr	EF	ADQ	17%
							Propoxytrimethylsilane	1825-63-4	9.01E-05	24 hr	EF	ADQ	17%
							Isopropoxytrimethylsilane	1825-64-5	1.03E-04	24 hr	EF	ADQ	17%
							Butoxytrimethylsilane	1825-65-6	5.13E-05	24 hr	EF	ADQ	17%
							1-methylbutoxytrimethylsilane	1825-67-8	1.09E-04	24 hr	EF	ADQ	17%
Flare 2	Enclosed LFG Flare 2	140	871	3.66	15.2	-	Nitrogen Oxides	10102-44-0	4.66E-01	1 & 24 hr	EF	ADQ	19%
							Suspended particulate matter	N/A	1.93E-01	24 hr	EF	ADQ	4%
							Particulate matter (< 10 µm dia.)	N/A	1.93E-01	24 hr	EF	ADQ	8%
							Particulate matter (< 2.5 µm dia.)	N/A	1.93E-01	24 hr	EF	ADQ	22%
							Carbon Monoxide	630-08-0	8.60E+00	1/2 hr	EF	ADQ	45%
							Sulfur Dioxide	2025884	1.53E-01	1 & 24 hr	MB	ADQ	50%
							Hydrogen Chloride	7647-01-0	1.48E-01	24 hr	MB	ADQ	50%
							1,1,2,2-Tetrachloroethane	79-34-5	1.05E-04	24 hr	EF	MDQ	3%
							1,1,2-Trichloroethane	79-00-5	2.47E-05	24 hr	EF	MDQ	3%
							1,2-Dichloroethane (Ethylene dichloride)	107-06-2	1.84E-05	24 hr	EF	ADQ	3%
							1,2-Dichloroethene	540-59-0	1.30E-03	24 hr	EF	MDQ	3%
							1,3-Butadiene (Vinyl ethylene)	106-99-0	1.05E-05	Annual	EF	MDQ	3%
							2-Ethyltoluene	611-14-3	4.55E-05	24 hr	EF	MDQ	3%
							Acetaldehyde	75-07-0	4.00E-06	24 hr, 1/2 hr	EF	MDQ	3%
							Benzene	71-43-2	2.20E-04	Annual	EF	ADQ	3%
							Benzyl chloride	100-44-7	2.69E-06	24 hr	EF	ADQ	3%
							cis-2-Pentene	627-20-3	3.94E-06	24 hr	EF	MDQ	3%
							Dibromochloromethane	124-48-1	3.69E-06	24 hr	EF	MDQ	3%
							Dimethyl sulfide	75-18-3	4.12E-04	10 min	EF	ADQ	3%
							Formaldehyde	50-00-0	4.12E-07	24 hr	EF	MDQ	3%
							Hydrogen sulfide	7783-06-4	1.28E-03	24 hr, 10 min	EF	ADQ	3%
							Isoprene (2-Methyl-1,3-butadiene)	78-79-5	1.32E-06	24 hr	EF	MDQ	3%
							Naphthalene	91-20-3	1.61E-05	24 hr, 10 min	EF	MDQ	3%
							p-Cymene (1-Methyl-4-lsopropylbenzene)	99-87-6	5.63E-04	24 hr	EF	MDQ	3%
							Trichloroethylene (Trichloroethene)	79-01-6	1.28E-04	24 hr	EF	ADQ	3%
							Trichloromethane (Chloroform)	67-66-3	9.91E-06	24 hr	EF	ADQ	3%
							Vinyl chloride (Chloroethene)	75-01-4	1.04E-04	24 hr	EF	ADQ	3%
							Total Reduced Sulphur Compounds	NA	1.94E-03	24 hr, 10 min	MB	MDQ	3%
							1-Methylcyclohexene	591-49-1	2.56E-06	24 hr	EF	MDQ	3%
							1-Propanethiol (n-Propyl mercaptan)	107-03-9	1.12E-05	24 hr	EF	MDQ	3%
							2,4-Dimethylhexane	589-43-5	2.97E-05	24 hr	EF	MDQ	3%
							2,5-Dimethylhexane	592-13-2	2.22E-05	24 hr	EF	MDQ	3%
							2-Ethyl-1-butene	760-21-4	1.75E-06	24 hr	EF	MDQ	3%
							2-Methyl-1-propanethiol (Isobutyl mercaptan)	513-44-0	1.80E-05	24 hr	EF	MDQ	3%
							2-Methyl-2-propanethiol (tert- Butylmercaptan)	513-35-9	3.44E-05	24 hr	EF	MDQ	3%
							3,6-Dimethyloctane	15869-94-0	1.31E-04	24 hr	EF	MDQ	3%
							cis-1,4-Dimethylcyclohexane	624-29-3	3.26E-05	24 hr	EF	MDQ	3%
							cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohe	2207036	3.26E-05	24 hr	EF	MDQ	3%
							cis-2-Heptene	6443-92-1	2.82E-06	24 hr	EF	MDQ	3%
							cis-2-Octene	2097322	2.89E-05	24 hr	EF	MDQ	3%
							cis-3-Methyl-2-pentene	922-62-3	1.77E-06	24 hr	EF	MDQ	3%
							Ethyl mercaptan (Ethanediol)	75-08-01	1.44E-05	24 hr	EF	ADQ	3%
							Isopropyl mercaptan	75-33-2	1.56E-05	24 hr	EF	ADQ	3%
							Methanethiol (Methyl mercaptan)	74-93-1	7.73E-05	24 hr	EF	ADQ	3%
							trans-1,2-Dimethylcyclohexane	6876-23-9	5.32E-05	24 hr	EF	MDQ	3%
							trans-1,4-Dimethylcyclohexane	2207047	2.70E-05	24 hr	EF	MDQ	3%
							trans-2-Octene	13389-42-9	3.17E-05	24 hr	EF	MDQ	3%
							trans-3-Methyl-2-pentene	616-12-6	1.53E-06	24 hr	EF	MDQ	3%
							Trichlorofluoromethane (Freon 11)	91315-61-6	3.99E-05	24 hr	EF	MDQ	3%
							Trimethylsilanol	1066-40-6	1.08E-02	24 hr	EF	ADQ	31%

Table A2. Source Summary Table - Alternative 1 Scenario B

Source ID	Source Description	Source Data (per each unit): Flow Rate [m³/s]	Exit Gas Temp. [°C]	Inner Dia. [m]	Height Above Grade [m]	Height Above Roof [m]	Contaminant	CAS Number	Emission Rate [g/s] (or ou/s for Odour)	Avg. Period [hr]	Emis. Est. Tech.[1]	Data Qual.[2]	% of Overall Emissions [%]
							Trimethylsilyl Fluoride	420-56-4	5.60E-04	24 hr	EF	ADQ	31%
							Methoxytrimethylsilane	1825-61-2	3.60E-04	24 hr	EF	ADQ	31%
							Ethoxytrimethylsilane	1825-62-3	2.08E-04	24 hr	EF	ADQ	31%
							Propoxytrimethylsilane	1825-63-4	1.62E-04	24 hr	EF	ADQ	31%
							Isopropoxytrimethylsilane	1825-64-5	1.86E-04	24 hr	EF	ADQ	31%
							Butoxytrimethylsilane	1825-65-6	9.24E-05	24 hr	EF	ADQ	31%
							1-methylbutoxytrimethylsilane	1825-67-8	1.97E-04	24 hr	EF	ADQ	31%
Siloxane Flare	Enclosed Siloxane/LFG Flare	1.23	871	0.77	9.17	-	Trimethylsilanol	1066-40-6	7.34E-03	24 hr	EF	ADQ	21%
							Trimethylsilyl Fluoride	420-56-4	3.81E-04	24 hr	EF	ADQ	21%
							Methoxytrimethylsilane	1825-61-2	2.45E-04	24 hr	EF	ADQ	21%
							Ethoxytrimethylsilane	1825-62-3	1.42E-04	24 hr	EF	ADQ	21%
							Propoxytrimethylsilane	1825-63-4	1.10E-04	24 hr	EF	ADQ	21%
							Isopropoxytrimethylsilane	1825-64-5	1.26E-04	24 hr	EF	ADQ	21%
							Butoxytrimethylsilane	1825-65-6	6.28E-05	24 hr	EF	ADQ	21%
							1-methylbutoxytrimethylsilane	1825-67-8	1.34E-04	24 hr	EF	ADQ	21%
BF1 to BF3	Biofilter - Exhaust from composting facility (Cells 1 to 3)	N/A	N/A	N/A	N/A	N/A	odour	N/A	9.05E+02	10 min	EC	MDQ	1%
Curing	Compost Curing Windrows (Windrows 1 to 12)	N/A	N/A	N/A	N/A	N/A	odour	N/A	3.99E+04 (Max seasons)	10 min	EC	MDQ	46%
LFYD_1 to LFYD_6	Leaf & yard waste stockpile (Stock piles 1 to 6)	N/A	N/A	N/A	N/A	N/A	odour	N/A	1.36E+04 (Max seasons)	10 min	EC	MDQ	16%

Table A2. Source Summary Table - Alternative 1 Scenario B

Source ID	Source Description	Source Data (per each unit) Flow Rate [m^3/s]	Exit Gas Temp. [°C]	Inner Dia. [m]	Height Above Grade [m]	Height Above Roof [m]	Contaminant	CAS Number	Emission Rate [g/s] (or ou/s for Odour)	Avg. Period [hr]	Emis. Est. Tech.[1]	Data Qual.[2]	% of Overall Emissions [%]
STG1 to STG9	Landfill surface - Stages 1 to 9 - Aggregate fugitive emissions from all nine stages	N/A	N/A	N/A	N/A	N/A	Carbon Monoxide	630-08-0	2.73E-02	1/2 hr	EF	MDQ	0%
							1,1,2,2-Tetrachloroethane	79-34-5	3.58E-03	24 hr	EF	MDQ	96%
							1,1,2-Trichloroethane	79-00-5	8.41E-04	24 hr	EF	MDQ	96%
							1,2-Dichloroethane (Ethylene dichloride)	107-06-2	6.28E-04	24 hr	EF	ADQ	96%
							1,2-Dichloroethene	540-59-0	4.41E-02	24 hr	EF	MDQ	96%
							1,3-Butadiene (Vinyl ethylene)	106-99-0	3.58E-04	Annual	EF	MDQ	96%
							2-Ethyltoluene	611-14-3	1.55E-03	24 hr	EF	MDQ	96%
							Acetaldehyde	75-07-0	1.36E-04	24 hr, 1/2 hr	EF	MDQ	96%
							Benzene	71-43-2	7.48E-03	Annual	EF	ADQ	96%
							Benzyl chloride	100-44-7	9.14E-05	24 hr	EF	ADQ	96%
							cis-2-Pentene	627-20-3	1.34E-04	24 hr	EF	MDQ	96%
							Dibromochloromethane	124-48-1	1.25E-04	24 hr	EF	MDQ	96%
							Dimethyl sulfide	75-18-3	1.40E-02	10 min	EF	ADQ	96%
							Formaldehyde	50-00-0	1.40E-05	24 hr	EF	MDQ	96%
							Hydrogen sulfide	7783-06-4	4.35E-02	24 hr, 10 min	EF	ADQ	96%
							Isoprene (2-Methyl-1,3-butadiene)	78-79-5	4.48E-05	24 hr	EF	MDQ	96%
							Naphthalene	91-20-3	5.47E-04	24 hr, 10 min	EF	MDQ	96%
							p-Cymene (1-Methyl-4-Isopropylbenzene)	99-87-6	1.92E-02	24 hr	EF	MDQ	96%
							Trichloroethylene (Trichloroethene)	79-01-6	4.34E-03	24 hr	EF	ADQ	96%
							Trichloromethane (Chloroform)	67-66-3	3.37E-04	24 hr	EF	ADQ	96%
							Vinyl chloride (Chloroethene)	75-01-4	3.54E-03	24 hr	EF	ADQ	96%
							Total Reduced Sulphur Compounds	NA	6.61E-02	24 hr, 10 min	MB	MDQ	96%
							1-Methylcyclohexene	591-49-1	8.71E-05	24 hr	EF	MDQ	96%
							1-Propanethiol (n-Propyl mercaptan)	107-03-9	3.80E-04	24 hr	EF	MDQ	96%
							2,4-Dimethylhexane	589-43-5	1.01E-03	24 hr	EF	MDQ	96%
							2,5-Dimethylhexane	592-13-2	7.56E-04	24 hr	EF	MDQ	96%
							2-Ethyl-1-butene	760-21-4	5.94E-05	24 hr	EF	MDQ	96%
							2-Methyl-1-propanethiol (Isobutyl mercaptan)	513-44-0	6.12E-04	24 hr	EF	MDQ	96%
							2-Methyl-2-propanethiol (tert- Butylmercaptan)	513-35-9	1.17E-03	24 hr	EF	MDQ	96%
							3,6-Dimethyloctane	15869-94-0	4.45E-03	24 hr	EF	MDQ	96%
							cis-1,4-Dimethylcyclohexane	624-29-3	1.11E-03	24 hr	EF	MDQ	96%
							cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohe	2207036	1.11E-03	24 hr	EF	MDQ	96%
							cis-2-Heptene	6443-92-1	9.59E-05	24 hr	EF	MDQ	96%
							cis-2-Octene	2097322	9.85E-04	24 hr	EF	MDQ	96%
							cis-3-Methyl-2-pentene	922-62-3	6.01E-05	24 hr	EF	MDQ	96%
							Ethyl mercaptan (Ethanediol)	75-08-01	4.91E-04	24 hr	EF	ADQ	96%
							Isopropyl mercaptan	75-33-2	5.32E-04	24 hr	EF	ADQ	96%
							Methanethiol (Methyl mercaptan)	74-93-1	2.63E-03	24 hr	EF	ADQ	96%
							trans-1,2-Dimethylcyclohexane	6876-23-9	1.81E-03	24 hr	EF	MDQ	96%
							trans-1,4-Dimethylcyclohexane	2207047	9.17E-04	24 hr	EF	MDQ	96%
							trans-2-Octene	13389-42-9	1.08E-03	24 hr	EF	MDQ	96%
							trans-3-Methyl-2-pentene	616-12-6	5.20E-05	24 hr	EF	MDQ	96%
							Trichlorofluoromethane (Freon 11)	91315-61-6	1.36E-03	24 hr	EF	MDQ	96%
							Trimethylsilanol	1066-40-6	1.03E-02	24 hr	EF	ADQ	30%
							Trimethylsilyl Fluoride	420-56-4	5.33E-04	24 hr	EF	ADQ	30%
							Methoxytrimethylsilane	1825-61-2	3.43E-04	24 hr	EF	ADQ	30%
							Ethoxytrimethylsilane	1825-62-3	1.98E-04	24 hr	EF	ADQ	30%
							Propoxytrimethylsilane	1825-63-4	1.54E-04	24 hr	EF	ADQ	30%
							Isopropoxytrimethylsilane	1825-64-5	1.77E-04	24 hr	EF	ADQ	30%
							Butoxytrimethylsilane	1825-65-6	8.78E-05	24 hr	EF	ADQ	30%
							1-methylbutoxytrimethylsilane	1825-67-8	1.87E-04	24 hr	EF	ADQ	30%
							odour	N/A	9.76E+03	10 min	EC	MDQ	11%
Paved_Road	Truck traffic on paved roads on site	N/A	N/A	N/A	N/A	N/A	Nitrogen Oxides	10102-44-0	4.68E-02	1 hr	EF	ADQ	1.9%
							Suspended particulate matter	N/A	3.40E+00	1 hr	EF	ADQ	63.07%
							Particulate matter (< 10 μm dia.)	N/A	6.83E-01	1 hr	EF	ADQ	29.68%
							Particulate matter (< 2.5 μm dia.)	N/A	1.68E-01	1 hr	EF	ADQ	19.31%
							Carbon Monoxide	630-08-0	1.47E-02	1/2 hr	EF	ADQ	0.1%

Table A2. Source Summary Table - Alternative 1 Scenario B

Source ID	Source Description	Source Data (per each unit)					Contaminant	CAS Number	Emission Rate [g/s] (or ou/s for Odour)	Avg. Period [hr]	Emis. Est. Tech.[1]	Data Qual.[2]	% of Overall Emissions [%]
		Flow Rate [m^3/s]	Exit Gas Temp. [°C]	Inner Dia. [m]	Height Above Grade [m]	Height Above Roof [m]							
Working Face	Landfill working face activities and nearby construction activities	N/A	N/A	N/A	N/A	N/A	Nitrogen Oxides	10102-44-0	1.54E-01	1 hr	EF	ADQ	6%
							Suspended particulate matter	N/A	1.43E+00	1 hr	EF	ADQ	26.6%
							Particulate matter (< 10 μm dia.)	N/A	1.06E+00	1 hr	EF	ADQ	46.1%
							Particulate matter (< 2.5 μm dia.)	N/A	1.51E-01	1 hr	EF	ADQ	17.3%
							Carbon Monoxide	630-08-0	1.35E+00	1/2 hr	EF	ADQ	7.1%
							odour	N/A	2.25E+04	10 min	EC	MDQ	26%
Compost_NRoad	Mobile Equipment at Compost Facility	N/A	N/A	N/A	N/A	N/A	Nitrogen Oxides	10102-44-0	2.06E-01	1 hr	EF	ADQ	8.6%
							Suspended particulate matter	N/A	1.03E-02	1 hr	EF	ADQ	0.2%
							Particulate matter (< 10 μm dia.)	N/A	1.03E-02	1 hr	EF	ADQ	0.4%
							Particulate matter (< 2.5 μm dia.)	N/A	5.00E-03	1 hr	EF	ADQ	0.6%
							Carbon Monoxide	630-08-0	1.79E+00	1/2 hr	EF	ADQ	9%

Note:

[1]Emission Estimating Technique: "V-ST" - Validated Source Test, "ST" - Source Test, "EF" - Emission Factor, "MB" - Mass Balance, "EC" - Engineering Calculation

[2]Emissions Data Quality: "HDQ" - Highest; "AADQ" - Above Average; "ADQ" - Average; and "MDQ" - Marginal

[3]Landfill Gas profiles were obtained from AP 42. The amount of total reduced sulfur was calculated per procedure described in O. Reg. 516/07.

Table A3. Emission Summary Table - Alternative 1 Scenario B

Contaminant	CAS Number	Total Facility Emission Rate [g/s]	Dispersion Model Used	Max. POI Conc. [µg/m³]	Max. at Sensitive Receptor [µg/m³]	MECP Limit					Percent of POI Limit [%]	Percent of Limit at Receptor [%]
						Avg. Period [hr]	Limit µg/m³	Limiting Effect	ACB Source[1]	Category[2]		
Nitrogen Oxides (as NO_2)	10102-44-0	2.4	AERMOD	45	7.1	24 hr	200	Health	Standard	B1	22%	4%
				178	45.4	1 hr	400	Health	Standard	B1	44%	11%
Nitrogen Dioxide	10102-44-0	2.4	AERMOD	45	7.1	24 hr	200	Health	AAQC	n/a	22%	4%
				178	45.4	1 hr	400	Health	AAQC	n/a	44%	11%
				96.4	25.4	1-hr	113	n/a	CAAQS	n/a	85%	22%
				5.61	0.72	Annual	32	n/a	CAAQS	n/a	18%	2%
Suspended particulate matter	n/a	5.4	AERMOD	191	85	24 hr	120	Visibility	Standard	B1	159%	71%
Particulate matter (< 10 µm dia.)	n/a	2.3	AERMOD	120	43	24 hr	50	Health	AAQC	n/a	241%	85%
Particulate matter (< 2.5 µm dia.)	n/a	0.9	AERMOD	7.2	1.5	24 hr	27	Health	AAQC	n/a	27%	6%
				1.88	0.32	annual	8.8	Health	AAQC	n/a	21%	4%
Carbon Monoxide	630-08-0	19.0	AERMOD	1860	450	0.5 hr	6000	Health	Standard	B1	31%	8%
				1550	375	1 hr	36,200	Health	AAQC	n/a	4%	1%
				866	210	8 hr	15,700	Health	AAQC	n/a	6%	1%
Sulfur Dioxide	7446-09-5	0.3	AERMOD	7.80	2.61	10 min	178	Health	AAQC	n/a	4%	1%
				4.73	1.58	1 hr	100	Health & Veg.	Standard	B1	5%	2%
				0.301	0.040	annual	10	Health & Veg.	Standard	B1	3%	<1%
				4.63	1.39	1 hr	173	n/a	CAAQS	n/a	n/a	n/a
Hydrogen Chloride	7647-01-0	0.295	AERMOD	2.33	0.33	24 hr	20	Health	Standard	B1	12%	2%
Odour[3] (units: ou/s, or ou/m³)	n/a	86,644 (Max seasons)	AERMOD	n/a	1.37	10 min	1	---	Guideline	---	n/a	137%
LFG Contaminants												
LFG Unit Emission Run		1.0E+00	AERMOD	61.7	34.6	1 hr						
				24.8	12.87	24 hr						
				3.39	1.590	annual						
				102	57.0	10 min						
1,1,2,2-Tetrachloroethane	79-34-5	3.7E-03	AERMOD	0.093	0.048	24 hr	0.1	Health	SL-JSL	B2	93%	48%
1,1,2-Trichloroethane	79-00-5	8.8E-04	AERMOD	0.022	0.011	24 hr	0.3	Health	SL-JSL	B2	7%	4%
1,2-Dichloroethane (Ethylene dichloride)	107-06-2	6.6E-04	AERMOD	0.016	0.008	24 hr	2	Health	Standard	B1	<1%	<1%
				0.002	0.001	Annual	0.4	Health	AAQC	n/a	<1%	<1%
1,2-Dichloroethene	540-59-0	4.6E-02	AERMOD	1.143	0.593	24 hr	105	Health	Guideline	B1	1%	<1%
1,3-Butadiene (Vinyl ethylene)	106-99-0	3.7E-04	AERMOD	0.001	0.0006	Annual	2	Health	Standard	B1	<1%	<1%
				0.009	0.005	24 hr	10	Health	AAQC	n/a	<1%	<1%
2-Ethyltoluene	611-14-3	1.6E-03	AERMOD	0.040	0.021	24 hr	0.5	Health	SL-JSL	B2	8%	4%
Acetaldehyde	75-07-0	1.4E-04	AERMOD	0.004	0.002	24 hr	500	Health	Standard	B1	<1%	<1%
				0.011	0.006	0.5 hr	500	Health	Standard	B1	<1%	<1%
Benzene	71-43-2	7.8E-03	AERMOD	0.027	0.012	Annual	0.45	Health	Standard	B1	6%	3%
				0.194	0.101	24 hr	2.3	Health	AAQC	n/a	8%	4%
Benzyl chloride	100-44-7	9.6E-05	AERMOD	0.002	0.001	24 hr	0.1	Health	SL-JSL	B2	2%	1%
cis-2-Pentene	627-20-3	1.4E-04	AERMOD	0.003	0.002	24 hr	0.5	Health	SL-JSL	B2	<1%	<1%
Dibromochloromethane	124-48-1	1.3E-04	AERMOD	0.003	0.002	24 hr	0.2	Health	SL-JSL	B2	2%	<1%
Formaldehyde	50-00-0	1.5E-05	AERMOD	0.000	0.0002	24 hr	65	Health	Standard	B1	<1%	<1%
Isoprene (2-Methyl-1,3-butadiene)	78-79-5	4.7E-05	AERMOD	0.001	0.0006	24 hr	0.1	Health	SL-JSL	B2	1%	<1%
Naphthalene	91-20-3	5.7E-04	AERMOD	0.014	0.007	24 hr	22.5	Health	Guideline	B1	<1%	<1%
				0.000	0.033	10 min	50	Odour	Guideline	B1	---	<1%
p-Cymene (1-Methyl-4-Isopropylbenzene)	99-87-6	2.0E-02	AERMOD	0.497	0.258	24 hr	50	Health	SL-JSL	B2	<1%	<1%
Trichloroethylene (Trichloroethene)	79-01-6	4.5E-03	AERMOD	0.112	0.058	24 hr	12	Health	Standard	B1	<1%	<1%
				0.015	0.0072	Annual	2.3	Health	AAQC	n/a	<1%	<1%

Table A3. Emission Summary Table - Alternative 1 Scenario B

Contaminant	CAS Number	Total Facility Emission Rate [g/s]	Dispersion Model Used	Max. POI Conc. [µg/m³]	Max. at Sensitive Receptor [µg/m³]	MECP Limit					Percent of POI Limit [%]	Percent of Limit at Receptor [%]
						Avg. Period [hr]	Limit µg/m³	Limiting Effect	ACB Source[1]	Category[2]		
Trichloromethane (Chloroform)	67-66-3	3.5E-04	AERMOD	0.009	0.005	24 hr	1	Health	Standard	B1	<1%	<1%
				0.001	0.0006	Annual	0.2	Health	AAQC	n/a	<1%	<1%
Vinyl chloride (Chloroethene)	75-01-4	3.7E-03	AERMOD	0.092	0.048	24 hr	1	Health	Standard	B1	9%	5%
				0.013	0.006	Annual	0.2	Health	AAQC	n/a	6%	3%
Total Reduced Sulphur Compounds	NA	6.9E-02	AERMOD	1.713	0.890	24 hr	7	Health	Guideline	B1	24%	13%
					3.940	10 min	13	Odour	Guideline	B1	---	30%
1-Methylcyclohexene	591-49-1	9.1E-05	AERMOD	0.002	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	2%	1%
2,4-Dimethylhexane	589-43-5	1.1E-03	AERMOD	0.026	0.014	24 hr	0.1	de minimus	Table B-2A	n/a	26%	14%
2,5-Dimethylhexane	592-13-2	7.9E-04	AERMOD	0.020	0.010	24 hr	0.1	de minimus	Table B-2A	n/a	20%	10%
2-Ethyl-1-butene	760-21-4	6.2E-05	AERMOD	0.002	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	2%	<1%
3,6-Dimethyloctane	15869-94-0	4.7E-03	AERMOD	0.115	0.060	24 hr	0.1	de minimus	Table B-2A	n/a	115%	60%
cis-1,4-Dimethylcyclohexane	624-29-3	1.2E-03	AERMOD	0.029	0.015	24 hr	0.1	de minimus	Table B-2A	n/a	29%	15%
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	1.2E-03	AERMOD	0.029	0.015	24 hr	0.1	de minimus	Table B-2A	n/a	29%	15%
trans-1,4-Dimethylcyclohexane	2207047	9.6E-04	AERMOD	0.024	0.012	24 hr	0.1	de minimus	Table B-2A	n/a	24%	12%
cis-2-Heptene	6443-92-1	1.0E-04	AERMOD	0.002	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	2%	1%
cis-2-Octene	2097322	1.0E-03	AERMOD	0.026	0.013	24 hr	0.1	de minimus	Table B-2A	n/a	26%	13%
cis-3-Methyl-2-pentene	922-62-3	6.3E-05	AERMOD	0.002	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	2%	<1%
Isopropyl mercaptan	75-33-2	5.6E-04	AERMOD	0.014	0.007	24 hr	0.1	de minimus	Table B-2A	n/a	14%	7%
trans-1,2-Dimethylcyclohexane	6876-23-9	1.9E-03	AERMOD	0.047	0.024	24 hr	0.1	de minimus	Table B-2A	n/a	47%	24%
trans-1,4-Dimethylcyclohexane	2207047	9.6E-04	AERMOD	0.024	0.012	24 hr	0.1	de minimus	Table B-2A	n/a	24%	12%
trans-2-Octene	13389-42-9	1.1E-03	AERMOD	0.028	0.015	24 hr	0.1	de minimus	Table B-2A	n/a	28%	15%
trans-3-Methyl-2-pentene	616-12-6	5.4E-05	AERMOD	0.001	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	1%	<1%
Trichlorofluoromethane (Freon 11)	91315-61-6	1.4E-03	AERMOD	0.035	0.018	24 hr	0.1	de minimus	Table B-2A	n/a	35%	18%
Siloxanes Siloxanes Unit Emission Run		1.0E+00	AERMOD	7.74	4.03	24 hr						
Trimethylsilanol	1066-40-6	3.4E-02	AERMOD	0.266	0.139	24 hr	32.5	Health	SL-JSL	B2	<1%	0%
Trimethylsilyl Fluoride	420-56-4	1.8E-03	AERMOD	0.014	0.007	24 hr	0.1	de minimus	Table B-2A	n/a	14%	7%
Methoxytrimethylsilane	1825-61-2	1.1E-03	AERMOD	0.009	0.005	24 hr	0.1	de minimus	Table B-2A	n/a	9%	5%
Ethoxytrimethylsilane	1825-62-3	6.6E-04	AERMOD	0.005	0.003	24 hr	0.1	de minimus	Table B-2A	n/a	5%	3%
Propoxytrimethylsilane	1825-63-4	5.2E-04	AERMOD	0.004	0.002	24 hr	0.1	de minimus	Table B-2A	n/a	4%	2%
Isopropoxytrimethylsilane	1825-64-5	5.9E-04	AERMOD	0.005	0.002	24 hr	0.1	de minimus	Table B-2A	n/a	5%	2%
Butoxytrimethylsilane	1825-65-6	2.9E-04	AERMOD	0.002	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	2%	1%
1-methylbutoxytrimethylsilane	1825-67-8	6.3E-04	AERMOD	0.005	0.003	24 hr	0.1	de minimus	Table B-2A	n/a	5%	3%

Note:

[1] ACB Source: "S" - Standard (for Section 20), "G" - Guideline (for Section 20), "SL-JSL" - Screening Level (SL) set by the MECP based on a review of toxicity information and/or other jurisdictional levels (JSL)

[2] Category: "B1" - Benchmark 1 , "B2" - Benchmark 2.

[3] The 1-hr air dispersion modelling output units were adjusted in AERMOD to reflect the expected peak 10-min average values using the MECP recommended standard conversion factor of 1.65.

Appendix A: Tables
Alternative 2 Scenario A

Table A1. Sources and Contaminants Identification Table - Alternative 2 Scenario A

Source ID	Source Description or Title	General Location	Expected Contaminants	Significant (Yes or No?)	Modelled (Yes or No)?	Rationale For Source/Contaminant Insignificance
STG1 to STG8	Landfill surface, Stages 1 to 8	Landfill	LFG	Yes	Yes	
			Odour	Yes	Yes	
Paved_Road	Truck traffic on paved roads on site	Landfill	Products of Combustion	Yes	Yes	
			Dust	Yes	Yes	
Unpaved_Road	Truck traffic on unpaved roads on site	Landfill	Products of Combustion	Yes	Yes	
			Dust	Yes	Yes	
Working Face	Landfill working face activities and nearby construction activities	Landfill	Products of Combustion	Yes	Yes	
			Dust	Yes	Yes	
Compost_NRoad	Mobile Equipment at Compost Facility	Compost Facility	Products of Combustion	Yes	Yes	
			Dust	No	No	Negligible compared to aggregate emissions
Leachate	Leachate treatment systems - treatment facility and holding ponds	Landfill	Odour	No	No	Negligible compared to aggregate emissions
GEN1 to GEN4	Reciprocating Engines – LFG Fueled	LFG Utilization Facility	Products of Combustion	Yes	Yes	
			Siloxanes	Yes	Yes	
			uncombusted LFG	No	No	< 5% of aggregate emissions
Flare 1	Enclosed LFG Flare 1	LFG Utilization Facility	Products of Combustion	Yes	Yes	
			Siloxanes	Yes	Yes	
			uncombusted LFG	Yes	Yes	
Flare 2	Enclosed LFG Flare 2	LFG Utilization Facility	Products of Combustion	Yes	Yes	
			Siloxanes	Yes	Yes	
			uncombusted LFG	Yes	Yes	
Siloxane Flare	Enclosed Siloxane/LFG Flare	LFG Utilization Facility	Products of Combustion	No	No	<5% of aggregate emissions
			Siloxanes	Yes	Yes	
			uncombusted LFG	No	No	<5% of aggregate emissions
BF1 to BF3	Biofilter - Exhaust from composting facility (Cells 1 to 3)	Compost Facility	Odour	Yes	Yes	
Finished Compost	Finished compost screening, stockiling, and packaging	Compost Facility	Odour	No	No	Negligible odour levels
Curing	Compost Curing Windrows (Windrows 1 to 12)	Compost Facility	Odour	Yes	Yes	
LFYD_1 to LFYD_6	Leaf & yard waste stockpile (Stockpiles 1 to 6)	Compost Facility	Odour	Yes	Yes	
Farm	Sod Farm	Agriculture area	Products of Combustion	No	No	Negligible compared to aggregate emissions
			Dust	Yes	Yes	
Welding	Maintenance Welding Station	Maintenance	Welding Fume	No	No	Table B-3B of MECP Document[1].
Heating	Comfort Heating	Offices and other small buildings	Products of Combustion	No	No	Table B-3B of MECP Document[1].

LFG - Landfill Gas

[1] MECP, "Procedure for Preparing an Emission Summary and Dispersion Modelling Report", Version 4.1, dated March 2018.

Table A2. Source Summary Table - Alternative 2 Scenario A

Source ID	Source Description	Source Data (per each unit) Flow Rate [m^3/s]	Exit Gas Temp. [°C]	Inner Dia. [m]	Height Above Grade [m]	Height Above Roof [m]	Contaminant	CAS Number	Emission Rate [g/s] (or ou/s for Odour)	Avg. Period [hr]	Emis. Est. Tech.[1]	Data Qual.[2]	% of Overall Emissions [%]
GEN1 to GEN4	Reciprocating Engines – LFG Fueled - Aggregate emissions of all 4 engines	1.4 (each)	509	0.25	5.6	3.0	Nitrogen Oxides	10102-44-0	1.28E+00	1 & 24 hr	EF	ADQ	54%
							Suspended particulate matter	N/A	2.46E-01	24 hr	EF	ADQ	6.1%
							Particulate matter (< 10 µm dia.)	N/A	2.46E-01	24 hr	EF	ADQ	12%
							Particulate matter (< 2.5 µm dia.)	N/A	2.46E-01	24 hr	EF	ADQ	31%
							Carbon Monoxide	630-08-0	2.40E+00	1/2 hr	EF	ADQ	13%
							Sulfur Dioxide	2025884	6.83E-02	1 & 24 hr	MB	ADQ	23%
							Hydrogen Chloride	7647-01-0	6.59E-02	24 hr	MB	ADQ	23%
Flare 1	Enclosed LFG Flare 1	82.8	871	3.05	12.2	-	Nitrogen Oxides	10102-44-0	2.51E-01	1 & 24 hr	EF	ADQ	11%
							Suspended particulate matter	N/A	1.04E-01	24 hr	EF	ADQ	2.6%
							Particulate matter (< 10 µm dia.)	N/A	1.04E-01	24 hr	EF	ADQ	5%
							Particulate matter (< 2.5 µm dia.)	N/A	1.04E-01	24 hr	EF	ADQ	13%
							Carbon Monoxide	630-08-0	4.63E+00	1/2 hr	EF	ADQ	25%
							Sulfur Dioxide	2025884	8.23E-02	1 & 24 hr	MB	ADQ	28%
							Hydrogen Chloride	7647-01-0	7.94E-02	24 hr	MB	ADQ	28%
							1,1,2,2-Tetrachloroethane	79-34-5	5.66E-05	24 hr	EF	MDQ	2%
							1,1,2-Trichloroethane	79-00-5	1.33E-05	24 hr	EF	MDQ	2%
							1,2-Dichloroethane (Ethylene dichloride)	107-06-2	9.93E-06	24 hr	EF	ADQ	2%
							1,2-Dichloroethene	540-59-0	6.97E-04	24 hr	EF	MDQ	2%
							1,3-Butadiene (Vinyl ethylene)	106-99-0	5.66E-06	Annual	EF	MDQ	2%
							2-Ethyltoluene	611-14-3	2.45E-05	24 hr	EF	MDQ	2%
							Acetaldehyde	75-07-0	2.15E-06	24 hr, 1/2 hr	EF	MDQ	2%
							Benzene	71-43-2	1.18E-04	Annual	EF	ADQ	2%
							Benzyl chloride	100-44-7	1.45E-06	24 hr	EF	ADQ	2%
							cis-2-Pentene	627-20-3	2.12E-06	24 hr	EF	MDQ	2%
							Dibromochloromethane	124-48-1	1.98E-06	24 hr	EF	MDQ	2%
							Dimethyl sulfide	75-18-3	2.22E-04	10 min	EF	ADQ	2%
							Formaldehyde	50-00-0	2.22E-07	24 hr	EF	MDQ	2%
							Hydrogen sulfide	7783-06-4	6.88E-04	24 hr, 10 min	EF	ADQ	2%
							Isoprene (2-Methyl-1,3-butadiene)	78-79-5	7.09E-07	24 hr	EF	MDQ	2%
							Naphthalene	91-20-3	8.65E-06	24 hr, 10 min	EF	MDQ	2%
							p-Cymene (1-Methyl-4-Isopropylbenzene)	99-87-6	3.03E-04	24 hr	EF	MDQ	2%
							Trichloroethylene (Trichloroethene)	79-01-6	6.86E-05	24 hr	EF	ADQ	2%
							Trichloromethane (Chloroform)	67-66-3	5.33E-06	24 hr	EF	ADQ	2%
							Vinyl chloride (Chloroethene)	75-01-4	5.60E-05	24 hr	EF	ADQ	2%
							Total Reduced Sulphur Compounds	NA	1.04E-03	24 hr, 10 min	MB	MDQ	2%
							1-Methylcyclohexene	591-49-1	1.38E-06	24 hr	EF	MDQ	2%
							1-Propanethiol (n-Propyl mercaptan)	107-03-9	6.01E-06	24 hr	EF	MDQ	2%
							2,4-Dimethylhexane	589-43-5	1.60E-05	24 hr	EF	MDQ	2%
							2,5-Dimethylhexane	592-13-2	1.20E-05	24 hr	EF	MDQ	2%
							2-Ethyl-1-butene	760-21-4	9.40E-07	24 hr	EF	MDQ	2%
							2-Methyl-1-propanethiol (Isobutyl mercaptan)	513-44-0	9.67E-06	24 hr	EF	MDQ	2%
							2-Methyl-2-propanethiol (tert- Butylmercaptan)	513-35-9	1.85E-05	24 hr	EF	MDQ	2%
							3,6-Dimethyloctane	15869-94-0	7.05E-05	24 hr	EF	MDQ	2%
							cis-1,4-Dimethylcyclohexane	624-29-3	1.76E-05	24 hr	EF	MDQ	2%
							cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohe	2207036	1.76E-05	24 hr	EF	MDQ	2%
							cis-2-Heptene	6443-92-1	1.52E-06	24 hr	EF	MDQ	2%
							cis-2-Octene	2097322	1.56E-05	24 hr	EF	MDQ	2%
							cis-3-Methyl-2-pentene	922-62-3	9.50E-07	24 hr	EF	MDQ	2%
							Ethyl mercaptan (Ethanediol)	75-08-01	7.76E-06	24 hr	EF	ADQ	2%
							Isopropyl mercaptan	75-33-2	8.41E-06	24 hr	EF	ADQ	2%
							Methanethiol (Methyl mercaptan)	74-93-1	4.16E-05	24 hr	EF	ADQ	2%

Table A2. Source Summary Table - Alternative 2 Scenario A

Source ID	Source Description	Source Data (per each unit)					Contaminant	CAS Number	Emission Rate [g/s] (or ou/s for Odour)	Avg. Period [hr]	Emis. Est. Tech.[1]	Data Qual.[2]	% of Overall Emissions [%]
		Flow Rate [m^3/s]	Exit Gas Temp. [°C]	Inner Dia. [m]	Height Above Grade [m]	Height Above Roof [m]							
							trans-1,2-Dimethylcyclohexane	6876-23-9	2.86E-05	24 hr	EF	MDQ	2%
							trans-1,4-Dimethylcyclohexane	2207047	1.45E-05	24 hr	EF	MDQ	2%
							trans-2-Octene	13389-42-9	1.71E-05	24 hr	EF	MDQ	2%
							trans-3-Methyl-2-pentene	616-12-6	8.23E-07	24 hr	EF	MDQ	2%
							Trichlorofluoromethane (Freon 11)	91315-61-6	2.15E-05	24 hr	EF	MDQ	2%
							Trimethylsilanol	1066-40-6	5.73E-03	24 hr	EF	ADQ	17%
							Trimethylsilyl Fluoride	420-56-4	2.98E-04	24 hr	EF	ADQ	17%
							Methoxytrimethylsilane	1825-61-2	1.91E-04	24 hr	EF	ADQ	17%
							Ethoxytrimethylsilane	1825-62-3	1.11E-04	24 hr	EF	ADQ	17%
							Propoxytrimethylsilane	1825-63-4	8.61E-05	24 hr	EF	ADQ	17%
							Isopropoxytrimethylsilane	1825-64-5	9.86E-05	24 hr	EF	ADQ	17%
							Butoxytrimethylsilane	1825-65-6	4.90E-05	24 hr	EF	ADQ	17%
							1-methylbutoxytrimethylsilane	1825-67-8	1.05E-04	24 hr	EF	ADQ	17%
Flare 2	Enclosed LFG Flare 2	140	871	3.66	15.2	-	Nitrogen Oxides	10102-44-0	4.51E-01	1 & 24 hr	EF	ADQ	19%
							Suspended particulate matter	N/A	1.87E-01	24 hr	EF	ADQ	5%
							Particulate matter (< 10 µm dia.)	N/A	1.87E-01	24 hr	EF	ADQ	9%
							Particulate matter (< 2.5 µm dia.)	N/A	1.87E-01	24 hr	EF	ADQ	24%
							Carbon Monoxide	630-08-0	8.33E+00	1/2 hr	EF	ADQ	45%
							Sulfur Dioxide	2025884	1.48E-01	1 & 24 hr	MB	ADQ	50%
							Hydrogen Chloride	7647-01-0	1.43E-01	24 hr	MB	ADQ	50%
							1,1,2,2-Tetrachloroethane	79-34-5	1.02E-04	24 hr	EF	MDQ	3%
							1,1,2-Trichloroethane	79-00-5	2.39E-05	24 hr	EF	MDQ	3%
							1,2-Dichloroethane (Ethylene dichloride)	107-06-2	1.79E-05	24 hr	EF	ADQ	3%
							1,2-Dichloroethene	540-59-0	1.25E-03	24 hr	EF	MDQ	3%
							1,3-Butadiene (Vinyl ethylene)	106-99-0	1.02E-05	Annual	EF	MDQ	3%
							2-Ethyltoluene	611-14-3	4.41E-05	24 hr	EF	MDQ	3%
							Acetaldehyde	75-07-0	3.87E-06	24 hr, 1/2 hr	EF	MDQ	3%
							Benzene	71-43-2	2.13E-04	Annual	EF	ADQ	3%
							Benzyl chloride	100-44-7	2.60E-06	24 hr	EF	ADQ	3%
							cis-2-Pentene	627-20-3	3.81E-06	24 hr	EF	MDQ	3%
							Dibromochloromethane	124-48-1	3.57E-06	24 hr	EF	MDQ	3%
							Dimethyl sulfide	75-18-3	3.99E-04	10 min	EF	ADQ	3%
							Formaldehyde	50-00-0	3.99E-07	24 hr	EF	MDQ	3%
							Hydrogen sulfide	7783-06-4	1.24E-03	24 hr, 10 min	EF	ADQ	3%
							Isoprene (2-Methyl-1,3-butadiene)	78-79-5	1.28E-06	24 hr	EF	MDQ	3%
							Naphthalene	91-20-3	1.56E-05	24 hr, 10 min	EF	MDQ	3%
							p-Cymene (1-Methyl-4-Isopropylbenzene)	99-87-6	5.46E-04	24 hr	EF	MDQ	3%
							Trichloroethylene (Trichloroethene)	79-01-6	1.24E-04	24 hr	EF	ADQ	3%
							Trichloromethane (Chloroform)	67-66-3	9.60E-06	24 hr	EF	ADQ	3%
							Vinyl chloride (Chloroethene)	75-01-4	1.01E-04	24 hr	EF	ADQ	3%
							Total Reduced Sulphur Compounds	NA	1.88E-03	24 hr, 10 min	MB	MDQ	3%
							1-Methylcyclohexene	591-49-1	2.48E-06	24 hr	EF	MDQ	3%
							1-Propanethiol (n-Propyl mercaptan)	107-03-9	1.08E-05	24 hr	EF	MDQ	3%
							2,4-Dimethylhexane	589-43-5	2.88E-05	24 hr	EF	MDQ	3%
							2,5-Dimethylhexane	592-13-2	2.15E-05	24 hr	EF	MDQ	3%
							2-Ethyl-1-butene	760-21-4	1.69E-06	24 hr	EF	MDQ	3%
							2-Methyl-1-propanethiol (Isobutyl mercaptan)	513-44-0	1.74E-05	24 hr	EF	MDQ	3%
							2-Methyl-2-propanethiol (tert- Butylmercaptan)	513-35-9	3.33E-05	24 hr	EF	MDQ	3%
							3,6-Dimethyloctane	15869-94-0	1.27E-04	24 hr	EF	MDQ	3%
							cis-1,4-Dimethylcyclohexane	624-29-3	3.16E-05	24 hr	EF	MDQ	3%
							cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohe	2207036	3.16E-05	24 hr	EF	MDQ	3%

Table A2. Source Summary Table - Alternative 2 Scenario A

Source ID	Source Description	Source Data (per each unit) Flow Rate [m³/s]	Exit Gas Temp. [°C]	Inner Dia. [m]	Height Above Grade [m]	Height Above Roof [m]	Contaminant	CAS Number	Emission Rate [g/s] (or ou/s for Odour)	Avg. Period [hr]	Emis. Est. Tech.[1]	Data Qual.[2]	% of Overall Emissions [%]
							cis-2-Heptene	6443-92-1	2.73E-06	24 hr	EF	MDQ	3%
							cis-2-Octene	2097322	2.80E-05	24 hr	EF	MDQ	3%
							cis-3-Methyl-2-pentene	922-62-3	1.71E-06	24 hr	EF	MDQ	3%
							Ethyl mercaptan (Ethanediol)	75-08-01	1.40E-05	24 hr	EF	ADQ	3%
							Isopropyl mercaptan	75-33-2	1.51E-05	24 hr	EF	ADQ	3%
							Methanethiol (Methyl mercaptan)	74-93-1	7.48E-05	24 hr	EF	ADQ	3%
							trans-1,2-Dimethylcyclohexane	6876-23-9	5.15E-05	24 hr	EF	MDQ	3%
							trans-1,4-Dimethylcyclohexane	2207047	2.61E-05	24 hr	EF	MDQ	3%
							trans-2-Octene	13389-42-9	3.07E-05	24 hr	EF	MDQ	3%
							trans-3-Methyl-2-pentene	616-12-6	1.48E-06	24 hr	EF	MDQ	3%
							Trichlorofluoromethane (Freon 11)	91315-61-6	3.87E-05	24 hr	EF	MDQ	3%
							Trimethylsilanol	1066-40-6	1.03E-02	24 hr	EF	ADQ	31%
							Trimethylsilyl Fluoride	420-56-4	5.36E-04	24 hr	EF	ADQ	31%
							Methoxytrimethylsilane	1825-61-2	3.44E-04	24 hr	EF	ADQ	31%
							Ethoxytrimethylsilane	1825-62-3	1.99E-04	24 hr	EF	ADQ	31%
							Propoxytrimethylsilane	1825-63-4	1.55E-04	24 hr	EF	ADQ	31%
							Isopropoxytrimethylsilane	1825-64-5	1.78E-04	24 hr	EF	ADQ	31%
							Butoxytrimethylsilane	1825-65-6	8.83E-05	24 hr	EF	ADQ	31%
							1-methylbutoxytrimethylsilane	1825-67-8	1.88E-04	24 hr	EF	ADQ	31%
Siloxane Flare	Enclosed Siloxane/LFG Flare	1.23	871	0.77	9.17	-	Trimethylsilanol	1066-40-6	7.34E-03	24 hr	EF	ADQ	22%
							Trimethylsilyl Fluoride	420-56-4	3.81E-04	24 hr	EF	ADQ	22%
							Methoxytrimethylsilane	1825-61-2	2.45E-04	24 hr	EF	ADQ	22%
							Ethoxytrimethylsilane	1825-62-3	1.42E-04	24 hr	EF	ADQ	22%
							Propoxytrimethylsilane	1825-63-4	1.10E-04	24 hr	EF	ADQ	22%
							Isopropoxytrimethylsilane	1825-64-5	1.26E-04	24 hr	EF	ADQ	22%
							Butoxytrimethylsilane	1825-65-6	6.28E-05	24 hr	EF	ADQ	22%
							1-methylbutoxytrimethylsilane	1825-67-8	1.34E-04	24 hr	EF	ADQ	22%
BF1 to BF3	Biofilter - Exhaust from composting facility (Cells 1 to 3)	N/A	N/A	N/A	N/A	N/A	odour	N/A	9.05E+02	10 min	EC	MDQ	1%
Curing	Compost Curing Windrows (Windrows 1 to 12)	N/A	N/A	N/A	N/A	N/A	odour	N/A	3.99E+04 (Max season)	10 min	EC	MDQ	46%
LFYD_1 to LFYD_6	Leaf & yard waste stockpile (Stockpiles 1 to 6)	N/A	N/A	N/A	N/A	N/A	odour	N/A	1.36E+04 (Max season)	10 min	EC	MDQ	16%

Table A2. Source Summary Table - Alternative 2 Scenario A

Source ID	Source Description	Source Data (per each unit): Flow Rate [m³/s]	Exit Gas Temp. [°C]	Inner Dia. [m]	Height Above Grade [m]	Height Above Roof [m]	Contaminant	CAS Number	Emission Rate [g/s] (or ou/s for Odour)	Avg. Period [hr]	Emis. Est. Tech.[1]	Data Qual.[2]	% of Overall Emissions [%]
STG1 to STG8	Landfill surface - Stages 1 to 8 - Aggregate fugitive emissions from all eight stages	N/A	N/A	N/A	N/A	N/A	Carbon Monoxide	630-08-0	2.66E-02	1/2 hr	EF	MDQ	0%
							1,1,2,2-Tetrachloroethane	79-34-5	3.50E-03	24 hr	EF	MDQ	96%
							1,1,2-Trichloroethane	79-00-5	8.20E-04	24 hr	EF	MDQ	96%
							1,2-Dichloroethane (Ethylene dichloride)	107-06-2	6.12E-04	24 hr	EF	ADQ	96%
							1,2-Dichloroethene	540-59-0	4.30E-02	24 hr	EF	MDQ	96%
							1,3-Butadiene (Vinyl ethylene)	106-99-0	3.50E-04	Annual	EF	MDQ	96%
							2-Ethyltoluene	611-14-3	1.51E-03	24 hr	EF	MDQ	96%
							Acetaldehyde	75-07-0	1.33E-04	24 hr, 1/2 hr	EF	MDQ	96%
							Benzene	71-43-2	7.30E-03	Annual	EF	ADQ	96%
							Benzyl chloride	100-44-7	8.92E-05	24 hr	EF	ADQ	96%
							cis-2-Pentene	627-20-3	1.31E-04	24 hr	EF	MDQ	96%
							Dibromochloromethane	124-48-1	1.22E-04	24 hr	EF	MDQ	96%
							Dimethyl sulfide	75-18-3	1.37E-02	10 min	EF	ADQ	96%
							Formaldehyde	50-00-0	1.37E-05	24 hr	EF	MDQ	96%
							Hydrogen sulfide	7783-06-4	4.24E-02	24 hr, 10 min	EF	ADQ	96%
							Isoprene (2-Methyl-1,3-butadiene)	78-79-5	4.38E-05	24 hr	EF	MDQ	96%
							Naphthalene	91-20-3	5.34E-04	24 hr, 10 min	EF	MDQ	96%
							p-Cymene (1-Methyl-4-Isopropylbenzene)	99-87-6	1.87E-02	24 hr	EF	MDQ	96%
							Trichloroethylene (Trichloroethene)	79-01-6	4.23E-03	24 hr	EF	ADQ	96%
							Trichloromethane (Chloroform)	67-66-3	3.29E-04	24 hr	EF	ADQ	96%
							Vinyl chloride (Chloroethene)	75-01-4	3.45E-03	24 hr	EF	ADQ	96%
							Total Reduced Sulphur Compounds	NA	6.45E-02	24 hr, 10 min	MB	MDQ	96%
							1-Methylcyclohexene	591-49-1	8.50E-05	24 hr	EF	MDQ	96%
							1-Propanethiol (n-Propyl mercaptan)	107-03-9	3.71E-04	24 hr	EF	MDQ	96%
							2,4-Dimethylhexane	589-43-5	9.87E-04	24 hr	EF	MDQ	96%
							2,5-Dimethylhexane	592-13-2	7.38E-04	24 hr	EF	MDQ	96%
							2-Ethyl-1-butene	760-21-4	5.80E-05	24 hr	EF	MDQ	96%
							2-Methyl-1-propanethiol (Isobutyl mercaptan)	513-44-0	5.97E-04	24 hr	EF	MDQ	96%
							2-Methyl-2-propanethiol (tert- Butylmercaptan)	513-35-9	1.14E-03	24 hr	EF	MDQ	96%
							3,6-Dimethyloctane	15869-94-0	4.35E-03	24 hr	EF	MDQ	96%
							cis-1,4-Dimethylcyclohexane	624-29-3	1.08E-03	24 hr	EF	MDQ	96%
							cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohe	2207036	1.08E-03	24 hr	EF	MDQ	96%
							cis-2-Heptene	6443-92-1	9.36E-05	24 hr	EF	MDQ	96%
							cis-2-Octene	2097322	9.61E-04	24 hr	EF	MDQ	96%
							cis-3-Methyl-2-pentene	922-62-3	5.86E-05	24 hr	EF	MDQ	96%
							Ethyl mercaptan (Ethanediol)	75-08-01	4.79E-04	24 hr	EF	ADQ	96%
							Isopropyl mercaptan	75-33-2	5.19E-04	24 hr	EF	ADQ	96%
							Methanethiol (Methyl mercaptan)	74-93-1	2.57E-03	24 hr	EF	ADQ	96%
							trans-1,2-Dimethylcyclohexane	6876-23-9	1.76E-03	24 hr	EF	MDQ	96%
							trans-1,4-Dimethylcyclohexane	2207047	8.95E-04	24 hr	EF	MDQ	96%
							trans-2-Octene	13389-42-9	1.05E-03	24 hr	EF	MDQ	96%
							trans-3-Methyl-2-pentene	616-12-6	5.08E-05	24 hr	EF	MDQ	96%
							Trichlorofluoromethane (Freon 11)	91315-61-6	1.33E-03	24 hr	EF	MDQ	96%
							Trimethylsilanol	1066-40-6	1.00E-02	24 hr	EF	ADQ	30%
							Trimethylsilyl Fluoride	420-56-4	5.20E-04	24 hr	EF	ADQ	30%
							Methoxytrimethylsilane	1825-61-2	3.34E-04	24 hr	EF	ADQ	30%
							Ethoxytrimethylsilane	1825-62-3	1.93E-04	24 hr	EF	ADQ	30%
							Propoxytrimethylsilane	1825-63-4	1.50E-04	24 hr	EF	ADQ	30%
							Isopropoxytrimethylsilane	1825-64-5	1.72E-04	24 hr	EF	ADQ	30%
							Butoxytrimethylsilane	1825-65-6	8.57E-05	24 hr	EF	ADQ	30%
							1-methylbutoxytrimethylsilane	1825-67-8	1.83E-04	24 hr	EF	ADQ	30%

Table A2. Source Summary Table - Alternative 2 Scenario A

Source ID	Source Description	Source Data (per each unit)					Contaminant	CAS Number	Emission Rate [g/s] (or ou/s for Odour)	Avg. Period [hr]	Emis. Est. Tech.[1]	Data Qual.[2]	% of Overall Emissions [%]
		Flow Rate [m^3/s]	Exit Gas Temp. [°C]	Inner Dia. [m]	Height Above Grade [m]	Height Above Roof [m]							
							odour	N/A	9.52E+03	10 min	EC	MDQ	11%
Paved_Road	Truck traffic on paved roads on site	N/A	N/A	N/A	N/A	N/A	Nitrogen Oxides	10102-44-0	2.81E-02	1 hr	EF	ADQ	1.2%
							Suspended particulate matter	N/A	2.04E+00	1 hr	EF	ADQ	50.76%
							Particulate matter (< 10 μm dia.)	N/A	4.10E-01	1 hr	EF	ADQ	20.32%
							Particulate matter (< 2.5 μm dia.)	N/A	1.01E-01	1 hr	EF	ADQ	12.72%
							Carbon Monoxide	630-08-0	8.81E-03	1/2 hr	EF	ADQ	0.0%
Working Face	Landfill working face activities and nearby construction activities	N/A	N/A	N/A	N/A	N/A	Nitrogen Oxides	10102-44-0	1.54E-01	1 hr	EF	ADQ	6%
							Suspended particulate matter	N/A	1.43E+00	1 hr	EF	ADQ	35.6%
							Particulate matter (< 10 μm dia.)	N/A	1.06E+00	1 hr	EF	ADQ	52.5%
							Particulate matter (< 2.5 μm dia.)	N/A	1.51E-01	1 hr	EF	ADQ	19.0%
							Carbon Monoxide	630-08-0	1.35E+00	1/2 hr	EF	ADQ	7.3%
							odour	N/A	2.25E+04	10 min	EC	MDQ	26%
Compost_NRoad	Mobile Equipment at Compost Facility	N/A	N/A	N/A	N/A	N/A	Nitrogen Oxides	10102-44-0	2.06E-01	1 hr	EF	ADQ	8.7%
							Suspended particulate matter	N/A	1.03E-02	1 hr	EF	ADQ	0.3%
							Particulate matter (< 10 μm dia.)	N/A	1.03E-02	1 hr	EF	ADQ	0.5%
							Particulate matter (< 2.5 μm dia.)	N/A	5.00E-03	1 hr	EF	ADQ	0.6%
							Carbon Monoxide	630-08-0	1.79E+00	1/2 hr	EF	ADQ	10%

Note:

[1]Emission Estimating Technique: "V-ST" - Validated Source Test, "ST" - Source Test, "EF" - Emission Factor, "MB" - Mass Balance, "EC" - Engineering Calculation

[2]Emissions Data Quality: "HDQ" - Highest; "AADQ" - Above Average; "ADQ" - Average; and "MDQ" - Marginal

[3]Landfill Gas profiles were obtained from AP 42. The amount of total reduced sulfur was calculated per procedure described in O. Reg. 516/07.

Table A3. Emission Summary Table - Alternative 2 Scenario A

Contaminant	CAS Number	Total Facility Emission Rate [g/s]	Dispersion Model Used	Max. POI Conc. [µg/m³]	Max. at Sensitive Receptor [µg/m³]	MECP Limit					Percent of POI Limit [%]	Percent of Limit at Receptor [%]
						Avg. Period [hr]	Limit µg/m³	Limiting Effect	ACB Source[1]	Category[2]		
Nitrogen Oxides (as NO_2)	10102-44-0	2.4	AERMOD	45	9.9	24 hr	200	Health	Standard	B1	22%	5%
				148	70.3	1 hr	400	Health	Standard	B1	37%	18%
Nitrogen Dioxide	10102-44-0	2.4	AERMOD	45	9.9	24 hr	200	Health	AAQC	n/a	22%	5%
				148	70.3	1 hr	400	Health	AAQC	n/a	37%	18%
				90.8	33.0	1-hr	113	n/a	CAAQS	n/a	80%	29%
				5.63	0.88	Annual	32	n/a	CAAQS	n/a	18%	3%
Suspended particulate matter	n/a	4.0	AERMOD	179	71	24 hr	120	Visibility	Standard	B1	149%	59%
Particulate matter (< 10 µm dia.)	n/a	2.0	AERMOD	92	40	24 hr	50	Health	AAQC	n/a	184%	80%
Particulate matter (< 2.5 µm dia.)	n/a	0.8	AERMOD	6.2	2.6	24 hr	27	Health	AAQC	n/a	23%	10%
				1.89	0.43	annual	8.8	Health	AAQC	n/a	21%	5%
Carbon Monoxide	630-08-0	18.5	AERMOD	1535	722	0.5 hr	6000	Health	Standard	B1	26%	12%
				1280	602	1 hr	36,200	Health	AAQC	n/a	4%	2%
				715	336	8 hr	15,700	Health	AAQC	n/a	5%	2%
Sulfur Dioxide	7446-09-5	0.3	AERMOD	7.80	2.61	10 min	178	Health	AAQC	n/a	4%	1%
				4.73	1.58	1 hr	100	Health & Veg.	Standard	B1	5%	2%
				0.300	0.040	annual	10	Health & Veg.	Standard	B1	3%	<1%
				4.63	1.39	1 hr	173	n/a	CAAQS	n/a	n/a	n/a
Hydrogen Chloride	7647-01-0	0.288	AERMOD	2.33	0.33	24 hr	20	Health	Standard	B1	12%	2%
Odour[3] (units: ou/s, or ou/m³)	n/a	86,409 (Max season)	AERMOD	n/a	1.85	10 min	1	---	Guideline	---	n/a	185%
LFG Contaminants												
LFG Unit Emission Run		1.0E+00	AERMOD	62.0	35.0	1 hr						
				24.7	11.53	24 hr						
				3.31	1.520	annual						
				102	57.8	10 min						
1,1,2,2-Tetrachloroethane	79-34-5	3.7E-03	AERMOD	0.090	0.042	24 hr	0.1	Health	SL-JSL	B2	90%	42%
1,1,2-Trichloroethane	79-00-5	8.6E-04	AERMOD	0.021	0.010	24 hr	0.3	Health	SL-JSL	B2	7%	3%
1,2-Dichloroethane (Ethylene dichloride)	107-06-2	6.4E-04	AERMOD	0.016	0.007	24 hr	2	Health	Standard	B1	<1%	<1%
				0.002	0.001	Annual	0.4	Health	AAQC	n/a	<1%	<1%
1,2-Dichloroethene	540-59-0	4.5E-02	AERMOD	1.110	0.518	24 hr	105	Health	Guideline	B1	1%	<1%
1,3-Butadiene (Vinyl ethylene)	106-99-0	3.7E-04	AERMOD	0.001	0.0006	Annual	2	Health	Standard	B1	<1%	<1%
				0.009	0.004	24 hr	10	Health	AAQC	n/a	<1%	<1%
2-Ethyltoluene	611-14-3	1.6E-03	AERMOD	0.039	0.018	24 hr	0.5	Health	SL-JSL	B2	8%	4%
Acetaldehyde	75-07-0	1.4E-04	AERMOD	0.003	0.002	24 hr	500	Health	Standard	B1	<1%	<1%
				0.010	0.006	0.5 hr	500	Health	Standard	B1	<1%	<1%
Benzene	71-43-2	7.6E-03	AERMOD	0.025	0.012	Annual	0.45	Health	Standard	B1	6%	3%
				0.188	0.088	24 hr	2.3	Health	AAQC	n/a	8%	4%
Benzyl chloride	100-44-7	9.3E-05	AERMOD	0.002	0.001	24 hr	0.1	Health	SL-JSL	B2	2%	1%
cis-2-Pentene	627-20-3	1.4E-04	AERMOD	0.003	0.002	24 hr	0.5	Health	SL-JSL	B2	<1%	<1%
Dibromochloromethane	124-48-1	1.3E-04	AERMOD	0.003	0.001	24 hr	0.2	Health	SL-JSL	B2	2%	<1%
Formaldehyde	50-00-0	1.4E-05	AERMOD	0.000	0.0002	24 hr	65	Health	Standard	B1	<1%	<1%
Isoprene (2-Methyl-1,3-butadiene)	78-79-5	4.6E-05	AERMOD	0.001	0.0005	24 hr	0.1	Health	SL-JSL	B2	1%	<1%
Naphthalene	91-20-3	5.6E-04	AERMOD	0.014	0.006	24 hr	22.5	Health	Guideline	B1	<1%	<1%
				0.000	0.032	10 min	50	Odour	Guideline	B1	---	<1%
p-Cymene (1-Methyl-4-Isopropylbenzene)	99-87-6	2.0E-02	AERMOD	0.483	0.225	24 hr	50	Health	SL-JSL	B2	<1%	<1%
Trichloroethylene (Trichloroethene)	79-01-6	4.4E-03	AERMOD	0.109	0.051	24 hr	12	Health	Standard	B1	<1%	<1%

Table A3. Emission Summary Table - Alternative 2 Scenario A													
Contaminant	CAS Number	Total Facility Emission Rate [g/s]	Dispersion Model Used	Max. POI Conc. [µg/m³]	Max. at Sensitive Receptor [µg/m³]	MECP Limit					Percent of POI Limit [%]	Percent of Limit at Receptor [%]
						Avg. Period [hr]	Limit µg/m³	Limiting Effect	ACB Source[1]	Category[2]		
				0.015	0.0067	Annual	2.3	Health	AAQC	n/a	<1%	<1%
Trichloromethane (Chloroform)	67-66-3	3.4E-04	AERMOD	0.008	0.004	24 hr	1	Health	Standard	B1	<1%	<1%
				0.001	0.0005	Annual	0.2	Health	AAQC	n/a	<1%	<1%
Vinyl chloride (Chloroethene)	75-01-4	3.6E-03	AERMOD	0.089	0.042	24 hr	1	Health	Standard	B1	9%	4%
				0.012	0.005	Annual	0.2	Health	AAQC	n/a	6%	3%
Total Reduced Sulphur Compounds	NA	6.7E-02	AERMOD	1.665	0.778	24 hr	7	Health	Guideline	B1	24%	11%
					3.894	10 min	13	Odour	Guideline	B1	---	30%
1-Methylcyclohexene	591-49-1	8.9E-05	AERMOD	0.002	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	2%	1%
2,4-Dimethylhexane	589-43-5	1.0E-03	AERMOD	0.025	0.012	24 hr	0.1	de minimus	Table B-2A	n/a	25%	12%
2,5-Dimethylhexane	592-13-2	7.7E-04	AERMOD	0.019	0.009	24 hr	0.1	de minimus	Table B-2A	n/a	19%	9%
2-Ethyl-1-butene	760-21-4	6.1E-05	AERMOD	0.001	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	1%	<1%
3,6-Dimethyloctane	15869-94-0	4.5E-03	AERMOD	0.112	0.052	24 hr	0.1	de minimus	Table B-2A	n/a	112%	52%
cis-1,4-Dimethylcyclohexane	624-29-3	1.1E-03	AERMOD	0.028	0.013	24 hr	0.1	de minimus	Table B-2A	n/a	28%	13%
cis-1,4-Dimethylcyclohexane/trans1,3-Dim	2207036	1.1E-03	AERMOD	0.028	0.013	24 hr	0.1	de minimus	Table B-2A	n/a	28%	13%
trans-1,4-Dimethylcyclohexane	2207047	9.4E-04	AERMOD	0.023	0.011	24 hr	0.1	de minimus	Table B-2A	n/a	23%	11%
cis-2-Heptene	6443-92-1	9.8E-05	AERMOD	0.002	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	2%	1%
cis-2-Octene	2097322	1.0E-03	AERMOD	0.025	0.012	24 hr	0.1	de minimus	Table B-2A	n/a	25%	12%
cis-3-Methyl-2-pentene	922-62-3	6.1E-05	AERMOD	0.002	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	2%	<1%
Isopropyl mercaptan	75-33-2	5.4E-04	AERMOD	0.013	0.006	24 hr	0.1	de minimus	Table B-2A	n/a	13%	6%
trans-1,2-Dimethylcyclohexane	6876-23-9	1.8E-03	AERMOD	0.046	0.021	24 hr	0.1	de minimus	Table B-2A	n/a	46%	21%
trans-1,4-Dimethylcyclohexane	2207047	9.4E-04	AERMOD	0.023	0.011	24 hr	0.1	de minimus	Table B-2A	n/a	23%	11%
trans-2-Octene	13389-42-9	1.1E-03	AERMOD	0.027	0.013	24 hr	0.1	de minimus	Table B-2A	n/a	27%	13%
trans-3-Methyl-2-pentene	616-12-6	5.3E-05	AERMOD	0.001	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	1%	<1%
Trichlorofluoromethane (Freon 11)	91315-61-6	1.4E-03	AERMOD	0.034	0.016	24 hr	0.1	de minimus	Table B-2A	n/a	34%	16%
Siloxanes Siloxanes Unit Emission Run		1.0E+00	AERMOD	9.0	3.77	24 hr						
Trimethylsilanol	1066-40-6	3.3E-02	AERMOD	0.300	0.126	24 hr	32.5	Health	SL-JSL	B2	<1%	0%
Trimethylsilyl Fluoride	420-56-4	1.7E-03	AERMOD	0.016	0.007	24 hr	0.1	de minimus	Table B-2A	n/a	16%	7%
Methoxytrimethylsilane	1825-61-2	1.1E-03	AERMOD	0.010	0.004	24 hr	0.1	de minimus	Table B-2A	n/a	10%	4%
Ethoxytrimethylsilane	1825-62-3	6.4E-04	AERMOD	0.006	0.002	24 hr	0.1	de minimus	Table B-2A	n/a	6%	2%
Propoxytrimethylsilane	1825-63-4	5.0E-04	AERMOD	0.005	0.002	24 hr	0.1	de minimus	Table B-2A	n/a	5%	2%
Isopropoxytrimethylsilane	1825-64-5	5.7E-04	AERMOD	0.005	0.002	24 hr	0.1	de minimus	Table B-2A	n/a	5%	2%
Butoxytrimethylsilane	1825-65-6	2.9E-04	AERMOD	0.003	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	3%	1%
1-methylbutoxytrimethylsilane	1825-67-8	6.1E-04	AERMOD	0.005	0.002	24 hr	0.1	de minimus	Table B-2A	n/a	5%	2%

Note:

[1] ACB Source: "S" - Standard (for Section 20), "G" - Guideline (for Section 20), "SL-JSL" - Screening Level (SL) set by the MECP based on a review of toxicity information and/or other jurisdictional levels (JSL)

[2] Category: "B1" - Benchmark 1 , "B2" - Benchmark 2.

[3] The 1-hr air dispersion modelling output units were adjusted in AERMOD to reflect the expected peak 10-min average values using the MECP recommended standard conversion factor of

Appendix A: Tables
Alternative 2 Scenario B

Table A1. Sources and Contaminants Identification Table - Alternative 2 Scenario B

Source Information			Expected Contaminants	Significant (Yes or No?)	Modelled (Yes or No)?	Rationale For Source/Contaminant Insignificance
Source ID	Source Description or Title	General Location				
STG1 to STG8	Landfill surface, Stages 1 to 8	Landfill	LFG	Yes	Yes	
			Odour	Yes	Yes	
Paved_Road	Truck traffic on paved roads on site	Landfill	Products of Combustion	Yes	Yes	
			Dust	Yes	Yes	
Unpaved_Road	Truck traffic on unpaved roads on site	Landfill	Products of Combustion	Yes	Yes	
			Dust	Yes	Yes	
Working Face	Landfill working face activities and nearby construction activities	Landfill	Products of Combustion	Yes	Yes	
			Dust	Yes	Yes	
Compost_NRoad	Mobile Equipment at Compost Facility	Compost Facility	Products of Combustion	Yes	Yes	
			Dust	No	No	Negligible compared to aggregate emissions
Leachate	Leachate treatment systems - treatment facility and holding ponds	Landfill	Odour	No	No	Negligible compared to aggregate emissions
GEN1 to GEN4	Reciprocating Engines – LFG Fueled	LFG Utilization Facility	Products of Combustion	Yes	Yes	
			Siloxanes	Yes	Yes	
			uncombusted LFG	No	No	< 5% of aggregate emissions
Flare 1	Enclosed LFG Flare 1	LFG Utilization Facility	Products of Combustion	Yes	Yes	
			Siloxanes	Yes	Yes	
			uncombusted LFG	Yes	Yes	
Flare 2	Enclosed LFG Flare 2	LFG Utilization Facility	Products of Combustion	Yes	Yes	
			Siloxanes	Yes	Yes	
			uncombusted LFG	Yes	Yes	
Siloxane Flare	Enclosed Siloxane/LFG Flare	LFG Utilization Facility	Products of Combustion	No	No	<5% of aggregate emissions
			Siloxanes	Yes	Yes	
			uncombusted LFG	No	No	<5% of aggregate emissions
BF1 to BF3	Biofilter - Exhaust from composting facility (Cells 1 to 3)	Compost Facility	Odour	Yes	Yes	
Finished Compost	Finished compost screening, stockiling, and packaging	Compost Facility	Odour	No	No	Negligible odour levels
Curing	Compost Curing Windrows (Windrows 1 to 12)	Compost Facility	Odour	Yes	Yes	
LFYD_1 to LFYD_6	Leaf & Yard Waste Stockpiles (Stockpiles 1 to 6)	Compost Facility	Odour	Yes	Yes	
Farm	Sod Farm	Agriculture area	Products of Combustion	No	No	Negligible compared to aggregate emissions
			Dust	Yes	Yes	
Welding	Maintenance Welding Station	Maintenance	Welding Fume	No	No	Table B-3B of MECP Document[1].
Heating	Comfort Heating	Offices and other small buildings	Products of Combustion	No	No	Table B-3B of MECP Document[1].

LFG - Landfill Gas

[1] MECP, "Procedure for Preparing an Emission Summary and Dispersion Modelling Report", Version 4.1, dated March 2018.

Table A2. Source Summary Table - Alternative 2 Scenario B

Source ID	Source Description	Source Data (per each unit) Flow Rate [m³/s]	Exit Gas Temp. [°C]	Inner Dia. [m]	Height Above Grade [m]	Height Above Roof [m]	Contaminant	CAS Number	Emission Rate [g/s] (or ou/s for Odour)	Avg. Period [hr]	Emis. Est. Tech.[1]	Data Qual.[2]	% of Overall Emissions [%]
GEN1 to GEN4	Reciprocating Engines – LFG Fueled - Aggregate emissions of all 4 engines	1.4 (each)	509	0.25	5.6	3.0	Nitrogen Oxides	10102-44-0	1.28E+00	1 & 24 hr	EF	ADQ	53%
							Suspended particulate matter	N/A	2.46E-01	24 hr	EF	ADQ	4.8%
							Particulate matter (< 10 µm dia.)	N/A	2.46E-01	24 hr	EF	ADQ	11%
							Particulate matter (< 2.5 µm dia.)	N/A	2.46E-01	24 hr	EF	ADQ	29%
							Carbon Monoxide	630-08-0	2.40E+00	1/2 hr	EF	ADQ	13%
							Sulfur Dioxide	2025884	6.83E-02	1 & 24 hr	MB	ADQ	22%
							Hydrogen Chloride	7647-01-0	6.59E-02	24 hr	MB	ADQ	22%
Flare 1	Enclosed LFG Flare 1	82.8	871	3.05	12.2	-	Nitrogen Oxides	10102-44-0	2.59E-01	1 & 24 hr	EF	ADQ	11%
							Suspended particulate matter	N/A	1.07E-01	24 hr	EF	ADQ	2.1%
							Particulate matter (< 10 µm dia.)	N/A	1.07E-01	24 hr	EF	ADQ	5%
							Particulate matter (< 2.5 µm dia.)	N/A	1.07E-01	24 hr	EF	ADQ	12%
							Carbon Monoxide	630-08-0	4.78E+00	1/2 hr	EF	ADQ	25%
							Sulfur Dioxide	2025884	8.50E-02	1 & 24 hr	MB	ADQ	28%
							Hydrogen Chloride	7647-01-0	8.20E-02	24 hr	MB	ADQ	28%
							1,1,2,2-Tetrachloroethane	79-34-5	5.85E-05	24 hr	EF	MDQ	2%
							1,1,2-Trichloroethane	79-00-5	1.37E-05	24 hr	EF	MDQ	2%
							1,2-Dichloroethane (Ethylene dichloride)	107-06-2	1.02E-05	24 hr	EF	ADQ	2%
							1,2-Dichloroethene	540-59-0	7.20E-04	24 hr	EF	MDQ	2%
							1,3-Butadiene (Vinyl ethylene)	106-99-0	5.85E-06	Annual	EF	MDQ	2%
							2-Ethyltoluene	611-14-3	2.53E-05	24 hr	EF	MDQ	2%
							Acetaldehyde	75-07-0	2.22E-06	24 hr, 1/2 hr	EF	MDQ	2%
							Benzene	71-43-2	1.22E-04	Annual	EF	ADQ	2%
							Benzyl chloride	100-44-7	1.49E-06	24 hr	EF	ADQ	2%
							cis-2-Pentene	627-20-3	2.19E-06	24 hr	EF	MDQ	2%
							Dibromochloromethane	124-48-1	2.05E-06	24 hr	EF	MDQ	2%
							Dimethyl sulfide	75-18-3	2.29E-04	10 min	EF	ADQ	2%
							Formaldehyde	50-00-0	2.29E-07	24 hr	EF	MDQ	2%
							Hydrogen sulfide	7783-06-4	7.10E-04	24 hr, 10 min	EF	ADQ	2%
							Isoprene (2-Methyl-1,3-butadiene)	78-79-5	7.32E-07	24 hr	EF	MDQ	2%
							Naphthalene	91-20-3	8.93E-06	24 hr, 10 min	EF	MDQ	2%
							p-Cymene (1-Methyl-4-Isopropylbenzene)	99-87-6	3.13E-04	24 hr	EF	MDQ	2%
							Trichloroethylene (Trichloroethene)	79-01-6	7.09E-05	24 hr	EF	ADQ	2%
							Trichloromethane (Chloroform)	67-66-3	5.51E-06	24 hr	EF	ADQ	2%
							Vinyl chloride (Chloroethene)	75-01-4	5.78E-05	24 hr	EF	ADQ	2%
							Total Reduced Sulphur Compounds	NA	1.08E-03	24 hr, 10 min	MB	MDQ	2%
							1-Methylcyclohexene	591-49-1	1.42E-06	24 hr	EF	MDQ	2%
							1-Propanethiol (n-Propyl mercaptan)	107-03-9	6.20E-06	24 hr	EF	MDQ	2%
							2,4-Dimethylhexane	589-43-5	1.65E-05	24 hr	EF	MDQ	2%
							2,5-Dimethylhexane	592-13-2	1.24E-05	24 hr	EF	MDQ	2%
							2-Ethyl-1-butene	760-21-4	9.70E-07	24 hr	EF	MDQ	2%
							2-Methyl-1-propanethiol (Isobutyl mercaptan)	513-44-0	9.99E-06	24 hr	EF	MDQ	2%
							2-Methyl-2-propanethiol (tert- Butylmercaptan)	513-35-9	1.91E-05	24 hr	EF	MDQ	2%
							3,6-Dimethyloctane	15869-94-0	7.28E-05	24 hr	EF	MDQ	2%
							cis-1,4-Dimethylcyclohexane	624-29-3	1.81E-05	24 hr	EF	MDQ	2%
							cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohe	2207036	1.81E-05	24 hr	EF	MDQ	2%
							cis-2-Heptene	6443-92-1	1.57E-06	24 hr	EF	MDQ	2%
							cis-2-Octene	2097322	1.61E-05	24 hr	EF	MDQ	2%
							cis-3-Methyl-2-pentene	922-62-3	9.81E-07	24 hr	EF	MDQ	2%
							Ethyl mercaptan (Ethanediol)	75-08-01	8.01E-06	24 hr	EF	ADQ	2%
							Isopropyl mercaptan	75-33-2	8.68E-06	24 hr	EF	ADQ	2%
							Methanethiol (Methyl mercaptan)	74-93-1	4.29E-05	24 hr	EF	ADQ	2%
							trans-1,2-Dimethylcyclohexane	6876-23-9	2.95E-05	24 hr	EF	MDQ	2%
							trans-1,4-Dimethylcyclohexane	2207047	1.50E-05	24 hr	EF	MDQ	2%

Table A2. Source Summary Table - Alternative 2 Scenario B

Source ID	Source Description	Source Data (per each unit) Flow Rate [m^3/s]	Exit Gas Temp. [°C]	Inner Dia. [m]	Height Above Grade [m]	Height Above Roof [m]	Contaminant	CAS Number	Emission Rate [g/s] (or ou/s for Odour)	Avg. Period [hr]	Emis. Est. Tech.[1]	Data Qual.[2]	% of Overall Emissions [%]
							trans-2-Octene	13389-42-9	1.76E-05	24 hr	EF	MDQ	2%
							trans-3-Methyl-2-pentene	616-12-6	8.50E-07	24 hr	EF	MDQ	2%
							Trichlorofluoromethane (Freon 11)	91315-61-6	2.22E-05	24 hr	EF	MDQ	2%
							Trimethylsilanol	1066-40-6	6.00E-03	24 hr	EF	ADQ	17%
							Trimethylsilyl Fluoride	420-56-4	3.11E-04	24 hr	EF	ADQ	17%
							Methoxytrimethylsilane	1825-61-2	2.00E-04	24 hr	EF	ADQ	17%
							Ethoxytrimethylsilane	1825-62-3	1.16E-04	24 hr	EF	ADQ	17%
							Propoxytrimethylsilane	1825-63-4	9.01E-05	24 hr	EF	ADQ	17%
							Isopropoxytrimethylsilane	1825-64-5	1.03E-04	24 hr	EF	ADQ	17%
							Butoxytrimethylsilane	1825-65-6	5.13E-05	24 hr	EF	ADQ	17%
							1-methylbutoxytrimethylsilane	1825-67-8	1.09E-04	24 hr	EF	ADQ	17%
Flare 2	Enclosed LFG Flare 2	140	871	3.66	15.2	-	Nitrogen Oxides	10102-44-0	4.66E-01	1 & 24 hr	EF	ADQ	19%
							Suspended particulate matter	N/A	1.93E-01	24 hr	EF	ADQ	4%
							Particulate matter (< 10 μm dia.)	N/A	1.93E-01	24 hr	EF	ADQ	9%
							Particulate matter (< 2.5 μm dia.)	N/A	1.93E-01	24 hr	EF	ADQ	22%
							Carbon Monoxide	630-08-0	8.60E+00	1/2 hr	EF	ADQ	45%
							Sulfur Dioxide	2025884	1.53E-01	1 & 24 hr	MB	ADQ	50%
							Hydrogen Chloride	7647-01-0	1.48E-01	24 hr	MB	ADQ	50%
							1,1,2,2-Tetrachloroethane	79-34-5	1.05E-04	24 hr	EF	MDQ	3%
							1,1,2-Trichloroethane	79-00-5	2.47E-05	24 hr	EF	MDQ	3%
							1,2-Dichloroethane (Ethylene dichloride)	107-06-2	1.84E-05	24 hr	EF	ADQ	3%
							1,2-Dichloroethene	540-59-0	1.30E-03	24 hr	EF	MDQ	3%
							1,3-Butadiene (Vinyl ethylene)	106-99-0	1.05E-05	Annual	EF	MDQ	3%
							2-Ethyltoluene	611-14-3	4.55E-05	24 hr	EF	MDQ	3%
							Acetaldehyde	75-07-0	4.00E-06	24 hr, 1/2 hr	EF	MDQ	3%
							Benzene	71-43-2	2.20E-04	Annual	EF	ADQ	3%
							Benzyl chloride	100-44-7	2.69E-06	24 hr	EF	ADQ	3%
							cis-2-Pentene	627-20-3	3.94E-06	24 hr	EF	MDQ	3%
							Dibromochloromethane	124-48-1	3.69E-06	24 hr	EF	MDQ	3%
							Dimethyl sulfide	75-18-3	4.12E-04	10 min	EF	ADQ	3%
							Formaldehyde	50-00-0	4.12E-07	24 hr	EF	MDQ	3%
							Hydrogen sulfide	7783-06-4	1.28E-03	24 hr, 10 min	EF	ADQ	3%
							Isoprene (2-Methyl-1,3-butadiene)	78-79-5	1.32E-06	24 hr	EF	MDQ	3%
							Naphthalene	91-20-3	1.61E-05	24 hr, 10 min	EF	MDQ	3%
							p-Cymene (1-Methyl-4-Isopropylbenzene)	99-87-6	5.63E-04	24 hr	EF	MDQ	3%
							Trichloroethylene (Trichloroethene)	79-01-6	1.28E-04	24 hr	EF	ADQ	3%
							Trichloromethane (Chloroform)	67-66-3	9.91E-06	24 hr	EF	ADQ	3%
							Vinyl chloride (Chloroethene)	75-01-4	1.04E-04	24 hr	EF	ADQ	3%
							Total Reduced Sulphur Compounds	NA	1.94E-03	24 hr, 10 min	MB	MDQ	3%
							1-Methylcyclohexene	591-49-1	2.56E-06	24 hr	EF	MDQ	3%
							1-Propanethiol (n-Propyl mercaptan)	107-03-9	1.12E-05	24 hr	EF	MDQ	3%
							2,4-Dimethylhexane	589-43-5	2.97E-05	24 hr	EF	MDQ	3%
							2,5-Dimethylhexane	592-13-2	2.22E-05	24 hr	EF	MDQ	3%
							2-Ethyl-1-butene	760-21-4	1.75E-06	24 hr	EF	MDQ	3%
							2-Methyl-1-propanethiol (Isobutyl mercaptan)	513-44-0	1.80E-05	24 hr	EF	MDQ	3%
							2-Methyl-2-propanethiol (tert- Butylmercaptan)	513-35-9	3.44E-05	24 hr	EF	MDQ	3%
							3,6-Dimethyloctane	15869-94-0	1.31E-04	24 hr	EF	MDQ	3%
							cis-1,4-Dimethylcyclohexane	624-29-3	3.26E-05	24 hr	EF	MDQ	3%
							cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohe	2207036	3.26E-05	24 hr	EF	MDQ	3%
							cis-2-Heptene	6443-92-1	2.82E-06	24 hr	EF	MDQ	3%
							cis-2-Octene	2097322	2.89E-05	24 hr	EF	MDQ	3%
							cis-3-Methyl-2-pentene	922-62-3	1.77E-06	24 hr	EF	MDQ	3%
							Ethyl mercaptan (Ethanediol)	75-08-01	1.44E-05	24 hr	EF	ADQ	3%

Table A2. Source Summary Table - Alternative 2 Scenario B

Source ID	Source Description	Source Data (per each unit)					Contaminant	CAS Number	Emission Rate [g/s] (or ou/s for Odour)	Avg. Period [hr]	Emis. Est. Tech.[1]	Data Qual.[2]	% of Overall Emissions [%]
		Flow Rate [m^3/s]	Exit Gas Temp. [°C]	Inner Dia. [m]	Height Above Grade [m]	Height Above Roof [m]							
							Isopropyl mercaptan	75-33-2	1.56E-05	24 hr	EF	ADQ	3%
							Methanethiol (Methyl mercaptan)	74-93-1	7.73E-05	24 hr	EF	ADQ	3%
							trans-1,2-Dimethylcyclohexane	6876-23-9	5.32E-05	24 hr	EF	MDQ	3%
							trans-1,4-Dimethylcyclohexane	2207047	2.70E-05	24 hr	EF	MDQ	3%
							trans-2-Octene	13389-42-9	3.17E-05	24 hr	EF	MDQ	3%
							trans-3-Methyl-2-pentene	616-12-6	1.53E-06	24 hr	EF	MDQ	3%
							Trichlorofluoromethane (Freon 11)	91315-61-6	3.99E-05	24 hr	EF	MDQ	3%
							Trimethylsilanol	1066-40-6	1.08E-02	24 hr	EF	ADQ	31%
							Trimethylsilyl Fluoride	420-56-4	5.60E-04	24 hr	EF	ADQ	31%
							Methoxytrimethylsilane	1825-61-2	3.60E-04	24 hr	EF	ADQ	31%
							Ethoxytrimethylsilane	1825-62-3	2.08E-04	24 hr	EF	ADQ	31%
							Propoxytrimethylsilane	1825-63-4	1.62E-04	24 hr	EF	ADQ	31%
							Isopropoxytrimethylsilane	1825-64-5	1.86E-04	24 hr	EF	ADQ	31%
							Butoxytrimethylsilane	1825-65-6	9.24E-05	24 hr	EF	ADQ	31%
							1-methylbutoxytrimethylsilane	1825-67-8	1.97E-04	24 hr	EF	ADQ	31%
Siloxane Flare	Enclosed Siloxane/LFG Flare	1.23	871	0.77	9.17	-	Trimethylsilanol	1066-40-6	7.34E-03	24 hr	EF	ADQ	21%
							Trimethylsilyl Fluoride	420-56-4	3.81E-04	24 hr	EF	ADQ	21%
							Methoxytrimethylsilane	1825-61-2	2.45E-04	24 hr	EF	ADQ	21%
							Ethoxytrimethylsilane	1825-62-3	1.42E-04	24 hr	EF	ADQ	21%
							Propoxytrimethylsilane	1825-63-4	1.10E-04	24 hr	EF	ADQ	21%
							Isopropoxytrimethylsilane	1825-64-5	1.26E-04	24 hr	EF	ADQ	21%
							Butoxytrimethylsilane	1825-65-6	6.28E-05	24 hr	EF	ADQ	21%
							1-methylbutoxytrimethylsilane	1825-67-8	1.34E-04	24 hr	EF	ADQ	21%
BF1 to BF3	Biofilter - Exhaust from composting facility (Cells 1 to 3)	N/A	N/A	N/A	N/A	N/A	odour	N/A	9.05E+02	10 min	EC	MDQ	1%
Curing	Compost Curing Windrows (Windrows 1 to 12)	N/A	N/A	N/A	N/A	N/A	odour	N/A	3.99E+04 (Max season)	10 min	EC	MDQ	46%
LFYD_1 to LFYD_6	Leaf & Yard Waste Stockpiles (Stockpiles 1 to 6)	N/A	N/A	N/A	N/A	N/A	odour	N/A	1.36E+04 (Max season)	10 min	EC	MDQ	16%

Table A2. Source Summary Table - Alternative 2 Scenario B

Source ID	Source Description	Source Data (per each unit): Flow Rate [m³/s]	Exit Gas Temp. [°C]	Inner Dia. [m]	Height Above Grade [m]	Height Above Roof [m]	Contaminant	CAS Number	Emission Rate [g/s] (or ou/s for Odour)	Avg. Period [hr]	Emis. Est. Tech.[1]	Data Qual.[2]	% of Overall Emissions [%]
STG1 to STG8	Landfill surface - Stages 1 to 8 - Aggregate fugitive emissions from all eight stages	N/A	N/A	N/A	N/A	N/A	Carbon Monoxide	630-08-0	2.73E-02	1/2 hr	EF	MDQ	0%
							1,1,2,2-Tetrachloroethane	79-34-5	3.58E-03	24 hr	EF	MDQ	96%
							1,1,2-Trichloroethane	79-00-5	8.41E-04	24 hr	EF	MDQ	96%
							1,2-Dichloroethane (Ethylene dichloride)	107-06-2	6.28E-04	24 hr	EF	ADQ	96%
							1,2-Dichloroethene	540-59-0	4.41E-02	24 hr	EF	MDQ	96%
							1,3-Butadiene (Vinyl ethylene)	106-99-0	3.58E-04	Annual	EF	MDQ	96%
							2-Ethyltoluene	611-14-3	1.55E-03	24 hr	EF	MDQ	96%
							Acetaldehyde	75-07-0	1.36E-04	24 hr, 1/2 hr	EF	MDQ	96%
							Benzene	71-43-2	7.48E-03	Annual	EF	ADQ	96%
							Benzyl chloride	100-44-7	9.14E-05	24 hr	EF	ADQ	96%
							cis-2-Pentene	627-20-3	1.34E-04	24 hr	EF	MDQ	96%
							Dibromochloromethane	124-48-1	1.25E-04	24 hr	EF	MDQ	96%
							Dimethyl sulfide	75-18-3	1.40E-02	10 min	EF	ADQ	96%
							Formaldehyde	50-00-0	1.40E-05	24 hr	EF	MDQ	96%
							Hydrogen sulfide	7783-06-4	4.35E-02	24 hr, 10 min	EF	ADQ	96%
							Isoprene (2-Methyl-1,3-butadiene)	78-79-5	4.48E-05	24 hr	EF	MDQ	96%
							Naphthalene	91-20-3	5.47E-04	24 hr, 10 min	EF	MDQ	96%
							p-Cymene (1-Methyl-4-Isopropylbenzene)	99-87-6	1.92E-02	24 hr	EF	MDQ	96%
							Trichloroethylene (Trichloroethene)	79-01-6	4.34E-03	24 hr	EF	ADQ	96%
							Trichloromethane (Chloroform)	67-66-3	3.37E-04	24 hr	EF	ADQ	96%
							Vinyl chloride (Chloroethene)	75-01-4	3.54E-03	24 hr	EF	ADQ	96%
							Total Reduced Sulphur Compounds	NA	6.61E-02	24 hr, 10 min	MB	MDQ	96%
							1-Methylcyclohexene	591-49-1	8.71E-05	24 hr	EF	MDQ	96%
							1-Propanethiol (n-Propyl mercaptan)	107-03-9	3.80E-04	24 hr	EF	MDQ	96%
							2,4-Dimethylhexane	589-43-5	1.01E-03	24 hr	EF	MDQ	96%
							2,5-Dimethylhexane	592-13-2	7.56E-04	24 hr	EF	MDQ	96%
							2-Ethyl-1-butene	760-21-4	5.94E-05	24 hr	EF	MDQ	96%
							2-Methyl-1-propanethiol (Isobutyl mercaptan)	513-44-0	6.12E-04	24 hr	EF	MDQ	96%
							2-Methyl-2-propanethiol (tert- Butylmercaptan)	513-35-9	1.17E-03	24 hr	EF	MDQ	96%
							3,6-Dimethyloctane	15869-94-0	4.45E-03	24 hr	EF	MDQ	96%
							cis-1,4-Dimethylcyclohexane	624-29-3	1.11E-03	24 hr	EF	MDQ	96%
							cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohe	2207036	1.11E-03	24 hr	EF	MDQ	96%
							cis-2-Heptene	6443-92-1	9.59E-05	24 hr	EF	MDQ	96%
							cis-2-Octene	2097322	9.85E-04	24 hr	EF	MDQ	96%
							cis-3-Methyl-2-pentene	922-62-3	6.01E-05	24 hr	EF	MDQ	96%
							Ethyl mercaptan (Ethanediol)	75-08-01	4.91E-04	24 hr	EF	ADQ	96%
							Isopropyl mercaptan	75-33-2	5.32E-04	24 hr	EF	ADQ	96%
							Methanethiol (Methyl mercaptan)	74-93-1	2.63E-03	24 hr	EF	ADQ	96%
							trans-1,2-Dimethylcyclohexane	6876-23-9	1.81E-03	24 hr	EF	MDQ	96%
							trans-1,4-Dimethylcyclohexane	2207047	9.17E-04	24 hr	EF	MDQ	96%
							trans-2-Octene	13389-42-9	1.08E-03	24 hr	EF	MDQ	96%
							trans-3-Methyl-2-pentene	616-12-6	5.20E-05	24 hr	EF	MDQ	96%
							Trichlorofluoromethane (Freon 11)	91315-61-6	1.36E-03	24 hr	EF	MDQ	96%
							Trimethylsilanol	1066-40-6	1.03E-02	24 hr	EF	ADQ	30%
							Trimethylsilyl Fluoride	420-56-4	5.33E-04	24 hr	EF	ADQ	30%
							Methoxytrimethylsilane	1825-61-2	3.43E-04	24 hr	EF	ADQ	30%
							Ethoxytrimethylsilane	1825-62-3	1.98E-04	24 hr	EF	ADQ	30%
							Propoxytrimethylsilane	1825-63-4	1.54E-04	24 hr	EF	ADQ	30%
							Isopropoxytrimethylsilane	1825-64-5	1.77E-04	24 hr	EF	ADQ	30%
							Butoxytrimethylsilane	1825-65-6	8.78E-05	24 hr	EF	ADQ	30%
							1-methylbutoxytrimethylsilane	1825-67-8	1.87E-04	24 hr	EF	ADQ	30%
							odour	N/A	9.76E+03	10 min	EC	MDQ	11%
							Nitrogen Oxides	10102-44-0	4.35E-02	1 hr	EF	ADQ	1.8%

Table A2. Source Summary Table - Alternative 2 Scenario B

Source ID	Source Description	Source Data (per each unit)					Contaminant	CAS Number	Emission Rate [g/s] (or ou/s for Odour)	Avg. Period [hr]	Emis. Est. Tech.[1]	Data Qual.[2]	% of Overall Emissions [%]
		Flow Rate [m^3/s]	Exit Gas Temp. [°C]	Inner Dia. [m]	Height Above Grade [m]	Height Above Roof [m]							
Paved_Road	Truck traffic on paved roads on site	N/A	N/A	N/A	N/A	N/A	Suspended particulate matter	N/A	3.16E+00	1 hr	EF	ADQ	61.37%
							Particulate matter (< 10 μm dia.)	N/A	6.35E-01	1 hr	EF	ADQ	28.20%
							Particulate matter (< 2.5 μm dia.)	N/A	1.57E-01	1 hr	EF	ADQ	18.21%
							Carbon Monoxide	630-08-0	1.36E-02	1/2 hr	EF	ADQ	0.1%
Working Face	Landfill working face activities and nearby construction activities	N/A	N/A	N/A	N/A	N/A	Nitrogen Oxides	10102-44-0	1.54E-01	1 hr	EF	ADQ	6%
							Suspended particulate matter	N/A	1.43E+00	1 hr	EF	ADQ	27.8%
							Particulate matter (< 10 μm dia.)	N/A	1.06E+00	1 hr	EF	ADQ	47.0%
							Particulate matter (< 2.5 μm dia.)	N/A	1.51E-01	1 hr	EF	ADQ	17.6%
							Carbon Monoxide	630-08-0	1.35E+00	1/2 hr	EF	ADQ	7.1%
							odour	N/A	2.25E+04	10 min	EC	MDQ	26%
Compost_NRoad	Mobile Equipment at Compost Facility	N/A	N/A	N/A	N/A	N/A	Nitrogen Oxides	10102-44-0	2.06E-01	1 hr	EF	ADQ	8.6%
							Suspended particulate matter	N/A	1.03E-02	1 hr	EF	ADQ	0.2%
							Particulate matter (< 10 μm dia.)	N/A	1.03E-02	1 hr	EF	ADQ	0.5%
							Particulate matter (< 2.5 μm dia.)	N/A	5.00E-03	1 hr	EF	ADQ	0.6%
							Carbon Monoxide	630-08-0	1.79E+00	1/2 hr	EF	ADQ	9%

Note:

[1]Emission Estimating Technique: "V-ST" - Validated Source Test, "ST" - Source Test, "EF" - Emission Factor, "MB" - Mass Balance, "EC" - Engineering Calculation

[2]Emissions Data Quality: "HDQ" - Highest; "AADQ" - Above Average; "ADQ" - Average; and "MDQ" - Marginal

[3]Landfill Gas profiles were obtained from AP 42. The amount of total reduced sulfur was calculated per procedure described in O. Reg. 516/07.

Table A3. Emission Summary Table - Alternative 2 Scenario B

Contaminant	CAS Number	Total Facility Emission Rate [g/s]	Dispersion Model Used	Max. POI Conc. [µg/m³]	Max. at Sensitive Receptor [µg/m³]	MECP Limit					Percent of POI Limit [%]	Percent of Limit at Receptor [%]
						Avg. Period [hr]	Limit µg/m³	Limiting Effect	ACB Source[1]	Category[2]		
Nitrogen Oxides (as NO_2)	10102-44-0	2.4	AERMOD	45	9.2	24 hr	200	Health	Standard	B1	22%	5%
				148	61.2	1 hr	400	Health	Standard	B1	37%	15%
Nitrogen Dioxide	10102-44-0	2.4	AERMOD	45	9.2	24 hr	200	Health	AAQC	n/a	22%	5%
				148	61.2	1 hr	400	Health	AAQC	n/a	37%	15%
				90.8	25.8	1-hr	113	n/a	CAAQS	n/a	80%	23%
				5.62	0.72	Annual	32	n/a	CAAQS	n/a	18%	2%
Suspended particulate matter	n/a	5.2	AERMOD	187	119	24 hr	120	Visibility	Standard	B1	156%	99%
Particulate matter (< 10 µm dia.)	n/a	2.3	AERMOD	76	67	24 hr	50	Health	AAQC	n/a	151%	135%
Particulate matter (< 2.5 µm dia.)	n/a	0.9	AERMOD	6.1	1.9	24 hr	27	Health	AAQC	n/a	23%	7%
				1.88	0.36	annual	8.8	Health	AAQC	n/a	21%	4%
Carbon Monoxide	630-08-0	19.0	AERMOD	1535	617	0.5 hr	6000	Health	Standard	B1	26%	10%
				1279	514	1 hr	36,200	Health	AAQC	n/a	4%	1%
				715	287	8 hr	15,700	Health	AAQC	n/a	5%	2%
Sulfur Dioxide	7446-09-5	0.3	AERMOD	7.80	2.61	10 min	178	Health	AAQC	n/a	4%	1%
				4.73	1.58	1 hr	100	Health & Veg.	Standard	B1	5%	2%
				0.301	0.040	annual	10	Health & Veg.	Standard	B1	3%	<1%
				4.63	1.39	1 hr	173	n/a	CAAQS	n/a	n/a	n/a
Hydrogen Chloride	7647-01-0	0.295	AERMOD	2.33	0.33	24 hr	20	Health	Standard	B1	12%	2%
Odour[3] (units: ou/s, or ou/m³)	n/a	86,644 (Max season)	AERMOD	n/a	1.52	10 min	1	---	Guideline	---	n/a	152%
LFG Contaminants												
LFG Unit Emission Run		1.0E+00	AERMOD	62.6	35.0	1 hr						
				25.2	12.07	24 hr						
				3.36	1.850	annual						
				103	57.7	10 min						
1,1,2,2-Tetrachloroethane	79-34-5	3.7E-03	AERMOD	0.094	0.045	24 hr	0.1	Health	SL-JSL	B2	94%	45%
1,1,2-Trichloroethane	79-00-5	8.8E-04	AERMOD	0.022	0.011	24 hr	0.3	Health	SL-JSL	B2	7%	4%
1,2-Dichloroethane (Ethylene dichloride)	107-06-2	6.6E-04	AERMOD	0.017	0.008	24 hr	2	Health	Standard	B1	<1%	<1%
				0.002	0.001	Annual	0.4	Health	AAQC	n/a	<1%	<1%
1,2-Dichloroethene	540-59-0	4.6E-02	AERMOD	1.161	0.556	24 hr	105	Health	Guideline	B1	1%	<1%
1,3-Butadiene (Vinyl ethylene)	106-99-0	3.7E-04	AERMOD	0.001	0.0007	Annual	2	Health	Standard	B1	<1%	<1%
				0.009	0.005	24 hr	10	Health	AAQC	n/a	<1%	<1%
2-Ethyltoluene	611-14-3	1.6E-03	AERMOD	0.041	0.020	24 hr	0.5	Health	SL-JSL	B2	8%	4%
Acetaldehyde	75-07-0	1.4E-04	AERMOD	0.004	0.002	24 hr	500	Health	Standard	B1	<1%	<1%
				0.011	0.006	0.5 hr	500	Health	Standard	B1	<1%	<1%
Benzene	71-43-2	7.8E-03	AERMOD	0.026	0.014	Annual	0.45	Health	Standard	B1	6%	3%
				0.197	0.094	24 hr	2.3	Health	AAQC	n/a	9%	4%
Benzyl chloride	100-44-7	9.6E-05	AERMOD	0.002	0.001	24 hr	0.1	Health	SL-JSL	B2	2%	1%
cis-2-Pentene	627-20-3	1.4E-04	AERMOD	0.004	0.002	24 hr	0.5	Health	SL-JSL	B2	<1%	<1%
Dibromochloromethane	124-48-1	1.3E-04	AERMOD	0.003	0.002	24 hr	0.2	Health	SL-JSL	B2	2%	<1%
Formaldehyde	50-00-0	1.5E-05	AERMOD	0.000	0.0002	24 hr	65	Health	Standard	B1	<1%	<1%
Isoprene (2-Methyl-1,3-butadiene)	78-79-5	4.7E-05	AERMOD	0.001	0.0006	24 hr	0.1	Health	SL-JSL	B2	1%	<1%
Naphthalene	91-20-3	5.7E-04	AERMOD	0.014	0.007	24 hr	22.5	Health	Guideline	B1	<1%	<1%
				0.000	0.033	10 min	50	Odour	Guideline	B1	---	<1%
p-Cymene (1-Methyl-4-Isopropylbenzene)	99-87-6	2.0E-02	AERMOD	0.505	0.242	24 hr	50	Health	SL-JSL	B2	1%	<1%

Table A3. Emission Summary Table - Alternative 2 Scenario B												
Contaminant	CAS Number	Total Facility Emission Rate [g/s]	Dispersion Model Used	Max. POI Conc. [µg/m³]	Max. at Sensitive Receptor [µg/m³]	MECP Limit					Percent of POI Limit [%]	Percent of Limit at Receptor [%]
						Avg. Period [hr]	Limit µg/m³	Limiting Effect	ACB Source[1]	Category[2]		
Trichloroethylene (Trichloroethene)	79-01-6	4.5E-03	AERMOD	0.114	0.055	24 hr	12	Health	Standard	B1	<1%	<1%
				0.015	0.0084	Annual	2.3	Health	AAQC	n/a	<1%	<1%
Trichloromethane (Chloroform)	67-66-3	3.5E-04	AERMOD	0.009	0.004	24 hr	1	Health	Standard	B1	<1%	<1%
				0.001	0.0007	Annual	0.2	Health	AAQC	n/a	<1%	<1%
Vinyl chloride (Chloroethene)	75-01-4	3.7E-03	AERMOD	0.093	0.045	24 hr	1	Health	Standard	B1	9%	4%
				0.012	0.007	Annual	0.2	Health	AAQC	n/a	6%	3%
Total Reduced Sulphur Compounds	NA	6.9E-02	AERMOD	1.741	0.834	24 hr	7	Health	Guideline	B1	25%	12%
					3.991	10 min	13	Odour	Guideline	B1	---	31%
1-Methylcyclohexene	591-49-1	9.1E-05	AERMOD	0.002	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	2%	1%
2,4-Dimethylhexane	589-43-5	1.1E-03	AERMOD	0.027	0.013	24 hr	0.1	de minimus	Table B-2A	n/a	27%	13%
2,5-Dimethylhexane	592-13-2	7.9E-04	AERMOD	0.020	0.010	24 hr	0.1	de minimus	Table B-2A	n/a	20%	10%
2-Ethyl-1-butene	760-21-4	6.2E-05	AERMOD	0.002	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	2%	<1%
3,6-Dimethyloctane	15869-94-0	4.7E-03	AERMOD	0.117	0.056	24 hr	0.1	de minimus	Table B-2A	n/a	117%	56%
cis-1,4-Dimethylcyclohexane	624-29-3	1.2E-03	AERMOD	0.029	0.014	24 hr	0.1	de minimus	Table B-2A	n/a	29%	14%
cis-1,4-Dimethylcyclohexane/trans1,3-Dim	2207036	1.2E-03	AERMOD	0.029	0.014	24 hr	0.1	de minimus	Table B-2A	n/a	29%	14%
trans-1,4-Dimethylcyclohexane	2207047	9.6E-04	AERMOD	0.024	0.012	24 hr	0.1	de minimus	Table B-2A	n/a	24%	12%
cis-2-Heptene	6443-92-1	1.0E-04	AERMOD	0.003	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	3%	1%
cis-2-Octene	2097322	1.0E-03	AERMOD	0.026	0.012	24 hr	0.1	de minimus	Table B-2A	n/a	26%	12%
cis-3-Methyl-2-pentene	922-62-3	6.3E-05	AERMOD	0.002	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	2%	<1%
Isopropyl mercaptan	75-33-2	5.6E-04	AERMOD	0.014	0.007	24 hr	0.1	de minimus	Table B-2A	n/a	14%	7%
trans-1,2-Dimethylcyclohexane	6876-23-9	1.9E-03	AERMOD	0.048	0.023	24 hr	0.1	de minimus	Table B-2A	n/a	48%	23%
trans-1,4-Dimethylcyclohexane	2207047	9.6E-04	AERMOD	0.024	0.012	24 hr	0.1	de minimus	Table B-2A	n/a	24%	12%
trans-2-Octene	13389-42-9	1.1E-03	AERMOD	0.028	0.014	24 hr	0.1	de minimus	Table B-2A	n/a	28%	14%
trans-3-Methyl-2-pentene	616-12-6	5.4E-05	AERMOD	0.001	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	1%	<1%
Trichlorofluoromethane (Freon 11)	91315-61-6	1.4E-03	AERMOD	0.036	0.017	24 hr	0.1	de minimus	Table B-2A	n/a	36%	17%
Siloxanes												
Siloxanes Unit Emission Run		1.0E+00	AERMOD	8.9	3.79	24 hr						
Trimethylsilanol	1066-40-6	3.4E-02	AERMOD	0.307	0.130	24 hr	32.5	Health	SL-JSL	B2	<1%	0%
Trimethylsilyl Fluoride	420-56-4	1.8E-03	AERMOD	0.016	0.007	24 hr	0.1	de minimus	Table B-2A	n/a	16%	7%
Methoxytrimethylsilane	1825-61-2	1.1E-03	AERMOD	0.010	0.004	24 hr	0.1	de minimus	Table B-2A	n/a	10%	4%
Ethoxytrimethylsilane	1825-62-3	6.6E-04	AERMOD	0.006	0.003	24 hr	0.1	de minimus	Table B-2A	n/a	6%	3%
Propoxytrimethylsilane	1825-63-4	5.2E-04	AERMOD	0.005	0.002	24 hr	0.1	de minimus	Table B-2A	n/a	5%	2%
Isopropoxytrimethylsilane	1825-64-5	5.9E-04	AERMOD	0.005	0.002	24 hr	0.1	de minimus	Table B-2A	n/a	5%	2%
Butoxytrimethylsilane	1825-65-6	2.9E-04	AERMOD	0.003	0.001	24 hr	0.1	de minimus	Table B-2A	n/a	3%	1%
1-methylbutoxytrimethylsilane	1825-67-8	6.3E-04	AERMOD	0.006	0.002	24 hr	0.1	de minimus	Table B-2A	n/a	6%	2%

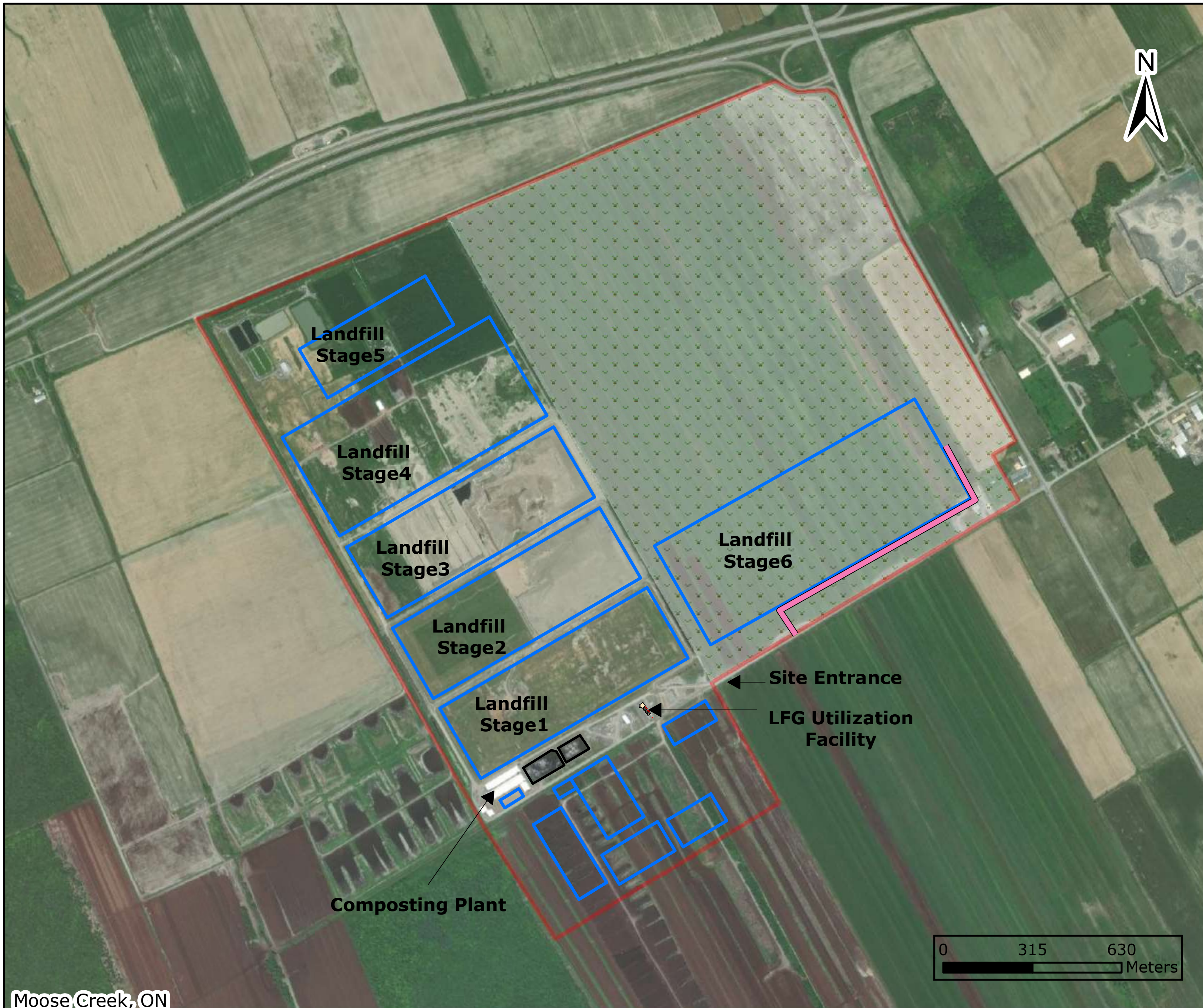
Note:

[1] ACB Source: "S" - Standard (for Section 20), "G" - Guideline (for Section 20), "SL-JSL" - Screening Level (SL) set by the MECP based on a review of toxicity information and/or other jurisdictional levels (JSL)

[2] Category: "B1" - Benchmark 1 , "B2" - Benchmark 2.

[3] The 1-hr air dispersion modelling output units were adjusted in AERMOD to reflect the expected peak 10-min average values using the MECP recommended standard conversion factor of

APPENDIX B:
FIGURES



Project No. 324000731

Map Created: 7/3/2022

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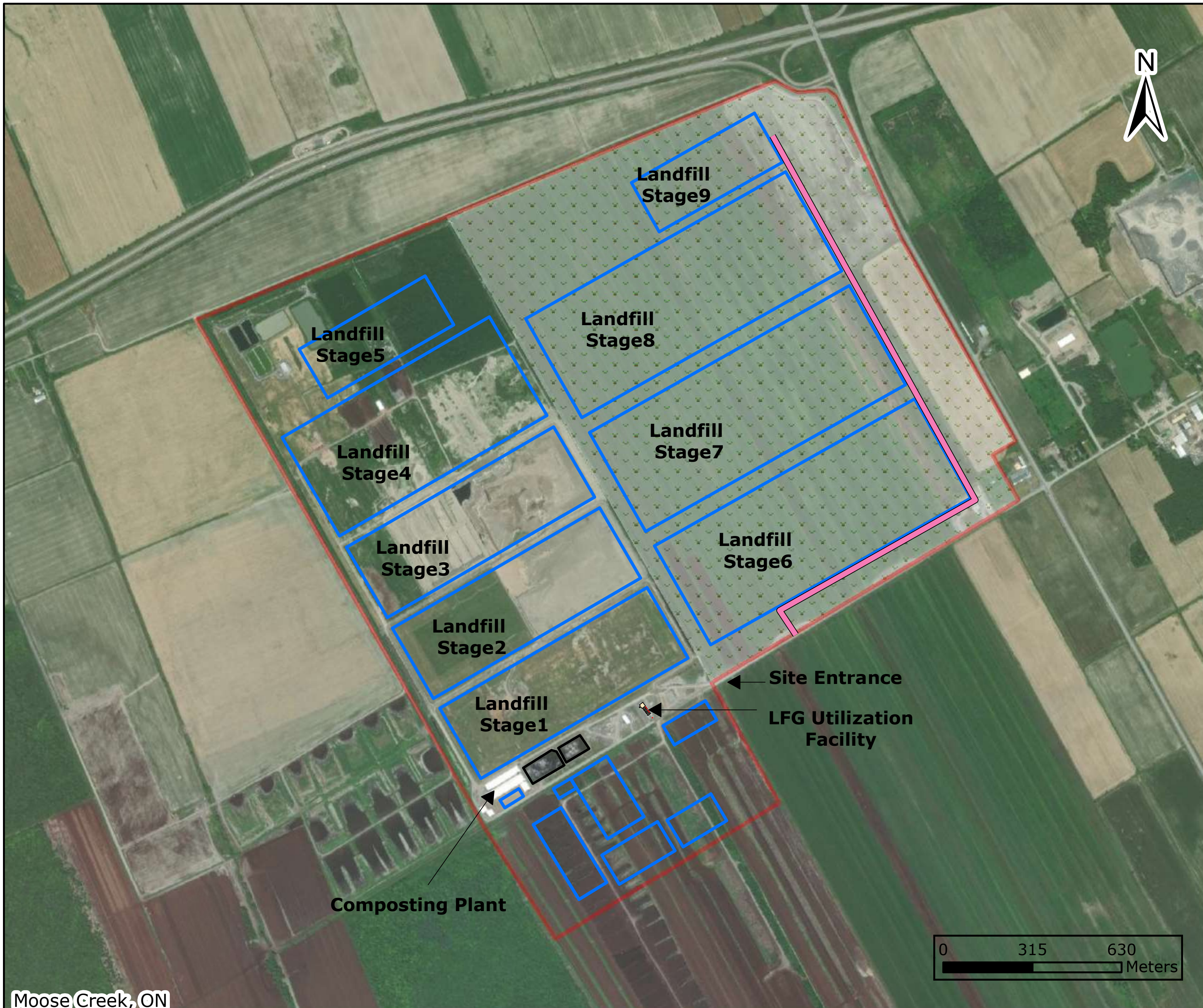
Figure B1

Site Plan GFL (Moose Creek,ON Facility) - Alternative 1 Scenario A

2400 Meadowpine Blvd, Suite 100
Mississauga, ON, Canada



Legend

Paved Road

Facility Boundary

Project No. 324000731

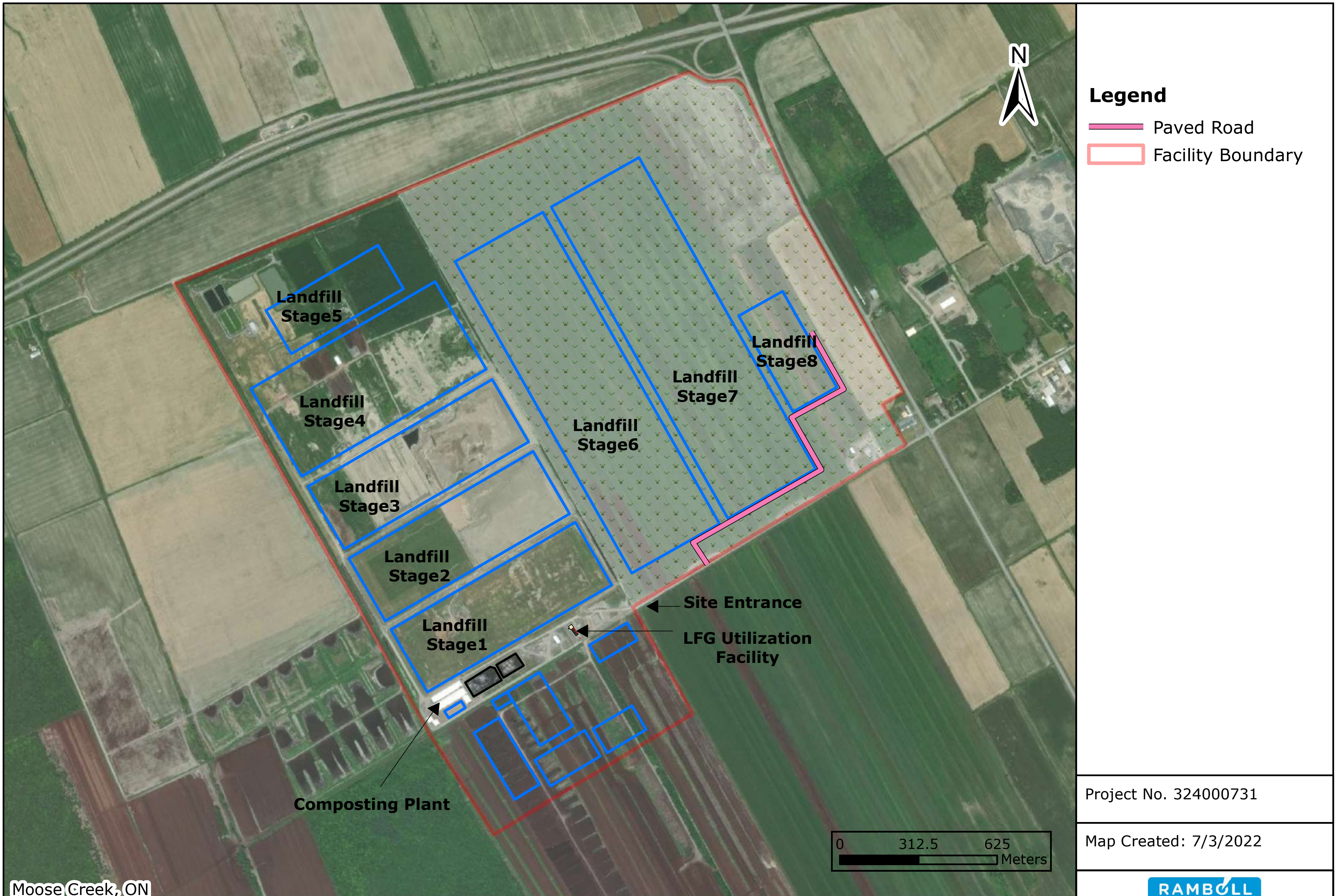
Map Created: 7/3/2022

RAMBOLL

2400 Meadowpine Blvd, Suite 100
Mississauga, ON, Canada

Figure B2

Site Plan GFL (Moose Creek,ON Facility) - Alternative 1 Scenario B



Project No. 324000731

Map Created: 7/3/2022

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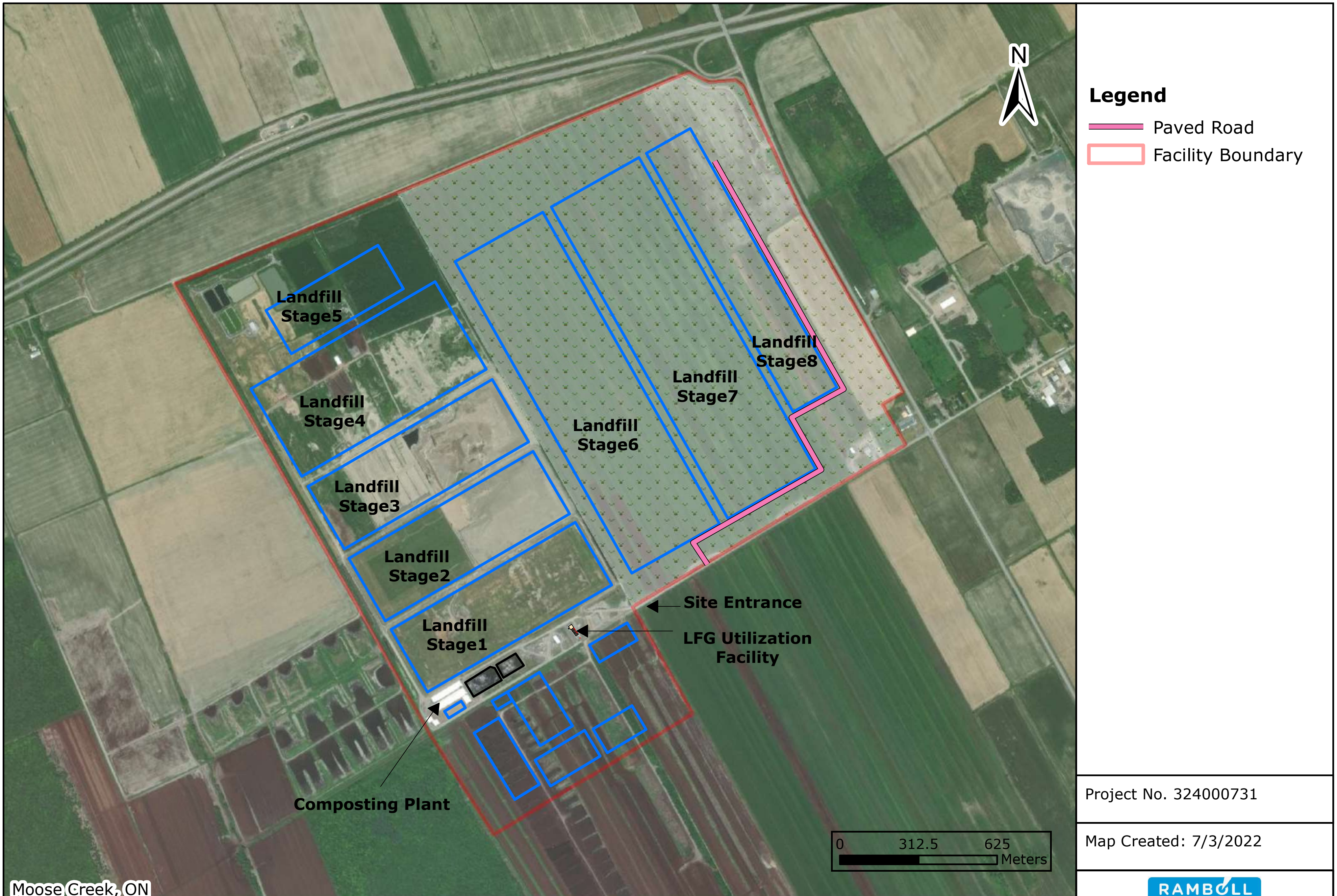
2400 Meadowpine Blvd, Suite 100
Mississauga, ON, Canada

Figure B3

Site Plan GFL (Moose Creek,ON Facility) - Alternative 2 Scenario A



Project No. 324000731

Map Created: 7/3/2022

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Figure B4

Site Plan GFL (Moose Creek,ON Facility) - Alternative 2 Scenario B

2400 Meadowpine Blvd, Suite 100
Mississauga, ON, Canada

Legend

- Facility Boundary
- Compost Curing Windrows (Windrows 1 to 12)
- Leaf & Yard Waste Stockpiles (Stockpiles 1 to 6)
- Leachate Aeration Ponds
- Buildings

Project No.: 324000731

Map Created: 26/05/2023

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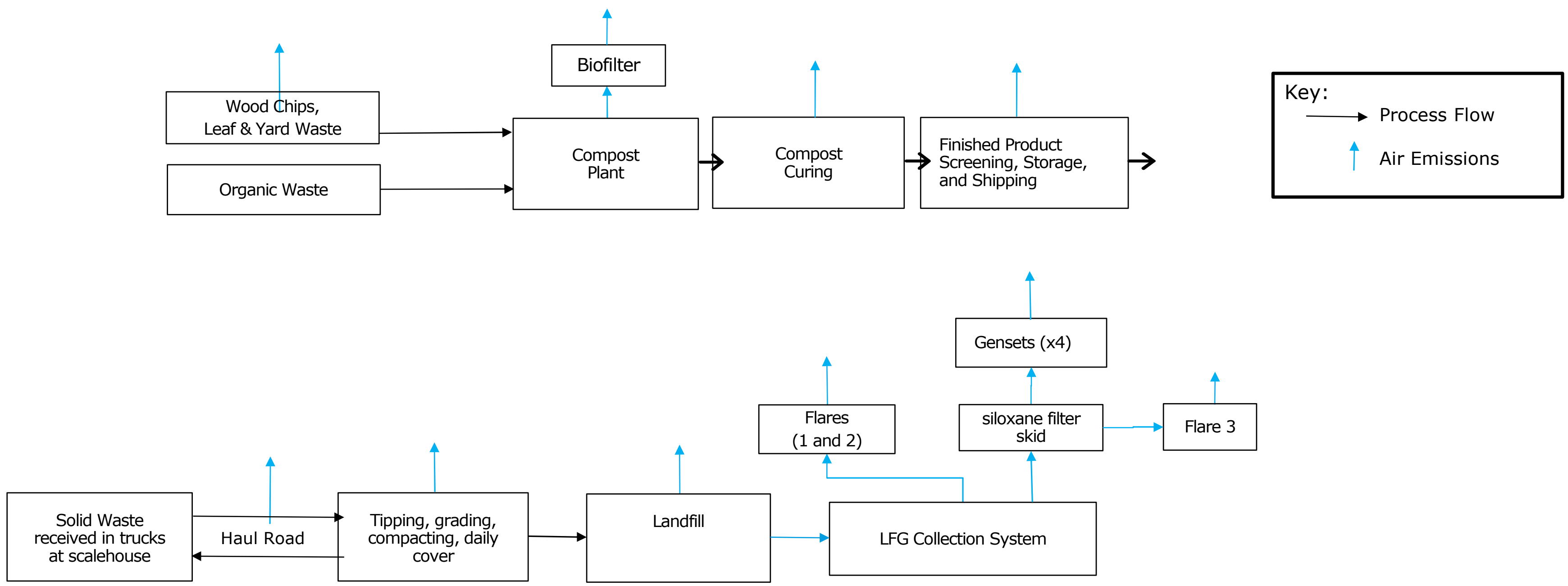
Figure B5

Site Plan - South End - GFL (Moose Creek, ON Facility)

2400 Meadowpine Blvd, Suite 100
Mississauga, ON, Canada

Figure B6: Process Flow Diagram



APPENDIX C:
NEGLIGIBLE SOURCES AND CONTAMINANTS

Appendix C: Negligible Sources and Contaminants
Alternative 1 Scenario A

Table C1. Insignificant Sources

Negligible Sources

Source	Contaminants	Rational
Maintenance Welding Station	Weld Fume	as per Table B-3B of MECP Procedure Document
Landfill leachate aeration ponds, treatment facility, and storage ponds	Odour, other contaminants	Negligible compared to aggregate emissions
Finished compost screening, stockpiling, and bagging	Odour	Negligible compared to aggregate emissions

Sources that are Negligible Compared to Total Emissions

Source	Contaminants	Rational
Engines (Gen1 to Gen4)	Siloxanes, LFG	<5% of aggregate emission
Siloxane flare (Flare 3)	LFG, Products of combustion	<5% of aggregate emission
Compost material handling	Particulate matter	Negligible compared to aggregate emissions
Farm Mobile Equipment	Products of Combustion	Negligible compared to aggregate emissions

Natural gas fired comfort heating equipment with a total facility-wide heat input usage of less than 20 million KJ/hr

Units	KJ/hr	number of units	Total heat input (KJ/hr)
boiler	1319000	1	1,319,000
HVAC	475000	1	475,000
		Total	**1,794,000**

Table C2. Insignificant Sources - Alternative 1 Scenario A

Negligible Contaminants as per Section B-1 of MECP Procedure Document

The product of a conservative dispersion modelling factor (in micrograms per cubic metre per gram per second emission) and the aggregate facility-wide emission rate of a contaminant (using the appropriate averaging period) can be compared to the corresponding ministry POI Limit as a means to conservatively but simply assess POI concentrations as appropriate. As per section 7.2 of the document, the contaminants with less than 50% of the MECP limit were deemed negligible and excluded from the modeling.

Distance from Source (m)	Rural Dispersion Factor ($\mu g/m^3$ per g/s)
250	2300

Source: Table B-1, Procedure for Preparing an ESDM Report

Averaging Period		1 hr	10 min	1/2 hr	24 hr	Annual
Rural Dispersion Factor ($\mu g/m^3$ per g/s)		2300	3795	2760	920	184

a) Contaminants with MECP Limits

Contaminant	CAS. NO	Total Emission Rate (g/s)	Rural Dispersion Factor ($\mu g/m^3$ / g/s)	Estimated Screening Conc. ($\mu g/m3$)	MECP Limit	Avg. Period	% of Limit	Insignificant ?
1,1,1-Trichloroethane	71556	6.24E-04	920	5.74E-01	115000	24 hr	0%	Insignificant
1,1,2,2-Tetrachloroethane	79345	2.87E-03	920	2.64E+00	0.1	24 hr	5283%	Significant
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	2.91E-05	920	2.68E-02	0.225	24 hr	24%	Insignificant
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	4.03E-04	920	3.70E-01	800000	24 hr	0%	Insignificant
1,1,2-Trichloroethane	79005	6.74E-04	920	6.20E-01	0.3	24 hr	413%	Significant
1,1-Dichloroethane	75343	6.58E-03	920	6.05E+00	165	24 hr	7%	Insignificant
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	4.96E-04	920	4.56E-01	10	24 hr	9%	Insignificant
1,2,3-Trimethylbenzene	526738	1.38E-03	920	1.27E+00	220	24 hr	1%	Insignificant
1,2,4-Trichlorobenzene	120821	3.20E-05	920	2.94E-02	400	24 hr	0%	Insignificant
1,2,4-Trimethylbenzene	95636	5.26E-03	920	4.84E+00	220	24 hr	4%	Insignificant
1,2-Dibromoethane (Ethylene dibromide)	106934	2.88E-05	920	2.65E-02	3	24 hr	2%	Insignificant
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	5.79E-04	920	5.33E-01	700000	24 hr	0%	Insignificant
1,2-Dichloroethane (Ethylene dichloride)	107062	5.03E-04	920	4.63E-01	2	24 hr	46%	Insignificant
1,2-Dichloroethene	540590	3.53E-02	920	3.25E+01	105	24 hr	62%	Significant
1,2-Dichloropropane	78875	1.88E-04	920	1.73E-01	2400	24 hr	0%	Insignificant
1,2-Diethylbenzene	135013	8.54E-05	920	7.86E-02	125	24 hr	0%	Insignificant
1,3,5-Trimethylbenzene	108678	2.39E-03	920	2.20E+00	220	24 hr	2%	Insignificant
1,3-Butadiene (Vinyl ethylene)	106990	2.87E-04	184	5.28E-02	2	Annual	5%	Insignificant
1,3-Diethylbenzene	141935	2.81E-04	920	2.59E-01	125	24 hr	0%	Insignificant
1,4-Diethylbenzene	105055	1.12E-03	920	1.03E+00	125	24 hr	2%	Insignificant
1,4-Dioxane (1,4-Diethylene dioxide)	123911	2.34E-05	920	2.15E-02	3500	24 hr	0%	Insignificant
1-Butene	106989	4.16E-03	920	3.83E+00	7000	24 hr	0%	Insignificant
2-Methylbutene	513359	3.41E-03	920	3.14E+00	530	24 hr	1%	Insignificant
1-Butene	106989	4.16E-03	920	3.83E+00	7000	24 hr	0%	Insignificant
2-Methylpropene	115117	1.97E-03	920	1.82E+00	7000	24 hr	0%	Insignificant
1-Ethyl-4-methylbenzene (4-Ethyl toluene)	622968	3.80E-03	920	3.50E+00	625	24 hr	1%	Insignificant
1-Heptene	592767	1.96E-03	920	1.81E+00	120	24 hr	3%	Insignificant
1-Hexene	592416	2.39E-04	920	2.20E-01	850	24 hr	0%	Insignificant
2-Methyl-1-pentene	763291	2.39E-04	920	2.20E-01	85	24 hr	1%	Insignificant
1-Methylcyclopentene	693890	6.62E-05	920	6.09E-02	405	24 hr	0%	Insignificant
1-Pentene	109671	4.93E-04	920	4.54E-01	2050	24 hr	0%	Insignificant
2,2,3-Trimethylbutane	464062	2.94E-05	920	2.71E-02	175	24 hr	0%	Insignificant
2,2,4-Trimethylpentane	540841	2.24E-03	920	2.06E+00	1750	24 hr	0%	Insignificant
2,2,5-Trimethylhexane	3522949	6.40E-04	920	5.89E-01	175	24 hr	1%	Insignificant
2,2-Dimethylbutane	75832	4.30E-04	920	3.95E-01	1750	24 hr	0%	Insignificant
2,2-Dimethylpentane	590352	1.95E-04	920	1.79E-01	175	24 hr	0%	Insignificant
2,2-Dimethylpropane	463821	6.32E-05	920	5.81E-02	35500	24 hr	0%	Insignificant
2,3,4-Trimethylpentane	565753	1.14E-03	920	1.05E+00	175	24 hr	1%	Insignificant
2,3-Dimethylbutane	79298	4.60E-04	920	4.23E-01	1750	24 hr	0%	Insignificant
2,3-Dimethylpentane	565593	9.93E-04	920	9.14E-01	1750	24 hr	0%	Insignificant
2,4-Dimethylpentane	108087	3.20E-04	920	2.95E-01	1750	24 hr	0%	Insignificant
2,5-Dimethylthiophene	638028	2.31E-04	920	2.13E-01	5	24 hr	9%	Insignificant
2-Butanone (Methyl ethyl ketone)	78933	9.24E-03	920	8.51E+00	1000	24 hr	2%	Insignificant
2-Ethylthiophene	872559	2.26E-04	920	2.08E-01	5	24 hr	8%	Insignificant
2-Ethyltoluene	611143	1.24E-03	920	1.14E+00	0.5	24 hr	457%	Significant
2-Hexanone (Methyl butyl ketone)	591786	1.96E-03	920	1.81E+00	150	24 hr	2%	Insignificant
2-Methyl-1-butene	563462	4.01E-04	920	3.69E-01	300	24 hr	0%	Insignificant
2-Methyl-2-butene	513359	3.41E-03	920	3.14E+00	530	24 hr	1%	Insignificant
2-Methylbutane	78784	5.21E-03	920	4.80E+00	35500	24 hr	0%	Insignificant
2-Methylheptane	592278	2.61E-03	920	2.41E+00	175	24 hr	3%	Insignificant

Table C2. Insignificant Sources - Alternative 1 Scenario A								
2-Methylhexane	591764	2.61E-03	920	2.40E+00	1535	24 hr	0%	Insignificant
2-Methylpentane	107835	1.90E-03	920	1.74E+00	1750	24 hr	0%	Insignificant
2-Propanol (Isopropyl alcohol)	67630	3.46E-03	920	3.18E+00	7300	24 hr	0%	Insignificant
3-Ethyltoluene	620144	3.00E-03	920	2.76E+00	62.5	24 hr	9%	Insignificant
3-Methylheptane	589811	2.79E-03	920	2.56E+00	175	24 hr	3%	Insignificant
3-Methylhexane	589344	3.62E-03	920	3.33E+00	1535	24 hr	0%	Insignificant
3-Methylpentane	96140	2.04E-03	920	1.88E+00	1750	24 hr	0%	Insignificant
3-Methylthiophene	616444	2.90E-04	920	2.67E-01	5	24 hr	11%	Insignificant
4-Methyl-1-pentene	691372	6.27E-05	920	5.77E-02	85	24 hr	0%	Insignificant
4-Methyl-2-pentanone (MIBK)	108101	2.83E-03	920	2.60E+00	1200	24 hr	0%	Insignificant
4-Methylheptane	589537	9.09E-04	920	8.37E-01	175	24 hr	1%	Insignificant
Acetaldehyde	75070	1.09E-04	920	1.00E-01	500	24 hr	0%	Insignificant
Acetaldehyde	75070	1.09E-04	2,760	1.00E-01	500	1/2 hr	0%	Insignificant
Acetone	67641	1.24E-02	920	1.14E+01	11880	24 hr	0%	Insignificant
Acetonitrile	75058	7.30E-04	920	6.71E-01	70	24 hr	2%	Insignificant
Benzene	71432	5.99E-03	184	1.10E+00	0.45	Annual	490%	Significant
Benzyl chloride	100447	7.32E-05	920	6.74E-02	0.1	24 hr	135%	Significant
Bromodichloromethane	75274	4.60E-05	920	4.23E-02	350	24 hr	0%	Insignificant
Bromomethane (Methyl bromide)	74839	6.37E-05	920	5.86E-02	1350	24 hr	0%	Insignificant
Butane	106978	1.16E-02	920	1.06E+01	3600	24 hr	1%	Insignificant
Carbon disulfide	75150	3.58E-04	920	3.29E-01	330	24 hr	0%	Insignificant
Carbon monoxide	630080	2.18E-02	2,760	6.03E+01	6000	1/2 hr	2%	Insignificant
Carbon tetrachloride	56235	3.92E-05	920	3.61E-02	2.4	24 hr	3%	Insignificant
Carbon tetrafluoride (Freon 14)	75730	4.25E-04	920	3.91E-01	900	24 hr	0%	Insignificant
Carbonyl sulfide (Carbon oxysulfide)	463581	2.34E-04	920	2.16E-01	13	24 hr	3%	Insignificant
Chlorobenzene	108907	1.74E-03	2,300	4.01E+00	3500	1 hr	0%	Insignificant
Chlorobenzene	108907	1.74E-03	3,795	4.01E+00	4500	10 min	0%	Insignificant
Chlorodifluoromethane (Freon 22)	75456	2.20E-03	920	2.02E+00	350000	24 hr	0%	Insignificant
Chloroethane (Ethyl chloride)	75003	8.15E-03	920	7.49E+00	5600	24 hr	0%	Insignificant
Chloromethane (Methyl chloride)	74873	3.94E-04	920	3.62E-01	320	24 hr	0%	Insignificant
cis-1,2-Dichloroethene	156592	3.84E-03	920	3.54E+00	105	24 hr	7%	Insignificant
cis-1,2-Dimethylcyclohexane	2207014	2.91E-04	920	2.67E-01	175	24 hr	0%	Insignificant
cis-1,3-Dichloropropene	10061015	1.07E-05	920	9.89E-03	2.25	24 hr	1%	Insignificant
cis-1,3-Dimethylcyclohexane	638040	1.80E-03	920	1.65E+00	175	24 hr	2%	Insignificant
cis-2-Butene	590181	1.88E-04	920	1.73E-01	2400	24 hr	0%	Insignificant
cis-2-Hexene	7688213	4.63E-05	920	4.26E-02	85	24 hr	0%	Insignificant
cis-2-Pentene	627203	1.07E-04	920	9.88E-02	0.5	24 hr	40%	Insignificant
Cyclohexane	110827	2.72E-03	920	2.50E+00	6100	24 hr	0%	Insignificant
Cyclohexene	110838	4.83E-05	920	4.45E-02	5000	24 hr	0%	Insignificant
Cyclopentane	287923	4.95E-05	920	4.56E-02	1700	24 hr	0%	Insignificant
Cyclopentene	142290	2.64E-05	920	2.42E-02	25	24 hr	0%	Insignificant
Decane	124185	1.73E-02	920	1.59E+01	60000	24 hr	0%	Insignificant
Dibromochloromethane	124481	1.01E-04	920	9.25E-02	0.2	24 hr	93%	Significant
Dibromomethane (Methylene dibromide)	74953	4.64E-06	920	4.27E-03	66	24 hr	0%	Insignificant
Dichlorobenzene	106467	4.42E-03	920	4.06E+00	95	24 hr	9%	Insignificant
Dichlorodifluoromethane (Freon 12)	75718	4.56E-03	920	4.20E+00	500000	24 hr	0%	Insignificant
Dichloromethane (Methylene chloride)	75092	1.67E-02	920	1.54E+01	220	24 hr	14%	Insignificant
Diethyl sulfide	352932	2.49E-04	920	2.29E-01	7	24 hr	7%	Insignificant
Dimethyl disulfide	624920	4.13E-04	3,795	1.57E+00	56	10 min	6%	Insignificant
Dimethyl sulfide	75183	1.12E-02	3,795	4.27E+01	30	10 min	284%	Significant
Dodecane (n-Dodecane)	112403	1.20E-03	920	1.11E+00	175	24 hr	1%	Insignificant
Ethane	74840	8.70E-03	920	8.00E+00	14500	24 hr	0%	Insignificant
Ethanol	64175	3.39E-04	920	3.12E-01	19000	24 hr	0%	Insignificant
Ethyl acetate	141786	5.30E-03	920	4.87E+00	19000	24 hr	0%	Insignificant
Ethyl methyl sulfide	624895	8.94E-05	920	8.22E-02	7	24 hr	2%	Insignificant
Ethylbenzene	100414	1.65E-02	3,795	6.26E+01	19000	10 min	1%	Insignificant
Formaldehyde	50000	1.12E-05	920	1.03E-02	65	24 hr	0%	Insignificant
Heptane	142825	4.29E-03	920	3.95E+00	11000	24 hr	0%	Insignificant
Hexane	110543	8.54E-03	920	7.86E+00	7500	24 hr	0%	Insignificant
Hydrogen sulfide	7783064	3.49E-02	920	3.21E+01	7	24 hr	916%	Significant
Hydrogen sulfide	7783064	3.49E-02	3,795	3.21E+01	13	10 min	493%	Significant
Indane (2,3-Dihydroindene)	496117	7.26E-05	920	6.68E-02	24	24 hr	1%	Insignificant
Isobutane (2-Methylpropane)	75285	1.52E-02	920	1.39E+01	3600	24 hr	1%	Insignificant
Isobutylbenzene	538932	1.75E-04	920	1.61E-01	62.5	24 hr	1%	Insignificant
Isoprene (2-Methyl-1,3-butadiene)	78795	3.59E-05	920	3.31E-02	0.1	24 hr	66%	Significant
Isopropylbenzene (Cumene)	98828	1.65E-03	920	1.52E+00	400	24 hr	1%	Insignificant
Mercury (total)	7439976	1.35E-06	920	1.24E-03	0.5	24 hr	0%	Insignificant
Mercury (elemental)	7439976	1.35E-06	920	1.24E-03	0.5	24 hr	0%	Insignificant
Methyl tert-butyl ether (MTBE)	1634044	3.33E-04	920	3.06E-01	7000	24 hr	0%	Insignificant
Methylcyclohexane	108872	4.05E-03	920	3.73E+00	8050	24 hr	0%	Insignificant
Methylcyclopentane	96377	1.75E-03	920	1.61E+00	3500	24 hr	0%	Insignificant
Naphthalene	91203	4.38E-04	920	4.03E-01	22.5	24 hr	4%	Insignificant
Naphthalene	91203	4.38E-04	3,795	4.03E-01	50	10 min	2%	Insignificant
n-Butylbenzene	104518	2.92E-04	920	2.68E-01	150	24 hr	0%	Insignificant
Nonane	111842	9.72E-03	920	8.94E+00	5250	24 hr	0%	Insignificant

Table C2. Insignificant Sources - Alternative 1 Scenario A

n-Propylbenzene (Propylbenzene)	103651	1.59E-03	920	1.46E+00	1250	24 hr	0%	Insignificant
Octane	111659	3.94E-03	3,795	1.50E+01	61800	10 min	0%	Insignificant
p-Cymene (1-Methyl-4-Isopropylbenzene)	99876	1.54E-02	920	1.41E+01	50	24 hr	57%	Significant
Pentane	109660	1.03E-02	920	9.46E+00	35500	24 hr	0%	Insignificant
Propane	74986	2.19E-02	920	2.01E+01	215000	24 hr	0%	Insignificant
Propene	115071	4.47E-03	920	4.11E+00	4000	24 hr	0%	Insignificant
Propyne	74997	4.87E-05	920	4.48E-02	8200	24 hr	0%	Insignificant
sec-Butylbenzene	135988	2.90E-04	920	2.66E-01	3	24 hr	18%	Insignificant
Styrene (Vinylbenzene)	100425	1.37E-03	920	1.26E+00	400	24 hr	1%	Insignificant
Tetrachloroethylene (Perchloroethylene)	127184	1.08E-02	920	9.90E+00	360	24 hr	6%	Insignificant
Tetrahydrofuran (Diethylene oxide)	109999	2.23E-03	920	2.06E+00	93000	24 hr	0%	Insignificant
Thiophene	110021	9.39E-04	920	8.64E-01	5	24 hr	35%	Insignificant
Toluene (Methyl benzene)	108883	8.69E-02	920	7.99E+01	2000	24 hr	8%	Insignificant
trans-1,2-Dichloroethene	156605	8.89E-05	920	8.18E-02	105	24 hr	0%	Insignificant
trans-1,3-Dichloropropene	10061026	3.35E-05	920	3.08E-02	2.25	24 hr	3%	Insignificant
trans-2-Butene	624646	1.87E-04	920	1.72E-01	2400	24 hr	0%	Insignificant
trans-2-Hexene	4050457	5.54E-05	920	5.10E-02	85	24 hr	0%	Insignificant
trans-2-Pentene	646048	7.78E-05	920	7.16E-02	300	24 hr	0%	Insignificant
Tribromomethane (Bromoform)	75252	1.00E-04	920	9.22E-02	55	24 hr	0%	Insignificant
Trichloroethylene (Trichloroethene)	79016	3.48E-03	920	3.20E+00	12	24 hr	53%	Significant
Undecane	1120214	8.35E-03	920	7.68E+00	175	24 hr	9%	Insignificant
Trichloromethane (Chloroform)	67663	2.70E-04	920	2.49E-01	1	24 hr	50%	Insignificant
Vinyl acetate	108054	0.00E+00	920	0.00E+00	1000	24 hr	0%	Insignificant
Vinyl chloride (Chloroethene)	75,014	2.84E-03	920	2.61E+00	1	24 hr	522%	Significant
Xylenes (o-, m-, p-, mixtures)	1330207	3.13E-02	920	2.88E+01	730	24 hr	8%	Insignificant
Xylenes (o-, m-, p-, mixtures)	1330207	3.13E-02	3,795	1.19E+02	3000	10 min	8%	Insignificant
Total Reduced Sulphur Compounds	N/A	0.00E+00	920	0.00E+00	7	24 hr	0%	Insignificant
Total Reduced Sulphur Compounds	N/A	0.00E+00	3,795	0.00E+00	13	10 min	0%	Insignificant
Tetramethylsilane	75763	7.71E-07	920	7.09E-04	650	24 hr	0%	Insignificant
Hexamethyldisiloxane	107460	1.63E-03	920	1.50E+00	1200	24 hr	0%	Insignificant
Octamethyltrisiloxane	107517	1.70E-04	920	1.56E-01	204	24 hr	0%	Insignificant
Decamethyltetrasiloxane	141628	2.08E-05	920	1.91E-02	0.5	24 hr	8%	Insignificant
Dodecamethylpentasiloxane	141639	2.24E-05	920	2.06E-02	0.75	24 hr	5%	Insignificant
Dodecamethylcyclohexasiloxane	540976	2.24E-05	920	2.06E-02	500	24 hr	0%	Insignificant
Decamethylcyclopentasiloxane	541026	3.29E-03	920	3.02E+00	500	24 hr	1%	Insignificant
Hexamethyltricyclosiloxane	541059	4.07E-04	920	3.74E-01	25	24 hr	3%	Insignificant
Octamethylcyclotetrasiloxane	556672	6.74E-03	920	6.20E+00	500	24 hr	2%	Insignificant
Trimethylsilanol	1066406	8.11E-03	920	7.46E+00	32.5	24 hr	46%	Insignificant

b) Contaminants without MECP limits

Screening concentrations compared to limits as per Table B-2A: De minimus Concentrations for Contaminants Not Listed in the ministry ACB List that Can Be Considered Insignificant in a Specific Situation

If substance **NOT** on ACB List **AND NOT** on Table B-2B List of Contaminants Excluded from de minimus level:
If < 0.1 µg/m³ (24-hour average) or < 0.3 µg/m³ (1/2-hr average), then impacts can be considered insignificant

Contaminant	CAS. NO	Total Emission Rate (g/s)	Rural Dispersion Factor (µg/m³ per g/s)	Estimated Screening Conc. (µg/m³)	De minimus Conc. (µg/m³)	Avg. Period	% of the De minimus Conc.	Insignificant ?
1-Methylcyclohexene	591491	6.98E-05	920	0.1	0.1	24 hr	128%	Significant
1-Propanethiol (n-Propyl mercaptan)	107039	3.04E-04	920	0.3	0.1	24 hr	560%	Significant
2,4-Dimethylhexane	589435	8.11E-04	920	0.7	0.1	24 hr	1492%	Significant
2,5-Dimethylhexane	592132	6.06E-04	920	0.6	0.1	24 hr	1115%	Significant
2-Ethyl-1-butene	760214	4.76E-05	920	0.0	0.1	24 hr	88%	Insignificant
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	4.90E-04	920	0.5	0.1	24 hr	902%	Significant
2-Methyl-2-propanethiol (tert-Butylmercaptan)	75661	9.37E-04	920	0.9	0.1	24 hr	1724%	Significant
3,6-Dimethyloctane	15869940	3.57E-03	920	3.3	0.1	24 hr	6570%	Significant
3-Methyl-1-pentene	760203	1.88E-05	920	0.0	0.1	24 hr	35%	Insignificant
cis-1,4-Dimethylcyclohexane	624293	8.90E-04	920	0.8	0.1	24 hr	1637%	Significant
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	8.90E-04	920	0.8	0.1	24 hr	1637%	Significant
cis-2-Heptene	6443921	7.69E-05	920	0.1	0.1	24 hr	142%	Significant
cis-2-Octene	7642048	7.89E-04	920	0.7	0.1	24 hr	1452%	Significant
cis-3-Methyl-2-pentene	922623	4.82E-05	920	0.0	0.1	24 hr	89%	Insignificant
Ethyl mercaptan (Ethanediol)	75081	3.93E-04	920	0.4	0.1	24 hr	724%	Significant
Isopropyl mercaptan	75332	4.26E-04	920	0.4	0.1	24 hr	784%	Significant
Mercury (monomethyl)	51176126	0.00E+00	920	0.0	0.1	24 hr	0%	Insignificant
Mercury (dimethyl)	627441	0.00E+00	920	0.0	0.1	24 hr	0%	Insignificant
Methanethiol (Methyl mercaptan)	74931	2.11E-03	920	1.9	0.1	24 hr	3877%	Significant
trans-1,2-Dimethylcyclohexane	6876239	1.45E-03	920	1.3	0.1	24 hr	2667%	Significant

Table C2. Insignificant Sources - Alternative 1 Scenario A

trans-1,4-Dimethylcyclohexane	2207047	7.35E-04	920	0.7	0.1	24 hr	1353%	Significant
trans-2-Heptene	14686136	7.85E-06	920	0.0	0.1	24 hr	14%	Insignificant
trans-2-Octene	13389429	8.65E-04	920	0.8	0.1	24 hr	1591%	Significant
trans-3-Methyl-2-pentene	616126	4.17E-05	920	0.0	0.1	24 hr	77%	Insignificant
Trichlorofluoromethane (Freon 11)	91315616	1.09E-03	920	1.0	0.1	24 hr	2004%	Significant
Trimethylsilyl Fluoride	420564	4.21E-04	920	0.4	0.1	24 hr	774%	Significant
Methoxytrimethylsilane	1825612	2.71E-04	920	0.2	0.1	24 hr	498%	Significant
Ethoxytrimethylsilane	1825623	1.56E-04	920	0.1	0.1	24 hr	288%	Significant
Propoxytrimethylsilane	1825634	1.22E-04	920	0.1	0.1	24 hr	224%	Significant
Isopropoxytrimethylsilane	1825645	1.39E-04	920	0.1	0.1	24 hr	257%	Significant
Butoxytrimethylsilane	1825656	6.94E-05	920	0.1	0.1	24 hr	128%	Significant
1-methylbutoxytrimethylsilane	1825678	1.48E-04	920	0.1	0.1	24 hr	272%	Significant

Appendix C: Negligible Sources and Contaminants
Alternative 1 Scenario B

Table C1. Insignificant Sources

Negligible Sources

Source	Contaminants	Rational
Maintenance Welding Station	Weld Fume	as per Table B-3B of MECP Procedure Document
Landfill leachate aeration ponds, treatment facility, and storage ponds	Odour, other contaminants	Negligible compared to aggregate emissions
Finished compost screening, stockpiling, and bagging	Odour	Negligible compared to aggregate emissions

Sources that are Negligible Compared to Total Emissions

Source	Contaminants	Rational
Engines (Gen1 to Gen4)	Siloxanes, LFG	<5% of aggregate emission
Siloxane flare (Flare 3)	LFG, Products of combustion	<5% of aggregate emission
Compost material handling	Particulate matter	Negligible compared to aggregate emissions
Farm Mobile Equipment	Products of Combustion	Negligible compared to aggregate emissions

Natural gas fired comfort heating equipment with a total facility-wide heat input usage of less than 20 million KJ/hr

Units	KJ/hr	number of units	Total heat input (KJ/hr)
boiler	1319000	1	1,319,000
HVAC	475000	1	475,000
		Total	**1,794,000**

Table C2. Insignificant Sources - Alternative 1 Scenario B

Negligible Contaminants as per Section B-1 of MECP Procedure Document

The product of a conservative dispersion modelling factor (in micrograms per cubic metre per gram per second emission) and the aggregate facility-wide emission rate of a contaminant (using the appropriate averaging period) can be compared to the corresponding ministry POI Limit as a means to conservatively but simply assess POI concentrations as appropriate. As per section 7.2 of the document, the contaminants with less than 50% of the MECP limit were deemed negligible and excluded from the modeling.

Distance from Source (m)	Rural Dispersion Factor (µg/m³ per g/s)
250	2300

Source: Table B-1, Procedure for Preparing an ESDM Report

Averaging Period		1 hr	10 min	1/2 hr	24 hr	Annual
Rural Dispersion Factor (µg/m³ per g/s)		2300	3795	2760	920	184

a) Contaminants with MECP Limits

Contaminant	CAS. NO	Total Emission Rate (g/s)	Rural Dispersion Factor (µg/m³ / g/s)	Estimated Screening Conc. (µg/m3)	MECP Limit	Avg. Period	% of Limit	Insignificant ?
1,1,1-Trichloroethane	71556	3.39E-04	920	3.12E-01	115000	24 hr	0%	Insignificant
1,1,2,2-Tetrachloroethane	79345	3.64E-03	920	3.35E+00	0.1	24 hr	6698%	Significant
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	3.69E-05	920	3.39E-02	0.225	24 hr	30%	Insignificant
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	5.10E-04	920	4.70E-01	800000	24 hr	0%	Insignificant
1,1,2-Trichloroethane	79005	8.54E-04	920	7.86E-01	0.3	24 hr	524%	Significant
1,1-Dichloroethane	75343	8.34E-03	920	7.68E+00	165	24 hr	9%	Insignificant
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	6.29E-04	920	5.78E-01	10	24 hr	12%	Insignificant
1,2,3-Trimethylbenzene	526738	1.75E-03	920	1.61E+00	220	24 hr	1%	Insignificant
1,2,4-Trichlorobenzene	120821	4.05E-05	920	3.73E-02	400	24 hr	0%	Insignificant
1,2,4-Trimethylbenzene	95636	6.67E-03	920	6.14E+00	220	24 hr	6%	Insignificant
1,2-Dibromoethane (Ethylene dibromide)	106934	3.66E-05	920	3.36E-02	3	24 hr	2%	Insignificant
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	7.34E-04	920	6.76E-01	700000	24 hr	0%	Insignificant
1,2-Dichloroethane (Ethylene dichloride)	107062	6.38E-04	920	5.87E-01	2	24 hr	59%	Significant
1,2-Dichloroethene	540590	4.48E-02	920	4.12E+01	105	24 hr	78%	Significant
1,2-Dichloropropane	78875	2.38E-04	920	2.19E-01	2400	24 hr	0%	Insignificant
1,2-Diethylbenzene	135013	1.08E-04	920	9.96E-02	125	24 hr	0%	Insignificant
1,3,5-Trimethylbenzene	108678	3.04E-03	920	2.79E+00	220	24 hr	3%	Insignificant
1,3-Butadiene (Vinyl ethylene)	106990	3.64E-04	184	6.70E-02	2	Annual	7%	Insignificant
1,3-Diethylbenzene	141935	3.56E-04	920	3.28E-01	125	24 hr	1%	Insignificant
1,4-Diethylbenzene	105055	1.43E-03	920	1.31E+00	125	24 hr	2%	Insignificant
1,4-Dioxane (1,4-Diethylene dioxide)	123911	2.96E-05	920	2.72E-02	3500	24 hr	0%	Insignificant
1-Butene	106989	5.28E-03	920	4.85E+00	7000	24 hr	0%	Insignificant
2-Methylbutene	513359	4.33E-03	920	3.98E+00	530	24 hr	2%	Insignificant
1-Butene	106989	5.28E-03	920	4.85E+00	7000	24 hr	0%	Insignificant
2-Methylpropene	115117	2.50E-03	920	2.30E+00	7000	24 hr	0%	Insignificant
1-Ethyl-4-methylbenzene (4-Ethyl toluene)	622968	4.82E-03	920	4.43E+00	625	24 hr	1%	Insignificant
1-Heptene	592767	2.49E-03	920	2.29E+00	120	24 hr	4%	Insignificant
1-Hexene	592416	3.03E-04	920	2.79E-01	850	24 hr	0%	Insignificant
2-Methyl-1-pentene	763291	3.03E-04	920	2.79E-01	85	24 hr	1%	Insignificant
1-Methylcyclopentene	693890	8.39E-05	920	7.72E-02	405	24 hr	0%	Insignificant
1-Pentene	109671	6.25E-04	920	5.75E-01	2050	24 hr	0%	Insignificant
2,2,3-Trimethylbutane	464062	3.73E-05	920	3.43E-02	175	24 hr	0%	Insignificant
2,2,4-Trimethylpentane	540841	2.84E-03	920	2.62E+00	1750	24 hr	0%	Insignificant
2,2,5-Trimethylhexane	3522949	8.11E-04	920	7.46E-01	175	24 hr	1%	Insignificant
2,2-Dimethylbutane	75832	5.45E-04	920	5.01E-01	1750	24 hr	0%	Insignificant
2,2-Dimethylpentane	590352	2.47E-04	920	2.27E-01	175	24 hr	0%	Insignificant
2,2-Dimethylpropane	463821	8.01E-05	920	7.37E-02	35500	24 hr	0%	Insignificant
2,3,4-Trimethylpentane	565753	1.44E-03	920	1.33E+00	175	24 hr	2%	Insignificant
2,3-Dimethylbutane	79298	5.83E-04	920	5.37E-01	1750	24 hr	0%	Insignificant
2,3-Dimethylpentane	565593	1.26E-03	920	1.16E+00	1750	24 hr	0%	Insignificant
2,4-Dimethylpentane	108087	4.06E-04	920	3.74E-01	1750	24 hr	0%	Insignificant
2,5-Dimethylthiophene	638028	2.93E-04	920	2.69E-01	5	24 hr	11%	Insignificant
2-Butanone (Methyl ethyl ketone)	78933	1.17E-02	920	1.08E+01	1000	24 hr	2%	Insignificant
2-Ethylthiophene	872559	2.86E-04	920	2.63E-01	5	24 hr	11%	Insignificant
2-Ethyltoluene	611143	1.57E-03	920	1.45E+00	0.5	24 hr	579%	Significant
2-Hexanone (Methyl butyl ketone)	591786	2.49E-03	920	2.29E+00	150	24 hr	3%	Insignificant
2-Methyl-1-butene	563462	5.09E-04	920	4.68E-01	300	24 hr	0%	Insignificant
2-Methyl-2-butene	513359	4.33E-03	920	3.98E+00	530	24 hr	2%	Insignificant

Table C2. Insignificant Sources - Alternative 1 Scenario B								
2-Methylbutane	78784	6.61E-03	920	6.08E+00	35500	24 hr	0%	Insignificant
2-Methylheptane	592278	3.32E-03	920	3.05E+00	175	24 hr	3%	Insignificant
2-Methylhexane	591764	3.31E-03	920	3.05E+00	1535	24 hr	0%	Insignificant
2-Methylpentane	107835	2.40E-03	920	2.21E+00	1750	24 hr	0%	Insignificant
2-Propanol (Isopropyl alcohol)	67630	4.39E-03	920	4.03E+00	7300	24 hr	0%	Insignificant
3-Ethyltoluene	620144	3.80E-03	920	3.50E+00	62.5	24 hr	11%	Insignificant
3-Methylheptane	589811	3.53E-03	920	3.25E+00	175	24 hr	4%	Insignificant
3-Methylhexane	589344	4.59E-03	920	4.22E+00	1535	24 hr	1%	Insignificant
3-Methylpentane	96140	2.59E-03	920	2.38E+00	1750	24 hr	0%	Insignificant
3-Methylthiophene	616444	3.68E-04	920	3.39E-01	5	24 hr	14%	Insignificant
4-Methyl-1-pentene	691372	7.95E-05	920	7.31E-02	85	24 hr	0%	Insignificant
4-Methyl-2-pentanone (MIBK)	108101	3.58E-03	920	3.30E+00	1200	24 hr	1%	Insignificant
4-Methylheptane	589537	1.15E-03	920	1.06E+00	175	24 hr	1%	Insignificant
Acetaldehyde	75070	1.38E-04	920	1.27E-01	500	24 hr	0%	Insignificant
Acetaldehyde	75070	1.38E-04	2,760	1.27E-01	500	1/2 hr	0%	Insignificant
Acetone	67641	1.58E-02	920	1.45E+01	11880	24 hr	0%	Insignificant
Acetonitrile	75058	9.25E-04	920	8.51E-01	70	24 hr	2%	Insignificant
Benzene	71432	7.60E-03	184	1.40E+00	0.45	Annual	621%	Significant
Benzyl chloride	100447	9.29E-05	920	8.54E-02	0.1	24 hr	171%	Significant
Bromodichloromethane	75274	5.83E-05	920	5.36E-02	350	24 hr	0%	Insignificant
Bromomethane (Methyl bromide)	74839	8.08E-05	920	7.44E-02	1350	24 hr	0%	Insignificant
Butane	106978	1.47E-02	920	1.35E+01	3600	24 hr	1%	Insignificant
Carbon disulfide	75150	4.54E-04	920	4.17E-01	330	24 hr	0%	Insignificant
Carbon monoxide	630080	2.77E-02	2,760	7.65E+01	6000	1/2 hr	3%	Insignificant
Carbon tetrachloride	56235	4.98E-05	920	4.58E-02	2.4	24 hr	4%	Insignificant
Carbon tetrafluoride (Freon 14)	75730	5.39E-04	920	4.96E-01	900	24 hr	0%	Insignificant
Carbonyl sulfide (Carbon oxysulfide)	463581	2.97E-04	920	2.73E-01	13	24 hr	4%	Insignificant
Chlorobenzene	108907	2.21E-03	2,300	5.08E+00	3500	1 hr	0%	Insignificant
Chlorobenzene	108907	2.21E-03	3,795	5.08E+00	4500	10 min	0%	Insignificant
Chlorodifluoromethane (Freon 22)	75456	2.79E-03	920	2.57E+00	350000	24 hr	0%	Insignificant
Chloroethane (Ethyl chloride)	75003	1.03E-02	920	9.50E+00	5600	24 hr	0%	Insignificant
Chloromethane (Methyl chloride)	74873	4.99E-04	920	4.59E-01	320	24 hr	0%	Insignificant
cis-1,2-Dichloroethene	156592	4.87E-03	920	4.48E+00	105	24 hr	9%	Insignificant
cis-1,2-Dimethylcyclohexane	2207014	3.68E-04	920	3.39E-01	175	24 hr	0%	Insignificant
cis-1,3-Dichloropropene	10061015	1.36E-05	920	1.25E-02	2.25	24 hr	1%	Insignificant
cis-1,3-Dimethylcyclohexane	638040	2.28E-03	920	2.10E+00	175	24 hr	2%	Insignificant
cis-2-Butene	590181	2.39E-04	920	2.20E-01	2400	24 hr	0%	Insignificant
cis-2-Hexene	7688213	5.87E-05	920	5.40E-02	85	24 hr	0%	Insignificant
cis-2-Pentene	627203	1.36E-04	920	1.25E-01	0.5	24 hr	50%	Significant
Cyclohexane	110827	3.45E-03	920	3.17E+00	6100	24 hr	0%	Insignificant
Cyclohexene	110838	6.13E-05	920	5.64E-02	5000	24 hr	0%	Insignificant
Cyclopentane	287923	6.28E-05	920	5.78E-02	1700	24 hr	0%	Insignificant
Cyclopentene	142290	3.34E-05	920	3.07E-02	25	24 hr	0%	Insignificant
Decane	124185	2.19E-02	920	2.02E+01	60000	24 hr	0%	Insignificant
Dibromochloromethane	124481	1.27E-04	920	1.17E-01	0.2	24 hr	117%	Significant
Dibromomethane (Methylene dibromide)	74953	5.88E-06	920	5.41E-03	66	24 hr	0%	Insignificant
Dichlorobenzene	106467	5.60E-03	920	5.15E+00	95	24 hr	11%	Insignificant
Dichlorodifluoromethane (Freon 12)	75718	5.78E-03	920	5.32E+00	500000	24 hr	0%	Insignificant
Dichloromethane (Methylene chloride)	75092	2.12E-02	920	1.95E+01	220	24 hr	18%	Insignificant
Diethyl sulfide	352932	3.15E-04	920	2.90E-01	7	24 hr	8%	Insignificant
Dimethyl disulfide	624920	5.23E-04	3,795	1.99E+00	56	10 min	7%	Insignificant
Dimethyl sulfide	75183	1.43E-02	3,795	5.41E+01	30	10 min	361%	Significant
Dodecane (n-Dodecane)	112403	1.53E-03	920	1.40E+00	175	24 hr	2%	Insignificant
Ethane	74840	1.10E-02	920	1.01E+01	14500	24 hr	0%	Insignificant
Ethanol	64175	4.30E-04	920	3.95E-01	19000	24 hr	0%	Insignificant
Ethyl acetate	141786	6.71E-03	920	6.18E+00	19000	24 hr	0%	Insignificant
Ethyl methyl sulfide	624895	1.13E-04	920	1.04E-01	7	24 hr	3%	Insignificant
Ethylbenzene	100414	2.09E-02	3,795	7.94E+01	19000	10 min	1%	Insignificant
Formaldehyde	50000	1.42E-05	920	1.31E-02	65	24 hr	0%	Insignificant
Heptane	142825	5.44E-03	920	5.01E+00	11000	24 hr	0%	Insignificant
Hexane	110543	1.08E-02	920	9.96E+00	7500	24 hr	0%	Insignificant
Hydrogen sulfide	7783064	4.42E-02	920	4.07E+01	7	24 hr	1162%	Significant
Hydrogen sulfide	7783064	4.42E-02	3,795	4.07E+01	13	10 min	626%	Significant
Indane (2,3-Dihydroindene)	496117	9.20E-05	920	8.46E-02	24	24 hr	1%	Insignificant
Isobutane (2-Methylpropane)	75285	1.92E-02	920	1.77E+01	3600	24 hr	1%	Insignificant
Isobutylbenzene	538932	2.21E-04	920	2.04E-01	62.5	24 hr	1%	Insignificant
Isoprene (2-Methyl-1,3-butadiene)	78795	4.56E-05	920	4.19E-02	0.1	24 hr	84%	Significant
Isopropylbenzene (Cumene)	98828	2.09E-03	920	1.93E+00	400	24 hr	1%	Insignificant
Mercury (total)	7439976	1.77E-06	920	1.63E-03	0.5	24 hr	1%	Insignificant
Mercury (elemental)	7439976	1.77E-06	920	1.63E-03	0.5	24 hr	1%	Insignificant
Methyl tert-butyl ether (MTBE)	1634044	4.22E-04	920	3.88E-01	7000	24 hr	0%	Insignificant
Methylcyclohexane	108872	5.13E-03	920	4.72E+00	8050	24 hr	0%	Insignificant
Methylcyclopentane	96377	2.22E-03	920	2.04E+00	3500	24 hr	0%	Insignificant
Naphthalene	91203	5.56E-04	920	5.11E-01	22.5	24 hr	5%	Insignificant
Naphthalene	91203	5.56E-04	3,795	5.11E-01	50	10 min	2%	Insignificant

Table C2. Insignificant Sources - Alternative 1 Scenario B

n-Butylbenzene	104518	3.70E-04	920	3.40E-01	150	24 hr	0%	Insignificant
Nonane	111842	1.23E-02	920	1.13E+01	5250	24 hr	0%	Insignificant
n-Propylbenzene (Propylbenzene)	103651	2.01E-03	920	1.85E+00	1250	24 hr	0%	Insignificant
Octane	111659	5.00E-03	3,795	1.90E+01	61800	10 min	0%	Insignificant
p-Cymene (1-Methyl-4-Isopropylbenzene)	99876	1.95E-02	920	1.79E+01	50	24 hr	72%	Significant
Pentane	109660	1.30E-02	920	1.20E+01	35500	24 hr	0%	Insignificant
Propane	74986	2.77E-02	920	2.55E+01	215000	24 hr	0%	Insignificant
Propene	115071	5.66E-03	920	5.21E+00	4000	24 hr	0%	Insignificant
Propyne	74997	6.17E-05	920	5.68E-02	8200	24 hr	0%	Insignificant
sec-Butylbenzene	135988	3.67E-04	920	3.38E-01	3	24 hr	23%	Insignificant
Styrene (Vinylbenzene)	100425	1.74E-03	920	1.60E+00	400	24 hr	1%	Insignificant
Tetrachloroethylene (Perchloroethylene)	127184	1.36E-02	920	1.26E+01	360	24 hr	7%	Insignificant
Tetrahydrofuran (Diethylene oxide)	109999	2.83E-03	920	2.61E+00	93000	24 hr	0%	Insignificant
Thiophene	110021	1.19E-03	920	1.10E+00	5	24 hr	44%	Insignificant
Toluene (Methyl benzene)	108883	1.10E-01	920	1.01E+02	2000	24 hr	10%	Insignificant
trans-1,2-Dichloroethene	156605	1.13E-04	920	1.04E-01	105	24 hr	0%	Insignificant
trans-1,3-Dichloropropene	10061026	4.24E-05	920	3.90E-02	2.25	24 hr	3%	Insignificant
trans-2-Butene	624646	2.37E-04	920	2.18E-01	2400	24 hr	0%	Insignificant
trans-2-Hexene	4050457	7.03E-05	920	6.47E-02	85	24 hr	0%	Insignificant
trans-2-Pentene	646048	9.86E-05	920	9.08E-02	300	24 hr	0%	Insignificant
Tribromomethane (Bromoform)	75252	1.27E-04	920	1.17E-01	55	24 hr	0%	Insignificant
Trichloroethylene (Trichloroethene)	79016	4.41E-03	920	4.06E+00	12	24 hr	68%	Significant
Undecane	1120214	1.06E-02	920	9.73E+00	175	24 hr	11%	Insignificant
Trichloromethane (Chloroform)	67663	3.43E-04	920	3.15E-01	1	24 hr	63%	Significant
Vinyl acetate	108054	0.00E+00	920	0.00E+00	1000	24 hr	0%	Insignificant
Vinyl chloride (Chloroethene)	75,014	3.60E-03	920	3.31E+00	1	24 hr	662%	Significant
Xylenes (o-, m-, p-, mixtures)	1330207	3.97E-02	920	3.65E+01	730	24 hr	10%	Insignificant
Xylenes (o-, m-, p-, mixtures)	1330207	3.97E-02	3,795	1.51E+02	3000	10 min	10%	Insignificant
Total Reduced Sulphur Compounds	N/A	0.00E+00	920	0.00E+00	7	24 hr	0%	Insignificant
Total Reduced Sulphur Compounds	N/A	0.00E+00	3,795	0.00E+00	13	10 min	0%	Insignificant
Tetramethylsilane	75763	9.76E-07	920	8.98E-04	650	24 hr	0%	Insignificant
Hexamethyldisiloxane	107460	2.06E-03	920	1.90E+00	1200	24 hr	0%	Insignificant
Octamethyltrisiloxane	107517	2.15E-04	920	1.98E-01	204	24 hr	0%	Insignificant
Decamethyltetrasiloxane	141628	2.63E-05	920	2.42E-02	0.5	24 hr	10%	Insignificant
Dodecamethylpentasiloxane	141639	2.83E-05	920	2.60E-02	0.75	24 hr	7%	Insignificant
Dodecamethylcyclohexasiloxane	540976	2.83E-05	920	2.60E-02	500	24 hr	0%	Insignificant
Decamethylcyclopentasiloxane	541026	4.16E-03	920	3.83E+00	500	24 hr	2%	Insignificant
Hexamethyltricyclosiloxane	541059	5.15E-04	920	4.74E-01	25	24 hr	4%	Insignificant
Octamethylcyclotetrasiloxane	556672	8.53E-03	920	7.85E+00	500	24 hr	3%	Insignificant
Trimethylsilanol	1066406	1.03E-02	920	9.45E+00	32.5	24 hr	58%	Significant

b) Contaminants without MECP limits

Screening concentrations compared to limits as per Table B-2A: De minimus Concentrations for Contaminants Not Listed in the ministry ACB List that Can Be Considered Insignificant in a Specific Situation

If substance **NOT** on ACB List **AND NOT** on Table B-2B List of Contaminants Excluded from de minimus level:
If < 0.1 µg/m³ (24-hour average) or < 0.3 µg/m³ (1/2-hr average), then impacts can be considered insignificant

Contaminant	CAS. NO	Total Emission Rate (g/s)	Rural Dispersion Factor (µg/m³ per g/s)	Estimated Screening Conc. (µg/m³)	De minimus Conc. (µg/m³)	Avg. Period	% of the De minimus Conc.	Insignificant ?
1-Methylcyclohexene	591491	8.85E-05	920	0.1	0.1	24 hr	163%	Significant
1-Propanethiol (n-Propyl mercaptan)	107039	3.86E-04	920	0.4	0.1	24 hr	710%	Significant
2,4-Dimethylhexane	589435	1.03E-03	920	0.9	0.1	24 hr	1891%	Significant
2,5-Dimethylhexane	592132	7.69E-04	920	0.7	0.1	24 hr	1414%	Significant
2-Ethyl-1-butene	760214	6.04E-05	920	0.1	0.1	24 hr	111%	Significant
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	6.21E-04	920	0.6	0.1	24 hr	1144%	Significant
2-Methyl-2-propanethiol (tert-Butylmercaptan)	75661	1.19E-03	920	1.1	0.1	24 hr	2186%	Significant
3,6-Dimethyloctane	15869940	4.53E-03	920	4.2	0.1	24 hr	8330%	Significant
3-Methyl-1-pentene	760203	2.38E-05	920	0.0	0.1	24 hr	44%	Insignificant
cis-1,4-Dimethylcyclohexane	624293	1.13E-03	920	1.0	0.1	24 hr	2076%	Significant
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	1.13E-03	920	1.0	0.1	24 hr	2076%	Significant
cis-2-Heptene	6443921	9.75E-05	920	0.1	0.1	24 hr	179%	Significant
cis-2-Octene	7642048	1.00E-03	920	0.9	0.1	24 hr	1841%	Significant
cis-3-Methyl-2-pentene	922623	6.11E-05	920	0.1	0.1	24 hr	112%	Significant
Ethyl mercaptan (Ethanediol)	75081	4.99E-04	920	0.5	0.1	24 hr	918%	Significant
Isopropyl mercaptan	75332	5.40E-04	920	0.5	0.1	24 hr	994%	Significant
Mercury (monomethyl)	51176126	0.00E+00	920	0.0	0.1	24 hr	0%	Insignificant
Mercury (dimethyl)	627441	0.00E+00	920	0.0	0.1	24 hr	0%	Insignificant

Table C2. Insignificant Sources - Alternative 1 Scenario B

Methanethiol (Methyl mercaptan)	74931	2.67E-03	920	2.5	0.1	24 hr	4916%	Significant
trans-1,2-Dimethylcyclohexane	6876239	1.84E-03	920	1.7	0.1	24 hr	3381%	Significant
trans-1,4-Dimethylcyclohexane	2207047	9.32E-04	920	0.9	0.1	24 hr	1716%	Significant
trans-2-Heptene	14686136	9.95E-06	920	0.0	0.1	24 hr	18%	Insignificant
trans-2-Octene	13389429	1.10E-03	920	1.0	0.1	24 hr	2017%	Significant
trans-3-Methyl-2-pentene	616126	5.29E-05	920	0.0	0.1	24 hr	97%	Insignificant
Trichlorofluoromethane (Freon 11)	91315616	1.38E-03	920	1.3	0.1	24 hr	2541%	Significant
Trimethylsilyl Fluoride	420564	5.33E-04	920	0.5	0.1	24 hr	980%	Significant
Methoxytrimethylsilane	1825612	3.43E-04	920	0.3	0.1	24 hr	630%	Significant
Ethoxytrimethylsilane	1825623	1.98E-04	920	0.2	0.1	24 hr	365%	Significant
Propoxytrimethylsilane	1825634	1.54E-04	920	0.1	0.1	24 hr	284%	Significant
Isopropoxytrimethylsilane	1825645	1.77E-04	920	0.2	0.1	24 hr	325%	Significant
Butoxytrimethylsilane	1825656	8.78E-05	920	0.1	0.1	24 hr	162%	Significant
1-methylbutoxytrimethylsilane	1825678	1.87E-04	920	0.2	0.1	24 hr	345%	Significant

Appendix C: Negligible Sources and Contaminants
Alternative 2 Scenario A

Table C1. Insignificant Sources

Negligible Sources

Source	Contaminants	Rational
Maintenance Welding Station	Weld Fume	as per Table B-3B of MECP Procedure Document
Landfill leachate aeration ponds, treatment facility, and storage ponds	Odour, other contaminants	Negligible compared to aggregate emissions
Finished compost screening, stockpiling, and bagging	Odour	Negligible compared to aggregate emissions

Sources that are Negligible Compared to Total Emissions

Source	Contaminants	Rational
Engines (Gen1 to Gen4)	Siloxanes, LFG	<5% of aggregate emission
Siloxane flare (Flare 3)	LFG, Products of combustion	<5% of aggregate emission
Compost material handling	Particulate matter	Negligible compared to aggregate emissions
Farm Mobile Equipment	Products of Combustion	Negligible compared to aggregate emissions

Natural gas fired comfort heating equipment with a total facility-wide heat input usage of less than 20 million KJ/hr

Units	KJ/hr	number of units	Total heat input (KJ/hr)
boiler	1319000	1	1,319,000
HVAC	475000	1	475,000
		Total	**1,794,000**

Table C2. Insignificant Sources - Alternative 2 Scenario A

Negligible Contaminants as per Section B-1 of MECP Procedure Document

The product of a conservative dispersion modelling factor (in micrograms per cubic metre per gram per second emission) and the aggregate facility-wide emission rate of a contaminant (using the appropriate averaging period) can be compared to the corresponding ministry POI Limit as a means to conservatively but simply assess POI concentrations as appropriate. As per section 7.2 of the document, the contaminants with less than 50% of the MECP limit were deemed negligible and excluded from the modeling.

Distance from Source (m)	Rural Dispersion Factor (µg/m³ per g/s)
250	2300

Source: Table B-1, Procedure for Preparing an ESDM Report

Averaging Period	1 hr	10 min	1/2 hr	24 hr	Annual
Rural Dispersion Factor (µg/m³ per g/s)	2300	3795	2760	920	184

a) Contaminants with MECP Limits

Contaminant	CAS. NO	Total Emission Rate (g/s)	Rural Dispersion Factor (µg/m³ / g/s)	Estimated Screening Conc. (µg/m3)	MECP Limit	Avg. Period	% of Limit	Insignificant ?
1,1,1-Trichloroethane	71556	3.72E-04	920	3.42E-01	115000	24 hr	0%	Insignificant
1,1,2,2-Tetrachloroethane	79345	3.55E-03	920	3.27E+00	0.1	24 hr	6536%	Significant
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	3.60E-05	920	3.31E-02	0.225	24 hr	29%	Insignificant
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	4.98E-04	920	4.58E-01	800000	24 hr	0%	Insignificant
1,1,2-Trichloroethane	79005	8.34E-04	920	7.67E-01	0.3	24 hr	511%	Significant
1,1-Dichloroethane	75343	8.14E-03	920	7.49E+00	165	24 hr	9%	Insignificant
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	6.14E-04	920	5.64E-01	10	24 hr	11%	Insignificant
1,2,3-Trimethylbenzene	526738	1.71E-03	920	1.57E+00	220	24 hr	1%	Insignificant
1,2,4-Trichlorobenzene	120821	3.95E-05	920	3.64E-02	400	24 hr	0%	Insignificant
1,2,4-Trimethylbenzene	95636	6.51E-03	920	5.99E+00	220	24 hr	5%	Insignificant
1,2-Dibromoethane (Ethylene dibromide)	106934	3.57E-05	920	3.28E-02	3	24 hr	2%	Insignificant
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	7.17E-04	920	6.59E-01	700000	24 hr	0%	Insignificant
1,2-Dichloroethane (Ethylene dichloride)	107062	6.22E-04	920	5.73E-01	2	24 hr	57%	Significant
1,2-Dichloroethene	540590	4.37E-02	920	4.02E+01	105	24 hr	77%	Significant
1,2-Dichloropropane	78875	2.32E-04	920	2.14E-01	2400	24 hr	0%	Insignificant
1,2-Diethylbenzene	135013	1.06E-04	920	9.72E-02	125	24 hr	0%	Insignificant
1,3,5-Trimethylbenzene	108678	2.96E-03	920	2.72E+00	220	24 hr	2%	Insignificant
1,3-Butadiene (Vinyl ethylene)	106990	3.55E-04	184	6.54E-02	2	Annual	7%	Insignificant
1,3-Diethylbenzene	141935	3.48E-04	920	3.20E-01	125	24 hr	1%	Insignificant
1,4-Diethylbenzene	105055	1.39E-03	920	1.28E+00	125	24 hr	2%	Insignificant
1,4-Dioxane (1,4-Diethylene dioxide)	123911	2.89E-05	920	2.66E-02	3500	24 hr	0%	Insignificant
1-Butene	106989	5.15E-03	920	4.74E+00	7000	24 hr	0%	Insignificant
2-Methylbutene	513359	4.22E-03	920	3.89E+00	530	24 hr	1%	Insignificant
1-Butene	106989	5.15E-03	920	4.74E+00	7000	24 hr	0%	Insignificant
2-Methylpropene	115117	2.44E-03	920	2.25E+00	7000	24 hr	0%	Insignificant
1-Ethyl-4-methylbenzene (4-Ethyl toluene)	622968	4.70E-03	920	4.33E+00	625	24 hr	1%	Insignificant
1-Heptene	592767	2.43E-03	920	2.23E+00	120	24 hr	4%	Insignificant
1-Hexene	592416	2.96E-04	920	2.72E-01	850	24 hr	0%	Insignificant
2-Methyl-1-pentene	763291	2.96E-04	920	2.72E-01	85	24 hr	1%	Insignificant
1-Methylcyclopentene	693890	8.19E-05	920	7.53E-02	405	24 hr	0%	Insignificant
1-Pentene	109671	6.10E-04	920	5.61E-01	2050	24 hr	0%	Insignificant
2,2,3-Trimethylbutane	464062	3.64E-05	920	3.35E-02	175	24 hr	0%	Insignificant
2,2,4-Trimethylpentane	540841	2.77E-03	920	2.55E+00	1750	24 hr	0%	Insignificant
2,2,5-Trimethylhexane	3522949	7.91E-04	920	7.28E-01	175	24 hr	1%	Insignificant
2,2-Dimethylbutane	75832	5.32E-04	920	4.89E-01	1750	24 hr	0%	Insignificant
2,2-Dimethylpentane	590352	2.41E-04	920	2.22E-01	175	24 hr	0%	Insignificant
2,2-Dimethylpropane	463821	7.82E-05	920	7.19E-02	35500	24 hr	0%	Insignificant
2,3,4-Trimethylpentane	565753	1.41E-03	920	1.30E+00	175	24 hr	1%	Insignificant
2,3-Dimethylbutane	79298	5.69E-04	920	5.24E-01	1750	24 hr	0%	Insignificant
2,3-Dimethylpentane	565593	1.23E-03	920	1.13E+00	1750	24 hr	0%	Insignificant
2,4-Dimethylpentane	108087	3.96E-04	920	3.65E-01	1750	24 hr	0%	Insignificant
2,5-Dimethylthiophene	638028	2.86E-04	920	2.63E-01	5	24 hr	11%	Insignificant
2-Butanone (Methyl ethyl ketone)	78933	1.14E-02	920	1.05E+01	1000	24 hr	2%	Insignificant
2-Ethylthiophene	872559	2.79E-04	920	2.57E-01	5	24 hr	10%	Insignificant
2-Ethyltoluene	611143	1.54E-03	920	1.41E+00	0.5	24 hr	565%	Significant
2-Hexanone (Methyl butyl ketone)	591786	2.43E-03	920	2.23E+00	150	24 hr	3%	Insignificant
2-Methyl-1-butene	563462	4.97E-04	920	4.57E-01	300	24 hr	0%	Insignificant
2-Methyl-2-butene	513359	4.22E-03	920	3.89E+00	530	24 hr	1%	Insignificant

Table C2. Insignificant Sources - Alternative 2 Scenario A								
2-Methylbutane	78784	6.45E-03	920	5.93E+00	35500	24 hr	0%	Insignificant
2-Methylheptane	592278	3.24E-03	920	2.98E+00	175	24 hr	3%	Insignificant
2-Methylhexane	591764	3.23E-03	920	2.98E+00	1535	24 hr	0%	Insignificant
2-Methylpentane	107835	2.35E-03	920	2.16E+00	1750	24 hr	0%	Insignificant
2-Propanol (Isopropyl alcohol)	67630	4.28E-03	920	3.94E+00	7300	24 hr	0%	Insignificant
3-Ethyltoluene	620144	3.71E-03	920	3.41E+00	62.5	24 hr	11%	Insignificant
3-Methylheptane	589811	3.45E-03	920	3.17E+00	175	24 hr	4%	Insignificant
3-Methylhexane	589344	4.48E-03	920	4.12E+00	1535	24 hr	1%	Insignificant
3-Methylpentane	96140	2.52E-03	920	2.32E+00	1750	24 hr	0%	Insignificant
3-Methylthiophene	616444	3.59E-04	920	3.30E-01	5	24 hr	13%	Insignificant
4-Methyl-1-pentene	691372	7.76E-05	920	7.14E-02	85	24 hr	0%	Insignificant
4-Methyl-2-pentanone (MIBK)	108101	3.50E-03	920	3.22E+00	1200	24 hr	1%	Insignificant
4-Methylheptane	589537	1.13E-03	920	1.04E+00	175	24 hr	1%	Insignificant
Acetaldehyde	75070	1.35E-04	920	1.24E-01	500	24 hr	0%	Insignificant
Acetaldehyde	75070	1.35E-04	2,760	1.24E-01	500	1/2 hr	0%	Insignificant
Acetone	67641	1.54E-02	920	1.42E+01	11880	24 hr	0%	Insignificant
Acetonitrile	75058	9.03E-04	920	8.31E-01	70	24 hr	2%	Insignificant
Benzene	71432	7.42E-03	184	1.36E+00	0.45	Annual	606%	Significant
Benzyl chloride	100447	9.06E-05	920	8.34E-02	0.1	24 hr	167%	Significant
Bromodichloromethane	75274	5.69E-05	920	5.23E-02	350	24 hr	0%	Insignificant
Bromomethane (Methyl bromide)	74839	7.89E-05	920	7.26E-02	1350	24 hr	0%	Insignificant
Butane	106978	1.43E-02	920	1.32E+01	3600	24 hr	1%	Insignificant
Carbon disulfide	75150	4.43E-04	920	4.07E-01	330	24 hr	0%	Insignificant
Carbon monoxide	630080	2.70E-02	2,760	7.46E+01	6000	1/2 hr	2%	Insignificant
Carbon tetrachloride	56235	4.86E-05	920	4.47E-02	2.4	24 hr	4%	Insignificant
Carbon tetrafluoride (Freon 14)	75730	5.26E-04	920	4.84E-01	900	24 hr	0%	Insignificant
Carbonyl sulfide (Carbon oxysulfide)	463581	2.90E-04	920	2.67E-01	13	24 hr	4%	Insignificant
Chlorobenzene	108907	2.15E-03	2,300	4.96E+00	3500	1 hr	0%	Insignificant
Chlorobenzene	108907	2.15E-03	3,795	4.96E+00	4500	10 min	0%	Insignificant
Chlorodifluoromethane (Freon 22)	75456	2.72E-03	920	2.50E+00	350000	24 hr	0%	Insignificant
Chloroethane (Ethyl chloride)	75003	1.01E-02	920	9.27E+00	5600	24 hr	0%	Insignificant
Chloromethane (Methyl chloride)	74873	4.87E-04	920	4.48E-01	320	24 hr	0%	Insignificant
cis-1,2-Dichloroethene	156592	4.75E-03	920	4.37E+00	105	24 hr	8%	Insignificant
cis-1,2-Dimethylcyclohexane	2207014	3.60E-04	920	3.31E-01	175	24 hr	0%	Insignificant
cis-1,3-Dichloropropene	10061015	1.33E-05	920	1.22E-02	2.25	24 hr	1%	Insignificant
cis-1,3-Dimethylcyclohexane	638040	2.22E-03	920	2.05E+00	175	24 hr	2%	Insignificant
cis-2-Butene	590181	2.33E-04	920	2.14E-01	2400	24 hr	0%	Insignificant
cis-2-Hexene	7688213	5.73E-05	920	5.27E-02	85	24 hr	0%	Insignificant
cis-2-Pentene	627203	1.33E-04	920	1.22E-01	0.5	24 hr	49%	Insignificant
Cyclohexane	110827	3.36E-03	920	3.09E+00	6100	24 hr	0%	Insignificant
Cyclohexene	110838	5.98E-05	920	5.50E-02	5000	24 hr	0%	Insignificant
Cyclopentane	287923	6.13E-05	920	5.64E-02	1700	24 hr	0%	Insignificant
Cyclopentene	142290	3.26E-05	920	3.00E-02	25	24 hr	0%	Insignificant
Decane	124185	2.14E-02	920	1.97E+01	60000	24 hr	0%	Insignificant
Dibromochloromethane	124481	1.24E-04	920	1.14E-01	0.2	24 hr	114%	Significant
Dibromomethane (Methylene dibromide)	74953	5.74E-06	920	5.28E-03	66	24 hr	0%	Insignificant
Dichlorobenzene	106467	5.47E-03	920	5.03E+00	95	24 hr	11%	Insignificant
Dichlorodifluoromethane (Freon 12)	75718	5.64E-03	920	5.19E+00	500000	24 hr	0%	Insignificant
Dichloromethane (Methylene chloride)	75092	2.07E-02	920	1.90E+01	220	24 hr	17%	Insignificant
Diethyl sulfide	352932	3.08E-04	920	2.83E-01	7	24 hr	8%	Insignificant
Dimethyl disulfide	624920	5.10E-04	3,795	1.94E+00	56	10 min	7%	Insignificant
Dimethyl sulfide	75183	1.39E-02	3,795	5.28E+01	30	10 min	352%	Significant
Dodecane (n-Dodecane)	112403	1.49E-03	920	1.37E+00	175	24 hr	2%	Insignificant
Ethane	74840	1.08E-02	920	9.90E+00	14500	24 hr	0%	Insignificant
Ethanol	64175	4.19E-04	920	3.86E-01	19000	24 hr	0%	Insignificant
Ethyl acetate	141786	6.55E-03	920	6.03E+00	19000	24 hr	0%	Insignificant
Ethyl methyl sulfide	624895	1.11E-04	920	1.02E-01	7	24 hr	3%	Insignificant
Ethylbenzene	100414	2.04E-02	3,795	7.75E+01	19000	10 min	1%	Insignificant
Formaldehyde	50000	1.39E-05	920	1.28E-02	65	24 hr	0%	Insignificant
Heptane	142825	5.31E-03	920	4.89E+00	11000	24 hr	0%	Insignificant
Hexane	110543	1.06E-02	920	9.72E+00	7500	24 hr	0%	Insignificant
Hydrogen sulfide	7783064	4.31E-02	920	3.97E+01	7	24 hr	1134%	Significant
Hydrogen sulfide	7783064	4.31E-02	3,795	3.97E+01	13	10 min	611%	Significant
Indane (2,3-Dihydroindene)	496117	8.98E-05	920	8.26E-02	24	24 hr	1%	Insignificant
Isobutane (2-Methylpropane)	75285	1.88E-02	920	1.73E+01	3600	24 hr	1%	Insignificant
Isobutylbenzene	538932	2.16E-04	920	1.99E-01	62.5	24 hr	1%	Insignificant
Isoprene (2-Methyl-1,3-butadiene)	78795	4.45E-05	920	4.09E-02	0.1	24 hr	82%	Significant
Isopropylbenzene (Cumene)	98828	2.04E-03	920	1.88E+00	400	24 hr	1%	Insignificant
Mercury (total)	7439976	1.72E-06	920	1.59E-03	0.5	24 hr	1%	Insignificant
Mercury (elemental)	7439976	1.72E-06	920	1.59E-03	0.5	24 hr	1%	Insignificant
Methyl tert-butyl ether (MTBE)	1634044	4.11E-04	920	3.79E-01	7000	24 hr	0%	Insignificant
Methylcyclohexane	108872	5.01E-03	920	4.61E+00	8050	24 hr	0%	Insignificant
Methylcyclopentane	96377	2.16E-03	920	1.99E+00	3500	24 hr	0%	Insignificant
Naphthalene	91203	5.42E-04	920	4.99E-01	22.5	24 hr	4%	Insignificant
Naphthalene	91203	5.42E-04	3,795	4.99E-01	50	10 min	2%	Insignificant

Table C2. Insignificant Sources - Alternative 2 Scenario A

n-Butylbenzene	104518	3.61E-04	920	3.32E-01	150	24 hr	0%	Insignificant
Nonane	111842	1.20E-02	920	1.11E+01	5250	24 hr	0%	Insignificant
n-Propylbenzene (Propylbenzene)	103651	1.96E-03	920	1.81E+00	1250	24 hr	0%	Insignificant
Octane	111659	4.88E-03	3,795	1.85E+01	61800	10 min	0%	Insignificant
p-Cymene (1-Methyl-4-Isopropylbenzene)	99876	1.90E-02	920	1.75E+01	50	24 hr	70%	Significant
Pentane	109660	1.27E-02	920	1.17E+01	35500	24 hr	0%	Insignificant
Propane	74986	2.70E-02	920	2.49E+01	215000	24 hr	0%	Insignificant
Propene	115071	5.53E-03	920	5.08E+00	4000	24 hr	0%	Insignificant
Propyne	74997	6.02E-05	920	5.54E-02	8200	24 hr	0%	Insignificant
sec-Butylbenzene	135988	3.58E-04	920	3.30E-01	3	24 hr	22%	Insignificant
Styrene (Vinylbenzene)	100425	1.69E-03	920	1.56E+00	400	24 hr	1%	Insignificant
Tetrachloroethylene (Perchloroethylene)	127184	1.33E-02	920	1.23E+01	360	24 hr	7%	Insignificant
Tetrahydrofuran (Diethylene oxide)	109999	2.76E-03	920	2.54E+00	93000	24 hr	0%	Insignificant
Thiophene	110021	1.16E-03	920	1.07E+00	5	24 hr	43%	Insignificant
Toluene (Methyl benzene)	108883	1.08E-01	920	9.89E+01	2000	24 hr	10%	Insignificant
trans-1,2-Dichloroethene	156605	1.10E-04	920	1.01E-01	105	24 hr	0%	Insignificant
trans-1,3-Dichloropropene	10061026	4.14E-05	920	3.81E-02	2.25	24 hr	3%	Insignificant
trans-2-Butene	624646	2.31E-04	920	2.12E-01	2400	24 hr	0%	Insignificant
trans-2-Hexene	4050457	6.86E-05	920	6.31E-02	85	24 hr	0%	Insignificant
trans-2-Pentene	646048	9.63E-05	920	8.86E-02	300	24 hr	0%	Insignificant
Tribromomethane (Bromoform)	75252	1.24E-04	920	1.14E-01	55	24 hr	0%	Insignificant
Trichloroethylene (Trichloroethene)	79016	4.30E-03	920	3.96E+00	12	24 hr	66%	Significant
Undecane	1120214	1.03E-02	920	9.50E+00	175	24 hr	11%	Insignificant
Trichloromethane (Chloroform)	67663	3.34E-04	920	3.08E-01	1	24 hr	62%	Significant
Vinyl acetate	108054	0.00E+00	920	0.00E+00	1000	24 hr	0%	Insignificant
Vinyl chloride (Chloroethene)	75,014	3.51E-03	920	3.23E+00	1	24 hr	646%	Significant
Xylenes (o-, m-, p-, mixtures)	1330207	3.88E-02	920	3.57E+01	730	24 hr	10%	Insignificant
Xylenes (o-, m-, p-, mixtures)	1330207	3.88E-02	3,795	1.47E+02	3000	10 min	10%	Insignificant
Total Reduced Sulphur Compounds	N/A	0.00E+00	920	0.00E+00	7	24 hr	0%	Insignificant
Total Reduced Sulphur Compounds	N/A	0.00E+00	3,795	0.00E+00	13	10 min	0%	Insignificant
Tetramethylsilane	75763	9.52E-07	920	8.76E-04	650	24 hr	0%	Insignificant
Hexamethyldisiloxane	107460	2.01E-03	920	1.85E+00	1200	24 hr	0%	Insignificant
Octamethyltrisiloxane	107517	2.10E-04	920	1.93E-01	204	24 hr	0%	Insignificant
Decamethyltetrasiloxane	141628	2.57E-05	920	2.37E-02	0.5	24 hr	9%	Insignificant
Dodecamethylpentasiloxane	141639	2.76E-05	920	2.54E-02	0.75	24 hr	7%	Insignificant
Dodecamethylcyclohexasiloxane	540976	2.76E-05	920	2.54E-02	500	24 hr	0%	Insignificant
Decamethylcyclopentasiloxane	541026	4.06E-03	920	3.74E+00	500	24 hr	1%	Insignificant
Hexamethyltricyclosiloxane	541059	5.03E-04	920	4.63E-01	25	24 hr	4%	Insignificant
Octamethylcyclotetrasiloxane	556672	8.32E-03	920	7.66E+00	500	24 hr	3%	Insignificant
Trimethylsilanol	1066406	1.00E-02	920	9.22E+00	32.5	24 hr	57%	Significant

b) Contaminants without MECP limits

Screening concentrations compared to limits as per Table B-2A: De minimus Concentrations for Contaminants Not Listed in the ministry ACB List that Can Be Considered Insignificant in a Specific Situation

If substance **NOT** on ACB List **AND NOT** on Table B-2B List of Contaminants Excluded from de minimus level:
If < 0.1 µg/m³ (24-hour average) or < 0.3 µg/m³ (1/2-hr average), then impacts can be considered insignificant

Contaminant	CAS. NO	Total Emission Rate (g/s)	Rural Dispersion Factor (µg/m³ per g/s)	Estimated Screening Conc. (µg/m³)	De minimus Conc. (µg/m³)	Avg. Period	% of the De minimus Conc.	Insignificant ?
1-Methylcyclohexene	591491	8.64E-05	920	0.1	0.1	24 hr	159%	Significant
1-Propanethiol (n-Propyl mercaptan)	107039	3.77E-04	920	0.3	0.1	24 hr	693%	Significant
2,4-Dimethylhexane	589435	1.00E-03	920	0.9	0.1	24 hr	1846%	Significant
2,5-Dimethylhexane	592132	7.50E-04	920	0.7	0.1	24 hr	1380%	Significant
2-Ethyl-1-butene	760214	5.89E-05	920	0.1	0.1	24 hr	108%	Significant
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	6.06E-04	920	0.6	0.1	24 hr	1116%	Significant
2-Methyl-2-propanethiol (tert-Butylmercaptan)	75661	1.16E-03	920	1.1	0.1	24 hr	2133%	Significant
3,6-Dimethyloctane	15869940	4.42E-03	920	4.1	0.1	24 hr	8129%	Significant
3-Methyl-1-pentene	760203	2.33E-05	920	0.0	0.1	24 hr	43%	Insignificant
cis-1,4-Dimethylcyclohexane	624293	1.10E-03	920	1.0	0.1	24 hr	2025%	Significant
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	1.10E-03	920	1.0	0.1	24 hr	2025%	Significant
cis-2-Heptene	6443921	9.52E-05	920	0.1	0.1	24 hr	175%	Significant
cis-2-Octene	7642048	9.76E-04	920	0.9	0.1	24 hr	1797%	Significant
cis-3-Methyl-2-pentene	922623	5.96E-05	920	0.1	0.1	24 hr	110%	Significant
Ethyl mercaptan (Ethanediol)	75081	4.87E-04	920	0.4	0.1	24 hr	895%	Significant
Isopropyl mercaptan	75332	5.27E-04	920	0.5	0.1	24 hr	970%	Significant
Mercury (monomethyl)	51176126	0.00E+00	920	0.0	0.1	24 hr	0%	Insignificant
Mercury (dimethyl)	627441	0.00E+00	920	0.0	0.1	24 hr	0%	Insignificant

Table C2. Insignificant Sources - Alternative 2 Scenario A								
Methanethiol (Methyl mercaptan)	74931	2.61E-03	920	2.4	0.1	24 hr	4797%	Significant
trans-1,2-Dimethylcyclohexane	6876239	1.79E-03	920	1.6	0.1	24 hr	3299%	Significant
trans-1,4-Dimethylcyclohexane	2207047	9.10E-04	920	0.8	0.1	24 hr	1674%	Significant
trans-2-Heptene	14686136	9.71E-06	920	0.0	0.1	24 hr	18%	Insignificant
trans-2-Octene	13389429	1.07E-03	920	1.0	0.1	24 hr	1968%	Significant
trans-3-Methyl-2-pentene	616126	5.16E-05	920	0.0	0.1	24 hr	95%	Insignificant
Trichlorofluoromethane (Freon 11)	91315616	1.35E-03	920	1.2	0.1	24 hr	2480%	Significant
Trimethylsilyl Fluoride	420564	5.20E-04	920	0.5	0.1	24 hr	957%	Significant
Methoxytrimethylsilane	1825612	3.34E-04	920	0.3	0.1	24 hr	615%	Significant
Ethoxytrimethylsilane	1825623	1.93E-04	920	0.2	0.1	24 hr	356%	Significant
Propoxytrimethylsilane	1825634	1.50E-04	920	0.1	0.1	24 hr	277%	Significant
Isopropoxytrimethylsilane	1825645	1.72E-04	920	0.2	0.1	24 hr	317%	Significant
Butoxytrimethylsilane	1825656	8.57E-05	920	0.1	0.1	24 hr	158%	Significant
1-methylbutoxytrimethylsilane	1825678	1.83E-04	920	0.2	0.1	24 hr	336%	Significant

Appendix C: Negligible Sources and Contaminants
Alternative 2 Scenario B

Table C1. Insignificant Sources

Negligible Sources

Source	Contaminants	Rational
Maintenance Welding Station	Weld Fume	as per Table B-3B of MECP Procedure Document
Landfill leachate aeration ponds, treatment facility, and storage ponds	Odour, other contaminants	Negligible compared to aggregate emissions
Finished compost screening, stockpiling, and bagging	Odour	Negligible compared to aggregate emissions

Sources that are Negligible Compared to Total Emissions

Source	Contaminants	Rational
Engines (Gen1 to Gen4)	Siloxanes, LFG	<5% of aggregate emission
Siloxane flare (Flare 3)	LFG, Products of combustion	<5% of aggregate emission
Compost material handling	Particulate matter	Negligible compared to aggregate emissions
Farm Mobile Equipment	Products of Combustion	Negligible compared to aggregate emissions

Natural gas fired comfort heating equipment with a total facility-wide heat input usage of less than 20 million KJ/hr

Units	KJ/hr	number of units	Total heat input (KJ/hr)
boiler	1319000	1	1,319,000
HVAC	475000	1	475,000
		Total	**1,794,000**

Table C2. Insignificant Sources - Alternative 2 Scenario B

Negligible Contaminants as per Section B-1 of MECP Procedure Document

The product of a conservative dispersion modelling factor (in micrograms per cubic metre per gram per second emission) and the aggregate facility-wide emission rate of a contaminant (using the appropriate averaging period) can be compared to the corresponding ministry POI Limit as a means to conservatively but simply assess POI concentrations as appropriate. As per section 7.2 of the document, the contaminants with less than 50% of the MECP limit were deemed negligible and excluded from the modeling.

Distance from Source (m)	Rural Dispersion Factor (μg/m³ per g/s)
250	2300

Source: Table B-1, Procedure for Preparing an ESDM Report

Averaging Period		1 hr	10 min	1/2 hr	24 hr	Annual
Rural Dispersion Factor ($\mu g/m^3$ per g/s)		2300	3795	2760	920	184

a) Contaminants with MECP Limits

Contaminant	CAS. NO	Total Emission Rate (g/s)	Rural Dispersion Factor (μg/m³ / g/s)	Estimated Screening Conc. (μg/m3)	MECP Limit	Avg. Period	% of Limit	Insignificant ?
1,1,1-Trichloroethane	71556	3.39E-04	920	3.12E-01	115000	24 hr	0%	Insignificant
1,1,2,2-Tetrachloroethane	79345	3.64E-03	920	3.35E+00	0.1	24 hr	6698%	Significant
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	3.69E-05	920	3.39E-02	0.225	24 hr	30%	Insignificant
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	5.10E-04	920	4.70E-01	800000	24 hr	0%	Insignificant
1,1,2-Trichloroethane	79005	8.54E-04	920	7.86E-01	0.3	24 hr	524%	Significant
1,1-Dichloroethane	75343	8.34E-03	920	7.68E+00	165	24 hr	9%	Insignificant
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	6.29E-04	920	5.78E-01	10	24 hr	12%	Insignificant
1,2,3-Trimethylbenzene	526738	1.75E-03	920	1.61E+00	220	24 hr	1%	Insignificant
1,2,4-Trichlorobenzene	120821	4.05E-05	920	3.73E-02	400	24 hr	0%	Insignificant
1,2,4-Trimethylbenzene	95636	6.67E-03	920	6.14E+00	220	24 hr	6%	Insignificant
1,2-Dibromoethane (Ethylene dibromide)	106934	3.66E-05	920	3.36E-02	3	24 hr	2%	Insignificant
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	7.34E-04	920	6.76E-01	700000	24 hr	0%	Insignificant
1,2-Dichloroethane (Ethylene dichloride)	107062	6.38E-04	920	5.87E-01	2	24 hr	59%	Significant
1,2-Dichloroethene	540590	4.48E-02	920	4.12E+01	105	24 hr	78%	Significant
1,2-Dichloropropane	78875	2.38E-04	920	2.19E-01	2400	24 hr	0%	Insignificant
1,2-Diethylbenzene	135013	1.08E-04	920	9.96E-02	125	24 hr	0%	Insignificant
1,3,5-Trimethylbenzene	108678	3.04E-03	920	2.79E+00	220	24 hr	3%	Insignificant
1,3-Butadiene (Vinyl ethylene)	106990	3.64E-04	184	6.70E-02	2	Annual	7%	Insignificant
1,3-Diethylbenzene	141935	3.56E-04	920	3.28E-01	125	24 hr	1%	Insignificant
1,4-Diethylbenzene	105055	1.43E-03	920	1.31E+00	125	24 hr	2%	Insignificant
1,4-Dioxane (1,4-Diethylene dioxide)	123911	2.96E-05	920	2.72E-02	3500	24 hr	0%	Insignificant
1-Butene	106989	5.28E-03	920	4.85E+00	7000	24 hr	0%	Insignificant
2-Methylbutene	513359	4.33E-03	920	3.98E+00	530	24 hr	2%	Insignificant
1-Butene	106989	5.28E-03	920	4.85E+00	7000	24 hr	0%	Insignificant
2-Methylpropene	115117	2.50E-03	920	2.30E+00	7000	24 hr	0%	Insignificant
1-Ethyl-4-methylbenzene (4-Ethyl toluene)	622968	4.82E-03	920	4.43E+00	625	24 hr	1%	Insignificant
1-Heptene	592767	2.49E-03	920	2.29E+00	120	24 hr	4%	Insignificant
1-Hexene	592416	3.03E-04	920	2.79E-01	850	24 hr	0%	Insignificant
2-Methyl-1-pentene	763291	3.03E-04	920	2.79E-01	85	24 hr	1%	Insignificant
1-Methylcyclopentene	693890	8.39E-05	920	7.72E-02	405	24 hr	0%	Insignificant
1-Pentene	109671	6.25E-04	920	5.75E-01	2050	24 hr	0%	Insignificant
2,2,3-Trimethylbutane	464062	3.73E-05	920	3.43E-02	175	24 hr	0%	Insignificant
2,2,4-Trimethylpentane	540841	2.84E-03	920	2.62E+00	1750	24 hr	0%	Insignificant
2,2,5-Trimethylhexane	3522949	8.11E-04	920	7.46E-01	175	24 hr	1%	Insignificant
2,2-Dimethylbutane	75832	5.45E-04	920	5.01E-01	1750	24 hr	0%	Insignificant
2,2-Dimethylpentane	590352	2.47E-04	920	2.27E-01	175	24 hr	0%	Insignificant
2,2-Dimethylpropane	463821	8.01E-05	920	7.37E-02	35500	24 hr	0%	Insignificant
2,3,4-Trimethylpentane	565753	1.44E-03	920	1.33E+00	175	24 hr	2%	Insignificant
2,3-Dimethylbutane	79298	5.83E-04	920	5.37E-01	1750	24 hr	0%	Insignificant
2,3-Dimethylpentane	565593	1.26E-03	920	1.16E+00	1750	24 hr	0%	Insignificant
2,4-Dimethylpentane	108087	4.06E-04	920	3.74E-01	1750	24 hr	0%	Insignificant
2,5-Dimethylthiophene	638028	2.93E-04	920	2.69E-01	5	24 hr	11%	Insignificant
2-Butanone (Methyl ethyl ketone)	78933	1.17E-02	920	1.08E+01	1000	24 hr	2%	Insignificant
2-Ethylthiophene	872559	2.86E-04	920	2.63E-01	5	24 hr	11%	Insignificant
2-Ethyltoluene	611143	1.57E-03	920	1.45E+00	0.5	24 hr	579%	Significant
2-Hexanone (Methyl butyl ketone)	591786	2.49E-03	920	2.29E+00	150	24 hr	3%	Insignificant
2-Methyl-1-butene	563462	5.09E-04	920	4.68E-01	300	24 hr	0%	Insignificant
2-Methyl-2-butene	513359	4.33E-03	920	3.98E+00	530	24 hr	2%	Insignificant
2-Methylbutane	78784	6.61E-03	920	6.08E+00	35500	24 hr	0%	Insignificant

Table C2. Insignificant Sources - Alternative 2 Scenario B

2-Methylheptane	592278	3.32E-03	920	3.05E+00	175	24 hr	3%	Insignificant
2-Methylhexane	591764	3.31E-03	920	3.05E+00	1535	24 hr	0%	Insignificant
2-Methylpentane	107835	2.40E-03	920	2.21E+00	1750	24 hr	0%	Insignificant
2-Propanol (Isopropyl alcohol)	67630	4.39E-03	920	4.03E+00	7300	24 hr	0%	Insignificant
3-Ethyltoluene	620144	3.80E-03	920	3.50E+00	62.5	24 hr	11%	Insignificant
3-Methylheptane	589811	3.53E-03	920	3.25E+00	175	24 hr	4%	Insignificant
3-Methylhexane	589344	4.59E-03	920	4.22E+00	1535	24 hr	1%	Insignificant
3-Methylpentane	96140	2.59E-03	920	2.38E+00	1750	24 hr	0%	Insignificant
3-Methylthiophene	616444	3.68E-04	920	3.39E-01	5	24 hr	14%	Insignificant
4-Methyl-1-pentene	691372	7.95E-05	920	7.31E-02	85	24 hr	0%	Insignificant
4-Methyl-2-pentanone (MIBK)	108101	3.58E-03	920	3.30E+00	1200	24 hr	1%	Insignificant
4-Methylheptane	589537	1.15E-03	920	1.06E+00	175	24 hr	1%	Insignificant
Acetaldehyde	75070	1.38E-04	920	1.27E-01	500	24 hr	0%	Insignificant
Acetaldehyde	75070	1.38E-04	2,760	1.27E-01	500	1/2 hr	0%	Insignificant
Acetone	67641	1.58E-02	920	1.45E+01	11880	24 hr	0%	Insignificant
Acetonitrile	75058	9.25E-04	920	8.51E-01	70	24 hr	2%	Insignificant
Benzene	71432	7.60E-03	184	1.40E+00	0.45	Annual	621%	Significant
Benzyl chloride	100447	9.29E-05	920	8.54E-02	0.1	24 hr	171%	Significant
Bromodichloromethane	75274	5.83E-05	920	5.36E-02	350	24 hr	0%	Insignificant
Bromomethane (Methyl bromide)	74839	8.08E-05	920	7.44E-02	1350	24 hr	0%	Insignificant
Butane	106978	1.47E-02	920	1.35E+01	3600	24 hr	1%	Insignificant
Carbon disulfide	75150	4.54E-04	920	4.17E-01	330	24 hr	0%	Insignificant
Carbon monoxide	630080	2.77E-02	2,760	7.65E+01	6000	1/2 hr	3%	Insignificant
Carbon tetrachloride	56235	4.98E-05	920	4.58E-02	2.4	24 hr	4%	Insignificant
Carbon tetrafluoride (Freon 14)	75730	5.39E-04	920	4.96E-01	900	24 hr	0%	Insignificant
Carbonyl sulfide (Carbon oxysulfide)	463581	2.97E-04	920	2.73E-01	13	24 hr	4%	Insignificant
Chlorobenzene	108907	2.21E-03	2,300	5.08E+00	3500	1 hr	0%	Insignificant
Chlorobenzene	108907	2.21E-03	3,795	5.08E+00	4500	10 min	0%	Insignificant
Chlorodifluoromethane (Freon 22)	75456	2.79E-03	920	2.57E+00	350000	24 hr	0%	Insignificant
Chloroethane (Ethyl chloride)	75003	1.03E-02	920	9.50E+00	5600	24 hr	0%	Insignificant
Chloromethane (Methyl chloride)	74873	4.99E-04	920	4.59E-01	320	24 hr	0%	Insignificant
cis-1,2-Dichloroethene	156592	4.87E-03	920	4.48E+00	105	24 hr	9%	Insignificant
cis-1,2-Dimethylcyclohexane	2207014	3.68E-04	920	3.39E-01	175	24 hr	0%	Insignificant
cis-1,3-Dichloropropene	10061015	1.36E-05	920	1.25E-02	2.25	24 hr	1%	Insignificant
cis-1,3-Dimethylcyclohexane	638040	2.28E-03	920	2.10E+00	175	24 hr	2%	Insignificant
cis-2-Butene	590181	2.39E-04	920	2.20E-01	2400	24 hr	0%	Insignificant
cis-2-Hexene	7688213	5.87E-05	920	5.40E-02	85	24 hr	0%	Insignificant
cis-2-Pentene	627203	1.36E-04	920	1.25E-01	0.5	24 hr	50%	Significant
Cyclohexane	110827	3.45E-03	920	3.17E+00	6100	24 hr	0%	Insignificant
Cyclohexene	110838	6.13E-05	920	5.64E-02	5000	24 hr	0%	Insignificant
Cyclopentane	287923	6.28E-05	920	5.78E-02	1700	24 hr	0%	Insignificant
Cyclopentene	142290	3.34E-05	920	3.07E-02	25	24 hr	0%	Insignificant
Decane	124185	2.19E-02	920	2.02E+01	60000	24 hr	0%	Insignificant
Dibromochloromethane	124481	1.27E-04	920	1.17E-01	0.2	24 hr	117%	Significant
Dibromomethane (Methylene dibromide)	74953	5.88E-06	920	5.41E-03	66	24 hr	0%	Insignificant
Dichlorobenzene	106467	5.60E-03	920	5.15E+00	95	24 hr	11%	Insignificant
Dichlorodifluoromethane (Freon 12)	75718	5.78E-03	920	5.32E+00	500000	24 hr	0%	Insignificant
Dichloromethane (Methylene chloride)	75092	2.12E-02	920	1.95E+01	220	24 hr	18%	Insignificant
Diethyl sulfide	352932	3.15E-04	920	2.90E-01	7	24 hr	8%	Insignificant
Dimethyl disulfide	624920	5.23E-04	3,795	1.99E+00	56	10 min	7%	Insignificant
Dimethyl sulfide	75183	1.43E-02	3,795	5.41E+01	30	10 min	361%	Significant
Dodecane (n-Dodecane)	112403	1.53E-03	920	1.40E+00	175	24 hr	2%	Insignificant
Ethane	74840	1.10E-02	920	1.01E+01	14500	24 hr	0%	Insignificant
Ethanol	64175	4.30E-04	920	3.95E-01	19000	24 hr	0%	Insignificant
Ethyl acetate	141786	6.71E-03	920	6.18E+00	19000	24 hr	0%	Insignificant
Ethyl methyl sulfide	624895	1.13E-04	920	1.04E-01	7	24 hr	3%	Insignificant
Ethylbenzene	100414	2.09E-02	3,795	7.94E+01	19000	10 min	1%	Insignificant
Formaldehyde	50000	1.42E-05	920	1.31E-02	65	24 hr	0%	Insignificant
Heptane	142825	5.44E-03	920	5.01E+00	11000	24 hr	0%	Insignificant
Hexane	110543	1.08E-02	920	9.96E+00	7500	24 hr	0%	Insignificant
Hydrogen sulfide	7783064	4.42E-02	920	4.07E+01	7	24 hr	1162%	Significant
Hydrogen sulfide	7783064	4.42E-02	3,795	4.07E+01	13	10 min	626%	Significant
Indane (2,3-Dihydroindene)	496117	9.20E-05	920	8.46E-02	24	24 hr	1%	Insignificant
Isobutane (2-Methylpropane)	75285	1.92E-02	920	1.77E+01	3600	24 hr	1%	Insignificant
Isobutylbenzene	538932	2.21E-04	920	2.04E-01	62.5	24 hr	1%	Insignificant
Isoprene (2-Methyl-1,3-butadiene)	78795	4.56E-05	920	4.19E-02	0.1	24 hr	84%	Significant
Isopropylbenzene (Cumene)	98828	2.09E-03	920	1.93E+00	400	24 hr	1%	Insignificant
Mercury (total)	7439976	1.77E-06	920	1.63E-03	0.5	24 hr	1%	Insignificant
Mercury (elemental)	7439976	1.77E-06	920	1.63E-03	0.5	24 hr	1%	Insignificant
Methyl tert-butyl ether (MTBE)	1634044	4.22E-04	920	3.88E-01	7000	24 hr	0%	Insignificant
Methylcyclohexane	108872	5.13E-03	920	4.72E+00	8050	24 hr	0%	Insignificant
Methylcyclopentane	96377	2.22E-03	920	2.04E+00	3500	24 hr	0%	Insignificant
Naphthalene	91203	5.56E-04	920	5.11E-01	22.5	24 hr	5%	Insignificant
Naphthalene	91203	5.56E-04	3,795	5.11E-01	50	10 min	2%	Insignificant
n-Butylbenzene	104518	3.70E-04	920	3.40E-01	150	24 hr	0%	Insignificant

Table C2. Insignificant Sources - Alternative 2 Scenario B

Nonane	111842	1.23E-02	920	1.13E+01	5250	24 hr	0%	Insignificant
n-Propylbenzene (Propylbenzene)	103651	2.01E-03	920	1.85E+00	1250	24 hr	0%	Insignificant
Octane	111659	5.00E-03	3,795	1.90E+01	61800	10 min	0%	Insignificant
p-Cymene (1-Methyl-4-Isopropylbenzene)	99876	1.95E-02	920	1.79E+01	50	24 hr	72%	Significant
Pentane	109660	1.30E-02	920	1.20E+01	35500	24 hr	0%	Insignificant
Propane	74986	2.77E-02	920	2.55E+01	215000	24 hr	0%	Insignificant
Propene	115071	5.66E-03	920	5.21E+00	4000	24 hr	0%	Insignificant
Propyne	74997	6.17E-05	920	5.68E-02	8200	24 hr	0%	Insignificant
sec-Butylbenzene	135988	3.67E-04	920	3.38E-01	3	24 hr	23%	Insignificant
Styrene (Vinylbenzene)	100425	1.74E-03	920	1.60E+00	400	24 hr	1%	Insignificant
Tetrachloroethylene (Perchloroethylene)	127184	1.36E-02	920	1.26E+01	360	24 hr	7%	Insignificant
Tetrahydrofuran (Diethylene oxide)	109999	2.83E-03	920	2.61E+00	93000	24 hr	0%	Insignificant
Thiophene	110021	1.19E-03	920	1.10E+00	5	24 hr	44%	Insignificant
Toluene (Methyl benzene)	108883	1.10E-01	920	1.01E+02	2000	24 hr	10%	Insignificant
trans-1,2-Dichloroethene	156605	1.13E-04	920	1.04E-01	105	24 hr	0%	Insignificant
trans-1,3-Dichloropropene	10061026	4.24E-05	920	3.90E-02	2.25	24 hr	3%	Insignificant
trans-2-Butene	624646	2.37E-04	920	2.18E-01	2400	24 hr	0%	Insignificant
trans-2-Hexene	4050457	7.03E-05	920	6.47E-02	85	24 hr	0%	Insignificant
trans-2-Pentene	646048	9.86E-05	920	9.08E-02	300	24 hr	0%	Insignificant
Tribromomethane (Bromoform)	75252	1.27E-04	920	1.17E-01	55	24 hr	0%	Insignificant
Trichloroethylene (Trichloroethene)	79016	4.41E-03	920	4.06E+00	12	24 hr	68%	Significant
Undecane	1120214	1.06E-02	920	9.73E+00	175	24 hr	11%	Insignificant
Trichloromethane (Chloroform)	67663	3.43E-04	920	3.15E-01	1	24 hr	63%	Significant
Vinyl acetate	108054	0.00E+00	920	0.00E+00	1000	24 hr	0%	Insignificant
Vinyl chloride (Chloroethene)	75,014	3.60E-03	920	3.31E+00	1	24 hr	662%	Significant
Xylenes (o-, m-, p-, mixtures)	1330207	3.97E-02	920	3.65E+01	730	24 hr	10%	Insignificant
Xylenes (o-, m-, p-, mixtures)	1330207	3.97E-02	3,795	1.51E+02	3000	10 min	10%	Insignificant
Total Reduced Sulphur Compounds	N/A	0.00E+00	920	0.00E+00	7	24 hr	0%	Insignificant
Total Reduced Sulphur Compounds	N/A	0.00E+00	3,795	0.00E+00	13	10 min	0%	Insignificant
Tetramethylsilane	75763	9.76E-07	920	8.98E-04	650	24 hr	0%	Insignificant
Hexamethyldisiloxane	107460	2.06E-03	920	1.90E+00	1200	24 hr	0%	Insignificant
Octamethyltrisiloxane	107517	2.15E-04	920	1.98E-01	204	24 hr	0%	Insignificant
Decamethyltetrasiloxane	141628	2.63E-05	920	2.42E-02	0.5	24 hr	10%	Insignificant
Dodecamethylpentasiloxane	141639	2.83E-05	920	2.60E-02	0.75	24 hr	7%	Insignificant
Dodecamethylcyclohexasiloxane	540976	2.83E-05	920	2.60E-02	500	24 hr	0%	Insignificant
Decamethylcyclopentasiloxane	541026	4.16E-03	920	3.83E+00	500	24 hr	2%	Insignificant
Hexamethyltricyclosiloxane	541059	5.15E-04	920	4.74E-01	25	24 hr	4%	Insignificant
Octamethylcyclotetrasiloxane	556672	8.53E-03	920	7.85E+00	500	24 hr	3%	Insignificant
Trimethylsilanol	1066406	1.03E-02	920	9.45E+00	32.5	24 hr	58%	Significant

b) Contaminants without MECP limits

Screening concentrations compared to limits as per Table B-2A: De minimus Concentrations for Contaminants Not Listed in the ministry ACB List that Can Be Considered Insignificant in a Specific Situation

If substance **NOT** on ACB List **AND NOT** on Table B-2B List of Contaminants Excluded from de minimus level:
If < 0.1 µg/m³ (24-hour average) or < 0.3 µg/m³ (1/2-hr average), then impacts can be considered insignificant

Contaminant	CAS. NO	Total Emission Rate (g/s)	Rural Dispersion Factor (µg/m³ per g/s)	Estimated Screening Conc. (µg/m³)	De minimus Conc. (µg/m³)	Avg. Period	% of the De minimus Conc.	Insignificant ?
1-Methylcyclohexene	591491	8.85E-05	920	0.1	0.1	24 hr	163%	Significant
1-Propanethiol (n-Propyl mercaptan)	107039	3.86E-04	920	0.4	0.1	24 hr	710%	Significant
2,4-Dimethylhexane	589435	1.03E-03	920	0.9	0.1	24 hr	1891%	Significant
2,5-Dimethylhexane	592132	7.69E-04	920	0.7	0.1	24 hr	1414%	Significant
2-Ethyl-1-butene	760214	6.04E-05	920	0.1	0.1	24 hr	111%	Significant
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	6.21E-04	920	0.6	0.1	24 hr	1144%	Significant
2-Methyl-2-propanethiol (tert-Butylmercaptan)	75661	1.19E-03	920	1.1	0.1	24 hr	2186%	Significant
3,6-Dimethyloctane	15869940	4.53E-03	920	4.2	0.1	24 hr	8330%	Significant
3-Methyl-1-pentene	760203	2.38E-05	920	0.0	0.1	24 hr	44%	Insignificant
cis-1,4-Dimethylcyclohexane	624293	1.13E-03	920	1.0	0.1	24 hr	2076%	Significant
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	1.13E-03	920	1.0	0.1	24 hr	2076%	Significant
cis-2-Heptene	6443921	9.75E-05	920	0.1	0.1	24 hr	179%	Significant
cis-2-Octene	7642048	1.00E-03	920	0.9	0.1	24 hr	1841%	Significant
cis-3-Methyl-2-pentene	922623	6.11E-05	920	0.1	0.1	24 hr	112%	Significant
Ethyl mercaptan (Ethanediol)	75081	4.99E-04	920	0.5	0.1	24 hr	918%	Significant
Isopropyl mercaptan	75332	5.40E-04	920	0.5	0.1	24 hr	994%	Significant
Mercury (monomethyl)	51176126	0.00E+00	920	0.0	0.1	24 hr	0%	Insignificant
Mercury (dimethyl)	627441	0.00E+00	920	0.0	0.1	24 hr	0%	Insignificant
Methanethiol (Methyl mercaptan)	74931	2.67E-03	920	2.5	0.1	24 hr	4916%	Significant

Table C2. Insignificant Sources - Alternative 2 Scenario B

trans-1,2-Dimethylcyclohexane	6876239	1.84E-03	920	1.7	0.1	24 hr	3381%	Significant
trans-1,4-Dimethylcyclohexane	2207047	9.32E-04	920	0.9	0.1	24 hr	1716%	Significant
trans-2-Heptene	14686136	9.95E-06	920	0.0	0.1	24 hr	18%	Insignificant
trans-2-Octene	13389429	1.10E-03	920	1.0	0.1	24 hr	2017%	Significant
trans-3-Methyl-2-pentene	616126	5.29E-05	920	0.0	0.1	24 hr	97%	Insignificant
Trichlorofluoromethane (Freon 11)	91315616	1.38E-03	920	1.3	0.1	24 hr	2541%	Significant
Trimethylsilyl Fluoride	420564	5.33E-04	920	0.5	0.1	24 hr	980%	Significant
Methoxytrimethylsilane	1825612	3.43E-04	920	0.3	0.1	24 hr	630%	Significant
Ethoxytrimethylsilane	1825623	1.98E-04	920	0.2	0.1	24 hr	365%	Significant
Propoxytrimethylsilane	1825634	1.54E-04	920	0.1	0.1	24 hr	284%	Significant
Isopropoxytrimethylsilane	1825645	1.77E-04	920	0.2	0.1	24 hr	325%	Significant
Butoxytrimethylsilane	1825656	8.78E-05	920	0.1	0.1	24 hr	162%	Significant
1-methylbutoxytrimethylsilane	1825678	1.87E-04	920	0.2	0.1	24 hr	345%	Significant

APPENDIX D:
DISPERSION MODELLING

Project No.: 324000731

Map Created: 26/05/2023

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Figure D1

Dispersion Model Sources - GFL (Moose Creek,ON Facility) - Alternative 1 Scenario A

2400 Meadowpine Blvd, Suite 100
Mississauga, ON, Canada

Legend

- Facility Boundary
- Area Sources
- Volume Sources
- Point Sources

Project No.: 324000731

Map Created: 26/05/2023

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Figure D2

Dispersion Model Sources - GFL (Moose Creek,ON Facility) - Alternative 1 Scenario B

2400 Meadowpine Blvd, Suite 100
Mississauga, ON, Canada

Legend

- Facility Boundary
- Area Sources
- Volume Sources
- Point Sources

Project No.: 324000731

Map Created: 26/05/2023

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Figure D3

Dispersion Model Sources - GFL (Moose Creek,ON Facility) - Alternative 2 Scenario A

2400 Meadowpine Blvd, Suite 100
Mississauga, ON, Canada

Legend

- Facility Boundary
- Area Sources
- Volume Sources
- Point Sources

Project No.: 324000731

Map Created: 26/05/2023

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Figure D4

Dispersion Model Sources - GFL (Moose Creek,ON Facility) - Alternative 2 Scenario B

2400 Meadowpine Blvd, Suite 100
Mississauga, ON, Canada

Legend

- Facility Boundary
- Area Sources
- Volume Sources
- Point Sources
- Buildings

Project No.: 324000731

Map Created: 26/05/2023

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Figure D5

Dispersion Model Sources (South End) - GFL (Moose Creek,ON Facility)

2400 Meadowpine Blvd, Suite 100
Mississauga, ON, Canada

Legend

Facility Boundary

Sensitive Receptors

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Figure D6

Dispersion Model Sensitive Receptors - GFL (Moose Creek,ON Facility)

2400 Meadowpine Blvd, Suite 100
Mississauga, ON, Canada

Appendix D: Dispersion Modelling
Alternative 1 Scenario A

Table D1. Dispersion Modelling Input Summary Table

Relevant Section of the Regulation	Section Title	Description of How the Approved Dispersion Model was Used
Section 8	Negligible Sources	See Section 3 of this ESDM Report.
Section 9	Same Structure Contamination	Not Applicable
Section 10	Operating Conditions	See Section 4.1 of this ESDM Report.
Section 11	Source of Contaminant Emission Rates	See Section 4.2 of this ESDM Report.
Section 12	Combined Effect of Assumptions for Operating Conditions and Emission Rates	Not Applicable
Section 13	Meteorological Conditions	Site specific meteorological data provided by MECP
Section 14	Area of Modelling Coverage	Property Boundary Receptors and Multi Tier Receptor Grid in Accordance with ADMGO, over 13km x 13km domain.
Section 15	Stack Height for Certain New Sources of Contaminant	Not Applicable
Section 16	Terrain Data	Terrain files from MECP Website
Section 17	Averaging Periods	AERMOD set for 1 hour, 24 hour and annual averaging periods. Conversion to other periods as per ADMGO.

Table D2. Point Source Parameters - Alternative 1 Scenario A

Modelled Emission Rates

Model ID	Source	Emission Rates								
		LFG (base run)	Siloxane (base run)	CO	SO_2	HCL	NOx	PM	PM_{10}	$PM_{2.5}$
		(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)
GEN1	Reciprocating Engines	-	-	0.600	0.0171	0.0165	0.320	0.0616	0.0616	0.0616
GEN2		-	-	0.600	0.0171	0.0165	0.320	0.0616	0.0616	0.0616
GEN3		-	-	0.600	0.0171	0.0165	0.320	0.0616	0.0616	0.0616
GEN4		-	-	0.600	0.0171	0.0165	0.320	0.0616	0.0616	0.0616
Flare1	LFG Flare 1	0.014	0.143	3.459	0.0615	0.0594	0.187	0.078	0.078	0.078
Flare2	LFG Flare 2	0.026	0.257	6.226	0.111	0.107	0.337	0.140	0.140	0.140
Flare3	Enclosed Siloxane Flare	-	0.285	-	-	-	-	-	-	-

Modelled Discharge Parameters

Model ID	Source	UTM Coordinates*		Height Above Grade	Exit Temp.	Stack Diameter	Exit Velocity	Release Type
		X (m)	Y (m)	(m)	[K]	(m)	[m/s]	
GEN1	Reciprocating Engines	500582	5016784	5.6	782	0.25	28.5	Vertical
GEN2		500586	5016778	5.6	782	0.25	28.5	Vertical
GEN3		500590	5016773	5.6	782	0.25	28.5	Vertical
GEN4		500594	5016768	5.6	782	0.25	28.5	Vertical
Flare1	LFG Flare 1	500623	5016774	12.2	1144	3.05	11.3	Vertical
Flare2	LFG Flare 2	500631	5016765	12.2	1144	3.66	13.3	Vertical
Flare3	Enclosed Siloxane	500606	5016746	9.2	1144	0.77	2.7	Vertical

*UTM Zone 18

Table D3. Area Source Parameters - Alternative 1 Scenario A

Modelled Emission Rates

Source	Model ID	Emission Rate				Area	Modelled Emission Flux		
		Season	LFG (base run) (g/s)	Siloxane (base run) (g/s)	Odour (ou/s)	(m²)	LFG (base run) (g/s/m²)	Siloxane (base run) (g/s/m²)	Odour (ou/s/m²)
Previous Landfill (Stages 1 to Stage 5)	STG1	-	0.146	0.0479	953	244,000	5.9915E-07	1.9641E-07	0.00391
	STG2	-	0.146	0.0479	953	244,000	5.9915E-07	1.9641E-07	0.00391
	STG3	-	0.146	0.0479	953	244,000	5.9915E-07	1.9641E-07	0.00391
	STG4	-	0.205	0.0672	1,336	342,000	5.9915E-07	1.9641E-07	0.00391
	STG5	-	0.062	0.0202	402	102,948	5.9915E-07	1.9641E-07	0.00391
New Landfill	STG6	-	0.255	0.0835	3,110	424,976	5.9915E-07	1.9641E-07	0.00732
Compost Curing Windrows (Windrows 1 to 12)	CURING	Winter	-	-	1,715	4,875	-	-	0.3518
		Spring	-	-	20,794		-	-	4.2655
		Summer	-	-	39,874		-	-	8.1792
		Fall	-	-	20,794		-	-	4.2655
Leaf & Yard Waste Stockpile 1	LFYD_1	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	2.0226
		Fall	-	-	1,739		-	-	1.5527
Leaf & Yard Waste Stockpile 2	LFYD_2	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	2.0226
		Fall	-	-	1,739		-	-	1.5527

Table D3. Area Source Parameters - Alternative 1 Scenario A									
Leaf & Yard Waste Stockpile 3	LFYD_3	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	2.0226
		Fall	-	-	1,739		-	-	1.5527
Leaf & Yard Waste Stockpile 4	LFYD_4	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	2.0226
		Fall	-	-	1,739		-	-	1.5527
Leaf & Yard Waste Stockpile 5	LFYD_5	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	2.0226
		Fall	-	-	1,739		-	-	1.5527
Leaf & Yard Waste Stockpile 6	LFYD_6	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	2.0226
		Fall	-	-	1,739		-	-	1.5527

Table D3. Area Source Parameters - Alternative 1 Scenario A

Modelled Discharge Parameters

Source	**Model ID**	**Release Height** (m)	**Sigma Z** (m)	**UTM Coordinates*** X (m)	Y (m)	**Length X** (m)	**Length Y** (m)	**Rotation Angle** (deg)
Previous Landfill (Stages 1 to Stage 5)	STG1	0	0	500000	5016531	847.2	288.0	-30
	STG2	0	0	499670	5017100	847.2	288.0	-30
	STG3	0	0	499832	5016813	847.2	288.0	-30
	STG4	0	0	499501	5017389	847.2	403.7	-30
	STG5	0	0	499459	5017876	514.8	200.0	-30
New Landfill (Stages 6 to 9)	STG6	0	0	500811	5017004	1,055.0	402.8	-30
	STG7	0	0	500581	5017405	1,055.0	402.8	-30
	STG8	0	0	500356	5017807	1,055.0	402.8	-30
	STG9	0	0	500630	5018465	500.0	200.0	-30
Compost Curing Windrows (Windrows 1 to 12)	CURING	1.00	0.93	500330	5016527	65.0	75.0	58.41
Leaf & Yard Waste Stockpile 1	LFYD_1	2.00	1.86	500199	5016364	140.0	8.0	58.56
Leaf & Yard Waste Stockpile 2	LFYD_2	2.00	1.86	500213	5016373	140.0	8.0	58.56
Leaf & Yard Waste Stockpile 3	LFYD_3	2.00	1.86	500228	5016382	140.0	8.0	58.56
Leaf & Yard Waste Stockpile 4	LFYD_4	2.00	1.86	500242	5016391	140.0	8.0	58.56
Leaf & Yard Waste Stockpile 5	LFYD_5	2.00	1.86	500257	5016400	140.0	8.0	58.56
Leaf & Yard Waste Stockpile 6	LFYD_6	2.00	1.86	500271	5016409	140.0	8.0	58.56

*UTM Zone 18

Note: For Stage 1 to Stage 4, an additional 10 m height was added to base elevation estimated by AERMAP.

Table D4. Volume Source Parameters - Alternative 1 Scenario A

Modelled Emission Rates

Model ID	Source	Emission Rate					
		PM (g/s)	PM10 (g/s)	PM2.5 (g/s)	NOx (g/s)	CO (g/s)	Odour (ou/s)
BF1	Biofilter	-	-	-	-	-	603
BF2		-	-	-	-	-	603
BF3		-	-	-	-	-	603
WORKINGFACE	working face/construction	1.43	1.06	0.15	0.15	1.35	22,514
COMP_NROAD	Compost Mobile Equipment	0.01	0.01	0.01	0.21	1.79	-
P_ROAD	Paved Roads	1.60	0.32	0.08	0.02	0.01	-
UP_ROAD	Unpaved Roads	0.00	0.00	0.00	0.00	0.00	-

Modelled Discharge Parameters - Volume Sources

Model ID	Source	UTM Coordinates*		Release Height	Inititial Lateral Dim.	Initial Vertical Dim.	Side Length
		X (m)	Y (m)	(m)	(m)	(m)	(m)
BF1	Biofilter	500081	5016449	9	7	7	28
BF2		500105	5016464	9	7	7	28
BF3		500130	5016479	9	7	7	28
WORKINGFACE	working face/construction	501537	5017642	0	35	1	149
COMP_NROAD	Compost Mobile Equipment	500383	5016359	0	54	1	231

Modelled Discharge Parameters - Line Volume Sources

Model ID	Source	Node Coordinates*		Release Height	Plume Height	Plume Width	Config.
		X m	Y m	(m)	(m)	(m)	
P_ROAD	Paved Roads	501111	5017039	2.55	5.1	13	Adjacent
		501054	5017125				
		501746	5017517				
		501641	5017708				

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Table D5. Facility Boundary and Buildings

Facility Boundary Coordinates

Point No.	UTM Coordinates*		Point No.	UTM Coordinates*	
	X (m)	Y (m)		X (m)	Y (m)
Point 1	498995	5018155	Point 9	501888	5017726
Point 2	501035	5019002	Point 10	501806	5017678
Point 3	501116	5018960	Point 11	501897	5017518
Point 4	501215	5018969	Point 12	500814	5016872
Point 5	501222	5018968	Point 13	501052	5016448
Point 6	501253	5018946	Point 14	500262	5015965
Point 7	501363	5018712	Point 15	500010	5016364
Point 8	501485	5018439			

Building Parameters

Building ID	No. of Points	No. of Tiers	Height (m)	UTM Coordinates*	
				X (m)	Y (m)
BLD_1	8	1	4.57	500559	5016784
				500563	5016787
				500560	5016791
				500572	5016800
				500581	5016787
				500569	5016779
				500565	5016784
				500561	5016781
BLD_2	4	1	2	500572	5016777
				500582	5016785
				500584	5016782
				500574	5016775
BLD_3	4	1	2	500576	5016772
				500586	5016779
				500588	5016777
				500578	5016769
BLD_4	4	1	2	500580	5016767
				500590	5016774
				500592	5016771
				500582	5016764
BLD_5	4	1	2	500584	5016762
				500594	5016769
				500596	5016766
				500586	5016759
BLD_6	4	1	2	500588	5016756
				500598	5016763
				500599	5016761
				500590	5016754

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Appendix D: Dispersion Modelling
Alternative 1 Scenario B

Table D1. Dispersion Modelling Input Summary Table

Relevant Section of the Regulation	Section Title	Description of How the Approved Dispersion Model was Used
Section 8	Negligible Sources	See Section 3 of this ESDM Report.
Section 9	Same Structure Contamination	Not Applicable
Section 10	Operating Conditions	See Section 4.1 of this ESDM Report.
Section 11	Source of Contaminant Emission Rates	See Section 4.2 of this ESDM Report.
Section 12	Combined Effect of Assumptions for Operating Conditions and Emission Rates	Not Applicable
Section 13	Meteorological Conditions	Site specific meteorological data provided by MECP
Section 14	Area of Modelling Coverage	Property Boundary Receptors and Multi Tier Receptor Grid in Accordance with ADMGO, over 13km x 13km domain.
Section 15	Stack Height for Certain New Sources of Contaminant	Not Applicable
Section 16	Terrain Data	Terrain files from MECP Website
Section 17	Averaging Periods	AERMOD set for 1 hour, 24 hour and annual averaging periods. Conversion to other periods as per ADMGO.

Table D2. Point Source Parameters - Alternative 1 Scenario B

Modelled Emission Rates

Model ID	Source	Emission Rates								
		LFG (base run)	Siloxane (base run)	CO	SO_2	HCL	NOx	PM	PM_{10}	$PM_{2.5}$
		(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)
GEN1	Reciprocating Engines	-	-	0.600	0.0171	0.0165	0.320	0.0616	0.0616	0.0616
GEN2		-	-	0.600	0.0171	0.0165	0.320	0.0616	0.0616	0.0616
GEN3		-	-	0.600	0.0171	0.0165	0.320	0.0616	0.0616	0.0616
GEN4		-	-	0.600	0.0171	0.0165	0.320	0.0616	0.0616	0.0616
Flare1	LFG Flare 1	0.016	0.174	4.778	0.0850	0.0820	0.259	0.107	0.107	0.107
Flare2	LFG Flare 2	0.028	0.314	8.601	0.153	0.148	0.466	0.193	0.193	0.193
Flare3	Enclosed Siloxane Flare	-	0.213	-	-	-	-	-	-	-

Modelled Discharge Parameters

Model ID	Source	UTM Coordinates*		Height Above Grade	Exit Temp.	Stack Diameter	Exit Velocity	Release Type
		X (m)	Y (m)	(m)	[K]	(m)	[m/s]	
GEN1	Reciprocating Engines	500582	5016784	5.6	782	0.25	28.5	Vertical
GEN2		500586	5016778	5.6	782	0.25	28.5	Vertical
GEN3		500590	5016773	5.6	782	0.25	28.5	Vertical
GEN4		500594	5016768	5.6	782	0.25	28.5	Vertical
Flare1	LFG Flare 1	500623	5016774	12.2	1144	3.05	11.3	Vertical
Flare2	LFG Flare 2	500631	5016765	12.2	1144	3.66	13.3	Vertical
Flare3	Enclosed Siloxane	500606	5016746	9.2	1144	0.77	2.7	Vertical

*UTM Zone 18

Table D3. Area Source Parameters - Alternative 1 Scenario B

Modelled Emission Rates

Source	Model ID	Emission Rate				Area	Emission Flux		
		Season	LFG (base run) (g/s)	Siloxane (base run) (g/s)	Odour (ou/s)	(m²)	LFG (base run) (g/s/m²)	Siloxane (base run) (g/s/m²)	Odour (ou/s/m²)
Previous Landfill (Stages 1 to Stage 5)	STG1	-	0.091	0.0285	497	244,000	3.7474E-07	1.1694E-07	0.00204
	STG2	-	0.091	0.0285	497	244,000	3.7474E-07	1.1694E-07	0.00204
	STG3	-	0.091	0.0285	497	244,000	3.7474E-07	1.1694E-07	0.00204
	STG4	-	0.128	0.0400	697	342,000	3.7474E-07	1.1694E-07	0.00204
	STG5	-	0.039	0.0120	210	102,948	3.7474E-07	1.1694E-07	0.00204
New Landfill (Stages 6 to 9)	STG6	-	0.159	0.0497	2,275	424,976	3.7474E-07	1.1694E-07	0.00535
	STG7	-	0.159	0.0497	2,275	424,976	3.7474E-07	1.1694E-07	0.00535
	STG8	-	0.159	0.0497	2,275	424,976	3.7474E-07	1.1694E-07	0.00535
	STG9	-	0.037	0.0117	535	100,020	3.7474E-07	1.1694E-07	0.00535
Compost Curing Windrows (Windrows 1 to 12)	CURING	Winter	-	-	1,715	4,875	-	-	0.3518
		Spring	-	-	20,794		-	-	4.2655
		Summer	-	-	39,874		-	-	8.1792
		Fall	-	-	20,794		-	-	4.2655
Leaf & Yard Waste Stockpile 1	LFYD_1	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	2.0226
		Fall	-	-	1,739		-	-	1.5527
Leaf & Yard Waste Stockpile 2	LFYD_2	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	2.0226
		Fall	-	-	1,739		-	-	1.5527

Leaf & Yard Waste Stockpile 3	LFYD_3	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	2.0226
		Fall	-	-	1,739		-	-	1.5527
Leaf & Yard Waste Stockpile 4	LFYD_4	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	2.0226
		Fall	-	-	1,739		-	-	1.5527
Leaf & Yard Waste Stockpile 5	LFYD_5	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	2.0226
		Fall	-	-	1,739		-	-	1.5527
Leaf & Yard Waste Stockpile 6	LFYD_6	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	2.0226
		Fall	-	-	1,739		-	-	1.5527

Modelled Discharge Parameters

Source	Model ID	Release Height	Sigma Z	UTM Coordinates*		Length X	Length Y	Rotation Angle
		(m)	(m)	X (m)	Y (m)	(m)	(m)	(deg)
Previous Landfill (Stages 1 to Stage 5)	STG1	0	0	500000	5016531	847.2	288.0	-30
	STG2	0	0	499670	5017100	847.2	288.0	-30
	STG3	0	0	499832	5016813	847.2	288.0	-30
	STG4	0	0	499501	5017389	847.2	403.7	-30
	STG5	0	0	499459	5017876	514.8	200.0	-30
New Landfill (Stages 6 to 9)	STG6	0	0	500811	5017004	1,055.0	402.8	-30
	STG7	0	0	500581	5017405	1,055.0	402.8	-30
	STG8	0	0	500356	5017807	1,055.0	402.8	-30
	STG9	0	0	500630	5018465	500.0	200.0	-30
Compost Curing Windrows (Windrows 1 to 12)	CURING	1.00	0.93	500330	5016527	65.0	75.0	58.41
Leaf & Yard Waste Stockpile 1	LFYD_1	2.00	1.86	500199	5016364	140.0	8.0	58.56
Leaf & Yard Waste Stockpile 2	LFYD_2	2.00	1.86	500213	5016373	140.0	8.0	58.56
Leaf & Yard Waste Stockpile 3	LFYD_3	2.00	1.86	500228	5016382	140.0	8.0	58.56
Leaf & Yard Waste Stockpile 4	LFYD_4	2.00	1.86	500242	5016391	140.0	8.0	58.56
Leaf & Yard Waste Stockpile 5	LFYD_5	2.00	1.86	500257	5016400	140.0	8.0	58.56
Leaf & Yard Waste Stockpile 6	LFYD_6	2.00	1.86	500271	5016409	140.0	8.0	58.56

*UTM Zone 18
Note: For Stage 1 to Stage 4, an additional 10 m height was added to base elevation estimated by AERMAP.

Table D4. Volume Source Parameters - Alternative 1 Scenario B

Modelled Emission Rates

Model ID	Source	Emission Rate					
		PM (g/s)	PM10 (g/s)	PM2.5 (g/s)	NOx (g/s)	CO (g/s)	Odour (ou/s)
BF1	Biofilter	-	-	-	-	-	603
BF2		-	-	-	-	-	603
BF3		-	-	-	-	-	603
WORKINGFACE	working face/construction	1.43	1.06	0.15	0.15	1.35	22,514
COMP_NROAD	Compost Mobile Equipment	0.01	0.01	0.01	0.21	1.79	-
P_ROAD	Paved Roads	3.40	0.68	0.17	0.05	0.01	-
UP_ROAD	Unpaved Roads	0.00	0.00	0.00	0.00	0.00	-

Modelled Discharge Parameters - Volume Sources

Model ID	Source	UTM Coordinates*		Release Height	Initial Lateral Dim.	Initial Vertical Dim.	Side Length
		X (m)	Y (m)	(m)	(m)	(m)	(m)
BF1	Biofilter	500081	5016449	9	7	7	28
BF2		500105	5016464	9	7	7	28
BF3		500130	5016479	9	7	7	28
WORKINGFACE	working face/construction	500802	5018676	0	35	1	149
COMP_NROAD	Compost Mobile Equipment	500383	5016359	0	54	1	231

Modelled Discharge Parameters - Line Volume Sources

Model ID	Source	Node Coordinates*		Release Height	Plume Height	Plume Width	Config.
		X m	Y m	(m)	(m)	(m)	
P_ROAD	Paved Roads	501111	5017039	2.55	5.1	13	Adjacent
		501054	5017125				
		501746	5017517				
		501029	5018805				

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Table D5. Facility Boundary and Buildings

Facility Boundary Coordinates

Point No.	UTM Coordinates*		Point No.	UTM Coordinates*	
	X (m)	Y (m)		X (m)	Y (m)
Point 1	498995	5018155	Point 9	501888	5017726
Point 2	501035	5019002	Point 10	501806	5017678
Point 3	501116	5018960	Point 11	501897	5017518
Point 4	501215	5018969	Point 12	500814	5016872
Point 5	501222	5018968	Point 13	501052	5016448
Point 6	501253	5018946	Point 14	500262	5015965
Point 7	501363	5018712	Point 15	500010	5016364
Point 8	501485	5018439			

Building Parameters

Building ID	No. of Points	No. of Tiers	Height (m)	UTM Coordinates*	
				X (m)	Y (m)
BLD_1	8	1	4.57	500559	5016784
				500563	5016787
				500560	5016791
				500572	5016800
				500581	5016787
				500569	5016779
				500565	5016784
				500561	5016781
BLD_2	4	1	2	500572	5016777
				500582	5016785
				500584	5016782
				500574	5016775
BLD_3	4	1	2	500576	5016772
				500586	5016779
				500588	5016777
				500578	5016769
BLD_4	4	1	2	500580	5016767
				500590	5016774
				500592	5016771
				500582	5016764
BLD_5	4	1	2	500584	5016762
				500594	5016769
				500596	5016766
				500586	5016759
BLD_6	4	1	2	500588	5016756
				500598	5016763
				500599	5016761
				500590	5016754

*UTM Zone 18

Appendix D: Dispersion Modelling
Alternative 2 Scenario A

Table D1. Dispersion Modelling Input Summary Table

Relevant Section of the Regulation	Section Title	Description of How the Approved Dispersion Model was Used
Section 8	Negligible Sources	See Section 3 of this ESDM Report.
Section 9	Same Structure Contamination	Not Applicable
Section 10	Operating Conditions	See Section 4.1 of this ESDM Report.
Section 11	Source of Contaminant Emission Rates	See Section 4.2 of this ESDM Report.
Section 12	Combined Effect of Assumptions for Operating Conditions and Emission Rates	Not Applicable
Section 13	Meteorological Conditions	Site specific meteorological data provided by MECP
Section 14	Area of Modelling Coverage	Property Boundary Receptors and Multi Tier Receptor Grid in Accordance with ADMGO, over 13km x 13km domain.
Section 15	Stack Height for Certain New Sources of Contaminant	Not Applicable
Section 16	Terrain Data	Terrain files from MECP Website
Section 17	Averaging Periods	AERMOD set for 1 hour, 24 hour and annual averaging periods. Conversion to other periods as per ADMGO.

Table D2. Point Source Parameters - Alternative 2 Scenario A

Modelled Emission Rates

Model ID	Source	Emission Rates								
		LFG (base run)	Siloxane (base run)	CO	SO_2	HCL	NOx	PM	PM_{10}	$PM_{2.5}$
		(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)
GEN1	Reciprocating Engines	-	-	0.600	0.0171	0.0165	0.320	0.0616	0.0616	0.0616
GEN2		-	-	0.600	0.0171	0.0165	0.320	0.0616	0.0616	0.0616
GEN3		-	-	0.600	0.0171	0.0165	0.320	0.0616	0.0616	0.0616
GEN4		-	-	0.600	0.0171	0.0165	0.320	0.0616	0.0616	0.0616
Flare1	LFG Flare 1	0.015	0.172	4.627	0.0823	0.0794	0.251	0.104	0.104	0.104
Flare2	LFG Flare 2	0.028	0.309	8.329	0.148	0.143	0.451	0.187	0.187	0.187
Flare3	Enclosed Siloxane Flare	-	0.220	-	-	-	-	-	-	-

Modelled Discharge Parameters

Model ID	Source	UTM Coordinates*		Height Above Grade	Exit Temp.	Stack Diameter	Exit Velocity	Release Type
		X (m)	Y (m)	(m)	[K]	(m)	[m/s]	
GEN1	Reciprocating Engines	500582	5016784	5.6	782	0.25	28.5	Vertical
GEN2		500586	5016778	5.6	782	0.25	28.5	Vertical
GEN3		500590	5016773	5.6	782	0.25	28.5	Vertical
GEN4		500594	5016768	5.6	782	0.25	28.5	Vertical
Flare1	LFG Flare 1	500623	5016774	12.2	1144	3.05	11.3	Vertical
Flare2	LFG Flare 2	500631	5016765	12.2	1144	3.66	13.3	Vertical
Flare3	Enclosed Siloxane	500606	5016746	9.2	1144	0.77	2.7	Vertical

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Table D3. Area Source Parameters - Alternative 2 Scenario A

Modelled Emission Rates

Source	Model ID	Emission Rate				Area	Emission Flux		
		Season	LFG (base run) (g/s)	Siloxane (base run) (g/s)	Odour (ou/s)	(m^2)	LFG (base run) ($g/s/m^2$)	Siloxane (base run) ($g/s/m^2$)	Odour ($ou/s/m^2$)
Previous Landfill (Stages 1 to Stage 5)	STG1	-	0.091	0.0286	550	244,000	3.7405E-07	1.17244E-07	0.00225
	STG2	-	0.091	0.0286	550	244,000	3.7405E-07	1.17244E-07	0.00225
	STG3	-	0.091	0.0286	550	244,000	3.7405E-07	1.17244E-07	0.00225
	STG4	-	0.128	0.0401	771	342,000	3.7405E-07	1.17244E-07	0.00225
	STG5	-	0.039	0.0121	232	102,948	3.7405E-07	1.17244E-07	0.00225
New Landfill (Stages 6 to 9)	STG6	-	0.213	0.0668	2,837	570,062	3.7405E-07	1.17244E-07	0.00498
	STG7	-	0.213	0.0668	2,837	570,062	3.7405E-07	1.17244E-07	0.00498
	STG8	-	0.090	0.0282	1,197	240,403	3.7405E-07	1.17244E-07	0.00498
Compost Curing Windrows (Windrows 1 to 12)	CURING	Winter	-	-	1,715	4,875	-	-	0.3518
		Spring	-	-	20,794		-	-	4.2655
		Summer	-	-	39,874		-	-	**8.1792**
		Fall	-	-	20,794		-	-	4.2655
Leaf & Yard Waste Stockpile 1	LFYD_1	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	**2.0226**
		Fall	-	-	1,739		-	-	1.5527
Leaf & Yard Waste Stockpile 2	LFYD_2	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	2.0226
		Fall	-	-	1,739		-	-	1.5527

Leaf & Yard Waste Stockpile 3	LFYD_3	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	2.0226
		Fall	-	-	1,739		-	-	1.5527
Leaf & Yard Waste Stockpile 4	LFYD_4	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	2.0226
		Fall	-	-	1,739		-	-	1.5527
Leaf & Yard Waste Stockpile 5	LFYD_5	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	2.0226
		Fall	-	-	1,739		-	-	1.5527
Leaf & Yard Waste Stockpile 6	LFYD_6	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	2.0226
		Fall	-	-	1,739		-	-	1.5527

Modelled Discharge Parameters

Source	Model ID	Release Height	Sigma Z	UTM Coordinates*		Length X	Length Y	Rotation Angle
		(m)	(m)	X (m)	Y (m)	(m)	(m)	(deg)
Previous Landfill (Stages 1 to Stage 5)	STG1	0	0	500000	5016531	847.2	288.0	-30
	STG2	0	0	499670	5017100	847.2	288.0	-30
	STG3	0	0	499832	5016813	847.2	288.0	-30
	STG4	0	0	499501	5017389	847.2	403.7	-30
	STG5	0	0	499459	5017876	514.8	200.0	-30
New Landfill (Stages 6 to 9)	STG6	0	0	500811	5017004	400.0	1,425.0	-30
	STG7	0	0	501193	5017221	400.0	1,425.0	-30
	STG8	0	0	501451	5017646	200.0	1,183.0	-30
Compost Curing Windrows (Windrows 1 to 12)	CURING	1.00	0.93	500330	5016527	65.0	75.0	58.41
Leaf & Yard Waste Stockpile 1	LFYD_1	2.00	1.86	500199	5016364	140.0	8.0	58.56
Leaf & Yard Waste Stockpile 2	LFYD_2	2.00	1.86	500213	5016373	140.0	8.0	58.56
Leaf & Yard Waste Stockpile 3	LFYD_3	2.00	1.86	500228	5016382	140.0	8.0	58.56
Leaf & Yard Waste Stockpile 4	LFYD_4	2.00	1.86	500242	5016391	140.0	8.0	58.56
Leaf & Yard Waste Stockpile 5	LFYD_5	2.00	1.86	500257	5016400	140.0	8.0	58.56
Leaf & Yard Waste Stockpile 6	LFYD_6	2.00	1.86	500271	5016409	140.0	8.0	58.56

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Note: For Stage 1 to Stage 4, an additional 10 m height was added to base elevation estimated by AERMAP.

Table D4. Volume Source Parameters - Alternative 2 Scenario A

Modelled Emission Rates

Model ID	Source	Emission Rate					
		PM (g/s)	PM10 (g/s)	PM2.5 (g/s)	NOx (g/s)	CO (g/s)	Odour (ou/s)
BF1	Biofilter	-	-	-	-	-	603
BF2		-	-	-	-	-	603
BF3		-	-	-	-	-	603
WORKINGFACE	working face/construction	1.43	1.06	0.15	0.15	1.35	22,514
COMP_NROAD	Compost Mobile Equipment	0.01	0.01	0.01	0.21	1.79	-
P_ROAD	Paved Roads	2.04	0.41	0.10	0.03	0.01	-
UP_ROAD	Unpaved Roads	0.00	0.00	0.00	0.00	0.00	-

Modelled Discharge Parameters - Volume Sources

Model ID	Source	UTM Coordinates*		Release Height	Initital Lateral Dim.	Initial Vertical Dim.	Side Length
		X (m)	Y (m)	(m)	(m)	(m)	(m)
BF1	Biofilter	500081	5016449	9	7	7	28
BF2		500105	5016464	9	7	7	28
BF3		500130	5016479	9	7	7	28
WORKINGFACE	working face/construction	501434	5017881	0	35	1	149
COMP_NROAD	Compost Mobile Equipment	500383	5016359	0	54	1	231

Modelled Discharge Parameters - Line Volume Sources

Model ID	Source	Node Coordinates*		Release Height	Plume Height	Plume Width	Config.
		X m	Y m	(m)	(m)	(m)	
P_ROAD	Paved Roads	501111	5017039	2.55	5.1	13	Adjacent
		501054	5017125				
		501564	5017416				
		501446	5017624				
		501653	5017737				
		501525	5017964				

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Table D5. Facility Boundary and Buildings

Facility Boundary Coordinates

Point No.	UTM Coordinates*		Point No.	UTM Coordinates*	
	X (m)	Y (m)		X (m)	Y (m)
Point 1	498995	5018155	Point 9	501888	5017726
Point 2	501035	5019002	Point 10	501806	5017678
Point 3	501116	5018960	Point 11	501897	5017518
Point 4	501215	5018969	Point 12	500814	5016872
Point 5	501222	5018968	Point 13	501052	5016448
Point 6	501253	5018946	Point 14	500262	5015965
Point 7	501363	5018712	Point 15	500010	5016364
Point 8	501485	5018439			

Building Parameters

Building ID	No. of Points	No. of Tiers	Height (m)	UTM Coordinates*	
				X (m)	Y (m)
BLD_1	8	1	4.57	500559	5016784
				500563	5016787
				500560	5016791
				500572	5016800
				500581	5016787
				500569	5016779
				500565	5016784
				500561	5016781
BLD_2	4	1	2	500572	5016777
				500582	5016785
				500584	5016782
				500574	5016775
BLD_3	4	1	2	500576	5016772
				500586	5016779
				500588	5016777
				500578	5016769
BLD_4	4	1	2	500580	5016767
				500590	5016774
				500592	5016771
				500582	5016764
BLD_5	4	1	2	500584	5016762
				500594	5016769
				500596	5016766
				500586	5016759
BLD_6	4	1	2	500588	5016756
				500598	5016763
				500599	5016761
				500590	5016754

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Appendix D: Dispersion Modelling
Alternative 2 Scenario B

Table D1. Dispersion Modelling Input Summary Table

Relevant Section of the Regulation	Section Title	Description of How the Approved Dispersion Model was Used
Section 8	Negligible Sources	See Section 3 of this ESDM Report.
Section 9	Same Structure Contamination	Not Applicable
Section 10	Operating Conditions	See Section 4.1 of this ESDM Report.
Section 11	Source of Contaminant Emission Rates	See Section 4.2 of this ESDM Report.
Section 12	Combined Effect of Assumptions for Operating Conditions and Emission Rates	Not Applicable
Section 13	Meteorological Conditions	Site specific meteorological data provided by MECP
Section 14	Area of Modelling Coverage	Property Boundary Receptors and Multi Tier Receptor Grid in Accordance with ADMGO, over 13km x 13km domain.
Section 15	Stack Height for Certain New Sources of Contaminant	Not Applicable
Section 16	Terrain Data	Terrain files from MECP Website
Section 17	Averaging Periods	AERMOD set for 1 hour, 24 hour and annual averaging periods. Conversion to other periods as per ADMGO.

Table D2. Point Source Parameters - Alternative 2 Scenario B

Modelled Emission Rates

Model ID	Source	Emission Rates								
		LFG (base run)	Siloxane (base run)	CO	SO_2	HCL	NOx	PM	PM_{10}	$PM_{2.5}$
		(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)
GEN1	Reciprocating Engines	-	-	0.600	0.0171	0.0165	0.320	0.0616	0.0616	0.0616
GEN2		-	-	0.600	0.0171	0.0165	0.320	0.0616	0.0616	0.0616
GEN3		-	-	0.600	0.0171	0.0165	0.320	0.0616	0.0616	0.0616
GEN4		-	-	0.600	0.0171	0.0165	0.320	0.0616	0.0616	0.0616
Flare1	LFG Flare 1	0.016	0.174	4.778	0.0850	0.0820	0.259	0.107	0.107	0.107
Flare2	LFG Flare 2	0.028	0.314	8.601	0.153	0.148	0.466	0.193	0.193	0.193
Flare3	Enclosed Siloxane Flare	-	0.213	-	-	-	-	-	-	-

Modelled Discharge Parameters

Model ID	Source	UTM Coordinates*		Height Above Grade	Exit Temp.	Stack Diameter	Exit Velocity	Release Type
		X (m)	Y (m)	(m)	[K]	(m)	[m/s]	
GEN1	Reciprocating Engines	500582	5016784	5.6	782	0.25	28.5	Vertical
GEN2		500586	5016778	5.6	782	0.25	28.5	Vertical
GEN3		500590	5016773	5.6	782	0.25	28.5	Vertical
GEN4		500594	5016768	5.6	782	0.25	28.5	Vertical
Flare1	LFG Flare 1	500623	5016774	12.2	1144	3.05	11.3	Vertical
Flare2	LFG Flare 2	500631	5016765	12.2	1144	3.66	13.3	Vertical
Flare3	Enclosed Siloxane	500606	5016746	9.2	1144	0.77	2.7	Vertical

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Table D3. Area Source Parameters - Alternative 2 Scenario B

Modelled Emission Rates

Source	Model ID	Emission Rate				Area	Emission Flux		
		Season	LFG (base run) (g/s)	Siloxane (base run) (g/s)	Odour (ou/s)	(m²)	LFG (base run) (g/s/m²)	Siloxane (base run) (g/s/m²)	Odour (ou/s/m²)
Previous Landfill (Stages 1 to Stage 5)	STG1	-	0.091	0.0285	497	244,000	3.7392E-07	1.16684E-07	0.00204
	STG2	-	0.091	0.0285	497	244,000	3.7392E-07	1.16684E-07	0.00204
	STG3	-	0.091	0.0285	497	244,000	3.7392E-07	1.16684E-07	0.00204
	STG4	-	0.128	0.0399	697	342,000	3.7392E-07	1.16684E-07	0.00204
	STG5	-	0.038	0.0120	210	102,948	3.7392E-07	1.16684E-07	0.00204
New Landfill (Stages 6 to 9)	STG6	-	0.213	0.0665	3,039	570,062	3.7392E-07	1.16684E-07	0.00533
	STG7	-	0.213	0.0665	3,039	570,062	3.7392E-07	1.16684E-07	0.00533
	STG8	-	0.090	0.0281	1,281	240,403	3.7392E-07	1.16684E-07	0.00533
Compost Curing Windrows (Windrows 1 to 12)	CURING	Winter	-	-	1,715	4,875	-	-	0.3518
		Spring	-	-	20,794		-	-	4.2655
		Summer	-	-	39,874		-	-	8.1792
		Fall	-	-	20,794		-	-	4.2655
Leaf & Yard Waste Stockpile 1	LFYD_1	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	2.0226
		Fall	-	-	1,739		-	-	1.5527
Leaf & Yard Waste Stockpile 2	LFYD_2	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	2.0226
		Fall	-	-	1,739		-	-	1.5527

Leaf & Yard Waste Stockpile 3	LFYD_3	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	2.0226
		Fall	-	-	1,739		-	-	1.5527
Leaf & Yard Waste Stockpile 4	LFYD_4	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	2.0226
		Fall	-	-	1,739		-	-	1.5527
Leaf & Yard Waste Stockpile 5	LFYD_5	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	2.0226
		Fall	-	-	1,739		-	-	1.5527
Leaf & Yard Waste Stockpile 6	LFYD_6	Winter	-	-	1,213	1,120	-	-	1.0828
		Spring	-	-	1,739		-	-	1.5527
		Summer	-	-	2,265		-	-	2.0226
		Fall	-	-	1,739		-	-	1.5527

Modelled Discharge Parameters

Source	Model ID	Release Height	Sigma Z	UTM Coordinates*		Length X	Length Y	Rotation Angle
		(m)	(m)	X (m)	Y (m)	(m)	(m)	(deg)
Previous Landfill (Stages 1 to Stage 5)	STG1	0	0	500000	5016531	847.2	288.0	-30
	STG2	0	0	499670	5017100	847.2	288.0	-30
	STG3	0	0	499832	5016813	847.2	288.0	-30
	STG4	0	0	499501	5017389	847.2	403.7	-30
	STG5	0	0	499459	5017876	514.8	200.0	-30
New Landfill (Stages 6 to 9)	STG6	0	0	500811	5017004	400.0	1,425.0	-30
	STG7	0	0	501193	5017221	400.0	1,425.0	-30
	STG8	0	0	501451	5017646	200.0	1,183.0	-30
Compost Curing Windrows (Windrows 1 to 12)	CURING	1.00	0.93	500330	5016527	65.0	75.0	58.41
Leaf & Yard Waste Stockpile 1	LFYD_1	2.00	1.86	500199	5016364	140.0	8.0	58.56
Leaf & Yard Waste Stockpile 2	LFYD_2	2.00	1.86	500213	5016373	140.0	8.0	58.56
Leaf & Yard Waste Stockpile 3	LFYD_3	2.00	1.86	500228	5016382	140.0	8.0	58.56
Leaf & Yard Waste Stockpile 4	LFYD_4	2.00	1.86	500242	5016391	140.0	8.0	58.56
Leaf & Yard Waste Stockpile 5	LFYD_5	2.00	1.86	500257	5016400	140.0	8.0	58.56
Leaf & Yard Waste Stockpile 6	LFYD_6	2.00	1.86	500271	5016409	140.0	8.0	58.56

*UTM Zone 18

Note: For Stage 1 to Stage 4, an additional 10 m height was added to base elevation estimated by AERMAP.

Table D4. Volume Source Parameters - Alternative 2 Scenario B

Modelled Emission Rates

Model ID	Source	Emission Rate					
		PM (g/s)	PM10 (g/s)	PM2.5 (g/s)	NOx (g/s)	CO (g/s)	Odour (ou/s)
BF1	Biofilter	-	-	-	-	-	603
BF2		-	-	-	-	-	603
BF3		-	-	-	-	-	603
WORKINGFACE	working face/construction	1.43	1.06	0.15	0.15	1.35	22,514
COMP_NROAD	Compost Mobile Equipment	0.01	0.01	0.01	0.21	1.79	-
P_ROAD	Paved Roads	3.16	0.64	0.16	0.04	0.01	-
UP_ROAD	Unpaved Roads	0.00	0.00	0.00	0.00	0.00	-

Modelled Discharge Parameters - Volume Sources

Model ID	Source	UTM Coordinates*		Release Height	Initital Lateral Dim.	Initial Vertical Dim.	Side Length
		X (m)	Y (m)	(m)	(m)	(m)	(m)
BF1	Biofilter	500081	5016449	9	7	7	28
BF2		500105	5016464	9	7	7	28
BF3		500130	5016479	9	7	7	28
WORKINGFACE	working face/construction	501051	5018562	0	35	1	149
COMP_NROAD	Compost Mobile Equipment	500383	5016359	0	54	1	231

Modelled Discharge Parameters - Line Volume Sources

Model ID	Source	Node Coordinates*		Release Height	Plume Height	Plume Width	Config.
		X m	Y m	(m)	(m)	(m)	
P_ROAD	Paved Roads	501111	5017039	2.55	5.1	13	Adjacent
		501054	5017125				
		501564	5017416				
		501446	5017624				
		501653	5017737				
		501140	5018644				

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Table D5. Facility Boundary and Buildings

Facility Boundary Coordinates

Point No.	UTM Coordinates*		Point No.	UTM Coordinates*	
	X (m)	Y (m)		X (m)	Y (m)
Point 1	498995	5018155	Point 9	501888	5017726
Point 2	501035	5019002	Point 10	501806	5017678
Point 3	501116	5018960	Point 11	501897	5017518
Point 4	501215	5018969	Point 12	500814	5016872
Point 5	501222	5018968	Point 13	501052	5016448
Point 6	501253	5018946	Point 14	500262	5015965
Point 7	501363	5018712	Point 15	500010	5016364
Point 8	501485	5018439			

Building Parameters

Building ID	No. of Points	No. of Tiers	Height (m)	UTM Coordinates*	
				X (m)	Y (m)
BLD_1	8	1	4.57	500559	5016784
				500563	5016787
				500560	5016791
				500572	5016800
				500581	5016787
				500569	5016779
				500565	5016784
				500561	5016781
BLD_2	4	1	2	500572	5016777
				500582	5016785
				500584	5016782
				500574	5016775
BLD_3	4	1	2	500576	5016772
				500586	5016779
				500588	5016777
				500578	5016769
BLD_4	4	1	2	500580	5016767
				500590	5016774
				500592	5016771
				500582	5016764
BLD_5	4	1	2	500584	5016762
				500594	5016769
				500596	5016766
				500586	5016759
BLD_6	4	1	2	500588	5016756
				500598	5016763
				500599	5016761
				500590	5016754

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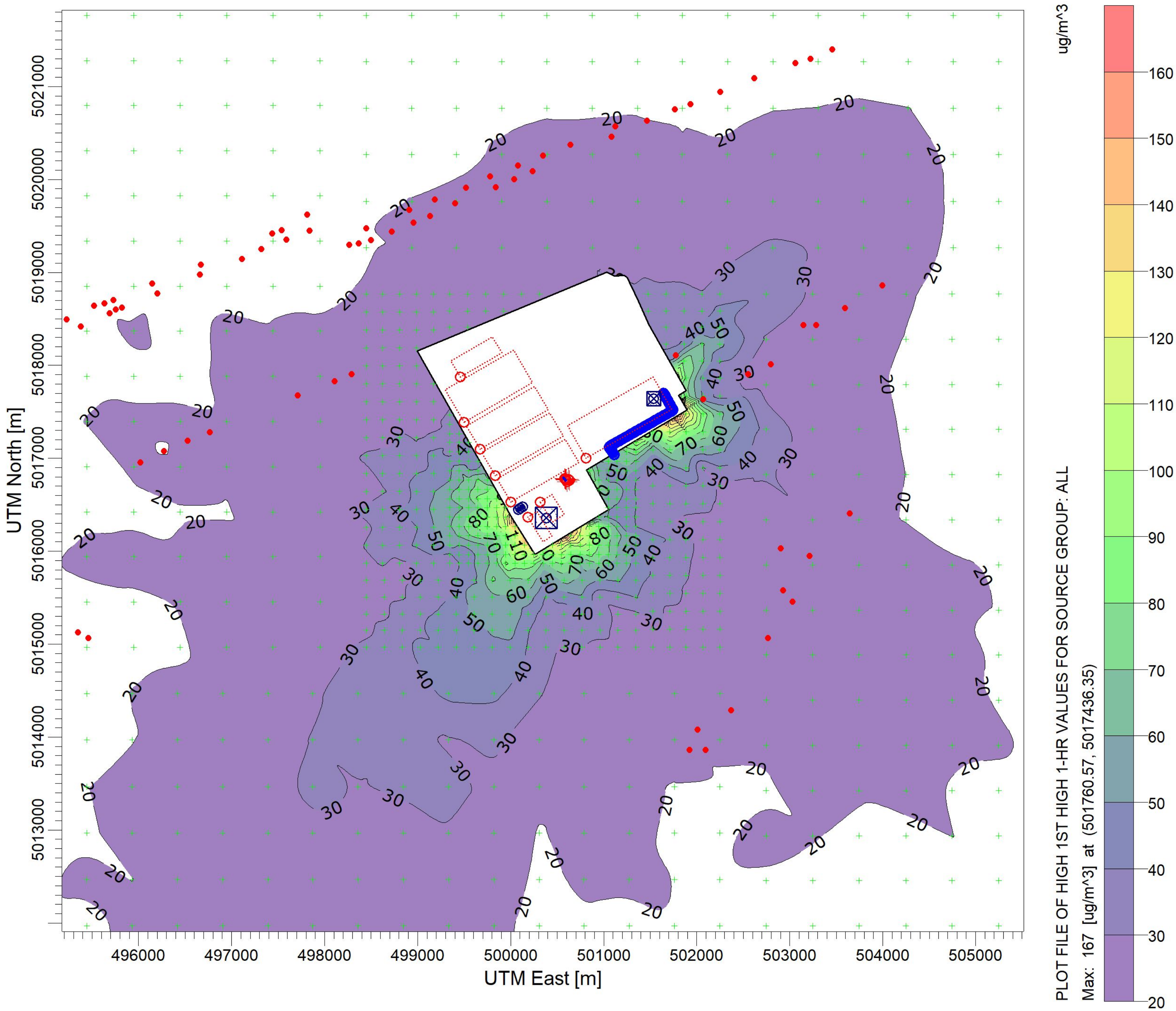
PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario A
Nitrogen Oxides (NOx) Peak 1 Hour Average Concentration Contours



COMMENTS:

SOURCES:
21

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
167 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-03

SCALE: 1:60,000

0 2 km

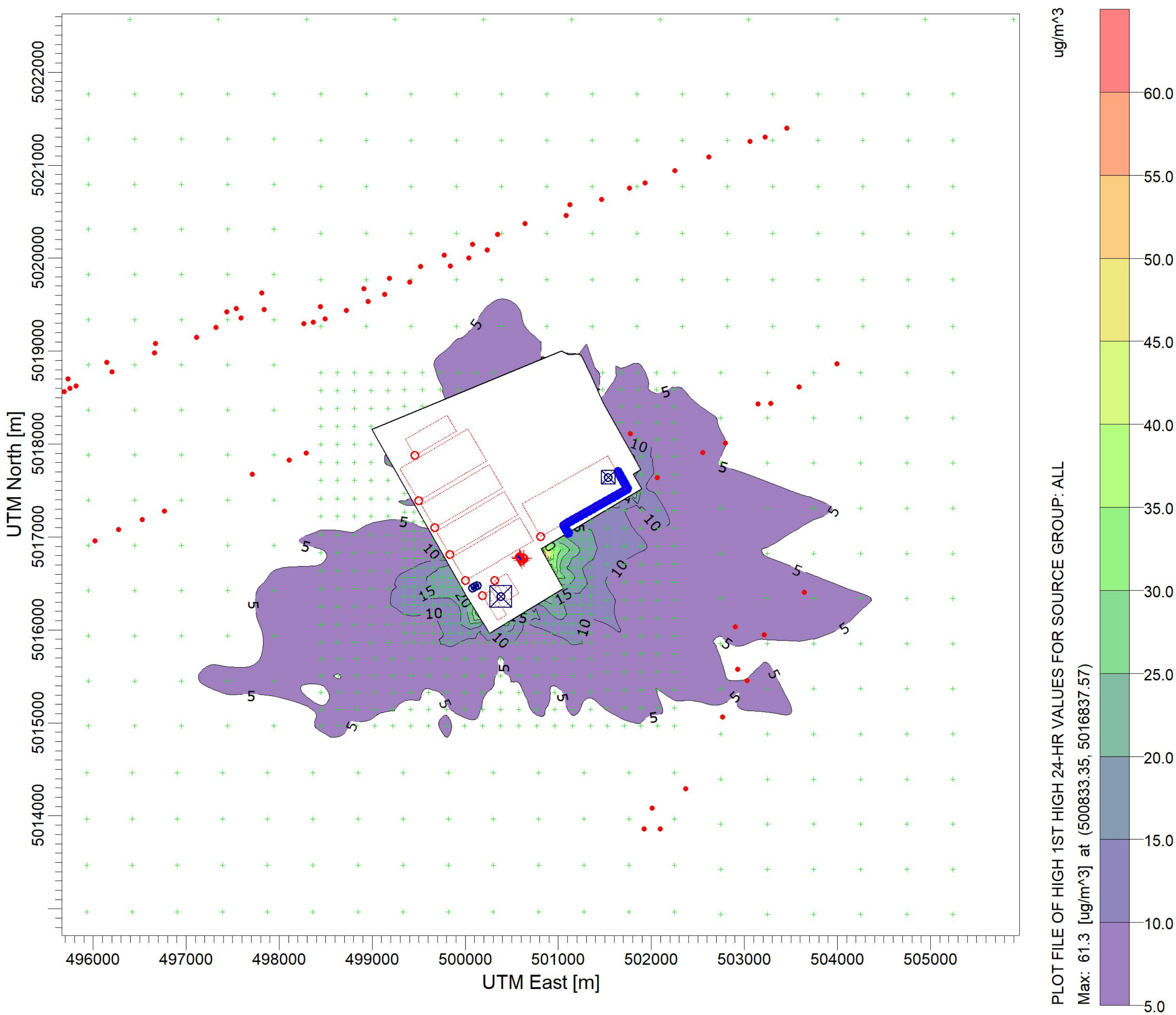
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario A
Nitrogen Oxides (NOx) Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:
21

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
61.3 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-03

SCALE: 1:60,000

0 2 km

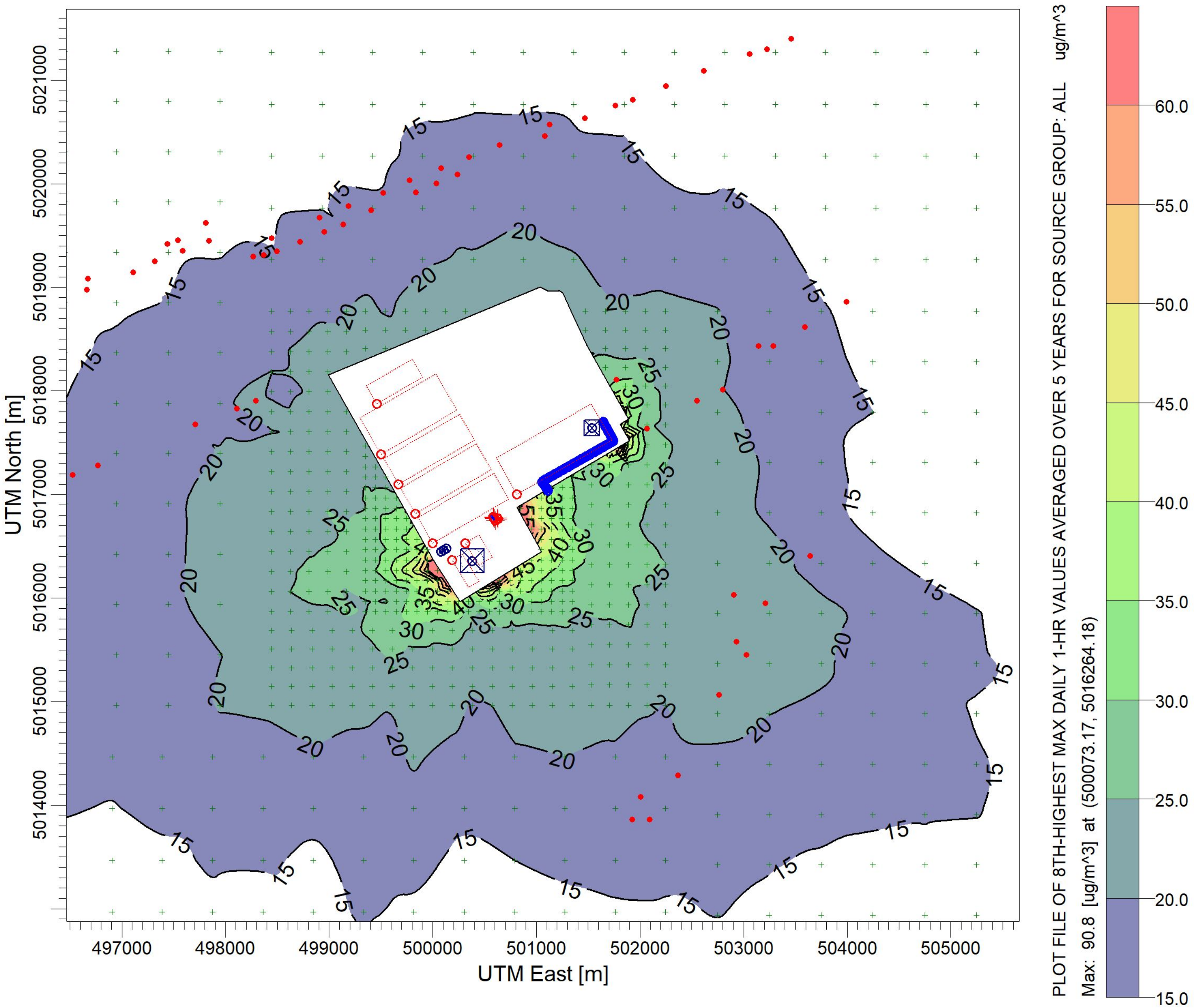
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario A
Nitrogen Dioxide - Multi year average of 98th percentile of daily maximum 1-hr concentration



COMMENTS:

SOURCES:
21

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
90.8 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

SCALE: 1:60,000

0 — 2 km

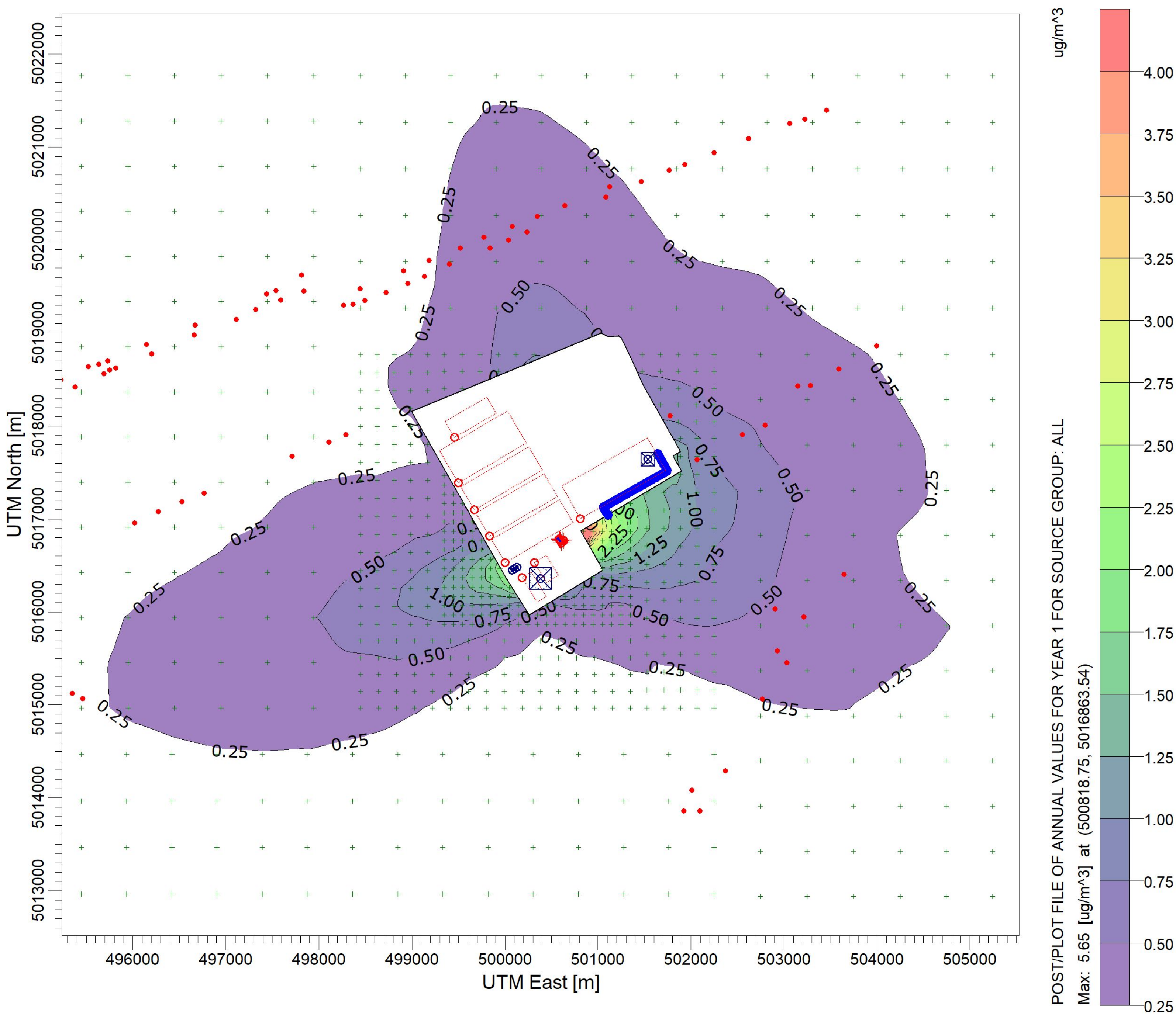
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario A
Nitrogen Dioxide - Annual concentration, highest year (Year 3)



COMMENTS:

SOURCES:
21

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
5.65 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

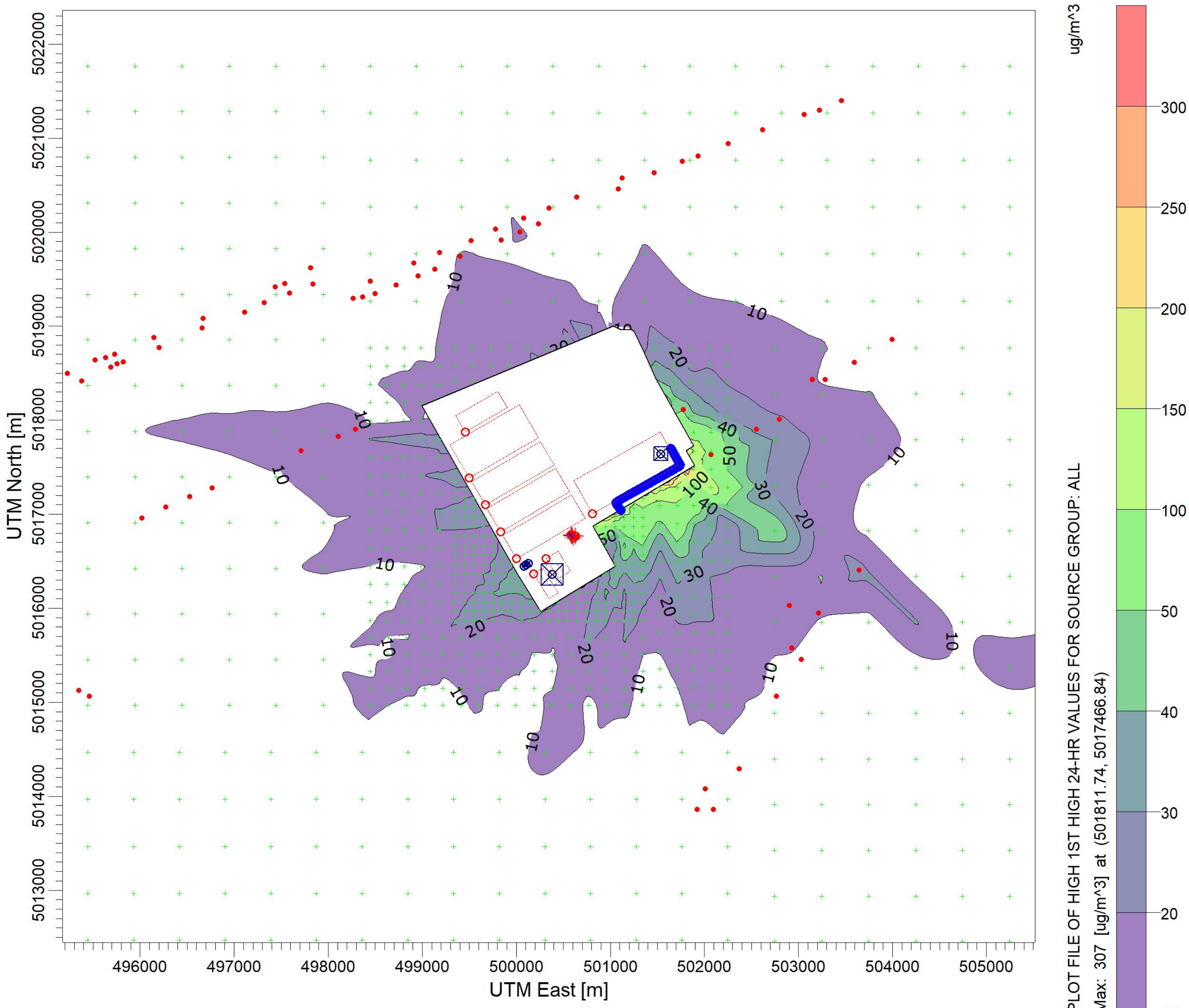
SCALE: 1:60,000

0 2 km

PROJECT NO.:
324000731

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario A
PM Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:
21

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
307 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-03

SCALE: 1:60,000

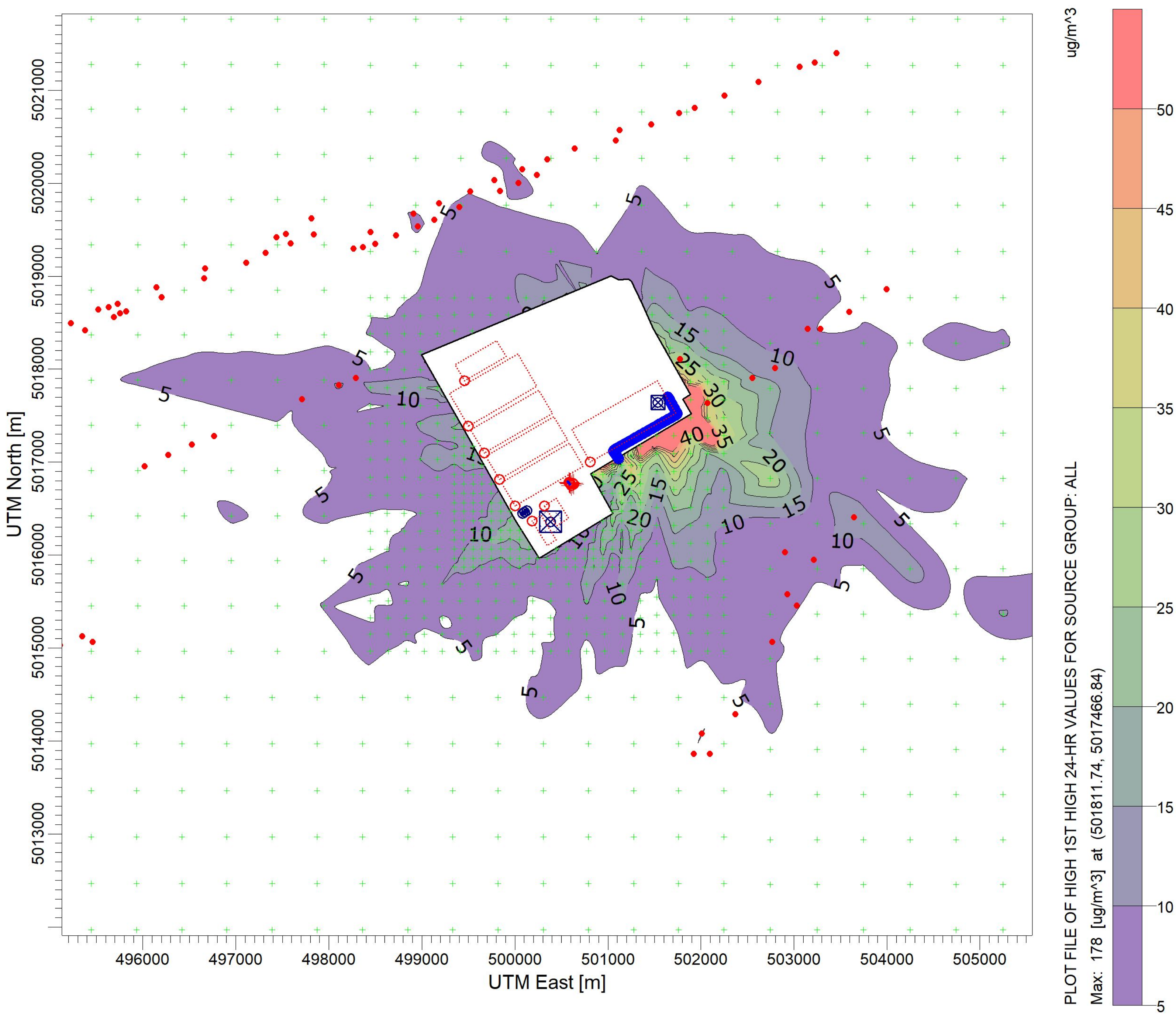
0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario A
PM10 Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:
21

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
178 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-28

SCALE: 1:60,000

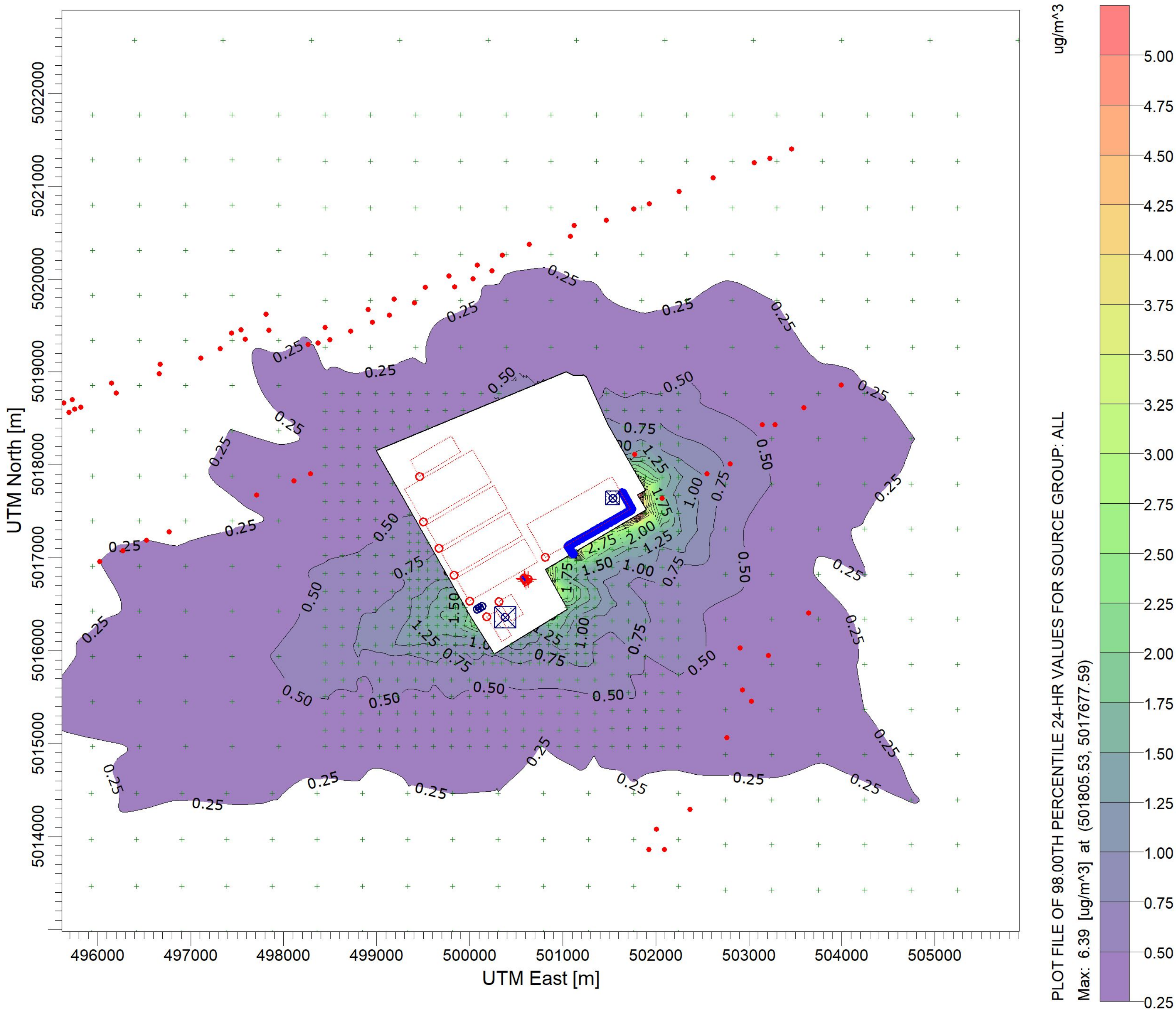
0 2 km

RAMBOLL

PROJECT NO.:
324000731

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario A
PM2.5 Peak 24 Hour Average Concentration Contours - 98th Percentile - Year 1 (2015)



COMMENTS:

SOURCES:
21

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
6.39 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

SCALE: 1:60,000

0 2 km

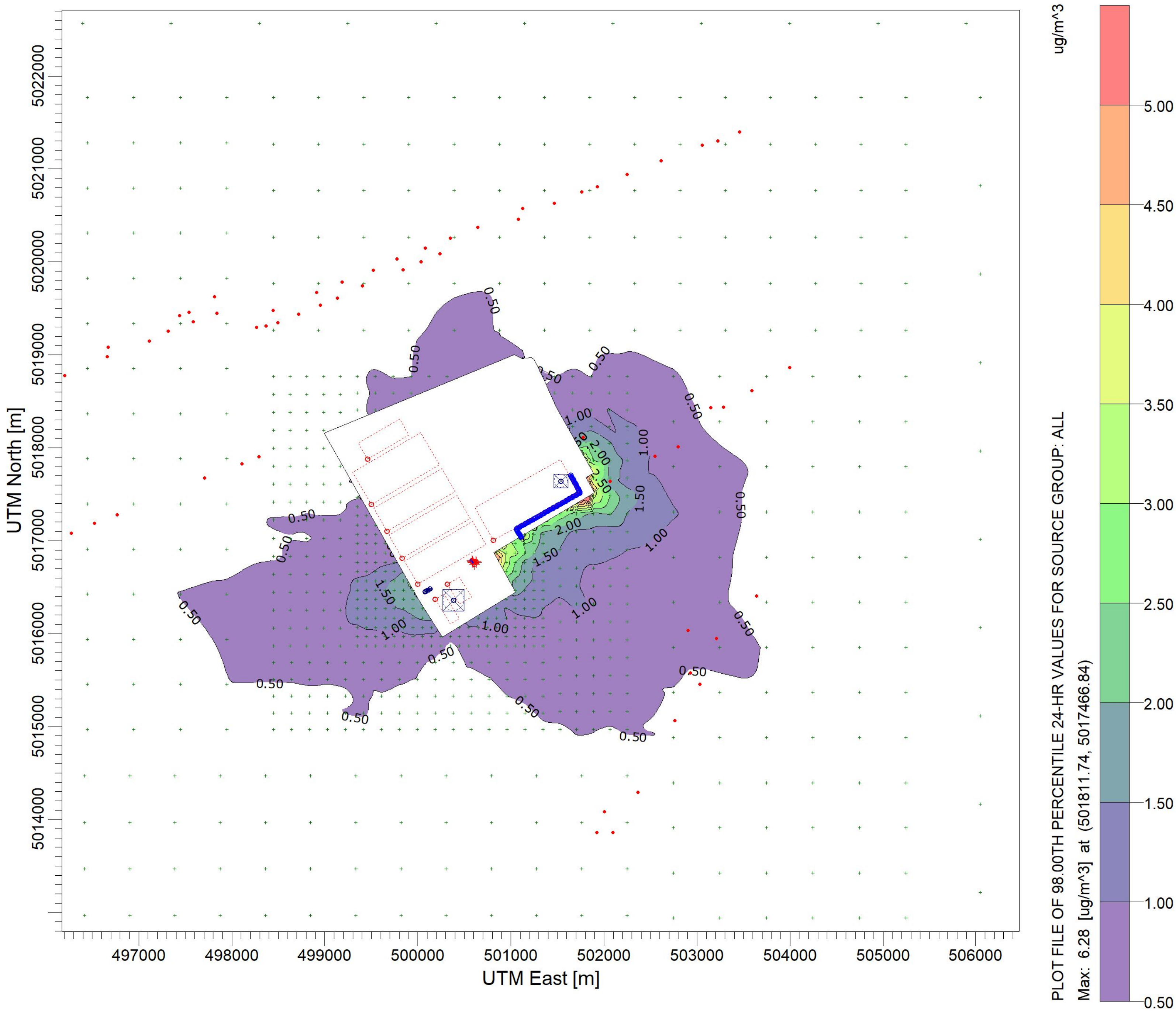
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario A
PM2.5 Peak 24 Hour Average Concentration Contours - 98th Percentile - Year 2 (2016)



COMMENTS:

SOURCES: 21

RECEPTORS: 1922

OUTPUT TYPE: Concentration

MAX: 6.28 ug/m^3

COMPANY NAME: Ramboll Canada Inc.

MODELER: EM

DATE: 2022-06-27

SCALE: 1:60,000

0 2 km

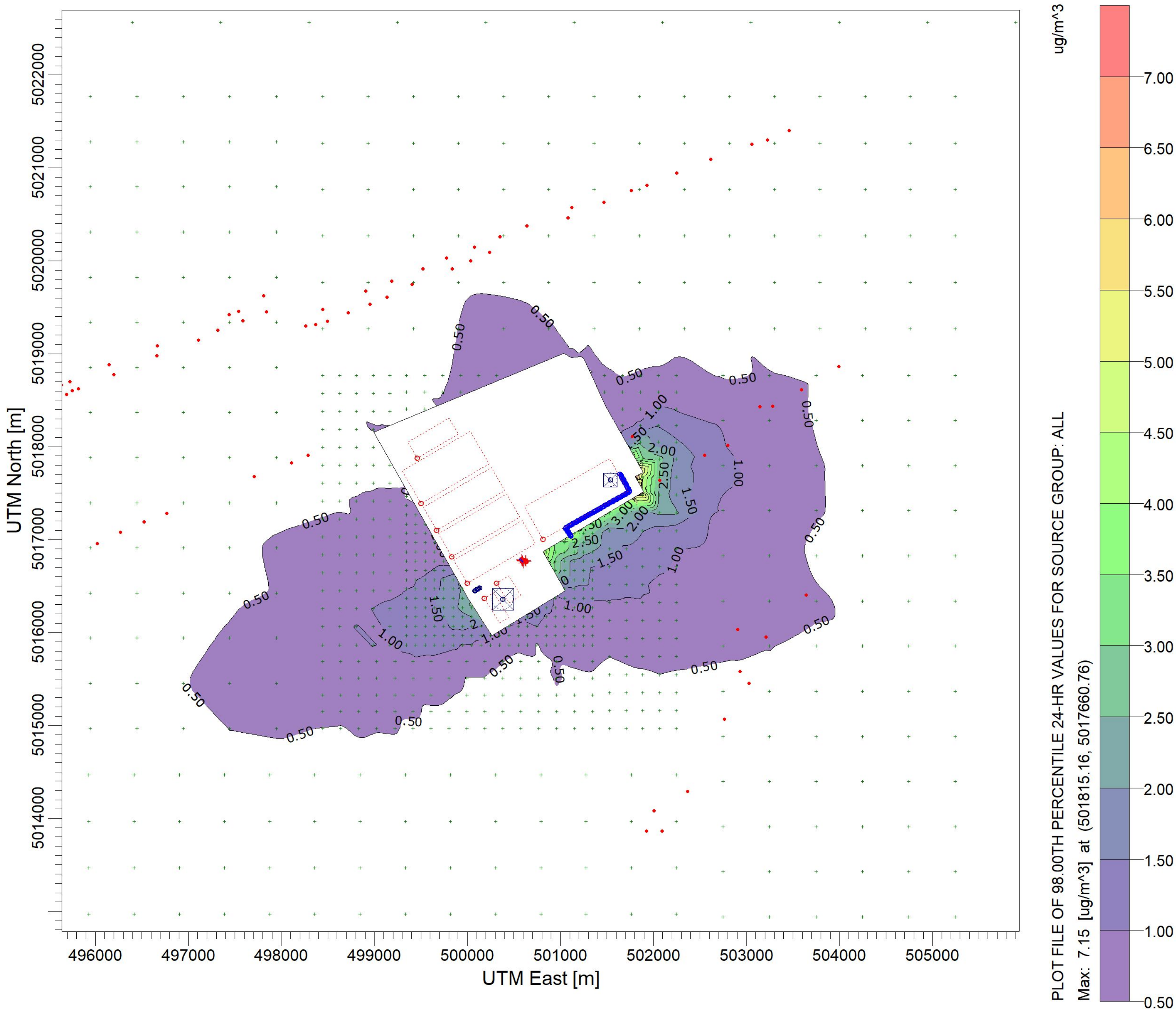
RAMBOLL

PROJECT NO.: 324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario A
PM2.5 Peak 24 Hour Average Concentration Contours - 98th Percentile - Year 3 (2017)



COMMENTS:

SOURCES:
21

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
7.15 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

SCALE: 1:60,000

0 2 km

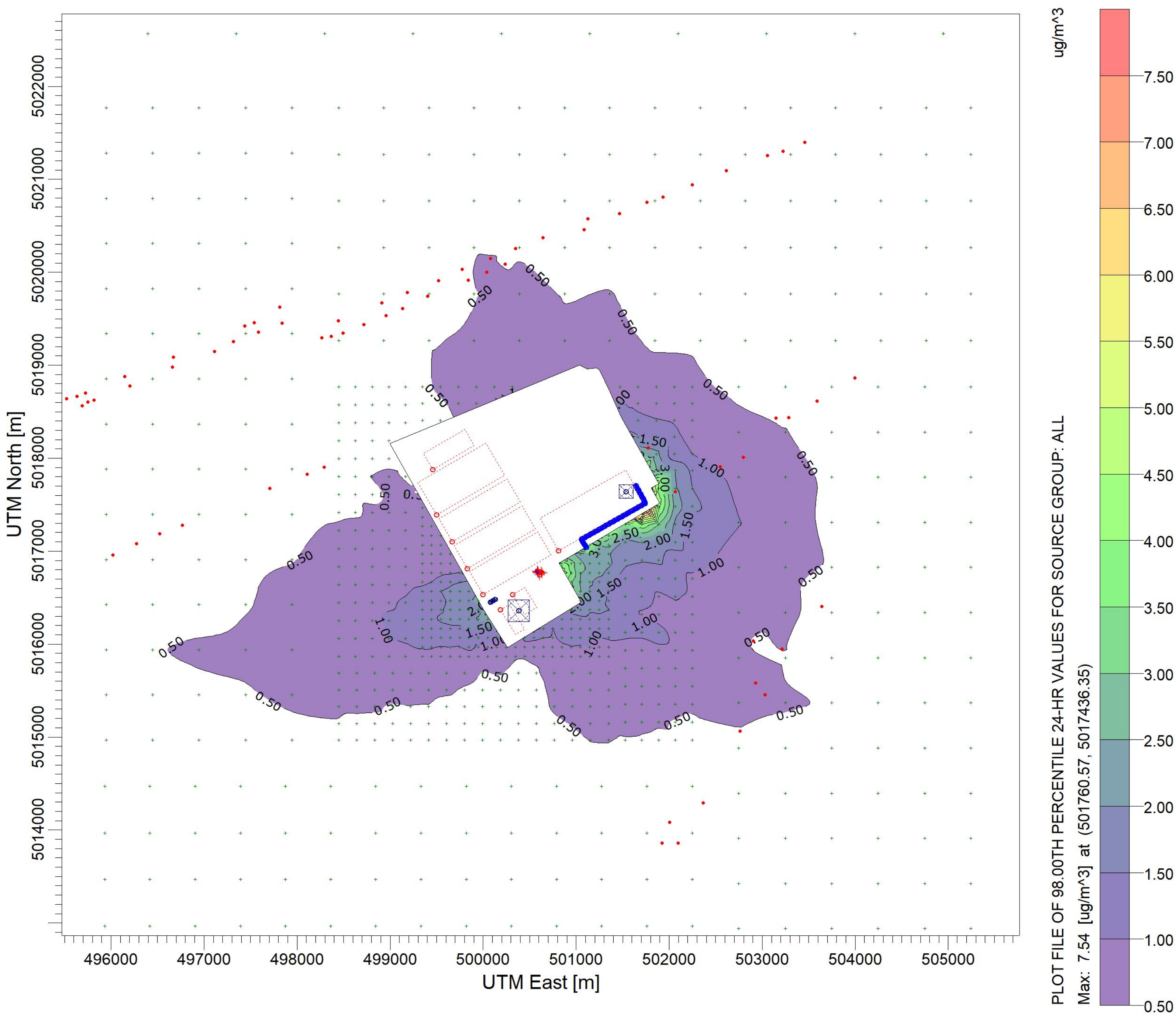
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario A
PM2.5 Peak 24 Hour Average Concentration Contours - 98th Percentile - Year 4 (2018)



COMMENTS:

SOURCES:
21

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
7.54 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

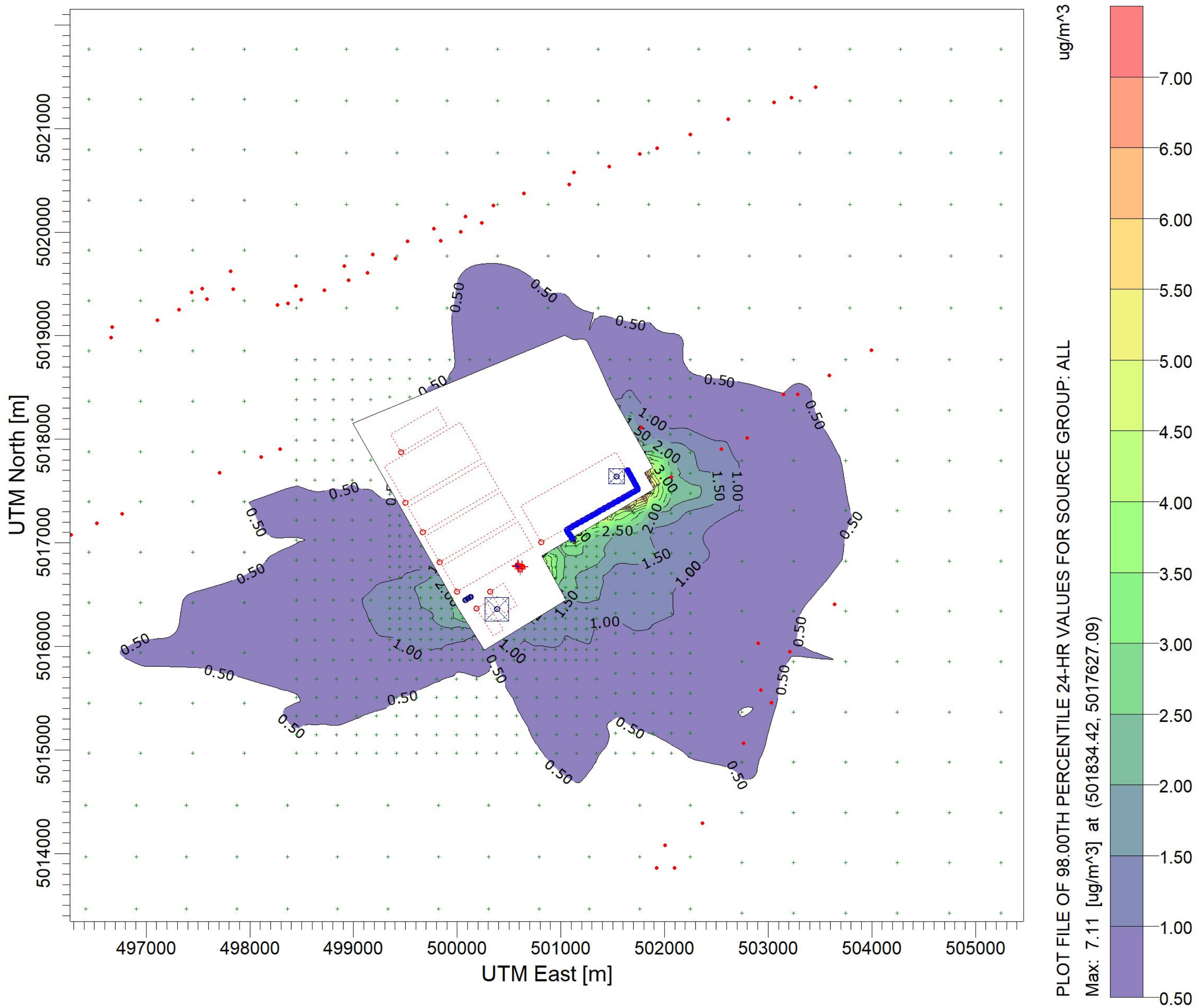
SCALE: 1:60,000

0 2 km

PROJECT NO.:
324000731

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario A
PM2.5 Peak 24 Hour Average Concentration Contours - 98th Percentile - Year 5 (2019)



COMMENTS:

SOURCES:
21

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
7.11 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

SCALE: 1:60,000

0 2 km

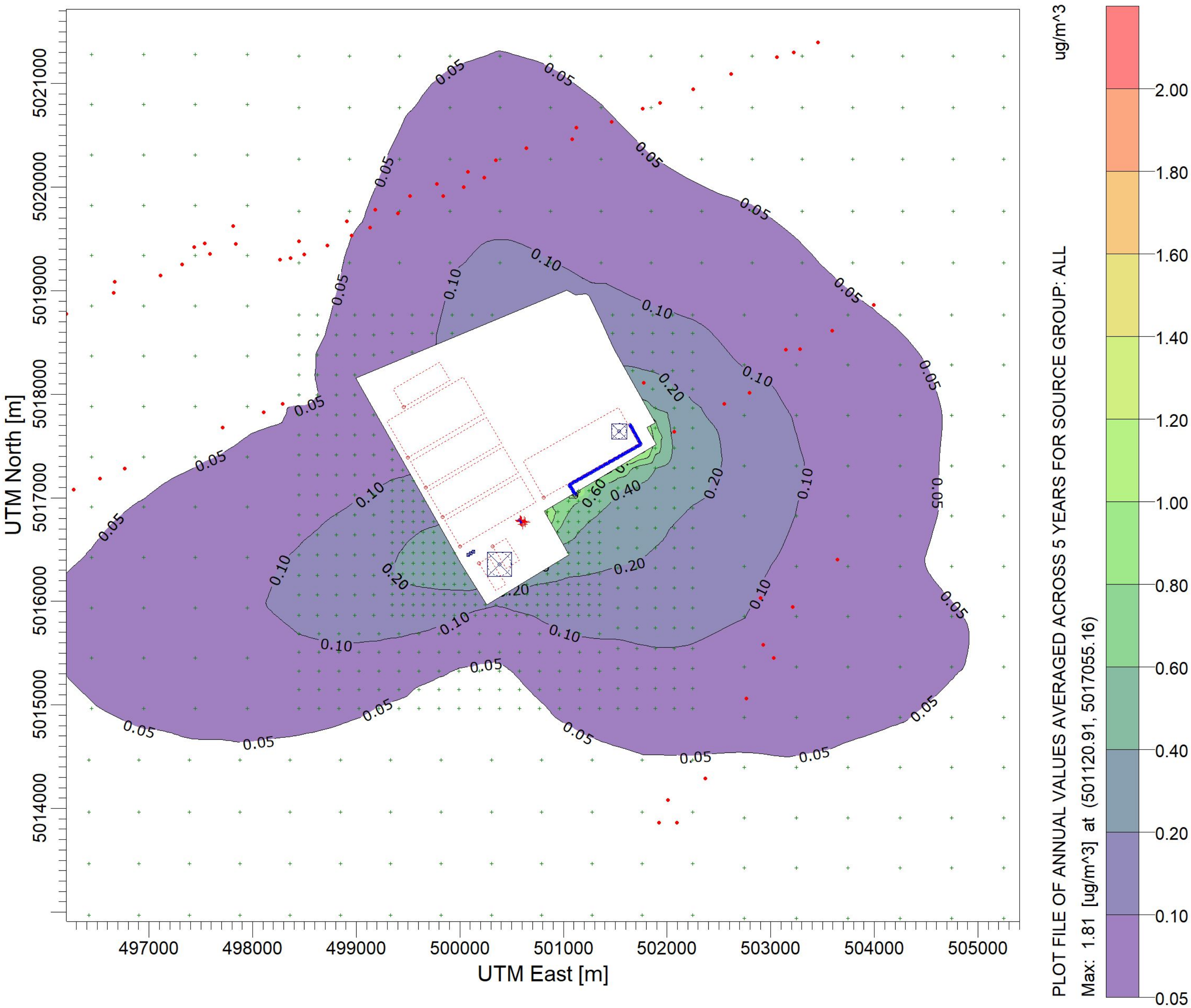
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario A
PM2.5 Peak Annual Average Concentration Contours

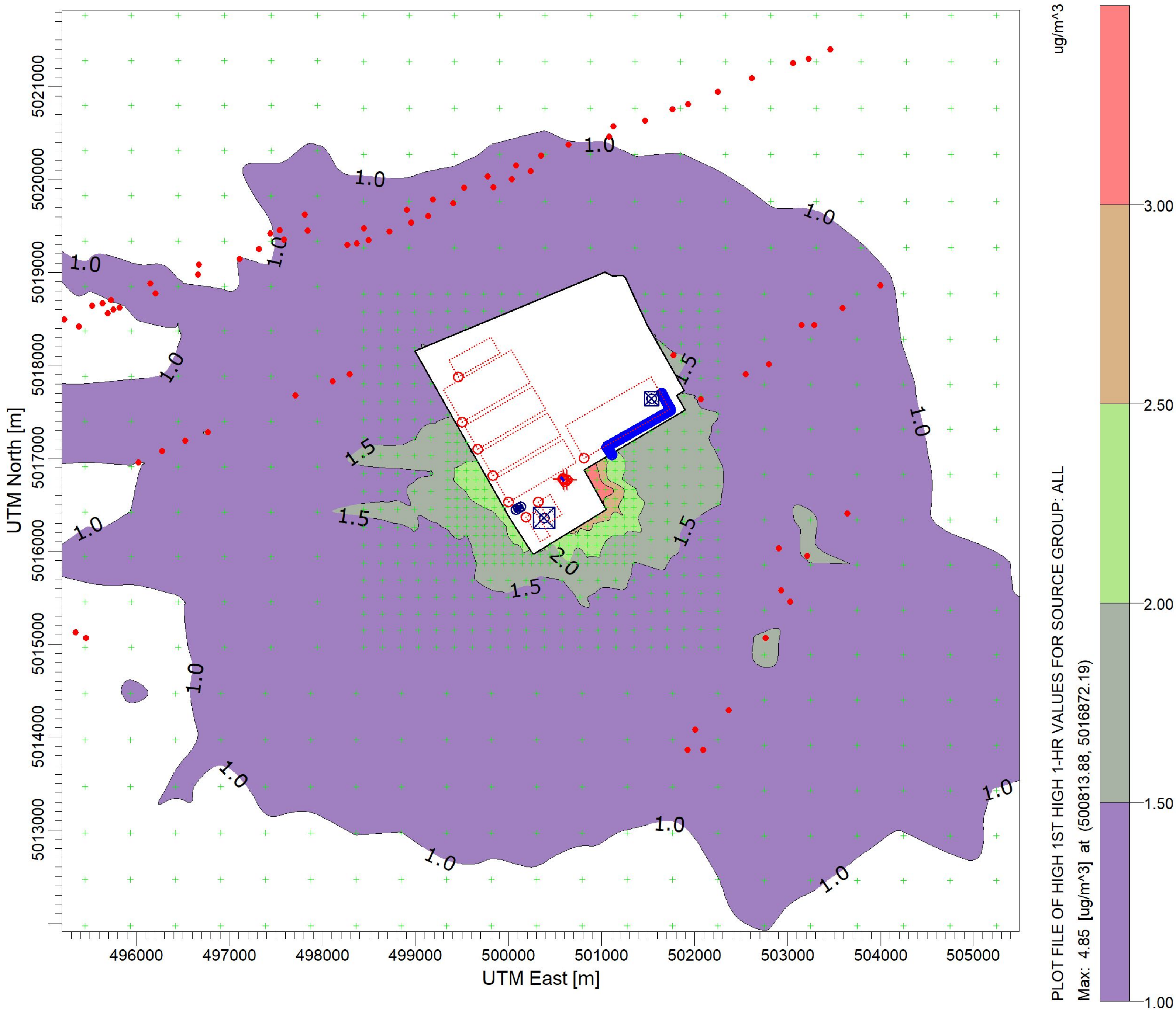


COMMENTS:	
SOURCES:	21
RECEPTORS:	1922
OUTPUT TYPE:	Concentration
MAX:	1.81 ug/m^3
COMPANY NAME:	Ramboll Canada Inc.
MODELER:	EM
DATE:	2022-06-27
SCALE:	1:60,000 (0 – 2 km)
PROJECT NO.:	324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario A
Sulphur Dioxide Peak 1 Hour Concentration Contours



COMMENTS:

SOURCES:

21

RECEPTORS:

1922

OUTPUT TYPE:

Concentration

MAX:

4.85 ug/m^3

COMPANY NAME:

Ramboll Canada Inc.

MODELER:

EM

DATE:

2022-06-28

SCALE: 1:60,000

0 — 2 km

RAMBOLL

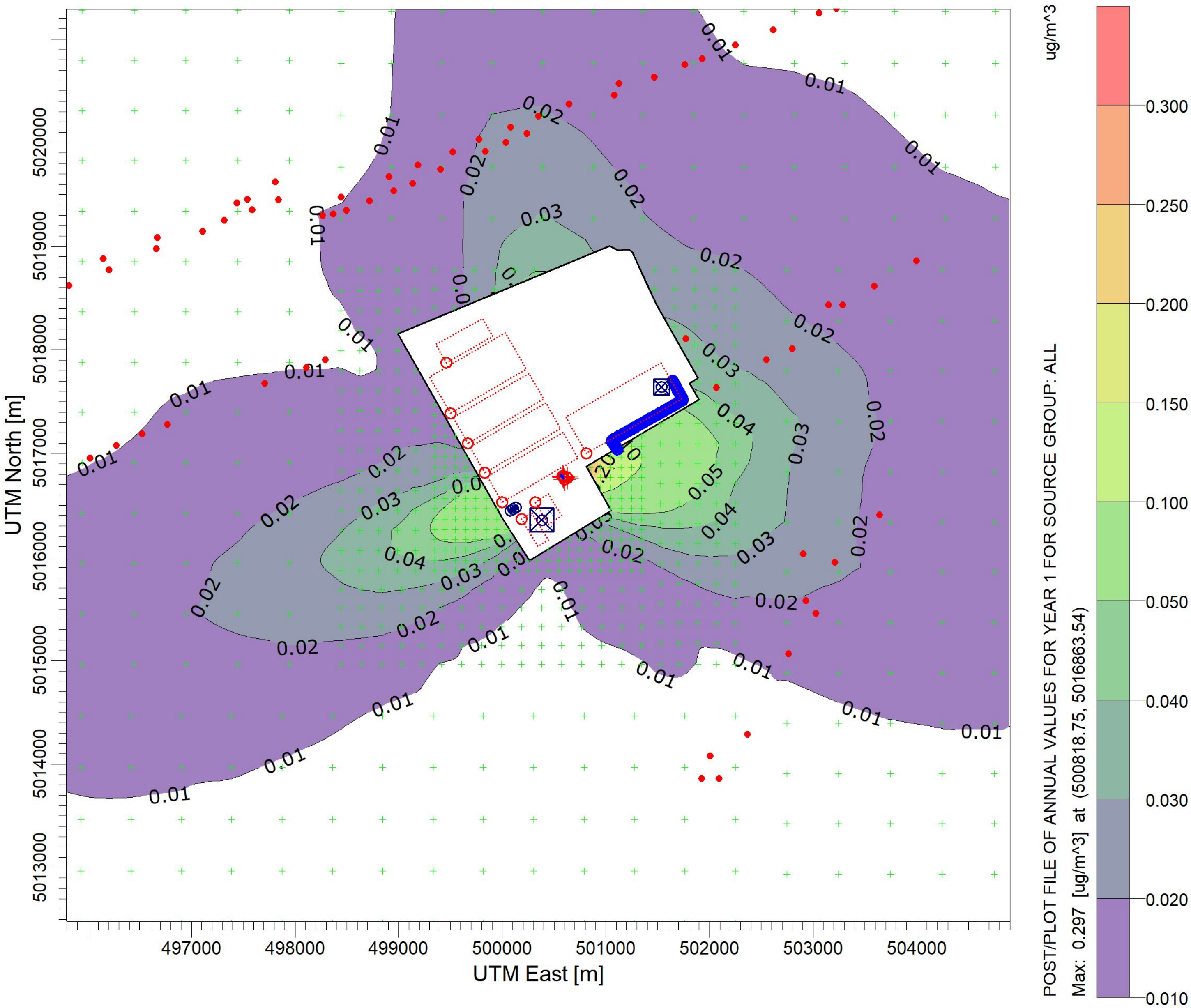
PROJECT NO.:

324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario A
Sulphur Dioxide Peak Annual Concentration Contours, Highest Year (Year 3)



COMMENTS:

SOURCES:
21

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
0.297 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-30

SCALE: 1:60,000

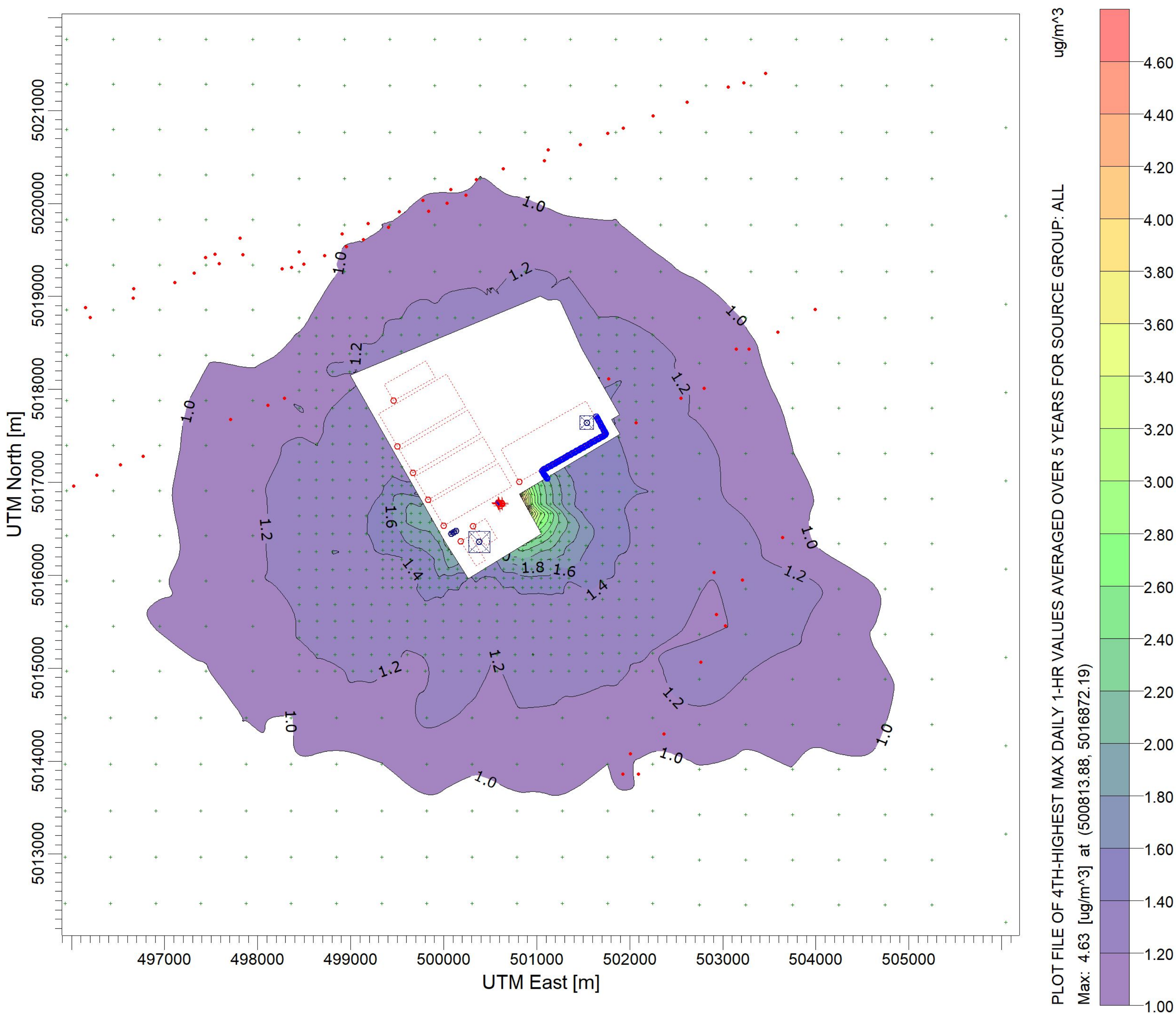
0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario A
Sulphur Dioxide, 1 Hour CAAQS - Multi year average of the 99th percentile daily maximum 1-hour concentration



COMMENTS:

SOURCES:
21

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
4.63 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-04

SCALE: 1:60,000

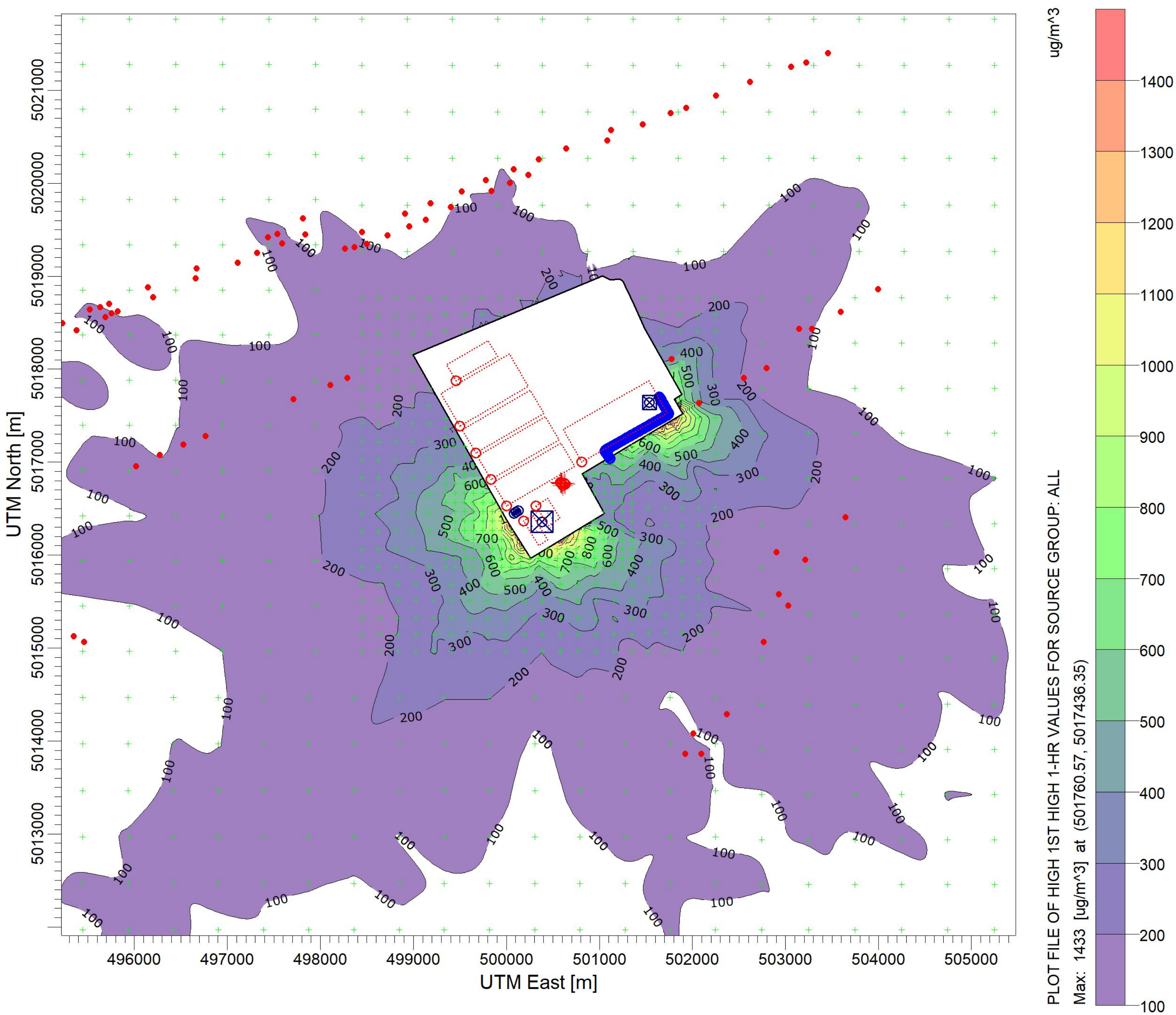
0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario A
Carbon Monoxide Peak 1 Hour Average Concentration Contours



COMMENTS:

SOURCES:

21

RECEPTORS:

1922

OUTPUT TYPE:

Concentration

MAX:

1433 ug/m^3

COMPANY NAME:

Ramboll Canada Inc.

MODELER:

EM

DATE:

2022-07-03

SCALE: 1:60,000

0 2 km

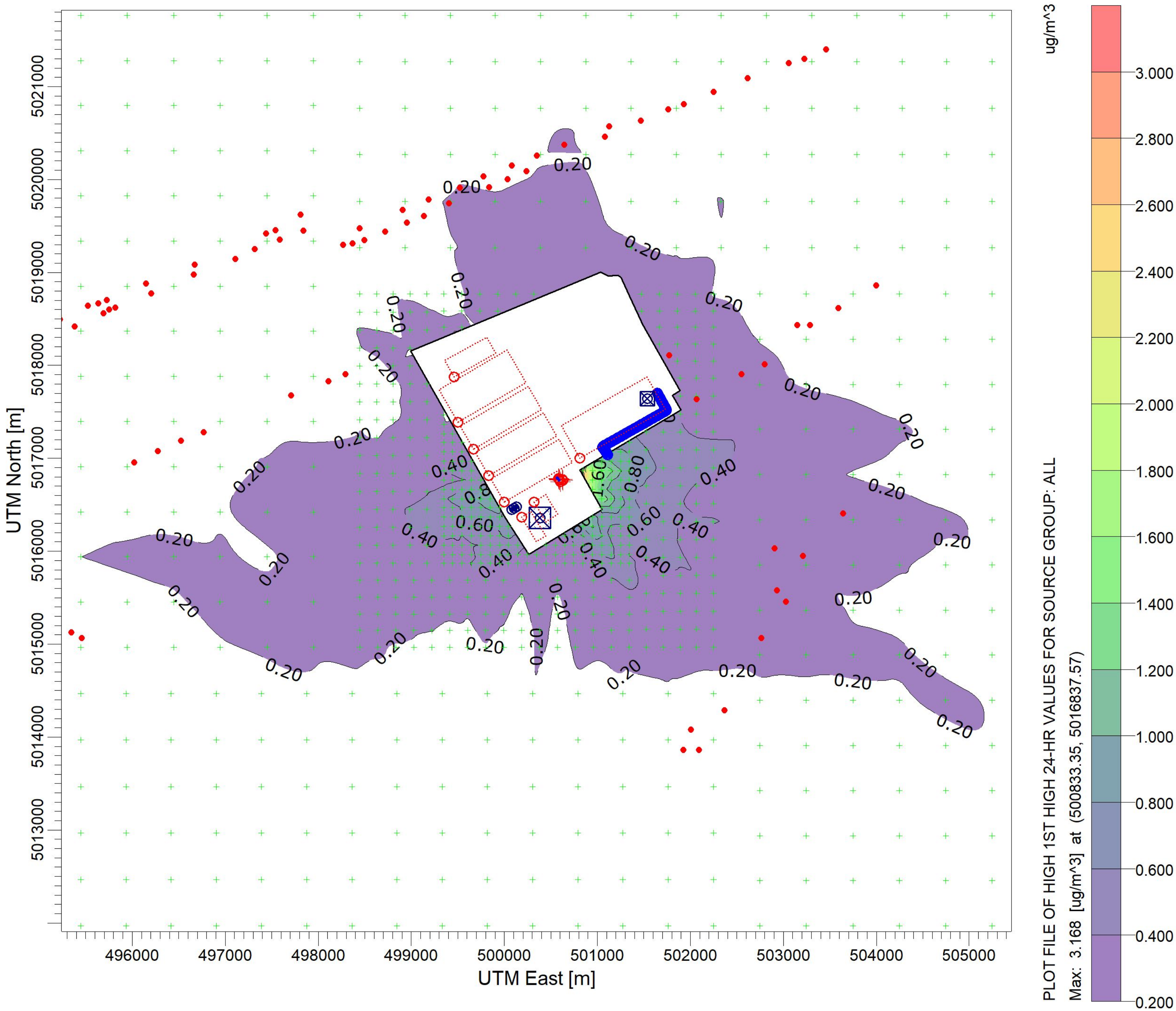
RAMBOLL

PROJECT NO.:

324000731

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario A
Hydrogen Chloride Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:
21

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
3.168 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-03

SCALE: 1:60,000

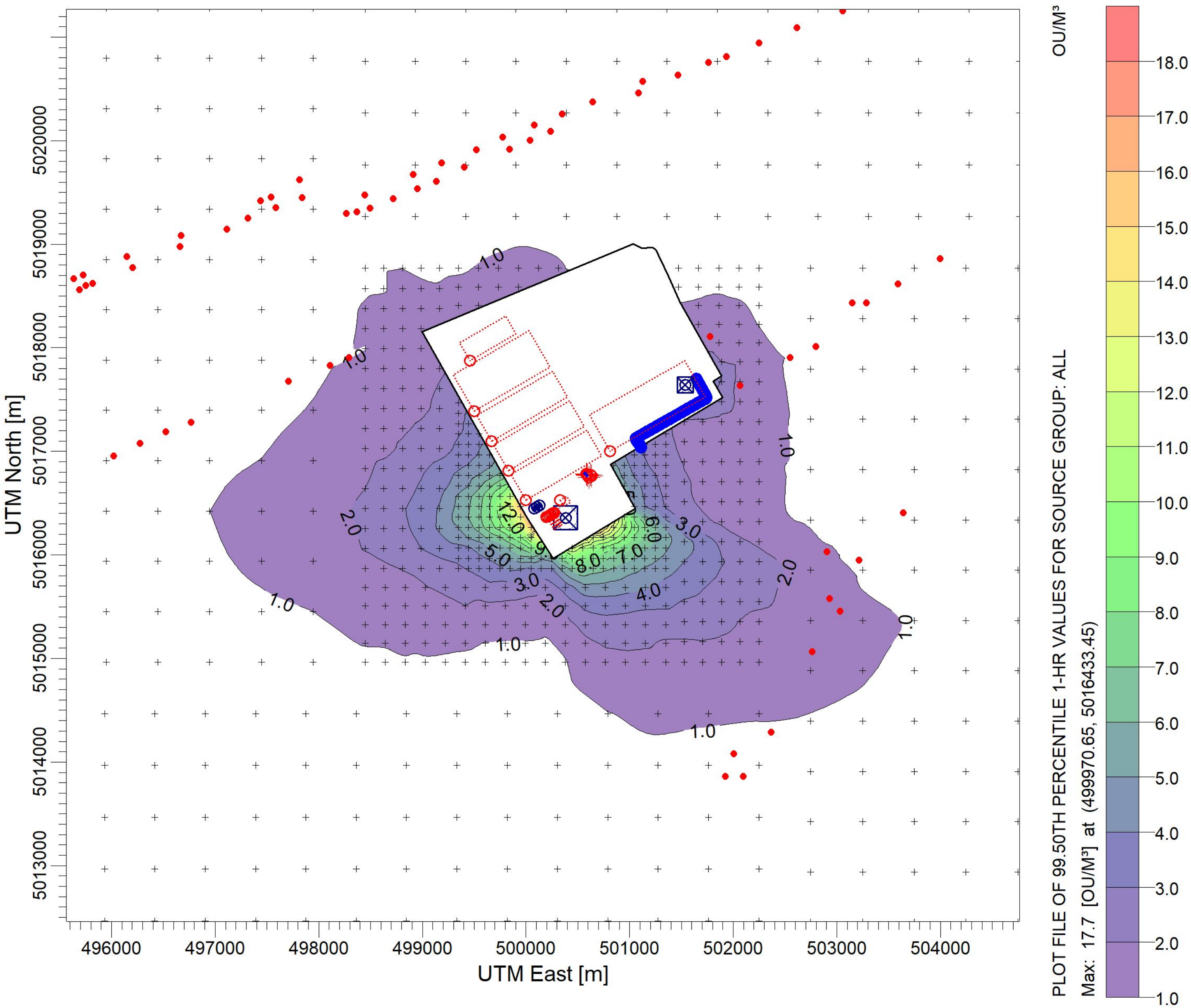
0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario A
Odour 10 Minute Average Peak Concentration Contours (99.5th Percentile)



COMMENTS:

The 1-hr air dispersion modelling output units were adjusted in AERMOD to reflect the expected peak 10-min average values using the MECP recommended standard conversion factor of 1.65.

SOURCES:

26

RECEPTORS:

1922

OUTPUT TYPE:

Concentration

MAX:

17.7 OU/M³

COMPANY NAME:

Ramboll Canada Inc.

DATE:

2023-05-29

SCALE: 1:60,000

0 2 km

RAMBOLL

PROJECT NO.:

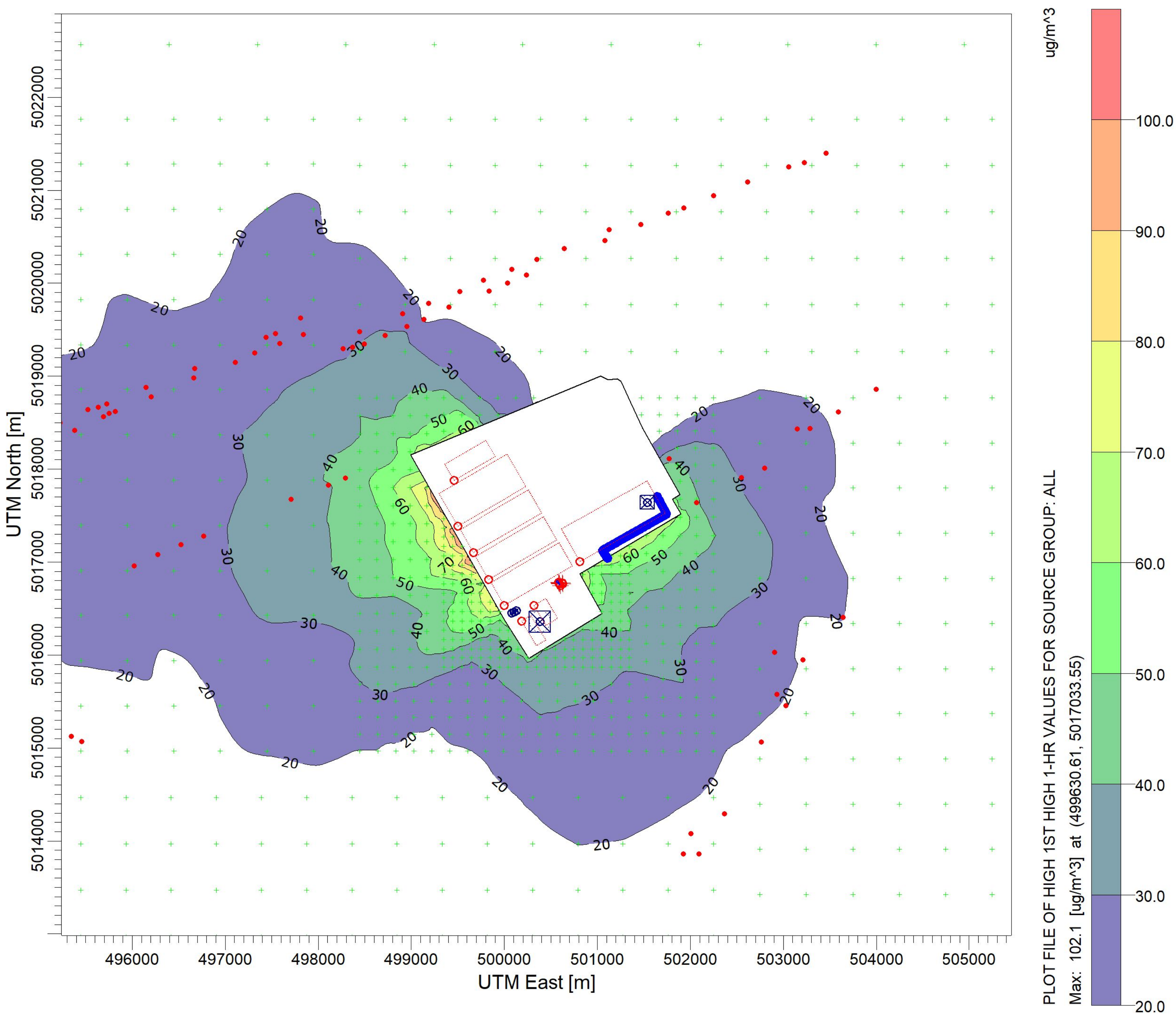
324000731

AERMOD View - Lakes Environmental Software

D:\324000731 - GFL Moosecreek\AERMOD\South Piles\Odour_1A\Odour_1A.isc

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario A
Landfill Gas (LFG) Base Run (1 g/s) Peak 1 Hour Average Concentration Contours



COMMENTS:

SOURCES:
21

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
102.1 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-03

SCALE: 1:60,000

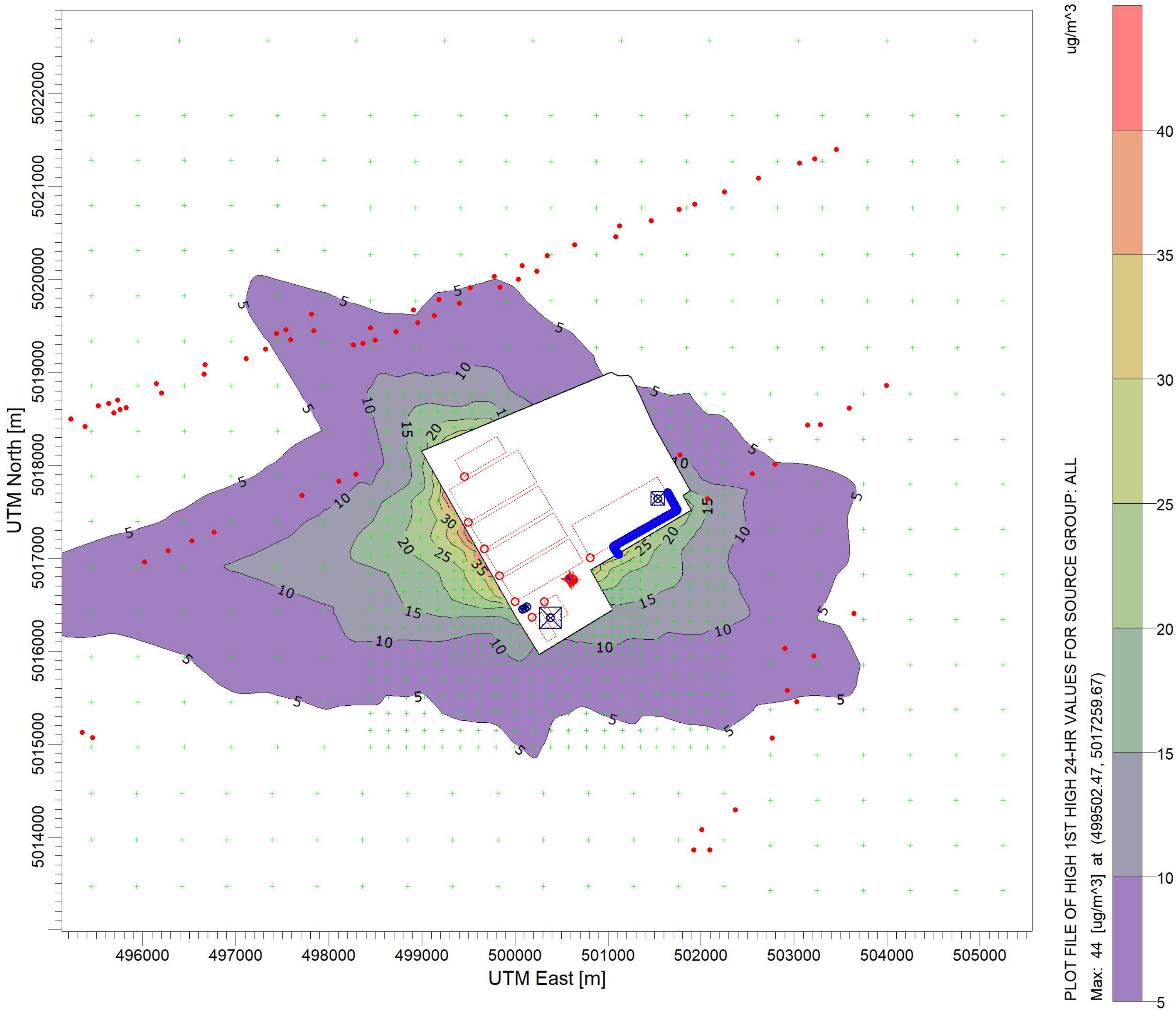
0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario A
Landfill Gas (LFG) Base Run (1 g/s) Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:
21

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
44 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-03

SCALE: 1:60,000

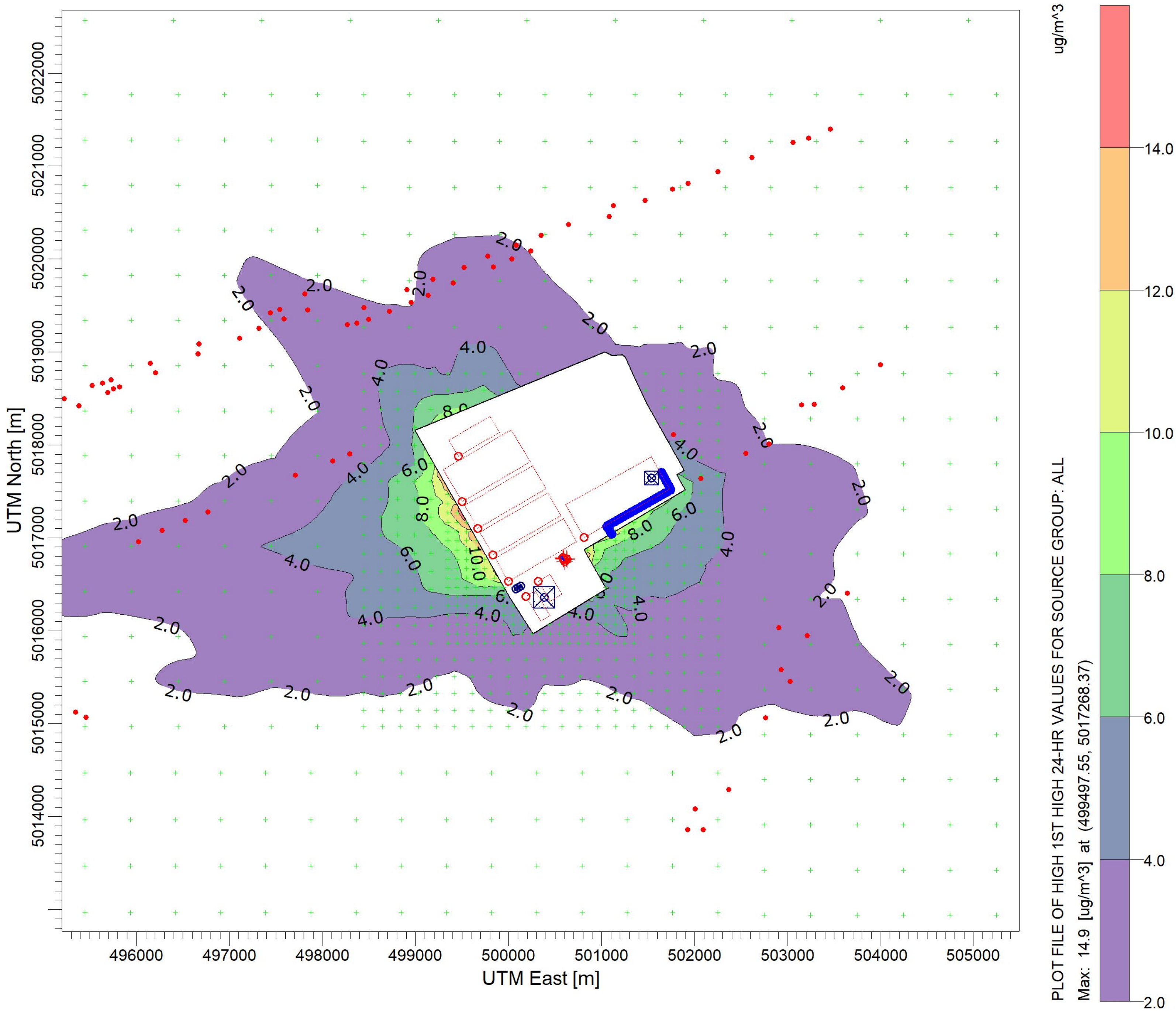
0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario A
Siloxane Base Run (1 g/s) Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:
21

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
14.9 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-04

SCALE: 1:60,000

0 2 km

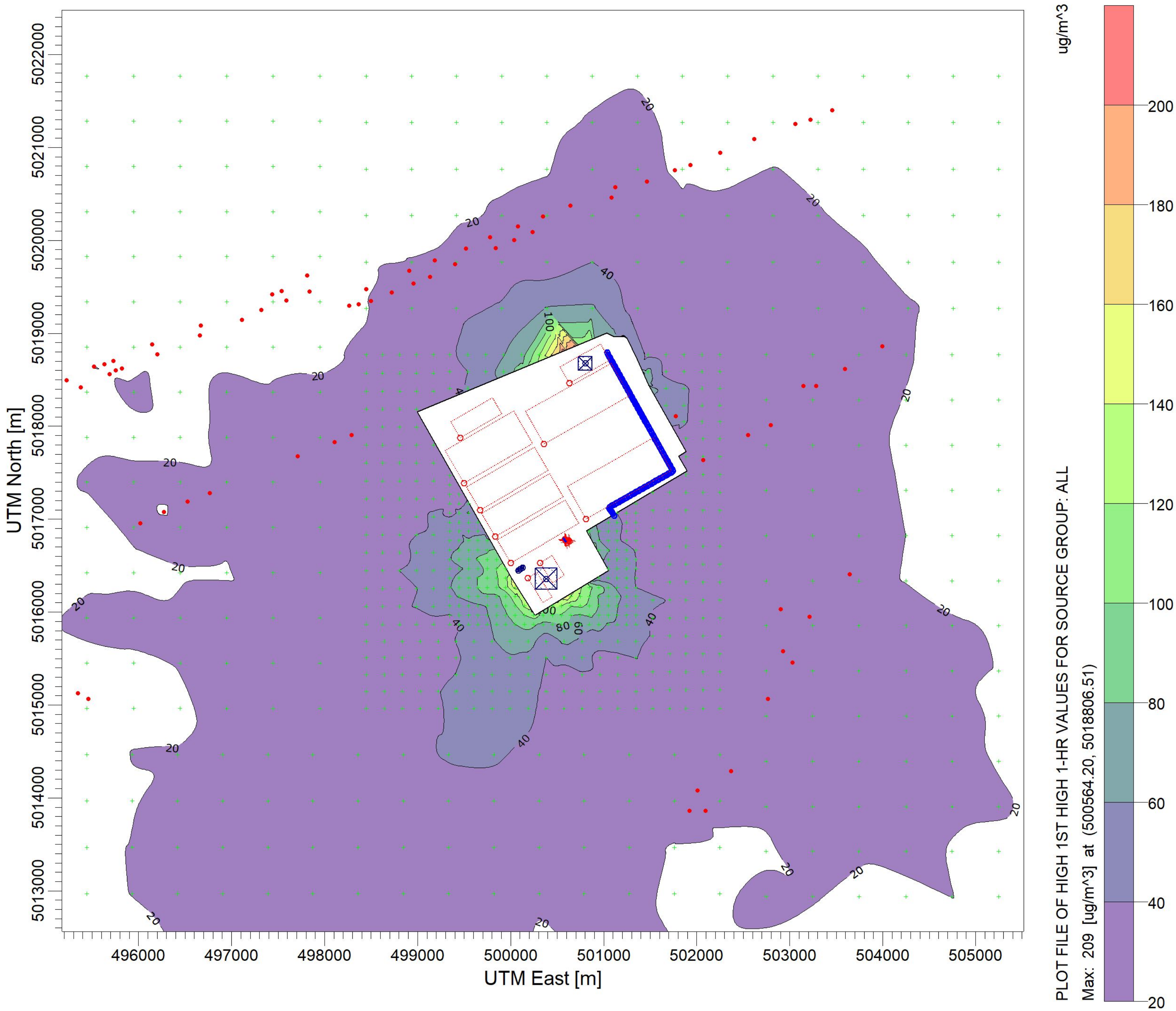
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario B
Nitrogen Oxides (NOx) Peak 1 Hour Average Concentration Contours



COMMENTS:

SOURCES: 24

RECEPTORS: 1922

OUTPUT TYPE: Concentration

MAX: 209 ug/m^3

COMPANY NAME: Ramboll Canada Inc.

MODELER: EM

DATE: 2022-07-04

SCALE: 1:60,000

0 2 km

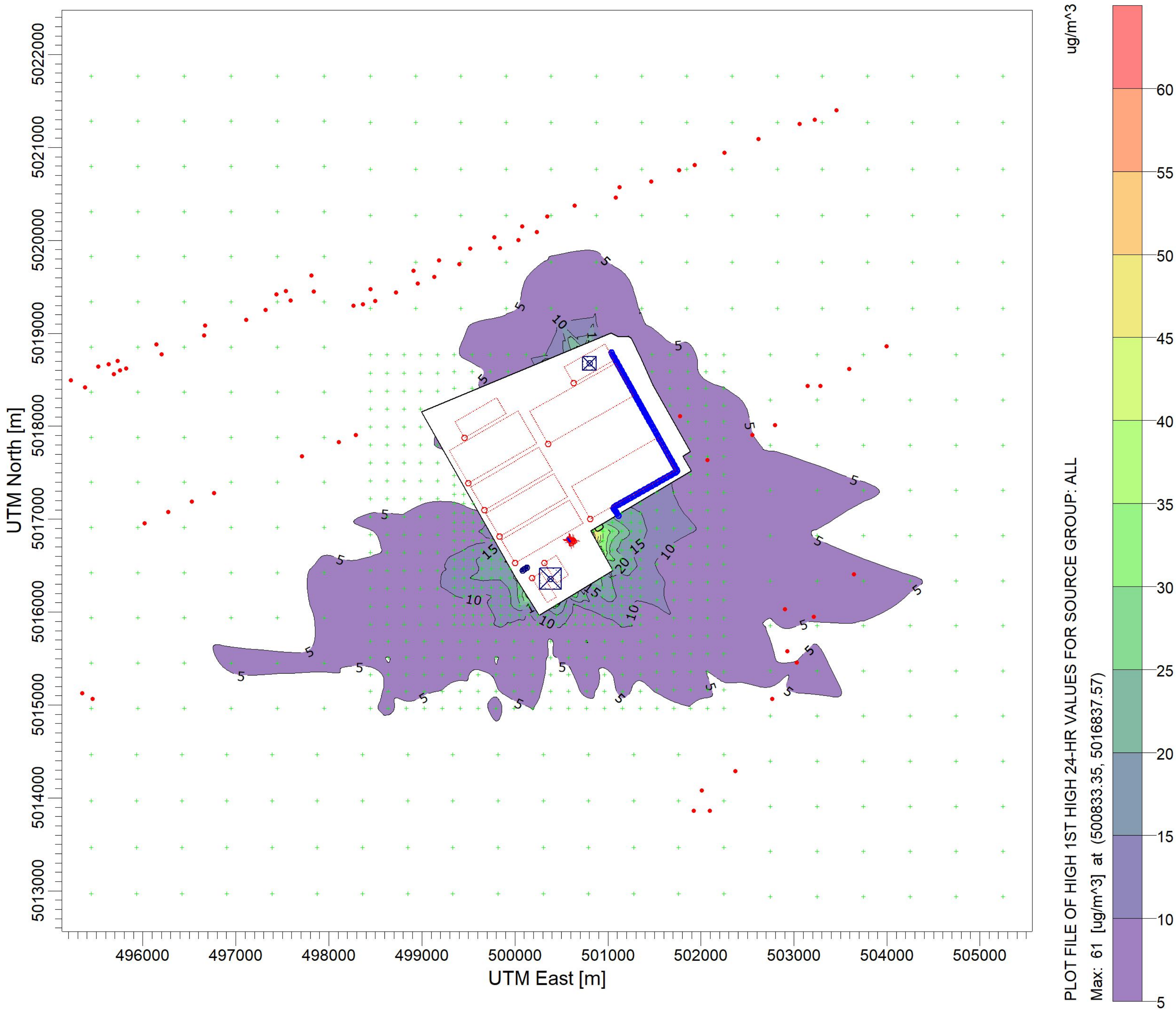
RAMBOLL

PROJECT NO.: 324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario B
Nitrogen Oxides (NOx) Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:
24

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
61 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-04

SCALE: 1:60,000

0 2 km

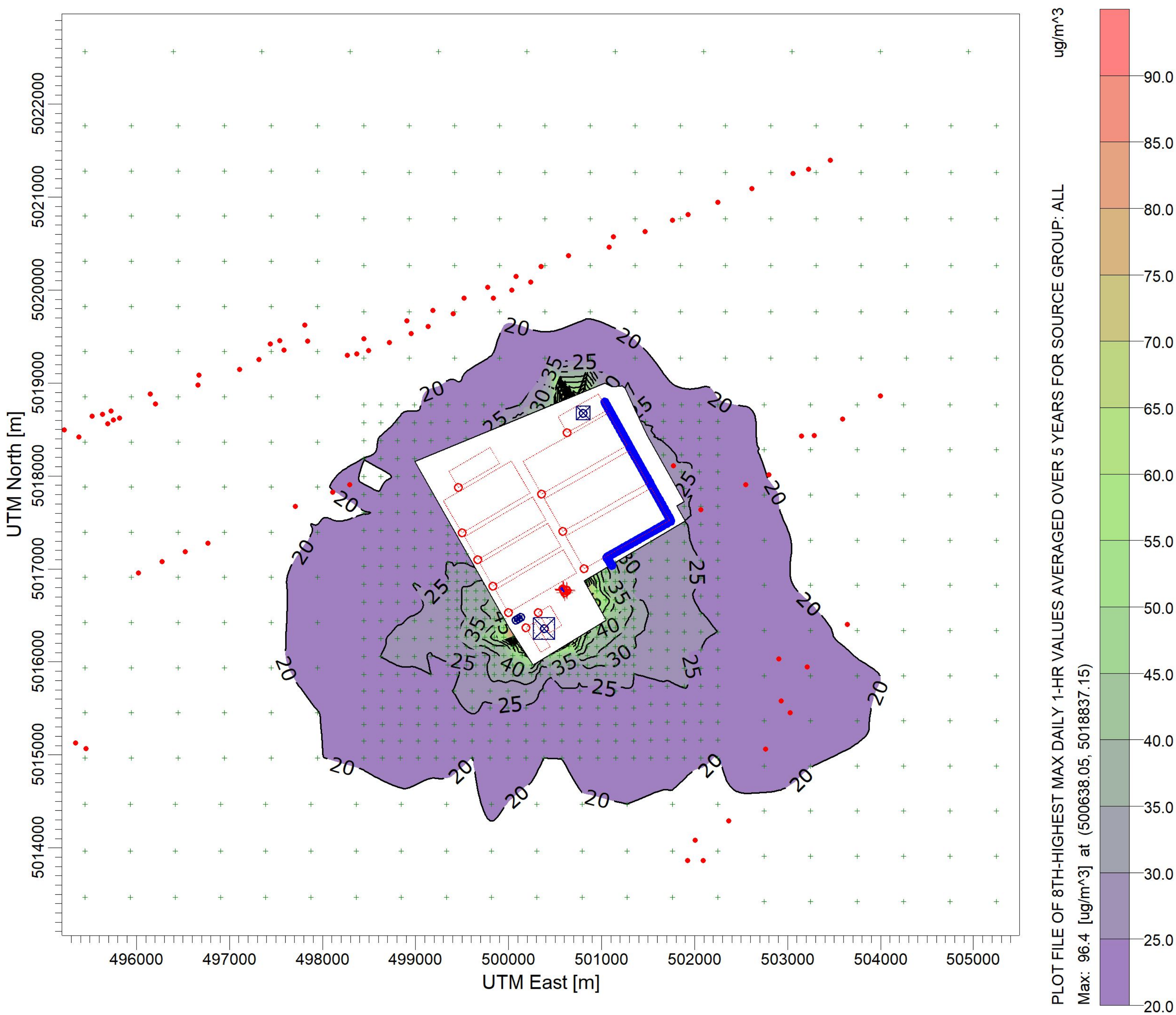
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario B
Nitrogen Dioxide - Multi year average of 98th percentile of daily maximum 1-hr concentration



COMMENTS:

SOURCES:
24

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
96.4 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

SCALE: 1:60,000

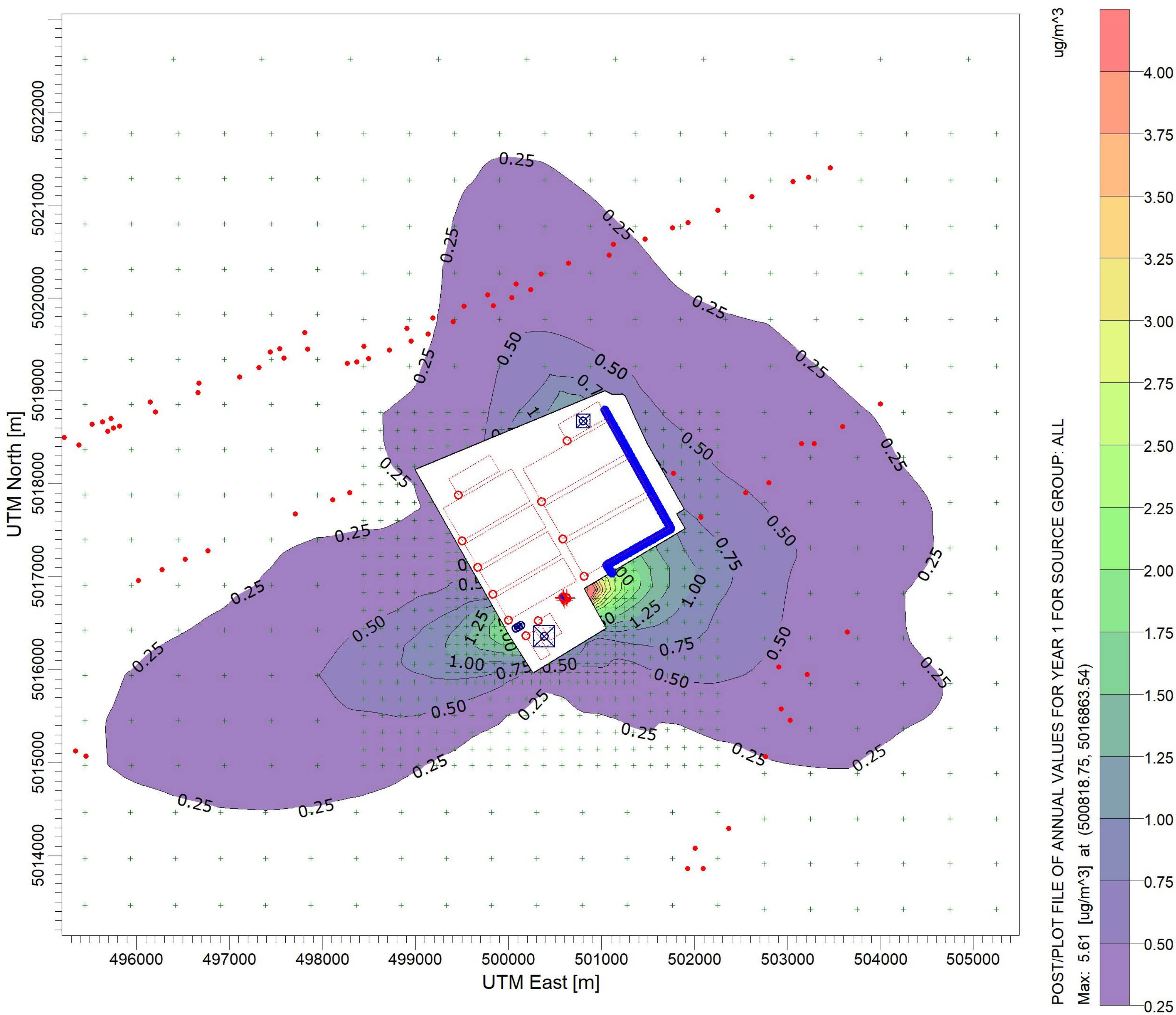
0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario B
Nitrogen Dioxide - Annual concentration, highest year (Year 3)



COMMENTS:

SOURCES:
24

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
5.61 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

SCALE: 1:60,000
0 2 km

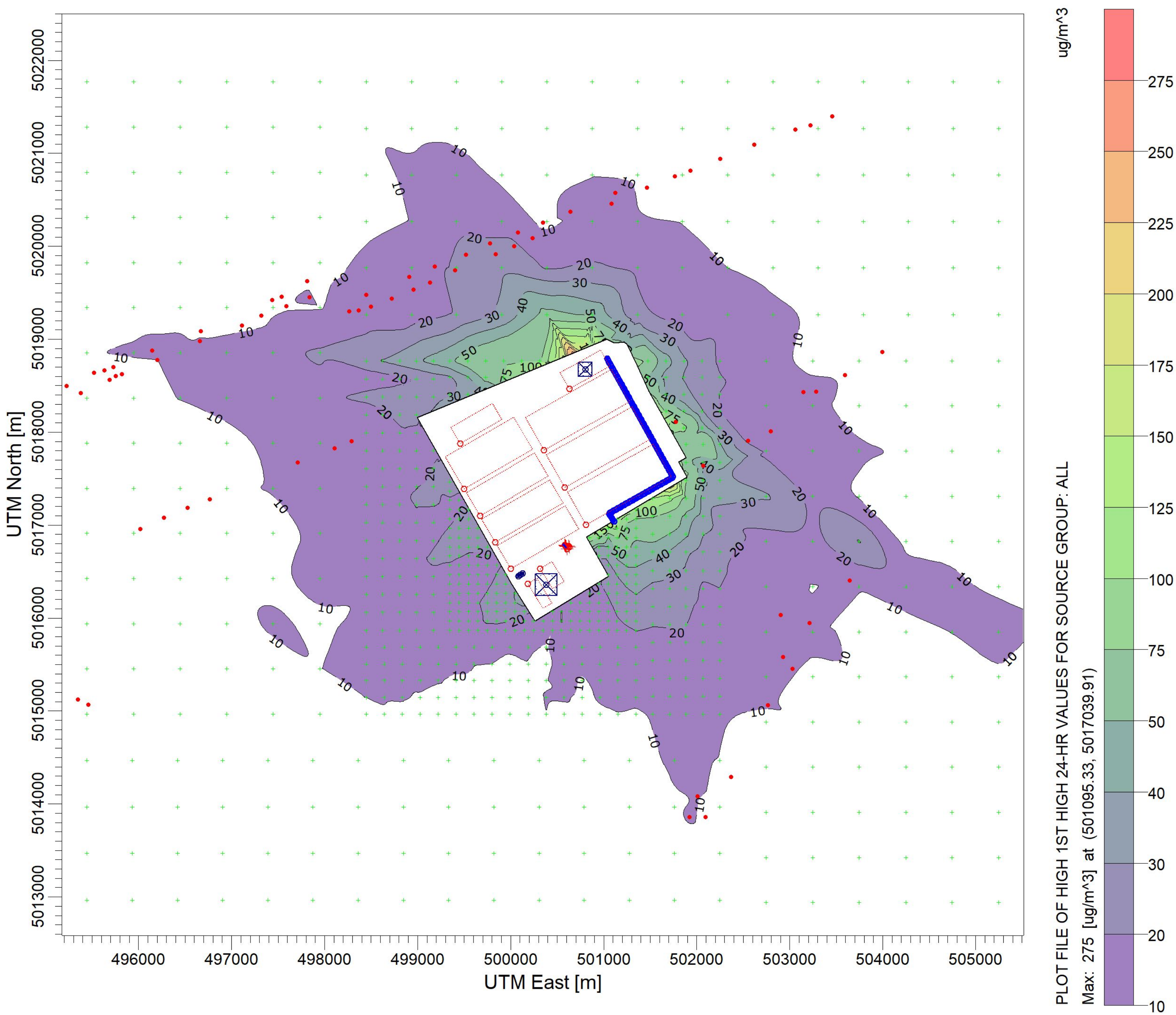
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario B
Particulate Matter (PM) Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:
24

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
275 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-04

SCALE: 1:60,000

0 — 2 km

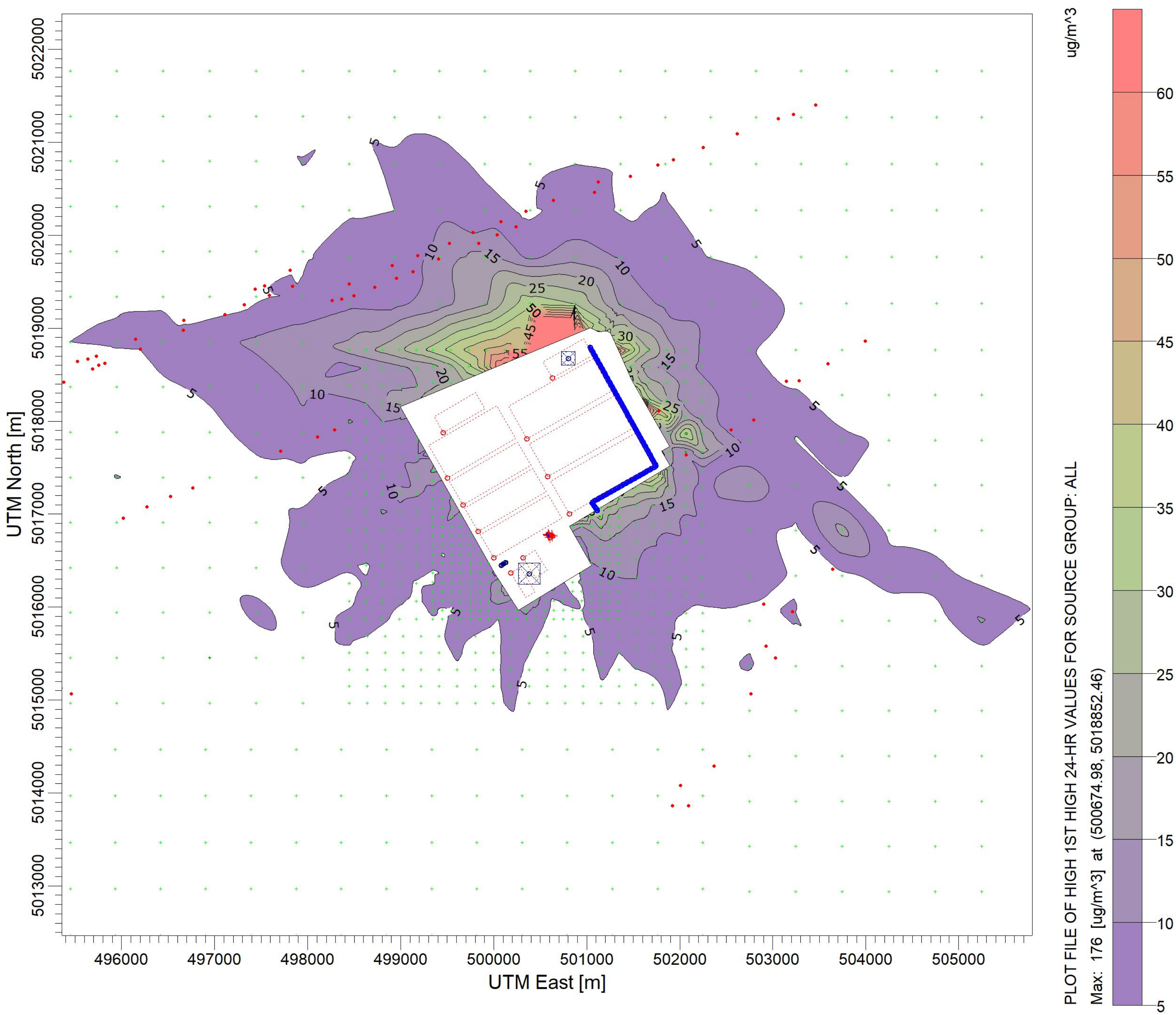
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario B
PM10 Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:

24

RECEPTORS:

1922

OUTPUT TYPE:

Concentration

MAX:

176 ug/m^3

COMPANY NAME:

Ramboll Canada Inc.

MODELER:

EM

DATE:

2022-06-28

SCALE: 1:60,000

0 2 km

RAMBOLL

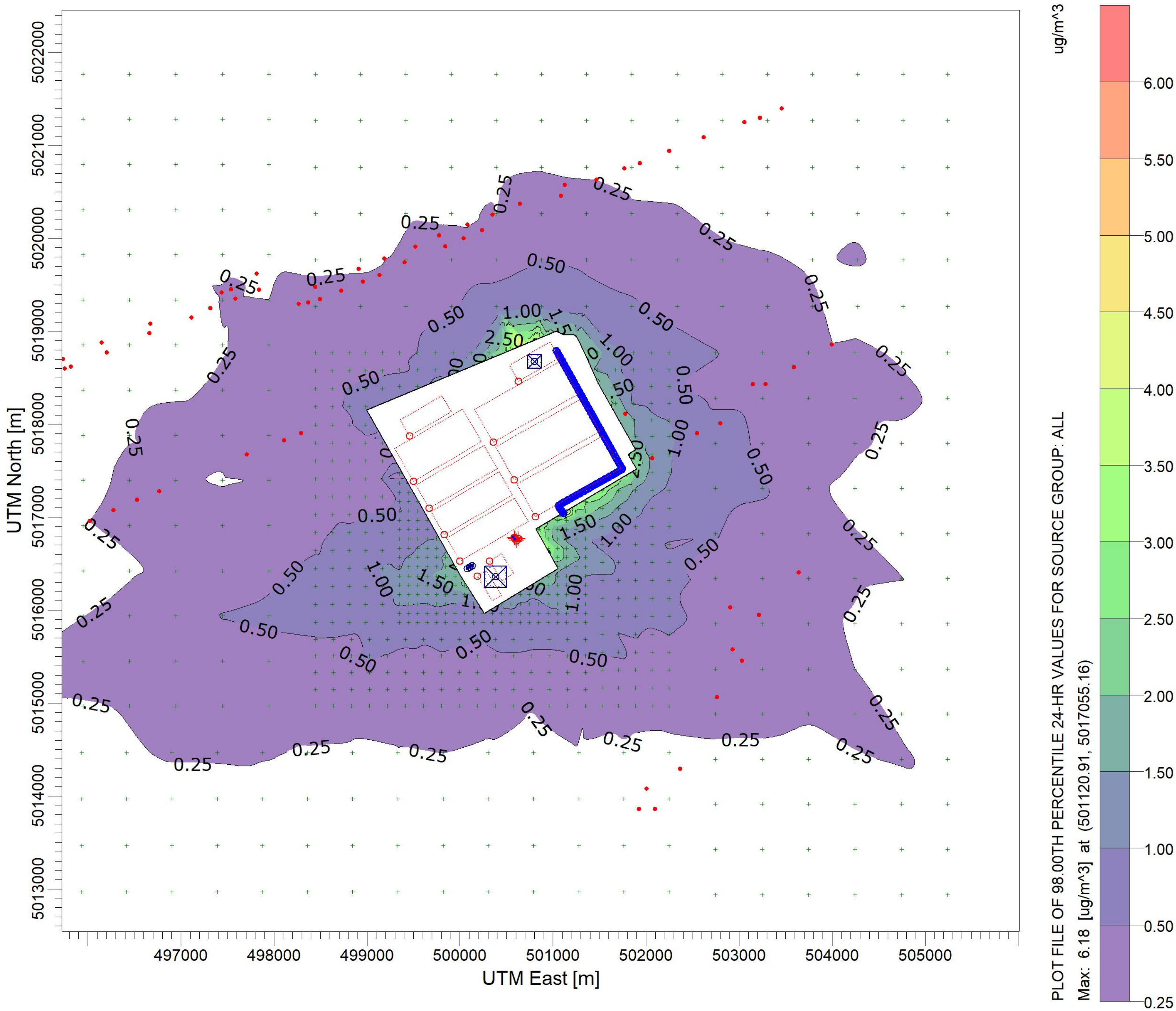
PROJECT NO.:

324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario B
PM2.5 Peak 24 Hour Average Concentration Contours - 98th Percentile - Year 1 (2015)



COMMENTS:

SOURCES:
24

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
6.18 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

SCALE: 1:60,000

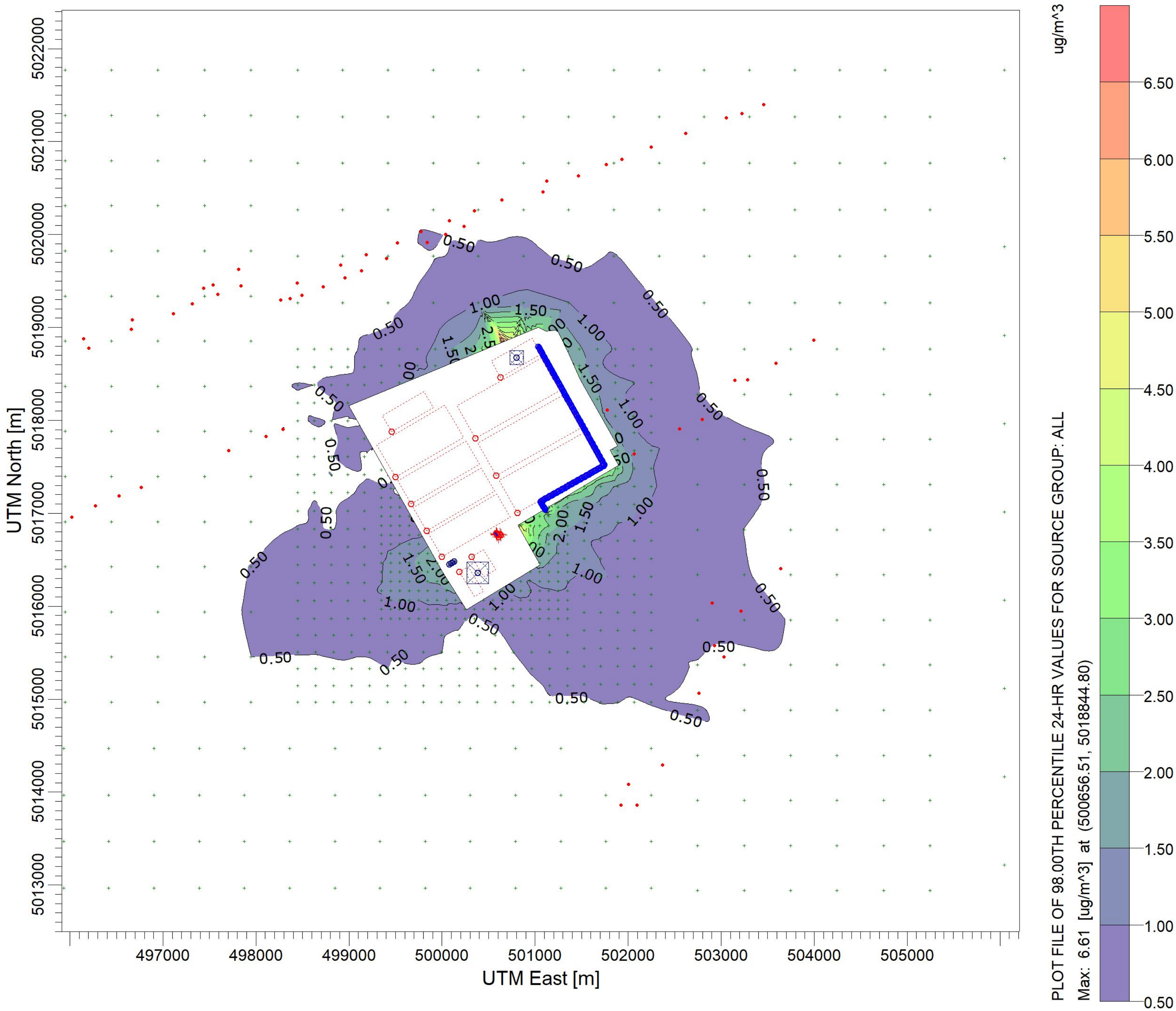
0 — 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario B
PM2.5 Peak 24 Hour Average Concentration Contours - 98th Percentile - Year 2 (2016)



COMMENTS:

SOURCES:

24

RECEPTORS:

1922

OUTPUT TYPE:

Concentration

MAX:

6.61 ug/m^3

COMPANY NAME:

Ramboll Canada Inc.

MODELER:

EM

DATE:

2022-06-27

SCALE: 1:60,000

0 2 km

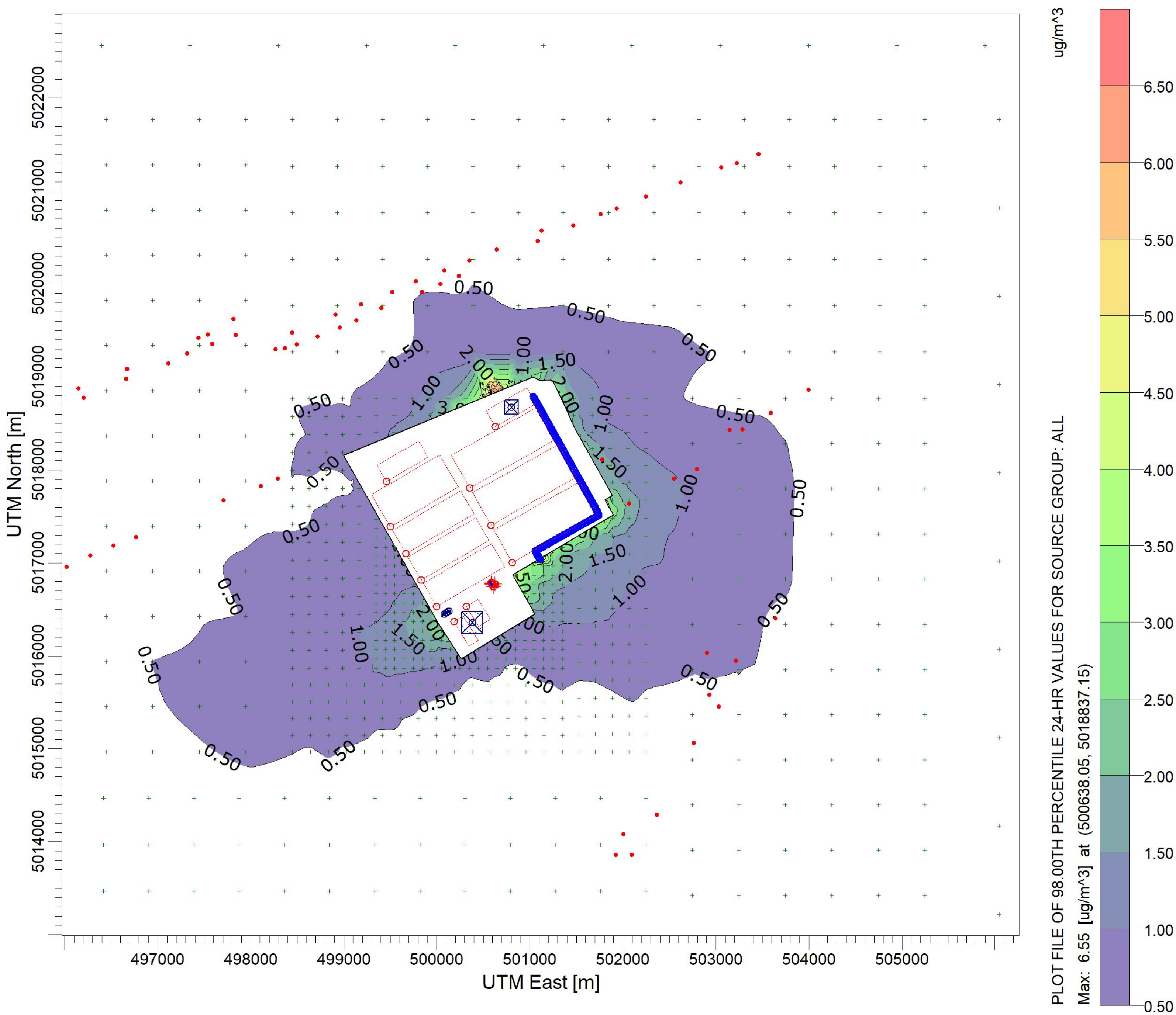
PROJECT NO.:

324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario B
PM2.5 Peak 24 Hour Average Concentration Contours - 98th Percentile - Year 3 (2017)



COMMENTS:

SOURCES:
24

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
6.55 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

SCALE: 1:60,000

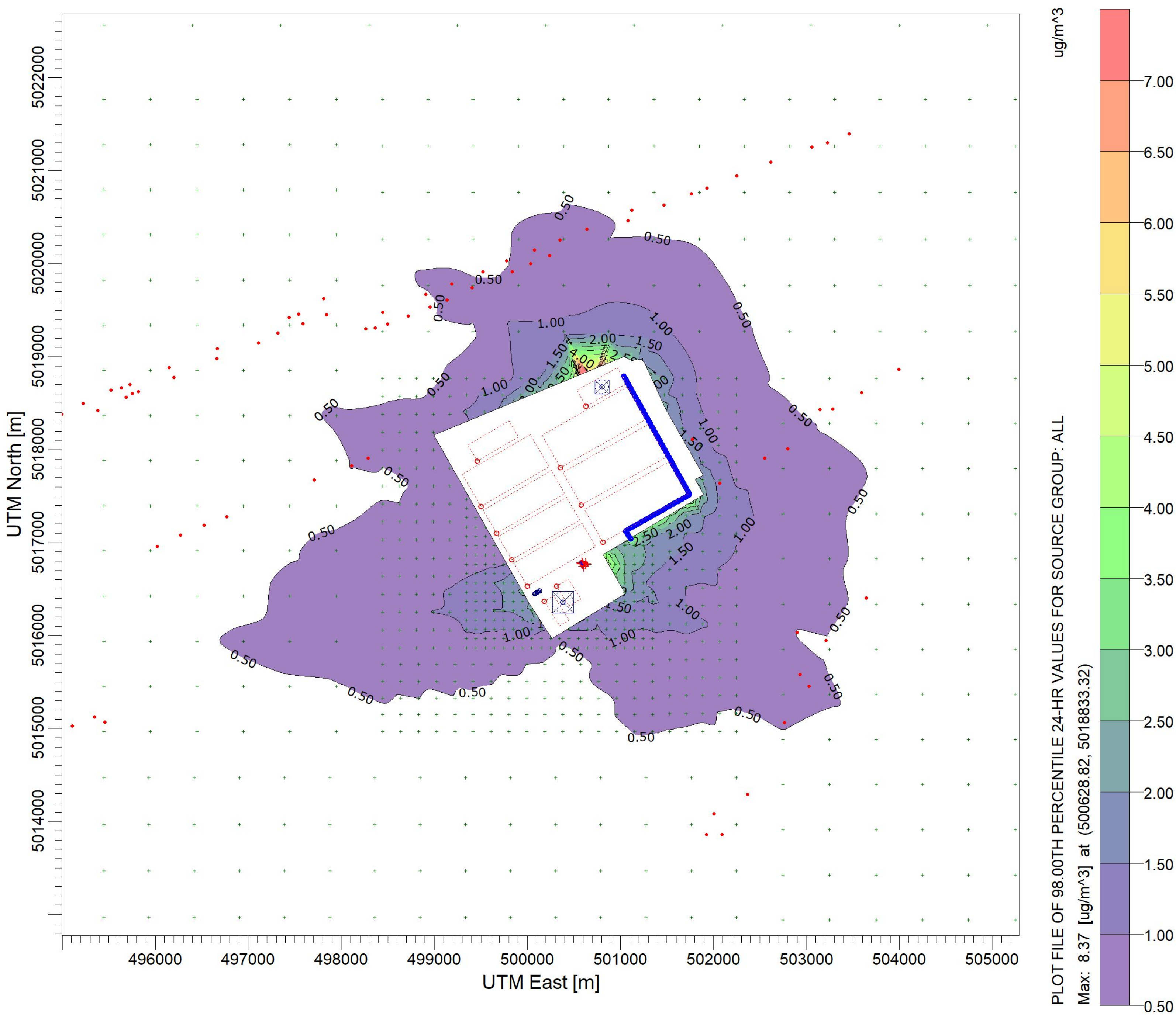
0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario B
PM2.5 Peak 24 Hour Average Concentration Contours - 98th Percentile - Year 4 (2018)



COMMENTS:

SOURCES:
24

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
8.37 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

SCALE: 1:60,000

0 2 km

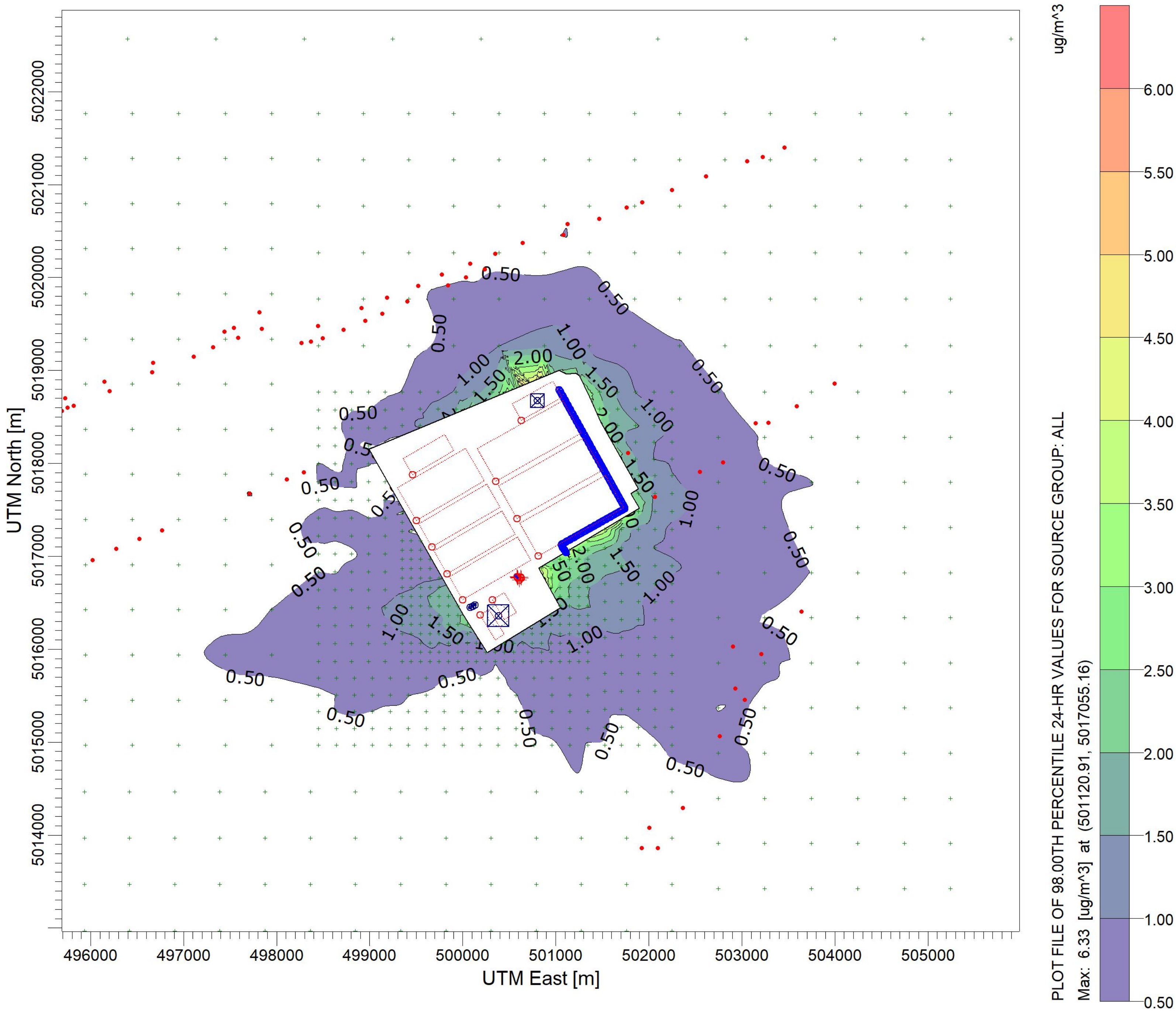
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario B
PM2.5 Peak 24 Hour Average Concentration Contours - 98th Percentile - Year 5 (2019)



COMMENTS:

SOURCES:
24

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
6.33 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

SCALE: 1:60,000

0 2 km

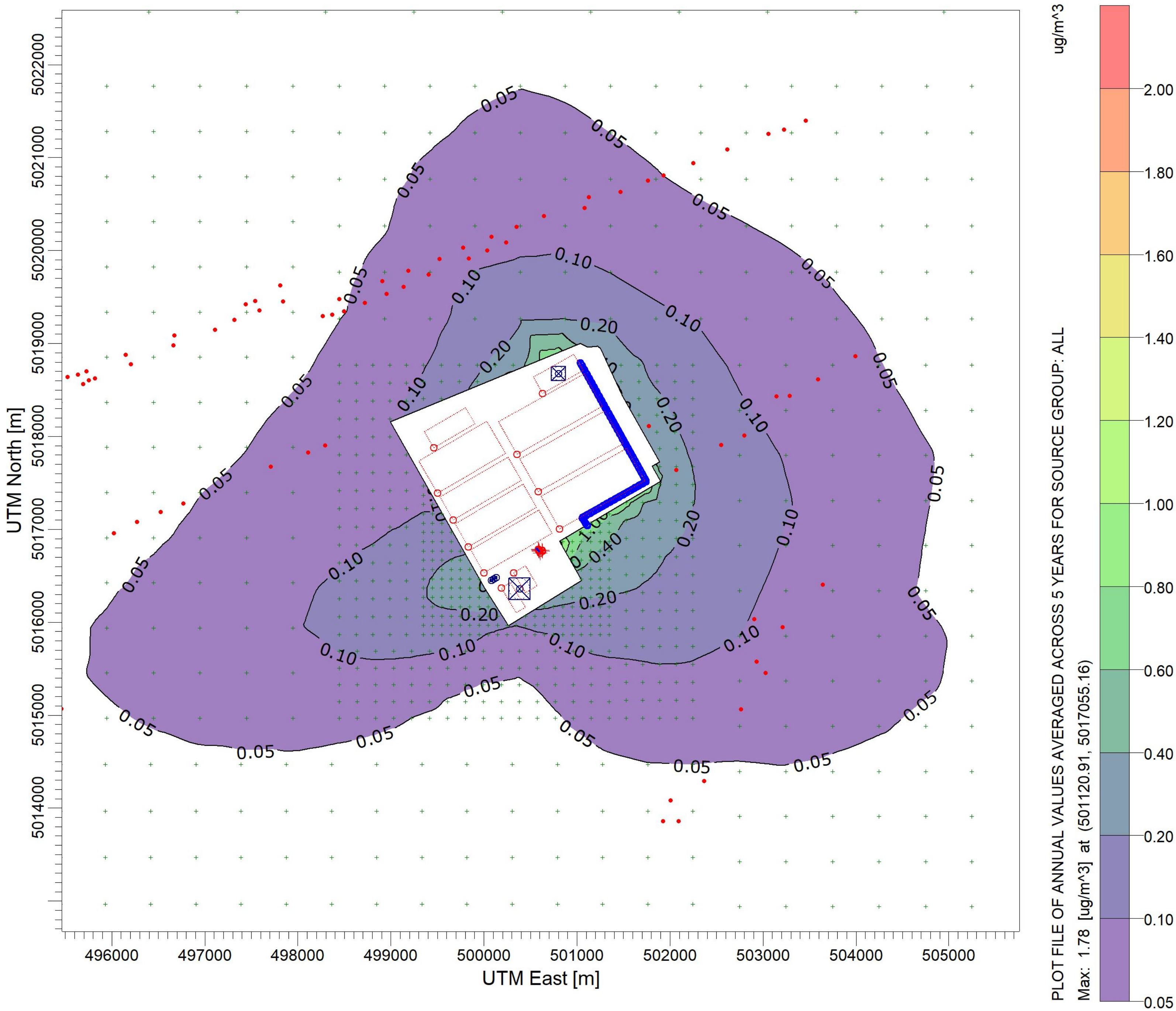
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario B
PM2.5 Peak Annual Average Concentration Contours



COMMENTS:

SOURCES:

24

RECEPTORS:

1922

OUTPUT TYPE:

Concentration

MAX:

1.78 ug/m^3

COMPANY NAME:

Ramboll Canada Inc.

MODELER:

EM

DATE:

2022-06-27

SCALE: 1:60,000

0 2 km

RAMBOLL

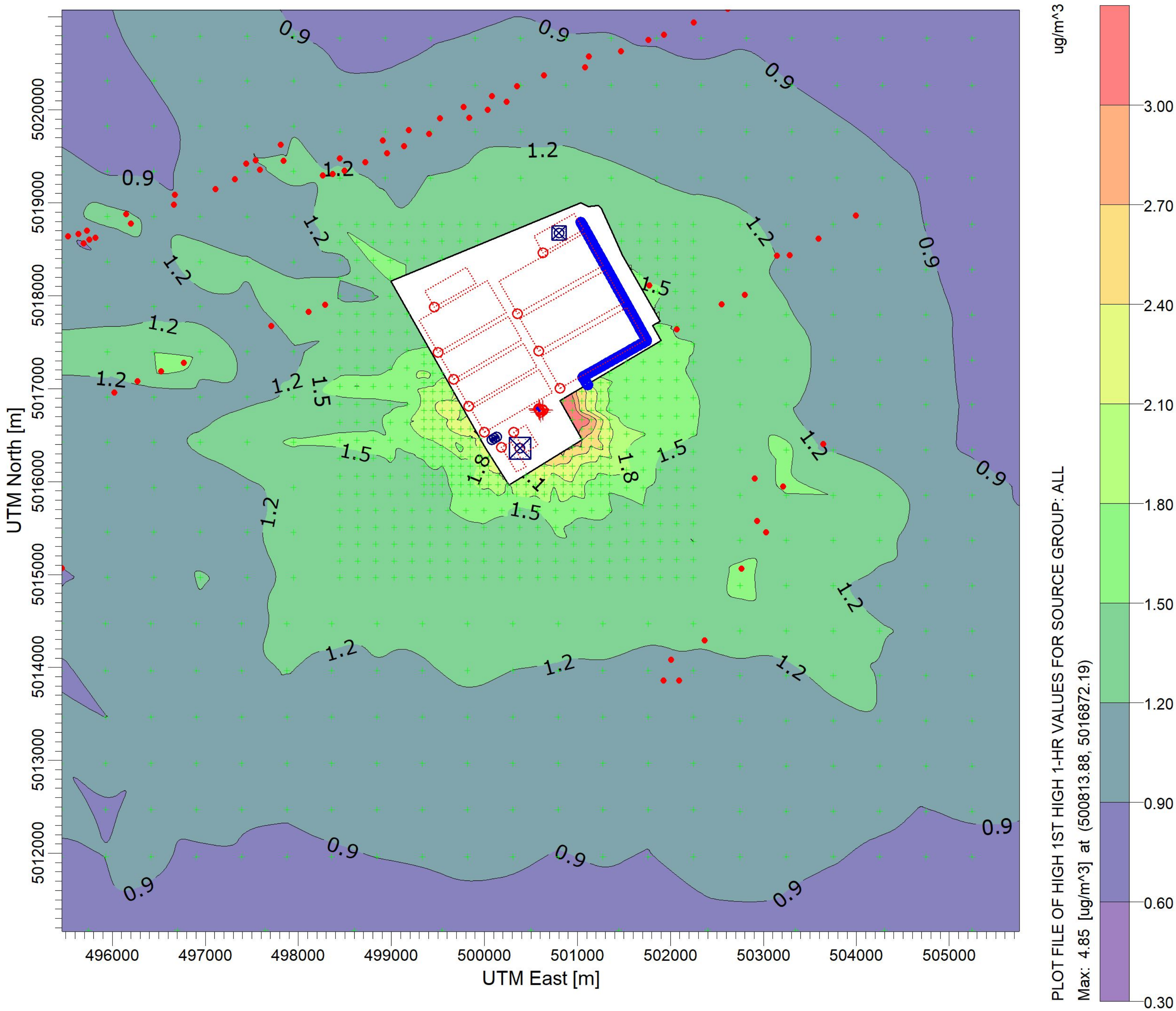
PROJECT NO.:

324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario B
Sulphur Dioxide Peak 1 Hour Concentration Contours



COMMENTS:

SOURCES:
24

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
4.85 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-28

SCALE: 1:60,000

0 2 km

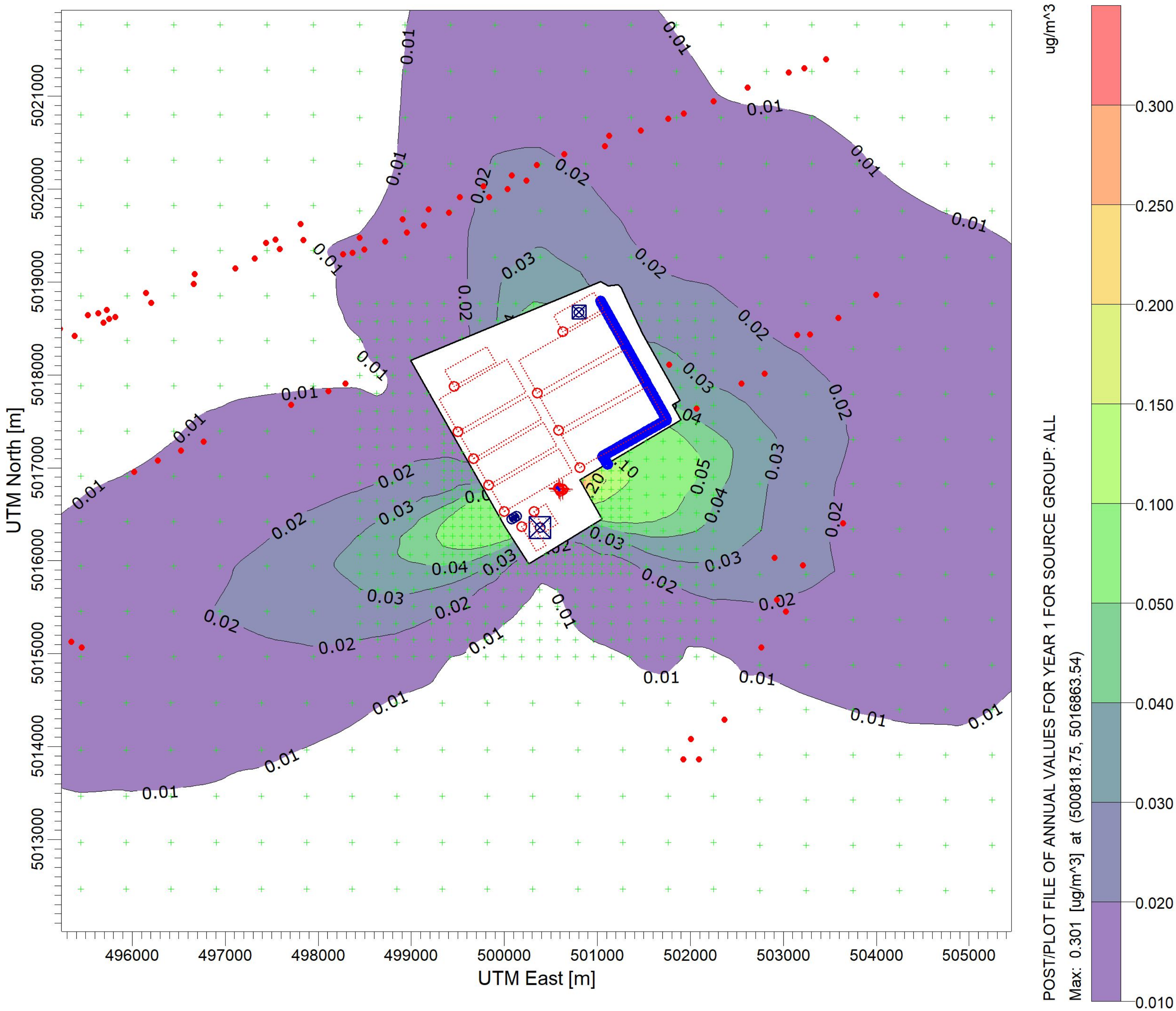
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario B
Sulphur Dioxide Peak Annual Concentration Contours, Highest Year (Year 3)



COMMENTS:

SOURCES:
24

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
0.301 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-30

SCALE: 1:60,000

0 — 2 km

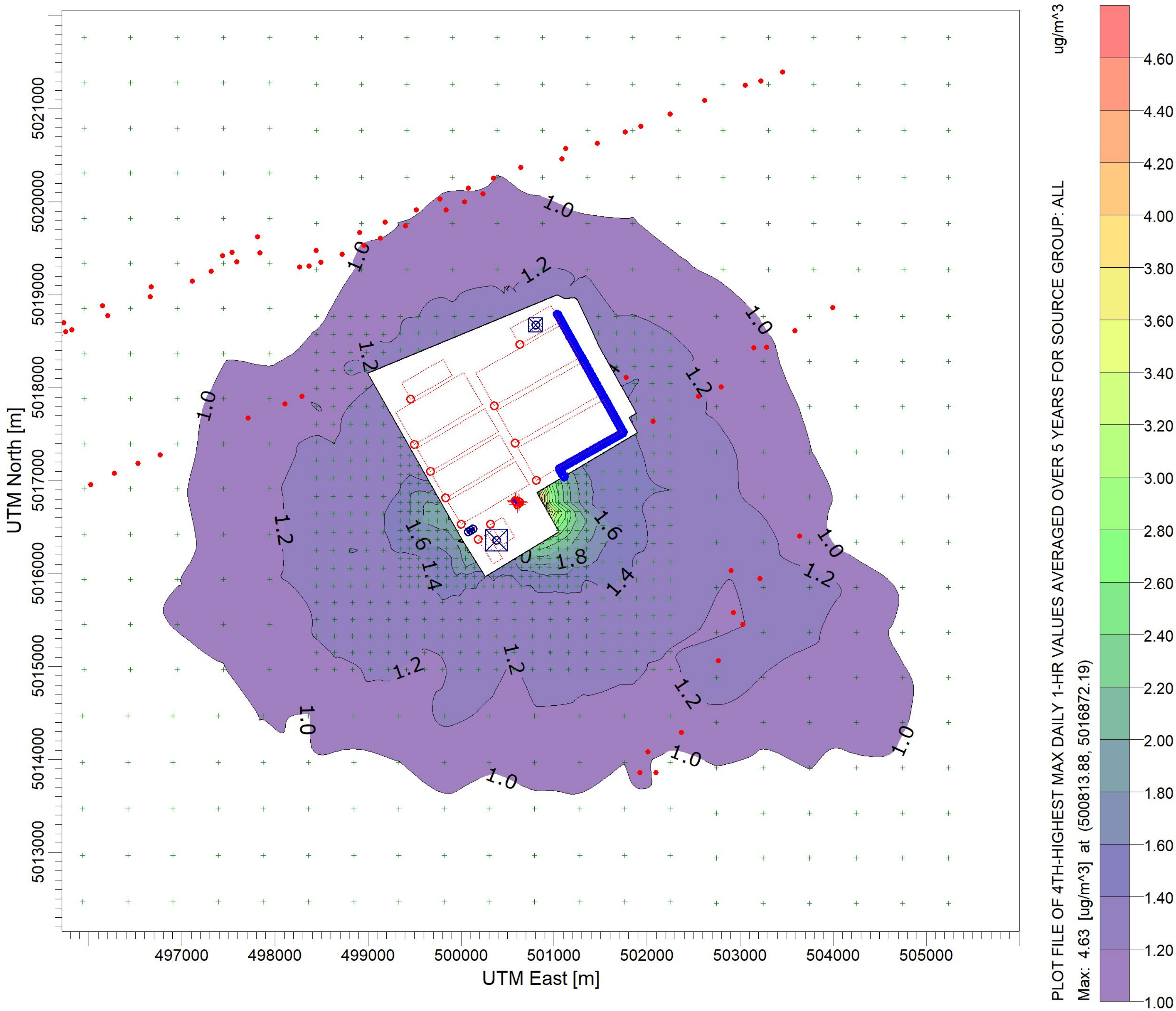
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario B
Sulphur Dioxide, 1 Hour CAAQS - Multi year average of the 99th percentile daily maximum 1-hour concentration



COMMENTS:

SOURCES: 24

RECEPTORS: 1922

OUTPUT TYPE: Concentration

MAX: 4.63 ug/m^3

COMPANY NAME: Ramboll Canada Inc.

MODELER: EM

DATE: 2022-07-04

SCALE: 1:60,000

0 2 km

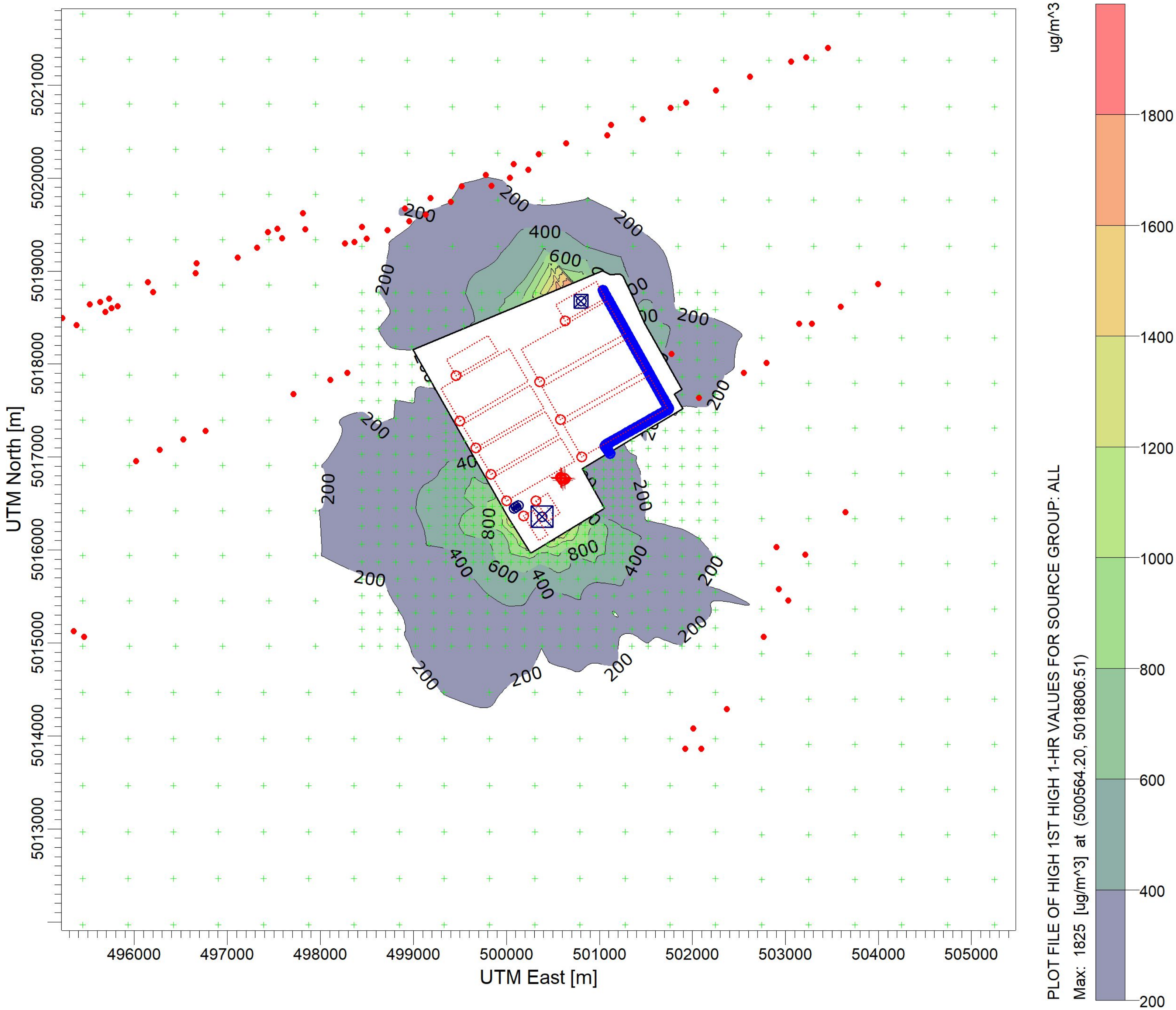
RAMBOLL

PROJECT NO.: 324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario B
Carbon Monoxide Peak 1 Hour Average Concentration Contours



COMMENTS:

SOURCES:
24

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
1825 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-04

SCALE: 1:60,000

0 2 km

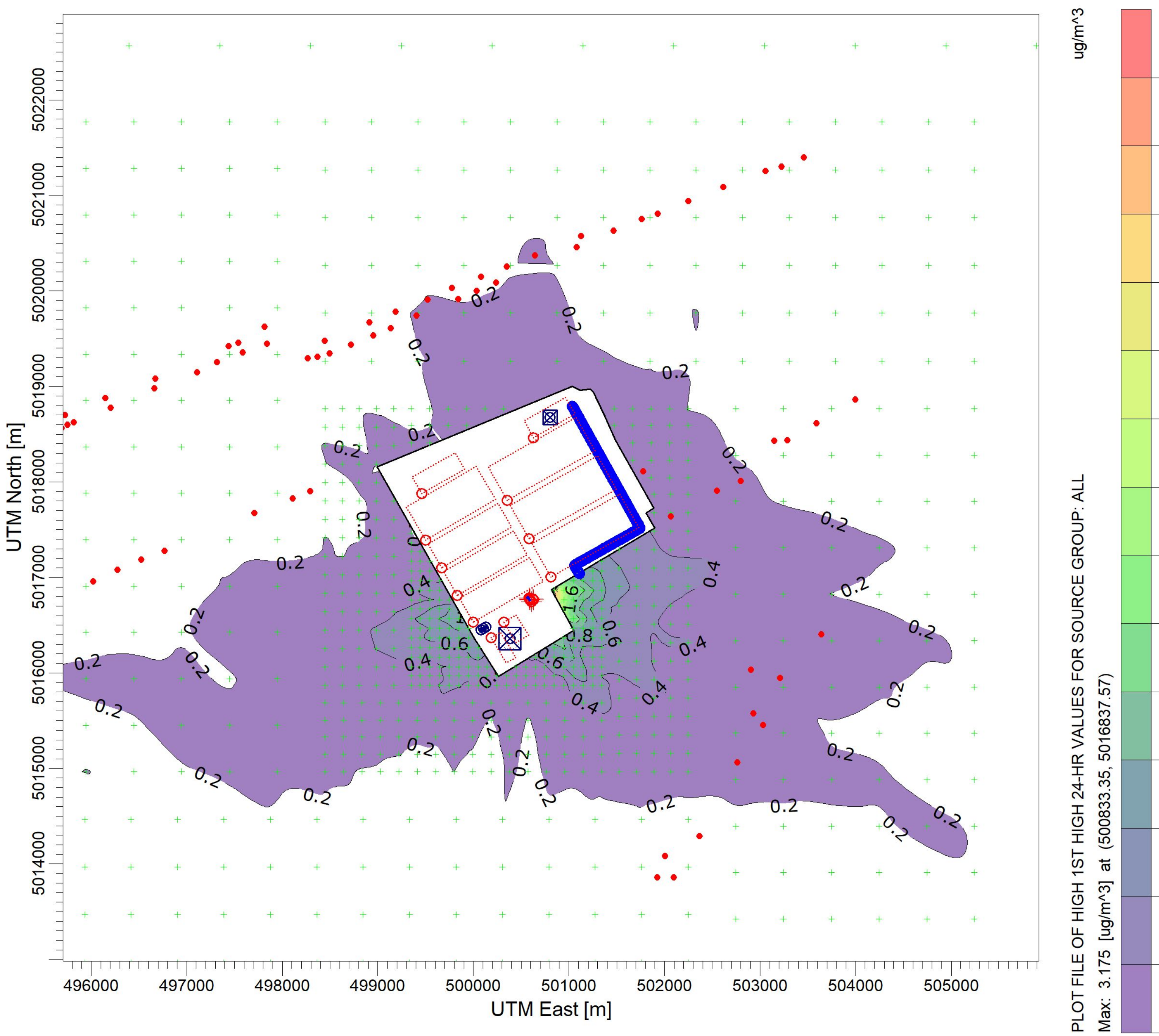
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario B
Hydrogen Chloride Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:
24

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
3.175 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-04

SCALE: 1:60,000

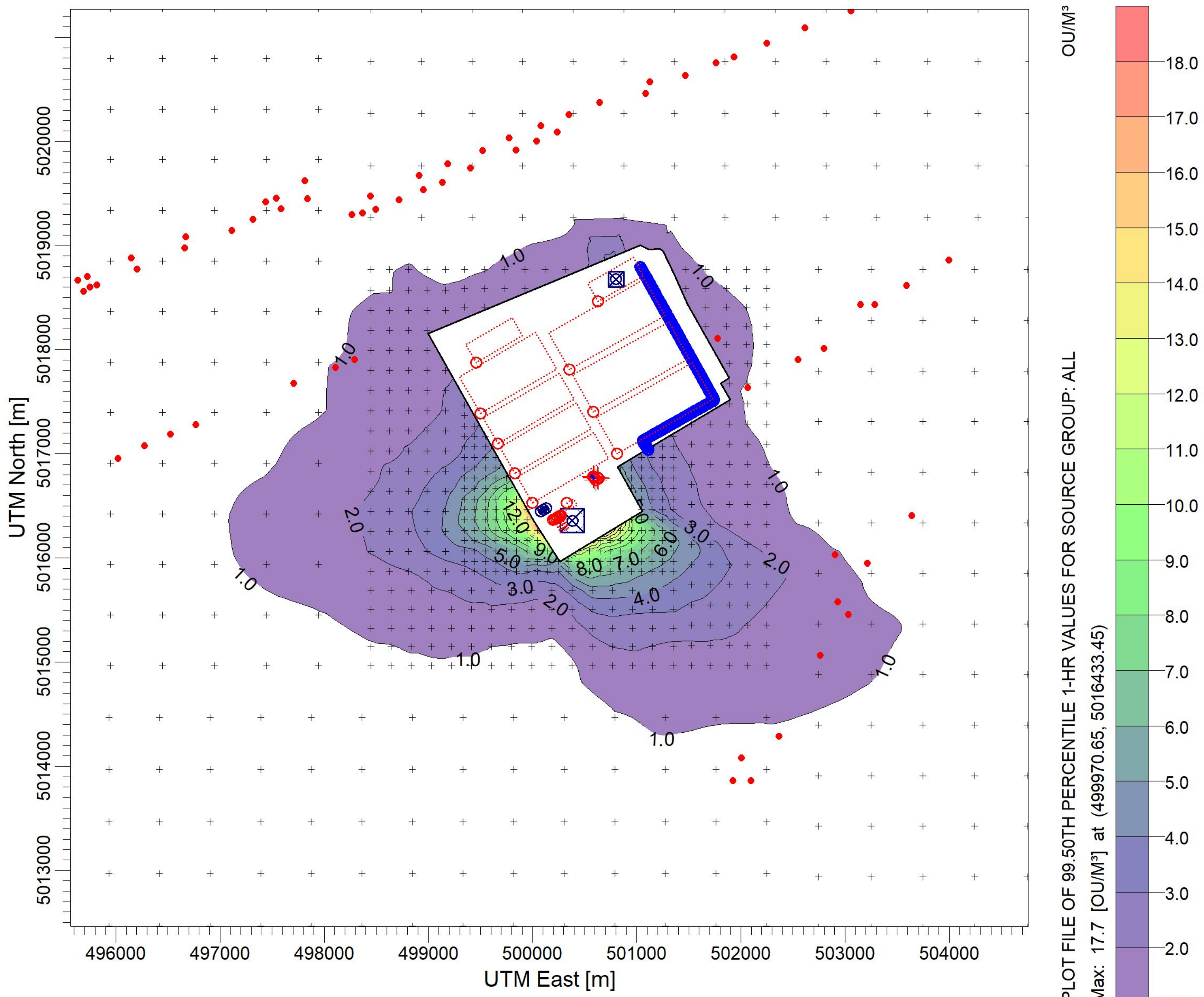
0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario B
Odour 10 Minute Average Peak Concentration Contours (99.5th Percentile)



COMMENTS:

The 1-hr air dispersion modelling output units were adjusted in AERMOD to reflect the expected peak 10-min average values using the MECP recommended standard conversion factor of 1.65.

SOURCES:

29

RECEPTORS:

1922

OUTPUT TYPE:

Concentration

MAX:

17.7 OU/M³

COMPANY NAME:

Ramboll Canada Inc.

DATE:

2023-05-29

SCALE: 1:60,000

0 2 km

RAMBOLL

PROJECT NO.:

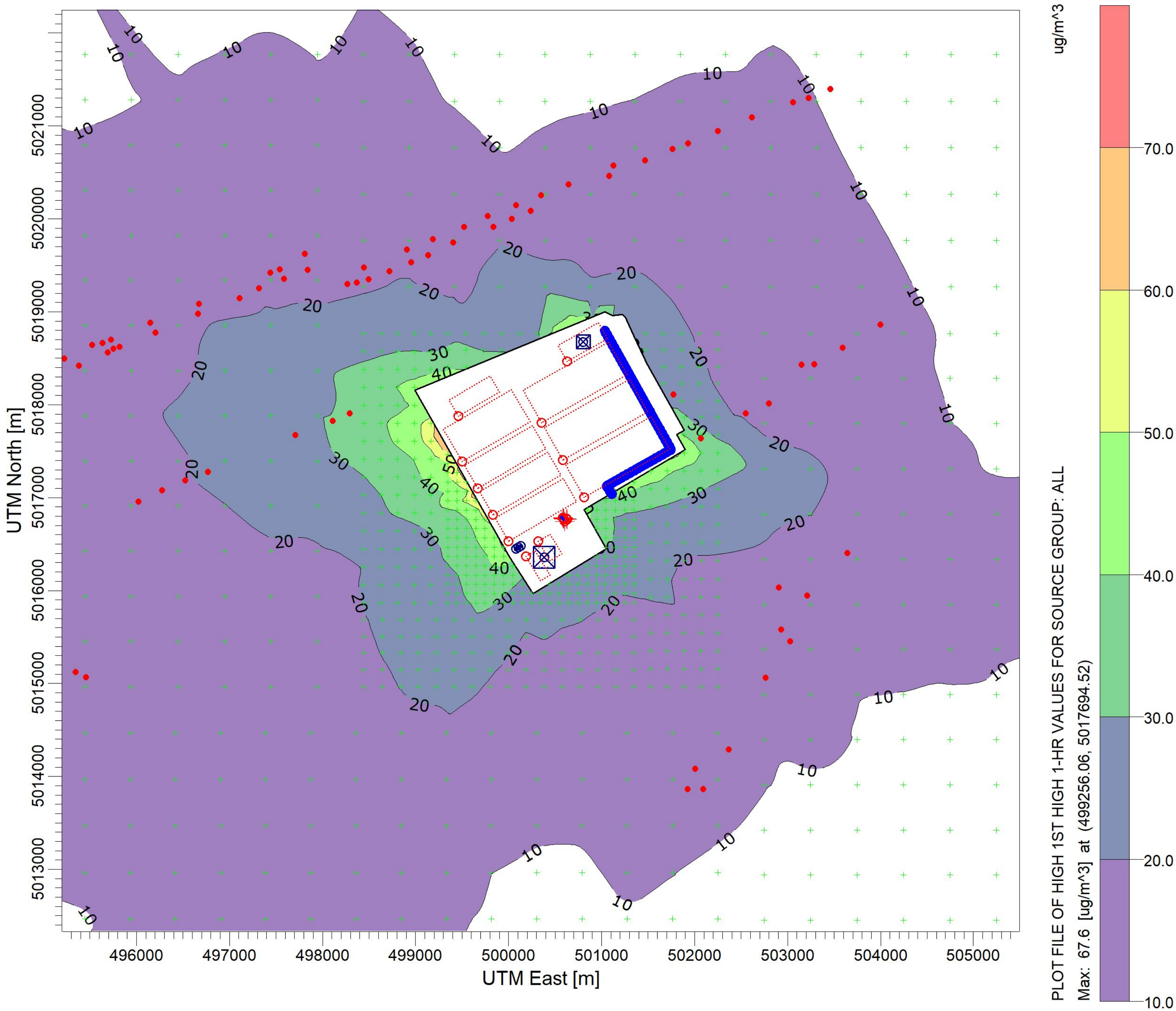
324000731

AERMOD View - Lakes Environmental Software

D:\324000731 - GFL Moosecreek\AERMOD\South Piles\Odour_1B\Odour_1B.isc

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario B
Landfill Gas (LFGLandfill Gas (LFG) Base Run (1 g/s) Peak 1 Hour Average Concentration Contours



COMMENTS:

SOURCES:
24

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
67.6 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-04

SCALE: 1:60,000

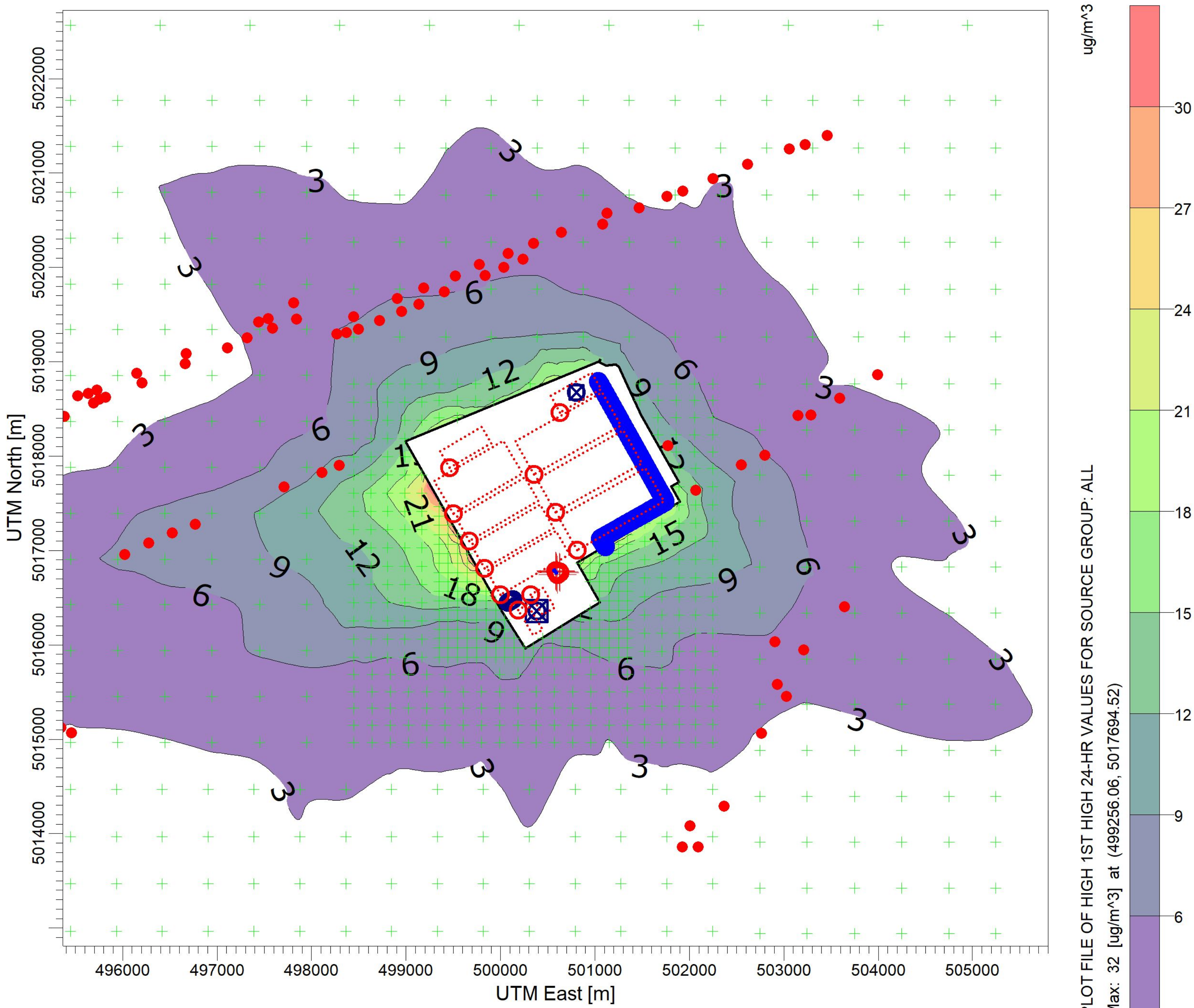
0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario B
Landfill Gas (LFGLandfill Gas (LFG) Base Run (1 g/s) Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:
24

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
32 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-28

SCALE: 1:60,000

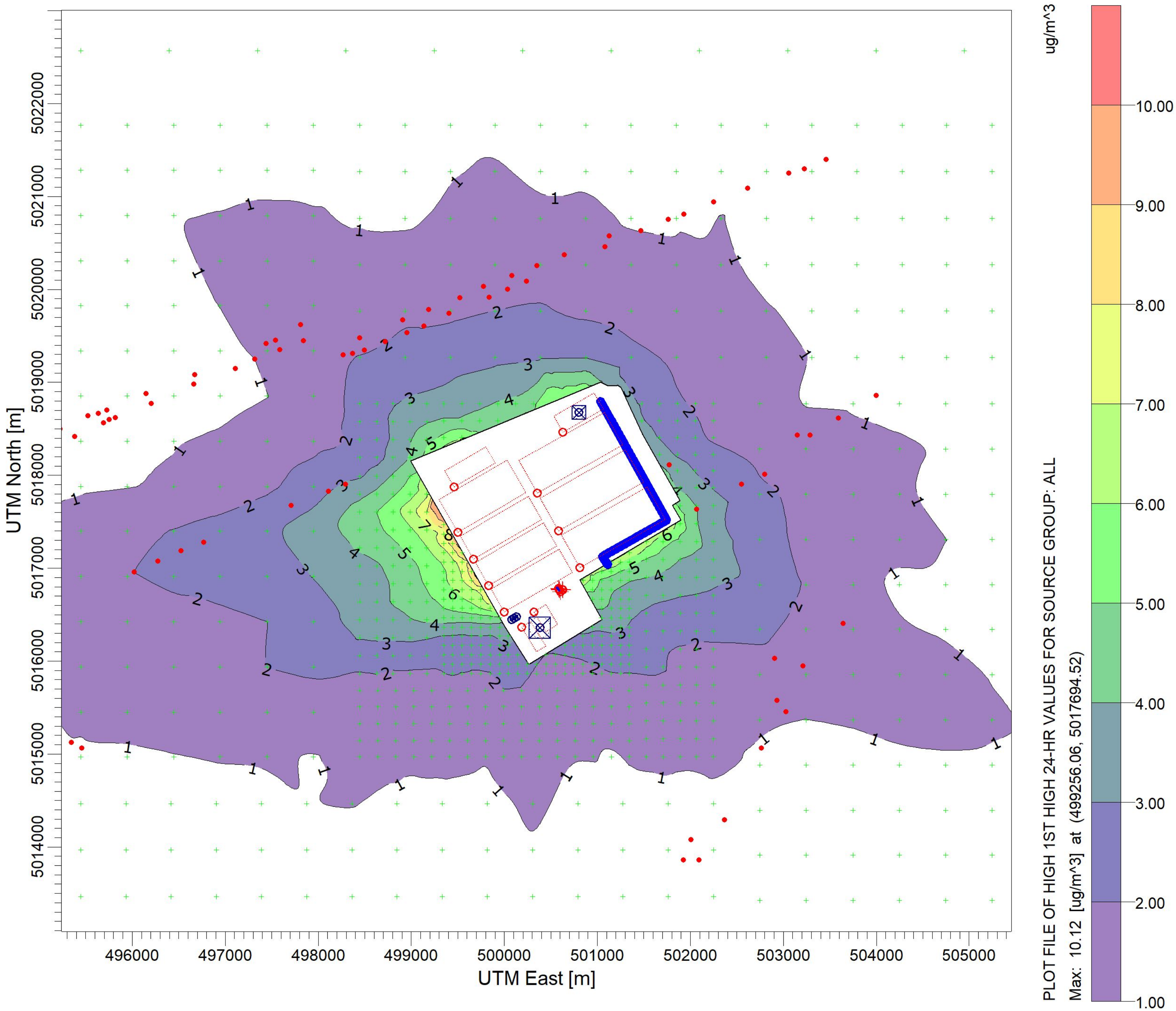
0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 1 Scenario B
Siloxane Base Run (1 g/s) Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:
24

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
10.12 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-04

SCALE: 1:60,000

0 2 km

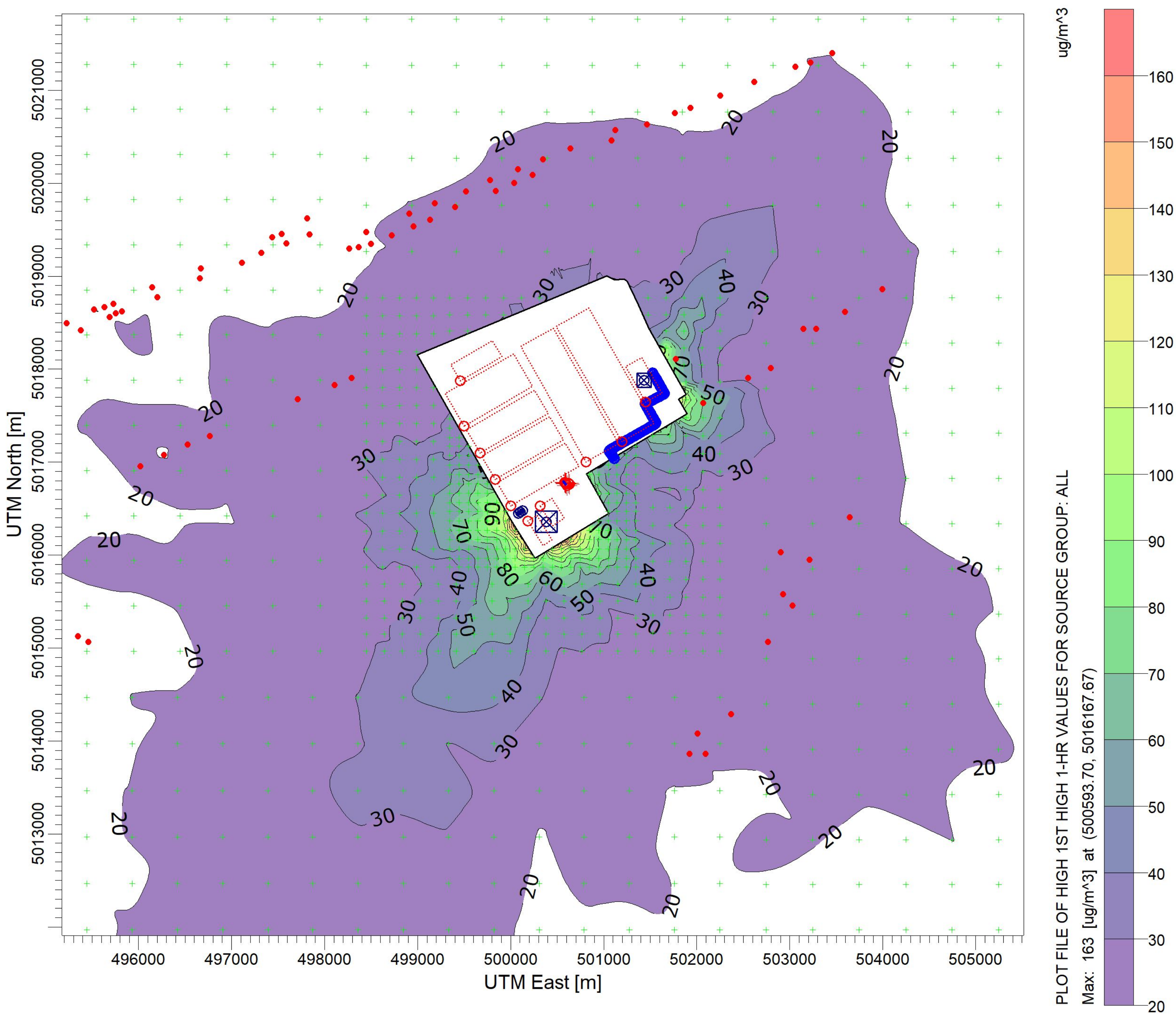
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario A
Nitrogen Oxides (NOx) Peak 1 Hour Average Concentration Contours



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
163 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-04

SCALE: 1:60,000

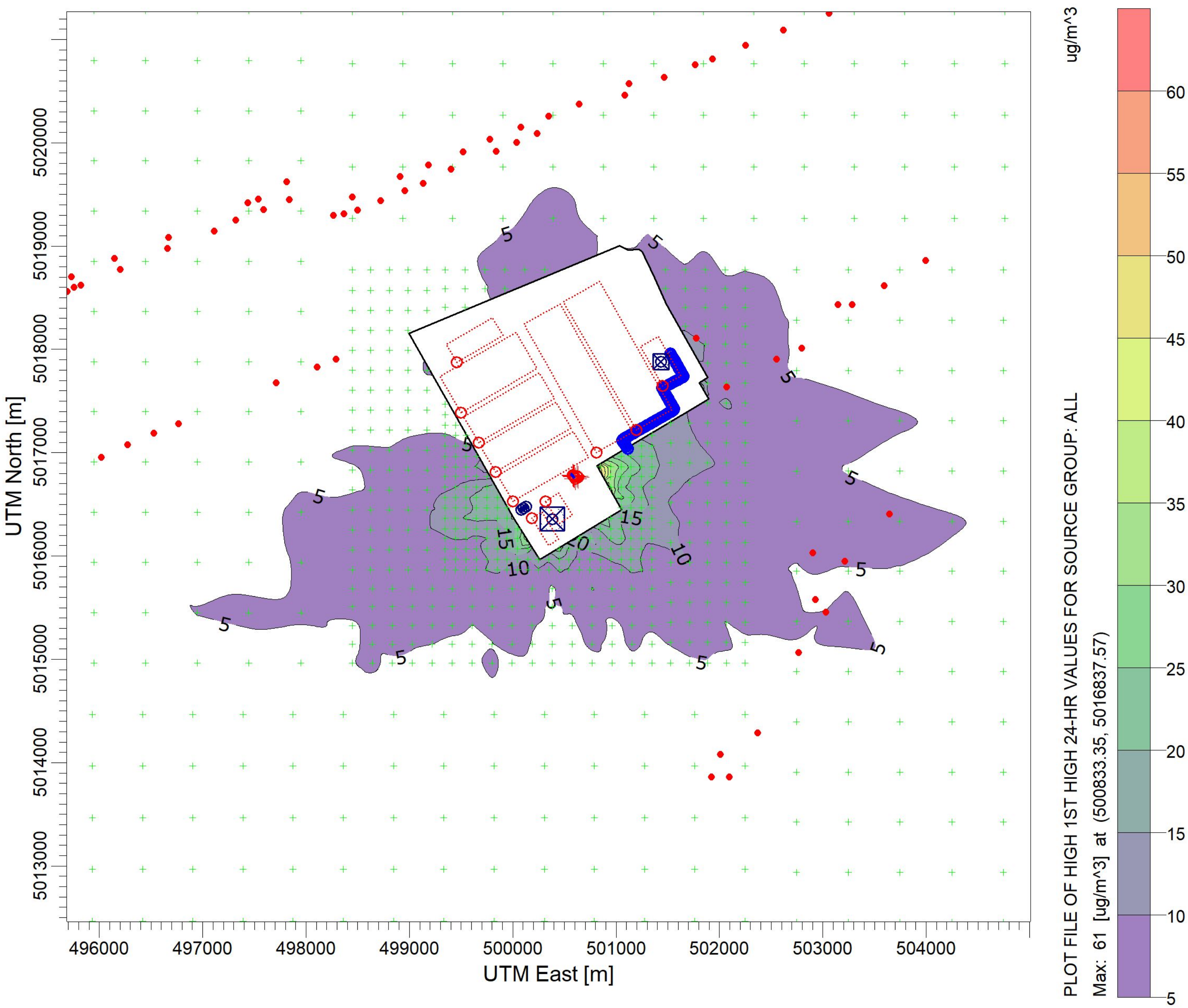
0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario A
Nitrogen Oxides (NOx) Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
61 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-04

SCALE: 1:60,000

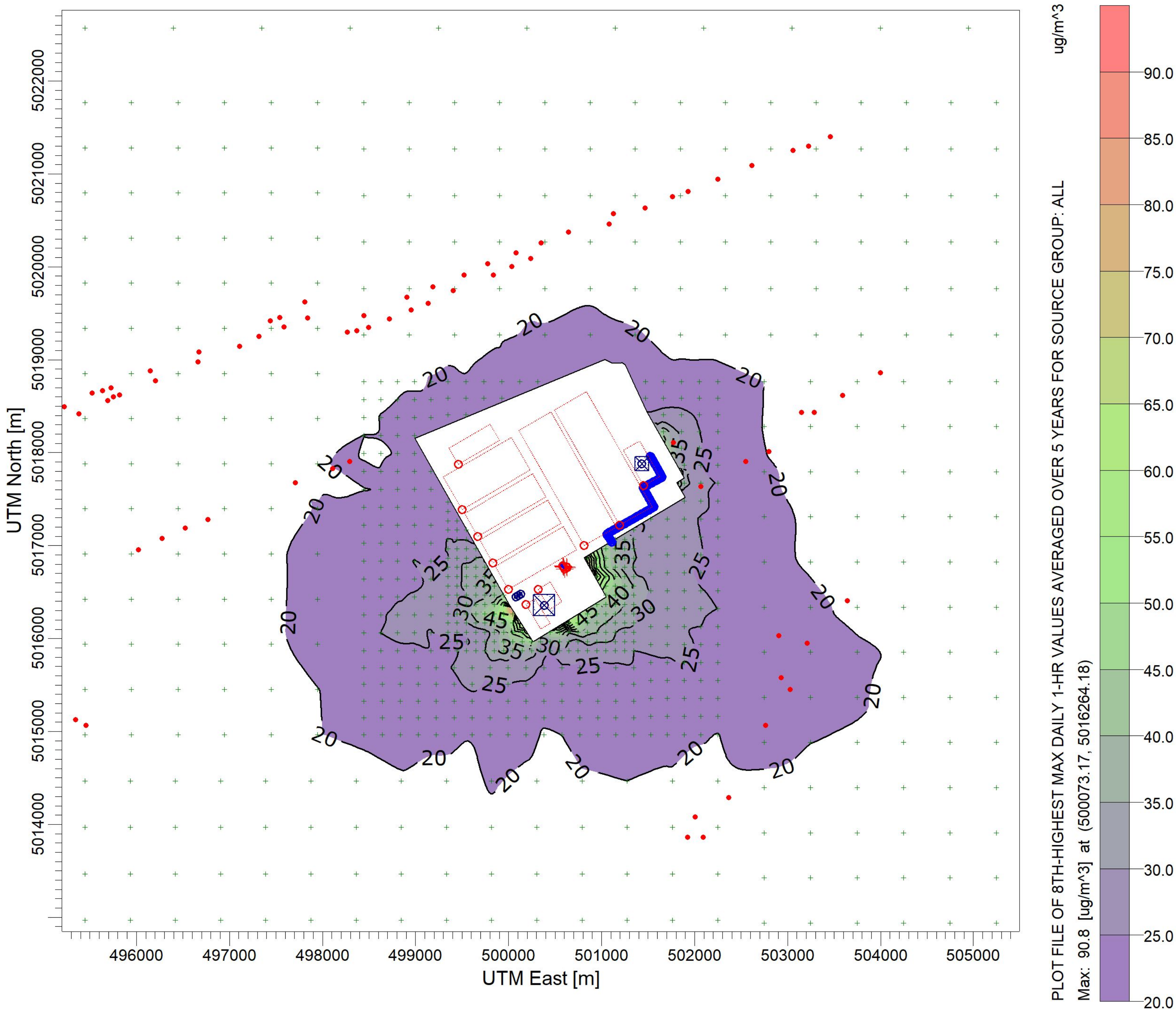
0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario A
Nitrogen Dioxide - Multi year average of 98th percentile of daily maximum 1-hr concentration



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
90.8 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

SCALE: 1:60,000

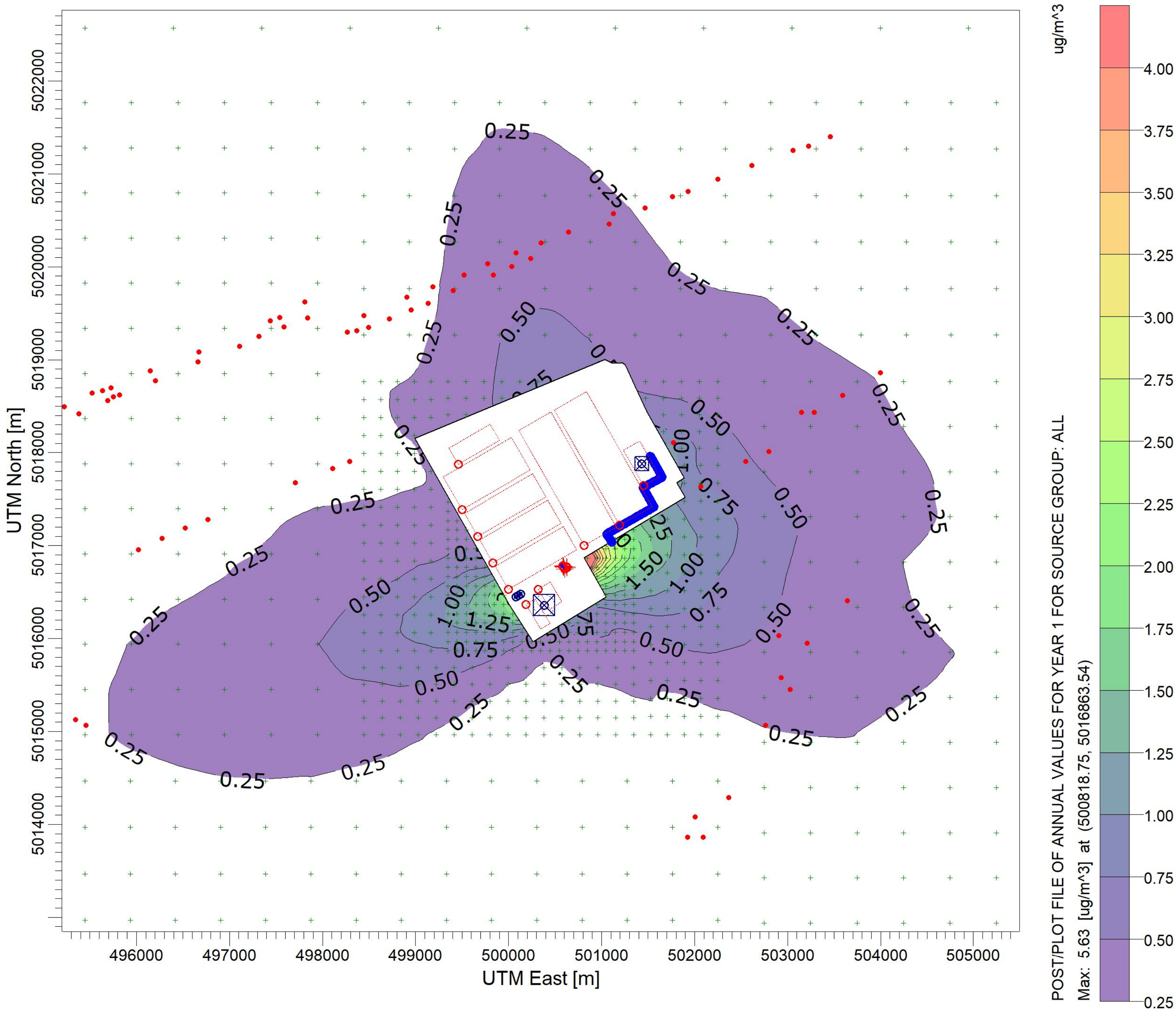
0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario A
Nitrogen Dioxide - Annual concentration, highest year (Year 3)



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
5.63 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

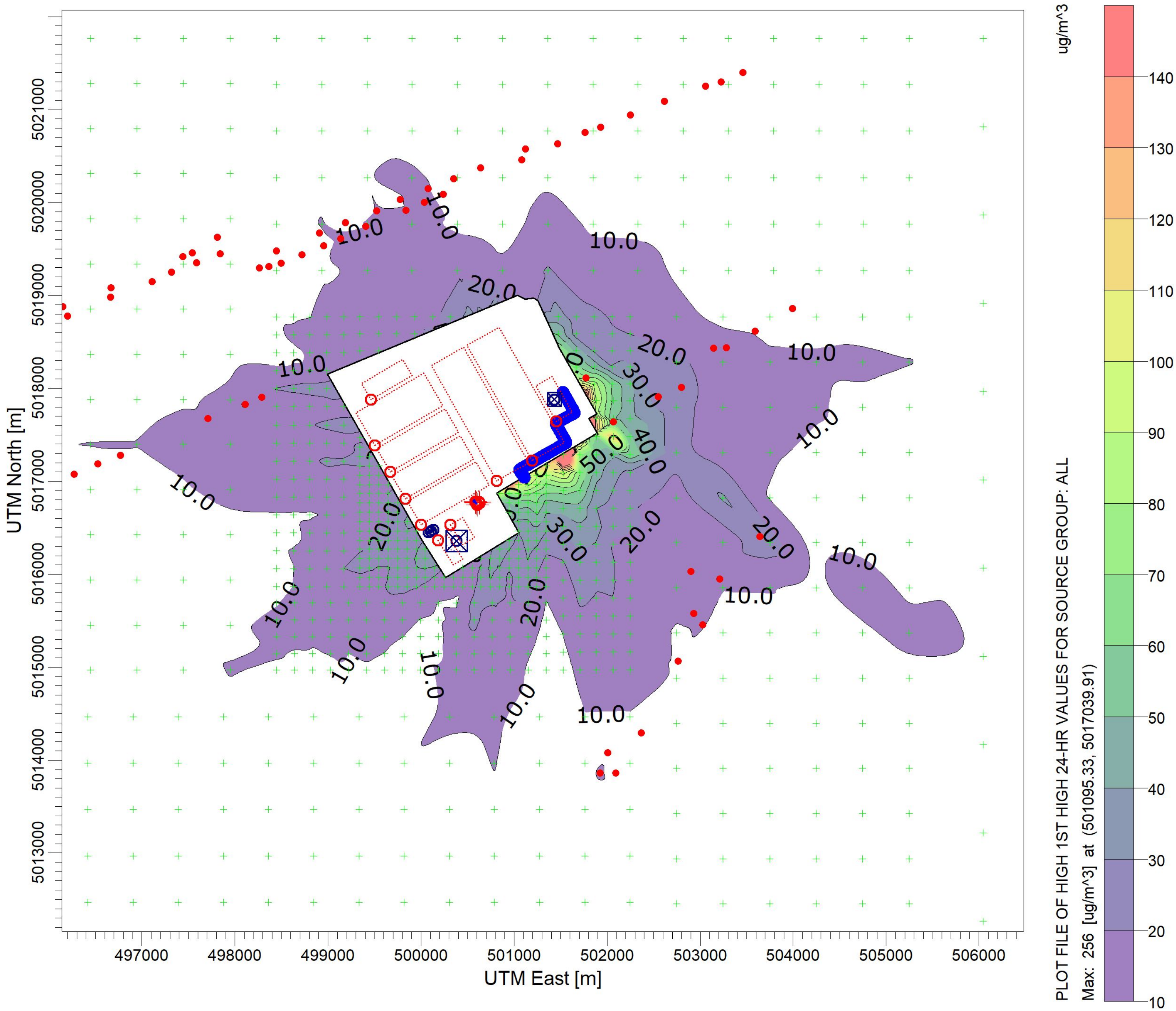
SCALE: 1:60,000
0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario A
Particulate Matter (PM) Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
256 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-29

SCALE: 1:60,000

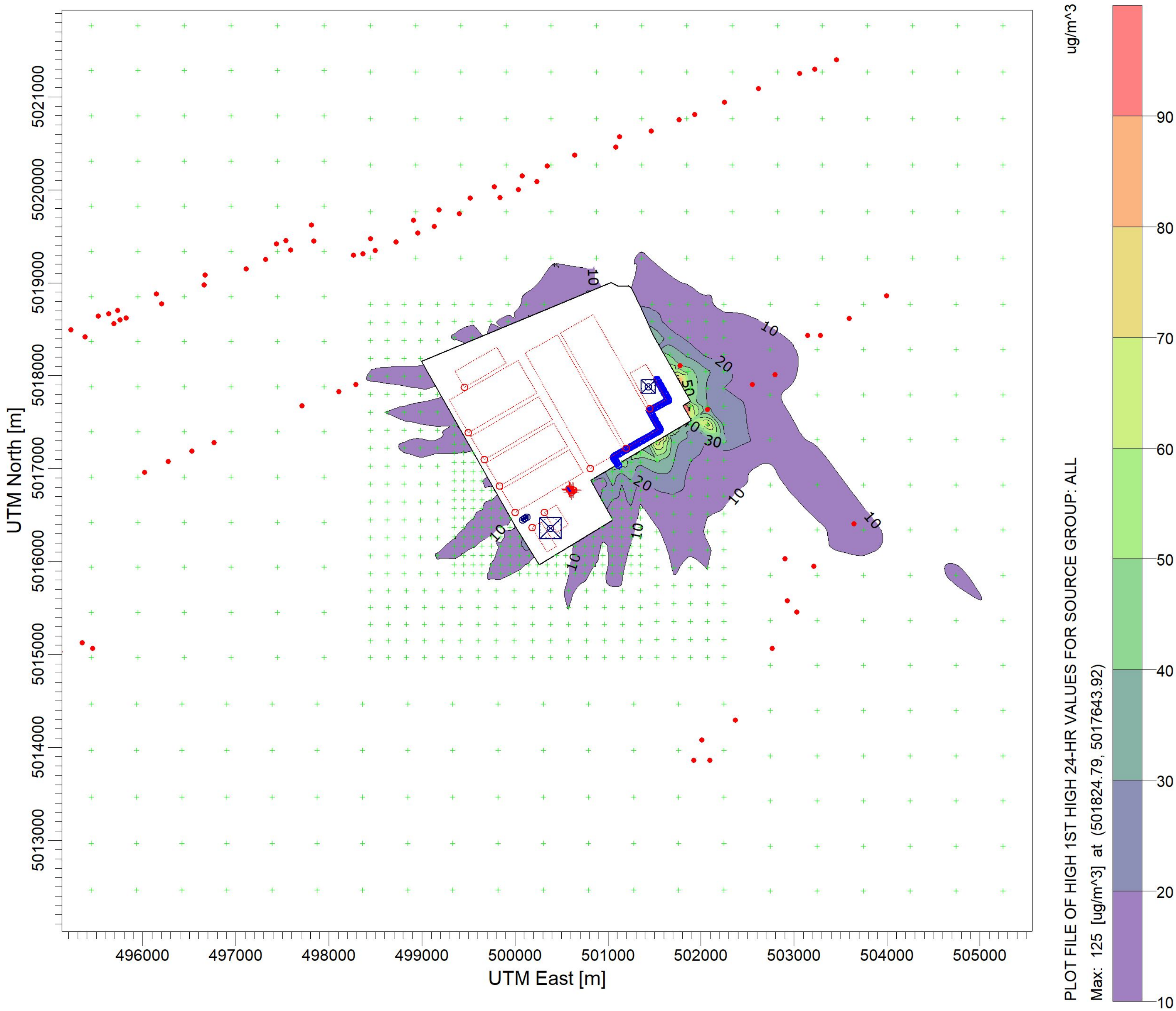
0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario A
PM10 Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
125 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-29

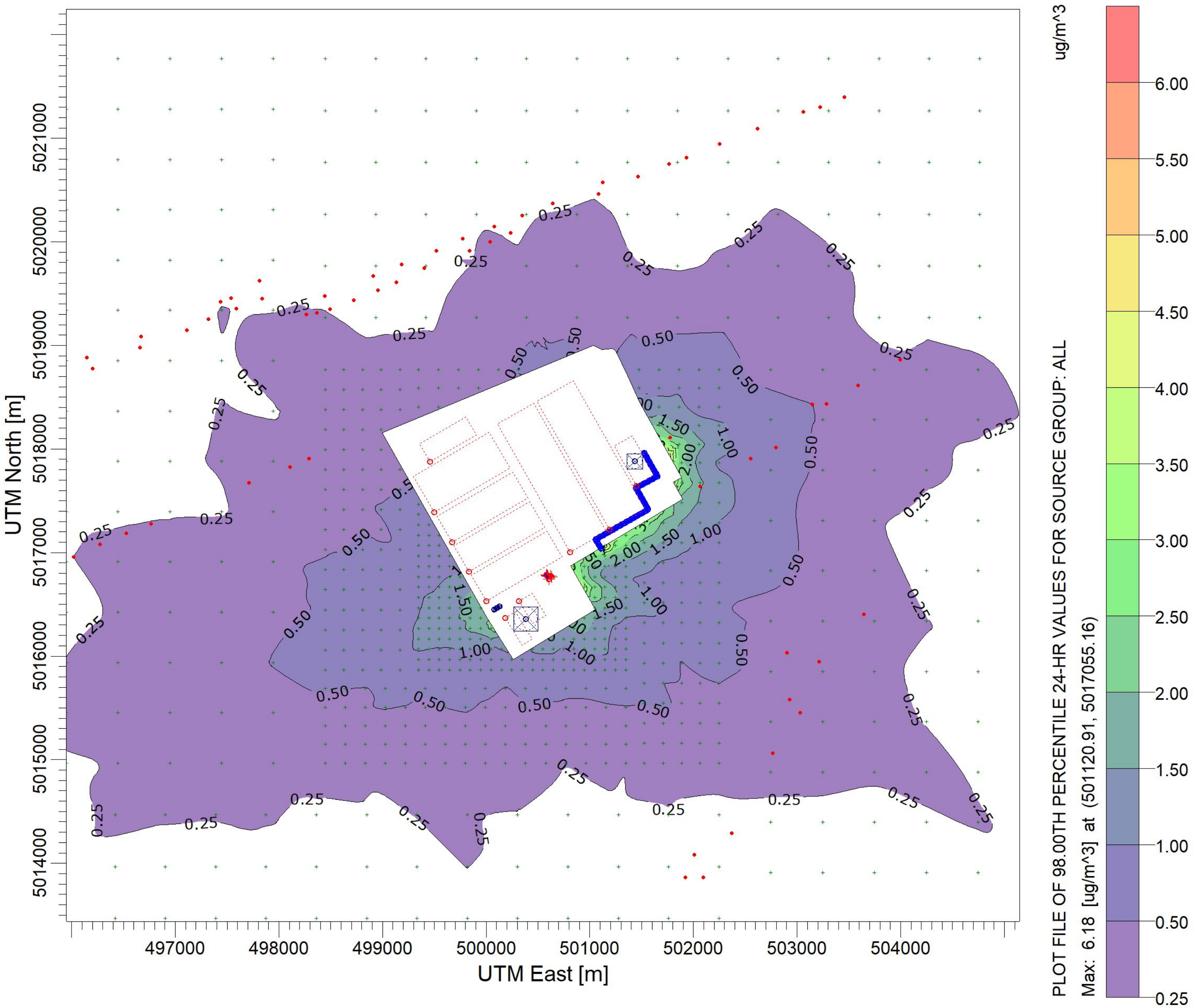
SCALE: 1:60,000

0 — 2 km

PROJECT NO.:
324000731

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario A
PM2.5 Peak 24 Hour Average Concentration Contours - 98th Percentile - Year 1 (2015)



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
6.18 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

SCALE: 1:60,000

0 — 2 km

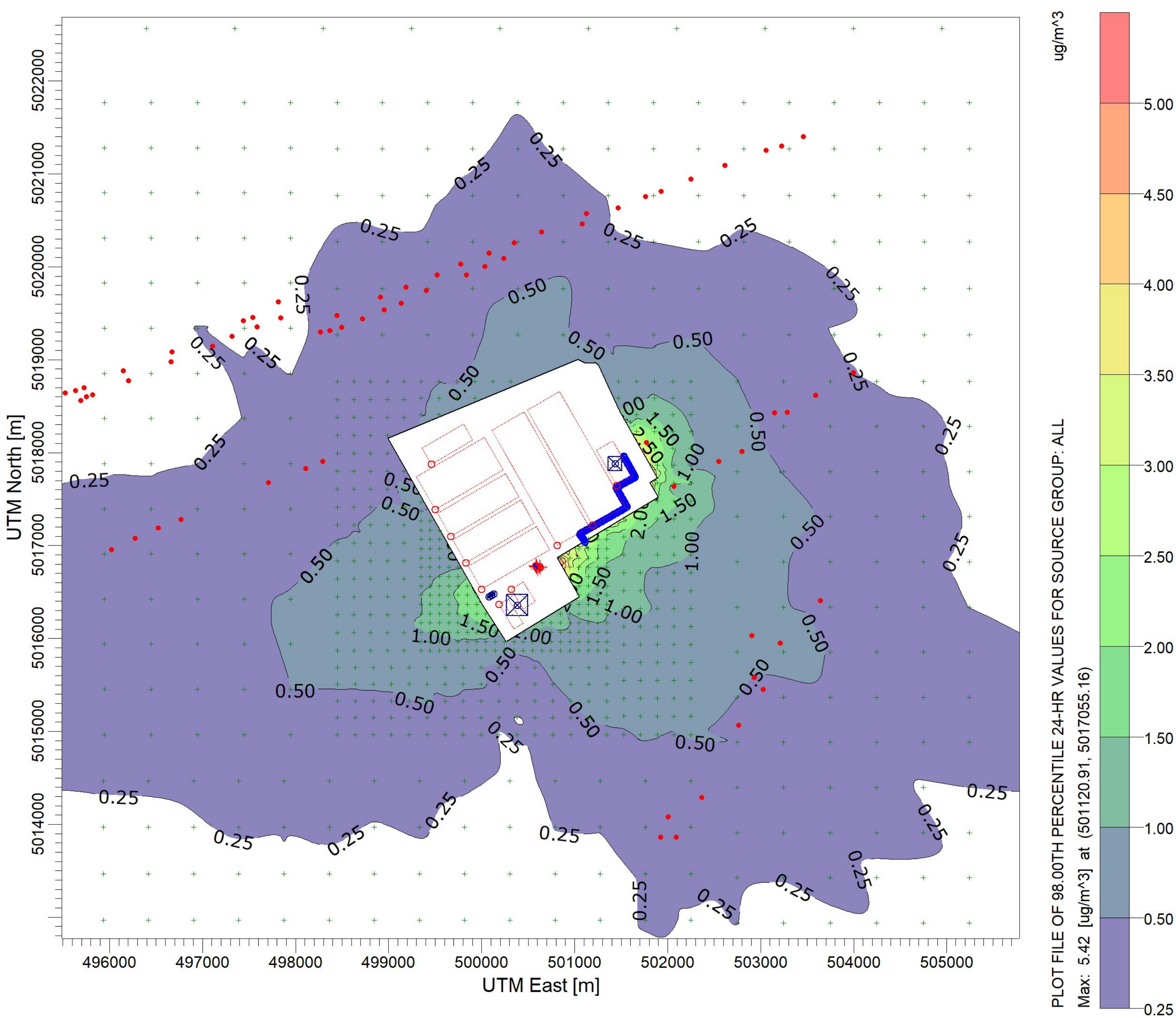
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario A
PM2.5 Peak 24 Hour Average Concentration Contours - 98th Percentile - Year 2 (2016)



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
5.42 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

SCALE: 1:60,000

0 2 km

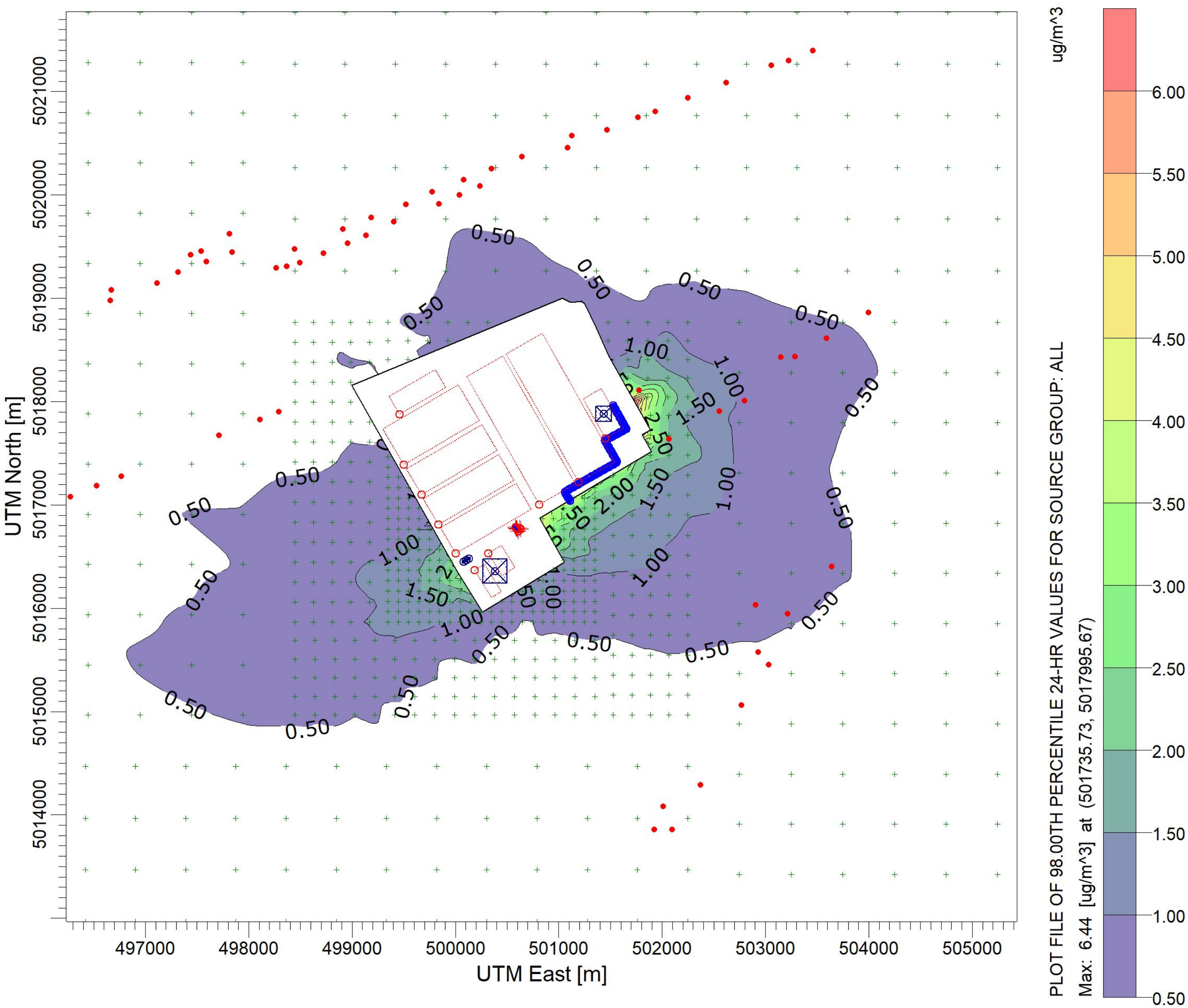
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario A
PM2.5 Peak 24 Hour Average Concentration Contours - 98th Percentile - Year 3 (2017)



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
6.44 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

SCALE: 1:60,000

0 2 km

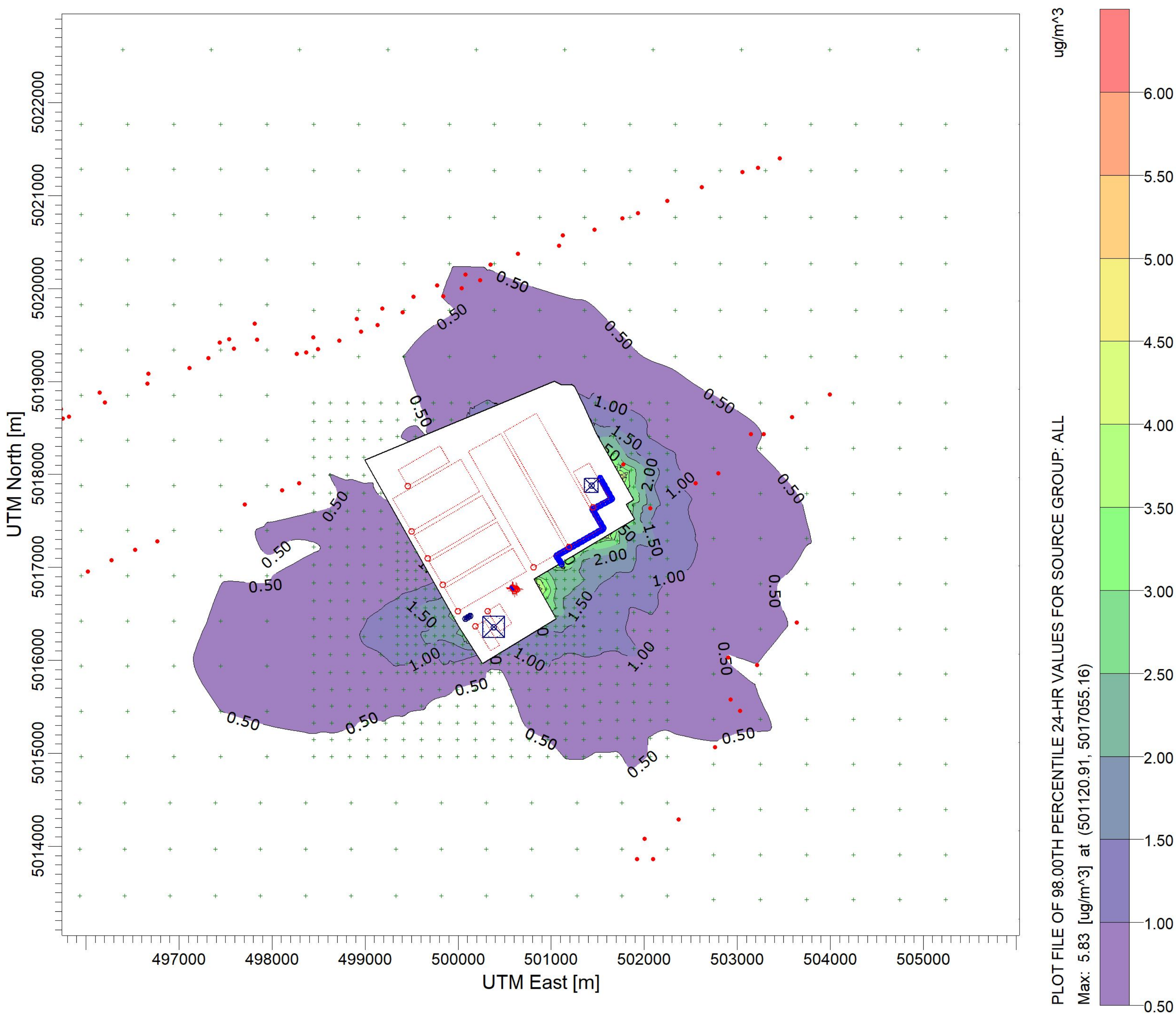
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario A
PM2.5 Peak 24 Hour Average Concentration Contours - 98th Percentile - Year 4 (2018)



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
5.83 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

SCALE: 1:60,000

0 2 km

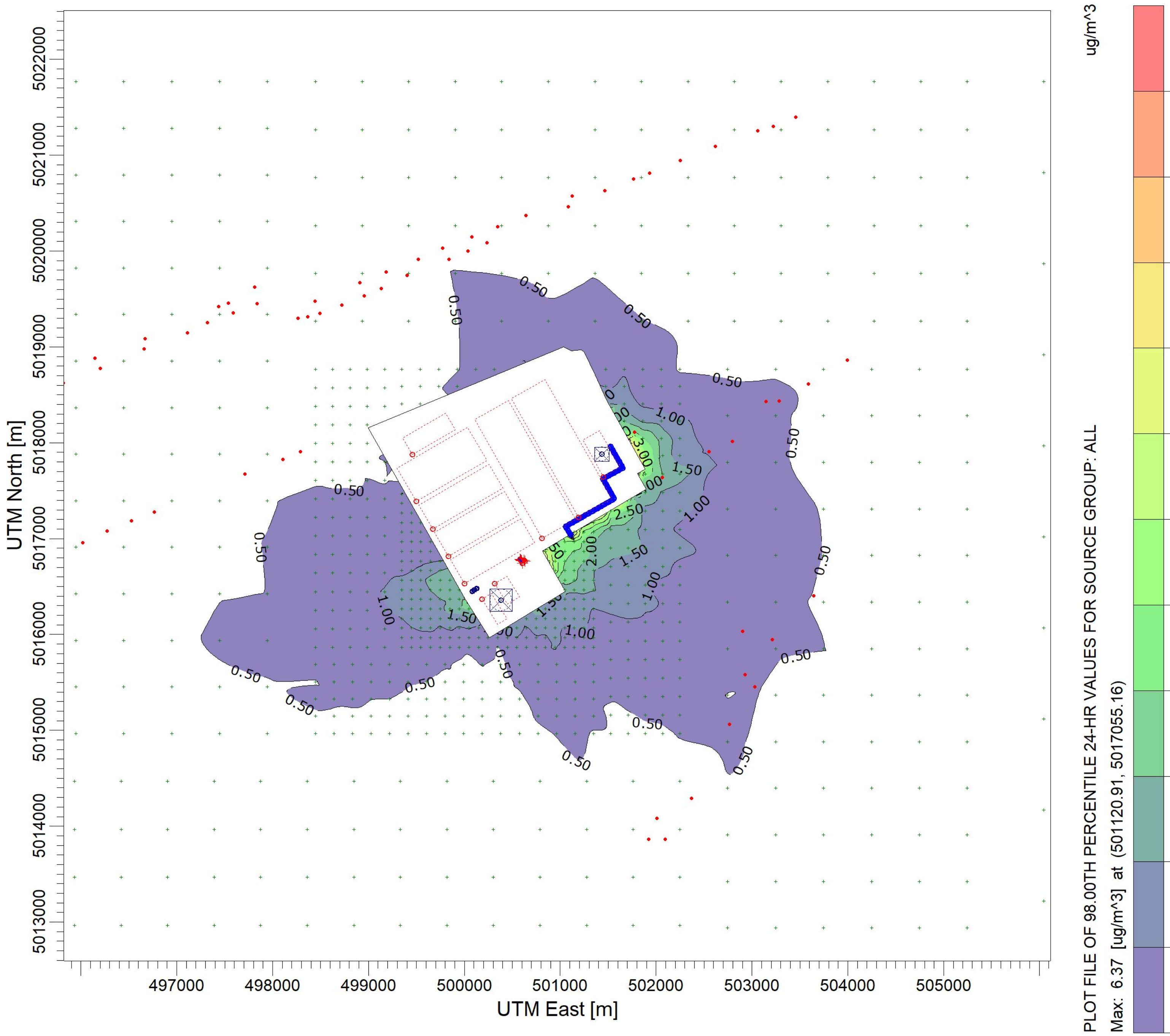
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Existing Conditions - Alternative 2 Scenario A
PM2.5 Peak 24 Hour Average Concentration Contours - 98th Percentile - Year 5 (2019)



COMMENTS:

SOURCES:

23

RECEPTORS:

1922

OUTPUT TYPE:

Concentration

MAX:

6.37 ug/m^3

COMPANY NAME:

Ramboll Canada Inc.

MODELER:

EM

DATE:

2022-06-27

SCALE: 1:60,000

0 2 km

RAMBOLL

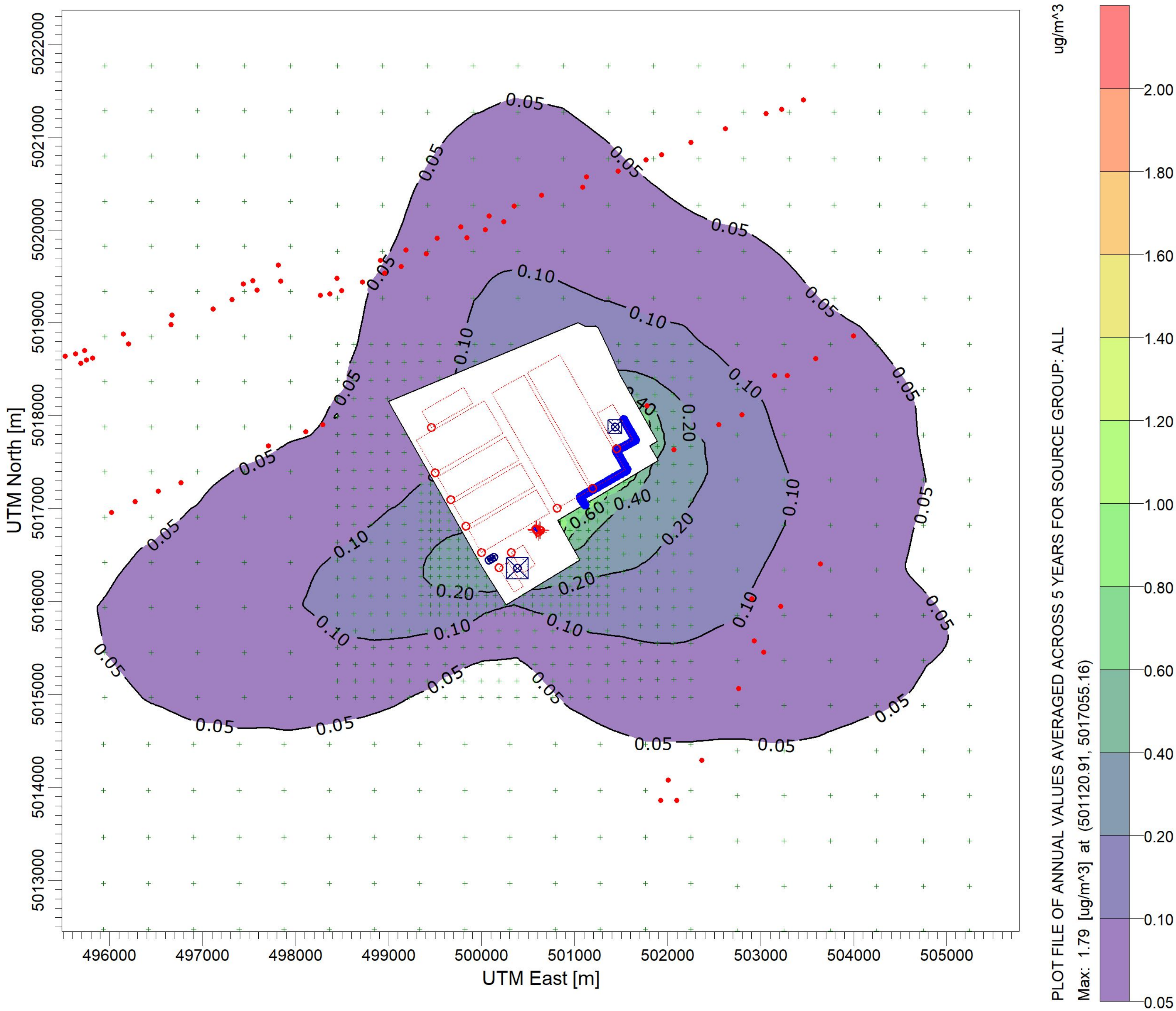
PROJECT NO.:

324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario A
PM2.5 Peak Annual Average Concentration Contours



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
1.79 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

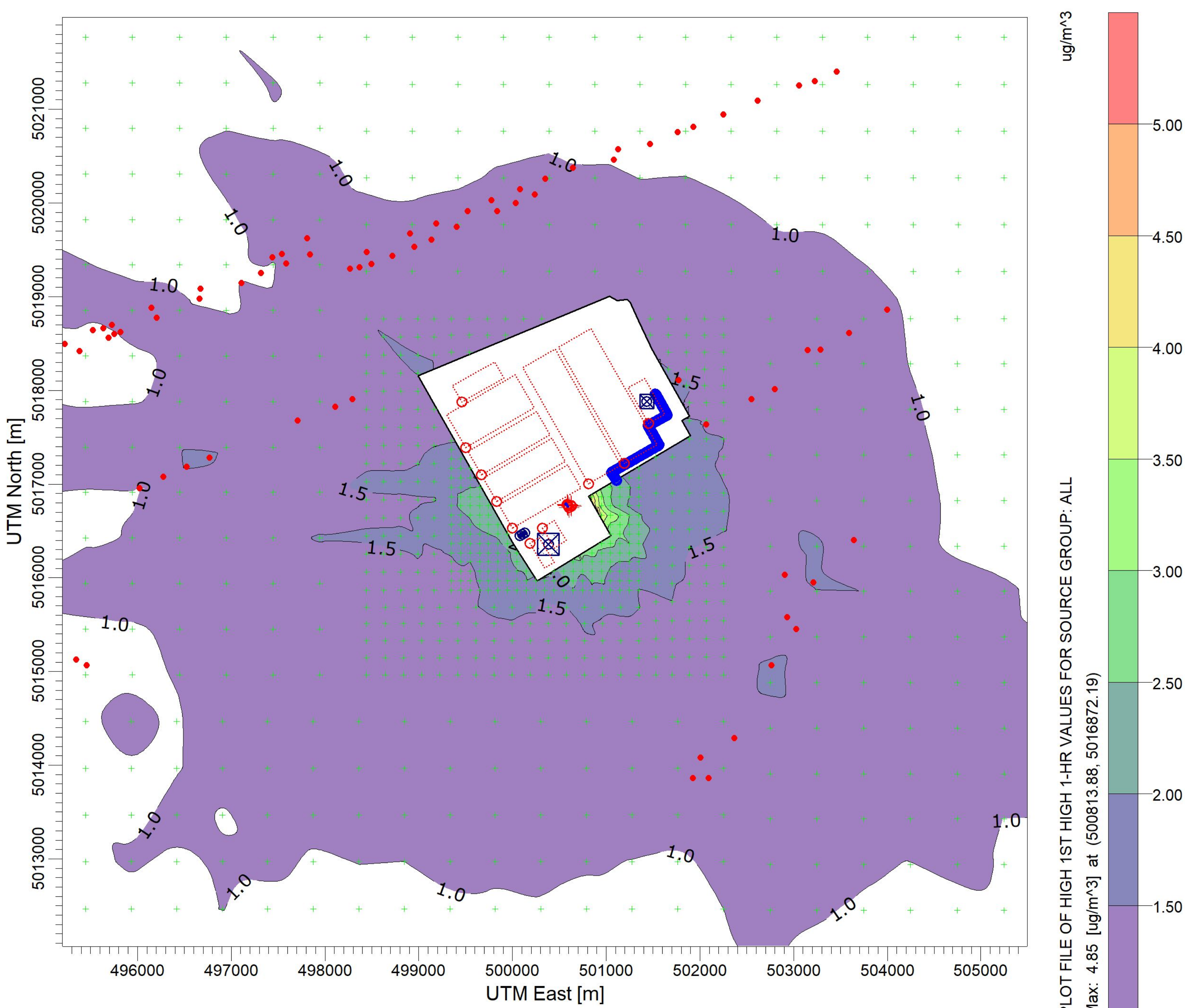
SCALE: 1:60,000
0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario A
Sulphur Dioxide Peak 1 Hour Average Concentration Contours



COMMENTS:

SOURCES:

23

RECEPTORS:

1922

OUTPUT TYPE:

Concentration

MAX:

4.85 ug/m^3

COMPANY NAME:

Ramboll Canada Inc.

MODELER:

EM

DATE:

2022-07-04

SCALE: 1:60,000

0 2 km

RAMBOLL

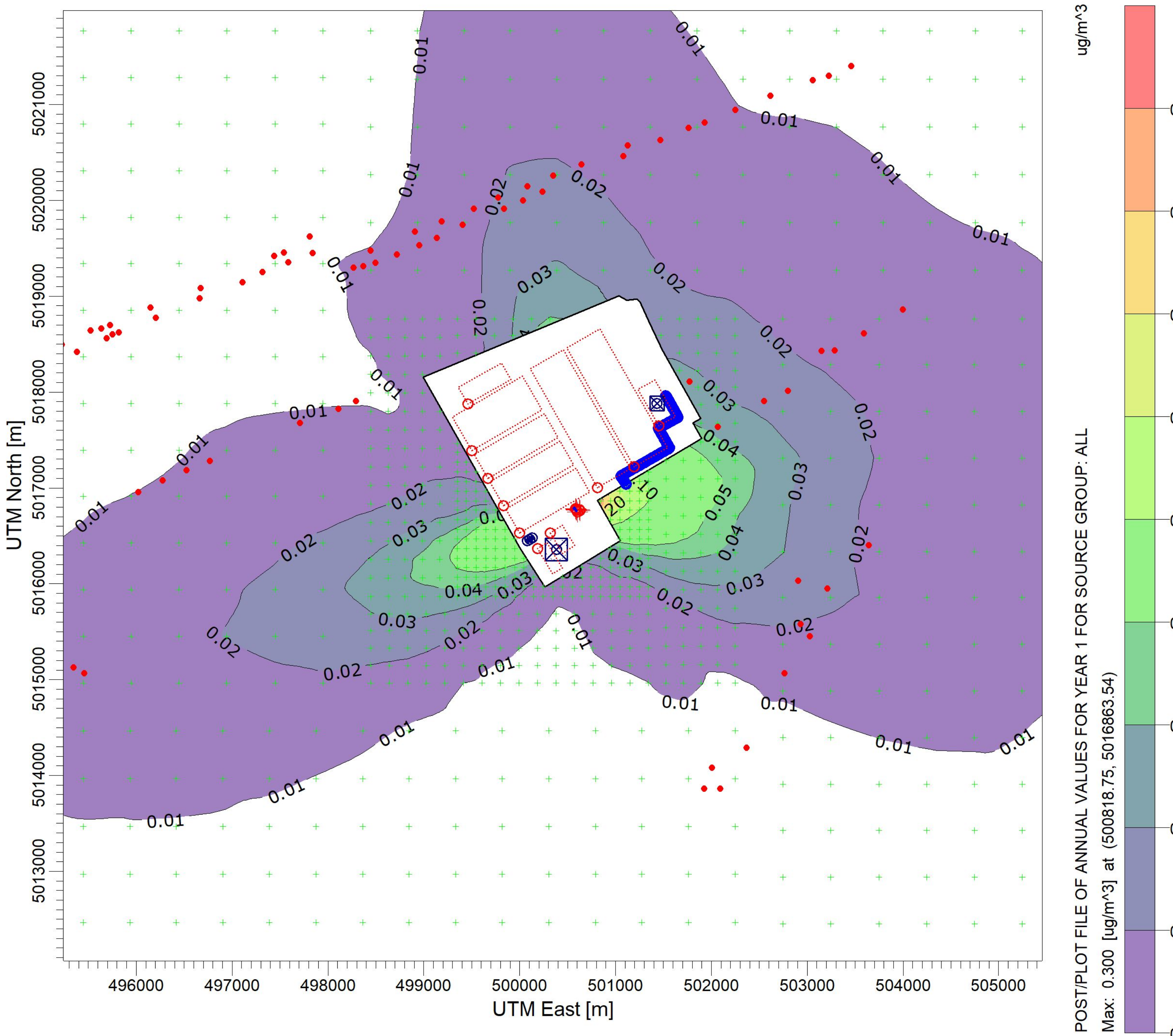
PROJECT NO.:

324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario A
Sulphur Dioxide Peak Annual Concentration Contours, Highest Year (Year 3)



COMMENTS:

SOURCES: 23

RECEPTORS: 1922

OUTPUT TYPE: Concentration

MAX: 0.300 ug/m^3

COMPANY NAME: Ramboll Canada Inc.

MODELER: EM

DATE: 2022-06-30

SCALE: 1:60,000

0 — 2 km

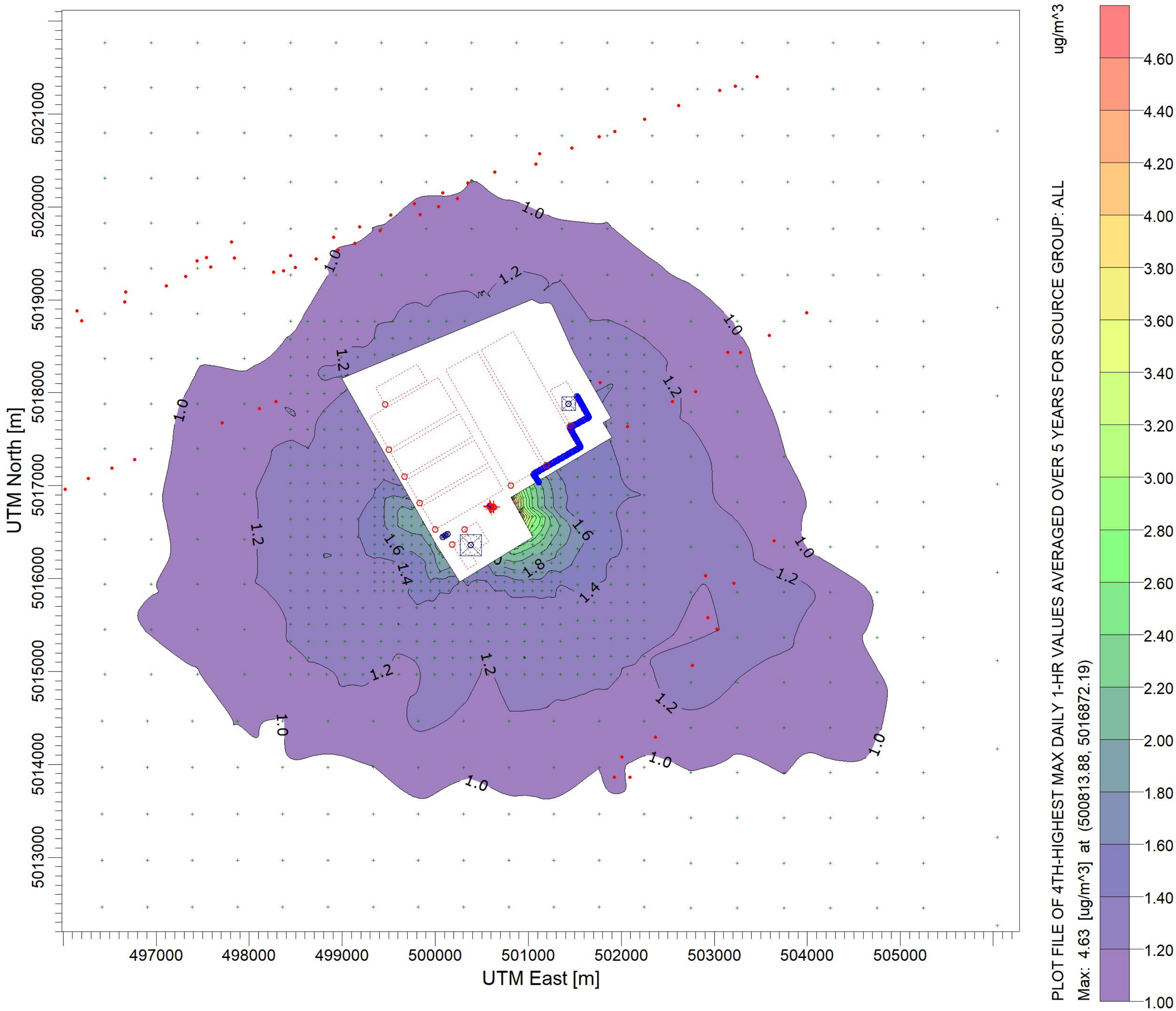
RAMBOLL

PROJECT NO.: 324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario A
Sulphur Dioxide, 1 Hour CAAQS - Multi year average of the 99th percentile daily maximum 1-hour concentration



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
4.63 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-04

SCALE: 1:60,000

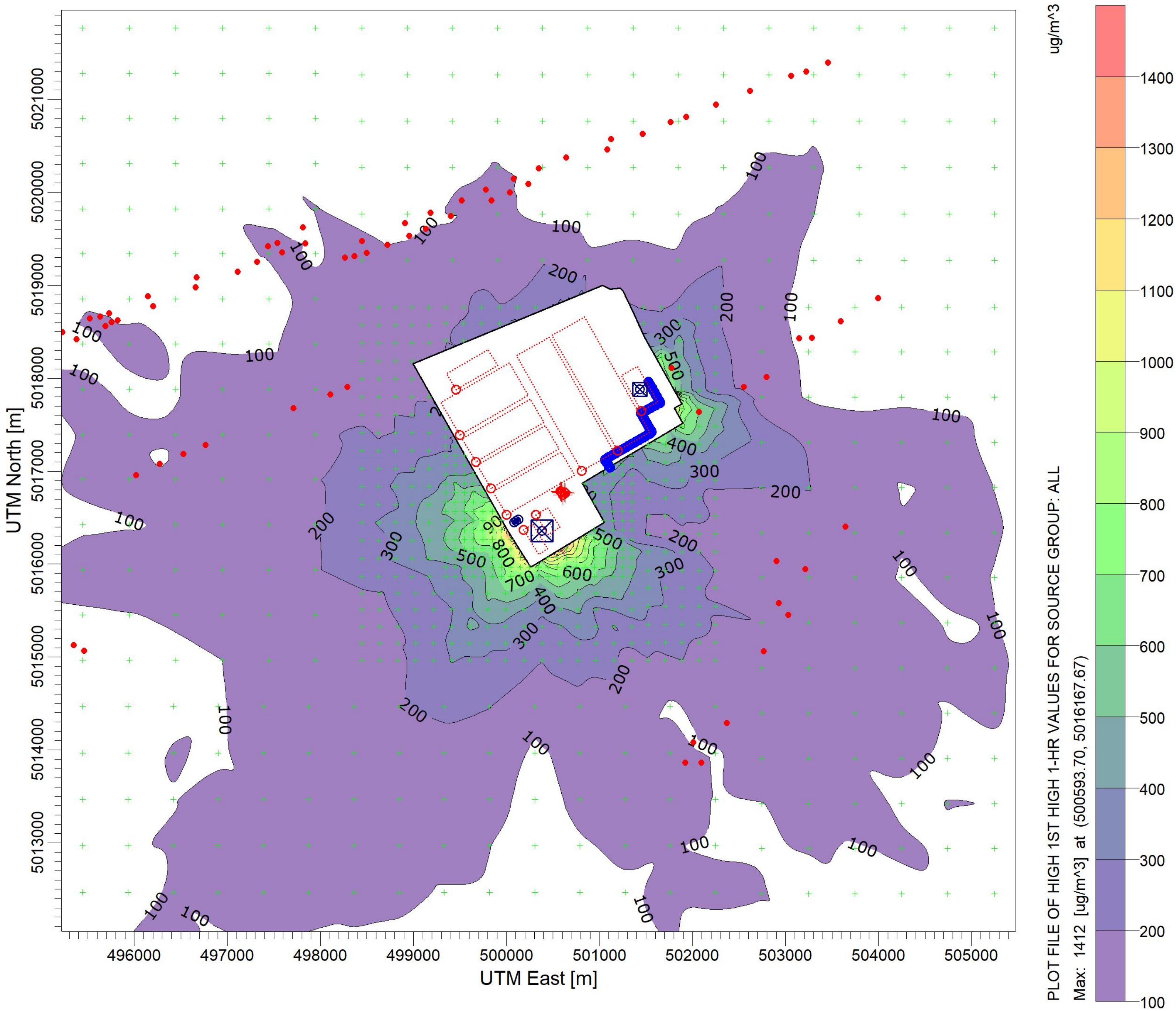
0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario A
Carbon Monoxide Peak 1 Hour Average Concentration Contours



COMMENTS:

SOURCES:

23

RECEPTORS:

1922

OUTPUT TYPE:

Concentration

MAX:

1412 ug/m^3

COMPANY NAME:

Ramboll Canada Inc.

MODELER:

EM

DATE:

2022-07-04

SCALE: 1:60,000

0 2 km

RAMBOLL

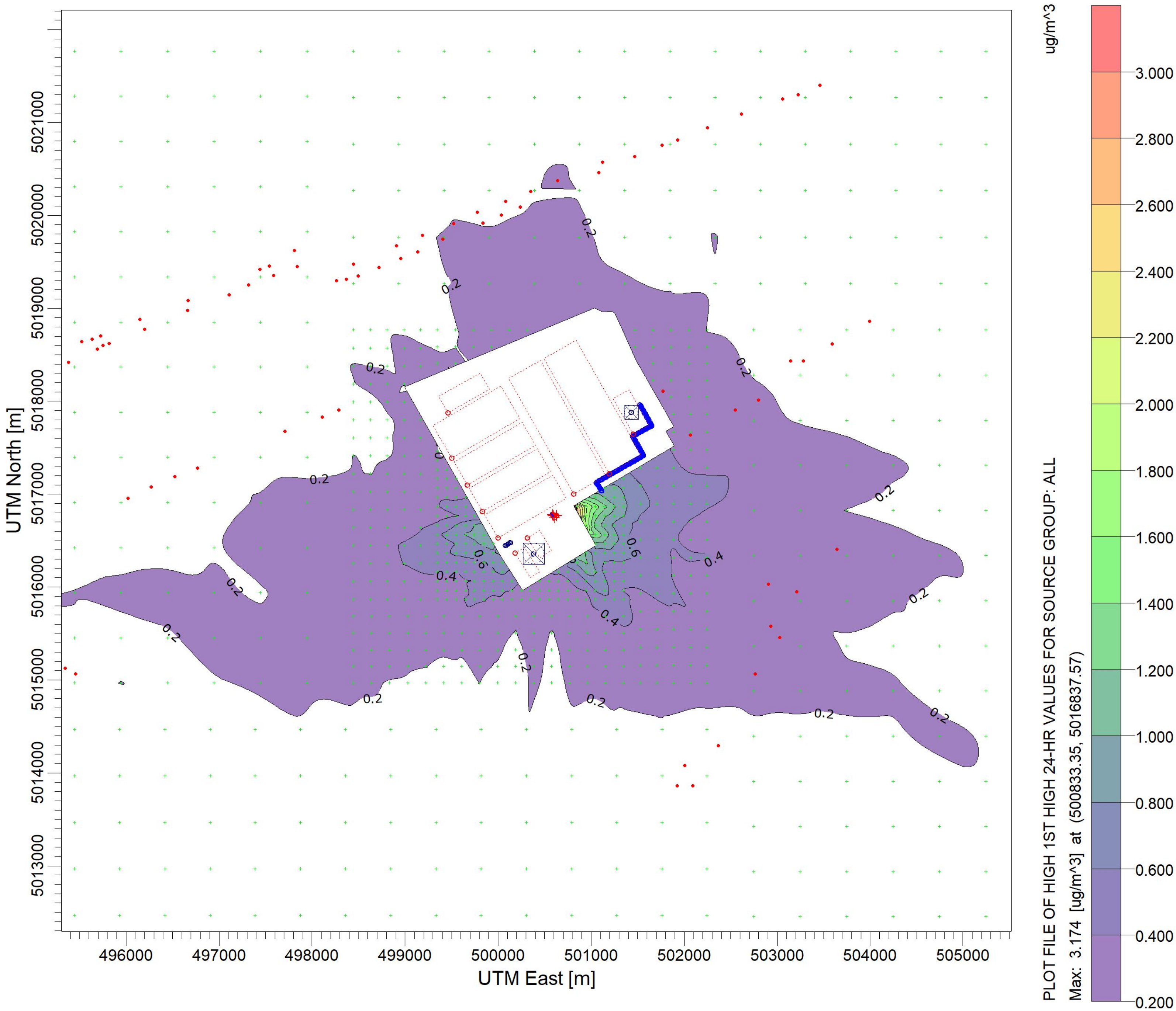
PROJECT NO.:

324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario A
Hydrogen Chloride Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
3.174 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-04

SCALE: 1:60,000

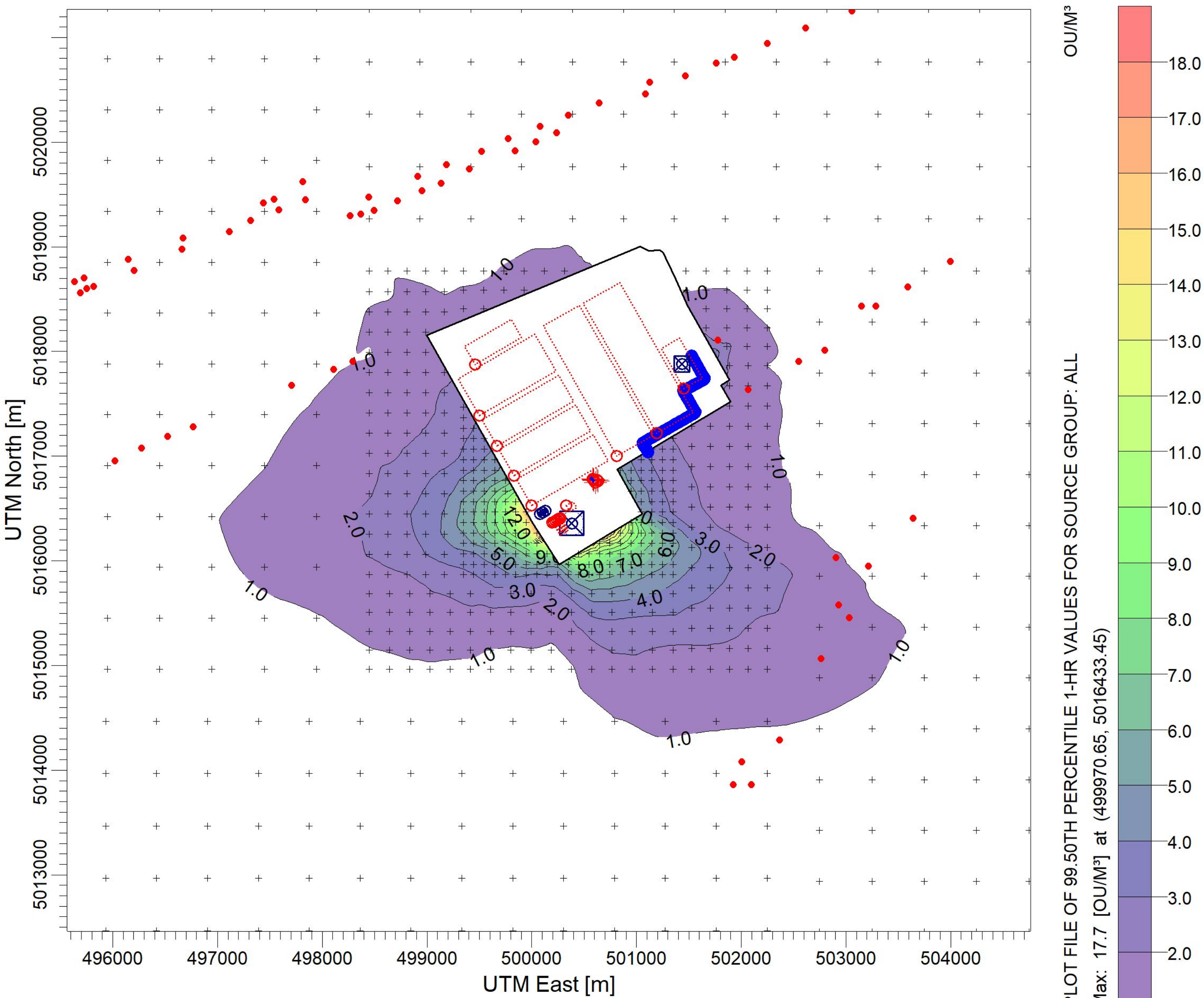
0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario A
Odour 10 Minute Average Peak Concentration Contours (99.5th Percentile)



COMMENTS:

The 1-hr air dispersion modelling output units were adjusted in AERMOD to reflect the expected peak 10-min average values using the MECP recommended standard conversion factor of 1.65.

SOURCES:

28

RECEPTORS:

1922

OUTPUT TYPE:

Concentration

MAX:

17.7 OU/M³

COMPANY NAME:

Ramboll Canada Inc.

DATE:

2023-05-29

SCALE: 1:60,000

0 2 km

RAMBOLL

PROJECT NO.:

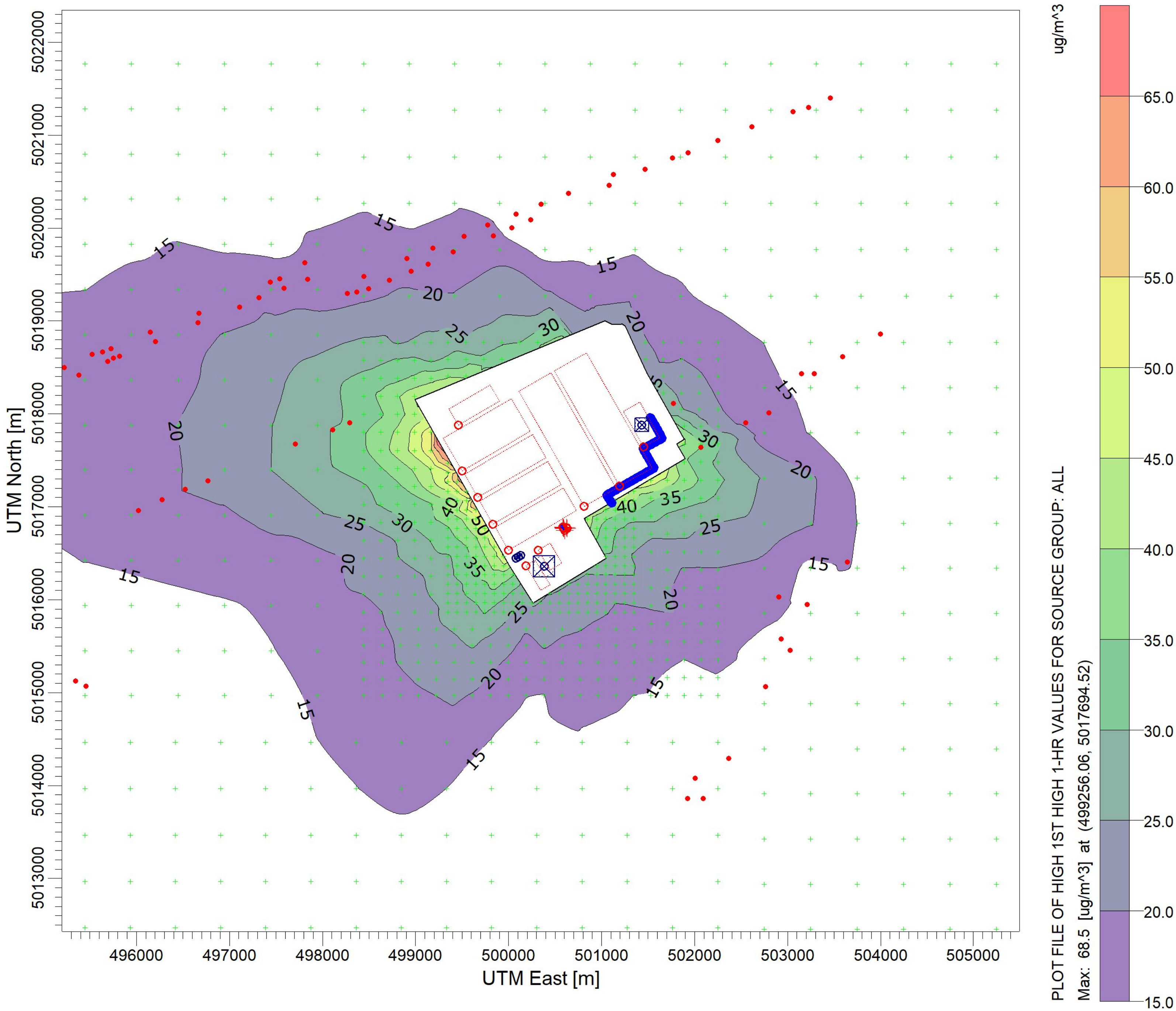
324000731

AERMOD View - Lakes Environmental Software

D:\324000731 - GFL Moosecreek\AERMOD\South Piles\Odour_2A\Odour_2A.isc

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario A
Landfill Gas (LFG) Base Run (1 g/s) Peak 1 Hour Average Concentration Contours



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
68.5 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-04

SCALE: 1:60,000
0 2 km

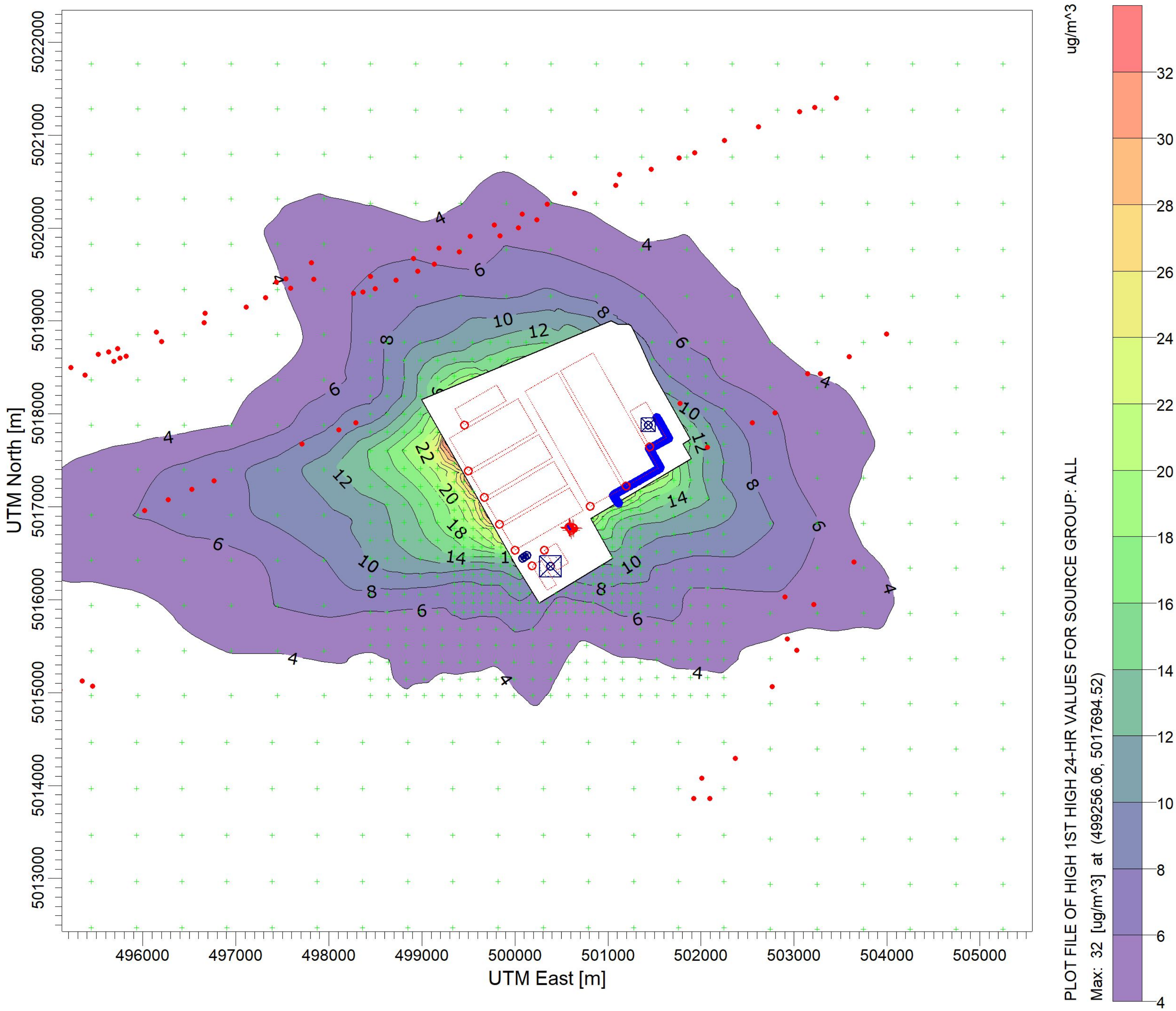
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario A
Landfill Gas (LFG) Base Run (1 g/s) Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
32 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-04

SCALE: 1:60,000

0 2 km

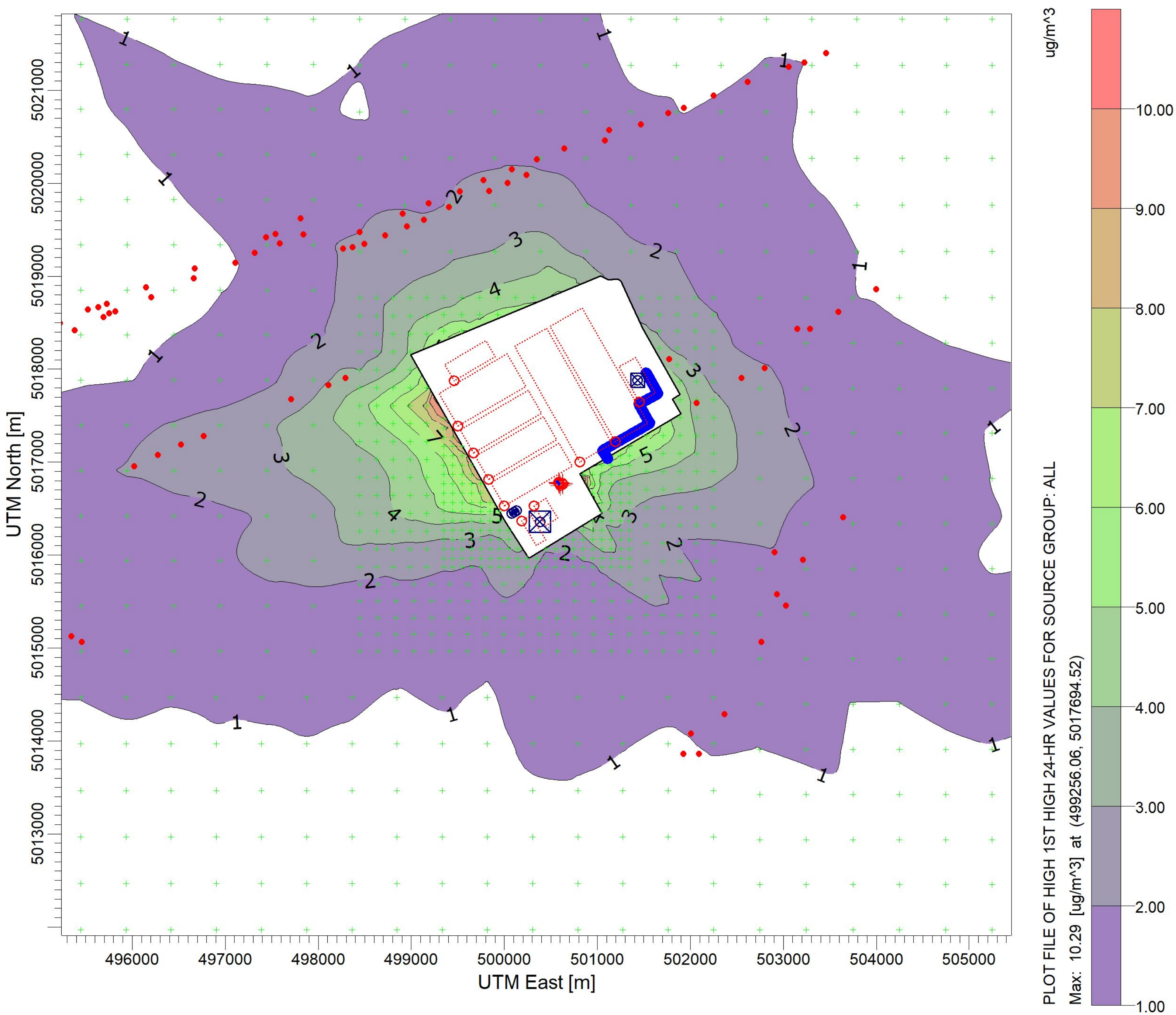
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario A
Siloxane Base Run (1 g/s) Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
10.29 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-29

SCALE: 1:60,000

0 2 km

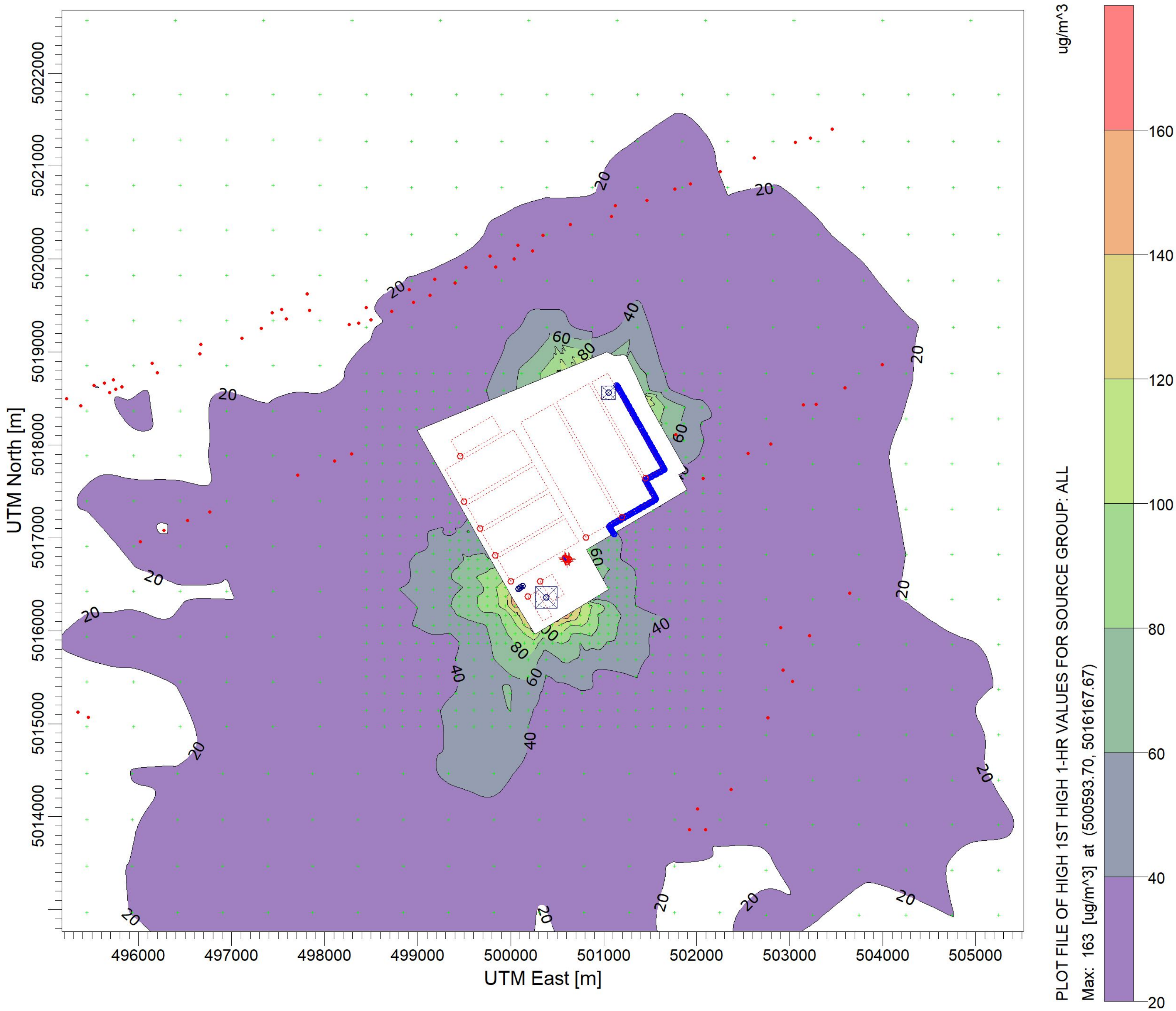
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario B
Nitrogen Oxides (NOx) Peak 1 Hour Average Concentration Contours



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
163 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-04

SCALE: 1:60,000

0 2 km

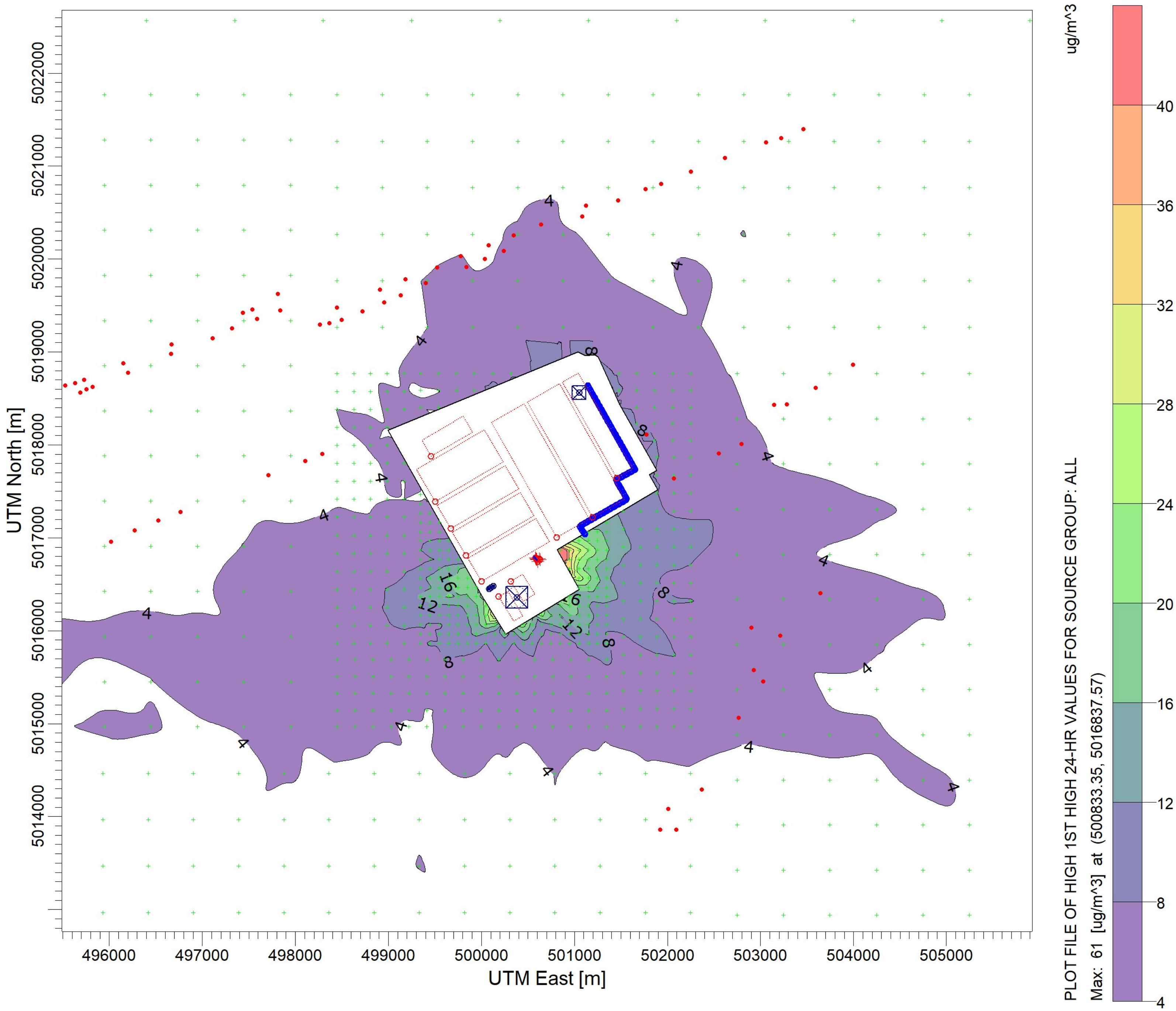
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario B
Nitrogen Oxides (NOx) Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
61 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-29

SCALE: 1:60,000

0 — 2 km

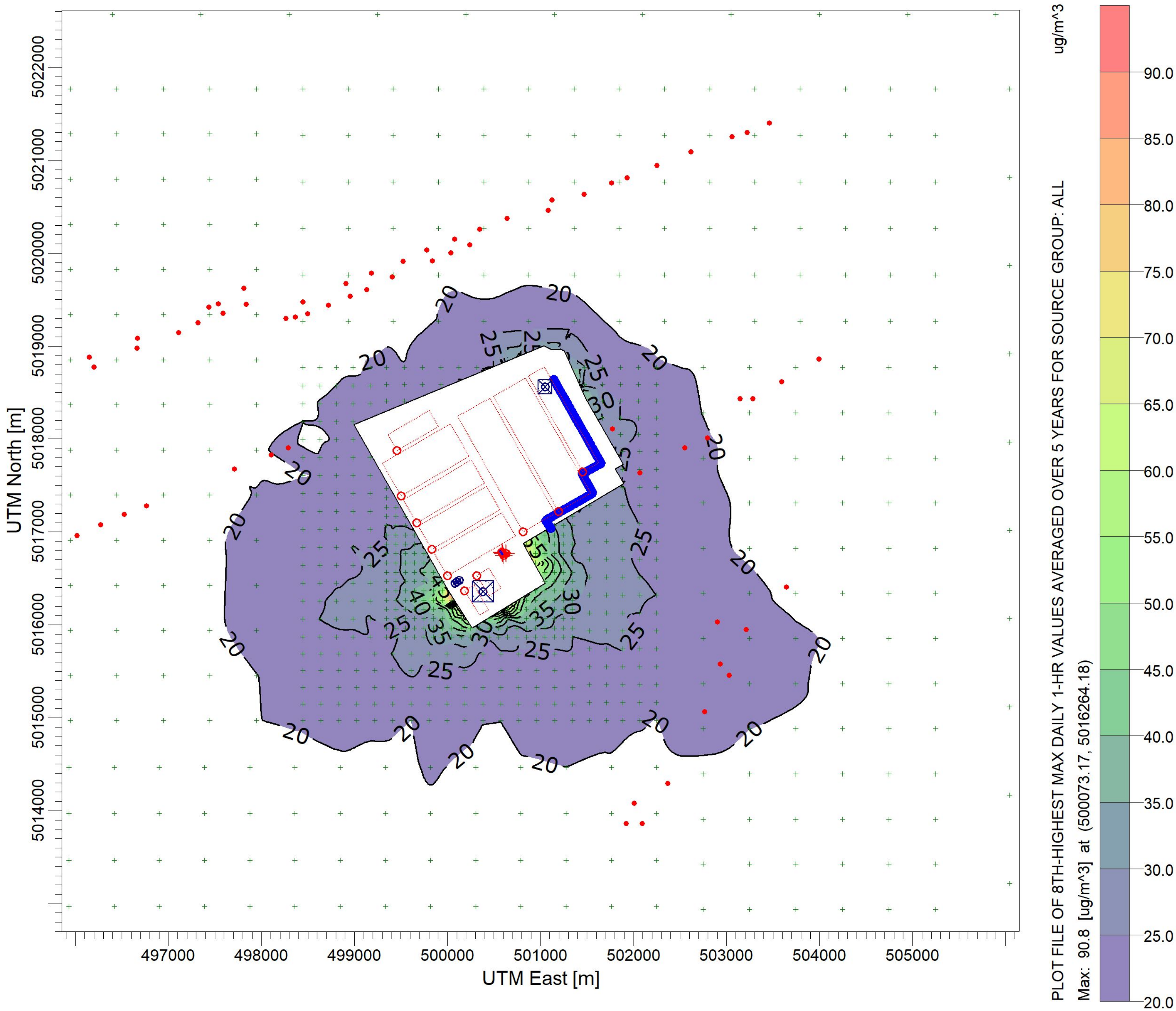
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario B
Nitrogen Dioxide - Multi year average of 98th percentile of daily maximum 1-hr concentration



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
90.8 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

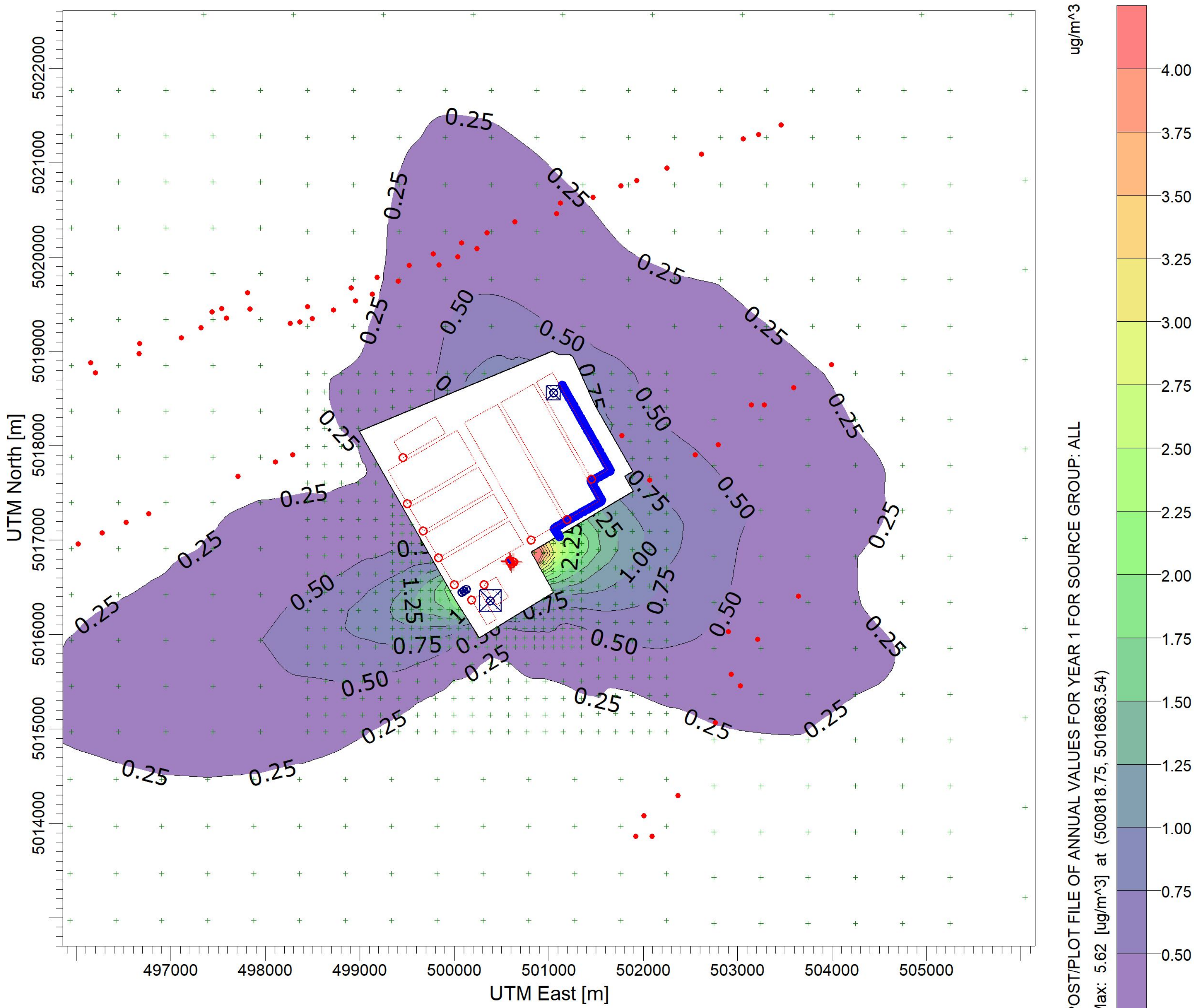
SCALE: 1:60,000

0 2 km

PROJECT NO.:
324000731

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario B
Nitrogen Dioxide - Annual concentration, highest year (Year 3)



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
5.62 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

SCALE: 1:60,000
0 2 km

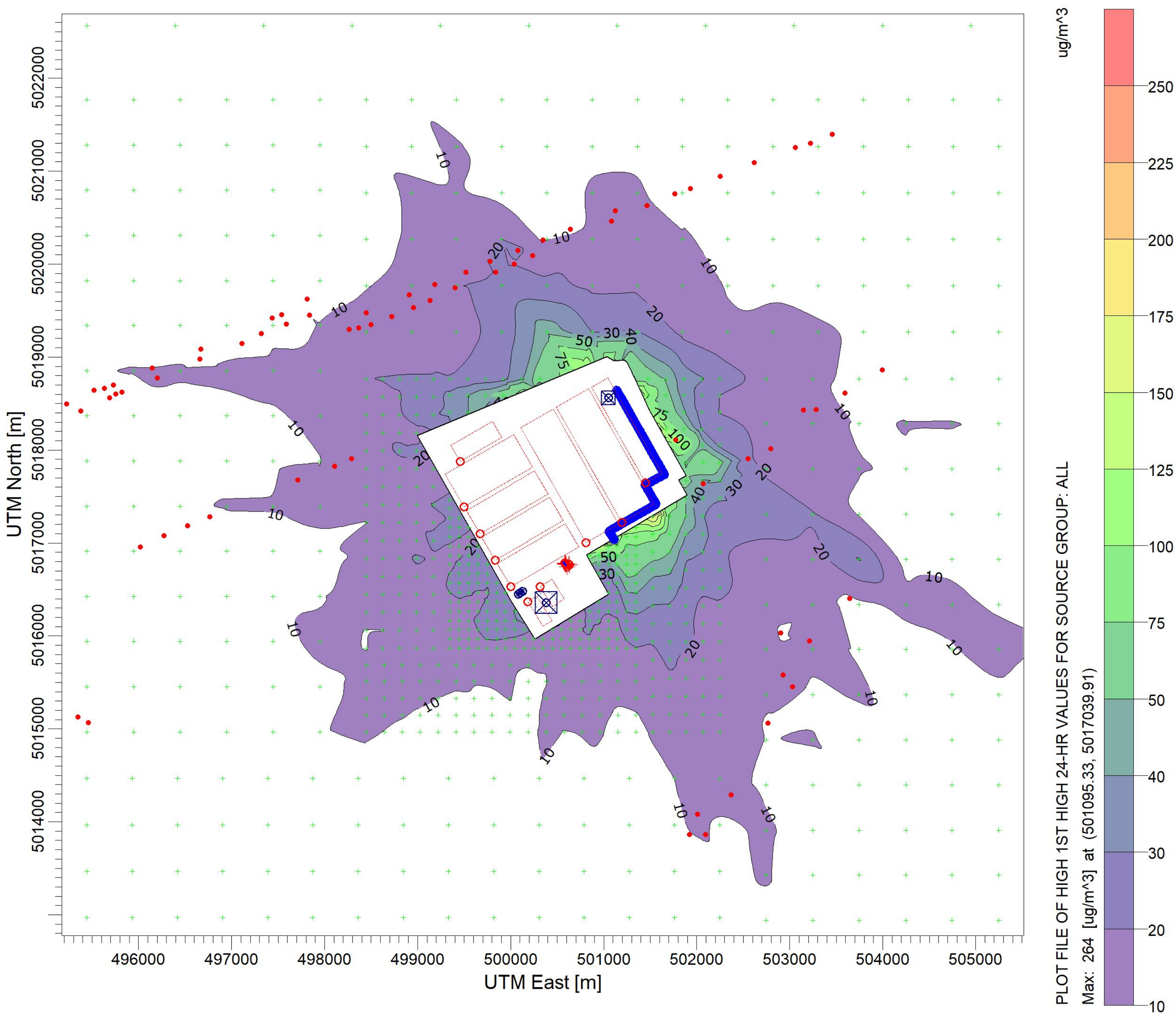
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario B
Particulate Matter (PM) Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:

23

RECEPTORS:

1922

OUTPUT TYPE:

Concentration

MAX:

264 ug/m^3

COMPANY NAME:

Ramboll Canada Inc.

MODELER:

EM

DATE:

2022-07-04

SCALE: 1:60,000

0 2 km

RAMBOLL

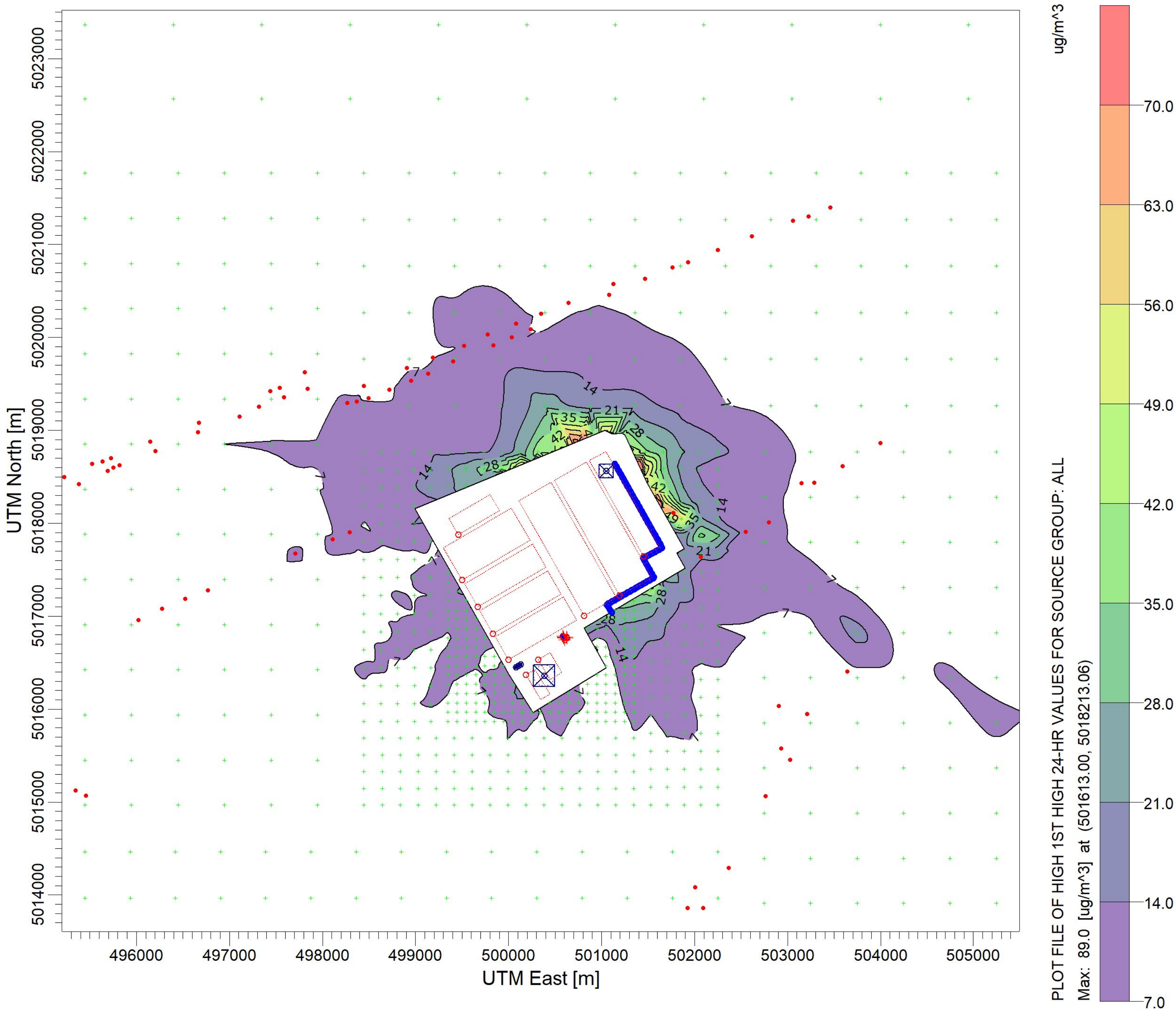
PROJECT NO.:

324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario B
PM10 Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
89.0 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-29

SCALE: 1:60,000

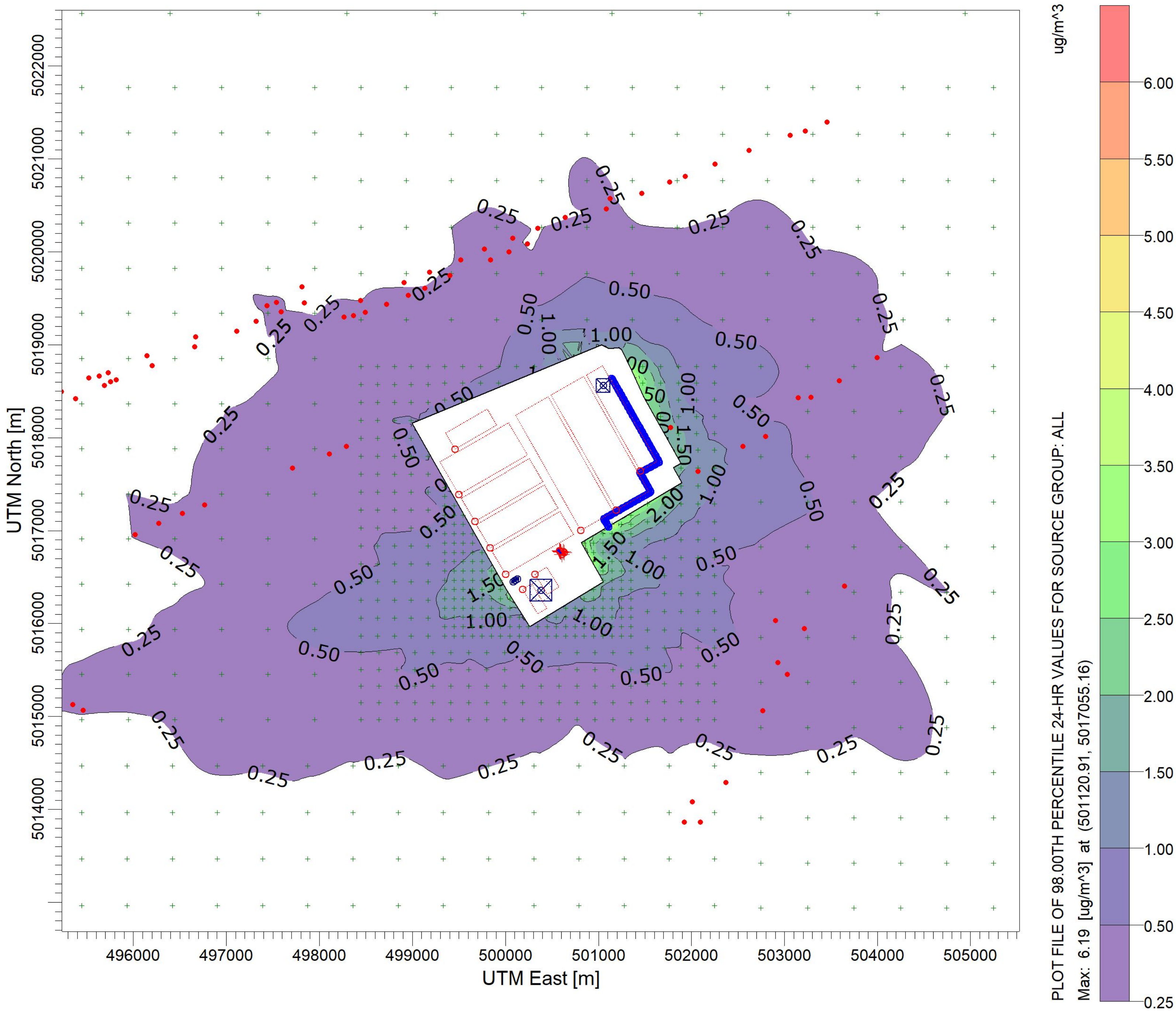
0 — 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario B
PM2.5 Peak 24 Hour Average Concentration Contours - 98th Percentile - Year 1 (2015)



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
6.19 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

SCALE: 1:60,000

0 2 km

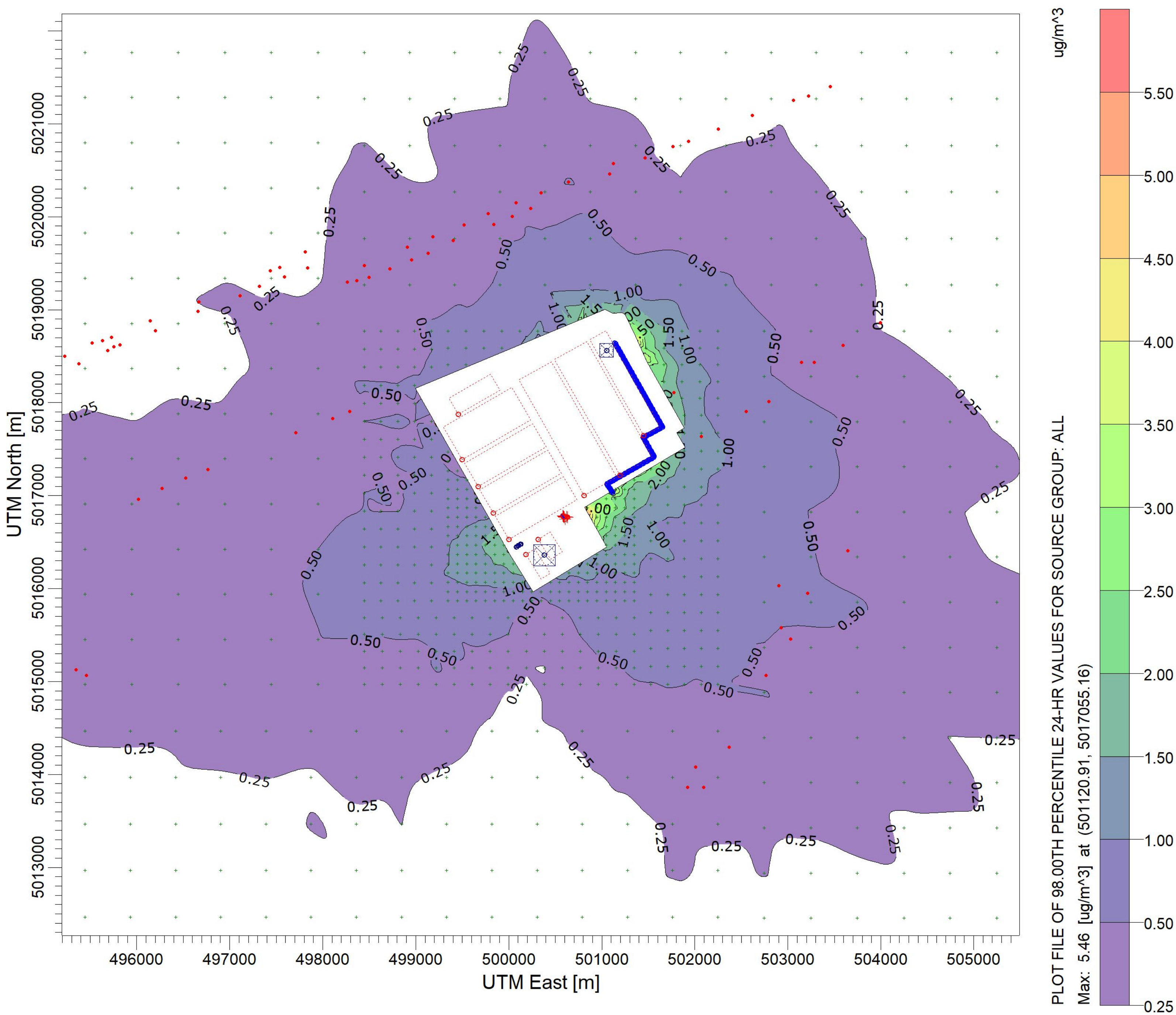
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario B
PM2.5 Peak 24 Hour Average Concentration Contours - 98th Percentile - Year 2 (2016)



COMMENTS:

SOURCES:

23

RECEPTORS:

1922

OUTPUT TYPE:

Concentration

MAX:

5.46 ug/m^3

COMPANY NAME:

Ramboll Canada Inc.

MODELER:

EM

DATE:

2022-06-27

SCALE: 1:60,000

0 2 km

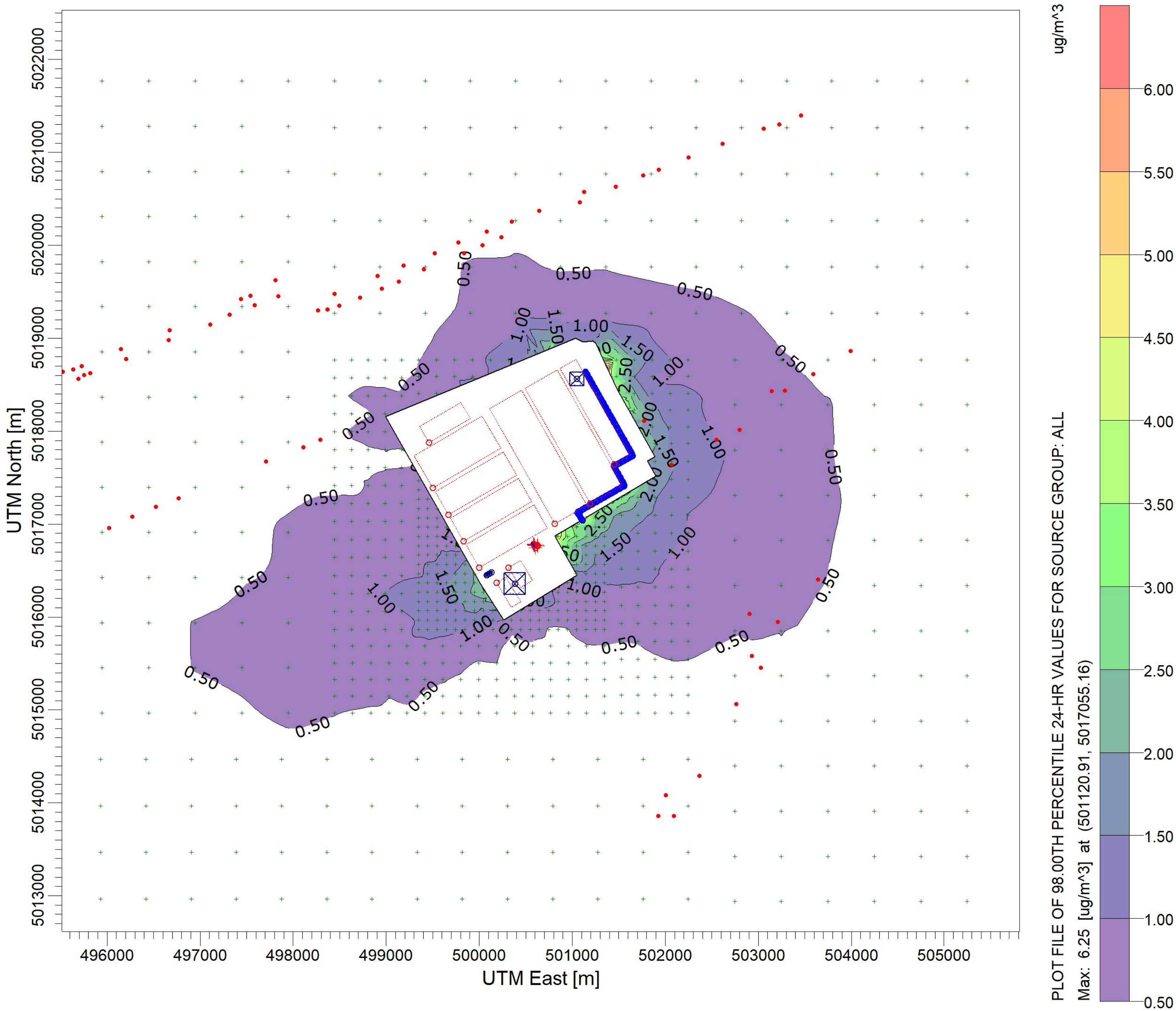
PROJECT NO.:

324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario B
PM2.5 Peak 24 Hour Average Concentration Contours - 98th Percentile - Year 3 (2017)



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
6.25 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

SCALE: 1:60,000

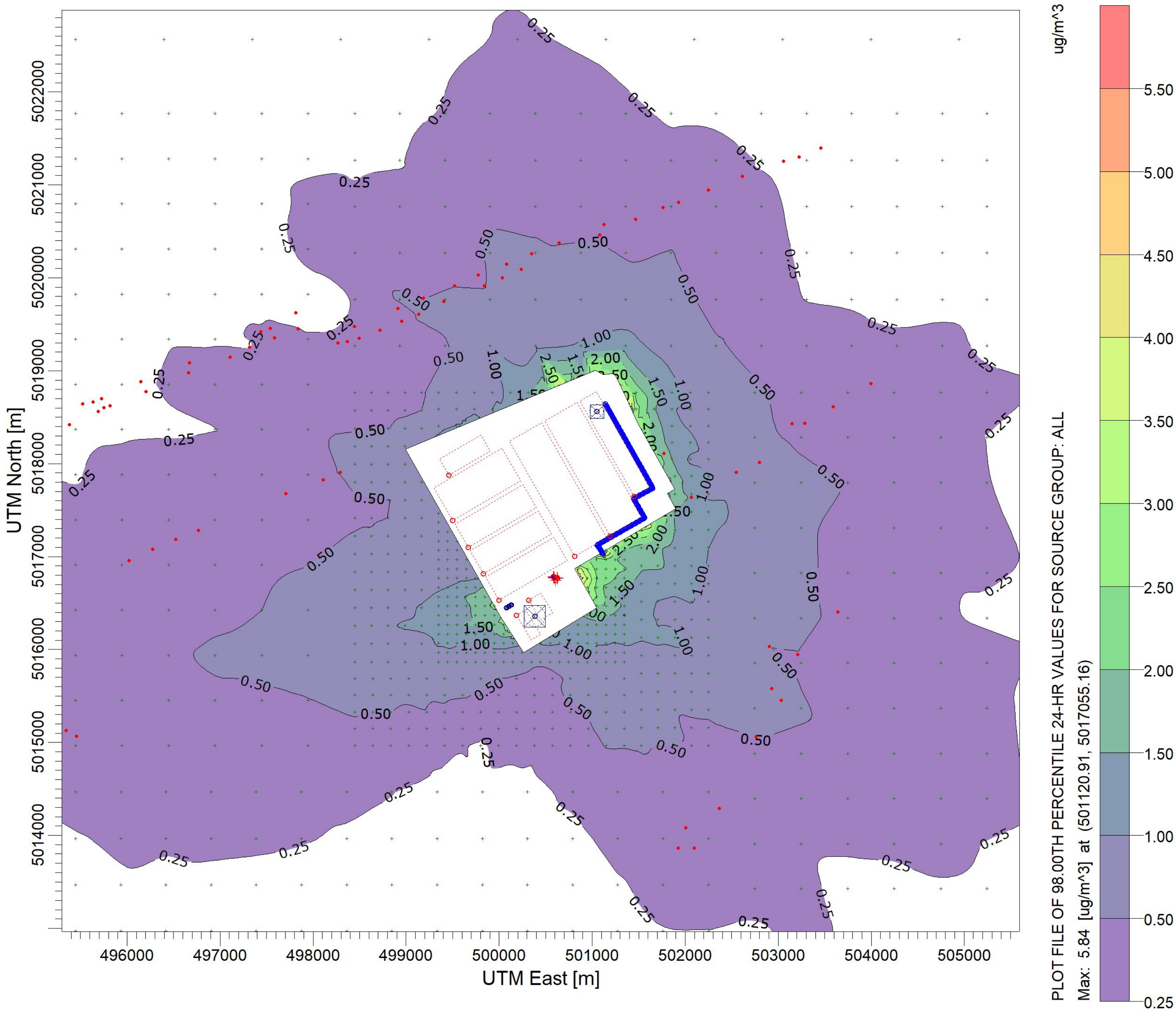
0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario B
PM2.5 Peak 24 Hour Average Concentration Contours - 98th Percentile - Year 4 (2018)



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
5.84 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

SCALE: 1:60,000

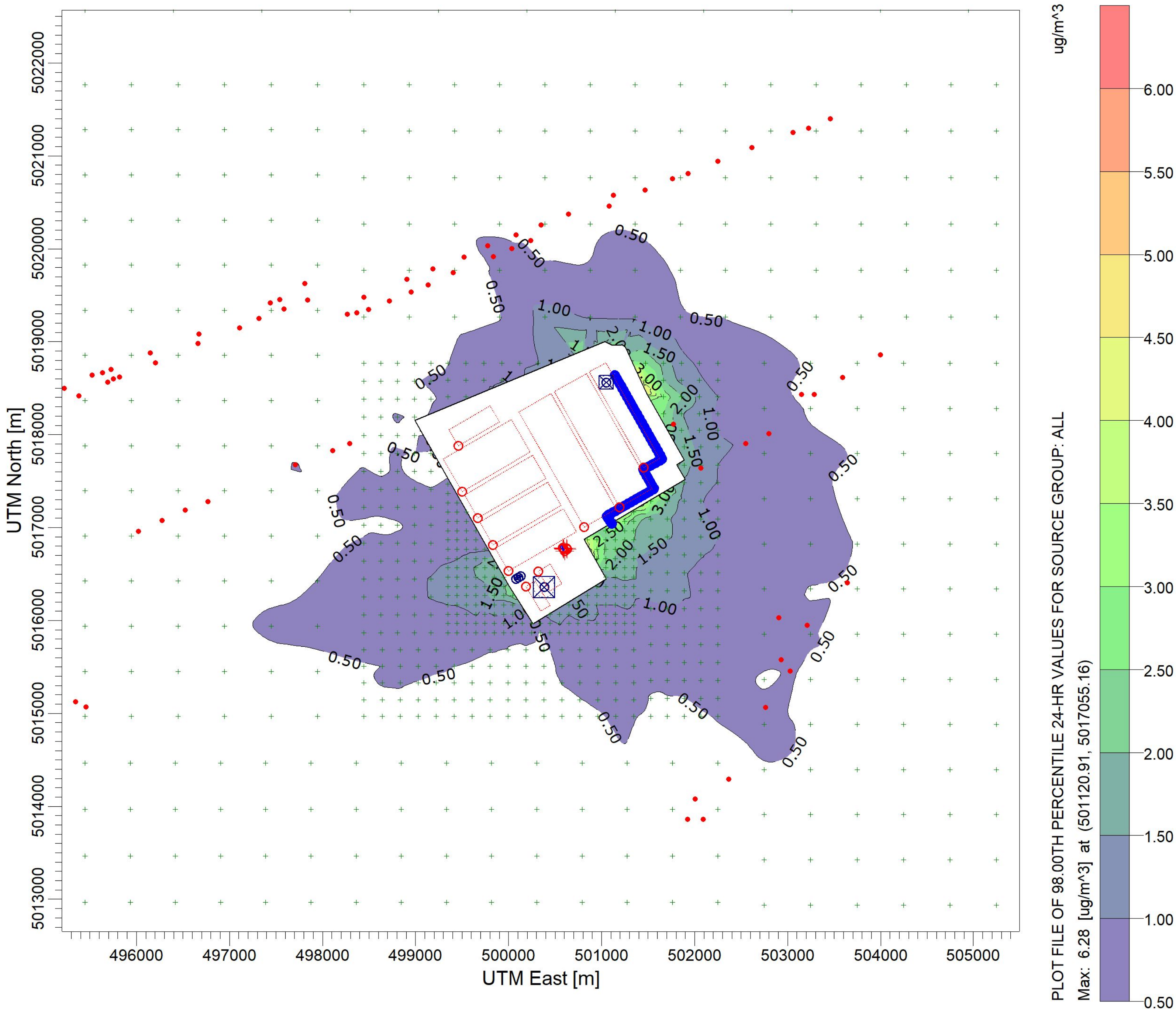
0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario B
PM2.5 Peak 24 Hour Average Concentration Contours - 98th Percentile - Year 5 (2019)



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
6.28 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

SCALE: 1:60,000

0 2 km

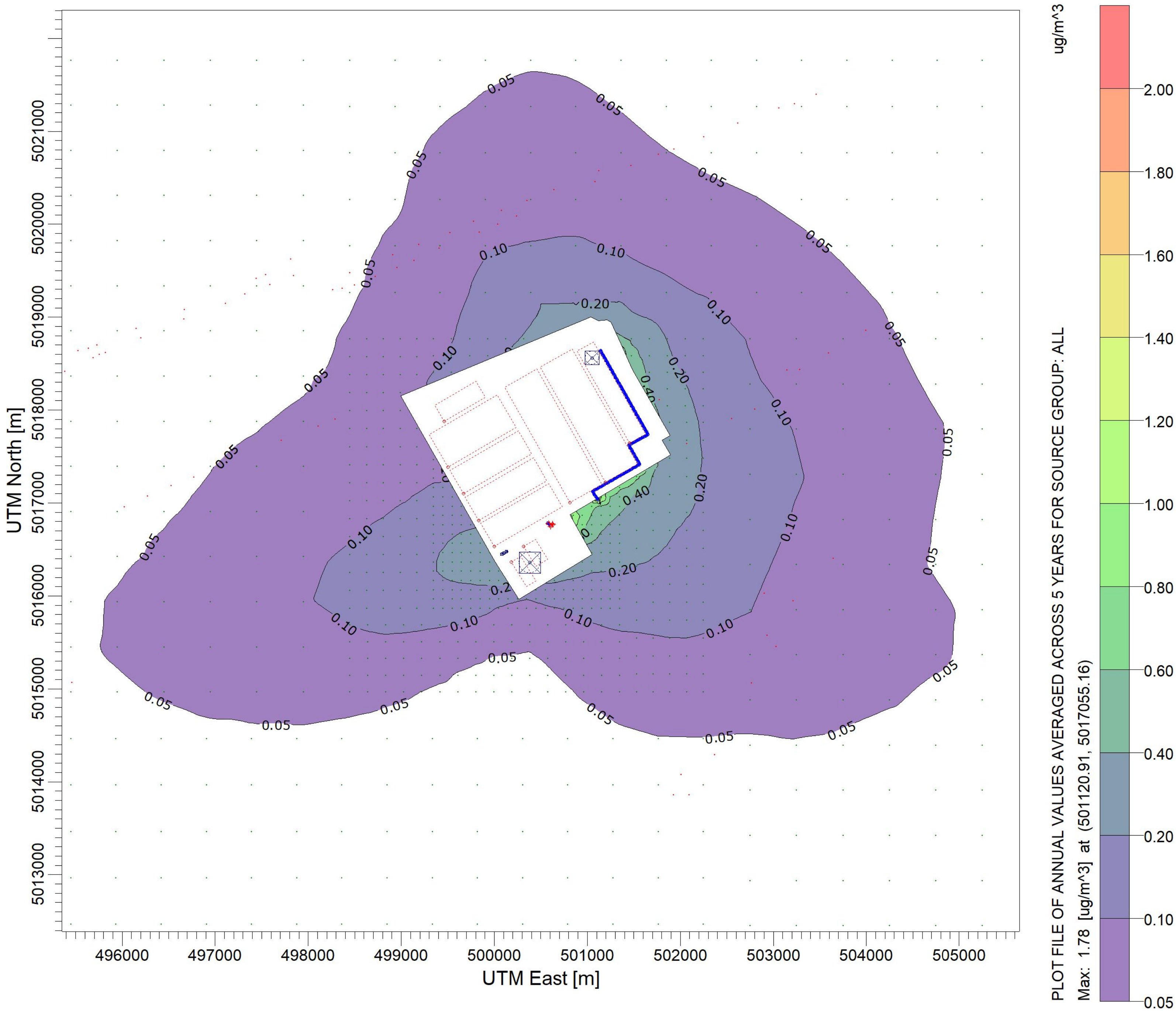
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario B
PM2.5 Peak Annual Average Concentration Contours



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
1.78 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-27

SCALE: 1:60,000

0 — 2 km

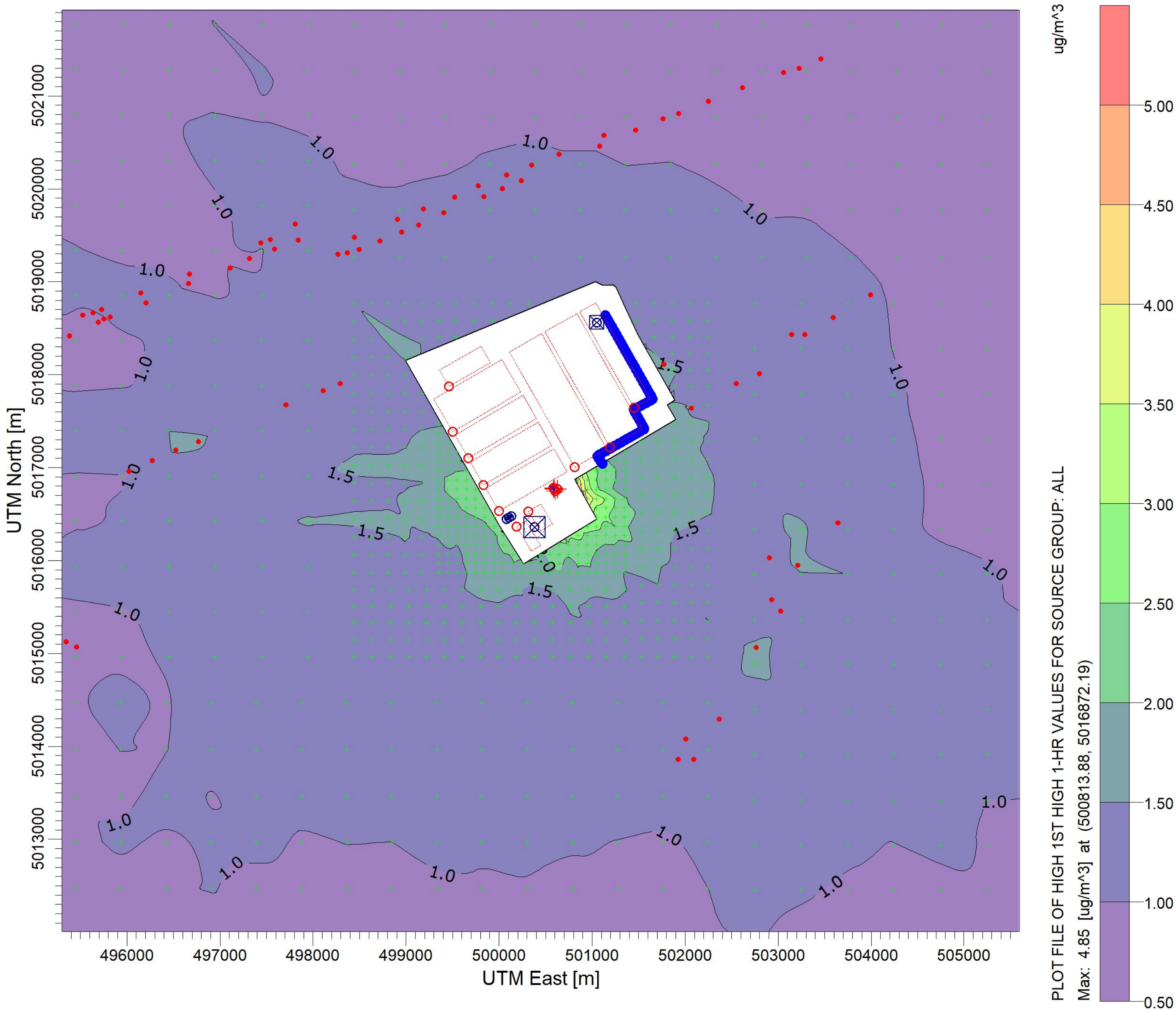
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario B
Sulphur Dioxide Peak 1 Hour Concentration Contours



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
4.85 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-29

SCALE: 1:60,000

0 2 km

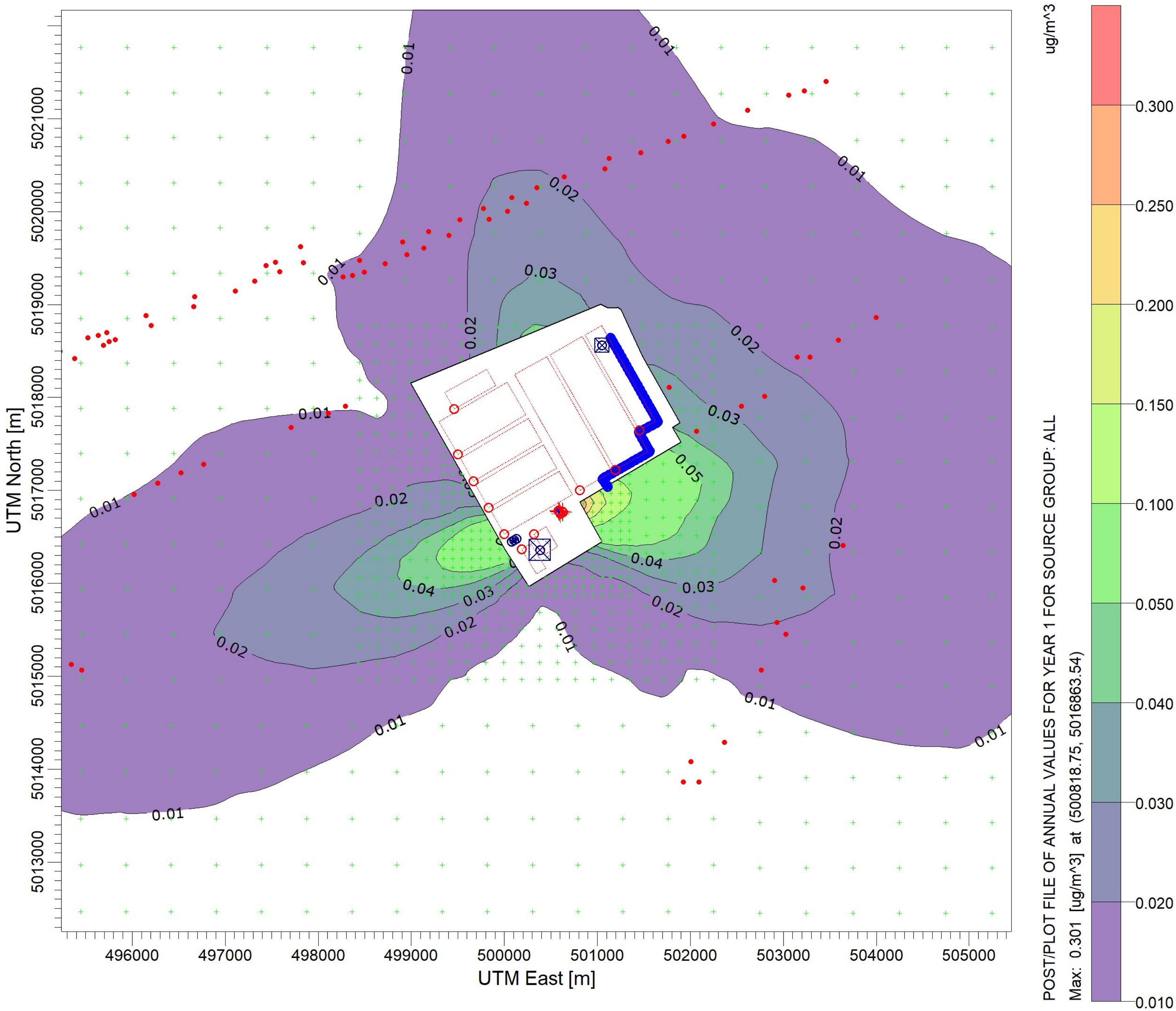
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario B
Sulphur Dioxide Peak Annual Concentration Contours, Highest Year (Year 3)



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
0.301 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-30

SCALE: 1:60,000
0 2 km

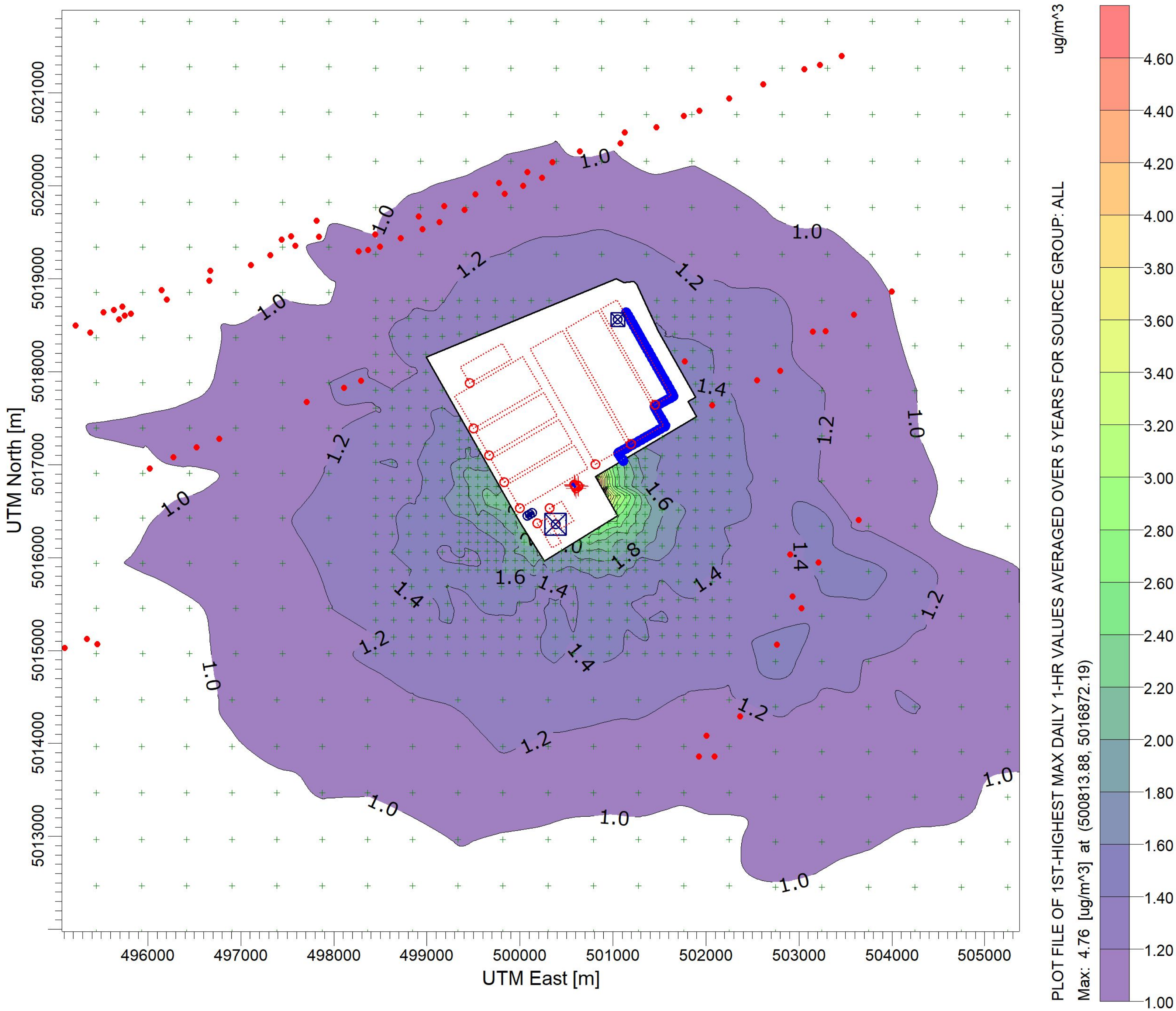
PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario B

Sulphur Dioxide, 1 Hour CAAQS - Multi year average of the 99th percentile daily maximum 1-hour concentration



COMMENTS:

SOURCES:

23

RECEPTORS:

1922

OUTPUT TYPE:

Concentration

MAX:

4.76 ug/m^3

COMPANY NAME:

Ramboll Canada Inc.

MODELER:

EM

DATE:

2022-07-04

SCALE: 1:60,000

0 2 km

RAMBOLL

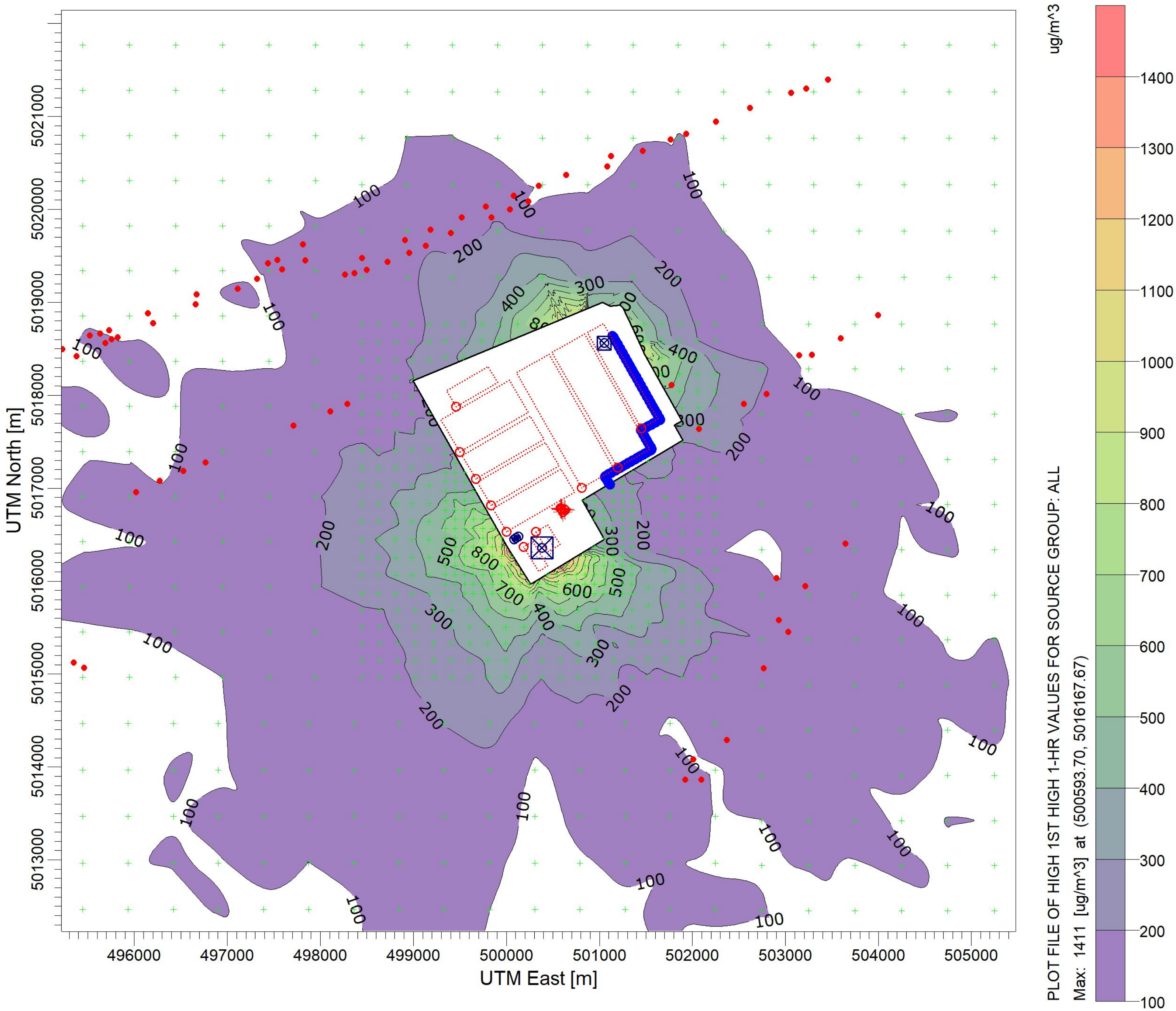
PROJECT NO.:

324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario B
Carbon Monoxide Peak 1 Hour Average Concentration Contours



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
1411 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-04

SCALE: 1:60,000

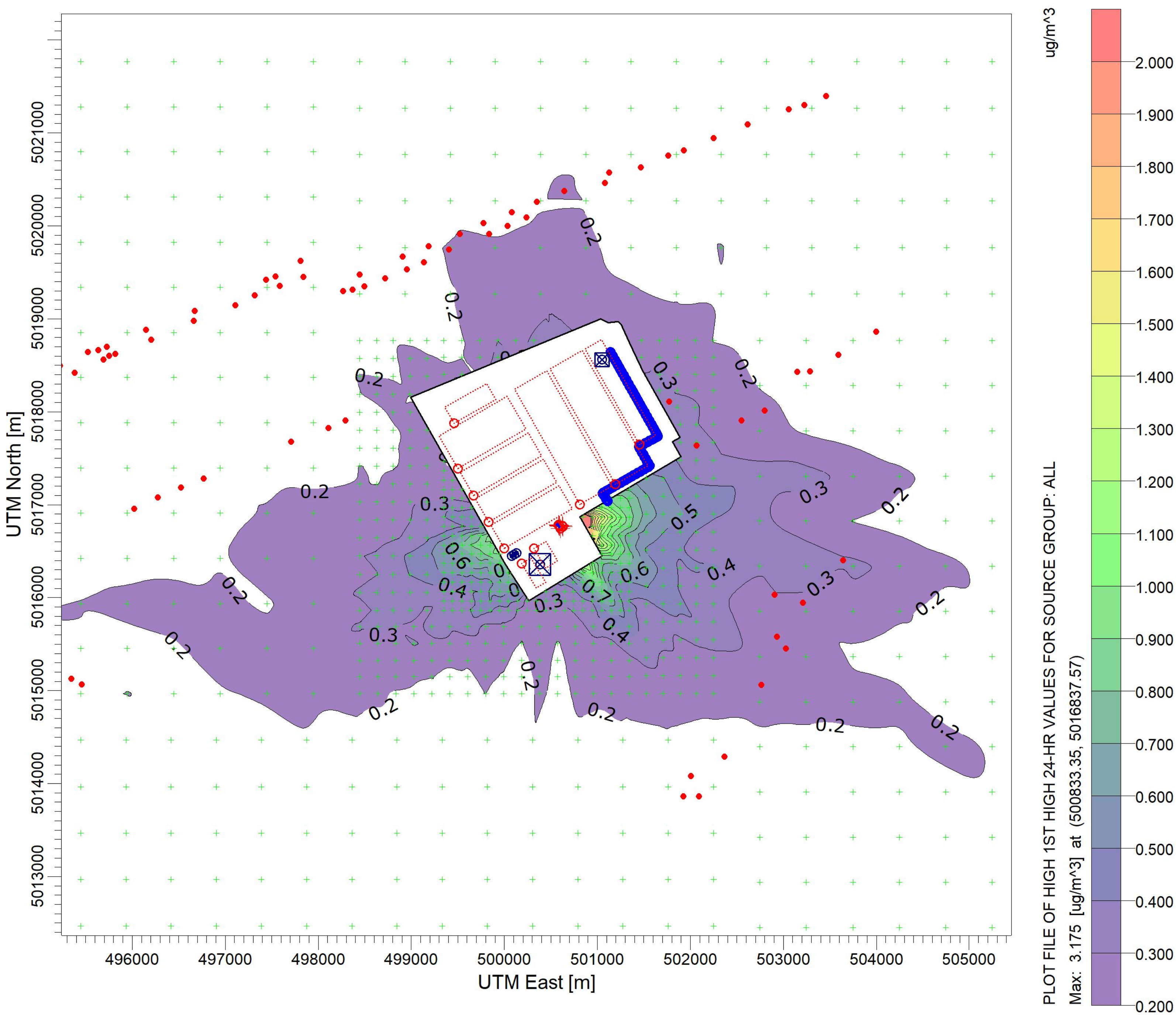
0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario B
Hydrogen Chloride Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:

23

RECEPTORS:

1922

OUTPUT TYPE:

Concentration

MAX:

3.175 ug/m^3

COMPANY NAME:

Ramboll Canada Inc.

MODELER:

EM

DATE:

2022-06-29

SCALE: 1:60,000

0 2 km

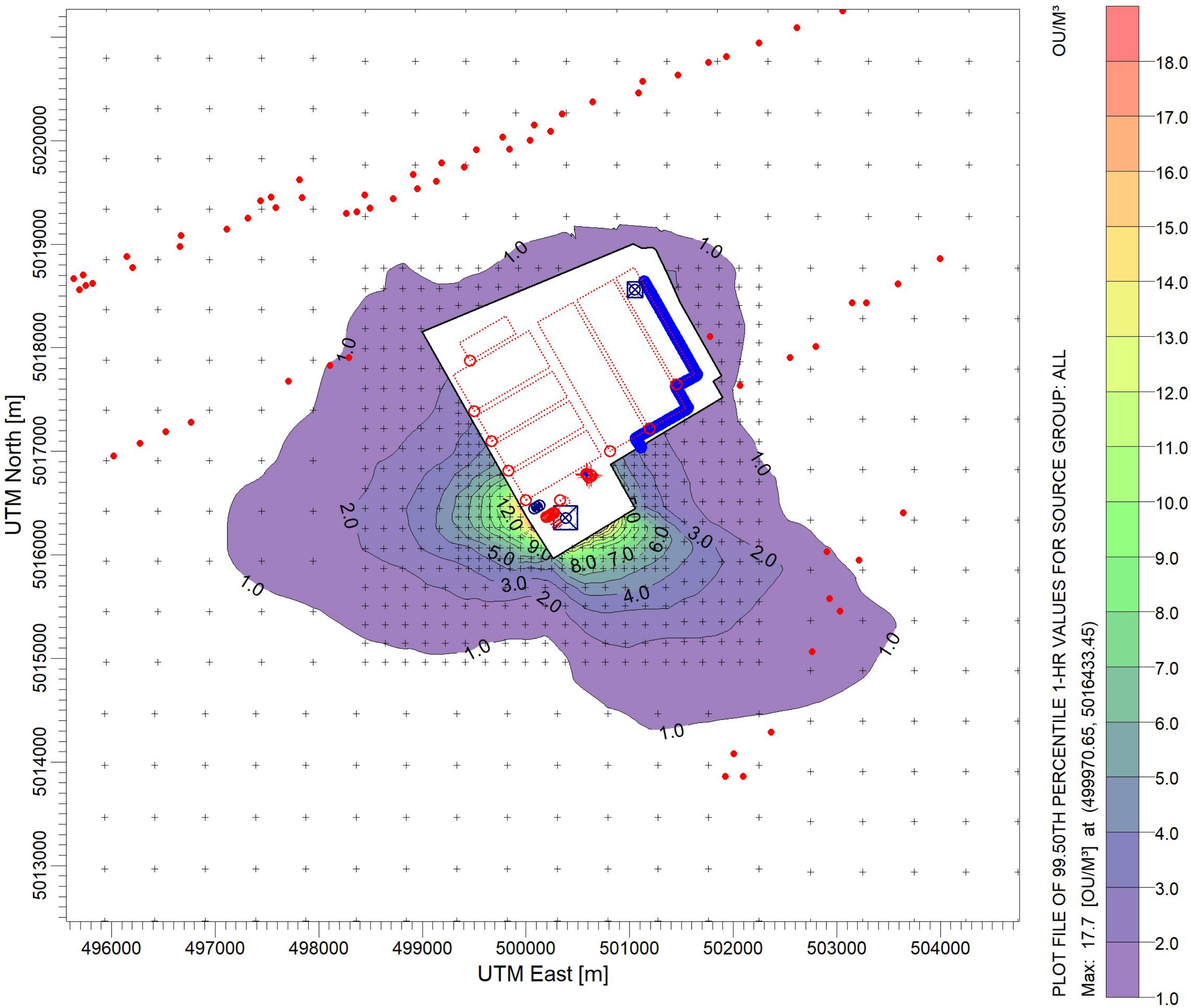
PROJECT NO.:

324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario B
Odour 10 Minute Average Peak Concentration Contours (99.5th Percentile)



COMMENTS:

The 1-hr air dispersion modelling output units were adjusted in AERMOD to reflect the expected peak 10-min average values using the MECP recommended standard conversion factor of 1.65.

SOURCES:

28

RECEPTORS:

1922

OUTPUT TYPE:

Concentration

MAX:

17.7 OU/M³

COMPANY NAME:

Ramboll Canada Inc.

DATE:

2023-05-29

SCALE: 1:60,000

0 2 km

PROJECT NO.:

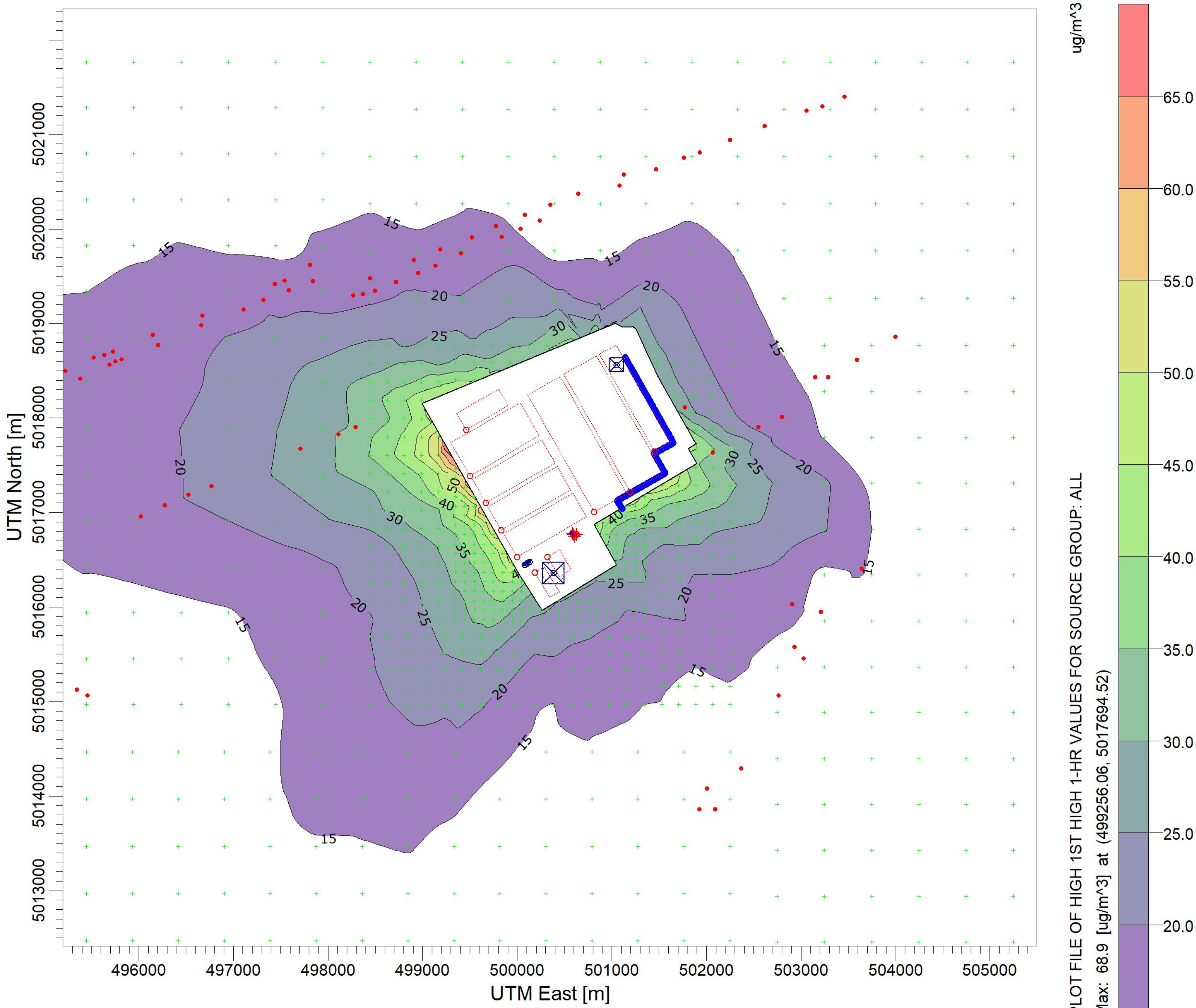
324000731

AERMOD View - Lakes Environmental Software

D:\324000731 - GFL Moosecreek\AERMOD\South Piles\Odour_2B\Odour_2B.isc

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario B
Landfill Gas (LFG) Base Run (1 g/s) Peak 1 Hour Average Concentration Contours



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
68.9 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-04

SCALE: 1:60,000

0 2 km

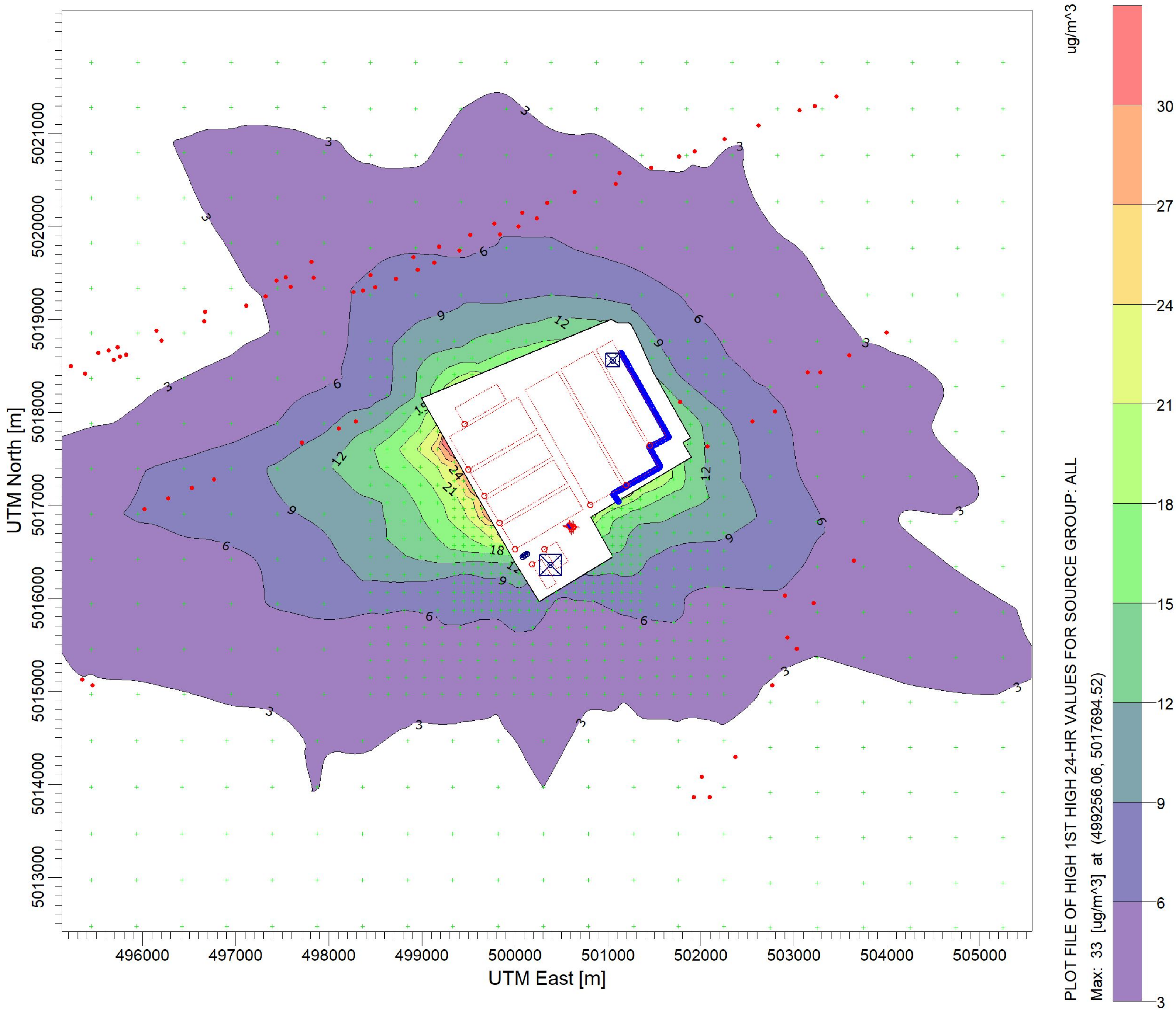
RAMBOLL

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario B
Landfill Gas (LFG) Base Run (1 g/s) Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
33 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-06-29

SCALE: 1:60,000

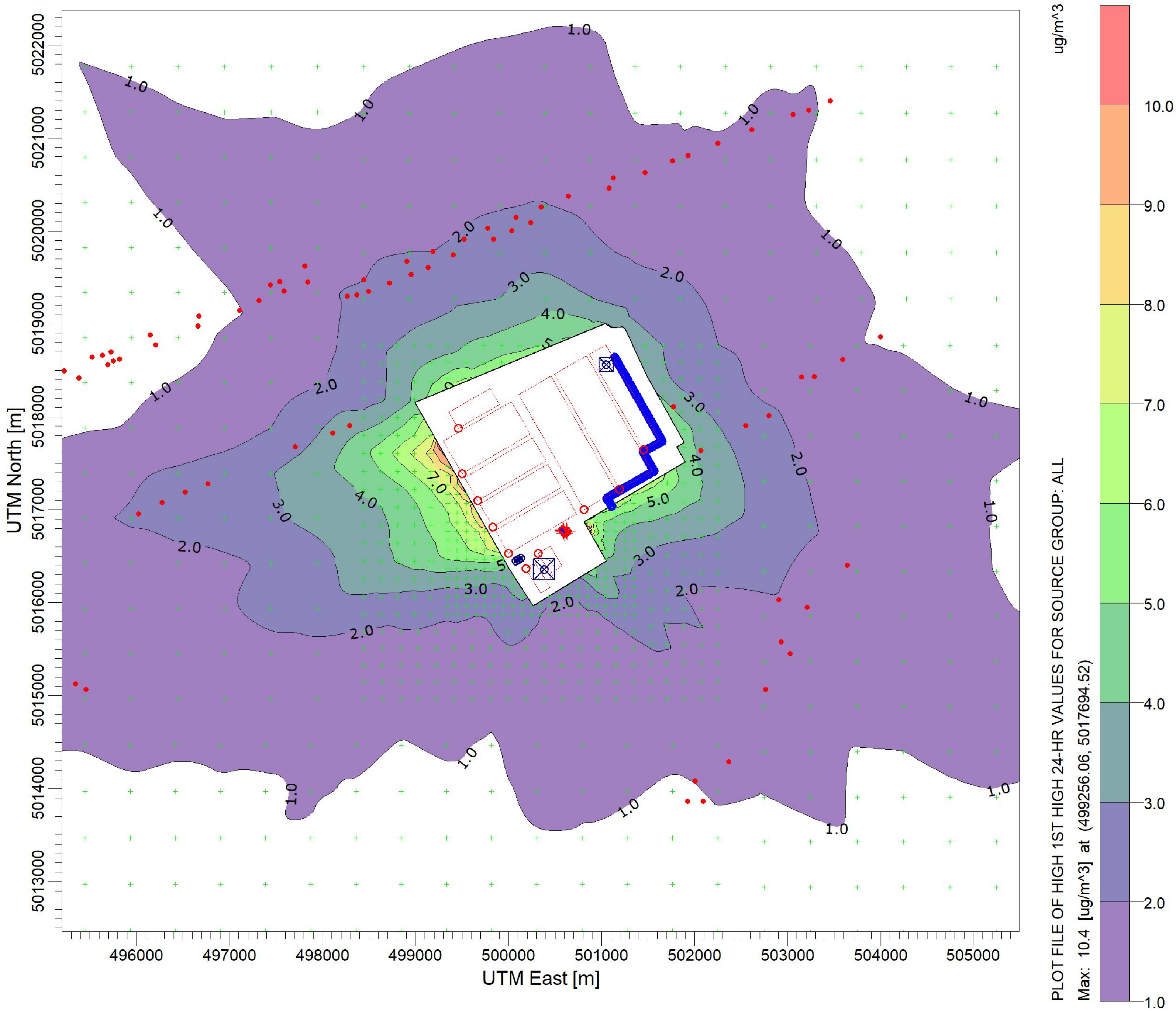
0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

PROJECT TITLE:

GFL Moosecreek Effects Assessment - Alternative 2 Scenario B
Siloxane Base Run (1 g/s) Peak 24 Hour Average Concentration Contours



COMMENTS:

SOURCES:
23

RECEPTORS:
1922

OUTPUT TYPE:
Concentration

MAX:
10.4 ug/m^3

COMPANY NAME:
Ramboll Canada Inc.

MODELER:
EM

DATE:
2022-07-04

SCALE: 1:60,000

0 2 km

PROJECT NO.:
324000731

AERMOD View - Lakes Environmental Software

APPENDIX E:
EMISSION ESTIMATES

Appendix E: Emission Estimates
Alternative 1 Scenario A

Calculation Sheet - Alternative 1 Scenario A

LFG Emissions from Gensets and Flares for Stages 1 to 5

The maximum quantity of LFG was estimated by using LandGEM Landfill Gas Emissions Model version 3.02, USEPA :

Max Quantity of LFG= 5.80E+07 m^3/year

It was assumed that the LFG collection system has a capture capacity of 75%. As such:

25% of LFG is emitted into the atmosphere as fugitive emissions:

=25% x 5.799e7 1.45E+07 m^3/year

75% of LFG is captured by LFG collection system and will be directed into the flares and generators.

=75% x 5.80e7 4.35E+07 m^3/year

The majority of collected LFG from collection system is directed into flare#1, and flare#2 (new flare). The remaining LFG will be directed into generators.

The LFG required to be filtered from siloxane compounds prior to combustion in generators in order to protect generators engines.
The purge gas from siloxane filter will be sent to flare 3 (siloxane filter) and will be combusted.

The amount of LFG combusted in flare #1 and #2 was estimated based on the following assumptions:
1. LFG quantity combusted in generators and siloxane flare was estimated based on actual quantity reported in 2019.
Approximately, 20,100,962 Sm3 and 891,340 Sm3 of total captured LFG was combusted in generators and siloxane flare, respectively.
2. The quantity of LFG combusted in generators and siloxane filter was subtract from total captured LFG to estimate the remaining quantity of LFG.
Quantity of remaining LFG =2.45e7 (m3/year) - 20,100,962 (m3/year) - 891,340 (m3/year)= 2.25E+07 m^3/year
3. The remaining quantity of LFG was splited between flare 1 and flare 2 based on their design capacity obtained from manufacturers.

Units	Design Capacity (cfm)	LFG Quantity
Flare 1	2500	8.04E+06
Flare 2	4500	1.45E+07

Source ID	LFG quantity[1,2]			No. of units	LFG quantity per unit	
	LFG Quantity (Sm^3/year)	hours/year	m^3/hr		m^3/hr	m^3/s
LFG Fugitive	14,497,500	8,760	1,655	-	1655	0.46
Engines	20,100,962	8,760	2,295	4	574	0.16
Flare 1	8,035,785	8,760	917	1	917	0.25
Flare 2	14,464,413	8,760	1,651	1	1651	0.46
Flare 3	891,340	8,760	102	1	102	0.03

1. LFG quantities combusted in generator engines and siloxane flare were provided by GFL and are based on 2019 calender year.
2. LFG quantities combusted in flare 1 and flare 2 were estimated based on design capacities obtained from manufacturers.

Control Efficiency (%) from Table 2.4-3, AP-42

LFG Emission Sources	LFG Quantity (Sm^3/year)	Capture Efficiency	LFG Emission Rate (m^3/yr)	LFG Emissions	Significant? (Yes or No)[1]
Fugitives	14,497,500	0.00%	14,497,500	93%	Yes
Engines	20,100,962	97.20%	562,827	4%	No
Flare 1	8,035,785	97.70%	184,823	1%	No
Flare 2	14,464,413	97.70%	332,681	2%	No
Flare 3 (Siloxane Flare)	891,340	97.70%	20,501	0%	No
		Total	15,598,332	100%	

1. Sources that are Insignificant Relative to Total Emissions per section 7.2.2 of ESDM guidance document.

Calculation Sheet - Alternative 1 Scenario A

LFG Emissions from Gensets and Flares for Stage 6

The maximum quantity of LFG was estimated by using LandGEM Landfill Gas Emissions Model version 3.02, USEPA :

Max Quantity of LFG= 3.92E+07 m^3/year

It was assumed that the LFG collection system has a capture capacity of 75%. As such:
25% of LFG is emitted into the atmosphere as fugitive emissions:

=25% x 3.92e7 9.81E+06 m^3/year

75% of LFG is captured by LFG collection system and will be directed into the flares and generators.

=75% x 3.92e7 2.94E+07 m^3/year

The majority of collected LFG from collection system is directed into flare#1, and flare#2 (new flare). The remaining LFG will be directed into generators.

The LFG required to be filtered from siloxane compounds prior to combustion in generators in order to protect generators engines.
The purge gas from siloxane filter will be sent to flare 3 (siloxane filter) and will be combusted.

The amount of LFG combusted in flare #1 and #2 was estimated based on the following assumptions:
1. LFG quantity combusted in generators and siloxane flare was estimated based on actual quantity reported in 2019.
Approximately, 20,100,962 Sm3 and 891,340 Sm3 of total captured LFG was combusted in generators and siloxane flare, respectively.
2. The quantity of LFG combusted in generators and siloxane filter was subtract from total captured LFG to estimate the remaining quantity of LFG.

Quantity of remaining LFG =6.96e7 (m3/year) - 20,100,962 (m3/year) - 891,340 (m3/year)= 8.43E+06 m^3/year
3. The remaining quantity of LFG was splited between flare 1 and flare 2 based on their design capacity obtained from manufacturers.

Units	Design Capacity (cfm)	LFG Quantity
Flare 1	2500	3.01E+06
Flare 2	4500	5.42E+06

Source ID	LFG quantity[1,2]			No. of units	LFG quantity per unit	
	LFG Quantity (Sm^3/year)	hours/year	m^3/hr		m^3/hr	m^3/s
LFG Fugitive	9,807,500	8,760	1,120	-	1120	0.31
Engines	20,100,962	8,760	2,295	4	574	0.16
Flare 1	3,010,785	8,760	344	1	344	0.10
Flare 2	5,419,413	8,760	619	1	619	0.17
Flare 3	891,340	8,760	102	1	102	0.03

1. LFG quantities combusted in generator engines and siloxane flare were provided by GFL and are based on 2019 calender year.
2. LFG quantities combusted in flare 1 and flare 2 were estimated based on design capacities obtained from manufacturers.

Control Efficiency (%) from Table 2.4-3, AP-42

LFG Emission Sources	LFG Quantity (Sm^3/year)	Capture Efficiency	LFG Emission Rate (m^3/yr)	LFG Emissions	Significant? (Yes or No)[1]
Fugitives	9,807,500	0.00%	9,807,500	93%	Yes
Engines	20,100,962	97.20%	562,827	5%	Yes
Flare 1	3,010,785	97.70%	69,248	1%	No
Flare 2	5,419,413	97.70%	124,646	1%	No
Flare 3 (Siloxane Flare)	891,340	97.70%	20,501	0%	No
		Total	10,584,722	100%	

1. Sources that are Insignificant Relative to Total Emissions per section 7.2.2 of ESDM guidance document.

Table E1. LFG Generation and Distribution for Stages 1 to 5 - Alternative 1 Scenario A

Landfill Gas (LFG) is generated by decomposition of organic materials within the landfill. The quantity of LFG generated per year was estimated using the US EPA LandGEM Landfill Gas Emissions Model version 3.02.

Model Inputs:

Inputs to the model were based on:

- 2019 and earlier - records of quantity of waste accepted annually (tonnes/year)
- 2020 to 2025 - assumed 755,000 tonnes/year of waste accepted
- Closure at end of 2025

Model Results

The LandGEM model estimates:

Maximum LFG generation rate: 57,990,000 m^3/year in 2032

LFG is assumed to be generated relatively uniformly through the year, so this equates to peak generation rate of:

57990000 (m^3/year) / 365 (days/year) / 24 (hours/day) / 3600 (seconds/hour)

LFG Generation Rate = 1.8 m^3/s

Distribution

The landfill has an LFG Collection System to capture LFG and route it to the LFG Utilization Facility. LFG that is not captured by the system is emitted to atmosphere through the landfill surface.

LFG Capture System Efficiency: 75%

LFG captured and combusted at the LFG Utilization facility:	1.8 (m^3/s) x 75% =	1.38	m^3/s
LFG not captured, and emitted from surface (e.g. fugitive):	1.8 (m^3/s) x (1-75%) =	0.46	m^3/s

At the LFG Utilization facility, LFG is used to fuel engines driving electrical generators (Gen1 to Gen4). Siloxanes are filtered from the engine fuel, and purge gas from the filter is mixed with LFG and combusted in an enclosed flare (Flare3). Excess LFG not used in Gen1 to Gen4 or Flare3 is combusted in two enclosed flares (Flare1 and Flare2). For the puroses of this analysis, LFG is assumed to be distributed between Flares1 and 2 proportional to their rated capacity.

Source	**LFG Combusted (m^3/s)**	
Engines (Gen1 to Gen 4)	0.38	m^3/s, at rated power (2019)
Siloxane Flare (Flare3)	0.029	m^3/s, at rated engine power (2019)
Flare 1	0.35	m^3/s (rated capacity 1.18 m^3/s)
Flare 2	0.62	m^3/s (rated capacity 2.12 m^3/s)
Total Combusted	1.38	m^3/s

Table E1. LFG Generation and Distribution for Stages 6 to 9 - Alternative 1 Scenario A

Landfill Gas (LFG) is generated by decomposition of organic materials within the landfill. The quantity of LFG generated per year was estimated using the US EPA LandGEM Landfill Gas Emissions Model version 3.02.

Model Inputs:

Inputs to the model were based on:
- 2026 to 2045 - assumed 755,000 tonnes/year of waste accepted
- Closure at end of 2045

Model Results

The LandGEM model estimates:

Maximum LFG generation rate: 39,230,000 m³/year in 2032

LFG is assumed to be generated relatively uniformly through the year, so this equates to peak generation rate of:

39230000 (m³/year) / 365 (days/year) / 24 (hours/day) / 3600 (seconds/hour)

LFG Generation Rate = 1.2 m³/s

Distribution

The landfill has an LFG Collection System to capture LFG and route it to the LFG Utilization Facility. LFG that is not captured by the system is emitted to atmosphere through the landfill surface.

LFG Capture System Efficiency: 75%

LFG captured and combusted at the LFG Utilization facility:	1.2 (m³/s) x 75% =	0.93	m³/s
LFG not captured, and emitted from surface (e.g. fugitive):	1.2 (m³/s) x (1-75%) =	0.31	m³/s

At the LFG Utilization facility, LFG is used to fuel engines driving electrical generators (Gen1 to Gen4). Siloxanes are filtered from the engine fuel, and purge gas from the filter is mixed with LFG and combusted in an enclosed flare (Flare3). Excess LFG not used in Gen1 to Gen4 or Flare3 is combusted in two enclosed flares (Flare1 and Flare2). For the puroses of this analysis, LFG is assumed to be distributed between Flares1 and 2 proportional to their rated capacity.

Source	**LFG Combusted (m³/s)**	
Engines (Gen1 to Gen 4)	0.26	m³/s, at rated power (2019)
Siloxane Flare (Flare3)	0.029	m³/s, at rated engine power (2019)
Flare 1	0.23	m³/s (rated capacity 1.18 m³/s)
Flare 2	0.42	m³/s (rated capacity 2.12 m³/s)
Total Combusted	0.93	m³/s

Table E2. Fugitive Emissions Of LFG for Stages 1 to 5 - Alternative 1 Scenario A

LFG that is not captured by the LFG Collection System is emitted from the surface of the landfill as fugitive. The previous landfill wass divided into five stages (STG1 to STG5). Fugitive LFG was assumed to to be emitted uniformly over the area of the five stages.

Concentrations of constituents of LFG are based on US EPA, AP-42, Table 2.4-1.

Total Fugitive LFG Emission Rate: 0.46 m^3/s (see Table E1 for calculation)

Emission Sources	Surface Area (m²)
STG1 - Stage 1	244,000
STG2 - Stage 2	244,000
STG3 - Stage 3	244,000
STG4 - Stage 4	342,000
STG5 - Stage 5	102,948
Total Surface Area	**1,176,948**

Sample Calculation (1,1,1-Trichloroethane)

Total emission rate = LFG Emission rate (m³/s) x Concentration in LFG (mg/m³) /1000 (mg/g)
= 0.24 (m³/s) x 1.32 (mg/m³) / 1000 (mg/g)
= 0.00061
Emission flux = Total emission rate (g/s) / Total surface area (m²)
= 0.0006 / 1176948 (m²)
= 5.17E-10

Aggregate Fugitive Emissions from Stages 1 to 5 (STG1 to STG5)

Constituent	CAS No.	MW (g/mole)	Concentration in LFG (ppmv)	Concentration in LFG (mg/m³)	Total Emission Rate (g/s)	Total Emission Flux (g/s/m²)	Emission Factor Rating
1,1,1-Trichloroethane	71556	133	2.43E-01	1.3	6.09E-04	5.17E-10	A
1,1,2,2-Tetrachloroethane	79345	168	5.35E-01	3.7	1.69E-03	1.43E-09	E
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	261	3.49E-03	0.0	1.71E-05	1.45E-11	D
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187	6.72E-02	0.5	2.37E-04	2.01E-10	C
1,1,2-Trichloroethane	79005	133	1.58E-01	0.9	3.96E-04	3.36E-10	D
1,1-Dichloroethane	75343	99	2.08E+00	8.4	3.87E-03	3.29E-09	A
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	97	1.60E-01	0.6	2.91E-04	2.48E-10	A
1,2,3-Trimethylbenzene	526738	120	3.59E-01	1.8	8.11E-04	6.89E-10	D
1,2,4-Trichlorobenzene	120821	181	5.51E-03	0.0	1.88E-05	1.60E-11	C
1,2,4-Trimethylbenzene	95636	120	1.37E+00	6.7	3.09E-03	2.63E-09	B
1,2-Dibromoethane (Ethylene dibromide)	106934	188	4.80E-03	0.0	1.69E-05	1.44E-11	B
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	171	1.06E-01	0.7	3.40E-04	2.89E-10	B
1,2-Dichloroethane (Ethylene dichloride)	107062	99	1.59E-01	0.6	2.96E-04	2.51E-10	A
1,2-Dichloroethene	540590	97	1.14E+01	45.2	2.08E-02	1.76E-08	E
1,2-Dichloropropane	78875	113	5.20E-02	0.2	1.10E-04	9.38E-11	D
1,2-Diethylbenzene	135013	134	1.99E-02	0.1	5.02E-05	4.26E-11	D
1,3,5-Trimethylbenzene	108678	120	6.23E-01	3.1	1.41E-03	1.20E-09	C
1,3-Butadiene (Vinyl ethylene)	106990	54	1.66E-01	0.4	1.69E-04	1.43E-10	C
1,3-Diethylbenzene	141935	134	6.55E-02	0.4	1.65E-04	1.40E-10	D
1,4-Diethylbenzene	105055	134	2.62E-01	1.4	6.61E-04	5.61E-10	D
1,4-Dioxane (1,4-Diethylene dioxide)	123911	88	8.29E-03	0.0	1.37E-05	1.17E-11	D
1-Butene	106989	56	1.22E+00	2.8	1.29E-03	1.09E-09	D
2-Methylbutene	513359	70	1.22E+00	3.5	1.61E-03	1.37E-09	D
1-Butene	106989	56	1.10E+00	2.5	1.16E-03	9.85E-10	E
2-Methylpropene	115117	56	1.10E+00	2.5	1.16E-03	9.85E-10	E
1-Ethyl-4-methylbenzene (4-Ethyl toluene)	622968	120	9.89E-01	4.9	2.23E-03	1.90E-09	C
1-Heptene	592767	98	6.25E-01	2.5	1.15E-03	9.80E-10	E
1-Hexene	592416	84	8.88E-02	0.3	1.40E-04	1.19E-10	D
2-Methyl-1-pentene	763291	84	8.88E-02	0.3	1.40E-04	1.19E-10	D
1-Methylcyclohexene	591491	96	2.27E-02	0.1	4.10E-05	3.48E-11	D
1-Methylcyclopentene	693890	82	2.52E-02	0.1	3.89E-05	3.30E-11	D
1-Pentene	109671	70	2.20E-01	0.6	2.90E-04	2.46E-10	D
1-Propanethiol (n-Propyl mercaptan)	107039	76	1.25E-01	0.4	1.79E-04	1.52E-10	D
2,2,3-Trimethylbutane	464062	100	9.19E-03	0.0	1.73E-05	1.47E-11	D
2,2,4-Trimethylpentane	540841	114	6.14E-01	2.9	1.32E-03	1.12E-09	A
2,2,5-Trimethylhexane	3522949	128	1.56E-01	0.8	3.76E-04	3.19E-10	D
2,2-Dimethylbutane	75832	86	1.56E-01	0.5	2.53E-04	2.15E-10	D
2,2-Dimethylpentane	590352	100	6.08E-02	0.2	1.14E-04	9.73E-11	D
2,2-Dimethylpropane	463821	72	2.74E-02	0.1	3.71E-05	3.16E-11	D
2,3,4-Trimethylpentane	565753	114	3.12E-01	1.5	6.70E-04	5.69E-10	D

Constituent	CAS No.	MW	Concentration in LFG		Total Emission Rate	Total Emission Flux	Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(g/s)	(g/s/m²)	
2,3-Dimethylbutane	79298	86	1.67E-01	0.6	2.70E-04	2.30E-10	E
2,3-Dimethylpentane	565593	100	3.10E-01	1.3	5.84E-04	4.96E-10	D
2,4-Dimethylhexane	589435	114	2.22E-01	1.0	4.76E-04	4.05E-10	D
2,4-Dimethylpentane	108087	100	1.00E-01	0.4	1.88E-04	1.60E-10	D
2,5-Dimethylhexane	592132	114	1.66E-01	0.8	3.56E-04	3.03E-10	D
2,5-Dimethylthiophene	638028	112	6.44E-02	0.3	1.36E-04	1.15E-10	D
2-Butanone (Methyl ethyl ketone)	78933	72	4.01E+00	11.8	5.43E-03	4.62E-09	D
2-Ethyl-1-butene	760214	84	1.77E-02	0.1	2.80E-05	2.38E-11	E
2-Ethylthiophene	872559	112	6.29E-02	0.3	1.33E-04	1.13E-10	C
2-Ethyltoluene	611143	120	3.23E-01	1.6	7.29E-04	6.20E-10	D
2-Hexanone (Methyl butyl ketone)	591786	100	6.13E-01	2.5	1.15E-03	9.80E-10	E
2-Methyl-1-butene	563462	70	1.79E-01	0.5	2.36E-04	2.00E-10	D
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90	1.70E-01	0.6	2.88E-04	2.45E-10	E
2-Methyl-2-butene	513359	70	3.03E-01	0.9	3.99E-04	3.39E-10	D
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90	3.25E-01	1.2	5.51E-04	4.68E-10	E
2-Methylbutane	78784	72	2.26E+00	6.7	3.06E-03	2.60E-09	D
2-Methylheptane	592278	114	7.16E-01	3.3	1.54E-03	1.31E-09	D
2-Methylhexane	591764	100	8.16E-01	3.3	1.54E-03	1.31E-09	D
2-Methylpentane	107835	86	6.88E-01	2.4	1.11E-03	9.47E-10	D
2-Propanol (Isopropyl alcohol)	67630	60	1.80E+00	4.4	2.03E-03	1.73E-09	D
3,6-Dimethyloctane	15869940	142	7.85E-01	4.6	2.10E-03	1.78E-09	D
3-Ethyltoluene	620144	120	7.80E-01	3.8	1.76E-03	1.50E-09	D
3-Methyl-1-pentene	760203	84	6.99E-03	0.0	1.11E-05	9.39E-12	D
3-Methylheptane	589811	114	7.63E-01	3.6	1.64E-03	1.39E-09	D
3-Methylhexane	589344	100	1.13E+00	4.6	2.13E-03	1.81E-09	D
3-Methylpentane	96140	86	7.40E-01	2.6	1.20E-03	1.02E-09	D
3-Methylthiophene	616444	98	9.25E-02	0.4	1.71E-04	1.45E-10	E
4-Methyl-1-pentene	691372	84	2.33E-02	0.1	3.68E-05	3.13E-11	E
4-Methyl-2-pentanone (MIBK)	108101	100	8.83E-01	3.6	1.66E-03	1.41E-09	C
4-Methylheptane	589537	114	2.49E-01	1.2	5.34E-04	4.54E-10	D
Acetaldehyde	75070	44	7.74E-02	0.1	6.41E-05	5.44E-11	D
Acetone	67641	58	6.70E+00	15.9	7.31E-03	6.21E-09	C
Acetonitrile	75058	41	5.56E-01	0.9	4.29E-04	3.64E-10	A
Benzene	71432	78	2.40E+00	7.7	3.52E-03	2.99E-09	A
Benzyl chloride	100447	127	1.81E-02	0.1	4.30E-05	3.66E-11	A
Bromodichloromethane	75274	164	8.78E-03	0.1	2.70E-05	2.30E-11	E
Bromomethane (Methyl bromide)	74839	95	2.10E-02	0.1	3.75E-05	3.18E-11	C
Butane	106978	58	6.22E+00	14.8	6.79E-03	5.77E-09	C
Carbon disulfide	75150	76	1.47E-01	0.5	2.10E-04	1.79E-10	A
Carbon monoxide	630080	28	2.44E+01	27.9	1.28E-02	1.09E-08	C
Carbon tetrachloride	56235	154	7.98E-03	0.1	2.31E-05	1.96E-11	A
Carbon tetrafluoride (Freon 14)	75730	88	1.51E-01	0.5	2.50E-04	2.12E-10	E
Carbonyl sulfide (Carbon oxysulfide)	463581	60	1.22E-01	0.3	1.38E-04	1.17E-10	A
Chlorobenzene	108907	113	4.84E-01	2.2	1.02E-03	8.70E-10	A
Chlorodifluoromethane (Freon 22)	75456	86	7.96E-01	2.8	1.29E-03	1.10E-09	D
Chloroethane (Ethyl chloride)	75003	65	3.95E+00	10.4	4.79E-03	4.07E-09	B
Chloromethane (Methyl chloride)	74873	50	2.44E-01	0.5	2.31E-04	1.97E-10	B
cis-1,2-Dichloroethene	156592	97	1.24E+00	4.9	2.26E-03	1.92E-09	B
cis-1,2-Dimethylcyclohexane	2207014	112	8.10E-02	0.4	1.71E-04	1.45E-10	D
cis-1,3-Dichloropropene	10061015	111	3.03E-03	0.0	6.32E-06	5.37E-12	D
cis-1,3-Dimethylcyclohexane	638040	112	5.01E-01	2.3	1.06E-03	8.97E-10	D
cis-1,4-Dimethylcyclohexane	624293	112	2.48E-01	1.1	5.23E-04	4.44E-10	D
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	112	2.48E-01	1.1	5.23E-04	4.44E-10	D
cis-2-Butene	590181	56	1.05E-01	0.2	1.11E-04	9.41E-11	D
cis-2-Heptene	6443921	98	2.45E-02	0.1	4.52E-05	3.84E-11	E
cis-2-Hexene	7688213	84	1.72E-02	0.1	2.72E-05	2.31E-11	D
cis-2-Octene	7642048	112	2.20E-01	1.0	4.64E-04	3.94E-10	D
cis-2-Pentene	627203	70	4.79E-02	0.1	6.31E-05	5.36E-11	D
cis-3-Methyl-2-pentene	922623	84	1.79E-02	0.1	2.83E-05	2.40E-11	D
Cyclohexane	110827	84	1.01E+00	3.5	1.60E-03	1.36E-09	B
Cyclohexene	110838	82	1.84E-02	0.1	2.84E-05	2.41E-11	D
Cyclopentane	287923	70	2.21E-02	0.1	2.91E-05	2.47E-11	D
Cyclopentene	142290	68	1.21E-02	0.0	1.55E-05	1.32E-11	D
Decane	124185	142	3.80E+00	22.1	1.02E-02	8.63E-09	D
Dibromochloromethane	124481	208	1.51E-02	0.1	5.91E-05	5.02E-11	D
Dibromomethane (Methylene dibromide)	74953	174	8.35E-04	0.0	2.73E-06	2.32E-12	E
Dichlorobenzene	106467	147	9.40E-01	5.6	2.60E-03	2.21E-09	A

Constituent	CAS No.	MW	Concentration in LFG		Total Emission Rate	Total Emission Flux	Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(g/s)	(g/s/m²)	
Dichlorodifluoromethane (Freon 12)	75718	121	1.18E+00	5.8	2.68E-03	2.28E-09	B
Dichloromethane (Methylene chloride)	75092	85	6.15E+00	21.3	9.81E-03	8.34E-09	A
Diethyl sulfide	352932	90	8.62E-02	0.3	1.46E-04	1.24E-10	E
Dimethyl disulfide	624920	94	1.37E-01	0.5	2.42E-04	2.06E-10	A
Dimethyl sulfide	75183	62	5.66E+00	14.4	6.61E-03	5.61E-09	A
Dodecane (n-Dodecane)	112403	170	2.21E-01	1.5	7.07E-04	6.01E-10	D
Ethane	74840	30	9.05E+00	11.1	5.11E-03	4.34E-09	D
Ethanol	64175	46	2.30E-01	0.4	1.99E-04	1.69E-10	D
Ethyl acetate	141786	88	1.88E+00	6.8	3.11E-03	2.64E-09	C
Ethyl mercaptan (Ethanediol)	75081	62	1.98E-01	0.5	2.31E-04	1.96E-10	A
Ethyl methyl sulfide	624895	76	3.67E-02	0.1	5.25E-05	4.46E-11	E
Ethylbenzene	100414	106	4.86E+00	21.1	9.69E-03	8.24E-09	B
Formaldehyde	50000	30	1.17E-02	0.0	6.60E-06	5.61E-12	D
Heptane	142825	100	1.34E+00	5.5	2.52E-03	2.14E-09	B
Hexane	110543	86	3.10E+00	10.9	5.02E-03	4.26E-09	B
Hydrogen sulfide	7783064	34	3.20E+01	44.6	2.05E-02	1.74E-08	A
Indane (2,3-Dihydroindene)	496117	34	6.66E-02	0.1	4.26E-05	3.62E-11	D
Isobutane (2-Methylpropane)	75285	58	8.16E+00	19.4	8.91E-03	7.57E-09	D
Isobutylbenzene	538932	134	4.07E-02	0.2	1.03E-04	8.72E-11	D
Isoprene (2-Methyl-1,3-butadiene)	78795	68	1.65E-02	0.0	2.11E-05	1.79E-11	D
Isopropyl mercaptan	75332	76	1.75E-01	0.5	2.50E-04	2.13E-10	A
Isopropylbenzene (Cumene)	98828	120	4.30E-01	2.1	9.71E-04	8.25E-10	D
Mercury (total)	7439976	201	1.22E-04	0.0	4.60E-07	3.91E-13	B
Methanethiol (Methyl mercaptan)	74931	48	1.37E+00	2.7	1.24E-03	1.05E-09	A
Methyl tert-butyl ether (MTBE)	1634044	88	1.18E-01	0.4	1.95E-04	1.66E-10	D
Methylcyclohexane	108872	98	1.29E+00	5.2	2.38E-03	2.02E-09	D
Methylcyclopentane	96377	84	6.50E-01	2.2	1.03E-03	8.73E-10	D
Naphthalene	91203	128	1.07E-01	0.6	2.58E-04	2.19E-10	D
n-Butylbenzene	104518	134	6.80E-02	0.4	1.71E-04	1.46E-10	D
Nonane	111842	128	2.37E+00	12.4	5.71E-03	4.85E-09	D
n-Propylbenzene (Propylbenzene)	103651	120	4.13E-01	2.0	9.33E-04	7.92E-10	D
Octane	111659	114	1.08E+00	5.0	2.32E-03	1.97E-09	D
p-Cymene (1-Methyl-4-Isopropylbenzene)	99876	134	3.58E+00	19.6	9.03E-03	7.67E-09	D
Pentane	109660	72	4.46E+00	13.2	6.05E-03	5.14E-09	C
Propane	74986	44	1.55E+01	27.9	1.28E-02	1.09E-08	C
Propene	115071	42	3.32E+00	5.7	2.62E-03	2.23E-09	D
Propyne	74997	40	3.80E-02	0.1	2.86E-05	2.43E-11	E
sec-Butylbenzene	135988	134	6.75E-02	0.4	1.70E-04	1.45E-10	D
Styrene (Vinylbenzene)	100425	104	4.11E-01	1.7	8.04E-04	6.83E-10	B
Tetrachloroethylene (Perchloroethylene)	127184	166	2.03E+00	13.8	6.32E-03	5.37E-09	A
Tetrahydrofuran (Diethylene oxide)	109999	72	9.69E-01	2.9	1.31E-03	1.12E-09	C
Thiophene	110021	84	3.49E-01	1.2	5.52E-04	4.69E-10	E
Toluene (Methyl benzene)	108883	92	2.95E+01	111.1	5.11E-02	4.34E-08	A
trans-1,2-Dichloroethene	156605	97	2.87E-02	0.1	5.23E-05	4.44E-11	C
trans-1,2-Dimethylcyclohexane	6876239	112	4.04E-01	1.9	8.52E-04	7.24E-10	D
trans-1,3-Dichloropropene	10061026	111	9.43E-03	0.0	1.97E-05	1.67E-11	D
trans-1,4-Dimethylcyclohexane	2207047	112	2.05E-01	0.9	4.32E-04	3.67E-10	D
trans-2-Butene	624646	56	1.04E-01	0.2	1.10E-04	9.32E-11	D
trans-2-Heptene	14686136	98	2.50E-03	0.0	4.61E-06	3.92E-12	E
trans-2-Hexene	4050457	84	2.06E-02	0.1	3.26E-05	2.77E-11	D
trans-2-Octene	13389429	112	2.41E-01	1.1	5.08E-04	4.32E-10	D
trans-2-Pentene	646048	70	3.47E-02	0.1	4.57E-05	3.88E-11	D
trans-3-Methyl-2-pentene	616126	84	1.55E-02	0.1	2.45E-05	2.08E-11	D
Tribromomethane (Bromoform)	75252	253	1.24E-02	0.1	5.89E-05	5.00E-11	D
Trichloroethylene (Trichloroethene)	79016	131	8.28E-01	4.4	2.04E-03	1.74E-09	A
Trichlorofluoromethane (Freon 11)	91315616	137	2.48E-01	1.4	6.40E-04	5.44E-10	B
Trichloromethane (Chloroform)	67663	119	7.08E-02	0.3	1.59E-04	1.35E-10	A
Undecane	1120214	156	1.67E+00	10.7	4.90E-03	4.17E-09	D
Vinyl acetate	85306269	86	2.48E-01	0.9	4.01E-04	3.41E-10	C
Vinyl chloride (Chloroethene)	75014	63	1.42E+00	3.6	1.67E-03	1.42E-09	A
Xylenes (o-, m-, p-, mixtures)	1330207	106	9.23E+00	40.1	1.84E-02	1.56E-08	A
Total Reduced Sulphur Compounds	n/a	-	-	67.7	3.11E-02	2.65E-08	-

Table E2. Fugitive Emissions Of LFG for Stage 6 - Alternative 1 Scenario A

LFG that is not captured by the LFG Collection System is emitted from the surface of the landfill as fugitive. The active portion of the landfill is divided into four stages (STG6 to STG9) but only one stage is in operation during the year modelled (STG 6). Fugitive LFG was assumed to to be emitted uniformly over the area of Stage 6.

Concentrations of constituents of LFG are based on US EPA, AP-42, Table 2.4-1.

Total Fugitive LFG Emission Rate: 0.31 m^3/s (see Table E1 for calculation)

Emission Sources	Surface Area (m^2)
STG6 - Stage 6	424,976
Total Surface Area	**424,976**

Sample Calculation (1,1,1-Trichloroethane)

Total emission rate = LFG Emission rate (m^3/s) x Concentration in LFG (mg/m^3) /1000 (mg/g)
= 0.74 (m^3/s) x 1.32 (mg/m^3) / 1000 (mg/g)
= 0.00041
Emission flux = Total emission rate (g/s) / Total surface area (m^2)
= 0.00041 / 424976 (m^2)
= 9.70E-10

Aggregate Fugitive Emissions from Stage 6 (STG6)

Constituent	CAS No.	MW	Concentration in LFG		Total Emission Rate	Total Emission Flux	Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m^3)	(g/s)	($g/s/m^2$)	
1,1,1-Trichloroethane	71556	133	2.43E-01	1.3	4.12E-04	9.70E-10	A
1,1,2,2-Tetrachloroethane	79345	168	5.35E-01	3.7	1.14E-03	2.69E-09	E
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	261	3.49E-03	0.0	1.16E-05	2.72E-11	D
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187	6.72E-02	0.5	1.60E-04	3.77E-10	C
1,1,2-Trichloroethane	79005	133	1.58E-01	0.9	2.68E-04	6.30E-10	D
1,1-Dichloroethane	75343	99	2.08E+00	8.4	2.62E-03	6.16E-09	A
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	97	1.60E-01	0.6	1.97E-04	4.64E-10	A
1,2,3-Trimethylbenzene	526738	120	3.59E-01	1.8	5.48E-04	1.29E-09	D
1,2,4-Trichlorobenzene	120821	181	5.51E-03	0.0	1.27E-05	2.99E-11	C
1,2,4-Trimethylbenzene	95636	120	1.37E+00	6.7	2.09E-03	4.92E-09	B
1,2-Dibromoethane (Ethylene dibromide)	106934	188	4.80E-03	0.0	1.15E-05	2.70E-11	B
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	171	1.06E-01	0.7	2.30E-04	5.42E-10	B
1,2-Dichloroethane (Ethylene dichloride)	107062	99	1.59E-01	0.6	2.00E-04	4.71E-10	A
1,2-Dichloroethene	540590	97	1.14E+01	45.2	1.40E-02	3.31E-08	E
1,2-Dichloropropane	78875	113	5.20E-02	0.2	7.47E-05	1.76E-10	D
1,2-Diethylbenzene	135013	134	1.99E-02	0.1	3.39E-05	7.99E-11	D
1,3,5-Trimethylbenzene	108678	120	6.23E-01	3.1	9.52E-04	2.24E-09	C
1,3-Butadiene (Vinyl ethylene)	106990	54	1.66E-01	0.4	1.14E-04	2.69E-10	C
1,3-Diethylbenzene	141935	134	6.55E-02	0.4	1.12E-04	2.63E-10	D
1,4-Diethylbenzene	105055	134	2.62E-01	1.4	4.47E-04	1.05E-09	D
1,4-Dioxane (1,4-Diethylene dioxide)	123911	88	8.29E-03	0.0	9.28E-06	2.18E-11	D
1-Butene	106989	56	1.22E+00	2.8	8.70E-04	2.05E-09	D
2-Methylbutene	513359	70	1.22E+00	3.5	1.09E-03	2.56E-09	D
1-Butene	106989	56	1.10E+00	2.5	7.84E-04	1.85E-09	E
2-Methylpropene	115117	56	1.10E+00	2.5	7.84E-04	1.85E-09	E
1-Ethyl-4-methylbenzene (4-Ethyl toluene)	622968	120	9.89E-01	4.9	1.51E-03	3.56E-09	C
1-Heptene	592767	98	6.25E-01	2.5	7.80E-04	1.84E-09	E
1-Hexene	592416	84	8.88E-02	0.3	9.50E-05	2.24E-10	D
2-Methyl-1-pentene	763291	84	8.88E-02	0.3	9.50E-05	2.24E-10	D
1-Methylcyclohexene	591491	96	2.27E-02	0.1	2.77E-05	6.53E-11	D
1-Methylcyclopentene	693890	82	2.52E-02	0.1	2.63E-05	6.19E-11	D
1-Pentene	109671	70	2.20E-01	0.6	1.96E-04	4.61E-10	D
1-Propanethiol (n-Propyl mercaptan)	107039	76	1.25E-01	0.4	1.21E-04	2.85E-10	D
2,2,3-Trimethylbutane	464062	100	9.19E-03	0.0	1.17E-05	2.75E-11	D
2,2,4-Trimethylpentane	540841	114	6.14E-01	2.9	8.91E-04	2.10E-09	A
2,2,5-Trimethylhexane	3522949	128	1.56E-01	0.8	2.54E-04	5.98E-10	D
2,2-Dimethylbutane	75832	86	1.56E-01	0.5	1.71E-04	4.02E-10	D
2,2-Dimethylpentane	590352	100	6.08E-02	0.2	7.74E-05	1.82E-10	D
2,2-Dimethylpropane	463821	72	2.74E-02	0.1	2.51E-05	5.91E-11	D
2,3,4-Trimethylpentane	565753	114	3.12E-01	1.5	4.53E-04	1.07E-09	D
2,3-Dimethylbutane	79298	86	1.67E-01	0.6	1.83E-04	4.30E-10	E
2,3-Dimethylpentane	565593	100	3.10E-01	1.3	3.95E-04	9.29E-10	D
2,4-Dimethylhexane	589435	114	2.22E-01	1.0	3.22E-04	7.58E-10	D

Constituent	CAS No.	MW	Concentration in LFG		Total Emission Rate	Total Emission Flux	Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(g/s)	(g/s/m²)	
2,4-Dimethylpentane	108087	100	1.00E-01	0.4	1.27E-04	3.00E-10	D
2,5-Dimethylhexane	592132	114	1.66E-01	0.8	2.41E-04	5.67E-10	D
2,5-Dimethylthiophene	638028	112	6.44E-02	0.3	9.18E-05	2.16E-10	D
2-Butanone (Methyl ethyl ketone)	78933	72	4.01E+00	11.8	3.68E-03	8.65E-09	D
2-Ethyl-1-butene	760214	84	1.77E-02	0.1	1.89E-05	4.46E-11	E
2-Ethylthiophene	872559	112	6.29E-02	0.3	8.97E-05	2.11E-10	C
2-Ethyltoluene	611143	120	3.23E-01	1.6	4.93E-04	1.16E-09	D
2-Hexanone (Methyl butyl ketone)	591786	100	6.13E-01	2.5	7.80E-04	1.84E-09	E
2-Methyl-1-butene	563462	70	1.79E-01	0.5	1.60E-04	3.75E-10	D
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90	1.70E-01	0.6	1.95E-04	4.59E-10	E
2-Methyl-2-butene	513359	70	3.03E-01	0.9	2.70E-04	6.36E-10	D
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90	3.25E-01	1.2	3.73E-04	8.77E-10	E
2-Methylbutane	78784	72	2.26E+00	6.7	2.07E-03	4.88E-09	D
2-Methylheptane	592278	114	7.16E-01	3.3	1.04E-03	2.45E-09	D
2-Methylhexane	591764	100	8.16E-01	3.3	1.04E-03	2.45E-09	D
2-Methylpentane	107835	86	6.88E-01	2.4	7.54E-04	1.77E-09	D
2-Propanol (Isopropyl alcohol)	67630	60	1.80E+00	4.4	1.38E-03	3.24E-09	D
3,6-Dimethyloctane	15869940	142	7.85E-01	4.6	1.42E-03	3.34E-09	D
3-Ethyltoluene	620144	120	7.80E-01	3.8	1.19E-03	2.80E-09	D
3-Methyl-1-pentene	760203	84	6.99E-03	0.0	7.48E-06	1.76E-11	D
3-Methylheptane	589811	114	7.63E-01	3.6	1.11E-03	2.61E-09	D
3-Methylhexane	589344	100	1.13E+00	4.6	1.44E-03	3.39E-09	D
3-Methylpentane	96140	86	7.40E-01	2.6	8.11E-04	1.91E-09	D
3-Methylthiophene	616444	98	9.25E-02	0.4	1.15E-04	2.72E-10	E
4-Methyl-1-pentene	691372	84	2.33E-02	0.1	2.49E-05	5.86E-11	E
4-Methyl-2-pentanone (MIBK)	108101	100	8.83E-01	3.6	1.12E-03	2.65E-09	C
4-Methylheptane	589537	114	2.49E-01	1.2	3.62E-04	8.51E-10	D
Acetaldehyde	75070	44	7.74E-02	0.1	4.33E-05	1.02E-10	D
Acetone	67641	58	6.70E+00	15.9	4.95E-03	1.16E-08	C
Acetonitrile	75058	41	5.56E-01	0.9	2.90E-04	6.83E-10	A
Benzene	71432	78	2.40E+00	7.7	2.38E-03	5.61E-09	A
Benzyl chloride	100447	127	1.81E-02	0.1	2.91E-05	6.85E-11	A
Bromodichloromethane	75274	164	8.78E-03	0.1	1.83E-05	4.30E-11	E
Bromomethane (Methyl bromide)	74839	95	2.10E-02	0.1	2.53E-05	5.96E-11	C
Butane	106978	58	6.22E+00	14.8	4.59E-03	1.08E-08	C
Carbon disulfide	75150	76	1.47E-01	0.5	1.42E-04	3.35E-10	A
Carbon monoxide	630080	28	2.44E+01	27.9	8.69E-03	2.04E-08	C
Carbon tetrachloride	56235	154	7.98E-03	0.1	1.56E-05	3.67E-11	A
Carbon tetrafluoride (Freon 14)	75730	88	1.51E-01	0.5	1.69E-04	3.97E-10	E
Carbonyl sulfide (Carbon oxysulfide)	463581	60	1.22E-01	0.3	9.32E-05	2.19E-10	A
Chlorobenzene	108907	113	4.84E-01	2.2	6.92E-04	1.63E-09	A
Chlorodifluoromethane (Freon 22)	75456	86	7.96E-01	2.8	8.75E-04	2.06E-09	D
Chloroethane (Ethyl chloride)	75003	65	3.95E+00	10.4	3.24E-03	7.62E-09	B
Chloromethane (Methyl chloride)	74873	50	2.44E-01	0.5	1.57E-04	3.68E-10	B
cis-1,2-Dichloroethene	156592	97	1.24E+00	4.9	1.53E-03	3.60E-09	B
cis-1,2-Dimethylcyclohexane	2207014	112	8.10E-02	0.4	1.16E-04	2.72E-10	D
cis-1,3-Dichloropropene	10061015	111	3.03E-03	0.0	4.27E-06	1.01E-11	D
cis-1,3-Dimethylcyclohexane	638040	112	5.01E-01	2.3	7.15E-04	1.68E-09	D
cis-1,4-Dimethylcyclohexane	624293	112	2.48E-01	1.1	3.54E-04	8.32E-10	D
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	112	2.48E-01	1.1	3.54E-04	8.32E-10	D
cis-2-Butene	590181	56	1.05E-01	0.2	7.49E-05	1.76E-10	D
cis-2-Heptene	6443921	98	2.45E-02	0.1	3.06E-05	7.19E-11	E
cis-2-Hexene	7688213	84	1.72E-02	0.1	1.84E-05	4.33E-11	D
cis-2-Octene	7642048	112	2.20E-01	1.0	3.14E-04	7.38E-10	D
cis-2-Pentene	627203	70	4.79E-02	0.1	4.27E-05	1.00E-10	D
cis-3-Methyl-2-pentene	922623	84	1.79E-02	0.1	1.91E-05	4.51E-11	D
Cyclohexane	110827	84	1.01E+00	3.5	1.08E-03	2.54E-09	B
Cyclohexene	110838	82	1.84E-02	0.1	1.92E-05	4.52E-11	D
Cyclopentane	287923	70	2.21E-02	0.1	1.97E-05	4.64E-11	D
Cyclopentene	142290	68	1.21E-02	0.0	1.05E-05	2.47E-11	D
Decane	124185	142	3.80E+00	22.1	6.87E-03	1.62E-08	D
Dibromochloromethane	124481	208	1.51E-02	0.1	4.00E-05	9.41E-11	D
Dibromomethane (Methylene dibromide)	74953	174	8.35E-04	0.0	1.84E-06	4.34E-12	E
Dichlorobenzene	106467	147	9.40E-01	5.6	1.76E-03	4.13E-09	A
Dichlorodifluoromethane (Freon 12)	75718	121	1.18E+00	5.8	1.81E-03	4.27E-09	B
Dichloromethane (Methylene chloride)	75092	85	6.15E+00	21.3	6.64E-03	1.56E-08	A
Diethyl sulfide	352932	90	8.62E-02	0.3	9.88E-05	2.33E-10	E

Constituent	CAS No.	MW	Concentration in LFG		Total Emission Rate	Total Emission Flux	Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(g/s)	(g/s/m²)	
Dimethyl disulfide	624920	94	1.37E-01	0.5	1.64E-04	3.86E-10	A
Dimethyl sulfide	75183	62	5.66E+00	14.4	4.47E-03	1.05E-08	A
Dodecane (n-Dodecane)	112403	170	2.21E-01	1.5	4.78E-04	1.13E-09	D
Ethane	74840	30	9.05E+00	11.1	3.46E-03	8.14E-09	D
Ethanol	64175	46	2.30E-01	0.4	1.35E-04	3.17E-10	D
Ethyl acetate	141786	88	1.88E+00	6.8	2.11E-03	4.95E-09	C
Ethyl mercaptan (Ethanediol)	75081	62	1.98E-01	0.5	1.56E-04	3.68E-10	A
Ethyl methyl sulfide	624895	76	3.67E-02	0.1	3.55E-05	8.36E-11	E
Ethylbenzene	100414	106	4.86E+00	21.1	6.56E-03	1.54E-08	B
Formaldehyde	50000	30	1.17E-02	0.0	4.47E-06	1.05E-11	D
Heptane	142825	100	1.34E+00	5.5	1.71E-03	4.02E-09	B
Hexane	110543	86	3.10E+00	10.9	3.40E-03	7.99E-09	B
Hydrogen sulfide	7783064	34	3.20E+01	44.6	1.39E-02	3.26E-08	A
Indane (2,3-Dihydroindene)	496117	34	6.66E-02	0.1	2.88E-05	6.79E-11	D
Isobutane (2-Methylpropane)	75285	58	8.16E+00	19.4	6.03E-03	1.42E-08	D
Isobutylbenzene	538932	134	4.07E-02	0.2	6.94E-05	1.63E-10	D
Isoprene (2-Methyl-1,3-butadiene)	78795	68	1.65E-02	0.0	1.43E-05	3.36E-11	D
Isopropyl mercaptan	75332	76	1.75E-01	0.5	1.69E-04	3.99E-10	A
Isopropylbenzene (Cumene)	98828	120	4.30E-01	2.1	6.57E-04	1.55E-09	D
Mercury (total)	7439976	201	1.22E-04	0.0	3.11E-07	7.32E-13	B
Methanethiol (Methyl mercaptan)	74931	48	1.37E+00	2.7	8.38E-04	1.97E-09	A
Methyl tert-butyl ether (MTBE)	1634044	88	1.18E-01	0.4	1.32E-04	3.11E-10	D
Methylcyclohexane	108872	98	1.29E+00	5.2	1.61E-03	3.79E-09	D
Methylcyclopentane	96377	84	6.50E-01	2.2	6.95E-04	1.64E-09	D
Naphthalene	91203	128	1.07E-01	0.6	1.74E-04	4.10E-10	D
n-Butylbenzene	104518	134	6.80E-02	0.4	1.16E-04	2.73E-10	D
Nonane	111842	128	2.37E+00	12.4	3.86E-03	9.09E-09	D
n-Propylbenzene (Propylbenzene)	103651	120	4.13E-01	2.0	6.31E-04	1.48E-09	D
Octane	111659	114	1.08E+00	5.0	1.57E-03	3.69E-09	D
p-Cymene (1-Methyl-4-lsopropylbenzene)	99876	134	3.58E+00	19.6	6.11E-03	1.44E-08	D
Pentane	109660	72	4.46E+00	13.2	4.09E-03	9.62E-09	C
Propane	74986	44	1.55E+01	27.9	8.69E-03	2.04E-08	C
Propene	115071	42	3.32E+00	5.7	1.78E-03	4.18E-09	D
Propyne	74997	40	3.80E-02	0.1	1.93E-05	4.55E-11	E
sec-Butylbenzene	135988	134	6.75E-02	0.4	1.15E-04	2.71E-10	D
Styrene (Vinylbenzene)	100425	104	4.11E-01	1.7	5.44E-04	1.28E-09	B
Tetrachloroethylene (Perchloroethylene)	127184	166	2.03E+00	13.8	4.28E-03	1.01E-08	A
Tetrahydrofuran (Diethylene oxide)	109999	72	9.69E-01	2.9	8.88E-04	2.09E-09	C
Thiophene	110021	84	3.49E-01	1.2	3.73E-04	8.78E-10	E
Toluene (Methyl benzene)	108883	92	2.95E+01	111.1	3.45E-02	8.13E-08	A
trans-1,2-Dichloroethene	156605	97	2.87E-02	0.1	3.54E-05	8.32E-11	C
trans-1,2-Dimethylcyclohexane	6876239	112	4.04E-01	1.9	5.76E-04	1.36E-09	D
trans-1,3-Dichloropropene	10061026	111	9.43E-03	0.0	1.33E-05	3.13E-11	D
trans-1,4-Dimethylcyclohexane	2207047	112	2.05E-01	0.9	2.92E-04	6.88E-10	D
trans-2-Butene	624646	56	1.04E-01	0.2	7.42E-05	1.75E-10	D
trans-2-Heptene	14686136	98	2.50E-03	0.0	3.12E-06	7.34E-12	E
trans-2-Hexene	4050457	84	2.06E-02	0.1	2.20E-05	5.19E-11	D
trans-2-Octene	13389429	112	2.41E-01	1.1	3.44E-04	8.09E-10	D
trans-2-Pentene	646048	70	3.47E-02	0.1	3.09E-05	7.28E-11	D
trans-3-Methyl-2-pentene	616126	84	1.55E-02	0.1	1.66E-05	3.90E-11	D
Tribromomethane (Bromoform)	75252	253	1.24E-02	0.1	3.98E-05	9.37E-11	D
Trichloroethylene (Trichloroethene)	79016	131	8.28E-01	4.4	1.38E-03	3.25E-09	A
Trichlorofluoromethane (Freon 11)	91315616	137	2.48E-01	1.4	4.33E-04	1.02E-09	B
Trichloromethane (Chloroform)	67663	119	7.08E-02	0.3	1.07E-04	2.53E-10	A
Undecane	1120214	156	1.67E+00	10.7	3.32E-03	7.81E-09	D
Vinyl acetate	85306269	86	2.48E-01	0.9	2.71E-04	6.39E-10	C
Vinyl chloride (Chloroethene)	75014	63	1.42E+00	3.6	1.13E-03	2.65E-09	A
Xylenes (o-, m-, p-, mixtures)	1330207	106	9.23E+00	40.1	1.25E-02	2.93E-08	A
Total Reduced Sulphur Compounds	n/a	-	-	67.7	2.11E-02	4.96E-08	-

Table E3. Flares 1 and 2 - LFG Emissions - Stages 1 to 5 - Alternative 1 Scenario A

Combustible constituents of LFG will be combusted in the enclosed Flares 1 and 2 with a control efficiency of 98%. Residual LFG will be emitted.

Mercury and siloxanes are not combustible, so a control efficiency of 0% is assumed for these compounds.

Enclosed Flares	Quantity of LFG Combusted*	Control Efficiency
	m^3/s	%
Flare 1	0.35	98%
Flare 2	0.62	98%

* See Table E1 for calculation of quantity combusted.

The concentrations of constituents in LFG are based on AP-42, Table 2.4-1, AP-42, 2.4 Municipal Solid Waste Landfills, Draft Section - October 2008

Sample Calculation (1,1,1-Trichloroethane)

Concentration in LFG = Molecular Weight (g/mole) x Concentration (ppmv) / 24.45
= 133.4 (g/mole) x 0.243 (ppmv) / 24.45
= 1.33E+00 mg/m³

Emission Rate (Flare 1) = Quantity LFG Combusted (m³/s) x Concentration in LFG (mg/m³) x (1 - Control Efficiency) / 1000 (mg/g)
= 0.35 (m³/s) x 1.33 (mg/m³) x (1-0.98) /1000 (mg/g)
= 9.17E-06 g/s

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(%)	Flare 1	Flare 2	
1,1,1-Trichloroethane	71556	133.4	0.243	1.33	98%	9.2E-06	1.7E-05	A
1,1,2,2-Tetrachloroethane	79345	167.85	0.535	3.67	98%	2.5E-05	4.6E-05	E
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	260.76	0.00349	0.04	98%	2.6E-07	4.6E-07	D
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187.37	0.0672	0.51	98%	3.6E-06	6.4E-06	C
1,1,2-Trichloroethane	79005	133.4	0.158	0.86	98%	6.0E-06	1.1E-05	D
1,1-Dichloroethane	75343	98.96	2.08	8.42	98%	5.8E-05	1.0E-04	A
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	96.94	0.16	0.63	98%	4.4E-06	7.9E-06	A
1,2,3-Trimethylbenzene	526738	120.19	0.359	1.76	98%	1.2E-05	2.2E-05	D
1,2,4-Trichlorobenzene	120821	181.45	0.00551	0.04	98%	2.8E-07	5.1E-07	C
1,2,4-Trimethylbenzene	95636	120.19	1.37	6.73	98%	4.7E-05	8.4E-05	B
1,2-Dibromoethane (Ethylene dibromide)	106934	187.86	0.0048	0.04	98%	2.6E-07	4.6E-07	B
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	170.92	0.106	0.74	98%	5.1E-06	9.2E-06	B
1,2-Dichloroethane (Ethylene dichloride)	107062	98.96	0.159	0.64	98%	4.5E-06	8.0E-06	A
1,2-Dichloroethene	540590	96.94	11.4	45.20	98%	3.1E-04	5.6E-04	E
1,2-Dichloropropane	78875	112.99	0.052	0.24	98%	1.7E-06	3.0E-06	D
1,2-Diethylbenzene	135013	134.22	0.0199	0.11	98%	7.6E-07	1.4E-06	D
1,3,5-Trimethylbenzene	108678	120.19	0.623	3.06	98%	2.1E-05	3.8E-05	C
1,3-Butadiene (Vinyl ethylene)	106990	54.09	0.166	0.37	98%	2.5E-06	4.6E-06	C
1,3-Diethylbenzene	141935	134.22	0.0655	0.36	98%	2.5E-06	4.5E-06	D
1,4-Diethylbenzene	105055	134.22	0.262	1.44	98%	9.9E-06	1.8E-05	D
1,4-Dioxane (1,4-Diethylene dioxide)	123911	88.11	0.00829	0.03	98%	2.1E-07	3.7E-07	D
1-Butene	106989	56.11	1.22	2.80	98%	1.9E-05	3.5E-05	D
2-Methylbutene	513359	70.13	1.22	3.50	98%	2.4E-05	4.4E-05	D
1-Butene	106989	56.11	1.1	2.52	98%	1.7E-05	3.1E-05	E
2-Methylpropene	115117	56.11	1.1	2.52	98%	1.7E-05	3.1E-05	E
1-Ethyl-4-methylbenzene (4-Ethyl toluene)	622968	120.19	0.989	4.86	98%	3.4E-05	6.1E-05	C
1-Heptene	592767	98.19	0.625	2.51	98%	1.7E-05	3.1E-05	E
1-Hexene	592416	84.16	0.0888	0.31	98%	2.1E-06	3.8E-06	D
2-Methyl-1-pentene	763291	84.16	0.0888	0.31	98%	2.1E-06	3.8E-06	D
1-Methylcyclohexene	591491	96.17	0.0227	0.09	98%	6.2E-07	1.1E-06	D
1-Methylcyclopentene	693890	82.14	0.0252	0.08	98%	5.9E-07	1.1E-06	D
1-Pentene	109671	70.13	0.22	0.63	98%	4.4E-06	7.9E-06	D
1-Propanethiol (n-Propyl mercaptan)	107039	76.16	0.125	0.39	98%	2.7E-06	4.8E-06	D
2,2,3-Trimethylbutane	464062	100.2	0.00919	0.04	98%	2.6E-07	4.7E-07	D
2,2,4-Trimethylpentane	540841	114.23	0.614	2.87	98%	2.0E-05	3.6E-05	A
2,2,5-Trimethylhexane	3522949	128.26	0.156	0.82	98%	5.7E-06	1.0E-05	D
2,2-Dimethylbutane	75832	86.18	0.156	0.55	98%	3.8E-06	6.8E-06	D
2,2-Dimethylpentane	590352	100.2	0.0608	0.25	98%	1.7E-06	3.1E-06	D
2,2-Dimethylpropane	463821	72.15	0.0274	0.08	98%	5.6E-07	1.0E-06	D
2,3,4-Trimethylpentane	565753	114.23	0.312	1.46	98%	1.0E-05	1.8E-05	D
2,3-Dimethylbutane	79298	86.18	0.167	0.59	98%	4.1E-06	7.3E-06	E
2,3-Dimethylpentane	565593	100.2	0.31	1.27	98%	8.8E-06	1.6E-05	D
2,4-Dimethylhexane	589435	114.23	0.222	1.04	98%	7.2E-06	1.3E-05	D
2,4-Dimethylpentane	108087	100.2	0.1	0.41	98%	2.8E-06	5.1E-06	D
2,5-Dimethylhexane	592132	114.23	0.166	0.78	98%	5.4E-06	9.7E-06	D
2,5-Dimethylthiophene	638028	112.19	0.0644	0.30	98%	2.0E-06	3.7E-06	D

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(%)	Flare 1	Flare 2	
2-Butanone (Methyl ethyl ketone)	78933	72.11	4.01	11.83	98%	8.2E-05	1.5E-04	D
2-Ethyl-1-butene	760214	84.16	0.0177	0.06	98%	4.2E-07	7.6E-07	E
2-Ethylthiophene	872559	112.19	0.0629	0.29	98%	2.0E-06	3.6E-06	C
2-Ethyltoluene	611143	120.19	0.323	1.59	98%	1.1E-05	2.0E-05	D
2-Hexanone (Methyl butyl ketone)	591786	100.16	0.613	2.51	98%	1.7E-05	3.1E-05	E
2-Methyl-1-butene	563462	70.13	0.179	0.51	98%	3.6E-06	6.4E-06	D
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90.19	0.17	0.63	98%	4.3E-06	7.8E-06	E
2-Methyl-2-butene	513359	70.13	0.303	0.87	98%	6.0E-06	1.1E-05	D
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90.19	0.325	1.20	98%	8.3E-06	1.5E-05	E
2-Methylbutane	78784	72.15	2.26	6.67	98%	4.6E-05	8.3E-05	D
2-Methylheptane	592278	114.23	0.716	3.35	98%	2.3E-05	4.2E-05	D
2-Methylhexane	591764	100.2	0.816	3.34	98%	2.3E-05	4.2E-05	D
2-Methylpentane	107835	86.18	0.688	2.43	98%	1.7E-05	3.0E-05	D
2-Propanol (Isopropyl alcohol)	67630	60.1	1.8	4.42	98%	3.1E-05	5.5E-05	D
3,6-Dimethyloctane	15869940	142.28	0.785	4.57	98%	3.2E-05	5.7E-05	D
3-Ethyltoluene	620144	120.19	0.78	3.83	98%	2.7E-05	4.8E-05	D
3-Methyl-1-pentene	760203	84.16	0.00699	0.02	98%	1.7E-07	3.0E-07	D
3-Methylheptane	589811	114.23	0.763	3.56	98%	2.5E-05	4.4E-05	D
3-Methylhexane	589344	100.2	1.13	4.63	98%	3.2E-05	5.8E-05	D
3-Methylpentane	96140	86.18	0.74	2.61	98%	1.8E-05	3.2E-05	D
3-Methylthiophene	616444	98.17	0.0925	0.37	98%	2.6E-06	4.6E-06	E
4-Methyl-1-pentene	691372	84.16	0.0233	0.08	98%	5.5E-07	1.0E-06	E
4-Methyl-2-pentanone (MIBK)	108101	100.16	0.883	3.62	98%	2.5E-05	4.5E-05	C
4-Methylheptane	589537	114.23	0.249	1.16	98%	8.0E-06	1.4E-05	D
Acetaldehyde	75070	44.05	0.0774	0.14	98%	9.6E-07	1.7E-06	D
Acetone	67641	58.08	6.7	15.92	98%	1.1E-04	2.0E-04	C
Acetonitrile	75058	41.05	0.556	0.93	98%	6.5E-06	1.2E-05	A
Benzene	71432	78.11	2.4	7.67	98%	5.3E-05	9.5E-05	A
Benzyl chloride	100447	126.58	0.0181	0.09	98%	6.5E-07	1.2E-06	A
Bromodichloromethane	75274	163.83	0.00878	0.06	98%	4.1E-07	7.3E-07	E
Bromomethane (Methyl bromide)	74839	94.94	0.021	0.08	98%	5.6E-07	1.0E-06	C
Butane	106978	58.12	6.22	14.79	98%	1.0E-04	1.8E-04	C
Carbon disulfide	75150	76.14	0.147	0.46	98%	3.2E-06	5.7E-06	A
Carbon monoxide	630080	28.01	24.4	27.95	98%	1.9E-04	3.5E-04	C
Carbon tetrachloride	56235	153.82	0.00798	0.05	98%	3.5E-07	6.3E-07	A
Carbon tetrafluoride (Freon 14)	75730	88	0.151	0.54	98%	3.8E-06	6.8E-06	E
Carbonyl sulfide (Carbon oxysulfide)	463581	60.08	0.122	0.30	98%	2.1E-06	3.7E-06	A
Chlorobenzene	108907	112.56	0.484	2.23	98%	1.5E-05	2.8E-05	A
Chlorodifluoromethane (Freon 22)	75456	86.47	0.796	2.82	98%	1.9E-05	3.5E-05	D
Chloroethane (Ethyl chloride)	75003	64.51	3.95	10.42	98%	7.2E-05	1.3E-04	B
Chloromethane (Methyl chloride)	74873	50.49	0.244	0.50	98%	3.5E-06	6.3E-06	B
cis-1,2-Dichloroethene	156592	96.94	1.24	4.92	98%	3.4E-05	6.1E-05	B
cis-1,2-Dimethylcyclohexane	2207014	112.21	0.081	0.37	98%	2.6E-06	4.6E-06	D
cis-1,3-Dichloropropene	10061015	110.97	0.00303	0.01	98%	9.5E-08	1.7E-07	D
cis-1,3-Dimethylcyclohexane	638040	112.21	0.501	2.30	98%	1.6E-05	2.9E-05	D
cis-1,4-Dimethylcyclohexane	624293	112.21	0.248	1.14	98%	7.9E-06	1.4E-05	D
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	112.21	0.248	1.14	98%	7.9E-06	1.4E-05	D
cis-2-Butene	590181	56.11	0.105	0.24	98%	1.7E-06	3.0E-06	D
cis-2-Heptene	6443921	98.19	0.0245	0.10	98%	6.8E-07	1.2E-06	E
cis-2-Hexene	7688213	84.16	0.0172	0.06	98%	4.1E-07	7.4E-07	D
cis-2-Octene	7642048	112.21	0.22	1.01	98%	7.0E-06	1.3E-05	D
cis-2-Pentene	627203	70.13	0.0479	0.14	98%	9.5E-07	1.7E-06	D
cis-3-Methyl-2-pentene	922623	84.16	0.0179	0.06	98%	4.3E-07	7.7E-07	D
Cyclohexane	110827	84.16	1.01	3.48	98%	2.4E-05	4.3E-05	B
Cyclohexene	110838	82.14	0.0184	0.06	98%	4.3E-07	7.7E-07	D
Cyclopentane	287923	70.13	0.0221	0.06	98%	4.4E-07	7.9E-07	D
Cyclopentene	142290	68.12	0.0121	0.03	98%	2.3E-07	4.2E-07	D
Decane	124185	142.28	3.8	22.11	98%	1.5E-04	2.8E-04	D
Dibromochloromethane	124481	208.28	0.0151	0.13	98%	8.9E-07	1.6E-06	D
Dibromomethane (Methylene dibromide)	74953	173.84	0.000835	0.01	98%	4.1E-08	7.4E-08	E
Dichlorobenzene	106467	147	0.94	5.65	98%	3.9E-05	7.0E-05	A
Dichlorodifluoromethane (Freon 12)	75718	120.91	1.18	5.84	98%	4.0E-05	7.3E-05	B
Dichloromethane (Methylene chloride)	75092	84.93	6.15	21.36	98%	1.5E-04	2.7E-04	A
Diethyl sulfide	352932	90.19	0.0862	0.32	98%	2.2E-06	4.0E-06	E
Dimethyl disulfide	624920	94.2	0.137	0.53	98%	3.7E-06	6.6E-06	A
Dimethyl sulfide	75183	62.14	5.66	14.38	98%	1.0E-04	1.8E-04	A
Dodecane (n-Dodecane)	112403	170.33	0.221	1.54	98%	1.1E-05	1.9E-05	D
Ethane	74840	30.07	9.05	11.13	98%	7.7E-05	1.4E-04	D
Ethanol	64175	46.07	0.23	0.43	98%	3.0E-06	5.4E-06	D
Ethyl acetate	141786	88.11	1.88	6.77	98%	4.7E-05	8.4E-05	C
Ethyl mercaptan (Ethanediol)	75081	62.14	0.198	0.50	98%	3.5E-06	6.3E-06	A
Ethyl methyl sulfide	624895	76.16	0.0367	0.11	98%	7.9E-07	1.4E-06	E

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(%)	Flare 1	Flare 2	
Ethylbenzene	100414	106.17	4.86	21.10	98%	1.5E-04	2.6E-04	B
Formaldehyde	50000	30.03	0.0117	0.01	98%	9.9E-08	1.8E-07	D
Heptane	142825	100.2	1.34	5.49	98%	3.8E-05	6.8E-05	B
Hexane	110543	86.18	3.1	10.93	98%	7.6E-05	1.4E-04	B
Hydrogen sulfide	7783064	34.08	32	44.60	98%	3.1E-04	5.6E-04	A
Indane (2,3-Dihydroindene)	496117	34.08	0.0666	0.09	98%	6.4E-07	1.2E-06	D
Isobutane (2-Methylpropane)	75285	58.12	8.16	19.40	98%	1.3E-04	2.4E-04	D
Isobutylbenzene	538932	134.22	0.0407	0.22	98%	1.5E-06	2.8E-06	D
Isoprene (2-Methyl-1,3-butadiene)	78795	68.12	0.0165	0.05	98%	3.2E-07	5.7E-07	D
Isopropyl mercaptan	75332	76.16	0.175	0.55	98%	3.8E-06	6.8E-06	A
Isopropylbenzene (Cumene)	98828	120.19	0.43	2.11	98%	1.5E-05	2.6E-05	D
Mercury (total)	7439976	200.59	1.22E-04	1.00E-03	0%	3.5E-07	6.2E-07	B
Methanethiol (Methyl mercaptan)	74931	48.11	1.37	2.70	98%	1.9E-05	3.4E-05	A
Methyl tert-butyl ether (MTBE)	1634044	88.15	0.118	0.43	98%	2.9E-06	5.3E-06	D
Methylcyclohexane	108872	98.19	1.29	5.18	98%	3.6E-05	6.5E-05	D
Methylcyclopentane	96377	84.16	0.65	2.24	98%	1.5E-05	2.8E-05	D
Naphthalene	91203	128.17	0.107	0.56	98%	3.9E-06	7.0E-06	D
n-Butylbenzene	104518	134.22	0.068	0.37	98%	2.6E-06	4.6E-06	D
Nonane	111842	128.26	2.37	12.43	98%	8.6E-05	1.5E-04	D
n-Propylbenzene (Propylbenzene)	103651	120.19	0.413	2.03	98%	1.4E-05	2.5E-05	D
Octane	111659	114.23	1.08	5.05	98%	3.5E-05	6.3E-05	D
p-Cymene (1-Methyl-4-Isopropylbenzene)	99876	134.22	3.58	19.65	98%	1.4E-04	2.4E-04	D
Pentane	109660	72.15	4.46	13.16	98%	9.1E-05	1.6E-04	C
Propane	74986	44.1	15.5	27.96	98%	1.9E-04	3.5E-04	C
Propene	115071	42.08	3.32	5.71	98%	4.0E-05	7.1E-05	D
Propyne	74997	40.06	0.038	0.06	98%	4.3E-07	7.8E-07	E
sec-Butylbenzene	135988	134.22	0.0675	0.37	98%	2.6E-06	4.6E-06	D
Styrene (Vinylbenzene)	100425	104.15	0.411	1.75	98%	1.2E-05	2.2E-05	B
Tetrachloroethylene (Perchloroethylene)	127184	165.83	2.03	13.77	98%	9.5E-05	1.7E-04	A
Tetrahydrofuran (Diethylene oxide)	109999	72.11	0.969	2.86	98%	2.0E-05	3.6E-05	C
Thiophene	110021	84.14	0.349	1.20	98%	8.3E-06	1.5E-05	E
Toluene (Methyl benzene)	108883	92.14	29.5	111.17	98%	7.7E-04	1.4E-03	A
trans-1,2-Dichloroethene	156605	96.94	0.0287	0.11	98%	7.9E-07	1.4E-06	C
trans-1,2-Dimethylcyclohexane	6876239	112.21	0.404	1.85	98%	1.3E-05	2.3E-05	D
trans-1,3-Dichloropropene	10061026	110.97	0.00943	0.04	98%	3.0E-07	5.3E-07	D
trans-1,4-Dimethylcyclohexane	2207047	112.21	0.205	0.94	98%	6.5E-06	1.2E-05	D
trans-2-Butene	624646	56.11	0.104	0.24	98%	1.7E-06	3.0E-06	D
trans-2-Heptene	14686136	98.19	0.0025	0.01	98%	6.9E-08	1.3E-07	E
trans-2-Hexene	4050457	84.16	0.0206	0.07	98%	4.9E-07	8.8E-07	D
trans-2-Octene	13389429	112.21	0.241	1.11	98%	7.7E-06	1.4E-05	D
trans-2-Pentene	646048	70.13	0.0347	0.10	98%	6.9E-07	1.2E-06	D
trans-3-Methyl-2-pentene	616126	84.16	0.0155	0.05	98%	3.7E-07	6.6E-07	D
Tribromomethane (Bromoform)	75252	252.73	0.0124	0.13	98%	8.9E-07	1.6E-06	D
Trichloroethylene (Trichloroethene)	79016	131.39	0.828	4.45	98%	3.1E-05	5.5E-05	A
Trichlorofluoromethane (Freon 11)	91315616	137.37	0.248	1.39	98%	9.6E-06	1.7E-05	B
Trichloromethane (Chloroform)	67663	119.38	0.0708	0.35	98%	2.4E-06	4.3E-06	A
Undecane	1120214	156.31	1.67	10.68	98%	7.4E-05	1.3E-04	D
Vinyl acetate	85306269	86.09	0.248	0.87	98%	6.0E-06	1.1E-05	C
Vinyl chloride (Chloroethene)	75014	62.5	1.42	3.63	98%	2.5E-05	4.5E-05	A
Xylenes (o-, m-, p-, mixtures)	1330207	106.17	9.23	40.08	98%	2.8E-04	5.0E-04	A
Total Reduced Sulphur Compounds	n/a	-	-	67.7	98%	4.7E-04	8.4E-04	-

Table E3. Flares 1 and 2 - LFG Emissions - Stage 6 - Alternative 1 Scenario A

Combustible constituents of LFG will be combusted in the enclosed Flares 1 and 2 with a control efficiency of 98%. Residual LFG will be emitted.

Mercury and siloxanes are not combustible, so a control efficiency of 0% is assumed for these compounds.

Enclosed Flares	Quantity of LFG Combusted*	Control Efficiency
	m^3/s	%
Flare 1	0.23	98%
Flare 2	0.42	98%

* See Table E1 for calculation of quantity combusted.

The concentrations of constituents in LFG are based on AP-42, Table 2.4-1, AP-42, 2.4 Municipal Solid Waste Landfills, Draft Section - October 2008

Sample Calculation (1,1,1-Trichloroethane)

Concentration in LFG = Molecular Weight (g/mole) x Concentration (ppmv) / 24.45
= 133.4 (g/mole) x 0.243 (ppmv) / 24.45
= 1.33E+00 mg/m³

Emission Rate (Flare 1) = Quantity LFG Combusted (m³/s) x Concentration in LFG (mg/m³) x (1 - Control Efficiency) / 1000 (mg/g)
= 0.24 (m³/s) x 1.33 (mg/m³) x (1-0.98) /1000 (mg/g)
= 6.12E-06 g/s

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(%)	Flare 1	Flare 2	
1,1,1-Trichloroethane	71556	133.4	0.243	1.33	98%	6.1E-06	1.1E-05	A
1,1,2,2-Tetrachloroethane	79345	167.85	0.535	3.67	98%	1.7E-05	3.0E-05	E
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	260.76	0.00349	0.04	98%	1.7E-07	3.1E-07	D
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187.37	0.0672	0.51	98%	2.4E-06	4.3E-06	C
1,1,2-Trichloroethane	79005	133.4	0.158	0.86	98%	4.0E-06	7.2E-06	D
1,1-Dichloroethane	75343	98.96	2.08	8.42	98%	3.9E-05	7.0E-05	A
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	96.94	0.16	0.63	98%	2.9E-06	5.3E-06	A
1,2,3-Trimethylbenzene	526738	120.19	0.359	1.76	98%	8.1E-06	1.5E-05	D
1,2,4-Trichlorobenzene	120821	181.45	0.00551	0.04	98%	1.9E-07	3.4E-07	C
1,2,4-Trimethylbenzene	95636	120.19	1.37	6.73	98%	3.1E-05	5.6E-05	B
1,2-Dibromoethane (Ethylene dibromide)	106934	187.86	0.0048	0.04	98%	1.7E-07	3.1E-07	B
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	170.92	0.106	0.74	98%	3.4E-06	6.2E-06	B
1,2-Dichloroethane (Ethylene dichloride)	107062	98.96	0.159	0.64	98%	3.0E-06	5.3E-06	A
1,2-Dichloroethene	540590	96.94	11.4	45.20	98%	2.1E-04	3.8E-04	E
1,2-Dichloropropane	78875	112.99	0.052	0.24	98%	1.1E-06	2.0E-06	D
1,2-Diethylbenzene	135013	134.22	0.0199	0.11	98%	5.0E-07	9.1E-07	D
1,3,5-Trimethylbenzene	108678	120.19	0.623	3.06	98%	1.4E-05	2.5E-05	C
1,3-Butadiene (Vinyl ethylene)	106990	54.09	0.166	0.37	98%	1.7E-06	3.0E-06	C
1,3-Diethylbenzene	141935	134.22	0.0655	0.36	98%	1.7E-06	3.0E-06	D
1,4-Diethylbenzene	105055	134.22	0.262	1.44	98%	6.6E-06	1.2E-05	D
1,4-Dioxane (1,4-Diethylene dioxide)	123911	88.11	0.00829	0.03	98%	1.4E-07	2.5E-07	D
1-Butene	106989	56.11	1.22	2.80	98%	1.3E-05	2.3E-05	D
2-Methylbutene	513359	70.13	1.22	3.50	98%	1.6E-05	2.9E-05	D
1-Butene	106989	56.11	1.1	2.52	98%	1.2E-05	2.1E-05	E
2-Methylpropene	115117	56.11	1.1	2.52	98%	1.2E-05	2.1E-05	E
1-Ethyl-4-methylbenzene (4-Ethyl toluene)	622968	120.19	0.989	4.86	98%	2.2E-05	4.0E-05	C
1-Heptene	592767	98.19	0.625	2.51	98%	1.2E-05	2.1E-05	E
1-Hexene	592416	84.16	0.0888	0.31	98%	1.4E-06	2.5E-06	D
2-Methyl-1-pentene	763291	84.16	0.0888	0.31	98%	1.4E-06	2.5E-06	D
1-Methylcyclohexene	591491	96.17	0.0227	0.09	98%	4.1E-07	7.4E-07	D
1-Methylcyclopentene	693890	82.14	0.0252	0.08	98%	3.9E-07	7.0E-07	D
1-Pentene	109671	70.13	0.22	0.63	98%	2.9E-06	5.2E-06	D
1-Propanethiol (n-Propyl mercaptan)	107039	76.16	0.125	0.39	98%	1.8E-06	3.2E-06	D
2,2,3-Trimethylbutane	464062	100.2	0.00919	0.04	98%	1.7E-07	3.1E-07	D
2,2,4-Trimethylpentane	540841	114.23	0.614	2.87	98%	1.3E-05	2.4E-05	A
2,2,5-Trimethylhexane	3522949	128.26	0.156	0.82	98%	3.8E-06	6.8E-06	D
2,2-Dimethylbutane	75832	86.18	0.156	0.55	98%	2.5E-06	4.6E-06	D
2,2-Dimethylpentane	590352	100.2	0.0608	0.25	98%	1.1E-06	2.1E-06	D
2,2-Dimethylpropane	463821	72.15	0.0274	0.08	98%	3.7E-07	6.7E-07	D
2,3,4-Trimethylpentane	565753	114.23	0.312	1.46	98%	6.7E-06	1.2E-05	D
2,3-Dimethylbutane	79298	86.18	0.167	0.59	98%	2.7E-06	4.9E-06	E
2,3-Dimethylpentane	565593	100.2	0.31	1.27	98%	5.9E-06	1.1E-05	D
2,4-Dimethylhexane	589435	114.23	0.222	1.04	98%	4.8E-06	8.6E-06	D
2,4-Dimethylpentane	108087	100.2	0.1	0.41	98%	1.9E-06	3.4E-06	D
2,5-Dimethylhexane	592132	114.23	0.166	0.78	98%	3.6E-06	6.4E-06	D
2,5-Dimethylthiophene	638028	112.19	0.0644	0.30	98%	1.4E-06	2.5E-06	D

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(%)	Flare 1	Flare 2	
2-Butanone (Methyl ethyl ketone)	78933	72.11	4.01	11.83	98%	5.5E-05	9.8E-05	D
2-Ethyl-1-butene	760214	84.16	0.0177	0.06	98%	2.8E-07	5.1E-07	E
2-Ethylthiophene	872559	112.19	0.0629	0.29	98%	1.3E-06	2.4E-06	C
2-Ethyltoluene	611143	120.19	0.323	1.59	98%	7.3E-06	1.3E-05	D
2-Hexanone (Methyl butyl ketone)	591786	100.16	0.613	2.51	98%	1.2E-05	2.1E-05	E
2-Methyl-1-butene	563462	70.13	0.179	0.51	98%	2.4E-06	4.3E-06	D
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90.19	0.17	0.63	98%	2.9E-06	5.2E-06	E
2-Methyl-2-butene	513359	70.13	0.303	0.87	98%	4.0E-06	7.2E-06	D
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90.19	0.325	1.20	98%	5.5E-06	1.0E-05	E
2-Methylbutane	78784	72.15	2.26	6.67	98%	3.1E-05	5.5E-05	D
2-Methylheptane	592278	114.23	0.716	3.35	98%	1.5E-05	2.8E-05	D
2-Methylhexane	591764	100.2	0.816	3.34	98%	1.5E-05	2.8E-05	D
2-Methylpentane	107835	86.18	0.688	2.43	98%	1.1E-05	2.0E-05	D
2-Propanol (Isopropyl alcohol)	67630	60.1	1.8	4.42	98%	2.0E-05	3.7E-05	D
3,6-Dimethyloctane	15869940	142.28	0.785	4.57	98%	2.1E-05	3.8E-05	D
3-Ethyltoluene	620144	120.19	0.78	3.83	98%	1.8E-05	3.2E-05	D
3-Methyl-1-pentene	760203	84.16	0.00699	0.02	98%	1.1E-07	2.0E-07	D
3-Methylheptane	589811	114.23	0.763	3.56	98%	1.6E-05	3.0E-05	D
3-Methylhexane	589344	100.2	1.13	4.63	98%	2.1E-05	3.8E-05	D
3-Methylpentane	96140	86.18	0.74	2.61	98%	1.2E-05	2.2E-05	D
3-Methylthiophene	616444	98.17	0.0925	0.37	98%	1.7E-06	3.1E-06	E
4-Methyl-1-pentene	691372	84.16	0.0233	0.08	98%	3.7E-07	6.7E-07	E
4-Methyl-2-pentanone (MIBK)	108101	100.16	0.883	3.62	98%	1.7E-05	3.0E-05	C
4-Methylheptane	589537	114.23	0.249	1.16	98%	5.4E-06	9.7E-06	D
Acetaldehyde	75070	44.05	0.0774	0.14	98%	6.4E-07	1.2E-06	D
Acetone	67641	58.08	6.7	15.92	98%	7.3E-05	1.3E-04	C
Acetonitrile	75058	41.05	0.556	0.93	98%	4.3E-06	7.8E-06	A
Benzene	71432	78.11	2.4	7.67	98%	3.5E-05	6.4E-05	A
Benzyl chloride	100447	126.58	0.0181	0.09	98%	4.3E-07	7.8E-07	A
Bromodichloromethane	75274	163.83	0.00878	0.06	98%	2.7E-07	4.9E-07	E
Bromomethane (Methyl bromide)	74839	94.94	0.021	0.08	98%	3.8E-07	6.8E-07	C
Butane	106978	58.12	6.22	14.79	98%	6.8E-05	1.2E-04	C
Carbon disulfide	75150	76.14	0.147	0.46	98%	2.1E-06	3.8E-06	A
Carbon monoxide	630080	28.01	24.4	27.95	98%	1.3E-04	2.3E-04	C
Carbon tetrachloride	56235	153.82	0.00798	0.05	98%	2.3E-07	4.2E-07	A
Carbon tetrafluoride (Freon 14)	75730	88	0.151	0.54	98%	2.5E-06	4.5E-06	E
Carbonyl sulfide (Carbon oxysulfide)	463581	60.08	0.122	0.30	98%	1.4E-06	2.5E-06	A
Chlorobenzene	108907	112.56	0.484	2.23	98%	1.0E-05	1.8E-05	A
Chlorodifluoromethane (Freon 22)	75456	86.47	0.796	2.82	98%	1.3E-05	2.3E-05	D
Chloroethane (Ethyl chloride)	75003	64.51	3.95	10.42	98%	4.8E-05	8.7E-05	B
Chloromethane (Methyl chloride)	74873	50.49	0.244	0.50	98%	2.3E-06	4.2E-06	B
cis-1,2-Dichloroethene	156592	96.94	1.24	4.92	98%	2.3E-05	4.1E-05	B
cis-1,2-Dimethylcyclohexane	2207014	112.21	0.081	0.37	98%	1.7E-06	3.1E-06	D
cis-1,3-Dichloropropene	10061015	110.97	0.00303	0.01	98%	6.3E-08	1.1E-07	D
cis-1,3-Dimethylcyclohexane	638040	112.21	0.501	2.30	98%	1.1E-05	1.9E-05	D
cis-1,4-Dimethylcyclohexane	624293	112.21	0.248	1.14	98%	5.2E-06	9.4E-06	D
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	112.21	0.248	1.14	98%	5.2E-06	9.4E-06	D
cis-2-Butene	590181	56.11	0.105	0.24	98%	1.1E-06	2.0E-06	D
cis-2-Heptene	6443921	98.19	0.0245	0.10	98%	4.5E-07	8.2E-07	E
cis-2-Hexene	7688213	84.16	0.0172	0.06	98%	2.7E-07	4.9E-07	D
cis-2-Octene	7642048	112.21	0.22	1.01	98%	4.7E-06	8.4E-06	D
cis-2-Pentene	627203	70.13	0.0479	0.14	98%	6.3E-07	1.1E-06	D
cis-3-Methyl-2-pentene	922623	84.16	0.0179	0.06	98%	2.8E-07	5.1E-07	D
Cyclohexane	110827	84.16	1.01	3.48	98%	1.6E-05	2.9E-05	B
Cyclohexene	110838	82.14	0.0184	0.06	98%	2.9E-07	5.1E-07	D
Cyclopentane	287923	70.13	0.0221	0.06	98%	2.9E-07	5.3E-07	D
Cyclopentene	142290	68.12	0.0121	0.03	98%	1.6E-07	2.8E-07	D
Decane	124185	142.28	3.8	22.11	98%	1.0E-04	1.8E-04	D
Dibromochloromethane	124481	208.28	0.0151	0.13	98%	5.9E-07	1.1E-06	D
Dibromomethane (Methylene dibromide)	74953	173.84	0.000835	0.01	98%	2.7E-08	4.9E-08	E
Dichlorobenzene	106467	147	0.94	5.65	98%	2.6E-05	4.7E-05	A
Dichlorodifluoromethane (Freon 12)	75718	120.91	1.18	5.84	98%	2.7E-05	4.8E-05	B
Dichloromethane (Methylene chloride)	75092	84.93	6.15	21.36	98%	9.9E-05	1.8E-04	A
Diethyl sulfide	352932	90.19	0.0862	0.32	98%	1.5E-06	2.6E-06	E
Dimethyl disulfide	624920	94.2	0.137	0.53	98%	2.4E-06	4.4E-06	A
Dimethyl sulfide	75183	62.14	5.66	14.38	98%	6.6E-05	1.2E-04	A
Dodecane (n-Dodecane)	112403	170.33	0.221	1.54	98%	7.1E-06	1.3E-05	D
Ethane	74840	30.07	9.05	11.13	98%	5.1E-05	9.2E-05	D
Ethanol	64175	46.07	0.23	0.43	98%	2.0E-06	3.6E-06	D
Ethyl acetate	141786	88.11	1.88	6.77	98%	3.1E-05	5.6E-05	C
Ethyl mercaptan (Ethanediol)	75081	62.14	0.198	0.50	98%	2.3E-06	4.2E-06	A
Ethyl methyl sulfide	624895	76.16	0.0367	0.11	98%	5.3E-07	9.5E-07	E

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(%)	Flare 1	Flare 2	
Ethylbenzene	100414	106.17	4.86	21.10	98%	9.7E-05	1.8E-04	B
Formaldehyde	50000	30.03	0.0117	0.01	98%	6.6E-08	1.2E-07	D
Heptane	142825	100.2	1.34	5.49	98%	2.5E-05	4.6E-05	B
Hexane	110543	86.18	3.1	10.93	98%	5.0E-05	9.1E-05	B
Hydrogen sulfide	7783064	34.08	32	44.60	98%	2.1E-04	3.7E-04	A
Indane (2,3-Dihydroindene)	496117	34.08	0.0666	0.09	98%	4.3E-07	7.7E-07	D
Isobutane (2-Methylpropane)	75285	58.12	8.16	19.40	98%	8.9E-05	1.6E-04	D
Isobutylbenzene	538932	134.22	0.0407	0.22	98%	1.0E-06	1.9E-06	D
Isoprene (2-Methyl-1,3-butadiene)	78795	68.12	0.0165	0.05	98%	2.1E-07	3.8E-07	D
Isopropyl mercaptan	75332	76.16	0.175	0.55	98%	2.5E-06	4.5E-06	A
Isopropylbenzene (Cumene)	98828	120.19	0.43	2.11	98%	9.7E-06	1.8E-05	D
Mercury (total)	7439976	200.59	1.22E-04	1.00E-03	0%	2.3E-07	4.2E-07	B
Methanethiol (Methyl mercaptan)	74931	48.11	1.37	2.70	98%	1.2E-05	2.2E-05	A
Methyl tert-butyl ether (MTBE)	1634044	88.15	0.118	0.43	98%	2.0E-06	3.5E-06	D
Methylcyclohexane	108872	98.19	1.29	5.18	98%	2.4E-05	4.3E-05	D
Methylcyclopentane	96377	84.16	0.65	2.24	98%	1.0E-05	1.9E-05	D
Naphthalene	91203	128.17	0.107	0.56	98%	2.6E-06	4.7E-06	D
n-Butylbenzene	104518	134.22	0.068	0.37	98%	1.7E-06	3.1E-06	D
Nonane	111842	128.26	2.37	12.43	98%	5.7E-05	1.0E-04	D
n-Propylbenzene (Propylbenzene)	103651	120.19	0.413	2.03	98%	9.4E-06	1.7E-05	D
Octane	111659	114.23	1.08	5.05	98%	2.3E-05	4.2E-05	D
p-Cymene (1-Methyl-4-Isopropylbenzene)	99876	134.22	3.58	19.65	98%	9.1E-05	1.6E-04	D
Pentane	109660	72.15	4.46	13.16	98%	6.1E-05	1.1E-04	C
Propane	74986	44.1	15.5	27.96	98%	1.3E-04	2.3E-04	C
Propene	115071	42.08	3.32	5.71	98%	2.6E-05	4.7E-05	D
Propyne	74997	40.06	0.038	0.06	98%	2.9E-07	5.2E-07	E
sec-Butylbenzene	135988	134.22	0.0675	0.37	98%	1.7E-06	3.1E-06	D
Styrene (Vinylbenzene)	100425	104.15	0.411	1.75	98%	8.1E-06	1.5E-05	B
Tetrachloroethylene (Perchloroethylene)	127184	165.83	2.03	13.77	98%	6.4E-05	1.1E-04	A
Tetrahydrofuran (Diethylene oxide)	109999	72.11	0.969	2.86	98%	1.3E-05	2.4E-05	C
Thiophene	110021	84.14	0.349	1.20	98%	5.5E-06	1.0E-05	E
Toluene (Methyl benzene)	108883	92.14	29.5	111.17	98%	5.1E-04	9.2E-04	A
trans-1,2-Dichloroethene	156605	96.94	0.0287	0.11	98%	5.2E-07	9.4E-07	C
trans-1,2-Dimethylcyclohexane	6876239	112.21	0.404	1.85	98%	8.6E-06	1.5E-05	D
trans-1,3-Dichloropropene	10061026	110.97	0.00943	0.04	98%	2.0E-07	3.6E-07	D
trans-1,4-Dimethylcyclohexane	2207047	112.21	0.205	0.94	98%	4.3E-06	7.8E-06	D
trans-2-Butene	624646	56.11	0.104	0.24	98%	1.1E-06	2.0E-06	D
trans-2-Heptene	14686136	98.19	0.0025	0.01	98%	4.6E-08	8.3E-08	E
trans-2-Hexene	4050457	84.16	0.0206	0.07	98%	3.3E-07	5.9E-07	D
trans-2-Octene	13389429	112.21	0.241	1.11	98%	5.1E-06	9.2E-06	D
trans-2-Pentene	646048	70.13	0.0347	0.10	98%	4.6E-07	8.3E-07	D
trans-3-Methyl-2-pentene	616126	84.16	0.0155	0.05	98%	2.5E-07	4.4E-07	D
Tribromomethane (Bromoform)	75252	252.73	0.0124	0.13	98%	5.9E-07	1.1E-06	D
Trichloroethylene (Trichloroethene)	79016	131.39	0.828	4.45	98%	2.1E-05	3.7E-05	A
Trichlorofluoromethane (Freon 11)	91315616	137.37	0.248	1.39	98%	6.4E-06	1.2E-05	B
Trichloromethane (Chloroform)	67663	119.38	0.0708	0.35	98%	1.6E-06	2.9E-06	A
Undecane	1120214	156.31	1.67	10.68	98%	4.9E-05	8.9E-05	D
Vinyl acetate	85306269	86.09	0.248	0.87	98%	4.0E-06	7.2E-06	C
Vinyl chloride (Chloroethene)	75014	62.5	1.42	3.63	98%	1.7E-05	3.0E-05	A
Xylenes (o-, m-, p-, mixtures)	1330207	106.17	9.23	40.08	98%	1.8E-04	3.3E-04	A
Total Reduced Sulphur Compounds	n/a	-	-	67.7	98%	3.1E-04	5.6E-04	-

Table E4. Flares and Engines - Products of Combustion - Stages 1 to 5 - Alternative 1 Scenario A

Emissions of products of combustion were estimated based on emission factors given in Table 2.4-4, US EPA AP-42, 2.4 Municipal Solid Waste Landfills, 11/98, and the assumption that LFG is 50% methane (CH4).

Emissions of combustion gases from the siloxane flare (Flare 3) were deemed negligible because it represents less than 5% of combustion capacity.

Emissions of sulphur dioxide and hydrogen chloride were based on mass balance and the assumption that all sulphur and chlorine in LFG are converted to these compounds.

LFG Combustion Rate

Combustion Sources	LFG Combusted[1] (m^3/s)	CH4 Fraction in LFG	CH4 Combusted (m^3/s)	Percent of Total	Significant? (Yes or No)[2]
Engines (Gen1 to Gen 4) - Total	0.38	50%	0.19	28%	Yes
Flare 1	0.35	50%	0.17	25%	Yes
Flare 2	0.62	50%	0.31	45%	Yes
Flare 3 (Siloxane Flare)	0.029	50%	0.015	2%	No
Total	1.38		0.69		

1 See Table E1 for calculation of quantity combusted.

2. Sources that are Insignificant Relative to Total Emissions per section 7.2.2 of ESDM guidance document.

Emission Factors - US EPA AP-42, Table 2.4-4

Contaminant	CAS No.	IC Engines		Flares		Emission Factor Rating
		$kg/10^6$ dscm of CH_4	g/m^3 of CH4	$kg/10^6$ dscm of CH_4	g/m^3 of CH4	
Nitrogen Dioxide	10102-44-0	4000	4	650	0.65	C
Particulate Matter	N/A	770	0.77	270	0.27	D
Carbon Monoxide	630-08-0	7500	7.5	12000	12.00	C

No data on PM size distribution is provided in AP-42, Table 2.4-4; however, based on other gas-fired combustion sources, it is expected that most of the particulate matter is less than 2.5 microns. As such, it was assumed that PM=PM10=PM2.5

Emission rates - US EPA AP-42, Table 2.4-4

Contaminant	CAS No.	Emission Rate (g/s)		
		Engines	Flare 1	Flare 2
Nitrogen Dioxide	10102-44-0	0.76	0.112	0.202
Particulate Matter	N/A	0.147	0.05	0.08
Particulate Matter (PM10)	N/A	0.147	0.05	0.08
Particulate Matter (PM2.5)	N/A	0.147	0.05	0.08
Carbon Monoxide	630-08-0	1.43	2.08	3.74

Sample Calculation: (Particulate Matter, Engines)

PM Emission Rate = CH4 Combusted in Engines (m^3/s) * Emission Factor for IC Engines (g/m^3 of CH4)

= 0.32 (m^3/s) x 0.232 (g/m^3 of CH4)

= 0.146973215 (g/s)

Sulphur Dioxide Emission Factor (assumes all sulphur in LFG converts to sulphur dioxide)

Molecular Weight (MW) of Sulphur (S) = 32.1 g/mole

MW of Sulphur Dioxide (SO_2) = 64.1 g/mole

Sulphur Concentration in LFG

Contaminant	**CAS No.**	**MW of Contaminant**	**Conc. Of Contaminant in LFG (mg/m^3)**	**No. of S per molecule**	**Conc. of S in LFG (mg/m^3)**
1-Propanethiol (n-Propyl mercaptan)	107-03-9	76.16	3.89E-01	1	0.16
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90.19	6.27E-01	1	0.22
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90.19	1.20E+00	1	0.43
Carbon disulfide	75150	76.14	4.57E-01	2	0.38
Carbonyl sulfide (Carbon oxysulfide)	463581	60.08	3.00E-01	1	0.16
Diethyl sulfide	352932	90.19	3.18E-01	1	0.11
Dimethyl disulfide	624920	94.2	5.27E-01	2	0.36
Dimethyl sulfide	75183	62.14	1.44E+01	1	7.40
Ethyl mercaptan (Ethanediol)	75081	62.14	5.03E-01	1	0.26
Ethyl methyl sulfide	624895	76.16	1.14E-01	1	0.05
Hydrogen sulfide	7783064	34.08	4.46E+01	1	41.85
Isopropyl mercaptan	75332	76.16	5.45E-01	1	0.23
Methanethiol (Methyl mercaptan)	74931	48.11	2.69E+00	1	1.79
				Total Sulphur Concentration in LFG	**53**

If all S is converted to SO_2, the quantity of SO_2 generated is:

SO_2 Emission Factor = S concentration (mg/m^3 of LFG combusted) x MW of SO_2 / MW (g/mole) of S (g/mole)

= 53.4 (mg/m^3 of LFG combusted) x 64.1 (g/mole) / 32.1 (g/mole)

= 106.7 mg/m^3 of LFG combusted

Hydrogen Chloride Emission Factor (assumes all sulphur in LFG converts to sulphur dioxide)

Molecular Weight (MW) of chlorine (Cl) = 35.5 g/mole

MW of hydrogen chloride (HCl) = 36.5 g/mole

Chlorine Concentration in LFG

Contaminant	CAS No.	MW of Contaminant	Conc. Of Contaminant in LFG (mg/m^3)	No of Cl	Cl content (mg/m^3)
1,1,1-Trichloroethane	71556	133.4	1.32E+00	3	1.06
1,1,2,2-Tetrachloroethane	79345	167.85	3.67E+00	4	3.10
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	260.76	3.72E-02	6	0.03
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187.37	5.15E-01	3	0.29
1,1,2-Trichloroethane	79005	133.4	8.61E-01	3	0.69
1,1-Dichloroethane	75343	98.96	8.41E+00	2	6.03
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	96.94	6.34E-01	2	0.46
1,2,4-Trichlorobenzene	120821	181.45	4.09E-02	3	0.02
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	170.92	7.40E-01	2	0.31
1,2-Dichloroethane (Ethylene dichloride)	107062	98.96	6.43E-01	2	0.46
1,2-Dichloroethene	540590	96.94	4.52E+01	2	33.04
1,2-Dichloropropane	78875	112.99	2.40E-01	2	0.15
Bromodichloromethane	75274	163.83	5.88E-02	1	0.01
Chlorobenzene	108907	112.56	2.23E+00	1	0.70
Chlorodifluoromethane (Freon 22)	75456	86.47	2.81E+00	1	1.15
Chloroethane (Ethyl chloride)	75003	64.51	1.04E+01	1	5.72
Chloromethane (Methyl chloride)	74873	50.49	5.04E-01	1	0.35
cis-1,2-Dichloroethene	156592	96.94	4.91E+00	2	3.59
cis-1,3-Dichloropropene	10061015	110.97	1.37E-02	2	0.01
Dibromochloromethane	124481	208.28	1.29E-01	2	0.04
Dichlorobenzene	106467	147	5.65E+00	2	2.72
Dichlorodifluoromethane (Freon 12)	75718	120.91	5.83E+00	2	3.42
Dichloromethane (Methylene chloride)	75092	84.93	2.13E+01	2	17.82
Tetrachloroethylene (Perchloroethylene)	127184	165.83	1.38E+01	4	11.77
trans-1,2-Dichloroethene	156605	96.94	1.14E-01	2	0.08
trans-1,3-Dichloropropene	10061026	110.97	4.28E-02	2	0.03
Trichloroethylene (Trichloroethene)	79016	131.39	4.45E+00	3	3.60
Trichlorofluoromethane (Freon 11)	91315616	137.37	1.39E+00	3	1.08
Trichloromethane (Chloroform)	67-66-3	119.38	3.45E-01	3	0.31
Vinyl chloride (Chloroethene)	75014	62.5	3.63E+00	1	2.06
				Total chlorine concentration in LFG	**100**

If all Cl is converted to HCl, the quantity of HCL generated is:

HCL Emission Factor = Cl concentration (mg/m^3 of LFG combusted) x MW of HCl / MW (g/mole) of Cl (g/mole)

= 100.1 (mg/m^3 of LFG combusted) x 36.2 (g/mole) / 35.5 (g/mole)

= 103.0 mg/m^3 of LFG combusted

Emission Rates - SO2, HCl

Contaminant	CAS No.	Emission Factor (mg/m^3 of LFG)	Emission Rate (g/s)		
			Engines	Flare 1	Flare 2
Sulfur Dioxide	7446-09-05	106.7	4.07E-02	3.69E-02	6.64E-02
Hydrogen Chloride	7647-01-0	103.0	3.93E-02	3.56E-02	6.41E-02

Sample Calculation: (Sulphur dioxide, Engines)

SO2 Emission Rate = LFG combusted in Engines (m^3/s) * SO2 Emission Factor (mg/m^3 of LFG) / 1000 (mg/g)

= 0.64 (m^3/s) x 106.7 (mg/m^3 of LFG) / 1000 (mg/g)

= 0.0407 (g/s)

Table E4. Flares and Engines - Products of Combustion - Stage 6 - Alternative 1 Scenario A

Emissions of products of combustion were estimated based on emission factors given in Table 2.4-4, US EPA AP-42, 2.4 Municipal Solid Waste Landfills, 11/98, and the assumption that LFG is 50% methane (CH4).

Emissions of combustion gases from the siloxane flare (Flare 3) were deemed negligible because it represents less than 5% of combustion capacity.

Emissions of sulphur dioxide and hydrogen chloride were based on mass balance and the assumption that all sulphur and chlorine in LFG are converted to these compounds.

LFG Combustion Rate

Combustion Sources	LFG Combusted[1] (m³/s)	CH4 Fraction in LFG	CH4 Combusted (m³/s)	Percent of Total	Significant? (Yes or No)[2]
Engines (Gen1 to Gen 4) - Total	0.26	50%	0.13	28%	Yes
Flare 1	0.23	50%	0.12	25%	Yes
Flare 2	0.42	50%	0.21	44%	Yes
Flare 3 (Siloxane Flare)	0.029	50%	0.015	3%	No
Total	0.93		0.47		

1 See Table E1 for calculation of quantity combusted.

2. Sources that are Insignificant Relative to Total Emissions per section 7.2.2 of ESDM guidance document.

Emission Factors - US EPA AP-42, Table 2.4-4

Contaminant	CAS No.	IC Engines		Flares		Emission Factor Rating
		$kg/10^6$ dscm of CH_4	g/m³ of CH4	$kg/10^6$ dscm of CH_4	g/m³ of CH4	
Nitrogen Dioxide	10102-44-0	4000	4	650	0.65	C
Particulate Matter	N/A	770	0.77	270	0.27	D
Carbon Monoxide	630-08-0	7500	7.5	12000	12.00	C

No data on PM size distribution is provided in AP-42, Table 2.4-4; however, based on other gas-fired combustion sources, it is expected that most of the particulate matter is less than 2.5 microns. As such, it was assumed that PM=PM10=PM2.5

Emission rates - US EPA AP-42, Table 2.4-4

Contaminant	CAS No.	Emission Rate (g/s)		
		Engines	Flare 1	Flare 2
Nitrogen Dioxide	10102-44-0	0.52	0.075	0.135
Particulate Matter	N/A	0.099	0.03	0.06
Particulate Matter (PM10)	N/A	0.099	0.03	0.06
Particulate Matter (PM2.5)	N/A	0.099	0.03	0.06
Carbon Monoxide	630-08-0	0.97	1.38	2.49

Sample Calculation: (Particulate Matter, Engines)

PM Emission Rate = CH4 Combusted in Engines (m³/s) * Emission Factor for IC Engines (g/m³ of CH4)

= 0.32 (m³/s) x 0.232 (g/m³ of CH4)

= 0.099426785 (g/s)

Sulphur Dioxide Emission Factor (assumes all sulphur in LFG converts to sulphur dioxide)

Molecular Weight (MW) of Sulphur (S) = 32.1 g/mole

MW of Sulphur Dioxide (SO2) = 64.1 g/mole

Sulphur Concentration in LFG

Contaminant	**CAS No.**	**MW of Contaminant**	**Conc. Of Contaminant in LFG (mg/m^3)**	**No. of S per molecule**	**Conc. of S in LFG (mg/m^3)**
1-Propanethiol (n-Propyl mercaptan)	107-03-9	76.16	3.89E-01	1	0.16
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90.19	6.27E-01	1	0.22
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90.19	1.20E+00	1	0.43
Carbon disulfide	75150	76.14	4.57E-01	2	0.38
Carbonyl sulfide (Carbon oxysulfide)	463581	60.08	3.00E-01	1	0.16
Diethyl sulfide	352932	90.19	3.18E-01	1	0.11
Dimethyl disulfide	624920	94.2	5.27E-01	2	0.36
Dimethyl sulfide	75183	62.14	1.44E+01	1	7.40
Ethyl mercaptan (Ethanediol)	75081	62.14	5.03E-01	1	0.26
Ethyl methyl sulfide	624895	76.16	1.14E-01	1	0.05
Hydrogen sulfide	7783064	34.08	4.46E+01	1	41.85
Isopropyl mercaptan	75332	76.16	5.45E-01	1	0.23
Methanethiol (Methyl mercaptan)	74931	48.11	2.69E+00	1	1.79
				Total Sulphur Concentration in LFG	**53**

If all S is converted to SO2, the quantity of SO2 generated is:

SO2 Emission Factor = S concentration (mg/m³ of LFG combusted) x MW of SO2 / MW (g/mole) of S (g/mole)

= 53.4 (mg/m³ of LFG combusted) x 64.1 (g/mole) / 32.1 (g/mole)

= 106.7 mg/m³ of LFG combusted

Hydrogen Chloride Emission Factor (assumes all sulphur in LFG converts to sulphur dioxide)

Molecular Weight (MW) of chlorine (Cl) = 35.5 g/mole

MW of hydrogen chloride (HCl) = 36.5 g/mole

Chlorine Concentration in LFG

Contaminant	CAS No.	MW of Contaminant	Conc. Of Contaminant in LFG (mg/m^3)	No of Cl	Cl content (mg/m^3)
1,1,1-Trichloroethane	71556	133.4	1.32E+00	3	1.06
1,1,2,2-Tetrachloroethane	79345	167.85	3.67E+00	4	3.10
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	260.76	3.72E-02	6	0.03
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187.37	5.15E-01	3	0.29
1,1,2-Trichloroethane	79005	133.4	8.61E-01	3	0.69
1,1-Dichloroethane	75343	98.96	8.41E+00	2	6.03
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	96.94	6.34E-01	2	0.46
1,2,4-Trichlorobenzene	120821	181.45	4.09E-02	3	0.02
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	170.92	7.40E-01	2	0.31
1,2-Dichloroethane (Ethylene dichloride)	107062	98.96	6.43E-01	2	0.46
1,2-Dichloroethene	540590	96.94	4.52E+01	2	33.04
1,2-Dichloropropane	78875	112.99	2.40E-01	2	0.15
Bromodichloromethane	75274	163.83	5.88E-02	1	0.01
Chlorobenzene	108907	112.56	2.23E+00	1	0.70
Chlorodifluoromethane (Freon 22)	75456	86.47	2.81E+00	1	1.15
Chloroethane (Ethyl chloride)	75003	64.51	1.04E+01	1	5.72
Chloromethane (Methyl chloride)	74873	50.49	5.04E-01	1	0.35
cis-1,2-Dichloroethene	156592	96.94	4.91E+00	2	3.59
cis-1,3-Dichloropropene	10061015	110.97	1.37E-02	2	0.01
Dibromochloromethane	124481	208.28	1.29E-01	2	0.04
Dichlorobenzene	106467	147	5.65E+00	2	2.72
Dichlorodifluoromethane (Freon 12)	75718	120.91	5.83E+00	2	3.42
Dichloromethane (Methylene chloride)	75092	84.93	2.13E+01	2	17.82
Tetrachloroethylene (Perchloroethylene)	127184	165.83	1.38E+01	4	11.77
trans-1,2-Dichloroethene	156605	96.94	1.14E-01	2	0.08
trans-1,3-Dichloropropene	10061026	110.97	4.28E-02	2	0.03
Trichloroethylene (Trichloroethene)	79016	131.39	4.45E+00	3	3.60
Trichlorofluoromethane (Freon 11)	91315616	137.37	1.39E+00	3	1.08
Trichloromethane (Chloroform)	67-66-3	119.38	3.45E-01	3	0.31
Vinyl chloride (Chloroethene)	75014	62.5	3.63E+00	1	2.06
				Total chlorine concentration in LFG	**100**

If all Cl is converted to HCl, the quantity of HCL generated is:

HCL Emission Factor = Cl concentration (mg/m^3 of LFG combusted) x MW of HCl / MW (g/mole) of Cl (g/mole)

= 100.1 (mg/m^3 of LFG combusted) x 36.2 (g/mole) / 35.5 (g/mole)

= 103.0 mg/m^3 of LFG combusted

Emission Rates - SO2, HCl

Contaminant	CAS No.	Emission Factor (mg/m^3 of LFG)	Emission Rate (g/s)		
			Engines	Flare 1	Flare 2
Sulfur Dioxide	7446-09-05	106.7	2.76E-02	2.46E-02	4.43E-02
Hydrogen Chloride	7647-01-0	103.0	2.66E-02	2.37E-02	4.27E-02

Sample Calculation: (Sulphur dioxide, Engines)

SO2 Emission Rate = LFG combusted in Engines (m^3/s) * SO2 Emission Factor (mg/m^3 of LFG) / 1000 (mg/g)

= 0.64 (m^3/s) x 106.7 (mg/m^3 of LFG) / 1000 (mg/g)

= 0.0276 (g/s)

Table E5.   Siloxanes for Stages 1 to 5 - Alternative 1 Scenario A

Siloxanes are trace constituents in LFG that are essentially non-combustable, and are not controlled through combustion in flares. Siloxanes have the potential to damage engines, and are removed from the LFG fuel stream to the the engines and purged to the siloxane flare (Flare 3). Thus, all silozanes in LGF are emitted uncontrolled, through Flares 1 to 3, or as fugitive emissions from the landfill surface.

Siloxane Emission Sources	**LFG Release or Use Rate (m^3/s)**
Stg1 to Stg5 (fugitive)	0.46
Flare 1	0.25
Flare 2	0.46
Flare 3 (Siloxane Flare) - includes engines	0.41
Total	1.6

* See Table E1 for calculation of quantity combusted.

Contaminant	**CAS No.**	**Conc. in LFG mg/m^3**	**Emission Rate (g/s)**			
			Stg 1 to 5 (fugitive)	**Flare 1**	**Flare 2**	**Flare 3**
Tetramethylsilane	75-76-3	0.001	4.6E-07	2.5E-07	4.6E-07	4.1E-07
Hexamethyldisiloxane	107-46-0	2.114	9.7E-04	5.4E-04	9.7E-04	8.7E-04
Octamethyltrisiloxane	107-51-7	0.22	1.0E-04	5.6E-05	1.0E-04	9.0E-05
Decamethyltetrasiloxane	141-62-8	0.027	1.2E-05	6.9E-06	1.2E-05	1.1E-05
Dodecamethylpentasiloxane	141-63-9	0.029	1.3E-05	7.4E-06	1.3E-05	1.2E-05
Trimethylsilyl Fluoride	420-56-4	0.546	2.5E-04	1.4E-04	2.5E-04	2.2E-04
Dodecamethylcyclohexasiloxane	540-97-6	0.029	1.3E-05	7.4E-06	1.3E-05	1.2E-05
Decamethylcyclopentasiloxane	541-02-6	4.264	2.0E-03	1.1E-03	2.0E-03	1.8E-03
Hexamethyltricyclosiloxane	541-05-9	0.528	2.4E-04	1.3E-04	2.4E-04	2.2E-04
Octamethylcyclotetrasiloxane	556-67-2	8.739	4.0E-03	2.2E-03	4.0E-03	3.6E-03
Trimethylsilanol	1066-40-6	10.521	4.8E-03	2.7E-03	4.8E-03	4.3E-03
Methoxytrimethylsilane	1825-61-2	0.351	1.6E-04	8.9E-05	1.6E-04	1.4E-04
Ethoxytrimethylsilane	1825-62-3	0.203	9.3E-05	5.2E-05	9.3E-05	8.3E-05
Propoxytrimethylsilane	1825-63-4	0.158	7.3E-05	4.0E-05	7.2E-05	6.5E-05
Isopropoxytrimethylsilane	1825-64-5	0.181	8.3E-05	4.6E-05	8.3E-05	7.4E-05
Butoxytrimethylsilane	1825-65-6	0.09	4.1E-05	2.3E-05	4.1E-05	3.7E-05
1-methylbutoxytrimethylsilane	1825-67-8	0.192	8.8E-05	4.9E-05	8.8E-05	7.9E-05

Sample Calculation: (Tetramethylsilane, Flare 1)

PM Emission Rate = LFG Use in Flare 1 (m^3/s) * Concentration in LFG (mg/m^3 of LFG) / 1000 (mg/g)

= 0.26 (m^3/s) x 0.001 (mg/m^3 of LFG) / 1000 (mg/g)

= 2.55E-07 (g/s)

Note:

1. Siloxane concentrations were measured by OBS Labs, 2011.

Table E5.   Siloxanes for Stage 6 - Alternative 1 Scenario A

Siloxanes are trace constituents in LFG that are essentially non-combustable, and are not controlled through combustion in flares. Siloxanes have the potential to damage engines, and are removed from the LFG fuel stream to the the engines and purged to the siloxane flare (Flare 3). Thus, all silozanes in LGF are emitted uncontrolled, through Flares 1 to 3, or as fugitive emissions from the landfill surface.

Siloxane Emission Sources	**LFG Release or Use Rate (m^3/s)**
Stg6 (fugitive)	0.31
Flare 1	0.10
Flare 2	0.17
Flare 3 (Siloxane Flare) - includes engines	0.29
Total	0.9

* See Table E1 for calculation of quantity combusted.

Contaminant	**CAS No.**	**Conc. in LFG mg/m³**	**Emission Rate (g/s)**			
			Stg 6 to 9 (fugitive)	**Flare 1**	**Flare 2**	**Flare 3**
Tetramethylsilane	75-76-3	0.001	3.1E-07	9.5E-08	1.7E-07	2.9E-07
Hexamethyldisiloxane	107-46-0	2.114	6.6E-04	2.0E-04	3.6E-04	6.1E-04
Octamethyltrisiloxane	107-51-7	0.22	6.8E-05	2.1E-05	3.8E-05	6.3E-05
Decamethyltetrasiloxane	141-62-8	0.027	8.4E-06	2.6E-06	4.6E-06	7.8E-06
Dodecamethylpentasiloxane	141-63-9	0.029	9.0E-06	2.8E-06	5.0E-06	8.3E-06
Trimethylsilyl Fluoride	420-56-4	0.546	1.7E-04	5.2E-05	9.4E-05	1.6E-04
Dodecamethylcyclohexasiloxane	540-97-6	0.029	9.0E-06	2.8E-06	5.0E-06	8.3E-06
Decamethylcyclopentasiloxane	541-02-6	4.264	1.3E-03	4.1E-04	7.3E-04	1.2E-03
Hexamethyltricyclosiloxane	541-05-9	0.528	1.6E-04	5.0E-05	9.1E-05	1.5E-04
Octamethylcyclotetrasiloxane	556-67-2	8.739	2.7E-03	8.3E-04	1.5E-03	2.5E-03
Trimethylsilanol	1066-40-6	10.521	3.3E-03	1.0E-03	1.8E-03	3.0E-03
Methoxytrimethylsilane	1825-61-2	0.351	1.1E-04	3.4E-05	6.0E-05	1.0E-04
Ethoxytrimethylsilane	1825-62-3	0.203	6.3E-05	1.9E-05	3.5E-05	5.8E-05
Propoxytrimethylsilane	1825-63-4	0.158	4.9E-05	1.5E-05	2.7E-05	4.5E-05
Isopropoxytrimethylsilane	1825-64-5	0.181	5.6E-05	1.7E-05	3.1E-05	5.2E-05
Butoxytrimethylsilane	1825-65-6	0.09	2.8E-05	8.6E-06	1.5E-05	2.6E-05
1-methylbutoxytrimethylsilane	1825-67-8	0.192	6.0E-05	1.8E-05	3.3E-05	5.5E-05

Sample Calculation: (Tetramethylsilane, Flare 1)

PM Emission Rate = LFG Use in Flare 1 (m^3/s) * Concentration in LFG (mg/m^3 of LFG) / 1000 (mg/g)

= 0.1 (m^3/s) x 0.001 (mg/m^3 of LFG) / 1000 (mg/g)

= 9.55E-08 (g/s)

Note:

1. Siloxane concentrations were measured by OBS Labs, 2011.

Table E6. Tailpipe Emissions from Non-Road Mobile Equipment

Tailpipe emissions from non-road mobile equipment were based on US EPA Tier 1 to 4 Nonroad Diesel Engine Standards and load factors from the US EPA NONROAD model. Speciation of VOC and NMHC was estimated based on Speciation Profiles and Toxic Emission Factors for Nonroad Diesel Engines (MOVES2014b document). All PM (TSP) was assumed to be entirely PM10. PM2.5 was assumed to be same fraction of PM10 as calculated from On-Road mobile emissions (Table E8).

Emission Rate (g/s) = Power × LF × EF x 1hr/3600 s
where: Power = Rated Power (hp)
LF = Load Factor (dimensionless) from NONROAD model.
EF = Emission Factor (g/hp-hr) from nonroad diesel emission standards

Source ID : LFG_NROAD (Equipment mainly associated with landfilling activities)

Equipment[1]	Tier [2]	Fuel Rate (gal/day)	Engine HP	Cycle Load Factors[2]	Emission Factors (g/hp-hr)[3]			Emission Rates (g/s)- 1hr avg				
					CO	NOx	PM	CO	NOx	PM	PM10	PM2.5
JD Excavator	4	33	140	0.53	3.7	0.3	0.015	0.08	0.01	0.0003	0.0003	0.0001
JD 844K Loader	4	55	380	0.48	2.6	0.3	0.015	0.13	0.02	0.0008	0.0008	0.0004
JD 644K Loader	4	44	232	0.48	2.6	0.3	0.015	0.08	0.01	0.0005	0.0005	0.0002
JD 250D rock truck	4	44	265	0.59	2.6	0.3	0.015	0.11	0.01	0.0007	0.0007	0.0003
JD 1050K Bulldozer	4	88	350	0.59	2.6	0.3	0.015	0.15	0.02	0.0009	0.0009	0.0004
Aljon 600 compactor	4	220	600	0.59	2.6	0.3	0.015	0.26	0.03	0.0015	0.0015	0.0007
Aljon 960 compactor	4	154	500	0.59	2.6	0.3	0.015	0.21	0.02	0.0012	0.0012	0.0006
Volvo A25D rock truck	4	44	310	0.59	2.6	0.3	0.015	0.13	0.02	0.0008	0.0008	0.0004
Caterpillar D6N Bulldozer	4	33	150	0.59	2.6	0.3	0.015	0.06	0.01	0.0004	0.0004	0.0002
Cat 725 rock truck	4	44	325	0.59	2.6	0.3	0.015	0.14	0.02	0.0008	0.0008	0.0004
							Total	**1.35**	**0.15**	**0.008**	**0.008**	**0.004**

Source ID : COMPOST_NROAD (Equipment mainly associated with raw material and compost handling)

Equipment[1]	Tier [2]	Fuel Rate (gal/day)	Engine HP	Cycle Load Factors[2]	Emission Factors (g/hp-hr)[3]			Emission Rates (g/s)- 1hr avg				
					CO	NOx	PM	CO	NOx	PM	PM10	PM2.5
Vermeer 6000 grinder	4	141	600	0.59	2.6	0.3	0.015	0.26	0.030	0.0015	0.0015	0.0007
Komptech top turn	4	94	400	0.59	2.6	0.3	0.015	0.17	0.020	0.0010	0.0010	0.0005
John Deer 544k loader	4	42	180	0.48	2.6	0.3	0.015	0.06	0.007	0.0004	0.0004	0.0002
John Deer 544k loader	4	42	180	0.48	2.6	0.3	0.015	0.06	0.007	0.0004	0.0004	0.0002
John Deer 444k loader	4	33	140	0.48	2.6	0.3	0.015	0.05	0.006	0.0003	0.0003	0.0001
Cat 938 loader	4	47	200	0.48	2.6	0.3	0.015	0.07	0.008	0.0004	0.0004	0.0002
Freightliner dump truck	4	94	400	0.59	2.6	0.3	0.015	0.17	0.020	0.0010	0.0010	0.0005
Mack dump truck	4	106	450	0.59	2.6	0.3	0.015	0.19	0.022	0.0011	0.0011	0.0005
International dump truck	4	118	500	0.59	2.6	0.3	0.015	0.21	0.025	0.0012	0.0012	0.0006
International dump truck	4	112	475	0.59	2.6	0.3	0.015	0.20	0.023	0.0012	0.0012	0.0006
Western Star tractor	4	94	400	0.59	2.6	0.3	0.015	0.17	0.020	0.0010	0.0010	0.0005
Western Star dump truck	4	94	400	0.59	2.6	0.3	0.015	0.17	0.020	0.0010	0.0010	0.0005
							Total	**1.79**	**0.21**	**0.010**	**0.010**	**0.005**

Note:

1 The information regarding type of equipment, model year, engine size, operating hour, and fuel rate was provided by GFL, by email dated January 5,

2 The cycle load factors were obtained from the EPA document, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling (NR-005d)

3 Tier standard number and emission factors for NMHC, nitrogen oxide, and particulate matter were obtained from United States: Nonroad Diesel Engines, available at: https://dieselnet.com/standards/us/nonroad.php

4 Emission factor for Non-Methane Hydrocarbons (NMHC), nitrogen oxide, and particulate matter were obtained from Tier 4 emission standards—Engines up to 560 kW, available at: https://dieselnet.com/standards/us/nonroad.php

Table E7. Emissions from On-site Truck Traffic - Road Dust - Alternative 1 Scenario A

Emissions of road dust from on-site truck traffic were estimated based emisison factors obtained from US EPA AP-42, Section 13.2.1 Paved Roads and Section 13.2.2 Unpaved Roads. The detailed calculations are shown below.

Trucking occurs over a 12 hour operating period each day. Dust is controlled through watering and sweeping of paved roads, watering and other dust suppression on unpaved roads, and use of coarse gravel on haul roads.

Emission factors based on US EPA AP-42, Section 13.2.1 Paved Roads and Section 13.2.2 Unpaved Roads

Number of Trucks	200	trucks/day	
Mean Vehicle Weight	25.0	tonnes/truck	data received from GFL in 2020

GFL has indicated that the site entrance and main onsite road network is paved.

Road Segment Traffic:

Source ID	Length (m)	No. Trucks	Condition
Unpaved_Road	0	200	Unpaved
Paved_Road	2231.2	200	Paved

Emission Factors:

For vehicles traveling on unpaved surfaces at industrial sites, emissions are estimated from the following equation

$E = k\ (s/12)^a \times (W/3)^b$ Industrial Roads (Equation 1a)

size-specific emission factor (E)		lb/VMT (multiply by 281.9 to convert to g/VKT)
surface material silt content (s)	4.8	% Table 13.2.2-1, Avg. silt content for Sand and Gravel Processing
mean vehicle weight (W)	27.5	short ton
surface material moisture content (M)	6.5	% Table 13.2.2-3, midpoint of range of source conditions
constants (k, a, b)	see below	

For vehicles traveling on paved surfaces, emissions are estimated from the following equation

$E = k \times (sL)^{0.91} \times (W)^{1.02}$

Road surface silt loading (sL)	8.2 g/m^2	Table 13.2.1-3, AP-42
Particle size multiplier (k)	see below	

Unpaved - Industrial Roads - AP-42, 13.2.2			
Constant	PM	PM_{10}	$PM_{2.5}$
k (lb/VMT)	4.9	1.5	0.15
a	0.7	0.9	0.9
b	0.45	0.45	0.45

Paved Roads (Equation 1a) - AP-42, 13.2.1			
	PM	PM_{10}	$PM_{2.5}$
k (lb/VMT)	0.011	0.0022	0.00054

Emission Factors (E) converted to g/VKT

Emission Source	Road Type	EF Ref.	PM	PM_{10}	$PM_{2.5}$	Units	Controls	Control Efficiency (%)
Unpaved_Road	Unpaved Road	AP-42, 13.2.2	1971	502	50	g/VKT	controlled	75
Paved_Road	Paved Road	AP-42, 13.2.1	618	124	30	g/VKT	controlled	75

* VKT = Vehicle Kilometers Traveled

Emission Rates

Source ID	Road Length (km)	Trucks per Hour	Emission Rates (g/s, 1-hour average)		
			PM	PM_{10}	$PM_{2.5}$
Unpaved_Road	0.0	17	0.0	0.00	0.000
Paved_Road	2.2	17	1.60	0.319	0.078
Total			1.6	0.32	0.078

Table E8. Emissions from On-site Truck Traffic - Tail Pipe - Alternative 1 Scenario A

Tailpipe emissions from highway truck traffic on on-site roads were estimated based on emission factors from the US EPA MOVES2014b model. Speciation profiles of on road diesel exhaust from MOVES Onroad Technical Reports document were used to estimate the emission rates of individual pollutants. Daily traffic and activities occur over the 11 hour period 6:30am to 6:30pm. The detailed calculations are shown below.

Highway Truck Traffic

Number of Trucks	200	trucks/day	this will occur over 11 hours
Total travel distance on-site (km)	6	km	

Road Segment Traffic:

Source ID	Length (m)	Trucks / day	Paved or Unpaved?
Unpaved_Road	0	200	Unpaved
Paved_Road	2231.2	200	Paved

Emission Factors:

The Emission Factors for VOC, PM and NOx were obtained from MOVES2014b model, inventory run for nation region, aggregated all road types and 2021 calendar year. All PM (TSP) was assumed to be PM10.

Emission Factors (E) converted to g/VKT

Emission Source	EF Ref.	PM	PM_{10}	$PM_{2.5}$	NOx	CO	Units
Unpaved_Road	MOVES 2014b Master	1.52E-01	1.52E-01	7.40E-02	1.95E+00	6.12E-01	g/VKT
Paved_Road	MOVES 2014b Master	1.52E-01	1.52E-01	7.40E-02	1.95E+00	6.12E-01	g/VKT

* VKT = Vehicle Kilometers Traveled

Emission Rates

Source ID	Road Length (km)	Trucks per Hour	Emission Rates (g/s, 1-hour average)				
			PM	PM_{10}	$PM_{2.5}$	NOx	CO
Unpaved_Road	0.0	18	0.0000	0.0000	0.0000	0.0000	0.0000
Paved_Road	2.2	18	0.0017	0.0017	0.0008	0.0220	0.0069
		Total	**0.0017**	**0.0017**	**0.0008**	**0.022**	**0.007**

Table E9. Emissions from Working and Construction - Dust

Dust is generated during dumping and handling of waste and cover at the working face, and dumping and handling of construction materials on cells under construction. Dust emissions were estimated from US EPA AP-42, Chapters 13.2.4, Aggregate Handling and Storage Piles, and 11.9 Western Surface Coal Mining.

Quantity of materials Handled

Misc. Fill (Waste materials)			
Unloading rate	3,100	Mg/day	
Operating hours	12	hr/day	
Waste Unloading rate (Misc. Fill)	**0.07**	Mg/s	
Cover:			
Cover rate	310	Mg/day	assuming a 10:1 ratio for waste:cover
Cover Application hours	1	hr/day	
Cover materials- movement rate:	**0.09**	Mg/s	
Clay (Construction materials):			
soil density	1700	kg/m3	
Bucket size	1	m3	
Bucket load	1700	kg	
lifts/min	2	lifts/min	
operating hours	8	hr/day	
Clay movement rate	1632	Mg/day	
Clay movement rate	**0.06**	Mg/s	assumes 30 s/lift; 8 hr/day of continuous work

a) Emissions from material drop (unloading) activities:

E = emission factor (kg/tonnes)
k = particle size multiplier (dimensionless) < 30 μm = 0.74 AP-42 13.2.4
k = particle size multiplier (dimensionless) < 10 μm = 0.35 AP-42 13.2.4
k = particle size multiplier (dimensionless) < 2.5 μm = 0.05 AP-42 13.2.4
U = mean wind speed, meters per second (m/s) = 5 regional wind speed
M = material moisture content (%)

$$E = k\,(0.0016) \times \frac{(\frac{U}{2.2})^{1.3}}{(M * 0.5)^{1.4}}$$

Typical moisture contents were obtained from Table 13.2.4-1, Municipal solid waste landfill industries, AP-42, Chapter 13.2.4 Aggregate Handling And Storage Piles. Misc. Fill materials and Clay/Dirt Mix were selected to represent landfill waste materials and construction materials,

Unloading Material		Moisture Content %	EF (kg/Mg)			Rating	Reference
			PM	PM 10	PM 2.5		
			k= 0.74	k= 0.35	k= 0.053		
Waste (Misc. Fill materials)	Working Face	11.00	3.16E-04	1.50E-04	2.27E-05	A	AP-42 13.2.4
Cover	Working Face	12.00	2.80E-04	1.33E-04	2.01E-05	A	AP-42 13.2.4
Construction Material (Clay/Dirt Mix)	Construction	14.00	2.26E-04	1.07E-04	1.62E-05	A	AP-42 13.2.4

* source: AP-42, Chapter 13.2.4 Aggregate Handling And Storage Piles . Available at: https://www3.epa.gov/ttn/chief/ap42/ch13/final/c13s0204.pdf

Source Description		Material Movement Rate (Mg/s)	Emission Rate (g/s)- 1 hour average		
			PM	PM 10	PM 2.5
Unloading Waste materials (Misc. Fill)	Working Face	0.07	0.023	0.011	0.002
Unloading Cover materials (Cover)	Working Face	0.09	0.024	0.011	0.002
Unloading Construction materials (Clay/D	Construction	0.06	0.013	0.006	0.001
		Total	0.060	0.028	0.004

b) Emissions from Bulldozing,Compacting and Construction

Emission factors for bulldozing/compacting and construction activities are estimated using Table 11.9-2 of AP 42, bulldozing of overburden.

		reference:
EF= emission factor of TSP (kg/hr/vehicle)		AP 42 11.9
M = material moisture content (%)		AP-42 13.2.4
S = silt content (%)		AP-42 13.2.4
Scaling factor for PM10	0.75	AP 42 11.9
Scaling factor for PM2.5	0.105	AP 42 11.9

$$EF_{TSP} = 2.6 \times S^{1.2}/M^{1.3}$$

Source Description	Silt Content %	Moisture Content %	EF (kg/hr)	EF (kg/hr)	EF (kg/hr)	Rating	Reference
			PM	PM10	PM2.5		
Bulldozing/Compacting of Waste (Misc. Fi	12	11.00	2.27	1.70	0.24	B,D,D	AP 42 11.9
Bulldozing/Compacting of Cover	9	12.00	1.44	1.08	0.15	B,D,D	AP 42 11.9
Construction of Clay/Dirt Mix	9.2	14.00	1.21	0.90	0.13	B,D,D	AP 42 11.9

* source : AP 42 11.9 Western Surface Coal Mining (epa.gov)

Source Description		Emission Rate (g/s)		
		PM	PM10	PM2.5
Bulldozing/Compacting of Waste (Misc. Fi	Working Face	0.631	0.473	0.066
Bulldozing/Compacting of Cover	Working Face	0.399	0.299	0.042
Construction of Clay/Dirt Mix	Construction	0.335	0.251	0.035
Total		1.365	1.024	0.143

c) Total Emissions from Material Handling (a + b)

Source ID	Source Description		PM Emission Rate (g/s)		
			PM	PM10	PM2.5
Working Face	Waste Materials	Working Face	0.653	0.484	0.068
	Cover	Working Face	0.423	0.311	0.044
	Construction Materials (clay)	Construction	0.348	0.257	0.036
		Total	**1.424**	**1.052**	**0.148**

AP42 13.2.4 Aggregate Handling And Storage Piles (epa.gov)
AP 42 11.9 Western Surface Coal Mining (epa.gov)

Table E12. Landfill - Odour

Odour results from handling and placement of fresh waste, and from fugitive emissions of LFG

Odour from LFG
Fugitive, uncontrolled emissions of LFG contribute to odour. Odour emissions due to LFG are estimated based on the Interim Guide to Estimate and Assess Landfill Air Impacts (MOE 1992) default odour emission factor of 10,000 ou/m³ of landfill gas.

Fugitive LFG Emission Rate	0.77	m³/s, See Table E1 for calculation
Odour Emission Factor	10,000	ou/m³ of LFG

Source	Odour Emission Rate (ou/s)
Landfill (Stg1 to Stg6)	**7,707**

Sample Calculation: (LFG)

Emission Rate = LFG Emission Rate (m³/s) x Emission Factor (ou/m³ of LFG)
= 0.77 m³/s x 10,000 (ou/m³)
= 7,707 (ou/s)

Odour from Working Face
Tipping, spreading and compaction of fresh waste contributes to odour emissions. On any given day, the area of exposed fresh waste is relatively small, and estimated at about 3,200m². Estimates of odour emissions from the working face were based on measurements of odour flux from the literature with respect to municipal landfills.

Source	Subject of Measurements	Odour Flux ou/s/m²
Sironi et al. (2005)	freshly tipped waste	59
Longhurst, P. (2007)	freshly tipped refuse	2
Environmental Alliances Pty (2015)	active tipping area	35.6
Card, T.R. et al. (2015)	active face	0.58
	Geometric mean	7.0

* Longhurst reported a range of 1 to 4 ou/s/m²

Near final completion of the landfill (~2045), the working face will be on Cells 1 and 2 of Stage 9 of the landfill.

Emission Source	Approx. Working Area m²	Odour Flux ou/s/m²	Odour Emission Rate ou/s
Working Face	**3,200**	**7.0**	**22,514**

Sample Calculation: (Working Face)

Emission Rate = Exposed Working Area (m²) x Odour Flux (ou/s/m²)
= 3,200 (m²) x 7.0 (ou/s/m²)
= 22,514 (ou/s)

Table E13. Composting Process - Biofilter

Composting of organics generates significant odour emissions. Composting at the facility is done entirely within the compost plant, a closed building maintained under negative pressure. All exhaust from the building is treated in a biofilter for odour control.

Odour emission rate from the biofilter was measured during a compliance source test program in 2010 (Envirosolve Report No. E10004).

An expansion of the plant in 2012 essentially doubled the capacity of the facility. Assuming that odour generated is proportional to production rate, and that odour removal efficiency remains constant, odour emission rate should also double.

Emission Source		Gas Flow Rate[1]	Measured Odour Emission Rate[2] (2010)	Estimated Odour Emission Rate (post 2012)
Source	Cell or Bed			
		m^3/s	ou/s	ou/s
Biofilter	BF1	17.5	302	603
	BF2	17.5	302	603
	BF3	17.5	302	603
	Total	52.4	905	1,810

References:
1. Rated flow rates provided by GFL via email on 2019-06-17.
2. Odour concentrations from measurements (Envirosolve Reort No. E10004, 2010).

Table E14. Compost Curing - Odour

Compost is cured in windrows on the the compost curing pad. Odour emissions are highest when compost is fresh, and falls off as the compost is cured. Emissions are also affected by seasonal temperature. Measurements of odour flux were made on three windrows by Consumage in March (winter) and June (summer), 2019. For the modelling assessment, odour fluxes for spring and fall were interpolated using the measured data.

Odour Flux

	Seasonal Odour Flux (ou/s/m^2)			
Data source	Measurements	Interpolation	Measurements	Interpolation
Season	Winter	Spring	Summer	Fall
Months	Dec, Jan, Feb	Mar, Apr, May	Jun, July, Aug	Sept, Oct, Nov
Compost age				
Fresh	0.98	15.74	30.49	15.74
1 week old	0.28	4.71	9.15	4.71
3 months old	0.24	0.83	1.42	0.83

Storage piles (typical):	Number of windrows:	12	
	Windrow length:	75	m
	Windrow width:	4.5	m
	Windrow height:	2	m
	Effective surface area of each windrow:	450	m²
	Total effective surface area of all windro	5,399	m²

Curing Odour Emission Rate: Winter

Windrow	Age weeks	Odour Flux ou/s/m²	Interpolated Odour Flux ou/s/m²	Windrow Surface Area m²	Emission Rate ou/s
1	0 (fresh)	0.98		450	441
2	1	0.28		450	124
3	2		0.27	450	122
4	3		0.27	450	121
5	4		0.26	450	119
6	5		0.26	450	117
7	6		0.26	450	116
8	7		0.25	450	114
9	8		0.25	450	113
10	9		0.25	450	111
11	10		0.24	450	110
12	11	0.24		450	108
Total Winter Emission Rate from Curing					**1,715**

Curing Odour Emission Rate: Spring

Windrow	Age weeks	Odour Flux ou/s/m²	Interpolated Odour Flux ou/s/m²	Windrow Surface Area m²	Emission Rate ou/s
1	0 (fresh)	15.74		450	7,079
2	1	4.71		450	2,121
3	2		4.33	450	1,946
4	3		3.94	450	1,771
5	4		3.55	450	1,597
6	5		3.16	450	1,422
7	6		2.77	450	1,247
8	7		2.38	450	1,072
9	8		1.99	450	897
10	9		1.61	450	722
11	10		1.22	450	548
12	11	0.83		450	373
Total Spring Emission Rate from Curing					**20,794**

Curing Odour Emission Rate: Summer

Windrow	Age weeks	Odour Flux ou/s/m²	Interpolated Odour Flux ou/s/m²	Windrow Surface Area m²	Emission Rate ou/s
1	0 (fresh)	30.49		450	13,717
2	1	9.15		450	4,118
3	2		8.38	450	3,770
4	3		7.61	450	3,422
5	4		6.83	450	3,074
6	5		6.06	450	2,726
7	6		5.29	450	2,378
8	7		4.51	450	2,030
9	8		3.74	450	1,682
10	9		2.96	450	1,334
11	10		2.19	450	986
12	11	1.42		450	637
Total Summer Emission Rate from Curing					**39,874**

Curing Odour Emission Rate: Fall

Windrow	Age weeks	Odour Flux ou/s/m²	Interpolated Odour Flux ou/s/m²	Windrow Surface Area m²	Emission Rate ou/s
1	0 (fresh)	15.74		450	7,079
2	1	4.71		450	2,121
3	2		4.33	450	1,946
4	3		3.94	450	1,771
5	4		3.55	450	1,597
6	5		3.16	450	1,422
7	6		2.77	450	1,247
8	7		2.38	450	1,072
9	8		1.99	450	897
10	9		1.61	450	722
11	10		1.22	450	548
12	11	0.83		450	373
Total Fall Emission Rate from Curing					**20,794**

Table E15. Leaf & Yard Waste Stockpiles - Odour

Leaf & yard waste is used as a bulking agent in compost, and is stockpiled outdoors until needed. With age, the stockpiles of organic materials can produce odour. Odour from undisturbed surfaces is low, but odour from freshly disturbed surfaces can be higher. Odour can also be affected by seasonal temperature. Odour flux from undisturbed and freshly disturbed surfaces of the stockpiles was measured by Consumage in March (winter) and June (summer), 2019. For the modelling assessment, odour fluxes for spring and fall were interpolated using the measured data.

Odour Flux

	Seasonal Odour Flux (ou/s/m³)			
Data source	Measurements	Interpolation	Measurements	Interpolation
Season	Winter	Spring	Summer	Fall
Months	Dec, Jan, Feb	Mar, Apr, May	Jun, July, Aug	Sept, Oct, Nov
Stockpile surface				
Undisturbed surface	0.52	0.45	0.37	0.45
Freshly disturbed surface	1.31	21.18	41.0	21.18

At time of measurement, there were six stockpiles, each 140m x 8m x 4m high. Of the total surface area, only a small area of fresh surface would be exposed.

Stockpiles piles (typical):	Number of piles:	6	
	Pile length:	140	m
	Pile width:	8	m
	Pile height:	4	m
	Effective surface area per pile:	2,240	m²
	Total surface area of all piles:	13,440	m²
	Total freshly opened surface area:	210	m²

Odour Emission Rate: Winter

Source	Surface Area of Piles m²	Odour Flux ou/s/m²	Total Odour Emission Rate ou/s	Individual Pile Odour Emission Rate ou/s
Undisturbed surface	13,440	0.52	7,002	1,167
Freshly disturbed surface	210	1.31	274	46
Total Winter Emission Rate from Stockpiles			**7,277**	**1,213**

Odour Emission Rate: Spring

Source	Surface Area of Piles m²	Odour Flux ou/s/m²	Total Odour Emission Rate ou/s	Individual Pile Odour Emission Rate ou/s
Undisturbed surface	13,440	0.45	5,988	998
Freshly disturbed surface	210	21.18	4,447	741
Total Spring Emission Rate from Stockpiles			**10,434**	**1,739**

Odour Emission Rate: Summer

Source	Surface Area of Piles	Odour Flux	Total Odour Emission Rate	Individual Pile Odour Emission Rate
	m²	ou/s/m²	ou/s	ou/s
Undisturbed surface	13,440	0.37	4,973	829
Freshly disturbed surface	210	41.04	8,619	1,437
Total Summer Emission Rate from Stockpiles			**13,592**	**2,265**

Odour Emission Rate: Fall

Source	Surface Area of Piles	Odour Flux	Total Odour Emission Rate	Individual Pile Odour Emission Rate
	m²	ou/s/m²	ou/s	ou/s
Undisturbed surface	13,440	0.45	5,988	998
Freshly disturbed surface	210	21.18	4,447	741
Total Fall Emission Rate from Stockpiles			**10,434**	**1,739**

Appendix E: Emission Estimates
Alternative 1 Scenario B

Calculation Sheet - Alternative 1 Scenario B

LFG Emissions from Gensets and Flares for Stages 1 to 5

The maximum quantity of LFG was estimated by using LandGEM Landfill Gas Emissions Model version 3.02, USEPA :

Max Quantity of LFG= 3.03E+07 m^3/year

It was assumed that the LFG collection system has a capture capacity of 75%. As such:

25% of LFG is emitted into the atmosphere as fugitive emissions:

=25% x 3.027e7 7.57E+06 m^3/year

75% of LFG is captured by LFG collection system and will be directed into the flares and generators.

=75% x 3.027e7 2.27E+07 m^3/year

The majority of collected LFG from collection system is directed into flare#1, and flare#2 (new flare). The remaining LFG will be directed into generators.

The LFG required to be filtered from siloxane compounds prior to combustion in generators in order to protect generators engines.

The purge gas from siloxane filter will be sent to flare 3 (siloxane filter) and will be combusted.

The amount of LFG combusted in flare #1 and #2 was estimated based on the following assumptions:

1. LFG quantity combusted in generators and siloxane flare was estimated based on actual quantity reported in 2019.

Approximately, 20,100,962 Sm3 and 891,340 Sm3 of total captured LFG was combusted in generators and siloxane flare, respectively.

2. The quantity of LFG combusted in generators and siloxane filter was subtract from total captured LFG to estimate the remaining quantity of LFG.

Quantity of remaining LFG =2.45e7 (m3/year) - 20,100,962 (m3/year) - 891,340 (m3/year)= 1.71E+06 m^3/year

3. The remaining quantity of LFG was splited between flare 1 and flare 2 based on their design capacity obtained from manufacturers.

Units	Design Capacity (cfm)	LFG Quantity
Flare 1	2500	6.11E+05
Flare 2	4500	1.10E+06

Source ID	LFG quantity[1,2]			No. of units	LFG quantity per unit	
	LFG Quantity (Sm^3/year)	hours/year	m^3/hr		m^3/hr	m^3/s
LFG Fugitive	7,567,500	8,760	864	-	864	0.24
Engines	20,100,962	8,760	2,295	4	574	0.16
Flare 1	610,785	8,760	70	1	70	0.02
Flare 2	1,099,413	8,760	126	1	126	0.03
Flare 3	891,340	8,760	102	1	102	0.03

1. LFG quantities combusted in generator engines and siloxane flare were provided by GFL and are based on 2019 calender year.
2. LFG quantities combusted in flare 1 and flare 2 were estimated based on design capacities obtained from manufacturers.

Control Efficiency (%) from Table 2.4-3, AP-42

LFG Emission Sources	LFG Quantity (Sm^3/year)	Capture Efficiency	LFG Emission Rate (m^3/yr)	LFG Emissions	Significant? (Yes or No)[1]
Fugitives	7,567,500	0.00%	7,567,500	92%	Yes
Engines	20,100,962	97.20%	562,827	7%	Yes
Flare 1	610,785	97.70%	14,048	0%	No
Flare 2	1,099,413	97.70%	25,286	0%	No
Flare 3 (Siloxane Flare)	891,340	97.70%	20,501	0%	No
		Total	8,190,162	100%	

1. Sources that are Insignificant Relative to Total Emissions per section 7.2.2 of ESDM guidance document.

Calculation Sheet - Alternative 1 Scenario B

LFG Emissions from Gensets and Flares for Stages 6 to 9

The maximum quantity of LFG was estimated by using LandGEM Landfill Gas Emissions Model version 3.02, USEPA :

Max Quantity of LFG= 9.28E+07 m^3/year

It was assumed that the LFG collection system has a capture capacity of 75%. As such:
25% of LFG is emitted into the atmosphere as fugitive emissions:

=25% x 9.283e7 2.32E+07 m^3/year

75% of LFG is captured by LFG collection system and will be directed into the flares and generators.

=75% x 9.283e7 6.96E+07 m^3/year

The majority of collected LFG from collection system is directed into flare#1, and flare#2 (new flare). The remaining LFG will be directed into generators.
The LFG required to be filtered from siloxane compounds prior to combustion in generators in order to protect generators engines.
The purge gas from siloxane filter will be sent to flare 3 (siloxane filter) and will be combusted.

The amount of LFG combusted in flare #1 and #2 was estimated based on the following assumptions:
1. LFG quantity combusted in generators and siloxane flare was estimated based on actual quantity reported in 2019.
Approximately, 20,100,962 Sm3 and 891,340 Sm3 of total captured LFG was combusted in generators and siloxane flare, respectively.
2. The quantity of LFG combusted in generators and siloxane filter was subtract from total captured LFG to estimate the remaining quantity of LFG.
Quantity of remaining LFG =6.96e7 (m3/year) - 20,100,962 (m3/year) - 891,340 (m3/year)= 4.86E+07 m^3/year
3. The remaining quantity of LFG was splited between flare 1 and flare 2 based on their design capacity obtained from manufacturers.

Units	Design Capacity (cfm)	LFG Quantity
Flare 1	2500	1.74E+07
Flare 2	4500	3.13E+07

Source ID	LFG quantity[1,2]			No. of units	LFG quantity per unit	
	LFG Quantity (Sm^3/year)	hours/year	m^3/hr		m^3/hr	m^3/s
LFG Fugitive	23,207,500	8,760	2,649	-	2649	0.74
Engines	20,100,962	8,760	2,295	4	574	0.16
Flare 1	17,367,928	8,760	1,983	1	1983	0.55
Flare 2	31,262,270	8,760	3,569	1	3569	0.99
Flare 3	891,340	8,760	102	1	102	0.03

1. LFG quantities combusted in generator engines and siloxane flare were provided by GFL and are based on 2019 calender year.
2. LFG quantities combusted in flare 1 and flare 2 were estimated based on design capacities obtained from manufacturers.

Control Efficiency (%) from Table 2.4-3, AP-42

LFG Emission Sources	LFG Quantity (Sm^3/year)	Capture Efficiency	LFG Emission Rate (m^3/yr)	LFG Emissions	Significant? (Yes or No)[1]
Fugitives	23,207,500	0.00%	23,207,500	93%	Yes
Engines	20,100,962	97.20%	562,827	2%	No
Flare 1	17,367,928	97.70%	399,462	2%	No
Flare 2	31,262,270	97.70%	719,032	3%	No
Flare 3 (Siloxane Flare)	891,340	97.70%	20,501	0%	No
		Total	24,909,322	100%	

1. Sources that are Insignificant Relative to Total Emissions per section 7.2.2 of ESDM guidance document.

Table E1. LFG Generation and Distribution for Stages 1 to 5 - Alternative 1 Scenario B

Landfill Gas (LFG) is generated by decomposition of organic materials within the landfill. The quantity of LFG generated per year was estimated using the US EPA LandGEM Landfill Gas Emissions Model version 3.02.

Model Inputs:

Inputs to the model were based on:

- 2019 and earlier - records of quantity of waste accepted annually (tonnes/year)
- 2020 to 2025 - assumed 755,000 tonnes/year of waste accepted
- Closure at end of 2025

Model Results

The LandGEM model estimates:

Maximum LFG generation rate: 30,270,000 m³/year in 2045

LFG is assumed to be generated relatively uniformly through the year, so this equates to peak generation rate of:

30270000 (m³/year) / 365 (days/year) / 24 (hours/day) / 3600 (seconds/hour)

LFG Generation Rate = 1.0 m³/s

Distribution

The landfill has an LFG Collection System to capture LFG and route it to the LFG Utilization Facility. LFG that is not captured by the system is emitted to atmosphere through the landfill surface.

LFG Capture System Efficiency: 75%

LFG captured and combusted at the LFG Utilization facility:	1.0 (m³/s) x 75% =	0.72	m³/s
LFG not captured, and emitted from surface (e.g. fugitive):	1.0 (m³/s) x (1-75%) =	0.24	m³/s

At the LFG Utilization facility, LFG is used to fuel engines driving electrical generators (Gen1 to Gen4). Siloxanes are filtered from the engine fuel, and purge gas from the filter is mixed with LFG and combusted in an enclosed flare (Flare3). Excess LFG not used in Gen1 to Gen4 or Flare3 is combusted in two enclosed flares (Flare1 and Flare2). For the puroses of this analysis, LFG is assumed to be distributed between Flares1 and 2 proportional to their rated capacity.

Source	**LFG Combusted (m³/s)**	
Engines (Gen1 to Gen 4)	0.16	m³/s, capacity at rated power 0.64 m³/s total (2019)
Siloxane Flare (Flare3)	0.029	m³/s, at rated engine power (2019)
Flare 1	0.19	m³/s (rated capacity 1.18 m³/s)
Flare 2	0.34	m³/s (rated capacity 2.12 m³/s)
Total Combusted	0.72	m³/s

Table E1. LFG Generation and Distribution for Stages 6 to 9 - Alternative 1 Scenario B

Landfill Gas (LFG) is generated by decomposition of organic materials within the landfill. The quantity of LFG generated per year was estimated using the US EPA LandGEM Landfill Gas Emissions Model version 3.02.

Model Inputs:

Inputs to the model were based on:

- 2026 to 2045 - assumed 755,000 tonnes/year of waste accepted
- Closure at end of 2045

Model Results

The LandGEM model estimates:

Maximum LFG generation rate: 92,830,000 m³/year in 2045

LFG is assumed to be generated relatively uniformly through the year, so this equates to peak generation rate of:

92830000 (m³/year) / 365 (days/year) / 24 (hours/day) / 3600 (seconds/hour)

LFG Generation Rate = 2.9 m³/s

Distribution

The landfill has an LFG Collection System to capture LFG and route it to the LFG Utilization Facility. LFG that is not captured by the system is emitted to atmosphere through the landfill surface.

LFG Capture System Efficiency: 75%

LFG captured and combusted at the LFG Utilization facility:	2.9 (m³/s) x 75% =	2.21	m³/s
LFG not captured, and emitted from surface (e.g. fugitive):	2.9 (m³/s) x (1-75%) =	0.74	m³/s

At the LFG Utilization facility, LFG is used to fuel engines driving electrical generators (Gen1 to Gen4). Siloxanes are filtered from the engine fuel, and purge gas from the filter is mixed with LFG and combusted in an enclosed flare (Flare3). Excess LFG not used in Gen1 to Gen4 or Flare3 is combusted in two enclosed flares (Flare1 and Flare2). For the puroses of this analysis, LFG is assumed to be distributed between Flares1 and 2 proportional to their rated capacity.

Source	**LFG Combusted (m³/s)**	
Engines (Gen1 to Gen 4)	0.48	m³/s, at rated power (2019)
Siloxane Flare (Flare3)	0.029	m³/s, at rated engine power (2019)
Flare 1	0.61	m³/s (rated capacity 1.18 m³/s)
Flare 2	1.09	m³/s (rated capacity 2.12 m³/s)
Total Combusted	2.21	m³/s

Table E2. Fugitive Emissions Of LFG for Stages 1 to 5 - Alternative 1 Scenario B

LFG that is not captured by the LFG Collection System is emitted from the surface of the landfill as fugitive. The previous landfill wass divided into five stages (STG1 to STG5). Fugitive LFG was assumed to to be emitted uniformly over the area of the five stages.

Concentrations of constituents of LFG are based on US EPA, AP-42, Table 2.4-1.

Total Fugitive LFG Emission Rate: 0.24 m^3/s (see Table E1 for calculation)

Emission Sources	Surface Area (m^2)
STG1 - Stage 1	244,000
STG2 - Stage 2	244,000
STG3 - Stage 3	244,000
STG4 - Stage 4	342,000
STG5 - Stage 5	102,948
Total Surface Area	**1,176,948**

Sample Calculation (1,1,1-Trichloroethane)

Total emission rate = LFG Emission rate (m^3/s) x Concentration in LFG (mg/m^3) /1000 (mg/g)
= 0.24 (m^3/s) x 1.32 (mg/m^3) / 1000 (mg/g)
= 0.00032
Emission flux = Total emission rate (g/s) / Total surface area (m^2)
= 0.00031 / 1176948 (m^2)
= 2.70E-10

Aggregate Fugitive Emissions from Stages 1 to 5 (STG1 to STG5)

Constituent	CAS No.	MW	Concentration in LFG		Total Emission Rate	Total Emission Flux	Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m^3)	(g/s)	($g/s/m^2$)	
1,1,1-Trichloroethane	71556	133	2.43E-01	1.3	3.18E-04	2.70E-10	A
1,1,2,2-Tetrachloroethane	79345	168	5.35E-01	3.7	8.81E-04	7.48E-10	E
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	261	3.49E-03	0.0	8.93E-06	7.58E-12	D
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187	6.72E-02	0.5	1.23E-04	1.05E-10	C
1,1,2-Trichloroethane	79005	133	1.58E-01	0.9	2.07E-04	1.76E-10	D
1,1-Dichloroethane	75343	99	2.08E+00	8.4	2.02E-03	1.72E-09	A
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	97	1.60E-01	0.6	1.52E-04	1.29E-10	A
1,2,3-Trimethylbenzene	526738	120	3.59E-01	1.8	4.23E-04	3.60E-10	D
1,2,4-Trichlorobenzene	120821	181	5.51E-03	0.0	9.81E-06	8.33E-12	C
1,2,4-Trimethylbenzene	95636	120	1.37E+00	6.7	1.61E-03	1.37E-09	B
1,2-Dibromoethane (Ethylene dibromide)	106934	188	4.80E-03	0.0	8.84E-06	7.51E-12	B
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	171	1.06E-01	0.7	1.78E-04	1.51E-10	B
1,2-Dichloroethane (Ethylene dichloride)	107062	99	1.59E-01	0.6	1.54E-04	1.31E-10	A
1,2-Dichloroethene	540590	97	1.14E+01	45.2	1.08E-02	9.21E-09	E
1,2-Dichloropropane	78875	113	5.20E-02	0.2	5.76E-05	4.90E-11	D
1,2-Diethylbenzene	135013	134	1.99E-02	0.1	2.62E-05	2.23E-11	D
1,3,5-Trimethylbenzene	108678	120	6.23E-01	3.1	7.34E-04	6.24E-10	C
1,3-Butadiene (Vinyl ethylene)	106990	54	1.66E-01	0.4	8.81E-05	7.48E-11	C
1,3-Diethylbenzene	141935	134	6.55E-02	0.4	8.62E-05	7.33E-11	D
1,4-Diethylbenzene	105055	134	2.62E-01	1.4	3.45E-04	2.93E-10	D
1,4-Dioxane (1,4-Diethylene dioxide)	123911	88	8.29E-03	0.0	7.16E-06	6.09E-12	D
1-Butene	106989	56	1.22E+00	2.8	6.71E-04	5.70E-10	D
2-Methylbutene	513359	70	1.22E+00	3.5	8.39E-04	7.13E-10	D
1-Butene	106989	56	1.10E+00	2.5	6.05E-04	5.14E-10	E
2-Methylpropene	115117	56	1.10E+00	2.5	6.05E-04	5.14E-10	E
1-Ethyl-4-methylbenzene (4-Ethyl toluene)	622968	120	9.89E-01	4.9	1.17E-03	9.91E-10	C
1-Heptene	592767	98	6.25E-01	2.5	6.02E-04	5.11E-10	E
1-Hexene	592416	84	8.88E-02	0.3	7.33E-05	6.23E-11	D
2-Methyl-1-pentene	763291	84	8.88E-02	0.3	7.33E-05	6.23E-11	D
1-Methylcyclohexene	591491	96	2.27E-02	0.1	2.14E-05	1.82E-11	D
1-Methylcyclopentene	693890	82	2.52E-02	0.1	2.03E-05	1.72E-11	D
1-Pentene	109671	70	2.20E-01	0.6	1.51E-04	1.29E-10	D
1-Propanethiol (n-Propyl mercaptan)	107039	76	1.25E-01	0.4	9.34E-05	7.93E-11	D
2,2,3-Trimethylbutane	464062	100	9.19E-03	0.0	9.03E-06	7.67E-12	D
2,2,4-Trimethylpentane	540841	114	6.14E-01	2.9	6.88E-04	5.84E-10	A
2,2,5-Trimethylhexane	3522949	128	1.56E-01	0.8	1.96E-04	1.67E-10	D
2,2-Dimethylbutane	75832	86	1.56E-01	0.5	1.32E-04	1.12E-10	D
2,2-Dimethylpentane	590352	100	6.08E-02	0.2	5.97E-05	5.08E-11	D
2,2-Dimethylpropane	463821	72	2.74E-02	0.1	1.94E-05	1.65E-11	D
2,3,4-Trimethylpentane	565753	114	3.12E-01	1.5	3.50E-04	2.97E-10	D

Constituent	CAS No.	MW	Concentration in LFG		Total Emission Rate	Total Emission Flux	Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(g/s)	(g/s/m²)	
2,3-Dimethylbutane	79298	86	1.67E-01	0.6	1.41E-04	1.20E-10	E
2,3-Dimethylpentane	565593	100	3.10E-01	1.3	3.05E-04	2.59E-10	D
2,4-Dimethylhexane	589435	114	2.22E-01	1.0	2.49E-04	2.11E-10	D
2,4-Dimethylpentane	108087	100	1.00E-01	0.4	9.83E-05	8.35E-11	D
2,5-Dimethylhexane	592132	114	1.66E-01	0.8	1.86E-04	1.58E-10	D
2,5-Dimethylthiophene	638028	112	6.44E-02	0.3	7.09E-05	6.02E-11	D
2-Butanone (Methyl ethyl ketone)	78933	72	4.01E+00	11.8	2.84E-03	2.41E-09	D
2-Ethyl-1-butene	760214	84	1.77E-02	0.1	1.46E-05	1.24E-11	E
2-Ethylthiophene	872559	112	6.29E-02	0.3	6.92E-05	5.88E-11	C
2-Ethyltoluene	611143	120	3.23E-01	1.6	3.81E-04	3.23E-10	D
2-Hexanone (Methyl butyl ketone)	591786	100	6.13E-01	2.5	6.02E-04	5.12E-10	E
2-Methyl-1-butene	563462	70	1.79E-01	0.5	1.23E-04	1.05E-10	D
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90	1.70E-01	0.6	1.50E-04	1.28E-10	E
2-Methyl-2-butene	513359	70	3.03E-01	0.9	2.08E-04	1.77E-10	D
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90	3.25E-01	1.2	2.87E-04	2.44E-10	E
2-Methylbutane	78784	72	2.26E+00	6.7	1.60E-03	1.36E-09	D
2-Methylheptane	592278	114	7.16E-01	3.3	8.02E-04	6.82E-10	D
2-Methylhexane	591764	100	8.16E-01	3.3	8.02E-04	6.81E-10	D
2-Methylpentane	107835	86	6.88E-01	2.4	5.81E-04	4.94E-10	D
2-Propanol (Isopropyl alcohol)	67630	60	1.80E+00	4.4	1.06E-03	9.01E-10	D
3,6-Dimethyloctane	15869940	142	7.85E-01	4.6	1.10E-03	9.31E-10	D
3-Ethyltoluene	620144	120	7.80E-01	3.8	9.19E-04	7.81E-10	D
3-Methyl-1-pentene	760203	84	6.99E-03	0.0	5.77E-06	4.90E-12	D
3-Methylheptane	589811	114	7.63E-01	3.6	8.55E-04	7.26E-10	D
3-Methylhexane	589344	100	1.13E+00	4.6	1.11E-03	9.43E-10	D
3-Methylpentane	96140	86	7.40E-01	2.6	6.25E-04	5.31E-10	D
3-Methylthiophene	616444	98	9.25E-02	0.4	8.91E-05	7.57E-11	E
4-Methyl-1-pentene	691372	84	2.33E-02	0.1	1.92E-05	1.63E-11	E
4-Methyl-2-pentanone (MIBK)	108101	100	8.83E-01	3.6	8.67E-04	7.37E-10	C
4-Methylheptane	589537	114	2.49E-01	1.2	2.79E-04	2.37E-10	D
Acetaldehyde	75070	44	7.74E-02	0.1	3.34E-05	2.84E-11	D
Acetone	67641	58	6.70E+00	15.9	3.82E-03	3.24E-09	C
Acetonitrile	75058	41	5.56E-01	0.9	2.24E-04	1.90E-10	A
Benzene	71432	78	2.40E+00	7.7	1.84E-03	1.56E-09	A
Benzyl chloride	100447	127	1.81E-02	0.1	2.25E-05	1.91E-11	A
Bromodichloromethane	75274	164	8.78E-03	0.1	1.41E-05	1.20E-11	E
Bromomethane (Methyl bromide)	74839	95	2.10E-02	0.1	1.96E-05	1.66E-11	C
Butane	106978	58	6.22E+00	14.8	3.55E-03	3.01E-09	C
Carbon disulfide	75150	76	1.47E-01	0.5	1.10E-04	9.33E-11	A
Carbon monoxide	630080	28	2.44E+01	27.9	6.70E-03	5.70E-09	C
Carbon tetrachloride	56235	154	7.98E-03	0.1	1.20E-05	1.02E-11	A
Carbon tetrafluoride (Freon 14)	75730	88	1.51E-01	0.5	1.30E-04	1.11E-10	E
Carbonyl sulfide (Carbon oxysulfide)	463581	60	1.22E-01	0.3	7.19E-05	6.11E-11	A
Chlorobenzene	108907	113	4.84E-01	2.2	5.34E-04	4.54E-10	A
Chlorodifluoromethane (Freon 22)	75456	86	7.96E-01	2.8	6.75E-04	5.74E-10	D
Chloroethane (Ethyl chloride)	75003	65	3.95E+00	10.4	2.50E-03	2.12E-09	B
Chloromethane (Methyl chloride)	74873	50	2.44E-01	0.5	1.21E-04	1.03E-10	B
cis-1,2-Dichloroethene	156592	97	1.24E+00	4.9	1.18E-03	1.00E-09	B
cis-1,2-Dimethylcyclohexane	2207014	112	8.10E-02	0.4	8.91E-05	7.57E-11	D
cis-1,3-Dichloropropene	10061015	111	3.03E-03	0.0	3.30E-06	2.80E-12	D
cis-1,3-Dimethylcyclohexane	638040	112	5.01E-01	2.3	5.51E-04	4.68E-10	D
cis-1,4-Dimethylcyclohexane	624293	112	2.48E-01	1.1	2.73E-04	2.32E-10	D
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	112	2.48E-01	1.1	2.73E-04	2.32E-10	D
cis-2-Butene	590181	56	1.05E-01	0.2	5.78E-05	4.91E-11	D
cis-2-Heptene	6443921	98	2.45E-02	0.1	2.36E-05	2.00E-11	E
cis-2-Hexene	7688213	84	1.72E-02	0.1	1.42E-05	1.21E-11	D
cis-2-Octene	7642048	112	2.20E-01	1.0	2.42E-04	2.06E-10	D
cis-2-Pentene	627203	70	4.79E-02	0.1	3.29E-05	2.80E-11	D
cis-3-Methyl-2-pentene	922623	84	1.79E-02	0.1	1.48E-05	1.26E-11	D
Cyclohexane	110827	84	1.01E+00	3.5	8.34E-04	7.08E-10	B
Cyclohexene	110838	82	1.84E-02	0.1	1.48E-05	1.26E-11	D
Cyclopentane	287923	70	2.21E-02	0.1	1.52E-05	1.29E-11	D
Cyclopentene	142290	68	1.21E-02	0.0	8.08E-06	6.87E-12	D
Decane	124185	142	3.80E+00	22.1	5.30E-03	4.51E-09	D
Dibromochloromethane	124481	208	1.51E-02	0.1	3.08E-05	2.62E-11	D
Dibromomethane (Methylene dibromide)	74953	174	8.35E-04	0.0	1.42E-06	1.21E-12	E
Dichlorobenzene	106467	147	9.40E-01	5.6	1.36E-03	1.15E-09	A

Constituent	CAS No.	MW	Concentration in LFG		Total Emission Rate	Total Emission Flux	Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(g/s)	(g/s/m²)	
Dichlorodifluoromethane (Freon 12)	75718	121	1.18E+00	5.8	1.40E-03	1.19E-09	B
Dichloromethane (Methylene chloride)	75092	85	6.15E+00	21.3	5.12E-03	4.35E-09	A
Diethyl sulfide	352932	90	8.62E-02	0.3	7.62E-05	6.48E-11	E
Dimethyl disulfide	624920	94	1.37E-01	0.5	1.27E-04	1.08E-10	A
Dimethyl sulfide	75183	62	5.66E+00	14.4	3.45E-03	2.93E-09	A
Dodecane (n-Dodecane)	112403	170	2.21E-01	1.5	3.69E-04	3.14E-10	D
Ethane	74840	30	9.05E+00	11.1	2.67E-03	2.27E-09	D
Ethanol	64175	46	2.30E-01	0.4	1.04E-04	8.83E-11	D
Ethyl acetate	141786	88	1.88E+00	6.8	1.62E-03	1.38E-09	C
Ethyl mercaptan (Ethanediol)	75081	62	1.98E-01	0.5	1.21E-04	1.03E-10	A
Ethyl methyl sulfide	624895	76	3.67E-02	0.1	2.74E-05	2.33E-11	E
Ethylbenzene	100414	106	4.86E+00	21.1	5.06E-03	4.30E-09	B
Formaldehyde	50000	30	1.17E-02	0.0	3.45E-06	2.93E-12	D
Heptane	142825	100	1.34E+00	5.5	1.32E-03	1.12E-09	B
Hexane	110543	86	3.10E+00	10.9	2.62E-03	2.23E-09	B
Hydrogen sulfide	7783064	34	3.20E+01	44.6	1.07E-02	9.09E-09	A
Indane (2,3-Dihydroindene)	496117	34	6.66E-02	0.1	2.23E-05	1.89E-11	D
Isobutane (2-Methylpropane)	75285	58	8.16E+00	19.4	4.65E-03	3.95E-09	D
Isobutylbenzene	538932	134	4.07E-02	0.2	5.36E-05	4.55E-11	D
Isoprene (2-Methyl-1,3-butadiene)	78795	68	1.65E-02	0.0	1.10E-05	9.37E-12	D
Isopropyl mercaptan	75332	76	1.75E-01	0.5	1.31E-04	1.11E-10	A
Isopropylbenzene (Cumene)	98828	120	4.30E-01	2.1	5.07E-04	4.31E-10	D
Mercury (total)	7439976	201	1.22E-04	0.0	2.40E-07	2.04E-13	B
Methanethiol (Methyl mercaptan)	74931	48	1.37E+00	2.7	6.46E-04	5.49E-10	A
Methyl tert-butyl ether (MTBE)	1634044	88	1.18E-01	0.4	1.02E-04	8.67E-11	D
Methylcyclohexane	108872	98	1.29E+00	5.2	1.24E-03	1.06E-09	D
Methylcyclopentane	96377	84	6.50E-01	2.2	5.36E-04	4.56E-10	D
Naphthalene	91203	128	1.07E-01	0.6	1.34E-04	1.14E-10	D
n-Butylbenzene	104518	134	6.80E-02	0.4	8.95E-05	7.61E-11	D
Nonane	111842	128	2.37E+00	12.4	2.98E-03	2.53E-09	D
n-Propylbenzene (Propylbenzene)	103651	120	4.13E-01	2.0	4.87E-04	4.14E-10	D
Octane	111659	114	1.08E+00	5.0	1.21E-03	1.03E-09	D
p-Cymene (1-Methyl-4-Isopropylbenzene)	99876	134	3.58E+00	19.6	4.71E-03	4.00E-09	D
Pentane	109660	72	4.46E+00	13.2	3.16E-03	2.68E-09	C
Propane	74986	44	1.55E+01	27.9	6.70E-03	5.70E-09	C
Propene	115071	42	3.32E+00	5.7	1.37E-03	1.16E-09	D
Propyne	74997	40	3.80E-02	0.1	1.49E-05	1.27E-11	E
sec-Butylbenzene	135988	134	6.75E-02	0.4	8.89E-05	7.55E-11	D
Styrene (Vinylbenzene)	100425	104	4.11E-01	1.7	4.20E-04	3.57E-10	B
Tetrachloroethylene (Perchloroethylene)	127184	166	2.03E+00	13.8	3.30E-03	2.81E-09	A
Tetrahydrofuran (Diethylene oxide)	109999	72	9.69E-01	2.9	6.85E-04	5.82E-10	C
Thiophene	110021	84	3.49E-01	1.2	2.88E-04	2.45E-10	E
Toluene (Methyl benzene)	108883	92	2.95E+01	111.1	2.67E-02	2.26E-08	A
trans-1,2-Dichloroethene	156605	97	2.87E-02	0.1	2.73E-05	2.32E-11	C
trans-1,2-Dimethylcyclohexane	6876239	112	4.04E-01	1.9	4.45E-04	3.78E-10	D
trans-1,3-Dichloropropene	10061026	111	9.43E-03	0.0	1.03E-05	8.72E-12	D
trans-1,4-Dimethylcyclohexane	2207047	112	2.05E-01	0.9	2.26E-04	1.92E-10	D
trans-2-Butene	624646	56	1.04E-01	0.2	5.72E-05	4.86E-11	D
trans-2-Heptene	14686136	98	2.50E-03	0.0	2.41E-06	2.05E-12	E
trans-2-Hexene	4050457	84	2.06E-02	0.1	1.70E-05	1.44E-11	D
trans-2-Octene	13389429	112	2.41E-01	1.1	2.65E-04	2.25E-10	D
trans-2-Pentene	646048	70	3.47E-02	0.1	2.39E-05	2.03E-11	D
trans-3-Methyl-2-pentene	616126	84	1.55E-02	0.1	1.28E-05	1.09E-11	D
Tribromomethane (Bromoform)	75252	253	1.24E-02	0.1	3.07E-05	2.61E-11	D
Trichloroethylene (Trichloroethene)	79016	131	8.28E-01	4.4	1.07E-03	9.07E-10	A
Trichlorofluoromethane (Freon 11)	91315616	137	2.48E-01	1.4	3.34E-04	2.84E-10	B
Trichloromethane (Chloroform)	67663	119	7.08E-02	0.3	8.29E-05	7.04E-11	A
Undecane	1120214	156	1.67E+00	10.7	2.56E-03	2.18E-09	D
Vinyl acetate	85306269	86	2.48E-01	0.9	2.09E-04	1.78E-10	C
Vinyl chloride (Chloroethene)	75014	63	1.42E+00	3.6	8.70E-04	7.40E-10	A
Xylenes (o-, m-, p-, mixtures)	1330207	106	9.23E+00	40.1	9.61E-03	8.17E-09	A
Total Reduced Sulphur Compounds	n/a	-	-	67.7	1.63E-02	1.38E-08	-

Table E2. Fugitive Emissions Of LFG for Stages 6 to 9 - Alternative 1 Scenario B

LFG that is not captured by the LFG Collection System is emitted from the surface of the landfill as fugitive. The active portion of the landfill is divided into four stages (STG6 to STG9). Fugitive LFG was assumed to to be emitted uniformly over the area of the four stages.

Concentrations of constituents of LFG are based on US EPA, AP-42, Table 2.4-1.

Total Fugitive LFG Emission Rate: 0.74 m^3/s (see Table E1 for calculation)

Emission Sources	Surface Area (m^2)
STG6 - Stage 6	424,976
STG7 - Stage 7	424,976
STG8 - Stage 8	424,976
STG9 - Stage 9	10,020
Total Surface Area	**1,284,948**

Sample Calculation (1,1,1-Trichloroethane)

Total emission rate = LFG Emission rate (m^3/s) x Concentration in LFG (mg/m^3) /1000 (mg/g)
= 0.74 (m^3/s) x 1.32 (mg/m^3) / 1000 (mg/g)
= 0.00097
Emission flux = Total emission rate (g/s) / Total surface area (m^2)
= 0.00097 / 1284948 (m^2)
= 7.59E-10

Aggregate Fugitive Emissions from Stages 6 to 9 (STG6 to STG9)

Constituent	CAS No.	MW	Concentration in LFG		Total Emission Rate	Total Emission Flux	Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m^3)	(g/s)	($g/s/m^2$)	
1,1,1-Trichloroethane	71556	133	2.43E-01	1.3	9.75E-04	7.59E-10	A
1,1,2,2-Tetrachloroethane	79345	168	5.35E-01	3.7	2.70E-03	2.10E-09	E
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	261	3.49E-03	0.0	2.74E-05	2.13E-11	D
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187	6.72E-02	0.5	3.79E-04	2.95E-10	C
1,1,2-Trichloroethane	79005	133	1.58E-01	0.9	6.34E-04	4.93E-10	D
1,1-Dichloroethane	75343	99	2.08E+00	8.4	6.19E-03	4.82E-09	A
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	97	1.60E-01	0.6	4.66E-04	3.63E-10	A
1,2,3-Trimethylbenzene	526738	120	3.59E-01	1.8	1.30E-03	1.01E-09	D
1,2,4-Trichlorobenzene	120821	181	5.51E-03	0.0	3.01E-05	2.34E-11	C
1,2,4-Trimethylbenzene	95636	120	1.37E+00	6.7	4.95E-03	3.85E-09	B
1,2-Dibromoethane (Ethylene dibromide)	106934	188	4.80E-03	0.0	2.71E-05	2.11E-11	B
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	171	1.06E-01	0.7	5.45E-04	4.24E-10	B
1,2-Dichloroethane (Ethylene dichloride)	107062	99	1.59E-01	0.6	4.73E-04	3.68E-10	A
1,2-Dichloroethene	540590	97	1.14E+01	45.2	3.32E-02	2.59E-08	E
1,2-Dichloropropane	78875	113	5.20E-02	0.2	1.77E-04	1.38E-10	D
1,2-Diethylbenzene	135013	134	1.99E-02	0.1	8.03E-05	6.25E-11	D
1,3,5-Trimethylbenzene	108678	120	6.23E-01	3.1	2.25E-03	1.75E-09	C
1,3-Butadiene (Vinyl ethylene)	106990	54	1.66E-01	0.4	2.70E-04	2.10E-10	C
1,3-Diethylbenzene	141935	134	6.55E-02	0.4	2.64E-04	2.06E-10	D
1,4-Diethylbenzene	105055	134	2.62E-01	1.4	1.06E-03	8.23E-10	D
1,4-Dioxane (1,4-Diethylene dioxide)	123911	88	8.29E-03	0.0	2.20E-05	1.71E-11	D
1-Butene	106989	56	1.22E+00	2.8	2.06E-03	1.60E-09	D
2-Methylbutene	513359	70	1.22E+00	3.5	2.57E-03	2.00E-09	D
1-Butene	106989	56	1.10E+00	2.5	1.86E-03	1.44E-09	E
2-Methylpropene	115117	56	1.10E+00	2.5	1.86E-03	1.44E-09	E
1-Ethyl-4-methylbenzene (4-Ethyl toluene)	622968	120	9.89E-01	4.9	3.58E-03	2.78E-09	C
1-Heptene	592767	98	6.25E-01	2.5	1.85E-03	1.44E-09	E
1-Hexene	592416	84	8.88E-02	0.3	2.25E-04	1.75E-10	D
2-Methyl-1-pentene	763291	84	8.88E-02	0.3	2.25E-04	1.75E-10	D
1-Methylcyclohexene	591491	96	2.27E-02	0.1	6.57E-05	5.11E-11	D
1-Methylcyclopentene	693890	82	2.52E-02	0.1	6.23E-05	4.85E-11	D
1-Pentene	109671	70	2.20E-01	0.6	4.64E-04	3.61E-10	D
1-Propanethiol (n-Propyl mercaptan)	107039	76	1.25E-01	0.4	2.86E-04	2.23E-10	D
2,2,3-Trimethylbutane	464062	100	9.19E-03	0.0	2.77E-05	2.16E-11	D
2,2,4-Trimethylpentane	540841	114	6.14E-01	2.9	2.11E-03	1.64E-09	A
2,2,5-Trimethylhexane	3522949	128	1.56E-01	0.8	6.02E-04	4.68E-10	D
2,2-Dimethylbutane	75832	86	1.56E-01	0.5	4.04E-04	3.15E-10	D
2,2-Dimethylpentane	590352	100	6.08E-02	0.2	1.83E-04	1.43E-10	D
2,2-Dimethylpropane	463821	72	2.74E-02	0.1	5.95E-05	4.63E-11	D
2,3,4-Trimethylpentane	565753	114	3.12E-01	1.5	1.07E-03	8.34E-10	D
2,3-Dimethylbutane	79298	86	1.67E-01	0.6	4.33E-04	3.37E-10	E

Constituent	CAS No.	MW	Concentration in LFG		Total Emission Rate	Total Emission Flux	Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(g/s)	(g/s/m²)	
2,3-Dimethylpentane	565593	100	3.10E-01	1.3	9.34E-04	7.27E-10	D
2,4-Dimethylhexane	589435	114	2.22E-01	1.0	7.63E-04	5.94E-10	D
2,4-Dimethylpentane	108087	100	1.00E-01	0.4	3.01E-04	2.35E-10	D
2,5-Dimethylhexane	592132	114	1.66E-01	0.8	5.70E-04	4.44E-10	D
2,5-Dimethylthiophene	638028	112	6.44E-02	0.3	2.17E-04	1.69E-10	D
2-Butanone (Methyl ethyl ketone)	78933	72	4.01E+00	11.8	8.70E-03	6.77E-09	D
2-Ethyl-1-butene	760214	84	1.77E-02	0.1	4.48E-05	3.49E-11	E
2-Ethylthiophene	872559	112	6.29E-02	0.3	2.12E-04	1.65E-10	C
2-Ethyltoluene	611143	120	3.23E-01	1.6	1.17E-03	9.09E-10	D
2-Hexanone (Methyl butyl ketone)	591786	100	6.13E-01	2.5	1.85E-03	1.44E-09	E
2-Methyl-1-butene	563462	70	1.79E-01	0.5	3.78E-04	2.94E-10	D
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90	1.70E-01	0.6	4.61E-04	3.59E-10	E
2-Methyl-2-butene	513359	70	3.03E-01	0.9	6.39E-04	4.97E-10	D
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90	3.25E-01	1.2	8.82E-04	6.86E-10	E
2-Methylbutane	78784	72	2.26E+00	6.7	4.90E-03	3.82E-09	D
2-Methylheptane	592278	114	7.16E-01	3.3	2.46E-03	1.91E-09	D
2-Methylhexane	591764	100	8.16E-01	3.3	2.46E-03	1.91E-09	D
2-Methylpentane	107835	86	6.88E-01	2.4	1.78E-03	1.39E-09	D
2-Propanol (Isopropyl alcohol)	67630	60	1.80E+00	4.4	3.25E-03	2.53E-09	D
3,6-Dimethyloctane	15869940	142	7.85E-01	4.6	3.36E-03	2.61E-09	D
3-Ethyltoluene	620144	120	7.80E-01	3.8	2.82E-03	2.19E-09	D
3-Methyl-1-pentene	760203	84	6.99E-03	0.0	1.77E-05	1.38E-11	D
3-Methylheptane	589811	114	7.63E-01	3.6	2.62E-03	2.04E-09	D
3-Methylhexane	589344	100	1.13E+00	4.6	3.41E-03	2.65E-09	D
3-Methylpentane	96140	86	7.40E-01	2.6	1.92E-03	1.49E-09	D
3-Methylthiophene	616444	98	9.25E-02	0.4	2.73E-04	2.13E-10	E
4-Methyl-1-pentene	691372	84	2.33E-02	0.1	5.90E-05	4.59E-11	E
4-Methyl-2-pentanone (MIBK)	108101	100	8.83E-01	3.6	2.66E-03	2.07E-09	C
4-Methylheptane	589537	114	2.49E-01	1.2	8.55E-04	6.66E-10	D
Acetaldehyde	75070	44	7.74E-02	0.1	1.03E-04	7.98E-11	D
Acetone	67641	58	6.70E+00	15.9	1.17E-02	9.11E-09	C
Acetonitrile	75058	41	5.56E-01	0.9	6.86E-04	5.34E-10	A
Benzene	71432	78	2.40E+00	7.7	5.64E-03	4.39E-09	A
Benzyl chloride	100447	127	1.81E-02	0.1	6.89E-05	5.36E-11	A
Bromodichloromethane	75274	164	8.78E-03	0.1	4.33E-05	3.37E-11	E
Bromomethane (Methyl bromide)	74839	95	2.10E-02	0.1	6.00E-05	4.67E-11	C
Butane	106978	58	6.22E+00	14.8	1.09E-02	8.46E-09	C
Carbon disulfide	75150	76	1.47E-01	0.5	3.37E-04	2.62E-10	A
Carbon monoxide	630080	28	2.44E+01	27.9	2.06E-02	1.60E-08	C
Carbon tetrachloride	56235	154	7.98E-03	0.1	3.69E-05	2.87E-11	A
Carbon tetrafluoride (Freon 14)	75730	88	1.51E-01	0.5	4.00E-04	3.11E-10	E
Carbonyl sulfide (Carbon oxysulfide)	463581	60	1.22E-01	0.3	2.20E-04	1.72E-10	A
Chlorobenzene	108907	113	4.84E-01	2.2	1.64E-03	1.28E-09	A
Chlorodifluoromethane (Freon 22)	75456	86	7.96E-01	2.8	2.07E-03	1.61E-09	D
Chloroethane (Ethyl chloride)	75003	65	3.95E+00	10.4	7.66E-03	5.96E-09	B
Chloromethane (Methyl chloride)	74873	50	2.44E-01	0.5	3.71E-04	2.88E-10	B
cis-1,2-Dichloroethene	156592	97	1.24E+00	4.9	3.62E-03	2.81E-09	B
cis-1,2-Dimethylcyclohexane	2207014	112	8.10E-02	0.4	2.73E-04	2.13E-10	D
cis-1,3-Dichloropropene	10061015	111	3.03E-03	0.0	1.01E-05	7.87E-12	D
cis-1,3-Dimethylcyclohexane	638040	112	5.01E-01	2.3	1.69E-03	1.32E-09	D
cis-1,4-Dimethylcyclohexane	624293	112	2.48E-01	1.1	8.37E-04	6.51E-10	D
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	112	2.48E-01	1.1	8.37E-04	6.51E-10	D
cis-2-Butene	590181	56	1.05E-01	0.2	1.77E-04	1.38E-10	D
cis-2-Heptene	6443921	98	2.45E-02	0.1	7.24E-05	5.63E-11	E
cis-2-Hexene	7688213	84	1.72E-02	0.1	4.35E-05	3.39E-11	D
cis-2-Octene	7642048	112	2.20E-01	1.0	7.42E-04	5.78E-10	D
cis-2-Pentene	627203	70	4.79E-02	0.1	1.01E-04	7.86E-11	D
cis-3-Methyl-2-pentene	922623	84	1.79E-02	0.1	4.53E-05	3.53E-11	D
Cyclohexane	110827	84	1.01E+00	3.5	2.56E-03	1.99E-09	B
Cyclohexene	110838	82	1.84E-02	0.1	4.55E-05	3.54E-11	D
Cyclopentane	287923	70	2.21E-02	0.1	4.66E-05	3.63E-11	D
Cyclopentene	142290	68	1.21E-02	0.0	2.48E-05	1.93E-11	D
Decane	124185	142	3.80E+00	22.1	1.63E-02	1.27E-08	D
Dibromochloromethane	124481	208	1.51E-02	0.1	9.46E-05	7.36E-11	D
Dibromomethane (Methylene dibromide)	74953	174	8.35E-04	0.0	4.37E-06	3.40E-12	E
Dichlorobenzene	106467	147	9.40E-01	5.6	4.16E-03	3.23E-09	A
Dichlorodifluoromethane (Freon 12)	75718	121	1.18E+00	5.8	4.29E-03	3.34E-09	B

Constituent	CAS No.	MW	Concentration in LFG		Total Emission Rate	Total Emission Flux	Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(g/s)	(g/s/m²)	
Dichloromethane (Methylene chloride)	75092	85	6.15E+00	21.3	1.57E-02	1.22E-08	A
Diethyl sulfide	352932	90	8.62E-02	0.3	2.34E-04	1.82E-10	E
Dimethyl disulfide	624920	94	1.37E-01	0.5	3.88E-04	3.02E-10	A
Dimethyl sulfide	75183	62	5.66E+00	14.4	1.06E-02	8.23E-09	A
Dodecane (n-Dodecane)	112403	170	2.21E-01	1.5	1.13E-03	8.81E-10	D
Ethane	74840	30	9.05E+00	11.1	8.18E-03	6.37E-09	D
Ethanol	64175	46	2.30E-01	0.4	3.19E-04	2.48E-10	D
Ethyl acetate	141786	88	1.88E+00	6.8	4.98E-03	3.88E-09	C
Ethyl mercaptan (Ethanediol)	75081	62	1.98E-01	0.5	3.70E-04	2.88E-10	A
Ethyl methyl sulfide	624895	76	3.67E-02	0.1	8.41E-05	6.54E-11	E
Ethylbenzene	100414	106	4.86E+00	21.1	1.55E-02	1.21E-08	B
Formaldehyde	50000	30	1.17E-02	0.0	1.06E-05	8.22E-12	D
Heptane	142825	100	1.34E+00	5.5	4.04E-03	3.14E-09	B
Hexane	110543	86	3.10E+00	10.9	8.04E-03	6.25E-09	B
Hydrogen sulfide	7783064	34	3.20E+01	44.6	3.28E-02	2.55E-08	A
Indane (2,3-Dihydroindene)	496117	34	6.66E-02	0.1	6.83E-05	5.31E-11	D
Isobutane (2-Methylpropane)	75285	58	8.16E+00	19.4	1.43E-02	1.11E-08	D
Isobutylbenzene	538932	134	4.07E-02	0.2	1.64E-04	1.28E-10	D
Isoprene (2-Methyl-1,3-butadiene)	78795	68	1.65E-02	0.0	3.38E-05	2.63E-11	D
Isopropyl mercaptan	75332	76	1.75E-01	0.5	4.01E-04	3.12E-10	A
Isopropylbenzene (Cumene)	98828	120	4.30E-01	2.1	1.55E-03	1.21E-09	D
Mercury (total)	7439976	201	1.22E-04	0.0	7.36E-07	5.73E-13	B
Methanethiol (Methyl mercaptan)	74931	48	1.37E+00	2.7	1.98E-03	1.54E-09	A
Methyl tert-butyl ether (MTBE)	1634044	88	1.18E-01	0.4	3.13E-04	2.43E-10	D
Methylcyclohexane	108872	98	1.29E+00	5.2	3.81E-03	2.96E-09	D
Methylcyclopentane	96377	84	6.50E-01	2.2	1.65E-03	1.28E-09	D
Naphthalene	91203	128	1.07E-01	0.6	4.12E-04	3.21E-10	D
n-Butylbenzene	104518	134	6.80E-02	0.4	2.75E-04	2.14E-10	D
Nonane	111842	128	2.37E+00	12.4	9.14E-03	7.12E-09	D
n-Propylbenzene (Propylbenzene)	103651	120	4.13E-01	2.0	1.49E-03	1.16E-09	D
Octane	111659	114	1.08E+00	5.0	3.71E-03	2.89E-09	D
p-Cymene (1-Methyl-4-Isopropylbenzene)	99876	134	3.58E+00	19.6	1.45E-02	1.12E-08	D
Pentane	109660	72	4.46E+00	13.2	9.68E-03	7.53E-09	C
Propane	74986	44	1.55E+01	27.9	2.06E-02	1.60E-08	C
Propene	115071	42	3.32E+00	5.7	4.20E-03	3.27E-09	D
Propyne	74997	40	3.80E-02	0.1	4.58E-05	3.56E-11	E
sec-Butylbenzene	135988	134	6.75E-02	0.4	2.72E-04	2.12E-10	D
Styrene (Vinylbenzene)	100425	104	4.11E-01	1.7	1.29E-03	1.00E-09	B
Tetrachloroethylene (Perchloroethylene)	127184	166	2.03E+00	13.8	1.01E-02	7.88E-09	A
Tetrahydrofuran (Diethylene oxide)	109999	72	9.69E-01	2.9	2.10E-03	1.64E-09	C
Thiophene	110021	84	3.49E-01	1.2	8.83E-04	6.87E-10	E
Toluene (Methyl benzene)	108883	92	2.95E+01	111.1	8.18E-02	6.36E-08	A
trans-1,2-Dichloroethene	156605	97	2.87E-02	0.1	8.37E-05	6.51E-11	C
trans-1,2-Dimethylcyclohexane	6876239	112	4.04E-01	1.9	1.36E-03	1.06E-09	D
trans-1,3-Dichloropropene	10061026	111	9.43E-03	0.0	3.15E-05	2.45E-11	D
trans-1,4-Dimethylcyclohexane	2207047	112	2.05E-01	0.9	6.92E-04	5.38E-10	D
trans-2-Butene	624646	56	1.04E-01	0.2	1.76E-04	1.37E-10	D
trans-2-Heptene	14686136	98	2.50E-03	0.0	7.38E-06	5.75E-12	E
trans-2-Hexene	4050457	84	2.06E-02	0.1	5.21E-05	4.06E-11	D
trans-2-Octene	13389429	112	2.41E-01	1.1	8.13E-04	6.33E-10	D
trans-2-Pentene	646048	70	3.47E-02	0.1	7.32E-05	5.70E-11	D
trans-3-Methyl-2-pentene	616126	84	1.55E-02	0.1	3.92E-05	3.05E-11	D
Tribromomethane (Bromoform)	75252	253	1.24E-02	0.1	9.43E-05	7.34E-11	D
Trichloroethylene (Trichloroethene)	79016	131	8.28E-01	4.4	3.27E-03	2.55E-09	A
Trichlorofluoromethane (Freon 11)	91315616	137	2.48E-01	1.4	1.02E-03	7.97E-10	B
Trichloromethane (Chloroform)	67663	119	7.08E-02	0.3	2.54E-04	1.98E-10	A
Undecane	1120214	156	1.67E+00	10.7	7.85E-03	6.11E-09	D
Vinyl acetate	85306269	86	2.48E-01	0.9	6.42E-04	5.00E-10	C
Vinyl chloride (Chloroethene)	75014	63	1.42E+00	3.6	2.67E-03	2.08E-09	A
Xylenes (o-, m-, p-, mixtures)	1330207	106	9.23E+00	40.1	2.95E-02	2.29E-08	A
Total Reduced Sulphur Compounds	n/a	-	-	67.7	4.98E-02	3.88E-08	-

Table E3. Flares 1 and 2 - LFG Emissions - Stages 1 to 5 - Alternative 1 Scenario B

Combustible constituents of LFG will be combusted in the enclosed Flares 1 and 2 with a control efficiency of 98%. Residual LFG will be emitted.

Mercury and siloxanes are not combustible, so a control efficiency of 0% is assumed for these compounds.

Enclosed Flares	Quantity of LFG Combusted*	Control Efficiency
	m^3/s	%
Flare 1	0.19	98%
Flare 2	0.34	98%

* See Table E1 for calculation of quantity combusted.

The concentrations of constituents in LFG are based on AP-42, Table 2.4-1, AP-42, 2.4 Municipal Solid Waste Landfills, Draft Section - October 2008

Sample Calculation (1,1,1-Trichloroethane)

Concentration in LFG = Molecular Weight (g/mole) x Concentration (ppmv) / 24.45
= 133.4 (g/mole) x 0.243 (ppmv) / 24.45
= 1.33E+00 mg/m³

Emission Rate (Flare 1) = Quantity LFG Combusted (m³/s) x Concentration in LFG (mg/m³) x (1 - Control Efficiency) / 1000 (mg/g)
= 0.2 (m³/s) x 1.33 (mg/m³) x (1-0.98) /1000 (mg/g)
= 5.05E-06 g/s

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(%)	Flare 1	Flare 2	
1,1,1-Trichloroethane	71556	133.4	0.243	1.33	98%	5.1E-06	9.1E-06	A
1,1,2,2-Tetrachloroethane	79345	167.85	0.535	3.67	98%	1.4E-05	2.5E-05	E
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	260.76	0.00349	0.04	98%	1.4E-07	2.6E-07	D
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187.37	0.0672	0.51	98%	2.0E-06	3.5E-06	C
1,1,2-Trichloroethane	79005	133.4	0.158	0.86	98%	3.3E-06	5.9E-06	D
1,1-Dichloroethane	75343	98.96	2.08	8.42	98%	3.2E-05	5.8E-05	A
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	96.94	0.16	0.63	98%	2.4E-06	4.4E-06	A
1,2,3-Trimethylbenzene	526738	120.19	0.359	1.76	98%	6.7E-06	1.2E-05	D
1,2,4-Trichlorobenzene	120821	181.45	0.00551	0.04	98%	1.6E-07	2.8E-07	C
1,2,4-Trimethylbenzene	95636	120.19	1.37	6.73	98%	2.6E-05	4.6E-05	B
1,2-Dibromoethane (Ethylene dibromide)	106934	187.86	0.0048	0.04	98%	1.4E-07	2.5E-07	B
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	170.92	0.106	0.74	98%	2.8E-06	5.1E-06	B
1,2-Dichloroethane (Ethylene dichloride)	107062	98.96	0.159	0.64	98%	2.5E-06	4.4E-06	A
1,2-Dichloroethene	540590	96.94	11.4	45.20	98%	1.7E-04	3.1E-04	E
1,2-Dichloropropane	78875	112.99	0.052	0.24	98%	9.2E-07	1.6E-06	D
1,2-Diethylbenzene	135013	134.22	0.0199	0.11	98%	4.2E-07	7.5E-07	D
1,3,5-Trimethylbenzene	108678	120.19	0.623	3.06	98%	1.2E-05	2.1E-05	C
1,3-Butadiene (Vinyl ethylene)	106990	54.09	0.166	0.37	98%	1.4E-06	2.5E-06	C
1,3-Diethylbenzene	141935	134.22	0.0655	0.36	98%	1.4E-06	2.5E-06	D
1,4-Diethylbenzene	105055	134.22	0.262	1.44	98%	5.5E-06	9.9E-06	D
1,4-Dioxane (1,4-Diethylene dioxide)	123911	88.11	0.00829	0.03	98%	1.1E-07	2.0E-07	D
1-Butene	106989	56.11	1.22	2.80	98%	1.1E-05	1.9E-05	D
2-Methylbutene	513359	70.13	1.22	3.50	98%	1.3E-05	2.4E-05	D
1-Butene	106989	56.11	1.1	2.52	98%	9.6E-06	1.7E-05	E
2-Methylpropene	115117	56.11	1.1	2.52	98%	9.6E-06	1.7E-05	E
1-Ethyl-4-methylbenzene (4-Ethyl toluene)	622968	120.19	0.989	4.86	98%	1.9E-05	3.3E-05	C
1-Heptene	592767	98.19	0.625	2.51	98%	9.6E-06	1.7E-05	E
1-Hexene	592416	84.16	0.0888	0.31	98%	1.2E-06	2.1E-06	D
2-Methyl-1-pentene	763291	84.16	0.0888	0.31	98%	1.2E-06	2.1E-06	D
1-Methylcyclohexene	591491	96.17	0.0227	0.09	98%	3.4E-07	6.1E-07	D
1-Methylcyclopentene	693890	82.14	0.0252	0.08	98%	3.2E-07	5.8E-07	D
1-Pentene	109671	70.13	0.22	0.63	98%	2.4E-06	4.3E-06	D
1-Propanethiol (n-Propyl mercaptan)	107039	76.16	0.125	0.39	98%	1.5E-06	2.7E-06	D
2,2,3-Trimethylbutane	464062	100.2	0.00919	0.04	98%	1.4E-07	2.6E-07	D
2,2,4-Trimethylpentane	540841	114.23	0.614	2.87	98%	1.1E-05	2.0E-05	A
2,2,5-Trimethylhexane	3522949	128.26	0.156	0.82	98%	3.1E-06	5.6E-06	D
2,2-Dimethylbutane	75832	86.18	0.156	0.55	98%	2.1E-06	3.8E-06	D
2,2-Dimethylpentane	590352	100.2	0.0608	0.25	98%	9.5E-07	1.7E-06	D
2,2-Dimethylpropane	463821	72.15	0.0274	0.08	98%	3.1E-07	5.5E-07	D
2,3,4-Trimethylpentane	565753	114.23	0.312	1.46	98%	5.6E-06	1.0E-05	D
2,3-Dimethylbutane	79298	86.18	0.167	0.59	98%	2.2E-06	4.0E-06	E
2,3-Dimethylpentane	565593	100.2	0.31	1.27	98%	4.8E-06	8.7E-06	D
2,4-Dimethylhexane	589435	114.23	0.222	1.04	98%	4.0E-06	7.1E-06	D
2,4-Dimethylpentane	108087	100.2	0.1	0.41	98%	1.6E-06	2.8E-06	D
2,5-Dimethylhexane	592132	114.23	0.166	0.78	98%	3.0E-06	5.3E-06	D
2,5-Dimethylthiophene	638028	112.19	0.0644	0.30	98%	1.1E-06	2.0E-06	D

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(%)	Flare 1	Flare 2	
2-Butanone (Methyl ethyl ketone)	78933	72.11	4.01	11.83	98%	4.5E-05	8.1E-05	D
2-Ethyl-1-butene	760214	84.16	0.0177	0.06	98%	2.3E-07	4.2E-07	E
2-Ethylthiophene	872559	112.19	0.0629	0.29	98%	1.1E-06	2.0E-06	C
2-Ethyltoluene	611143	120.19	0.323	1.59	98%	6.1E-06	1.1E-05	D
2-Hexanone (Methyl butyl ketone)	591786	100.16	0.613	2.51	98%	9.6E-06	1.7E-05	E
2-Methyl-1-butene	563462	70.13	0.179	0.51	98%	2.0E-06	3.5E-06	D
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90.19	0.17	0.63	98%	2.4E-06	4.3E-06	E
2-Methyl-2-butene	513359	70.13	0.303	0.87	98%	3.3E-06	6.0E-06	D
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90.19	0.325	1.20	98%	4.6E-06	8.2E-06	E
2-Methylbutane	78784	72.15	2.26	6.67	98%	2.5E-05	4.6E-05	D
2-Methylheptane	592278	114.23	0.716	3.35	98%	1.3E-05	2.3E-05	D
2-Methylhexane	591764	100.2	0.816	3.34	98%	1.3E-05	2.3E-05	D
2-Methylpentane	107835	86.18	0.688	2.43	98%	9.2E-06	1.7E-05	D
2-Propanol (Isopropyl alcohol)	67630	60.1	1.8	4.42	98%	1.7E-05	3.0E-05	D
3,6-Dimethyloctane	15869940	142.28	0.785	4.57	98%	1.7E-05	3.1E-05	D
3-Ethyltoluene	620144	120.19	0.78	3.83	98%	1.5E-05	2.6E-05	D
3-Methyl-1-pentene	760203	84.16	0.00699	0.02	98%	9.2E-08	1.7E-07	D
3-Methylheptane	589811	114.23	0.763	3.56	98%	1.4E-05	2.4E-05	D
3-Methylhexane	589344	100.2	1.13	4.63	98%	1.8E-05	3.2E-05	D
3-Methylpentane	96140	86.18	0.74	2.61	98%	9.9E-06	1.8E-05	D
3-Methylthiophene	616444	98.17	0.0925	0.37	98%	1.4E-06	2.5E-06	E
4-Methyl-1-pentene	691372	84.16	0.0233	0.08	98%	3.1E-07	5.5E-07	E
4-Methyl-2-pentanone (MIBK)	108101	100.16	0.883	3.62	98%	1.4E-05	2.5E-05	C
4-Methylheptane	589537	114.23	0.249	1.16	98%	4.4E-06	8.0E-06	D
Acetaldehyde	75070	44.05	0.0774	0.14	98%	5.3E-07	9.6E-07	D
Acetone	67641	58.08	6.7	15.92	98%	6.1E-05	1.1E-04	C
Acetonitrile	75058	41.05	0.556	0.93	98%	3.6E-06	6.4E-06	A
Benzene	71432	78.11	2.4	7.67	98%	2.9E-05	5.3E-05	A
Benzyl chloride	100447	126.58	0.0181	0.09	98%	3.6E-07	6.4E-07	A
Bromodichloromethane	75274	163.83	0.00878	0.06	98%	2.2E-07	4.0E-07	E
Bromomethane (Methyl bromide)	74839	94.94	0.021	0.08	98%	3.1E-07	5.6E-07	C
Butane	106978	58.12	6.22	14.79	98%	5.6E-05	1.0E-04	C
Carbon disulfide	75150	76.14	0.147	0.46	98%	1.7E-06	3.1E-06	A
Carbon monoxide	630080	28.01	24.4	27.95	98%	1.1E-04	1.9E-04	C
Carbon tetrachloride	56235	153.82	0.00798	0.05	98%	1.9E-07	3.4E-07	A
Carbon tetrafluoride (Freon 14)	75730	88	0.151	0.54	98%	2.1E-06	3.7E-06	E
Carbonyl sulfide (Carbon oxysulfide)	463581	60.08	0.122	0.30	98%	1.1E-06	2.1E-06	A
Chlorobenzene	108907	112.56	0.484	2.23	98%	8.5E-06	1.5E-05	A
Chlorodifluoromethane (Freon 22)	75456	86.47	0.796	2.82	98%	1.1E-05	1.9E-05	D
Chloroethane (Ethyl chloride)	75003	64.51	3.95	10.42	98%	4.0E-05	7.1E-05	B
Chloromethane (Methyl chloride)	74873	50.49	0.244	0.50	98%	1.9E-06	3.5E-06	B
cis-1,2-Dichloroethene	156592	96.94	1.24	4.92	98%	1.9E-05	3.4E-05	B
cis-1,2-Dimethylcyclohexane	2207014	112.21	0.081	0.37	98%	1.4E-06	2.5E-06	D
cis-1,3-Dichloropropene	10061015	110.97	0.00303	0.01	98%	5.2E-08	9.4E-08	D
cis-1,3-Dimethylcyclohexane	638040	112.21	0.501	2.30	98%	8.8E-06	1.6E-05	D
cis-1,4-Dimethylcyclohexane	624293	112.21	0.248	1.14	98%	4.3E-06	7.8E-06	D
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	112.21	0.248	1.14	98%	4.3E-06	7.8E-06	D
cis-2-Butene	590181	56.11	0.105	0.24	98%	9.2E-07	1.7E-06	D
cis-2-Heptene	6443921	98.19	0.0245	0.10	98%	3.7E-07	6.7E-07	E
cis-2-Hexene	7688213	84.16	0.0172	0.06	98%	2.3E-07	4.1E-07	D
cis-2-Octene	7642048	112.21	0.22	1.01	98%	3.8E-06	6.9E-06	D
cis-2-Pentene	627203	70.13	0.0479	0.14	98%	5.2E-07	9.4E-07	D
cis-3-Methyl-2-pentene	922623	84.16	0.0179	0.06	98%	2.3E-07	4.2E-07	D
Cyclohexane	110827	84.16	1.01	3.48	98%	1.3E-05	2.4E-05	B
Cyclohexene	110838	82.14	0.0184	0.06	98%	2.4E-07	4.2E-07	D
Cyclopentane	287923	70.13	0.0221	0.06	98%	2.4E-07	4.3E-07	D
Cyclopentene	142290	68.12	0.0121	0.03	98%	1.3E-07	2.3E-07	D
Decane	124185	142.28	3.8	22.11	98%	8.4E-05	1.5E-04	D
Dibromochloromethane	124481	208.28	0.0151	0.13	98%	4.9E-07	8.8E-07	D
Dibromomethane (Methylene dibromide)	74953	173.84	0.000835	0.01	98%	2.3E-08	4.1E-08	E
Dichlorobenzene	106467	147	0.94	5.65	98%	2.2E-05	3.9E-05	A
Dichlorodifluoromethane (Freon 12)	75718	120.91	1.18	5.84	98%	2.2E-05	4.0E-05	B
Dichloromethane (Methylene chloride)	75092	84.93	6.15	21.36	98%	8.1E-05	1.5E-04	A
Diethyl sulfide	352932	90.19	0.0862	0.32	98%	1.2E-06	2.2E-06	E
Dimethyl disulfide	624920	94.2	0.137	0.53	98%	2.0E-06	3.6E-06	A
Dimethyl sulfide	75183	62.14	5.66	14.38	98%	5.5E-05	9.9E-05	A
Dodecane (n-Dodecane)	112403	170.33	0.221	1.54	98%	5.9E-06	1.1E-05	D
Ethane	74840	30.07	9.05	11.13	98%	4.2E-05	7.6E-05	D
Ethanol	64175	46.07	0.23	0.43	98%	1.7E-06	3.0E-06	D
Ethyl acetate	141786	88.11	1.88	6.77	98%	2.6E-05	4.6E-05	C
Ethyl mercaptan (Ethanediol)	75081	62.14	0.198	0.50	98%	1.9E-06	3.5E-06	A
Ethyl methyl sulfide	624895	76.16	0.0367	0.11	98%	4.4E-07	7.8E-07	E

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(%)	Flare 1	Flare 2	
Ethylbenzene	100414	106.17	4.86	21.10	98%	8.0E-05	1.4E-04	B
Formaldehyde	50000	30.03	0.0117	0.01	98%	5.5E-08	9.9E-08	D
Heptane	142825	100.2	1.34	5.49	98%	2.1E-05	3.8E-05	B
Hexane	110543	86.18	3.1	10.93	98%	4.2E-05	7.5E-05	B
Hydrogen sulfide	7783064	34.08	32	44.60	98%	1.7E-04	3.1E-04	A
Indane (2,3-Dihydroindene)	496117	34.08	0.0666	0.09	98%	3.5E-07	6.4E-07	D
Isobutane (2-Methylpropane)	75285	58.12	8.16	19.40	98%	7.4E-05	1.3E-04	D
Isobutylbenzene	538932	134.22	0.0407	0.22	98%	8.5E-07	1.5E-06	D
Isoprene (2-Methyl-1,3-butadiene)	78795	68.12	0.0165	0.05	98%	1.8E-07	3.2E-07	D
Isopropyl mercaptan	75332	76.16	0.175	0.55	98%	2.1E-06	3.7E-06	A
Isopropylbenzene (Cumene)	98828	120.19	0.43	2.11	98%	8.1E-06	1.4E-05	D
Mercury (total)	7439976	200.59	1.22E-04	1.00E-03	0%	1.9E-07	3.4E-07	B
Methanethiol (Methyl mercaptan)	74931	48.11	1.37	2.70	98%	1.0E-05	1.8E-05	A
Methyl tert-butyl ether (MTBE)	1634044	88.15	0.118	0.43	98%	1.6E-06	2.9E-06	D
Methylcyclohexane	108872	98.19	1.29	5.18	98%	2.0E-05	3.6E-05	D
Methylcyclopentane	96377	84.16	0.65	2.24	98%	8.5E-06	1.5E-05	D
Naphthalene	91203	128.17	0.107	0.56	98%	2.1E-06	3.8E-06	D
n-Butylbenzene	104518	134.22	0.068	0.37	98%	1.4E-06	2.6E-06	D
Nonane	111842	128.26	2.37	12.43	98%	4.7E-05	8.5E-05	D
n-Propylbenzene (Propylbenzene)	103651	120.19	0.413	2.03	98%	7.7E-06	1.4E-05	D
Octane	111659	114.23	1.08	5.05	98%	1.9E-05	3.5E-05	D
p-Cymene (1-Methyl-4-Isopropylbenzene)	99876	134.22	3.58	19.65	98%	7.5E-05	1.3E-04	D
Pentane	109660	72.15	4.46	13.16	98%	5.0E-05	9.0E-05	C
Propane	74986	44.1	15.5	27.96	98%	1.1E-04	1.9E-04	C
Propene	115071	42.08	3.32	5.71	98%	2.2E-05	3.9E-05	D
Propyne	74997	40.06	0.038	0.06	98%	2.4E-07	4.3E-07	E
sec-Butylbenzene	135988	134.22	0.0675	0.37	98%	1.4E-06	2.5E-06	D
Styrene (Vinylbenzene)	100425	104.15	0.411	1.75	98%	6.7E-06	1.2E-05	B
Tetrachloroethylene (Perchloroethylene)	127184	165.83	2.03	13.77	98%	5.2E-05	9.4E-05	A
Tetrahydrofuran (Diethylene oxide)	109999	72.11	0.969	2.86	98%	1.1E-05	2.0E-05	C
Thiophene	110021	84.14	0.349	1.20	98%	4.6E-06	8.2E-06	E
Toluene (Methyl benzene)	108883	92.14	29.5	111.17	98%	4.2E-04	7.6E-04	A
trans-1,2-Dichloroethene	156605	96.94	0.0287	0.11	98%	4.3E-07	7.8E-07	C
trans-1,2-Dimethylcyclohexane	6876239	112.21	0.404	1.85	98%	7.1E-06	1.3E-05	D
trans-1,3-Dichloropropene	10061026	110.97	0.00943	0.04	98%	1.6E-07	2.9E-07	D
trans-1,4-Dimethylcyclohexane	2207047	112.21	0.205	0.94	98%	3.6E-06	6.5E-06	D
trans-2-Butene	624646	56.11	0.104	0.24	98%	9.1E-07	1.6E-06	D
trans-2-Heptene	14686136	98.19	0.0025	0.01	98%	3.8E-08	6.9E-08	E
trans-2-Hexene	4050457	84.16	0.0206	0.07	98%	2.7E-07	4.9E-07	D
trans-2-Octene	13389429	112.21	0.241	1.11	98%	4.2E-06	7.6E-06	D
trans-2-Pentene	646048	70.13	0.0347	0.10	98%	3.8E-07	6.8E-07	D
trans-3-Methyl-2-pentene	616126	84.16	0.0155	0.05	98%	2.0E-07	3.7E-07	D
Tribromomethane (Bromoform)	75252	252.73	0.0124	0.13	98%	4.9E-07	8.8E-07	D
Trichloroethylene (Trichloroethene)	79016	131.39	0.828	4.45	98%	1.7E-05	3.1E-05	A
Trichlorofluoromethane (Freon 11)	91315616	137.37	0.248	1.39	98%	5.3E-06	9.6E-06	B
Trichloromethane (Chloroform)	67663	119.38	0.0708	0.35	98%	1.3E-06	2.4E-06	A
Undecane	1120214	156.31	1.67	10.68	98%	4.1E-05	7.3E-05	D
Vinyl acetate	85306269	86.09	0.248	0.87	98%	3.3E-06	6.0E-06	C
Vinyl chloride (Chloroethene)	75014	62.5	1.42	3.63	98%	1.4E-05	2.5E-05	A
Xylenes (o-, m-, p-, mixtures)	1330207	106.17	9.23	40.08	98%	1.5E-04	2.7E-04	A
Total Reduced Sulphur Compounds	n/a	-	-	67.7	98%	2.6E-04	4.6E-04	-

Table E3. Flares 1 and 2 - LFG Emissions - Stages 6 to 9 - Alternative 1 Scenario B

Combustible constituents of LFG will be combusted in the enclosed Flares 1 and 2 with a control efficiency of 98%. Residual LFG will be emitted.

Mercury and siloxanes are not combustible, so a control efficiency of 0% is assumed for these compounds.

Enclosed Flares	Quantity of LFG Combusted*	Control Efficiency
	m^3/s	%
Flare 1	0.61	98%
Flare 2	1.09	98%

* See Table E1 for calculation of quantity combusted.

The concentrations of constituents in LFG are based on AP-42, Table 2.4-1, AP-42, 2.4 Municipal Solid Waste Landfills, Draft Section - October 2008

Sample Calculation (1,1,1-Trichloroethane)

Concentration in LFG = Molecular Weight (g/mole) x Concentration (ppmv) / 24.45
= 133.4 (g/mole) x 0.243 (ppmv) / 24.45
= 1.33E+00 mg/m³

Emission Rate (Flare 1) = Quantity LFG Combusted (m³/s) x Concentration in LFG (mg/m³) x (1 - Control Efficiency) / 1000 (mg/g)
= 0.61 (m³/s) x 1.33 (mg/m³) x (1-0.98) /1000 (mg/g)
= 1.61E-05 g/s

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(%)	Flare 1	Flare 2	
1,1,1-Trichloroethane	71556	133.4	0.243	1.33	98%	1.6E-05	2.9E-05	A
1,1,2,2-Tetrachloroethane	79345	167.85	0.535	3.67	98%	4.4E-05	8.0E-05	E
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	260.76	0.00349	0.04	98%	4.5E-07	8.1E-07	D
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187.37	0.0672	0.51	98%	6.2E-06	1.1E-05	C
1,1,2-Trichloroethane	79005	133.4	0.158	0.86	98%	1.0E-05	1.9E-05	D
1,1-Dichloroethane	75343	98.96	2.08	8.42	98%	1.0E-04	1.8E-04	A
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	96.94	0.16	0.63	98%	7.7E-06	1.4E-05	A
1,2,3-Trimethylbenzene	526738	120.19	0.359	1.76	98%	2.1E-05	3.8E-05	D
1,2,4-Trichlorobenzene	120821	181.45	0.00551	0.04	98%	5.0E-07	8.9E-07	C
1,2,4-Trimethylbenzene	95636	120.19	1.37	6.73	98%	8.2E-05	1.5E-04	B
1,2-Dibromoethane (Ethylene dibromide)	106934	187.86	0.0048	0.04	98%	4.5E-07	8.0E-07	B
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	170.92	0.106	0.74	98%	9.0E-06	1.6E-05	B
1,2-Dichloroethane (Ethylene dichloride)	107062	98.96	0.159	0.64	98%	7.8E-06	1.4E-05	A
1,2-Dichloroethene	540590	96.94	11.4	45.20	98%	5.5E-04	9.9E-04	E
1,2-Dichloropropane	78875	112.99	0.052	0.24	98%	2.9E-06	5.2E-06	D
1,2-Diethylbenzene	135013	134.22	0.0199	0.11	98%	1.3E-06	2.4E-06	D
1,3,5-Trimethylbenzene	108678	120.19	0.623	3.06	98%	3.7E-05	6.7E-05	C
1,3-Butadiene (Vinyl ethylene)	106990	54.09	0.166	0.37	98%	4.4E-06	8.0E-06	C
1,3-Diethylbenzene	141935	134.22	0.0655	0.36	98%	4.4E-06	7.8E-06	D
1,4-Diethylbenzene	105055	134.22	0.262	1.44	98%	1.7E-05	3.1E-05	D
1,4-Dioxane (1,4-Diethylene dioxide)	123911	88.11	0.00829	0.03	98%	3.6E-07	6.5E-07	D
1-Butene	106989	56.11	1.22	2.80	98%	3.4E-05	6.1E-05	D
2-Methylbutene	513359	70.13	1.22	3.50	98%	4.2E-05	7.6E-05	D
1-Butene	106989	56.11	1.1	2.52	98%	3.1E-05	5.5E-05	E
2-Methylpropene	115117	56.11	1.1	2.52	98%	3.1E-05	5.5E-05	E
1-Ethyl-4-methylbenzene (4-Ethyl toluene)	622968	120.19	0.989	4.86	98%	5.9E-05	1.1E-04	C
1-Heptene	592767	98.19	0.625	2.51	98%	3.0E-05	5.5E-05	E
1-Hexene	592416	84.16	0.0888	0.31	98%	3.7E-06	6.7E-06	D
2-Methyl-1-pentene	763291	84.16	0.0888	0.31	98%	3.7E-06	6.7E-06	D
1-Methylcyclohexene	591491	96.17	0.0227	0.09	98%	1.1E-06	1.9E-06	D
1-Methylcyclopentene	693890	82.14	0.0252	0.08	98%	1.0E-06	1.8E-06	D
1-Pentene	109671	70.13	0.22	0.63	98%	7.6E-06	1.4E-05	D
1-Propanethiol (n-Propyl mercaptan)	107039	76.16	0.125	0.39	98%	4.7E-06	8.5E-06	D
2,2,3-Trimethylbutane	464062	100.2	0.00919	0.04	98%	4.6E-07	8.2E-07	D
2,2,4-Trimethylpentane	540841	114.23	0.614	2.87	98%	3.5E-05	6.3E-05	A
2,2,5-Trimethylhexane	3522949	128.26	0.156	0.82	98%	9.9E-06	1.8E-05	D
2,2-Dimethylbutane	75832	86.18	0.156	0.55	98%	6.7E-06	1.2E-05	D
2,2-Dimethylpentane	590352	100.2	0.0608	0.25	98%	3.0E-06	5.4E-06	D
2,2-Dimethylpropane	463821	72.15	0.0274	0.08	98%	9.8E-07	1.8E-06	D
2,3,4-Trimethylpentane	565753	114.23	0.312	1.46	98%	1.8E-05	3.2E-05	D
2,3-Dimethylbutane	79298	86.18	0.167	0.59	98%	7.1E-06	1.3E-05	E
2,3-Dimethylpentane	565593	100.2	0.31	1.27	98%	1.5E-05	2.8E-05	D
2,4-Dimethylhexane	589435	114.23	0.222	1.04	98%	1.3E-05	2.3E-05	D
2,4-Dimethylpentane	108087	100.2	0.1	0.41	98%	5.0E-06	8.9E-06	D
2,5-Dimethylhexane	592132	114.23	0.166	0.78	98%	9.4E-06	1.7E-05	D
2,5-Dimethylthiophene	638028	112.19	0.0644	0.30	98%	3.6E-06	6.4E-06	D

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(%)	Flare 1	Flare 2	
2-Butanone (Methyl ethyl ketone)	78933	72.11	4.01	11.83	98%	1.4E-04	2.6E-04	D
2-Ethyl-1-butene	760214	84.16	0.0177	0.06	98%	7.4E-07	1.3E-06	E
2-Ethylthiophene	872559	112.19	0.0629	0.29	98%	3.5E-06	6.3E-06	C
2-Ethyltoluene	611143	120.19	0.323	1.59	98%	1.9E-05	3.5E-05	D
2-Hexanone (Methyl butyl ketone)	591786	100.16	0.613	2.51	98%	3.0E-05	5.5E-05	E
2-Methyl-1-butene	563462	70.13	0.179	0.51	98%	6.2E-06	1.1E-05	D
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90.19	0.17	0.63	98%	7.6E-06	1.4E-05	E
2-Methyl-2-butene	513359	70.13	0.303	0.87	98%	1.1E-05	1.9E-05	D
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90.19	0.325	1.20	98%	1.5E-05	2.6E-05	E
2-Methylbutane	78784	72.15	2.26	6.67	98%	8.1E-05	1.5E-04	D
2-Methylheptane	592278	114.23	0.716	3.35	98%	4.1E-05	7.3E-05	D
2-Methylhexane	591764	100.2	0.816	3.34	98%	4.1E-05	7.3E-05	D
2-Methylpentane	107835	86.18	0.688	2.43	98%	2.9E-05	5.3E-05	D
2-Propanol (Isopropyl alcohol)	67630	60.1	1.8	4.42	98%	5.4E-05	9.6E-05	D
3,6-Dimethyloctane	15869940	142.28	0.785	4.57	98%	5.5E-05	1.0E-04	D
3-Ethyltoluene	620144	120.19	0.78	3.83	98%	4.6E-05	8.4E-05	D
3-Methyl-1-pentene	760203	84.16	0.00699	0.02	98%	2.9E-07	5.2E-07	D
3-Methylheptane	589811	114.23	0.763	3.56	98%	4.3E-05	7.8E-05	D
3-Methylhexane	589344	100.2	1.13	4.63	98%	5.6E-05	1.0E-04	D
3-Methylpentane	96140	86.18	0.74	2.61	98%	3.2E-05	5.7E-05	D
3-Methylthiophene	616444	98.17	0.0925	0.37	98%	4.5E-06	8.1E-06	E
4-Methyl-1-pentene	691372	84.16	0.0233	0.08	98%	9.7E-07	1.7E-06	E
4-Methyl-2-pentanone (MIBK)	108101	100.16	0.883	3.62	98%	4.4E-05	7.9E-05	C
4-Methylheptane	589537	114.23	0.249	1.16	98%	1.4E-05	2.5E-05	D
Acetaldehyde	75070	44.05	0.0774	0.14	98%	1.7E-06	3.0E-06	D
Acetone	67641	58.08	6.7	15.92	98%	1.9E-04	3.5E-04	C
Acetonitrile	75058	41.05	0.556	0.93	98%	1.1E-05	2.0E-05	A
Benzene	71432	78.11	2.4	7.67	98%	9.3E-05	1.7E-04	A
Benzyl chloride	100447	126.58	0.0181	0.09	98%	1.1E-06	2.0E-06	A
Bromodichloromethane	75274	163.83	0.00878	0.06	98%	7.1E-07	1.3E-06	E
Bromomethane (Methyl bromide)	74839	94.94	0.021	0.08	98%	9.9E-07	1.8E-06	C
Butane	106978	58.12	6.22	14.79	98%	1.8E-04	3.2E-04	C
Carbon disulfide	75150	76.14	0.147	0.46	98%	5.5E-06	1.0E-05	A
Carbon monoxide	630080	28.01	24.4	27.95	98%	3.4E-04	6.1E-04	C
Carbon tetrachloride	56235	153.82	0.00798	0.05	98%	6.1E-07	1.1E-06	A
Carbon tetrafluoride (Freon 14)	75730	88	0.151	0.54	98%	6.6E-06	1.2E-05	E
Carbonyl sulfide (Carbon oxysulfide)	463581	60.08	0.122	0.30	98%	3.6E-06	6.5E-06	A
Chlorobenzene	108907	112.56	0.484	2.23	98%	2.7E-05	4.9E-05	A
Chlorodifluoromethane (Freon 22)	75456	86.47	0.796	2.82	98%	3.4E-05	6.1E-05	D
Chloroethane (Ethyl chloride)	75003	64.51	3.95	10.42	98%	1.3E-04	2.3E-04	B
Chloromethane (Methyl chloride)	74873	50.49	0.244	0.50	98%	6.1E-06	1.1E-05	B
cis-1,2-Dichloroethene	156592	96.94	1.24	4.92	98%	6.0E-05	1.1E-04	B
cis-1,2-Dimethylcyclohexane	2207014	112.21	0.081	0.37	98%	4.5E-06	8.1E-06	D
cis-1,3-Dichloropropene	10061015	110.97	0.00303	0.01	98%	1.7E-07	3.0E-07	D
cis-1,3-Dimethylcyclohexane	638040	112.21	0.501	2.30	98%	2.8E-05	5.0E-05	D
cis-1,4-Dimethylcyclohexane	624293	112.21	0.248	1.14	98%	1.4E-05	2.5E-05	D
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	112.21	0.248	1.14	98%	1.4E-05	2.5E-05	D
cis-2-Butene	590181	56.11	0.105	0.24	98%	2.9E-06	5.3E-06	D
cis-2-Heptene	6443921	98.19	0.0245	0.10	98%	1.2E-06	2.1E-06	E
cis-2-Hexene	7688213	84.16	0.0172	0.06	98%	7.2E-07	1.3E-06	D
cis-2-Octene	7642048	112.21	0.22	1.01	98%	1.2E-05	2.2E-05	D
cis-2-Pentene	627203	70.13	0.0479	0.14	98%	1.7E-06	3.0E-06	D
cis-3-Methyl-2-pentene	922623	84.16	0.0179	0.06	98%	7.5E-07	1.3E-06	D
Cyclohexane	110827	84.16	1.01	3.48	98%	4.2E-05	7.6E-05	B
Cyclohexene	110838	82.14	0.0184	0.06	98%	7.5E-07	1.3E-06	D
Cyclopentane	287923	70.13	0.0221	0.06	98%	7.7E-07	1.4E-06	D
Cyclopentene	142290	68.12	0.0121	0.03	98%	4.1E-07	7.4E-07	D
Decane	124185	142.28	3.8	22.11	98%	2.7E-04	4.8E-04	D
Dibromochloromethane	124481	208.28	0.0151	0.13	98%	1.6E-06	2.8E-06	D
Dibromomethane (Methylene dibromide)	74953	173.84	0.000835	0.01	98%	7.2E-08	1.3E-07	E
Dichlorobenzene	106467	147	0.94	5.65	98%	6.8E-05	1.2E-04	A
Dichlorodifluoromethane (Freon 12)	75718	120.91	1.18	5.84	98%	7.1E-05	1.3E-04	B
Dichloromethane (Methylene chloride)	75092	84.93	6.15	21.36	98%	2.6E-04	4.7E-04	A
Diethyl sulfide	352932	90.19	0.0862	0.32	98%	3.9E-06	6.9E-06	E
Dimethyl disulfide	624920	94.2	0.137	0.53	98%	6.4E-06	1.2E-05	A
Dimethyl sulfide	75183	62.14	5.66	14.38	98%	1.7E-04	3.1E-04	A
Dodecane (n-Dodecane)	112403	170.33	0.221	1.54	98%	1.9E-05	3.4E-05	D
Ethane	74840	30.07	9.05	11.13	98%	1.3E-04	2.4E-04	D
Ethanol	64175	46.07	0.23	0.43	98%	5.3E-06	9.5E-06	D
Ethyl acetate	141786	88.11	1.88	6.77	98%	8.2E-05	1.5E-04	C
Ethyl mercaptan (Ethanediol)	75081	62.14	0.198	0.50	98%	6.1E-06	1.1E-05	A
Ethyl methyl sulfide	624895	76.16	0.0367	0.11	98%	1.4E-06	2.5E-06	E

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(%)	Flare 1	Flare 2	
Ethylbenzene	100414	106.17	4.86	21.10	98%	2.6E-04	4.6E-04	B
Formaldehyde	50000	30.03	0.0117	0.01	98%	1.7E-07	3.1E-07	D
Heptane	142825	100.2	1.34	5.49	98%	6.7E-05	1.2E-04	B
Hexane	110543	86.18	3.1	10.93	98%	1.3E-04	2.4E-04	B
Hydrogen sulfide	7783064	34.08	32	44.60	98%	5.4E-04	9.7E-04	A
Indane (2,3-Dihydroindene)	496117	34.08	0.0666	0.09	98%	1.1E-06	2.0E-06	D
Isobutane (2-Methylpropane)	75285	58.12	8.16	19.40	98%	2.3E-04	4.2E-04	D
Isobutylbenzene	538932	134.22	0.0407	0.22	98%	2.7E-06	4.9E-06	D
Isoprene (2-Methyl-1,3-butadiene)	78795	68.12	0.0165	0.05	98%	5.6E-07	1.0E-06	D
Isopropyl mercaptan	75332	76.16	0.175	0.55	98%	6.6E-06	1.2E-05	A
Isopropylbenzene (Cumene)	98828	120.19	0.43	2.11	98%	2.6E-05	4.6E-05	D
Mercury (total)	7439976	200.59	1.22E-04	1.00E-03	0%	6.1E-07	1.1E-06	B
Methanethiol (Methyl mercaptan)	74931	48.11	1.37	2.70	98%	3.3E-05	5.9E-05	A
Methyl tert-butyl ether (MTBE)	1634044	88.15	0.118	0.43	98%	5.2E-06	9.3E-06	D
Methylcyclohexane	108872	98.19	1.29	5.18	98%	6.3E-05	1.1E-04	D
Methylcyclopentane	96377	84.16	0.65	2.24	98%	2.7E-05	4.9E-05	D
Naphthalene	91203	128.17	0.107	0.56	98%	6.8E-06	1.2E-05	D
n-Butylbenzene	104518	134.22	0.068	0.37	98%	4.5E-06	8.1E-06	D
Nonane	111842	128.26	2.37	12.43	98%	1.5E-04	2.7E-04	D
n-Propylbenzene (Propylbenzene)	103651	120.19	0.413	2.03	98%	2.5E-05	4.4E-05	D
Octane	111659	114.23	1.08	5.05	98%	6.1E-05	1.1E-04	D
p-Cymene (1-Methyl-4-Isopropylbenzene)	99876	134.22	3.58	19.65	98%	2.4E-04	4.3E-04	D
Pentane	109660	72.15	4.46	13.16	98%	1.6E-04	2.9E-04	C
Propane	74986	44.1	15.5	27.96	98%	3.4E-04	6.1E-04	C
Propene	115071	42.08	3.32	5.71	98%	6.9E-05	1.2E-04	D
Propyne	74997	40.06	0.038	0.06	98%	7.5E-07	1.4E-06	E
sec-Butylbenzene	135988	134.22	0.0675	0.37	98%	4.5E-06	8.1E-06	D
Styrene (Vinylbenzene)	100425	104.15	0.411	1.75	98%	2.1E-05	3.8E-05	B
Tetrachloroethylene (Perchloroethylene)	127184	165.83	2.03	13.77	98%	1.7E-04	3.0E-04	A
Tetrahydrofuran (Diethylene oxide)	109999	72.11	0.969	2.86	98%	3.5E-05	6.2E-05	C
Thiophene	110021	84.14	0.349	1.20	98%	1.5E-05	2.6E-05	E
Toluene (Methyl benzene)	108883	92.14	29.5	111.17	98%	1.3E-03	2.4E-03	A
trans-1,2-Dichloroethene	156605	96.94	0.0287	0.11	98%	1.4E-06	2.5E-06	C
trans-1,2-Dimethylcyclohexane	6876239	112.21	0.404	1.85	98%	2.2E-05	4.0E-05	D
trans-1,3-Dichloropropene	10061026	110.97	0.00943	0.04	98%	5.2E-07	9.3E-07	D
trans-1,4-Dimethylcyclohexane	2207047	112.21	0.205	0.94	98%	1.1E-05	2.1E-05	D
trans-2-Butene	624646	56.11	0.104	0.24	98%	2.9E-06	5.2E-06	D
trans-2-Heptene	14686136	98.19	0.0025	0.01	98%	1.2E-07	2.2E-07	E
trans-2-Hexene	4050457	84.16	0.0206	0.07	98%	8.6E-07	1.5E-06	D
trans-2-Octene	13389429	112.21	0.241	1.11	98%	1.3E-05	2.4E-05	D
trans-2-Pentene	646048	70.13	0.0347	0.10	98%	1.2E-06	2.2E-06	D
trans-3-Methyl-2-pentene	616126	84.16	0.0155	0.05	98%	6.5E-07	1.2E-06	D
Tribromomethane (Bromoform)	75252	252.73	0.0124	0.13	98%	1.6E-06	2.8E-06	D
Trichloroethylene (Trichloroethene)	79016	131.39	0.828	4.45	98%	5.4E-05	9.7E-05	A
Trichlorofluoromethane (Freon 11)	91315616	137.37	0.248	1.39	98%	1.7E-05	3.0E-05	B
Trichloromethane (Chloroform)	67663	119.38	0.0708	0.35	98%	4.2E-06	7.5E-06	A
Undecane	1120214	156.31	1.67	10.68	98%	1.3E-04	2.3E-04	D
Vinyl acetate	85306269	86.09	0.248	0.87	98%	1.1E-05	1.9E-05	C
Vinyl chloride (Chloroethene)	75014	62.5	1.42	3.63	98%	4.4E-05	7.9E-05	A
Xylenes (o-, m-, p-, mixtures)	1330207	106.17	9.23	40.08	98%	4.9E-04	8.7E-04	A
Total Reduced Sulphur Compounds	n/a	-	-	67.7	98%	8.2E-04	1.5E-03	-

Table E4. Flares and Engines - Products of Combustion - Stages 1 to 5 - Alternative 1 Scenario B

Emissions of products of combustion were estimated based on emission factors given in Table 2.4-4, US EPA AP-42, 2.4 Municipal Solid Waste Landfills, 11/98, and the assumption that LFG is 50% methane (CH4).

Emissions of combustion gases from the siloxane flare (Flare 3) were deemed negligible because it represents less than 5% of combustion capacity.

Emissions of sulphur dioxide and hydrogen chloride were based on mass balance and the assumption that all sulphur and chlorine in LFG are converted to these compounds.

LFG Combustion Rate

Combustion Sources	LFG Combusted[1] (m³/s)	CH4 Fraction in LFG	CH4 Combusted (m³/s)	Percent of Total	Significant? (Yes or No)[2]
Engines (Gen1 to Gen 4) - Total	0.16	50%	0.08	22%	Yes
Flare 1	0.19	50%	0.10	26%	Yes
Flare 2	0.34	50%	0.17	48%	Yes
Flare 3 (Siloxane Flare)	0.029	50%	0.015	4%	No
Total	0.72		0.36		

1 See Table E1 for calculation of quantity combusted.

2. Sources that are Insignificant Relative to Total Emissions per section 7.2.2 of ESDM guidance document.

Emission Factors - US EPA AP-42, Table 2.4-4

Contaminant	CAS No.	IC Engines		Flares		Emission Factor Rating
		kg/10^6 dscm of CH_4	g/m³ of CH4	kg/10^6 dscm of CH_4	g/m³ of CH4	
Nitrogen Dioxide	10102-44-0	4000	4	650	0.65	C
Particulate Matter	N/A	770	0.77	270	0.27	D
Carbon Monoxide	630-08-0	7500	7.5	12000	12.00	C

No data on PM size distribution is provided in AP-42, Table 2.4-4; however, based on other gas-fired combustion sources, it is expected that most of the particulate matter is less than 2.5 microns. As such, it was assumed that PM=PM10=PM2.5

Emission rates - US EPA AP-42, Table 2.4-4

Contaminant	CAS No.	Emission Rate (g/s)		
		Engines	Flare 1	Flare 2
Nitrogen Dioxide	10102-44-0	0.31	0.062	0.111
Particulate Matter	N/A	0.061	0.03	0.05
Particulate Matter (PM10)	N/A	0.061	0.03	0.05
Particulate Matter (PM2.5)	N/A	0.061	0.03	0.05
Carbon Monoxide	630-08-0	0.59	1.14	2.06

Sample Calculation: (Particulate Matter, Engines)

PM Emission Rate = CH4 Combusted in Engines (m³/s) * Emission Factor for IC Engines (g/m³ of CH4)

= 0.32 (m³/s) x 0.232 (g/m³ of CH4)

= 0.06058918 (g/s)

Sulphur Dioxide Emission Factor (assumes all sulphur in LFG converts to sulphur dioxide)

Molecular Weight (MW) of Sulphur (S) = 32.1 g/mole

MW of Sulphur Dioxide (SO2) = 64.1 g/mole

Sulphur Concentration in LFG

Contaminant	**CAS No.**	**MW of Contaminant**	**Conc. Of Contaminant in LFG (mg/m^3)**	**No. of S per molecule**	**Conc. of S in LFG (mg/m^3)**
1-Propanethiol (n-Propyl mercaptan)	107-03-9	76.16	3.89E-01	1	0.16
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90.19	6.27E-01	1	0.22
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90.19	1.20E+00	1	0.43
Carbon disulfide	75150	76.14	4.57E-01	2	0.38
Carbonyl sulfide (Carbon oxysulfide)	463581	60.08	3.00E-01	1	0.16
Diethyl sulfide	352932	90.19	3.18E-01	1	0.11
Dimethyl disulfide	624920	94.2	5.27E-01	2	0.36
Dimethyl sulfide	75183	62.14	1.44E+01	1	7.40
Ethyl mercaptan (Ethanediol)	75081	62.14	5.03E-01	1	0.26
Ethyl methyl sulfide	624895	76.16	1.14E-01	1	0.05
Hydrogen sulfide	7783064	34.08	4.46E+01	1	41.85
Isopropyl mercaptan	75332	76.16	5.45E-01	1	0.23
Methanethiol (Methyl mercaptan)	74931	48.11	2.69E+00	1	1.79
				Total Sulphur Concentration in LFG	**53**

If all S is converted to SO2, the quantity of SO2 generated is:

SO2 Emission Factor = S concentration (mg/m³ of LFG combusted) x MW of SO2 / MW (g/mole) of S (g/mole)

= 53.4 (mg/m³ of LFG combusted) x 64.1 (g/mole) / 32.1 (g/mole)

= 106.7 mg/m³ of LFG combusted

Hydrogen Chloride Emission Factor (assumes all sulphur in LFG converts to sulphur dioxide)

Molecular Weight (MW) of chlorine (Cl) = 35.5 g/mole

MW of hydrogen chloride (HCl) = 36.5 g/mole

Chlorine Concentration in LFG

Contaminant	CAS No.	MW of Contaminant	Conc. Of Contaminant in LFG (mg/m^3)	No of Cl	Cl content (mg/m^3)
1,1,1-Trichloroethane	71556	133.4	1.32E+00	3	1.06
1,1,2,2-Tetrachloroethane	79345	167.85	3.67E+00	4	3.10
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	260.76	3.72E-02	6	0.03
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187.37	5.15E-01	3	0.29
1,1,2-Trichloroethane	79005	133.4	8.61E-01	3	0.69
1,1-Dichloroethane	75343	98.96	8.41E+00	2	6.03
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	96.94	6.34E-01	2	0.46
1,2,4-Trichlorobenzene	120821	181.45	4.09E-02	3	0.02
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	170.92	7.40E-01	2	0.31
1,2-Dichloroethane (Ethylene dichloride)	107062	98.96	6.43E-01	2	0.46
1,2-Dichloroethene	540590	96.94	4.52E+01	2	33.04
1,2-Dichloropropane	78875	112.99	2.40E-01	2	0.15
Bromodichloromethane	75274	163.83	5.88E-02	1	0.01
Chlorobenzene	108907	112.56	2.23E+00	1	0.70
Chlorodifluoromethane (Freon 22)	75456	86.47	2.81E+00	1	1.15
Chloroethane (Ethyl chloride)	75003	64.51	1.04E+01	1	5.72
Chloromethane (Methyl chloride)	74873	50.49	5.04E-01	1	0.35
cis-1,2-Dichloroethene	156592	96.94	4.91E+00	2	3.59
cis-1,3-Dichloropropene	10061015	110.97	1.37E-02	2	0.01
Dibromochloromethane	124481	208.28	1.29E-01	2	0.04
Dichlorobenzene	106467	147	5.65E+00	2	2.72
Dichlorodifluoromethane (Freon 12)	75718	120.91	5.83E+00	2	3.42
Dichloromethane (Methylene chloride)	75092	84.93	2.13E+01	2	17.82
Tetrachloroethylene (Perchloroethylene)	127184	165.83	1.38E+01	4	11.77
trans-1,2-Dichloroethene	156605	96.94	1.14E-01	2	0.08
trans-1,3-Dichloropropene	10061026	110.97	4.28E-02	2	0.03
Trichloroethylene (Trichloroethene)	79016	131.39	4.45E+00	3	3.60
Trichlorofluoromethane (Freon 11)	91315616	137.37	1.39E+00	3	1.08
Trichloromethane (Chloroform)	67-66-3	119.38	3.45E-01	3	0.31
Vinyl chloride (Chloroethene)	75014	62.5	3.63E+00	1	2.06
				Total chlorine concentration in LFG	**100**

If all Cl is converted to HCl, the quantity of HCL generated is:

HCL Emission Factor = Cl concentration (mg/m³ of LFG combusted) x MW of HCl / MW (g/mole) of Cl (g/mole)

= 100.1 (mg/m³ of LFG combusted) x 36.2 (g/mole) / 35.5 (g/mole)

= 103.0 mg/m³ of LFG combusted

Emission Rates - SO2, HCl

Contaminant	CAS No.	Emission Factor (mg/m³ of LFG)	Emission Rate (g/s)		
			Engines	Flare 1	Flare 2
Sulfur Dioxide	7446-09-05	106.7	1.68E-02	2.03E-02	3.66E-02
Hydogen Chloride	7647-01-0	103.0	1.62E-02	1.96E-02	3.53E-02

Sample Calculation: (Sulphur dioxide, Engines)

SO2 Emission Rate = LFG combusted in Engines (m³/s) * SO2 Emission Factor (mg/m³ of LFG) / 1000 (mg/g)

= 0.64 (m³/s) x 106.7 (mg/m³ of LFG) / 1000 (mg/g)

= 0.0168 (g/s)

Table E4. Flares and Engines - Products of Combustion - Stages 6 to 9 - Alternative 1 Scenario B

Emissions of products of combustion were estimated based on emission factors given in Table 2.4-4, US EPA AP-42, 2.4 Municipal Solid Waste Landfills, 11/98, and the assumption that LFG is 50% methane (CH4).

Emissions of combustion gases from the siloxane flare (Flare 3) were deemed negligible because it represents less than 5% of combustion capacity.

Emissions of sulphur dioxide and hydrogen chloride were based on mass balance and the assumption that all sulphur and chlorine in LFG are converted to these compounds.

LFG Combustion Rate

Combustion Sources	LFG Combusted[1] (m³/s)	CH4 Fraction in LFG	CH4 Combusted (m³/s)	Percent of Total	Significant? (Yes or No)[2]
Engines (Gen1 to Gen 4) - Total	0.48	50%	0.24	22%	Yes
Flare 1	0.61	50%	0.30	27%	Yes
Flare 2	1.09	50%	0.55	49%	Yes
Flare 3 (Siloxane Flare)	0.029	50%	0.015	1%	No
Total	2.21		1.10		

1 See Table E1 for calculation of quantity combusted.

2. Sources that are Insignificant Relative to Total Emissions per section 7.2.2 of ESDM guidance document.

Emission Factors - US EPA AP-42, Table 2.4-4

Contaminant	CAS No.	IC Engines		Flares		Emission Factor Rating
		kg/10^6 dscm of CH_4	g/m³ of CH4	kg/10^6 dscm of CH_4	g/m³ of CH4	
Nitrogen Dioxide	10102-44-0	4000	4	650	0.65	C
Particulate Matter	N/A	770	0.77	270	0.27	D
Carbon Monoxide	630-08-0	7500	7.5	12000	12.00	C

No data on PM size distribution is provided in AP-42, Table 2.4-4; however, based on other gas-fired combustion sources, it is expected that most of the particulate matter is less than 2.5 microns. As such, it was assumed that PM=PM10=PM2.5

Emission rates - US EPA AP-42, Table 2.4-4

Contaminant	CAS No.	Emission Rate (g/s)		
		Engines	Flare 1	Flare 2
Nitrogen Dioxide	10102-44-0	0.97	0.197	0.354
Particulate Matter	N/A	0.186	0.08	0.15
Particulate Matter (PM10)	N/A	0.186	0.08	0.15
Particulate Matter (PM2.5)	N/A	0.186	0.08	0.15
Carbon Monoxide	630-08-0	1.81	3.63	6.54

Sample Calculation: (Particulate Matter, Engines)

PM Emission Rate = CH4 Combusted in Engines (m³/s) * Emission Factor for IC Engines (g/m³ of CH4)

= 0.32 (m³/s) x 0.232 (g/m³ of CH4)

= 0.18581082 (g/s)

Sulphur Dioxide Emission Factor (assumes all sulphur in LFG converts to sulphur dioxide)

Molecular Weight (MW) of Sulphur (S) = 32.1 g/mole

MW of Sulphur Dioxide (SO2) = 64.1 g/mole

Sulphur Concentration in LFG

Contaminant	**CAS No.**	**MW of Contaminant**	**Conc. Of Contaminant in LFG (mg/m^3)**	**No. of S per molecule**	**Conc. of S in LFG (mg/m^3)**
1-Propanethiol (n-Propyl mercaptan)	107-03-9	76.16	3.89E-01	1	0.16
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90.19	6.27E-01	1	0.22
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90.19	1.20E+00	1	0.43
Carbon disulfide	75150	76.14	4.57E-01	2	0.38
Carbonyl sulfide (Carbon oxysulfide)	463581	60.08	3.00E-01	1	0.16
Diethyl sulfide	352932	90.19	3.18E-01	1	0.11
Dimethyl disulfide	624920	94.2	5.27E-01	2	0.36
Dimethyl sulfide	75183	62.14	1.44E+01	1	7.40
Ethyl mercaptan (Ethanediol)	75081	62.14	5.03E-01	1	0.26
Ethyl methyl sulfide	624895	76.16	1.14E-01	1	0.05
Hydrogen sulfide	7783064	34.08	4.46E+01	1	41.85
Isopropyl mercaptan	75332	76.16	5.45E-01	1	0.23
Methanethiol (Methyl mercaptan)	74931	48.11	2.69E+00	1	1.79
				Total Sulphur Concentration in LFG	**53**

If all S is converted to SO2, the quantity of SO2 generated is:

SO2 Emission Factor = S concentration (mg/m^3 of LFG combusted) x MW of SO2 / MW (g/mole) of S (g/mole)

= 53.4 (mg/m^3 of LFG combusted) x 64.1 (g/mole) / 32.1 (g/mole)

= 106.7 mg/m^3 of LFG combusted

Hydrogen Chloride Emission Factor (assumes all sulphur in LFG converts to sulphur dioxide)

Molecular Weight (MW) of chlorine (Cl) = 35.5 g/mole

MW of hydrogen chloride (HCl) = 36.5 g/mole

Chlorine Concentration in LFG

Contaminant	CAS No.	MW of Contaminant	Conc. Of Contaminant in LFG (mg/m^3)	No of Cl	Cl content (mg/m^3)
1,1,1-Trichloroethane	71556	133.4	1.32E+00	3	1.06
1,1,2,2-Tetrachloroethane	79345	167.85	3.67E+00	4	3.10
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	260.76	3.72E-02	6	0.03
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187.37	5.15E-01	3	0.29
1,1,2-Trichloroethane	79005	133.4	8.61E-01	3	0.69
1,1-Dichloroethane	75343	98.96	8.41E+00	2	6.03
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	96.94	6.34E-01	2	0.46
1,2,4-Trichlorobenzene	120821	181.45	4.09E-02	3	0.02
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	170.92	7.40E-01	2	0.31
1,2-Dichloroethane (Ethylene dichloride)	107062	98.96	6.43E-01	2	0.46
1,2-Dichloroethene	540590	96.94	4.52E+01	2	33.04
1,2-Dichloropropane	78875	112.99	2.40E-01	2	0.15
Bromodichloromethane	75274	163.83	5.88E-02	1	0.01
Chlorobenzene	108907	112.56	2.23E+00	1	0.70
Chlorodifluoromethane (Freon 22)	75456	86.47	2.81E+00	1	1.15
Chloroethane (Ethyl chloride)	75003	64.51	1.04E+01	1	5.72
Chloromethane (Methyl chloride)	74873	50.49	5.04E-01	1	0.35
cis-1,2-Dichloroethene	156592	96.94	4.91E+00	2	3.59
cis-1,3-Dichloropropene	10061015	110.97	1.37E-02	2	0.01
Dibromochloromethane	124481	208.28	1.29E-01	2	0.04
Dichlorobenzene	106467	147	5.65E+00	2	2.72
Dichlorodifluoromethane (Freon 12)	75718	120.91	5.83E+00	2	3.42
Dichloromethane (Methylene chloride)	75092	84.93	2.13E+01	2	17.82
Tetrachloroethylene (Perchloroethylene)	127184	165.83	1.38E+01	4	11.77
trans-1,2-Dichloroethene	156605	96.94	1.14E-01	2	0.08
trans-1,3-Dichloropropene	10061026	110.97	4.28E-02	2	0.03
Trichloroethylene (Trichloroethene)	79016	131.39	4.45E+00	3	3.60
Trichlorofluoromethane (Freon 11)	91315616	137.37	1.39E+00	3	1.08
Trichloromethane (Chloroform)	67-66-3	119.38	3.45E-01	3	0.31
Vinyl chloride (Chloroethene)	75014	62.5	3.63E+00	1	2.06
				Total chlorine concentration in LFG	**100**

If all Cl is converted to HCl, the quantity of HCL generated is:

HCL Emission Factor = Cl concentration (mg/m³ of LFG combusted) x MW of HCl / MW (g/mole) of Cl (g/mole)

= 100.1 (mg/m³ of LFG combusted) x 36.2 (g/mole) / 35.5 (g/mole)

= 103.0 mg/m³ of LFG combusted

Emission Rates - SO2, HCl

Contaminant	CAS No.	Emission Factor (mg/m³ of LFG)	Emission Rate (g/s)		
			Engines	Flare 1	Flare 2
Sulfur Dioxide	7446-09-05	106.7	5.15E-02	6.46E-02	1.16E-01
Hydrogen Chloride	7647-01-0	103.0	4.97E-02	6.24E-02	1.12E-01

Sample Calculation: (Sulphur dioxide, Engines)

SO2 Emission Rate = LFG combusted in Engines (m³/s) * SO2 Emission Factor (mg/m³ of LFG) / 1000 (mg/g)

= 0.64 (m³/s) x 106.7 (mg/m³ of LFG) / 1000 (mg/g)

= 0.0515 (g/s)

Table E5. Siloxanes for Stages 1 to 5 - Alternative 1 Scenario B

Siloxanes are trace constituents in LFG that are essentially non-combustable, and are not controlled through combustion in flares. Siloxanes have the potential to damage engines, and are removed from the LFG fuel stream to the the engines and purged to the siloxane flare (Flare 3). Thus, all silozanes in LGF are emitted uncontrolled, through Flares 1 to 3, or as fugitive emissions from the landfill surface.

Siloxane Emission Sources	**LFG Release or Use Rate (m^3/s)**
Stg1 to Stg5 (fugitive)	0.24
Flare 1	0.02
Flare 2	0.03
Flare 3 (Siloxane Flare) - includes engines	0.19
Total	0.5

* See Table E1 for calculation of quantity combusted.

Contaminant	**CAS No.**	**Conc. in LFG mg/m³**	**Emission Rate (g/s)**			
			Stg 1 to 5 (fugitive)	**Flare 1**	**Flare 2**	**Flare 3**
Tetramethylsilane	75-76-3	0.001	2.4E-07	1.9E-08	3.5E-08	1.9E-07
Hexamethyldisiloxane	107-46-0	2.114	5.1E-04	4.1E-05	7.4E-05	3.9E-04
Octamethyltrisiloxane	107-51-7	0.22	5.3E-05	4.3E-06	7.7E-06	4.1E-05
Decamethyltetrasiloxane	141-62-8	0.027	6.5E-06	5.2E-07	9.4E-07	5.0E-06
Dodecamethylpentasiloxane	141-63-9	0.029	7.0E-06	5.6E-07	1.0E-06	5.4E-06
Trimethylsilyl Fluoride	420-56-4	0.546	1.3E-04	1.1E-05	1.9E-05	1.0E-04
Dodecamethylcyclohexasiloxane	540-97-6	0.029	7.0E-06	5.6E-07	1.0E-06	5.4E-06
Decamethylcyclopentasiloxane	541-02-6	4.264	1.0E-03	8.3E-05	1.5E-04	7.9E-04
Hexamethyltricyclosiloxane	541-05-9	0.528	1.3E-04	1.0E-05	1.8E-05	9.8E-05
Octamethylcyclotetrasiloxane	556-67-2	8.739	2.1E-03	1.7E-04	3.0E-04	1.6E-03
Trimethylsilanol	1066-40-6	10.521	2.5E-03	2.0E-04	3.7E-04	2.0E-03
Methoxytrimethylsilane	1825-61-2	0.351	8.4E-05	6.8E-06	1.2E-05	6.5E-05
Ethoxytrimethylsilane	1825-62-3	0.203	4.9E-05	3.9E-06	7.1E-06	3.8E-05
Propoxytrimethylsilane	1825-63-4	0.158	3.8E-05	3.1E-06	5.5E-06	2.9E-05
Isopropoxytrimethylsilane	1825-64-5	0.181	4.3E-05	3.5E-06	6.3E-06	3.4E-05
Butoxytrimethylsilane	1825-65-6	0.09	2.2E-05	1.7E-06	3.1E-06	1.7E-05
1-methylbutoxytrimethylsilane	1825-67-8	0.192	4.6E-05	3.7E-06	6.7E-06	3.6E-05

Sample Calculation: (Tetramethylsilane, Flare 1)

PM Emission Rate = LFG Use in Flare 1 (m^3/s) * Concentration in LFG (mg/m^3 of LFG) / 1000 (mg/g)
= 0.02 (m^3/s) x 0.001 (mg/m^3 of LFG) / 1000 (mg/g)
= 1.94E-08 (g/s)

Note:
1. Siloxane concentrations were measured by OBS Labs, 2011.

Table E5.   Siloxanes for Stages 6 to 9 - Alternative 1 Scenario B

Siloxanes are trace constituents in LFG that are essentially non-combustable, and are not controlled through combustion in flares. Siloxanes have the potential to damage engines, and are removed from the LFG fuel stream to the the engines and purged to the siloxane flare (Flare 3). Thus, all silozanes in LGF are emitted uncontrolled, through Flares 1 to 3, or as fugitive emissions from the landfill surface.

Siloxane Emission Sources	**LFG Release or Use Rate (m^3/s)**
Stg6 to Stg9 (fugitive)	0.74
Flare 1	0.55
Flare 2	0.99
Flare 3 (Siloxane Flare) - includes engines	0.51
Total	2.8

* See Table E1 for calculation of quantity combusted.

Contaminant	**CAS No.**	**Conc. in LFG mg/m^3**	**Emission Rate (g/s)**			
			Stg 6 to 9 (fugitive)	**Flare 1**	**Flare 2**	**Flare 3**
Tetramethylsilane	75-76-3	0.001	7.4E-07	5.5E-07	9.9E-07	5.1E-07
Hexamethyldisiloxane	107-46-0	2.114	1.6E-03	1.2E-03	2.1E-03	1.1E-03
Octamethyltrisiloxane	107-51-7	0.22	1.6E-04	1.2E-04	2.2E-04	1.1E-04
Decamethyltetrasiloxane	141-62-8	0.027	2.0E-05	1.5E-05	2.7E-05	1.4E-05
Dodecamethylpentasiloxane	141-63-9	0.029	2.1E-05	1.6E-05	2.9E-05	1.5E-05
Trimethylsilyl Fluoride	420-56-4	0.546	4.0E-04	3.0E-04	5.4E-04	2.8E-04
Dodecamethylcyclohexasiloxane	540-97-6	0.029	2.1E-05	1.6E-05	2.9E-05	1.5E-05
Decamethylcyclopentasiloxane	541-02-6	4.264	3.1E-03	2.3E-03	4.2E-03	2.2E-03
Hexamethyltricyclosiloxane	541-05-9	0.528	3.9E-04	2.9E-04	5.2E-04	2.7E-04
Octamethylcyclotetrasiloxane	556-67-2	8.739	6.4E-03	4.8E-03	8.7E-03	4.5E-03
Trimethylsilanol	1066-40-6	10.521	7.7E-03	5.8E-03	1.0E-02	5.4E-03
Methoxytrimethylsilane	1825-61-2	0.351	2.6E-04	1.9E-04	3.5E-04	1.8E-04
Ethoxytrimethylsilane	1825-62-3	0.203	1.5E-04	1.1E-04	2.0E-04	1.0E-04
Propoxytrimethylsilane	1825-63-4	0.158	1.2E-04	8.7E-05	1.6E-04	8.1E-05
Isopropoxytrimethylsilane	1825-64-5	0.181	1.3E-04	1.0E-04	1.8E-04	9.3E-05
Butoxytrimethylsilane	1825-65-6	0.09	6.6E-05	5.0E-05	8.9E-05	4.6E-05
1-methylbutoxytrimethylsilane	1825-67-8	0.192	1.4E-04	1.1E-04	1.9E-04	9.8E-05

Sample Calculation: (Tetramethylsilane, Flare 1)

PM Emission Rate = LFG Use in Flare 1 (m^3/s) * Concentration in LFG (mg/m^3 of LFG) / 1000 (mg/g)

= 0.56 (m^3/s) x 0.001 (mg/m^3 of LFG) / 1000 (mg/g)

= 5.51E-07 (g/s)

Note:
1. Siloxane concentrations were measured by OBS Labs, 2011.

Table E6. Tailpipe Emissions from Non-Road Mobile Equipment

Tailpipe emissions from non-road mobile equipment were based on US EPA Tier 1 to 4 Nonroad Diesel Engine Standards and load factors from the US EPA NONROAD model. Speciation of VOC and NMHC was estimated based on Speciation Profiles and Toxic Emission Factors for Nonroad Diesel Engines (MOVES2014b document). All PM (TSP) was assumed to be entirely PM10. PM2.5 was assumed to be same fraction of PM10 as calculated from On-Road mobile emissions (Table E8).

Emission Rate (g/s) = Power × LF × EF x 1hr/3600 s
where: Power = Rated Power (hp)
LF = Load Factor (dimensionless) from NONROAD model.
EF = Emission Factor (g/hp-hr) from nonroad diesel emission standards

Source ID : LFG_NROAD (Equipment mainly associated with landfilling activities)

Equipment[1]	Tier [2]	Fuel Rate (gal/day)	Engine HP	Cycle Load Factors[2]	Emission Factors (g/hp-hr)[3]			Emission Rates (g/s)- 1hr avg				
					CO	NOx	PM	CO	NOx	PM	PM10	PM2.5
JD Excavator	4	33	140	0.53	3.7	0.3	0.015	0.08	0.01	0.0003	0.0003	0.0001
JD 844K Loader	4	55	380	0.48	2.6	0.3	0.015	0.13	0.02	0.0008	0.0008	0.0004
JD 644K Loader	4	44	232	0.48	2.6	0.3	0.015	0.08	0.01	0.0005	0.0005	0.0002
JD 250D rock truck	4	44	265	0.59	2.6	0.3	0.015	0.11	0.01	0.0007	0.0007	0.0003
JD 1050K Bulldozer	4	88	350	0.59	2.6	0.3	0.015	0.15	0.02	0.0009	0.0009	0.0004
Aljon 600 compactor	4	220	600	0.59	2.6	0.3	0.015	0.26	0.03	0.0015	0.0015	0.0007
Aljon 960 compactor	4	154	500	0.59	2.6	0.3	0.015	0.21	0.02	0.0012	0.0012	0.0006
Volvo A25D rock truck	4	44	310	0.59	2.6	0.3	0.015	0.13	0.02	0.0008	0.0008	0.0004
Caterpillar D6N Bulldozer	4	33	150	0.59	2.6	0.3	0.015	0.06	0.01	0.0004	0.0004	0.0002
Cat 725 rock truck	4	44	325	0.59	2.6	0.3	0.015	0.14	0.02	0.0008	0.0008	0.0004
							Total	**1.35**	**0.15**	**0.008**	**0.008**	**0.004**

Source ID : COMPOST_NROAD (Equipment mainly associated with raw material and compost handling)

Equipment[1]	Tier [2]	Fuel Rate (gal/day)	Engine HP	Cycle Load Factors[2]	Emission Factors (g/hp-hr)[3]			Emission Rates (g/s)- 1hr avg				
					CO	NOx	PM	CO	NOx	PM	PM10	PM2.5
Vermeer 6000 grinder	4	141	600	0.59	2.6	0.3	0.015	0.26	0.030	0.0015	0.0015	0.0007
Komptech top turn	4	94	400	0.59	2.6	0.3	0.015	0.17	0.020	0.0010	0.0010	0.0005
John Deer 544k loader	4	42	180	0.48	2.6	0.3	0.015	0.06	0.007	0.0004	0.0004	0.0002
John Deer 544k loader	4	42	180	0.48	2.6	0.3	0.015	0.06	0.007	0.0004	0.0004	0.0002
John Deer 444k loader	4	33	140	0.48	2.6	0.3	0.015	0.05	0.006	0.0003	0.0003	0.0001
Cat 938 loader	4	47	200	0.48	2.6	0.3	0.015	0.07	0.008	0.0004	0.0004	0.0002
Freightliner dump truck	4	94	400	0.59	2.6	0.3	0.015	0.17	0.020	0.0010	0.0010	0.0005
Mack dump truck	4	106	450	0.59	2.6	0.3	0.015	0.19	0.022	0.0011	0.0011	0.0005
International dump truck	4	118	500	0.59	2.6	0.3	0.015	0.21	0.025	0.0012	0.0012	0.0006
International dump truck	4	112	475	0.59	2.6	0.3	0.015	0.20	0.023	0.0012	0.0012	0.0006
Western Star tractor	4	94	400	0.59	2.6	0.3	0.015	0.17	0.020	0.0010	0.0010	0.0005
Western Star dump truck	4	94	400	0.59	2.6	0.3	0.015	0.17	0.020	0.0010	0.0010	0.0005
							Total	**1.79**	**0.21**	**0.010**	**0.010**	**0.005**

Note:

1 The information regarding type of equipment, model year, engine size, operating hour, and fuel rate was provided by GFL, by email dated January 5,

2 The cycle load factors were obtained from the EPA document, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling (NR-005d)

3 Tier standard number and emission factors for NMHC, nitrogen oxide, and particulate matter were obtained from United States: Nonroad Diesel Engines, available at: https://dieselnet.com/standards/us/nonroad.php

4 Emission factor for Non-Methane Hydrocarbons (NMHC), nitrogen oxide, and particulate matter were obtained from Tier 4 emission standards—Engines up to 560 kW, available at: https://dieselnet.com/standards/us/nonroad.php

Table E7. Emissions from On-site Truck Traffic - Road Dust - Alternative 1 Scenario B

Emissions of road dust from on-site truck traffic were estimated based emisison factors obtained from US EPA AP-42, Section 13.2.1 Paved Roads and Section 13.2.2 Unpaved Roads. The detailed calculations are shown below.

Trucking occurs over a 12 hour operating period each day. Dust is controlled through watering and sweeping of paved roads, watering and other dust suppression on unpaved roads, and use of coarse gravel on haul roads.

Emission factors based on US EPA AP-42, Section 13.2.1 Paved Roads and Section 13.2.2 Unpaved Roads

Number of Trucks	200	trucks/day	
Mean Vehicle Weight	25.0	tonnes/truck	data received from GFL in 2020

GFL has indicated that the site entrance and main onsite road network is paved.

Road Segment Traffic:

Source ID	Length (m)	No. Trucks	Condition
Unpaved_Road	0	200	Unpaved
Paved_Road	4743.8	200	Paved

Emission Factors:

For vehicles traveling on unpaved surfaces at industrial sites, emissions are estimated from the following equation

$E = k\ (s/12)^a \times (W/3)^b$ Industrial Roads (Equation 1a)

size-specific emission factor (E)		lb/VMT (multiply by 281.9 to convert to g/VKT)	
surface material silt content (s)	4.8	%	Table 13.2.2-1, Avg. silt content for Sand and Gravel Processing
mean vehicle weight (W)	27.5	short ton	
surface material moisture content (M)	6.5	%	Table 13.2.2-3, midpoint of range of source conditions
constants (k, a, b)	see below		

For vehicles traveling on paved surfaces, emissions are estimated from the following equation

$E = k \times (sL)^{0.91} \times (W)^{1.02}$

Road surface silt loading (sL)	8.2	g/m^2	Table 13.2.1-3, AP-42
Particle size multiplier (k)	see below		

Unpaved - Industrial Roads - AP-42, 13.2.2			
Constant	PM	PM_{10}	$PM_{2.5}$
k (lb/VMT)	4.9	1.5	0.15
a	0.7	0.9	0.9
b	0.45	0.45	0.45

Paved Roads (Equation 1a) - AP-42, 13.2.1			
	PM	PM_{10}	$PM_{2.5}$
k (lb/VMT)	0.011	0.0022	0.00054

Emission Factors (E) converted to g/VKT

Emission Source	Road Type	EF Ref.	PM	PM_{10}	$PM_{2.5}$	Units	Controls	Control Efficiency (%)
Unpaved_Road	Unpaved Road	AP-42, 13.2.2	1971	502	50	g/VKT	controlled	75
Paved_Road	Paved Road	AP-42, 13.2.1	618	124	30	g/VKT	controlled	75

* VKT = Vehicle Kilometers Traveled

Emission Rates

Source ID	Road Length (km)	Trucks per Hour	Emission Rates (g/s, 1-hour average)		
			PM	PM_{10}	$PM_{2.5}$
Unpaved_Road	0.0	17	0.0	0.00	0.000
Paved_Road	4.7	17	3.39	0.679	0.167
Total			3.4	0.68	0.167

Table E8. Emissions from On-site Truck Traffic - Tail Pipe - Alternative 1 Scenario B

Tailpipe emissions from highway truck traffic on on-site roads were estimated based on emission factors from the US EPA MOVES2014b model. Speciation profiles of on road diesel exhaust from MOVES Onroad Technical Reports document were used to estimate the emission rates of individual pollutants. Daily traffic and activities occur over the 11 hour period 6:30am to 6:30pm. The detailed calculations are shown below.

Highway Truck Traffic

Number of Trucks	200	trucks/day	this will occur over 11 hours
Total travel distance on-site (km)	6	km	

Road Segment Traffic:

Source ID	Length (m)	Trucks / day	Paved or Unpaved?
Unpaved_Road	0	200	Unpaved
Paved_Road	4743.8	200	Paved

Emission Factors:

The Emission Factors for VOC, PM and NOx were obtained from MOVES2014b model, inventory run for nation region, aggregated all road types and 2021 calendar year. All PM (TSP) was assumed to be PM10.

Emission Factors (E) converted to g/VKT

Emission Source	EF Ref.	PM	PM_{10}	$PM_{2.5}$	NOx	CO	Units
Unpaved_Road	MOVES 2014b Master	1.52E-01	1.52E-01	7.40E-02	1.95E+00	6.12E-01	g/VKT
Paved_Road	MOVES 2014b Master	1.52E-01	1.52E-01	7.40E-02	1.95E+00	6.12E-01	g/VKT

* VKT = Vehicle Kilometers Traveled

Emission Rates

Source ID	Road Length (km)	Trucks per Hour	Emission Rates (g/s, 1-hour average)				
			PM	PM_{10}	$PM_{2.5}$	NOx	CO
Unpaved_Road	0.0	18	0.0000	0.0000	0.0000	0.0000	0.0000
Paved_Road	4.7	18	0.0037	0.0037	0.0018	0.0468	0.0147
		Total	**0.0037**	**0.0037**	**0.0018**	**0.047**	**0.015**

Table E9. Emissions from Working and Construction - Dust

Dust is generated during dumping and handling of waste and cover at the working face, and dumping and handling of construction materials on cells under construction. Dust emissions were estimated from US EPA AP-42, Chapters 13.2.4, Aggregate Handling and Storage Piles, and 11.9 Western Surface Coal Mining.

Quantity of materials Handled

Misc. Fill (Waste materials)			
Unloading rate	3,100	Mg/day	
Operating hours	12	hr/day	
Waste Unloading rate (Misc. Fill)	**0.07**	Mg/s	
Cover:			
Cover rate	310	Mg/day	assuming a 10:1 ratio for waste:cover
Cover Application hours	1	hr/day	
Cover materials- movement rate:	**0.09**	Mg/s	
Clay (Construction materials):			
soil density	1700	kg/m3	
Bucket size	1	m3	
Bucket load	1700	kg	
lifts/min	2	lifts/min	
operating hours	8	hr/day	
Clay movement rate	1632	Mg/day	
Clay movement rate	**0.06**	Mg/s	assumes 30 s/lift; 8 hr/day of continuous work

a) Emissions from material drop (unloading) activities:

E = emission factor (kg/tonnes)

k = particle size multiplier (dimensionless) < 30 μm =	0.74	AP-42 13.2.4
k = particle size multiplier (dimensionless) < 10 μm =	0.35	AP-42 13.2.4
k = particle size multiplier (dimensionless) < 2.5 μm =	0.05	AP-42 13.2.4
U = mean wind speed, meters per second (m/s) =	5	regional wind speed

M = material moisture content (%)

$$E = k\,(0.0016) \times \frac{(\frac{U}{2.2})^{1.3}}{(M * 0.5)^{1.4}}$$

Typical moisture contents were obtained from Table 13.2.4-1, Municipal solid waste landfill industries, AP-42, Chapter 13.2.4 Aggregate Handling And Storage Piles. Misc. Fill materials and Clay/Dirt Mix were selected to represent landfill waste materials and construction materials,

Unloading Material		**Moisture Content %**	**EF (kg/Mg)**			**Rating**	**Reference**
			PM	**PM 10**	**PM 2.5**		
			k= 0.74	**k= 0.35**	**k= 0.053**		
Waste (Misc. Fill materials)	Working Face	11.00	3.16E-04	1.50E-04	2.27E-05	A	AP-42 13.2.4
Cover	Working Face	12.00	2.80E-04	1.33E-04	2.01E-05	A	AP-42 13.2.4
Construction Material (Clay/Dirt Mix)	Construction	14.00	2.26E-04	1.07E-04	1.62E-05	A	AP-42 13.2.4

* source: AP-42, Chapter 13.2.4 Aggregate Handling And Storage Piles . Available at: https://www3.epa.gov/ttn/chief/ap42/ch13/final/c13s0204.pdf

Source Description		**Material Movement Rate (Mg/s)**	**Emission Rate (g/s)- 1 hour average**		
			PM	**PM 10**	**PM 2.5**
Unloading Waste materials (Misc. Fill)	Working Face	0.07	0.023	0.011	0.002
Unloading Cover materials (Cover)	Working Face	0.09	0.024	0.011	0.002
Unloading Construction materials (Clay/D	Construction	0.06	0.013	0.006	0.001
		Total	0.060	0.028	0.004

b) Emissions from Bulldozing,Compacting and Construction

Emission factors for bulldozing/compacting and construction activities are estimated using Table 11.9-2 of AP 42, bulldozing of overburden.

		reference:
EF= emission factor of TSP (kg/hr/vehicle)		AP 42 11.9
M = material moisture content (%)		AP-42 13.2.4
S = silt content (%)		AP-42 13.2.4
Scaling factor for PM10	0.75	AP 42 11.9
Scaling factor for PM2.5	0.105	AP 42 11.9

$$EF_{TSP} = 2.6 \times S^{1.2}/M^{1.3}$$

Source Description	Silt Content %	Moisture Content %	EF (kg/hr)	EF (kg/hr)	EF (kg/hr)	Rating	Reference
			PM	PM10	PM2.5		
Bulldozing/Compacting of Waste (Misc. Fi	12	11.00	2.27	1.70	0.24	B,D,D	AP 42 11.9
Bulldozing/Compacting of Cover	9	12.00	1.44	1.08	0.15	B,D,D	AP 42 11.9
Construction of Clay/Dirt Mix	9.2	14.00	1.21	0.90	0.13	B,D,D	AP 42 11.9

* source : AP 42 11.9 Western Surface Coal Mining (epa.gov)

Source Description		Emission Rate (g/s)		
		PM	PM10	PM2.5
Bulldozing/Compacting of Waste (Misc. Fi	Working Face	0.631	0.473	0.066
Bulldozing/Compacting of Cover	Working Face	0.399	0.299	0.042
Construction of Clay/Dirt Mix	Construction	0.335	0.251	0.035
Total		1.365	1.024	0.143

c) Total Emissions from Material Handling (a + b)

Source ID	Source Description		PM Emission Rate (g/s)		
			PM	PM10	PM2.5
Working Face	Waste Materials	Working Face	0.653	0.484	0.068
	Cover	Working Face	0.423	0.311	0.044
	Construction Materials (clay)	Construction	0.348	0.257	0.036
		Total	**1.424**	**1.052**	**0.148**

AP42 13.2.4 Aggregate Handling And Storage Piles (epa.gov)
AP 42 11.9 Western Surface Coal Mining (epa.gov)

Table E12. Landfill - Odour

Odour results from handling and placement of fresh waste, and from fugitive emissions of LFG

Odour from LFG

Fugitive, uncontrolled emissions of LFG contribute to odour. Odour emissions due to LFG are estimated based on the Interim Guide to Estimate and Assess Landfill Air Impacts (MOE 1992) default odour emission factor of 10,000 ou/m³ of landfill gas.

Fugitive LFG Emission Rate	0.98	m³/s, See Table E1 for calculation
Odour Emission Factor	10,000	ou/m³ of LFG

Source	Odour Emission Rate (ou/s)
Landfill (Stg1 to Stg4)	**9,759**

Sample Calculation: (LFG)

Emission Rate = LFG Emission Rate (m³/s) x Emission Factor (ou/m³ of LFG)
= 0.98 m³/s x 10,000 (ou/m³)
= 9,759 (ou/s)

Odour from Working Face

Tipping, spreading and compaction of fresh waste contributes to odour emissions. On any given day, the area of exposed fresh waste is relatively small, and estimated at about 3,200m². Estimates of odour emissions from the working face were based on measurements of odour flux from the literature with respect to municipal landfills.

Source	Subject of Measurements	Odour Flux ou/s/m²
Sironi et al. (2005)	freshly tipped waste	59
Longhurst, P. (2007)	freshly tipped refuse	2
Environmental Alliances Pty (2015)	active tipping area	35.6
Card, T.R. et al. (2015)	active face	0.58
	Geometric mean	7.0

* Longhurst reported a range of 1 to 4 ou/s/m²

Near final completion of the landfill (~2045), the working face will be on Cells 1 and 2 of Stage 9 of the landfill.

Emission Source	Approx. Working Area m²	Odour Flux ou/s/m²	Odour Emission Rate ou/s
Working Face	**3,200**	**7.0**	**22,514**

Sample Calculation: (Working Face)

Emission Rate = Exposed Working Area (m²) x Odour Flux (ou/s/m²)
= 3,200 (m²) x 7.0 (ou/s/m²)
= 22,514 (ou/s)

Table E13. Composting Process - Biofilter

Composting of organics generates significant odour emissions. Composting at the facility is done entirely within the compost plant, a closed building maintained under negative pressure. All exhaust from the building is treated in a biofilter for odour control.

Odour emission rate from the biofilter was measured during a compliance source test program in 2010 (Envirosolve Report No. E10004).

An expansion of the plant in 2012 essentially doubled the capacity of the facility. Assuming that odour generated is proportional to production rate, and that odour removal efficiency remains constant, odour emission rate should also double.

Emission Source		**Gas Flow Rate**[1]	**Measured Odour Emission Rate**[2] **(2010)**	**Estimated Odour Emission Rate (post 2012)**
Source	**Cell or Bed**			
		m^3/s	ou/s	ou/s
Biofilter	BF1	17.5	302	603
	BF2	17.5	302	603
	BF3	17.5	302	603
	Total	52.4	905	1,810

References:
1. Rated flow rates provided by GFL via email on 2019-06-17.
2. Odour concentrations from measurements (Envirosolve Reort No. E10004, 2010).

Table E14. Compost Curing - Odour

Compost is cured in windrows on the the compost curing pad. Odour emissions are highest when compost is fresh, and falls off as the compost is cured. Emissions are also affected by seasonal temperature. Measurements of odour flux were made on three windrows by Consumage in March (winter) and June (summer), 2019. For the modelling assessment, odour fluxes for spring and fall were interpolated using the measured data.

Odour Flux

	Seasonal Odour Flux (ou/s/m³)			
Data source	Measurements	Interpolation	Measurements	Interpolation
Season	Winter	Spring	Summer	Fall
Months	Dec, Jan, Feb	Mar, Apr, May	Jun, July, Aug	Sept, Oct, Nov
Compost age				
Fresh	0.98	15.74	30.49	15.74
1 week old	0.28	4.71	9.15	4.71
3 months old	0.24	0.83	1.42	0.83

Storage piles (typical):	Number of windrows:	12	
	Windrow length:	75	m
	Windrow width:	4.5	m
	Windrow height:	2	m
	Effective surface area of each windrow:	450	m²
	Total effective surface area of all windrows	5,399	m²

Curing Odour Emission Rate: Winter

Windrow	**Age** weeks	**Odour Flux** ou/s/m²	**Interpolated Odour Flux** ou/s/m²	**Windrow Surface Area** m²	**Emission Rate** ou/s
1	0 (fresh)	0.98		450	441
2	1	0.28		450	124
3	2		0.27	450	122
4	3		0.27	450	121
5	4		0.26	450	119
6	5		0.26	450	117
7	6		0.26	450	116
8	7		0.25	450	114
9	8		0.25	450	113
10	9		0.25	450	111
11	10		0.24	450	110
12	11	0.24		450	108
				Total Winter Emission Rate from Curing	**1,715**

Curing Odour Emission Rate: Spring

Windrow	Age weeks	Odour Flux ou/s/m²	Interpolated Odour Flux ou/s/m²	Windrow Surface Area m²	Emission Rate ou/s
1	0 (fresh)	15.74		450	7,079
2	1	4.71		450	2,121
3	2		4.33	450	1,946
4	3		3.94	450	1,771
5	4		3.55	450	1,597
6	5		3.16	450	1,422
7	6		2.77	450	1,247
8	7		2.38	450	1,072
9	8		1.99	450	897
10	9		1.61	450	722
11	10		1.22	450	548
12	11	0.83		450	373
				Total Spring Emission Rate from Curing	**20,794**

Curing Odour Emission Rate: Summer

Windrow	Age weeks	Odour Flux ou/s/m²	Interpolated Odour Flux ou/s/m²	Windrow Surface Area m²	Emission Rate ou/s
1	0 (fresh)	30.49		450	13,717
2	1	9.15		450	4,118
3	2		8.38	450	3,770
4	3		7.61	450	3,422
5	4		6.83	450	3,074
6	5		6.06	450	2,726
7	6		5.29	450	2,378
8	7		4.51	450	2,030
9	8		3.74	450	1,682
10	9		2.96	450	1,334
11	10		2.19	450	986
12	11	1.42		450	637
				Total Summer Emission Rate from Curing	**39,874**

Curing Odour Emission Rate: Fall

Windrow	Age weeks	Odour Flux ou/s/m²	Interpolated Odour Flux ou/s/m²	Windrow Surface Area m²	Emission Rate ou/s
1	0 (fresh)	15.74		450	7,079
2	1	4.71		450	2,121
3	2		4.33	450	1,946
4	3		3.94	450	1,771
5	4		3.55	450	1,597
6	5		3.16	450	1,422
7	6		2.77	450	1,247
8	7		2.38	450	1,072
9	8		1.99	450	897
10	9		1.61	450	722
11	10		1.22	450	548
12	11	0.83		450	373
				Total Fall Emission Rate from Curing	**20,794**

Table E15. Leaf & Yard Waste Stockpiles - Odour

Leaf & yard waste is used as a bulking agent in compost, and is stockpiled outdoors until needed. With age, the stockpiles of organic materials can produce odour. Odour from undisturbed surfaces is low, but odour from freshly disturbed surfaces can be higher. Odour can also be affected by seasonal temperature. Odour flux from undisturbed and freshly disturbed surfaces of the stockpiles was measured by Consumage in March (winter) and June (summer), 2019. For the modelling assessment, odour fluxes for spring and fall were interpolated using the measured data.

Odour Flux

	Seasonal Odour Flux (ou/s/m²)			
Data source	Measurements	Interpolation	Measurements	Interpolation
Seasons	Winter	Spring	Summer	Fall
Months	Dec, Jan, Feb	Mar, Apr, May	Jun, July, Aug	Sept, Oct, Nov
Stockpile surface				
Undisturbed surface	0.52	0.45	0.37	0.45
Freshly disturbed surface	1.31	21.18	41.0	21.18

At time of measurement, there were six stockpiles, each 140m x 8m x 4m high. Of the total surface area, only a small area of fresh surface would be exposed.

Stockpiles piles (typical):	Number of piles:	6	
	Pile length:	140	m
	Pile width:	8	m
	Pile height:	4	m
	Effective surface area per pile:	2,240	m²
	Total surface area of all piles:	13,440	m²
	Total freshly opened surface area:	210	m²

Odour Emission Rate: Winter

Source	Surface Area of Piles m²	Odour Flux ou/s/m²	Total Odour Emission Rate ou/s	Individual Pile Odour Emission Rate ou/s
Freshly disturbed surface	13,440	0.52	7,002	1,167
Undisturbed surface	210	1.31	274	46
Total Winter Emission Rate from Stockpiles			**7,277**	**1,213**

Odour Emission Rate: Spring

Source	Surface Area of Piles m²	Odour Flux ou/s/m²	Total Odour Emission Rate ou/s	Individual Pile Odour Emission Rate ou/s
Freshly disturbed surface	13,440	0.45	5,988	998
Undisturbed surface	210	21.18	4,447	741
Total Spring Emission Rate from Stockpiles			**10,434**	**1,739**

Odour Emission Rate: Summer

Source	Surface Area of Piles m²	Odour Flux ou/s/m²	Total Odour Emission Rate ou/s	Individual Pile Odour Emission Rate ou/s
Freshly disturbed surface	13,440	0.37	4,973	829
Undisturbed surface	210	41.04	8,619	1,437
Total Summer Emission Rate from Stockpiles			**13,592**	**2,265**

Odour Emission Rate: Fall

Source	Surface Area of Piles	Odour Flux	Total Odour Emission Rate	Individual Pile Odour Emission Rate
	m^2	$ou/s/m^2$	ou/s	ou/s
Freshly disturbed surface	13,440	0.45	5,988	998
Undisturbed surface	210	21.18	4,447	741
Total Fall Emission Rate from Stockpiles			**10,434**	**1,739**

Appendix E: Emission Estimates
Alternative 2 Scenario A

Calculation Sheet - Alternative 2 Scenario A

LFG Emissions from Gensets and Flares for Stages 1 to 5

The maximum quantity of LFG was estimated by using LandGEM Landfill Gas Emissions Model version 3.02, USEPA :

Max Quantity of LFG= 3.35E+07 m^3/year

It was assumed that the LFG collection system has a capture capacity of 75%. As such:
25% of LFG is emitted into the atmosphere as fugitive emissions:

=25% x 3.346e7 8.37E+06 m^3/year

75% of LFG is captured by LFG collection system and will be directed into the flares and generators.

=75% x 3.346e7 2.51E+07 m^3/year

The majority of collected LFG from collection system is directed into flare#1, and flare#2 (new flare). The remaining LFG will be directed into generators.
The LFG required to be filtered from siloxane compounds prior to combustion in generators in order to protect generators engines.
The purge gas from siloxane filter will be sent to flare 3 (siloxane filter) and will be combusted.

The amount of LFG combusted in flare #1 and #2 was estimated based on the following assumptions:
1. LFG quantity combusted in generators and siloxane flare was estimated based on actual quantity reported in 2019.
Approximately, 20,100,962 Sm3 and 891,340 Sm3 of total captured LFG was combusted in generators and siloxane flare, respectively.

Quantity of remaining LFG =2.45e7 (m3/year) - 20,100,962 (m3/year) - 891,340 (m3/year)= 4.10E+06 m^3/year
3. The remaining quantity of LFG was splited between flare 1 and flare 2 based on their design capacity obtained from manufacturers.

Units	Design Capacity (cfm)	LFG Quantity
Flare 1	2500	1.47E+06
Flare 2	4500	2.64E+06

Source ID	LFG quantity[1,2]			No. of units	LFG quantity per unit	
	LFG Quantity (Sm^3/year)	hours/year	m^3/hr		m^3/hr	m^3/s
LFG Fugitive	8,365,000	8,760	955	-	955	0.27
Engines	20,100,962	8,760	2,295	4	574	0.16
Flare 1	1,465,249	8,760	167	1	167	0.05
Flare 2	2,637,449	8,760	301	1	301	0.08
Flare 3	891,340	8,760	102	1	102	0.03

1. LFG quantities combusted in generator engines and siloxane flare were provided by GFL and are based on 2019 calender year.
2. LFG quantities combusted in flare 1 and flare 2 were estimated based on design capacities obtained from manufacturers.

Control Efficiency (%) from Table 2.4-3, AP-42

LFG Emission Sources	LFG Quantity (Sm^3/year)	Capture Efficiency	LFG Emission Rate (m^3/yr)	LFG Emissions	Significant? (Yes or No)[1]
Fugitives	8,365,000	0.00%	8,365,000	93%	Yes
Engines	20,100,962	97.20%	562,827	6%	Yes
Flare 1	1,465,249	97.70%	33,701	0%	No
Flare 2	2,637,449	97.70%	60,661	1%	No
Flare 3 (Siloxane Flare)	891,340	97.70%	20,501	0%	No
		Total	9,042,690	100%	

1. Sources that are Insignificant Relative to Total Emissions per section 7.2.2 of ESDM guidance document.

Calculation Sheet - Alternative 2 Scenario A

LFG Emissions from Gensets and Flares for Stages 6 to 8

The maximum quantity of LFG was estimated by using LandGEM Landfill Gas Emissions Model version 3.02, USEPA :

Max Quantity of LFG= 8.67E+07 m^3/year

It was assumed that the LFG collection system has a capture capacity of 75%. As such:
25% of LFG is emitted into the atmosphere as fugitive emissions:

=25% x 8.668e7 2.17E+07 m^3/year

75% of LFG is captured by LFG collection system and will be directed into the flares and generators.

=75% x 8.668e7 6.50E+07 m^3/year

The majority of collected LFG from collection system is directed into flare#1, and flare#2 (new flare). The remaining LFG will be directed into generators.
The LFG required to be filtered from siloxane compounds prior to combustion in generators in order to protect generators engines.
The purge gas from siloxane filter will be sent to flare 3 (siloxane filter) and will be combusted.

The amount of LFG combusted in flare #1 and #2 was estimated based on the following assumptions:
1. LFG quantity combusted in generators and siloxane flare was estimated based on actual quantity reported in 2019.
Approximately, 20,100,962 Sm3 and 891,340 Sm3 of total captured LFG was combusted in generators and siloxane flare, respectively.
2. The quantity of LFG combusted in generators and siloxane filter was subtract from total captured LFG to estimate the remaining quantity of LFG.
Quantity of remaining LFG =6.96e7 (m3/year) - 20,100,962 (m3/year) - 891,340 (m3/year)= 4.40E+07 m^3/year
3. The remaining quantity of LFG was splited between flare 1 and flare 2 based on their design capacity obtained from manufacturers.

Units	Design Capacity (cfm)	LFG Quantity
Flare 1	2500	1.57E+07
Flare 2	4500	2.83E+07

Source ID	LFG quantity[1,2]			No. of units	LFG quantity per unit	
	LFG Quantity (Sm^3/year)	hours/year	m^3/hr		m^3/hr	m^3/s
LFG Fugitive	21,670,000	8,760	2,474	-	2474	0.69
Engines	20,100,962	8,760	2,295	4	574	0.16
Flare 1	15,720,606	8,760	1,795	1	1795	0.50
Flare 2	28,297,092	8,760	3,230	1	3230	0.90
Flare 3	891,340	8,760	102	1	102	0.03

1. LFG quantities combusted in generator engines and siloxane flare were provided by GFL and are based on 2019 calender year.
2. LFG quantities combusted in flare 1 and flare 2 were estimated based on design capacities obtained from manufacturers.

Control Efficiency (%) from Table 2.4-3, AP-42

LFG Emission Sources	LFG Quantity (Sm^3/year)	Capture Efficiency	LFG Emission Rate (m^3/yr)	LFG Emissions	Significant? (Yes or No)[1]
Fugitives	21,670,000	0.00%	21,670,000	93%	Yes
Engines	20,100,962	97.20%	562,827	2%	No
Flare 1	15,720,606	97.70%	361,574	2%	No
Flare 2	28,297,092	97.70%	650,833	3%	No
Flare 3 (Siloxane Flare)	891,340	97.70%	20,501	0%	No
		Total	23,265,735	100%	

1. Sources that are Insignificant Relative to Total Emissions per section 7.2.2 of ESDM guidance document.

Table E1. LFG Generation and Distribution for Stages 1 to 5 - Alternative 2 Scenario A

Landfill Gas (LFG) is generated by decomposition of organic materials within the landfill. The quantity of LFG generated per year was estimated using the US EPA LandGEM Landfill Gas Emissions Model version 3.02.

Model Inputs:

Inputs to the model were based on:

- 2019 and earlier - records of quantity of waste accepted annually (tonnes/year)
- 2020 to 2025 - assumed 755,000 tonnes/year of waste accepted
- Closure at end of 2025

Model Results

The LandGEM model estimates:

Maximum LFG generation rate: 33,460,000 m³/year in 2043

LFG is assumed to be generated relatively uniformly through the year, so this equates to peak generation rate of:

33460000 (m³/year) / 365 (days/year) / 24 (hours/day) / 3600 (seconds/hour)

LFG Generation Rate = 1.1 m³/s

Distribution

The landfill has an LFG Collection System to capture LFG and route it to the LFG Utilization Facility. LFG that is not captured by the system is emitted to atmosphere through the landfill surface.

LFG Capture System Efficiency: 75%

LFG captured and combusted at the LFG Utilization facility:	1.1 (m³/s) x 75% =	0.80	m³/s
LFG not captured, and emitted from surface (e.g. fugitive):	1.1 (m³/s) x (1-75%) =	0.27	m³/s

At the LFG Utilization facility, LFG is used to fuel engines driving electrical generators (Gen1 to Gen4). Siloxanes are filtered from the engine fuel, and purge gas from the filter is mixed with LFG and combusted in an enclosed flare (Flare3). Excess LFG not used in Gen1 to Gen4 or Flare3 is combusted in two enclosed flares (Flare1 and Flare2). For the puroses of this analysis, LFG is assumed to be distributed between Flares1 and 2 proportional to their rated capacity.

Source	**LFG Combusted (m³/s)**	
Engines (Gen1 to Gen 4)	0.18	m³/s, capacity at rated power 0.64 m³/s total (2019)
Siloxane Flare (Flare3)	0.029	m³/s, at rated engine power (2019)
Flare 1	0.21	m³/s (rated capacity 1.18 m³/s)
Flare 2	0.38	m³/s (rated capacity 2.12 m³/s)
Total Combusted	0.80	m³/s

Table E1. LFG Generation and Distribution for Stages 6 to 8 - Alternative 2 Scenario A

Landfill Gas (LFG) is generated by decomposition of organic materials within the landfill. The quantity of LFG generated per year was estimated using the US EPA LandGEM Landfill Gas Emissions Model version 3.02.

Model Inputs:

Inputs to the model were based on:

- 2026 to 2045 - assumed 755,000 tonnes/year of waste accepted
- Closure at end of 2045

Model Results

The LandGEM model estimates:

Maximum LFG generation rate: 86,680,000 m^3/year in 2043

LFG is assumed to be generated relatively uniformly through the year, so this equates to peak generation rate of:

86680000 (m^3/year) / 365 (days/year) / 24 (hours/day) / 3600 (seconds/hour)

LFG Generation Rate = 2.7 m^3/s

Distribution

The landfill has an LFG Collection System to capture LFG and route it to the LFG Utilization Facility. LFG that is not captured by the system is emitted to atmosphere through the landfill surface.

LFG Capture System Efficiency: 75%

LFG captured and combusted at the LFG Utilization facility:	2.7 (m^3/s) x 75% =	2.06	m^3/s
LFG not captured, and emitted from surface (e.g. fugitive):	2.7 (m^3/s) x (1-75%) =	0.69	m^3/s

At the LFG Utilization facility, LFG is used to fuel engines driving electrical generators (Gen1 to Gen4). Siloxanes are filtered from the engine fuel, and purge gas from the filter is mixed with LFG and combusted in an enclosed flare (Flare3). Excess LFG not used in Gen1 to Gen4 or Flare3 is combusted in two enclosed flares (Flare1 and Flare2). For the puroses of this analysis, LFG is assumed to be distributed between Flares1 and 2 proportional to their rated capacity.

Source	LFG Combusted (m^3/s)	
Engines (Gen1 to Gen 4)	0.46	m^3/s, at rated power (2019)
Siloxane Flare (Flare3)	0.029	m^3/s, at rated engine power (2019)
Flare 1	0.56	m^3/s (rated capacity 1.18 m^3/s)
Flare 2	1.01	m^3/s (rated capacity 2.12 m^3/s)
Total Combusted	2.06	m^3/s

Table E2. Fugitive Emissions Of LFG for Stages 1 to 5 - Alternative 2 Scenario A

LFG that is not captured by the LFG Collection System is emitted from the surface of the landfill as fugitive. The previous landfill was divided into five stages (STG1 to STG5). Fugitive LFG was assumed to to be emitted uniformly over the area of the five stages.

Concentrations of constituents of LFG are based on US EPA, AP-42, Table 2.4-1.

Total Fugitive LFG Emission Rate: 0.27 m^3/s (see Table E1 for calculation)

Emission Sources	Surface Area (m^2)
STG1 - Stage 1	244,000
STG2 - Stage 2	244,000
STG3 - Stage 3	244,000
STG4 - Stage 4	342,000
STG5 - Stage 5	102,948
Total Surface Area	**1,176,948**

Sample Calculation (1,1,1-Trichloroethane)

Total emission rate = LFG Emission rate (m^3/s) x Concentration in LFG (mg/m^3) /1000 (mg/g)
= 0.24 (m^3/s) x 1.32 (mg/m^3) / 1000 (mg/g)
= 0.00035
Emission flux = Total emission rate (g/s) / Total surface area (m^2)
= 0.00035 / 1176948 (m^2)
= 2.99E-10

Aggregate Fugitive Emissions from Stages 1 to 5 (STG1 to STG5)

Constituent	CAS No.	MW	Concentration in LFG		Total Emission Rate	Total Emission Flux	Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m^3)	(g/s)	($g/s/m^2$)	
1,1,1-Trichloroethane	71556	133	2.43E-01	1.3	3.51E-04	2.99E-10	A
1,1,2,2-Tetrachloroethane	79345	168	5.35E-01	3.7	9.74E-04	8.27E-10	E
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	261	3.49E-03	0.0	9.87E-06	8.38E-12	D
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187	6.72E-02	0.5	1.37E-04	1.16E-10	C
1,1,2-Trichloroethane	79005	133	1.58E-01	0.9	2.28E-04	1.94E-10	D
1,1-Dichloroethane	75343	99	2.08E+00	8.4	2.23E-03	1.90E-09	A
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	97	1.60E-01	0.6	1.68E-04	1.43E-10	A
1,2,3-Trimethylbenzene	526738	120	3.59E-01	1.8	4.68E-04	3.97E-10	D
1,2,4-Trichlorobenzene	120821	181	5.51E-03	0.0	1.08E-05	9.21E-12	C
1,2,4-Trimethylbenzene	95636	120	1.37E+00	6.7	1.79E-03	1.52E-09	B
1,2-Dibromoethane (Ethylene dibromide)	106934	188	4.80E-03	0.0	9.78E-06	8.31E-12	B
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	171	1.06E-01	0.7	1.96E-04	1.67E-10	B
1,2-Dichloroethane (Ethylene dichloride)	107062	99	1.59E-01	0.6	1.71E-04	1.45E-10	A
1,2-Dichloroethene	540590	97	1.14E+01	45.2	1.20E-02	1.02E-08	E
1,2-Dichloropropane	78875	113	5.20E-02	0.2	6.37E-05	5.41E-11	D
1,2-Diethylbenzene	135013	134	1.99E-02	0.1	2.90E-05	2.46E-11	D
1,3,5-Trimethylbenzene	108678	120	6.23E-01	3.1	8.12E-04	6.90E-10	C
1,3-Butadiene (Vinyl ethylene)	106990	54	1.66E-01	0.4	9.73E-05	8.27E-11	C
1,3-Diethylbenzene	141935	134	6.55E-02	0.4	9.53E-05	8.10E-11	D
1,4-Diethylbenzene	105055	134	2.62E-01	1.4	3.81E-04	3.24E-10	D
1,4-Dioxane (1,4-Diethylene dioxide)	123911	88	8.29E-03	0.0	7.92E-06	6.73E-12	D
1-Butene	106989	56	1.22E+00	2.8	7.42E-04	6.31E-10	D
2-Methylbutene	513359	70	1.22E+00	3.5	9.28E-04	7.88E-10	D
1-Butene	106989	56	1.10E+00	2.5	6.69E-04	5.69E-10	E
2-Methylpropene	115117	56	1.10E+00	2.5	6.69E-04	5.69E-10	E
1-Ethyl-4-methylbenzene (4-Ethyl toluene)	622968	120	9.89E-01	4.9	1.29E-03	1.09E-09	C
1-Heptene	592767	98	6.25E-01	2.5	6.65E-04	5.65E-10	E
1-Hexene	592416	84	8.88E-02	0.3	8.10E-05	6.88E-11	D
2-Methyl-1-pentene	763291	84	8.88E-02	0.3	8.10E-05	6.88E-11	D
1-Methylcyclohexene	591491	96	2.27E-02	0.1	2.37E-05	2.01E-11	D
1-Methylcyclopentene	693890	82	2.52E-02	0.1	2.24E-05	1.91E-11	D
1-Pentene	109671	70	2.20E-01	0.6	1.67E-04	1.42E-10	D
1-Propanethiol (n-Propyl mercaptan)	107039	76	1.25E-01	0.4	1.03E-04	8.77E-11	D
2,2,3-Trimethylbutane	464062	100	9.19E-03	0.0	9.98E-06	8.48E-12	D
2,2,4-Trimethylpentane	540841	114	6.14E-01	2.9	7.60E-04	6.46E-10	A
2,2,5-Trimethylhexane	3522949	128	1.56E-01	0.8	2.17E-04	1.84E-10	D
2,2-Dimethylbutane	75832	86	1.56E-01	0.5	1.46E-04	1.24E-10	D
2,2-Dimethylpentane	590352	100	6.08E-02	0.2	6.60E-05	5.61E-11	D
2,2-Dimethylpropane	463821	72	2.74E-02	0.1	2.14E-05	1.82E-11	D
2,3,4-Trimethylpentane	565753	114	3.12E-01	1.5	3.86E-04	3.28E-10	D

Constituent	CAS No.	MW	Concentration in LFG		Total Emission Rate	Total Emission Flux	Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(g/s)	(g/s/m²)	
2,3-Dimethylbutane	79298	86	1.67E-01	0.6	1.56E-04	1.33E-10	E
2,3-Dimethylpentane	565593	100	3.10E-01	1.3	3.37E-04	2.86E-10	D
2,4-Dimethylhexane	589435	114	2.22E-01	1.0	2.75E-04	2.34E-10	D
2,4-Dimethylpentane	108087	100	1.00E-01	0.4	1.09E-04	9.23E-11	D
2,5-Dimethylhexane	592132	114	1.66E-01	0.8	2.06E-04	1.75E-10	D
2,5-Dimethylthiophene	638028	112	6.44E-02	0.3	7.83E-05	6.65E-11	D
2-Butanone (Methyl ethyl ketone)	78933	72	4.01E+00	11.8	3.13E-03	2.66E-09	D
2-Ethyl-1-butene	760214	84	1.77E-02	0.1	1.61E-05	1.37E-11	E
2-Ethylthiophene	872559	112	6.29E-02	0.3	7.65E-05	6.50E-11	C
2-Ethyltoluene	611143	120	3.23E-01	1.6	4.21E-04	3.58E-10	D
2-Hexanone (Methyl butyl ketone)	591786	100	6.13E-01	2.5	6.66E-04	5.66E-10	E
2-Methyl-1-butene	563462	70	1.79E-01	0.5	1.36E-04	1.16E-10	D
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90	1.70E-01	0.6	1.66E-04	1.41E-10	E
2-Methyl-2-butene	513359	70	3.03E-01	0.9	2.30E-04	1.96E-10	D
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90	3.25E-01	1.2	3.18E-04	2.70E-10	E
2-Methylbutane	78784	72	2.26E+00	6.7	1.77E-03	1.50E-09	D
2-Methylheptane	592278	114	7.16E-01	3.3	8.87E-04	7.53E-10	D
2-Methylhexane	591764	100	8.16E-01	3.3	8.86E-04	7.53E-10	D
2-Methylpentane	107835	86	6.88E-01	2.4	6.43E-04	5.46E-10	D
2-Propanol (Isopropyl alcohol)	67630	60	1.80E+00	4.4	1.17E-03	9.96E-10	D
3,6-Dimethyloctane	15869940	142	7.85E-01	4.6	1.21E-03	1.03E-09	D
3-Ethyltoluene	620144	120	7.80E-01	3.8	1.02E-03	8.64E-10	D
3-Methyl-1-pentene	760203	84	6.99E-03	0.0	6.38E-06	5.42E-12	D
3-Methylheptane	589811	114	7.63E-01	3.6	9.45E-04	8.03E-10	D
3-Methylhexane	589344	100	1.13E+00	4.6	1.23E-03	1.04E-09	D
3-Methylpentane	96140	86	7.40E-01	2.6	6.91E-04	5.87E-10	D
3-Methylthiophene	616444	98	9.25E-02	0.4	9.84E-05	8.36E-11	E
4-Methyl-1-pentene	691372	84	2.33E-02	0.1	2.13E-05	1.81E-11	E
4-Methyl-2-pentanone (MIBK)	108101	100	8.83E-01	3.6	9.59E-04	8.15E-10	C
4-Methylheptane	589537	114	2.49E-01	1.2	3.08E-04	2.62E-10	D
Acetaldehyde	75070	44	7.74E-02	0.1	3.70E-05	3.14E-11	D
Acetone	67641	58	6.70E+00	15.9	4.22E-03	3.58E-09	C
Acetonitrile	75058	41	5.56E-01	0.9	2.47E-04	2.10E-10	A
Benzene	71432	78	2.40E+00	7.7	2.03E-03	1.73E-09	A
Benzyl chloride	100447	127	1.81E-02	0.1	2.48E-05	2.11E-11	A
Bromodichloromethane	75274	164	8.78E-03	0.1	1.56E-05	1.32E-11	E
Bromomethane (Methyl bromide)	74839	95	2.10E-02	0.1	2.16E-05	1.84E-11	C
Butane	106978	58	6.22E+00	14.8	3.92E-03	3.33E-09	C
Carbon disulfide	75150	76	1.47E-01	0.5	1.21E-04	1.03E-10	A
Carbon monoxide	630080	28	2.44E+01	27.9	7.41E-03	6.30E-09	C
Carbon tetrachloride	56235	154	7.98E-03	0.1	1.33E-05	1.13E-11	A
Carbon tetrafluoride (Freon 14)	75730	88	1.51E-01	0.5	1.44E-04	1.22E-10	E
Carbonyl sulfide (Carbon oxysulfide)	463581	60	1.22E-01	0.3	7.95E-05	6.75E-11	A
Chlorobenzene	108907	113	4.84E-01	2.2	5.91E-04	5.02E-10	A
Chlorodifluoromethane (Freon 22)	75456	86	7.96E-01	2.8	7.46E-04	6.34E-10	D
Chloroethane (Ethyl chloride)	75003	65	3.95E+00	10.4	2.76E-03	2.35E-09	B
Chloromethane (Methyl chloride)	74873	50	2.44E-01	0.5	1.34E-04	1.13E-10	B
cis-1,2-Dichloroethene	156592	97	1.24E+00	4.9	1.30E-03	1.11E-09	B
cis-1,2-Dimethylcyclohexane	2207014	112	8.10E-02	0.4	9.85E-05	8.37E-11	D
cis-1,3-Dichloropropene	10061015	111	3.03E-03	0.0	3.65E-06	3.10E-12	D
cis-1,3-Dimethylcyclohexane	638040	112	5.01E-01	2.3	6.09E-04	5.18E-10	D
cis-1,4-Dimethylcyclohexane	624293	112	2.48E-01	1.1	3.02E-04	2.56E-10	D
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	112	2.48E-01	1.1	3.02E-04	2.56E-10	D
cis-2-Butene	590181	56	1.05E-01	0.2	6.39E-05	5.43E-11	D
cis-2-Heptene	6443921	98	2.45E-02	0.1	2.61E-05	2.22E-11	E
cis-2-Hexene	7688213	84	1.72E-02	0.1	1.57E-05	1.33E-11	D
cis-2-Octene	7642048	112	2.20E-01	1.0	2.68E-04	2.27E-10	D
cis-2-Pentene	627203	70	4.79E-02	0.1	3.64E-05	3.09E-11	D
cis-3-Methyl-2-pentene	922623	84	1.79E-02	0.1	1.63E-05	1.39E-11	D
Cyclohexane	110827	84	1.01E+00	3.5	9.21E-04	7.83E-10	B
Cyclohexene	110838	82	1.84E-02	0.1	1.64E-05	1.39E-11	D
Cyclopentane	287923	70	2.21E-02	0.1	1.68E-05	1.43E-11	D
Cyclopentene	142290	68	1.21E-02	0.0	8.94E-06	7.59E-12	D
Decane	124185	142	3.80E+00	22.1	5.86E-03	4.98E-09	D
Dibromochloromethane	124481	208	1.51E-02	0.1	3.41E-05	2.90E-11	D
Dibromomethane (Methylene dibromide)	74953	174	8.35E-04	0.0	1.57E-06	1.34E-12	E
Dichlorobenzene	106467	147	9.40E-01	5.6	1.50E-03	1.27E-09	A

Constituent	CAS No.	MW	Concentration in LFG		Total Emission Rate	Total Emission Flux	Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(g/s)	(g/s/m²)	
Dichlorodifluoromethane (Freon 12)	75718	121	1.18E+00	5.8	1.55E-03	1.31E-09	B
Dichloromethane (Methylene chloride)	75092	85	6.15E+00	21.3	5.66E-03	4.81E-09	A
Diethyl sulfide	352932	90	8.62E-02	0.3	8.43E-05	7.16E-11	E
Dimethyl disulfide	624920	94	1.37E-01	0.5	1.40E-04	1.19E-10	A
Dimethyl sulfide	75183	62	5.66E+00	14.4	3.81E-03	3.24E-09	A
Dodecane (n-Dodecane)	112403	170	2.21E-01	1.5	4.08E-04	3.47E-10	D
Ethane	74840	30	9.05E+00	11.1	2.95E-03	2.51E-09	D
Ethanol	64175	46	2.30E-01	0.4	1.15E-04	9.76E-11	D
Ethyl acetate	141786	88	1.88E+00	6.8	1.80E-03	1.53E-09	C
Ethyl mercaptan (Ethanediol)	75081	62	1.98E-01	0.5	1.33E-04	1.13E-10	A
Ethyl methyl sulfide	624895	76	3.67E-02	0.1	3.03E-05	2.57E-11	E
Ethylbenzene	100414	106	4.86E+00	21.1	5.59E-03	4.75E-09	B
Formaldehyde	50000	30	1.17E-02	0.0	3.81E-06	3.24E-12	D
Heptane	142825	100	1.34E+00	5.5	1.46E-03	1.24E-09	B
Hexane	110543	86	3.10E+00	10.9	2.90E-03	2.46E-09	B
Hydrogen sulfide	7783064	34	3.20E+01	44.6	1.18E-02	1.00E-08	A
Indane (2,3-Dihydroindene)	496117	34	6.66E-02	0.1	2.46E-05	2.09E-11	D
Isobutane (2-Methylpropane)	75285	58	8.16E+00	19.4	5.14E-03	4.37E-09	D
Isobutylbenzene	538932	134	4.07E-02	0.2	5.92E-05	5.03E-11	D
Isoprene (2-Methyl-1,3-butadiene)	78795	68	1.65E-02	0.0	1.22E-05	1.04E-11	D
Isopropyl mercaptan	75332	76	1.75E-01	0.5	1.44E-04	1.23E-10	A
Isopropylbenzene (Cumene)	98828	120	4.30E-01	2.1	5.60E-04	4.76E-10	D
Mercury (total)	7439976	201	1.22E-04	0.0	2.65E-07	2.25E-13	B
Methanethiol (Methyl mercaptan)	74931	48	1.37E+00	2.7	7.15E-04	6.07E-10	A
Methyl tert-butyl ether (MTBE)	1634044	88	1.18E-01	0.4	1.13E-04	9.58E-11	D
Methylcyclohexane	108872	98	1.29E+00	5.2	1.37E-03	1.17E-09	D
Methylcyclopentane	96377	84	6.50E-01	2.2	5.93E-04	5.04E-10	D
Naphthalene	91203	128	1.07E-01	0.6	1.49E-04	1.26E-10	D
n-Butylbenzene	104518	134	6.80E-02	0.4	9.89E-05	8.41E-11	D
Nonane	111842	128	2.37E+00	12.4	3.30E-03	2.80E-09	D
n-Propylbenzene (Propylbenzene)	103651	120	4.13E-01	2.0	5.38E-04	4.57E-10	D
Octane	111659	114	1.08E+00	5.0	1.34E-03	1.14E-09	D
p-Cymene (1-Methyl-4-lsopropylbenzene)	99876	134	3.58E+00	19.6	5.21E-03	4.43E-09	D
Pentane	109660	72	4.46E+00	13.2	3.49E-03	2.96E-09	C
Propane	74986	44	1.55E+01	27.9	7.41E-03	6.30E-09	C
Propene	115071	42	3.32E+00	5.7	1.51E-03	1.29E-09	D
Propyne	74997	40	3.80E-02	0.1	1.65E-05	1.40E-11	E
sec-Butylbenzene	135988	134	6.75E-02	0.4	9.82E-05	8.35E-11	D
Styrene (Vinylbenzene)	100425	104	4.11E-01	1.7	4.64E-04	3.94E-10	B
Tetrachloroethylene (Perchloroethylene)	127184	166	2.03E+00	13.8	3.65E-03	3.10E-09	A
Tetrahydrofuran (Diethylene oxide)	109999	72	9.69E-01	2.9	7.58E-04	6.44E-10	C
Thiophene	110021	84	3.49E-01	1.2	3.18E-04	2.70E-10	E
Toluene (Methyl benzene)	108883	92	2.95E+01	111.1	2.95E-02	2.50E-08	A
trans-1,2-Dichloroethene	156605	97	2.87E-02	0.1	3.02E-05	2.56E-11	C
trans-1,2-Dimethylcyclohexane	6876239	112	4.04E-01	1.9	4.91E-04	4.18E-10	D
trans-1,3-Dichloropropene	10061026	111	9.43E-03	0.0	1.13E-05	9.64E-12	D
trans-1,4-Dimethylcyclohexane	2207047	112	2.05E-01	0.9	2.49E-04	2.12E-10	D
trans-2-Butene	624646	56	1.04E-01	0.2	6.33E-05	5.38E-11	D
trans-2-Heptene	14686136	98	2.50E-03	0.0	2.66E-06	2.26E-12	E
trans-2-Hexene	4050457	84	2.06E-02	0.1	1.88E-05	1.60E-11	D
trans-2-Octene	13389429	112	2.41E-01	1.1	2.93E-04	2.49E-10	D
trans-2-Pentene	646048	70	3.47E-02	0.1	2.64E-05	2.24E-11	D
trans-3-Methyl-2-pentene	616126	84	1.55E-02	0.1	1.41E-05	1.20E-11	D
Tribromomethane (Bromoform)	75252	253	1.24E-02	0.1	3.40E-05	2.89E-11	D
Trichloroethylene (Trichloroethene)	79016	131	8.28E-01	4.4	1.18E-03	1.00E-09	A
Trichlorofluoromethane (Freon 11)	91315616	137	2.48E-01	1.4	3.69E-04	3.14E-10	B
Trichloromethane (Chloroform)	67663	119	7.08E-02	0.3	9.16E-05	7.79E-11	A
Undecane	1120214	156	1.67E+00	10.7	2.83E-03	2.40E-09	D
Vinyl acetate	85306269	86	2.48E-01	0.9	2.31E-04	1.97E-10	C
Vinyl chloride (Chloroethene)	75014	63	1.42E+00	3.6	9.62E-04	8.17E-10	A
Xylenes (o-, m-, p-, mixtures)	1330207	106	9.23E+00	40.1	1.06E-02	9.03E-09	A
Total Reduced Sulphur Compounds	n/a	-	-	67.7	1.80E-02	1.53E-08	-

Table E2. Fugitive Emissions Of LFG for Stages 6 to 8 - Alternative 2 Scenario A

LFG that is not captured by the LFG Collection System is emitted from the surface of the landfill as fugitive. The active portion of the landfill is divided into three stages (STG6 to STG8). Fugitive LFG was assumed to to be emitted uniformly over the area of the three stages.

Concentrations of constituents of LFG are based on US EPA, AP-42, Table 2.4-1.

Total Fugitive LFG Emission Rate: 0.69 m^3/s (see Table E1 for calculation)

Emission Sources	Surface Area (m^2)
STG6 - Stage 6	570,062
STG7 - Stage 7	570,062
STG8 - Stage 8	240,403
Total Surface Area	**1,380,527**

Sample Calculation (1,1,1-Trichloroethane)

Total emission rate = LFG Emission rate (m^3/s) x Concentration in LFG (mg/m^3) /1000 (mg/g)
= 0.74 (m^3/s) x 1.32 (mg/m^3) / 1000 (mg/g)
= 0.00091
Emission flux = Total emission rate (g/s) / Total surface area (m^2)
= 0.00091 / 1380527 (m^2)
= 6.59E-10

Aggregate Fugitive Emissions from Stages 6 to 9 (STG6 to STG9)

Constituent	CAS No.	MW	Concentration in LFG		Total Emission Rate	Total Emission Flux	Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m^3)	(g/s)	($g/s/m^2$)	
1,1,1-Trichloroethane	71556	133	2.43E-01	1.3	9.10E-04	6.59E-10	A
1,1,2,2-Tetrachloroethane	79345	168	5.35E-01	3.7	2.52E-03	1.83E-09	E
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	261	3.49E-03	0.0	2.56E-05	1.85E-11	D
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187	6.72E-02	0.5	3.54E-04	2.56E-10	C
1,1,2-Trichloroethane	79005	133	1.58E-01	0.9	5.92E-04	4.29E-10	D
1,1-Dichloroethane	75343	99	2.08E+00	8.4	5.78E-03	4.19E-09	A
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	97	1.60E-01	0.6	4.36E-04	3.16E-10	A
1,2,3-Trimethylbenzene	526738	120	3.59E-01	1.8	1.21E-03	8.78E-10	D
1,2,4-Trichlorobenzene	120821	181	5.51E-03	0.0	2.81E-05	2.03E-11	C
1,2,4-Trimethylbenzene	95636	120	1.37E+00	6.7	4.62E-03	3.35E-09	B
1,2-Dibromoethane (Ethylene dibromide)	106934	188	4.80E-03	0.0	2.53E-05	1.83E-11	B
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	171	1.06E-01	0.7	5.09E-04	3.69E-10	B
1,2-Dichloroethane (Ethylene dichloride)	107062	99	1.59E-01	0.6	4.42E-04	3.20E-10	A
1,2-Dichloroethene	540590	97	1.14E+01	45.2	3.10E-02	2.25E-08	E
1,2-Dichloropropane	78875	113	5.20E-02	0.2	1.65E-04	1.20E-10	D
1,2-Diethylbenzene	135013	134	1.99E-02	0.1	7.50E-05	5.43E-11	D
1,3,5-Trimethylbenzene	108678	120	6.23E-01	3.1	2.10E-03	1.52E-09	C
1,3-Butadiene (Vinyl ethylene)	106990	54	1.66E-01	0.4	2.52E-04	1.83E-10	C
1,3-Diethylbenzene	141935	134	6.55E-02	0.4	2.47E-04	1.79E-10	D
1,4-Diethylbenzene	105055	134	2.62E-01	1.4	9.88E-04	7.15E-10	D
1,4-Dioxane (1,4-Diethylene dioxide)	123911	88	8.29E-03	0.0	2.05E-05	1.49E-11	D
1-Butene	106989	56	1.22E+00	2.8	1.92E-03	1.39E-09	D
2-Methylbutene	513359	70	1.22E+00	3.5	2.40E-03	1.74E-09	D
1-Butene	106989	56	1.10E+00	2.5	1.73E-03	1.26E-09	E
2-Methylpropene	115117	56	1.10E+00	2.5	1.73E-03	1.26E-09	E
1-Ethyl-4-methylbenzene (4-Ethyl toluene)	622968	120	9.89E-01	4.9	3.34E-03	2.42E-09	C
1-Heptene	592767	98	6.25E-01	2.5	1.72E-03	1.25E-09	E
1-Hexene	592416	84	8.88E-02	0.3	2.10E-04	1.52E-10	D
2-Methyl-1-pentene	763291	84	8.88E-02	0.3	2.10E-04	1.52E-10	D
1-Methylcyclohexene	591491	96	2.27E-02	0.1	6.13E-05	4.44E-11	D
1-Methylcyclopentene	693890	82	2.52E-02	0.1	5.81E-05	4.21E-11	D
1-Pentene	109671	70	2.20E-01	0.6	4.33E-04	3.14E-10	D
1-Propanethiol (n-Propyl mercaptan)	107039	76	1.25E-01	0.4	2.67E-04	1.94E-10	D
2,2,3-Trimethylbutane	464062	100	9.19E-03	0.0	2.59E-05	1.87E-11	D
2,2,4-Trimethylpentane	540841	114	6.14E-01	2.9	1.97E-03	1.43E-09	A
2,2,5-Trimethylhexane	3522949	128	1.56E-01	0.8	5.62E-04	4.07E-10	D
2,2-Dimethylbutane	75832	86	1.56E-01	0.5	3.78E-04	2.73E-10	D
2,2-Dimethylpentane	590352	100	6.08E-02	0.2	1.71E-04	1.24E-10	D
2,2-Dimethylpropane	463821	72	2.74E-02	0.1	5.55E-05	4.02E-11	D
2,3,4-Trimethylpentane	565753	114	3.12E-01	1.5	1.00E-03	7.25E-10	D
2,3-Dimethylbutane	79298	86	1.67E-01	0.6	4.04E-04	2.93E-10	E
2,3-Dimethylpentane	565593	100	3.10E-01	1.3	8.72E-04	6.32E-10	D

Constituent	CAS No.	MW	Concentration in LFG		Total Emission Rate	Total Emission Flux	Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(g/s)	(g/s/m²)	
2,4-Dimethylhexane	589435	114	2.22E-01	1.0	7.12E-04	5.16E-10	D
2,4-Dimethylpentane	108087	100	1.00E-01	0.4	2.81E-04	2.04E-10	D
2,5-Dimethylhexane	592132	114	1.66E-01	0.8	5.33E-04	3.86E-10	D
2,5-Dimethylthiophene	638028	112	6.44E-02	0.3	2.03E-04	1.47E-10	D
2-Butanone (Methyl ethyl ketone)	78933	72	4.01E+00	11.8	8.12E-03	5.88E-09	D
2-Ethyl-1-butene	760214	84	1.77E-02	0.1	4.18E-05	3.03E-11	E
2-Ethylthiophene	872559	112	6.29E-02	0.3	1.98E-04	1.44E-10	C
2-Ethyltoluene	611143	120	3.23E-01	1.6	1.09E-03	7.90E-10	D
2-Hexanone (Methyl butyl ketone)	591786	100	6.13E-01	2.5	1.72E-03	1.25E-09	E
2-Methyl-1-butene	563462	70	1.79E-01	0.5	3.53E-04	2.55E-10	D
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90	1.70E-01	0.6	4.31E-04	3.12E-10	E
2-Methyl-2-butene	513359	70	3.03E-01	0.9	5.97E-04	4.32E-10	D
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90	3.25E-01	1.2	8.23E-04	5.96E-10	E
2-Methylbutane	78784	72	2.26E+00	6.7	4.58E-03	3.32E-09	D
2-Methylheptane	592278	114	7.16E-01	3.3	2.30E-03	1.66E-09	D
2-Methylhexane	591764	100	8.16E-01	3.3	2.30E-03	1.66E-09	D
2-Methylpentane	107835	86	6.88E-01	2.4	1.67E-03	1.21E-09	D
2-Propanol (Isopropyl alcohol)	67630	60	1.80E+00	4.4	3.04E-03	2.20E-09	D
3,6-Dimethyloctane	15869940	142	7.85E-01	4.6	3.14E-03	2.27E-09	D
3-Ethyltoluene	620144	120	7.80E-01	3.8	2.63E-03	1.91E-09	D
3-Methyl-1-pentene	760203	84	6.99E-03	0.0	1.65E-05	1.20E-11	D
3-Methylheptane	589811	114	7.63E-01	3.6	2.45E-03	1.77E-09	D
3-Methylhexane	589344	100	1.13E+00	4.6	3.18E-03	2.30E-09	D
3-Methylpentane	96140	86	7.40E-01	2.6	1.79E-03	1.30E-09	D
3-Methylthiophene	616444	98	9.25E-02	0.4	2.55E-04	1.85E-10	E
4-Methyl-1-pentene	691372	84	2.33E-02	0.1	5.51E-05	3.99E-11	E
4-Methyl-2-pentanone (MIBK)	108101	100	8.83E-01	3.6	2.48E-03	1.80E-09	C
4-Methylheptane	589537	114	2.49E-01	1.2	7.99E-04	5.79E-10	D
Acetaldehyde	75070	44	7.74E-02	0.1	9.58E-05	6.94E-11	D
Acetone	67641	58	6.70E+00	15.9	1.09E-02	7.92E-09	C
Acetonitrile	75058	41	5.56E-01	0.9	6.41E-04	4.64E-10	A
Benzene	71432	78	2.40E+00	7.7	5.26E-03	3.81E-09	A
Benzyl chloride	100447	127	1.81E-02	0.1	6.43E-05	4.66E-11	A
Bromodichloromethane	75274	164	8.78E-03	0.1	4.04E-05	2.93E-11	E
Bromomethane (Methyl bromide)	74839	95	2.10E-02	0.1	5.60E-05	4.06E-11	C
Butane	106978	58	6.22E+00	14.8	1.02E-02	7.35E-09	C
Carbon disulfide	75150	76	1.47E-01	0.5	3.14E-04	2.28E-10	A
Carbon monoxide	630080	28	2.44E+01	27.9	1.92E-02	1.39E-08	C
Carbon tetrachloride	56235	154	7.98E-03	0.1	3.45E-05	2.50E-11	A
Carbon tetrafluoride (Freon 14)	75730	88	1.51E-01	0.5	3.73E-04	2.70E-10	E
Carbonyl sulfide (Carbon oxysulfide)	463581	60	1.22E-01	0.3	2.06E-04	1.49E-10	A
Chlorobenzene	108907	113	4.84E-01	2.2	1.53E-03	1.11E-09	A
Chlorodifluoromethane (Freon 22)	75456	86	7.96E-01	2.8	1.93E-03	1.40E-09	D
Chloroethane (Ethyl chloride)	75003	65	3.95E+00	10.4	7.16E-03	5.18E-09	B
Chloromethane (Methyl chloride)	74873	50	2.44E-01	0.5	3.46E-04	2.51E-10	B
cis-1,2-Dichloroethene	156592	97	1.24E+00	4.9	3.38E-03	2.45E-09	B
cis-1,2-Dimethylcyclohexane	2207014	112	8.10E-02	0.4	2.55E-04	1.85E-10	D
cis-1,3-Dichloropropene	10061015	111	3.03E-03	0.0	9.44E-06	6.84E-12	D
cis-1,3-Dimethylcyclohexane	638040	112	5.01E-01	2.3	1.58E-03	1.14E-09	D
cis-1,4-Dimethylcyclohexane	624293	112	2.48E-01	1.1	7.82E-04	5.66E-10	D
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	112	2.48E-01	1.1	7.82E-04	5.66E-10	D
cis-2-Butene	590181	56	1.05E-01	0.2	1.65E-04	1.20E-10	D
cis-2-Heptene	6443921	98	2.45E-02	0.1	6.76E-05	4.89E-11	E
cis-2-Hexene	7688213	84	1.72E-02	0.1	4.07E-05	2.94E-11	D
cis-2-Octene	7642048	112	2.20E-01	1.0	6.93E-04	5.02E-10	D
cis-2-Pentene	627203	70	4.79E-02	0.1	9.43E-05	6.83E-11	D
cis-3-Methyl-2-pentene	922623	84	1.79E-02	0.1	4.23E-05	3.06E-11	D
Cyclohexane	110827	84	1.01E+00	3.5	2.39E-03	1.73E-09	B
Cyclohexene	110838	82	1.84E-02	0.1	4.24E-05	3.07E-11	D
Cyclopentane	287923	70	2.21E-02	0.1	4.35E-05	3.15E-11	D
Cyclopentene	142290	68	1.21E-02	0.0	2.31E-05	1.68E-11	D
Decane	124185	142	3.80E+00	22.1	1.52E-02	1.10E-08	D
Dibromochloromethane	124481	208	1.51E-02	0.1	8.83E-05	6.40E-11	D
Dibromomethane (Methylene dibromide)	74953	174	8.35E-04	0.0	4.08E-06	2.95E-12	E
Dichlorobenzene	106467	147	9.40E-01	5.6	3.88E-03	2.81E-09	A
Dichlorodifluoromethane (Freon 12)	75718	121	1.18E+00	5.8	4.01E-03	2.90E-09	B
Dichloromethane (Methylene chloride)	75092	85	6.15E+00	21.3	1.47E-02	1.06E-08	A

Constituent	CAS No.	MW	Concentration in LFG		Total Emission Rate	Total Emission Flux	Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(g/s)	(g/s/m²)	
Diethyl sulfide	352932	90	8.62E-02	0.3	2.18E-04	1.58E-10	E
Dimethyl disulfide	624920	94	1.37E-01	0.5	3.62E-04	2.63E-10	A
Dimethyl sulfide	75183	62	5.66E+00	14.4	9.88E-03	7.15E-09	A
Dodecane (n-Dodecane)	112403	170	2.21E-01	1.5	1.06E-03	7.66E-10	D
Ethane	74840	30	9.05E+00	11.1	7.64E-03	5.54E-09	D
Ethanol	64175	46	2.30E-01	0.4	2.98E-04	2.16E-10	D
Ethyl acetate	141786	88	1.88E+00	6.8	4.65E-03	3.37E-09	C
Ethyl mercaptan (Ethanediol)	75081	62	1.98E-01	0.5	3.46E-04	2.50E-10	A
Ethyl methyl sulfide	624895	76	3.67E-02	0.1	7.85E-05	5.69E-11	E
Ethylbenzene	100414	106	4.86E+00	21.1	1.45E-02	1.05E-08	B
Formaldehyde	50000	30	1.17E-02	0.0	9.87E-06	7.15E-12	D
Heptane	142825	100	1.34E+00	5.5	3.77E-03	2.73E-09	B
Hexane	110543	86	3.10E+00	10.9	7.50E-03	5.43E-09	B
Hydrogen sulfide	7783064	34	3.20E+01	44.6	3.06E-02	2.22E-08	A
Indane (2,3-Dihydroindene)	496117	34	6.66E-02	0.1	6.37E-05	4.62E-11	D
Isobutane (2-Methylpropane)	75285	58	8.16E+00	19.4	1.33E-02	9.65E-09	D
Isobutylbenzene	538932	134	4.07E-02	0.2	1.53E-04	1.11E-10	D
Isoprene (2-Methyl-1,3-butadiene)	78795	68	1.65E-02	0.0	3.16E-05	2.29E-11	D
Isopropyl mercaptan	75332	76	1.75E-01	0.5	3.74E-04	2.71E-10	A
Isopropylbenzene (Cumene)	98828	120	4.30E-01	2.1	1.45E-03	1.05E-09	D
Mercury (total)	7439976	201	1.22E-04	0.0	6.87E-07	4.98E-13	B
Methanethiol (Methyl mercaptan)	74931	48	1.37E+00	2.7	1.85E-03	1.34E-09	A
Methyl tert-butyl ether (MTBE)	1634044	88	1.18E-01	0.4	2.92E-04	2.12E-10	D
Methylcyclohexane	108872	98	1.29E+00	5.2	3.56E-03	2.58E-09	D
Methylcyclopentane	96377	84	6.50E-01	2.2	1.54E-03	1.11E-09	D
Naphthalene	91203	128	1.07E-01	0.6	3.85E-04	2.79E-10	D
n-Butylbenzene	104518	134	6.80E-02	0.4	2.56E-04	1.86E-10	D
Nonane	111842	128	2.37E+00	12.4	8.54E-03	6.18E-09	D
n-Propylbenzene (Propylbenzene)	103651	120	4.13E-01	2.0	1.39E-03	1.01E-09	D
Octane	111659	114	1.08E+00	5.0	3.46E-03	2.51E-09	D
p-Cymene (1-Methyl-4-lsopropylbenzene)	99876	134	3.58E+00	19.6	1.35E-02	9.77E-09	D
Pentane	109660	72	4.46E+00	13.2	9.04E-03	6.55E-09	C
Propane	74986	44	1.55E+01	27.9	1.92E-02	1.39E-08	C
Propene	115071	42	3.32E+00	5.7	3.92E-03	2.84E-09	D
Propyne	74997	40	3.80E-02	0.1	4.28E-05	3.10E-11	E
sec-Butylbenzene	135988	134	6.75E-02	0.4	2.54E-04	1.84E-10	D
Styrene (Vinylbenzene)	100425	104	4.11E-01	1.7	1.20E-03	8.71E-10	B
Tetrachloroethylene (Perchloroethylene)	127184	166	2.03E+00	13.8	9.45E-03	6.85E-09	A
Tetrahydrofuran (Diethylene oxide)	109999	72	9.69E-01	2.9	1.96E-03	1.42E-09	C
Thiophene	110021	84	3.49E-01	1.2	8.25E-04	5.97E-10	E
Toluene (Methyl benzene)	108883	92	2.95E+01	111.1	7.63E-02	5.53E-08	A
trans-1,2-Dichloroethene	156605	97	2.87E-02	0.1	7.81E-05	5.66E-11	C
trans-1,2-Dimethylcyclohexane	6876239	112	4.04E-01	1.9	1.27E-03	9.22E-10	D
trans-1,3-Dichloropropene	10061026	111	9.43E-03	0.0	2.94E-05	2.13E-11	D
trans-1,4-Dimethylcyclohexane	2207047	112	2.05E-01	0.9	6.46E-04	4.68E-10	D
trans-2-Butene	624646	56	1.04E-01	0.2	1.64E-04	1.19E-10	D
trans-2-Heptene	14686136	98	2.50E-03	0.0	6.89E-06	4.99E-12	E
trans-2-Hexene	4050457	84	2.06E-02	0.1	4.87E-05	3.53E-11	D
trans-2-Octene	13389429	112	2.41E-01	1.1	7.59E-04	5.50E-10	D
trans-2-Pentene	646048	70	3.47E-02	0.1	6.83E-05	4.95E-11	D
trans-3-Methyl-2-pentene	616126	84	1.55E-02	0.1	3.66E-05	2.65E-11	D
Tribromomethane (Bromoform)	75252	253	1.24E-02	0.1	8.80E-05	6.38E-11	D
Trichloroethylene (Trichloroethene)	79016	131	8.28E-01	4.4	3.06E-03	2.21E-09	A
Trichlorofluoromethane (Freon 11)	91315616	137	2.48E-01	1.4	9.57E-04	6.93E-10	B
Trichloromethane (Chloroform)	67663	119	7.08E-02	0.3	2.37E-04	1.72E-10	A
Undecane	1120214	156	1.67E+00	10.7	7.33E-03	5.31E-09	D
Vinyl acetate	85306269	86	2.48E-01	0.9	6.00E-04	4.34E-10	C
Vinyl chloride (Chloroethene)	75014	63	1.42E+00	3.6	2.49E-03	1.81E-09	A
Xylenes (o-, m-, p-, mixtures)	1330207	106	9.23E+00	40.1	2.75E-02	1.99E-08	A
Total Reduced Sulphur Compounds	n/a	-	-	67.7	4.65E-02	3.37E-08	-

Table E3. Flares 1 and 2 - LFG Emissions - Stages 1 to 5 - Alternative 2 Scenario A

Combustible constituents of LFG will be combusted in the enclosed Flares 1 and 2 with a control efficiency of 98%. Residual LFG will be emitted.

Mercury and siloxanes are not combustible, so a control efficiency of 0% is assumed for these compounds.

Enclosed Flares	Quantity of LFG Combusted*	Control Efficiency
	m^3/s	%
Flare 1	0.21	98%
Flare 2	0.38	98%

* See Table E1 for calculation of quantity combusted.

The concentrations of constituents in LFG are based on AP-42, Table 2.4-1, AP-42, 2.4 Municipal Solid Waste Landfills, Draft Section - October 2008

Sample Calculation (1,1,1-Trichloroethane)

Concentration in LFG = Molecular Weight (g/mole) x Concentration (ppmv) / 24.45
= 133.4 (g/mole) x 0.243 (ppmv) / 24.45
= 1.33E+00 mg/m³

Emission Rate (Flare 1) = Quantity LFG Combusted (m³/s) x Concentration in LFG (mg/m³) x (1 - Control Efficiency) / 1000 (mg/g)
= 0.22 (m³/s) x 1.33 (mg/m³) x (1-0.98) /1000 (mg/g)
= 5.57E-06 g/s

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(%)	Flare 1	Flare 2	
1,1,1-Trichloroethane	71556	133.4	0.243	1.33	98%	5.6E-06	1.0E-05	A
1,1,2,2-Tetrachloroethane	79345	167.85	0.535	3.67	98%	1.5E-05	2.8E-05	E
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	260.76	0.00349	0.04	98%	1.6E-07	2.8E-07	D
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187.37	0.0672	0.51	98%	2.2E-06	3.9E-06	C
1,1,2-Trichloroethane	79005	133.4	0.158	0.86	98%	3.6E-06	6.5E-06	D
1,1-Dichloroethane	75343	98.96	2.08	8.42	98%	3.5E-05	6.4E-05	A
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	96.94	0.16	0.63	98%	2.7E-06	4.8E-06	A
1,2,3-Trimethylbenzene	526738	120.19	0.359	1.76	98%	7.4E-06	1.3E-05	D
1,2,4-Trichlorobenzene	120821	181.45	0.00551	0.04	98%	1.7E-07	3.1E-07	C
1,2,4-Trimethylbenzene	95636	120.19	1.37	6.73	98%	2.8E-05	5.1E-05	B
1,2-Dibromoethane (Ethylene dibromide)	106934	187.86	0.0048	0.04	98%	1.6E-07	2.8E-07	B
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	170.92	0.106	0.74	98%	3.1E-06	5.6E-06	B
1,2-Dichloroethane (Ethylene dichloride)	107062	98.96	0.159	0.64	98%	2.7E-06	4.9E-06	A
1,2-Dichloroethene	540590	96.94	11.4	45.20	98%	1.9E-04	3.4E-04	E
1,2-Dichloropropane	78875	112.99	0.052	0.24	98%	1.0E-06	1.8E-06	D
1,2-Diethylbenzene	135013	134.22	0.0199	0.11	98%	4.6E-07	8.3E-07	D
1,3,5-Trimethylbenzene	108678	120.19	0.623	3.06	98%	1.3E-05	2.3E-05	C
1,3-Butadiene (Vinyl ethylene)	106990	54.09	0.166	0.37	98%	1.5E-06	2.8E-06	C
1,3-Diethylbenzene	141935	134.22	0.0655	0.36	98%	1.5E-06	2.7E-06	D
1,4-Diethylbenzene	105055	134.22	0.262	1.44	98%	6.0E-06	1.1E-05	D
1,4-Dioxane (1,4-Diethylene dioxide)	123911	88.11	0.00829	0.03	98%	1.3E-07	2.3E-07	D
1-Butene	106989	56.11	1.22	2.80	98%	1.2E-05	2.1E-05	D
2-Methylbutene	513359	70.13	1.22	3.50	98%	1.5E-05	2.6E-05	D
1-Butene	106989	56.11	1.1	2.52	98%	1.1E-05	1.9E-05	E
2-Methylpropene	115117	56.11	1.1	2.52	98%	1.1E-05	1.9E-05	E
1-Ethyl-4-methylbenzene (4-Ethyl toluene)	622968	120.19	0.989	4.86	98%	2.0E-05	3.7E-05	C
1-Heptene	592767	98.19	0.625	2.51	98%	1.1E-05	1.9E-05	E
1-Hexene	592416	84.16	0.0888	0.31	98%	1.3E-06	2.3E-06	D
2-Methyl-1-pentene	763291	84.16	0.0888	0.31	98%	1.3E-06	2.3E-06	D
1-Methylcyclohexene	591491	96.17	0.0227	0.09	98%	3.8E-07	6.8E-07	D
1-Methylcyclopentene	693890	82.14	0.0252	0.08	98%	3.6E-07	6.4E-07	D
1-Pentene	109671	70.13	0.22	0.63	98%	2.7E-06	4.8E-06	D
1-Propanethiol (n-Propyl mercaptan)	107039	76.16	0.125	0.39	98%	1.6E-06	2.9E-06	D
2,2,3-Trimethylbutane	464062	100.2	0.00919	0.04	98%	1.6E-07	2.8E-07	D
2,2,4-Trimethylpentane	540841	114.23	0.614	2.87	98%	1.2E-05	2.2E-05	A
2,2,5-Trimethylhexane	3522949	128.26	0.156	0.82	98%	3.4E-06	6.2E-06	D
2,2-Dimethylbutane	75832	86.18	0.156	0.55	98%	2.3E-06	4.2E-06	D
2,2-Dimethylpentane	590352	100.2	0.0608	0.25	98%	1.0E-06	1.9E-06	D
2,2-Dimethylpropane	463821	72.15	0.0274	0.08	98%	3.4E-07	6.1E-07	D
2,3,4-Trimethylpentane	565753	114.23	0.312	1.46	98%	6.1E-06	1.1E-05	D
2,3-Dimethylbutane	79298	86.18	0.167	0.59	98%	2.5E-06	4.5E-06	E
2,3-Dimethylpentane	565593	100.2	0.31	1.27	98%	5.3E-06	9.6E-06	D
2,4-Dimethylhexane	589435	114.23	0.222	1.04	98%	4.4E-06	7.8E-06	D
2,4-Dimethylpentane	108087	100.2	0.1	0.41	98%	1.7E-06	3.1E-06	D
2,5-Dimethylhexane	592132	114.23	0.166	0.78	98%	3.3E-06	5.9E-06	D
2,5-Dimethylthiophene	638028	112.19	0.0644	0.30	98%	1.2E-06	2.2E-06	D

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(%)	Flare 1	Flare 2	
2-Butanone (Methyl ethyl ketone)	78933	72.11	4.01	11.83	98%	5.0E-05	8.9E-05	D
2-Ethyl-1-butene	760214	84.16	0.0177	0.06	98%	2.6E-07	4.6E-07	E
2-Ethylthiophene	872559	112.19	0.0629	0.29	98%	1.2E-06	2.2E-06	C
2-Ethyltoluene	611143	120.19	0.323	1.59	98%	6.7E-06	1.2E-05	D
2-Hexanone (Methyl butyl ketone)	591786	100.16	0.613	2.51	98%	1.1E-05	1.9E-05	E
2-Methyl-1-butene	563462	70.13	0.179	0.51	98%	2.2E-06	3.9E-06	D
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90.19	0.17	0.63	98%	2.6E-06	4.7E-06	E
2-Methyl-2-butene	513359	70.13	0.303	0.87	98%	3.7E-06	6.6E-06	D
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90.19	0.325	1.20	98%	5.0E-06	9.1E-06	E
2-Methylbutane	78784	72.15	2.26	6.67	98%	2.8E-05	5.0E-05	D
2-Methylheptane	592278	114.23	0.716	3.35	98%	1.4E-05	2.5E-05	D
2-Methylhexane	591764	100.2	0.816	3.34	98%	1.4E-05	2.5E-05	D
2-Methylpentane	107835	86.18	0.688	2.43	98%	1.0E-05	1.8E-05	D
2-Propanol (Isopropyl alcohol)	67630	60.1	1.8	4.42	98%	1.9E-05	3.3E-05	D
3,6-Dimethyloctane	15869940	142.28	0.785	4.57	98%	1.9E-05	3.5E-05	D
3-Ethyltoluene	620144	120.19	0.78	3.83	98%	1.6E-05	2.9E-05	D
3-Methyl-1-pentene	760203	84.16	0.00699	0.02	98%	1.0E-07	1.8E-07	D
3-Methylheptane	589811	114.23	0.763	3.56	98%	1.5E-05	2.7E-05	D
3-Methylhexane	589344	100.2	1.13	4.63	98%	1.9E-05	3.5E-05	D
3-Methylpentane	96140	86.18	0.74	2.61	98%	1.1E-05	2.0E-05	D
3-Methylthiophene	616444	98.17	0.0925	0.37	98%	1.6E-06	2.8E-06	E
4-Methyl-1-pentene	691372	84.16	0.0233	0.08	98%	3.4E-07	6.1E-07	E
4-Methyl-2-pentanone (MIBK)	108101	100.16	0.883	3.62	98%	1.5E-05	2.7E-05	C
4-Methylheptane	589537	114.23	0.249	1.16	98%	4.9E-06	8.8E-06	D
Acetaldehyde	75070	44.05	0.0774	0.14	98%	5.9E-07	1.1E-06	D
Acetone	67641	58.08	6.7	15.92	98%	6.7E-05	1.2E-04	C
Acetonitrile	75058	41.05	0.556	0.93	98%	3.9E-06	7.1E-06	A
Benzene	71432	78.11	2.4	7.67	98%	3.2E-05	5.8E-05	A
Benzyl chloride	100447	126.58	0.0181	0.09	98%	3.9E-07	7.1E-07	A
Bromodichloromethane	75274	163.83	0.00878	0.06	98%	2.5E-07	4.5E-07	E
Bromomethane (Methyl bromide)	74839	94.94	0.021	0.08	98%	3.4E-07	6.2E-07	C
Butane	106978	58.12	6.22	14.79	98%	6.2E-05	1.1E-04	C
Carbon disulfide	75150	76.14	0.147	0.46	98%	1.9E-06	3.5E-06	A
Carbon monoxide	630080	28.01	24.4	27.95	98%	1.2E-04	2.1E-04	C
Carbon tetrachloride	56235	153.82	0.00798	0.05	98%	2.1E-07	3.8E-07	A
Carbon tetrafluoride (Freon 14)	75730	88	0.151	0.54	98%	2.3E-06	4.1E-06	E
Carbonyl sulfide (Carbon oxysulfide)	463581	60.08	0.122	0.30	98%	1.3E-06	2.3E-06	A
Chlorobenzene	108907	112.56	0.484	2.23	98%	9.4E-06	1.7E-05	A
Chlorodifluoromethane (Freon 22)	75456	86.47	0.796	2.82	98%	1.2E-05	2.1E-05	D
Chloroethane (Ethyl chloride)	75003	64.51	3.95	10.42	98%	4.4E-05	7.9E-05	B
Chloromethane (Methyl chloride)	74873	50.49	0.244	0.50	98%	2.1E-06	3.8E-06	B
cis-1,2-Dichloroethene	156592	96.94	1.24	4.92	98%	2.1E-05	3.7E-05	B
cis-1,2-Dimethylcyclohexane	2207014	112.21	0.081	0.37	98%	1.6E-06	2.8E-06	D
cis-1,3-Dichloropropene	10061015	110.97	0.00303	0.01	98%	5.8E-08	1.0E-07	D
cis-1,3-Dimethylcyclohexane	638040	112.21	0.501	2.30	98%	9.7E-06	1.7E-05	D
cis-1,4-Dimethylcyclohexane	624293	112.21	0.248	1.14	98%	4.8E-06	8.6E-06	D
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	112.21	0.248	1.14	98%	4.8E-06	8.6E-06	D
cis-2-Butene	590181	56.11	0.105	0.24	98%	1.0E-06	1.8E-06	D
cis-2-Heptene	6443921	98.19	0.0245	0.10	98%	4.1E-07	7.4E-07	E
cis-2-Hexene	7688213	84.16	0.0172	0.06	98%	2.5E-07	4.5E-07	D
cis-2-Octene	7642048	112.21	0.22	1.01	98%	4.2E-06	7.6E-06	D
cis-2-Pentene	627203	70.13	0.0479	0.14	98%	5.8E-07	1.0E-06	D
cis-3-Methyl-2-pentene	922623	84.16	0.0179	0.06	98%	2.6E-07	4.7E-07	D
Cyclohexane	110827	84.16	1.01	3.48	98%	1.5E-05	2.6E-05	B
Cyclohexene	110838	82.14	0.0184	0.06	98%	2.6E-07	4.7E-07	D
Cyclopentane	287923	70.13	0.0221	0.06	98%	2.7E-07	4.8E-07	D
Cyclopentene	142290	68.12	0.0121	0.03	98%	1.4E-07	2.6E-07	D
Decane	124185	142.28	3.8	22.11	98%	9.3E-05	1.7E-04	D
Dibromochloromethane	124481	208.28	0.0151	0.13	98%	5.4E-07	9.7E-07	D
Dibromomethane (Methylene dibromide)	74953	173.84	0.000835	0.01	98%	2.5E-08	4.5E-08	E
Dichlorobenzene	106467	147	0.94	5.65	98%	2.4E-05	4.3E-05	A
Dichlorodifluoromethane (Freon 12)	75718	120.91	1.18	5.84	98%	2.5E-05	4.4E-05	B
Dichloromethane (Methylene chloride)	75092	84.93	6.15	21.36	98%	9.0E-05	1.6E-04	A
Diethyl sulfide	352932	90.19	0.0862	0.32	98%	1.3E-06	2.4E-06	E
Dimethyl disulfide	624920	94.2	0.137	0.53	98%	2.2E-06	4.0E-06	A
Dimethyl sulfide	75183	62.14	5.66	14.38	98%	6.0E-05	1.1E-04	A
Dodecane (n-Dodecane)	112403	170.33	0.221	1.54	98%	6.5E-06	1.2E-05	D
Ethane	74840	30.07	9.05	11.13	98%	4.7E-05	8.4E-05	D
Ethanol	64175	46.07	0.23	0.43	98%	1.8E-06	3.3E-06	D
Ethyl acetate	141786	88.11	1.88	6.77	98%	2.8E-05	5.1E-05	C
Ethyl mercaptan (Ethanediol)	75081	62.14	0.198	0.50	98%	2.1E-06	3.8E-06	A
Ethyl methyl sulfide	624895	76.16	0.0367	0.11	98%	4.8E-07	8.6E-07	E

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(%)	Flare 1	Flare 2	
Ethylbenzene	100414	106.17	4.86	21.10	98%	8.9E-05	1.6E-04	B
Formaldehyde	50000	30.03	0.0117	0.01	98%	6.0E-08	1.1E-07	D
Heptane	142825	100.2	1.34	5.49	98%	2.3E-05	4.2E-05	B
Hexane	110543	86.18	3.1	10.93	98%	4.6E-05	8.3E-05	B
Hydrogen sulfide	7783064	34.08	32	44.60	98%	1.9E-04	3.4E-04	A
Indane (2,3-Dihydroindene)	496117	34.08	0.0666	0.09	98%	3.9E-07	7.0E-07	D
Isobutane (2-Methylpropane)	75285	58.12	8.16	19.40	98%	8.2E-05	1.5E-04	D
Isobutylbenzene	538932	134.22	0.0407	0.22	98%	9.4E-07	1.7E-06	D
Isoprene (2-Methyl-1,3-butadiene)	78795	68.12	0.0165	0.05	98%	1.9E-07	3.5E-07	D
Isopropyl mercaptan	75332	76.16	0.175	0.55	98%	2.3E-06	4.1E-06	A
Isopropylbenzene (Cumene)	98828	120.19	0.43	2.11	98%	8.9E-06	1.6E-05	D
Mercury (total)	7439976	200.59	1.22E-04	1.00E-03	0%	2.1E-07	3.8E-07	B
Methanethiol (Methyl mercaptan)	74931	48.11	1.37	2.70	98%	1.1E-05	2.0E-05	A
Methyl tert-butyl ether (MTBE)	1634044	88.15	0.118	0.43	98%	1.8E-06	3.2E-06	D
Methylcyclohexane	108872	98.19	1.29	5.18	98%	2.2E-05	3.9E-05	D
Methylcyclopentane	96377	84.16	0.65	2.24	98%	9.4E-06	1.7E-05	D
Naphthalene	91203	128.17	0.107	0.56	98%	2.4E-06	4.2E-06	D
n-Butylbenzene	104518	134.22	0.068	0.37	98%	1.6E-06	2.8E-06	D
Nonane	111842	128.26	2.37	12.43	98%	5.2E-05	9.4E-05	D
n-Propylbenzene (Propylbenzene)	103651	120.19	0.413	2.03	98%	8.5E-06	1.5E-05	D
Octane	111659	114.23	1.08	5.05	98%	2.1E-05	3.8E-05	D
p-Cymene (1-Methyl-4-Isopropylbenzene)	99876	134.22	3.58	19.65	98%	8.3E-05	1.5E-04	D
Pentane	109660	72.15	4.46	13.16	98%	5.5E-05	1.0E-04	C
Propane	74986	44.1	15.5	27.96	98%	1.2E-04	2.1E-04	C
Propene	115071	42.08	3.32	5.71	98%	2.4E-05	4.3E-05	D
Propyne	74997	40.06	0.038	0.06	98%	2.6E-07	4.7E-07	E
sec-Butylbenzene	135988	134.22	0.0675	0.37	98%	1.6E-06	2.8E-06	D
Styrene (Vinylbenzene)	100425	104.15	0.411	1.75	98%	7.4E-06	1.3E-05	B
Tetrachloroethylene (Perchloroethylene)	127184	165.83	2.03	13.77	98%	5.8E-05	1.0E-04	A
Tetrahydrofuran (Diethylene oxide)	109999	72.11	0.969	2.86	98%	1.2E-05	2.2E-05	C
Thiophene	110021	84.14	0.349	1.20	98%	5.0E-06	9.1E-06	E
Toluene (Methyl benzene)	108883	92.14	29.5	111.17	98%	4.7E-04	8.4E-04	A
trans-1,2-Dichloroethene	156605	96.94	0.0287	0.11	98%	4.8E-07	8.6E-07	C
trans-1,2-Dimethylcyclohexane	6876239	112.21	0.404	1.85	98%	7.8E-06	1.4E-05	D
trans-1,3-Dichloropropene	10061026	110.97	0.00943	0.04	98%	1.8E-07	3.2E-07	D
trans-1,4-Dimethylcyclohexane	2207047	112.21	0.205	0.94	98%	4.0E-06	7.1E-06	D
trans-2-Butene	624646	56.11	0.104	0.24	98%	1.0E-06	1.8E-06	D
trans-2-Heptene	14686136	98.19	0.0025	0.01	98%	4.2E-08	7.6E-08	E
trans-2-Hexene	4050457	84.16	0.0206	0.07	98%	3.0E-07	5.4E-07	D
trans-2-Octene	13389429	112.21	0.241	1.11	98%	4.6E-06	8.4E-06	D
trans-2-Pentene	646048	70.13	0.0347	0.10	98%	4.2E-07	7.5E-07	D
trans-3-Methyl-2-pentene	616126	84.16	0.0155	0.05	98%	2.2E-07	4.0E-07	D
Tribromomethane (Bromoform)	75252	252.73	0.0124	0.13	98%	5.4E-07	9.7E-07	D
Trichloroethylene (Trichloroethene)	79016	131.39	0.828	4.45	98%	1.9E-05	3.4E-05	A
Trichlorofluoromethane (Freon 11)	91315616	137.37	0.248	1.39	98%	5.9E-06	1.1E-05	B
Trichloromethane (Chloroform)	67663	119.38	0.0708	0.35	98%	1.5E-06	2.6E-06	A
Undecane	1120214	156.31	1.67	10.68	98%	4.5E-05	8.1E-05	D
Vinyl acetate	85306269	86.09	0.248	0.87	98%	3.7E-06	6.6E-06	C
Vinyl chloride (Chloroethene)	75014	62.5	1.42	3.63	98%	1.5E-05	2.7E-05	A
Xylenes (o-, m-, p-, mixtures)	1330207	106.17	9.23	40.08	98%	1.7E-04	3.0E-04	A
Total Reduced Sulphur Compounds	n/a	-	-	67.7	98%	2.8E-04	5.1E-04	-

Table E3. Flares 1 and 2 - LFG Emissions - Stages 6 to 8 - Alternative 2 Scenario A

Combustible constituents of LFG will be combusted in the enclosed Flares 1 and 2 with a control efficiency of 98%. Residual LFG will be emitted.

Mercury and siloxanes are not combustible, so a control efficiency of 0% is assumed for these compounds.

Enclosed Flares	Quantity of LFG Combusted*	Control Efficiency
	m^3/s	%
Flare 1	0.56	98%
Flare 2	1.01	98%

* See Table E1 for calculation of quantity combusted.

The concentrations of constituents in LFG are based on AP-42, Table 2.4-1, AP-42, 2.4 Municipal Solid Waste Landfills, Draft Section - October 2008

Sample Calculation (1,1,1-Trichloroethane)

Concentration in LFG = Molecular Weight (g/mole) x Concentration (ppmv) / 24.45
= 133.4 (g/mole) x 0.243 (ppmv) / 24.45
= 1.33E+00 mg/m³

Emission Rate (Flare 1) = Quantity LFG Combusted (m³/s) x Concentration in LFG (mg/m³) x (1 - Control Efficiency) / 1000 (mg/g)
= 0.57 (m³/s) x 1.33 (mg/m³) x (1-0.98) /1000 (mg/g)
= 1.49E-05 g/s

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(%)	Flare 1	Flare 2	
1,1,1-Trichloroethane	71556	133.4	0.243	1.33	98%	1.5E-05	2.7E-05	A
1,1,2,2-Tetrachloroethane	79345	167.85	0.535	3.67	98%	4.1E-05	7.4E-05	E
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	260.76	0.00349	0.04	98%	4.2E-07	7.5E-07	D
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187.37	0.0672	0.51	98%	5.8E-06	1.0E-05	C
1,1,2-Trichloroethane	79005	133.4	0.158	0.86	98%	9.7E-06	1.7E-05	D
1,1-Dichloroethane	75343	98.96	2.08	8.42	98%	9.4E-05	1.7E-04	A
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	96.94	0.16	0.63	98%	7.1E-06	1.3E-05	A
1,2,3-Trimethylbenzene	526738	120.19	0.359	1.76	98%	2.0E-05	3.6E-05	D
1,2,4-Trichlorobenzene	120821	181.45	0.00551	0.04	98%	4.6E-07	8.3E-07	C
1,2,4-Trimethylbenzene	95636	120.19	1.37	6.73	98%	7.6E-05	1.4E-04	B
1,2-Dibromoethane (Ethylene dibromide)	106934	187.86	0.0048	0.04	98%	4.1E-07	7.4E-07	B
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	170.92	0.106	0.74	98%	8.3E-06	1.5E-05	B
1,2-Dichloroethane (Ethylene dichloride)	107062	98.96	0.159	0.64	98%	7.2E-06	1.3E-05	A
1,2-Dichloroethene	540590	96.94	11.4	45.20	98%	5.1E-04	9.1E-04	E
1,2-Dichloropropane	78875	112.99	0.052	0.24	98%	2.7E-06	4.9E-06	D
1,2-Diethylbenzene	135013	134.22	0.0199	0.11	98%	1.2E-06	2.2E-06	D
1,3,5-Trimethylbenzene	108678	120.19	0.623	3.06	98%	3.4E-05	6.2E-05	C
1,3-Butadiene (Vinyl ethylene)	106990	54.09	0.166	0.37	98%	4.1E-06	7.4E-06	C
1,3-Diethylbenzene	141935	134.22	0.0655	0.36	98%	4.0E-06	7.3E-06	D
1,4-Diethylbenzene	105055	134.22	0.262	1.44	98%	1.6E-05	2.9E-05	D
1,4-Dioxane (1,4-Diethylene dioxide)	123911	88.11	0.00829	0.03	98%	3.4E-07	6.0E-07	D
1-Butene	106989	56.11	1.22	2.80	98%	3.1E-05	5.7E-05	D
2-Methylbutene	513359	70.13	1.22	3.50	98%	3.9E-05	7.1E-05	D
1-Butene	106989	56.11	1.1	2.52	98%	2.8E-05	5.1E-05	E
2-Methylpropene	115117	56.11	1.1	2.52	98%	2.8E-05	5.1E-05	E
1-Ethyl-4-methylbenzene (4-Ethyl toluene)	622968	120.19	0.989	4.86	98%	5.5E-05	9.8E-05	C
1-Heptene	592767	98.19	0.625	2.51	98%	2.8E-05	5.1E-05	E
1-Hexene	592416	84.16	0.0888	0.31	98%	3.4E-06	6.2E-06	D
2-Methyl-1-pentene	763291	84.16	0.0888	0.31	98%	3.4E-06	6.2E-06	D
1-Methylcyclohexene	591491	96.17	0.0227	0.09	98%	1.0E-06	1.8E-06	D
1-Methylcyclopentene	693890	82.14	0.0252	0.08	98%	9.5E-07	1.7E-06	D
1-Pentene	109671	70.13	0.22	0.63	98%	7.1E-06	1.3E-05	D
1-Propanethiol (n-Propyl mercaptan)	107039	76.16	0.125	0.39	98%	4.4E-06	7.9E-06	D
2,2,3-Trimethylbutane	464062	100.2	0.00919	0.04	98%	4.2E-07	7.6E-07	D
2,2,4-Trimethylpentane	540841	114.23	0.614	2.87	98%	3.2E-05	5.8E-05	A
2,2,5-Trimethylhexane	3522949	128.26	0.156	0.82	98%	9.2E-06	1.7E-05	D
2,2-Dimethylbutane	75832	86.18	0.156	0.55	98%	6.2E-06	1.1E-05	D
2,2-Dimethylpentane	590352	100.2	0.0608	0.25	98%	2.8E-06	5.0E-06	D
2,2-Dimethylpropane	463821	72.15	0.0274	0.08	98%	9.1E-07	1.6E-06	D
2,3,4-Trimethylpentane	565753	114.23	0.312	1.46	98%	1.6E-05	2.9E-05	D
2,3-Dimethylbutane	79298	86.18	0.167	0.59	98%	6.6E-06	1.2E-05	E
2,3-Dimethylpentane	565593	100.2	0.31	1.27	98%	1.4E-05	2.6E-05	D
2,4-Dimethylhexane	589435	114.23	0.222	1.04	98%	1.2E-05	2.1E-05	D
2,4-Dimethylpentane	108087	100.2	0.1	0.41	98%	4.6E-06	8.3E-06	D
2,5-Dimethylhexane	592132	114.23	0.166	0.78	98%	8.7E-06	1.6E-05	D
2,5-Dimethylthiophene	638028	112.19	0.0644	0.30	98%	3.3E-06	6.0E-06	D

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m^3)	(%)	Flare 1	Flare 2	
2-Butanone (Methyl ethyl ketone)	78933	72.11	4.01	11.83	98%	1.3E-04	2.4E-04	D
2-Ethyl-1-butene	760214	84.16	0.0177	0.06	98%	6.8E-07	1.2E-06	E
2-Ethylthiophene	872559	112.19	0.0629	0.29	98%	3.2E-06	5.8E-06	C
2-Ethyltoluene	611143	120.19	0.323	1.59	98%	1.8E-05	3.2E-05	D
2-Hexanone (Methyl butyl ketone)	591786	100.16	0.613	2.51	98%	2.8E-05	5.1E-05	E
2-Methyl-1-butene	563462	70.13	0.179	0.51	98%	5.8E-06	1.0E-05	D
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90.19	0.17	0.63	98%	7.0E-06	1.3E-05	E
2-Methyl-2-butene	513359	70.13	0.303	0.87	98%	9.8E-06	1.8E-05	D
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90.19	0.325	1.20	98%	1.3E-05	2.4E-05	E
2-Methylbutane	78784	72.15	2.26	6.67	98%	7.5E-05	1.3E-04	D
2-Methylheptane	592278	114.23	0.716	3.35	98%	3.8E-05	6.8E-05	D
2-Methylhexane	591764	100.2	0.816	3.34	98%	3.8E-05	6.8E-05	D
2-Methylpentane	107835	86.18	0.688	2.43	98%	2.7E-05	4.9E-05	D
2-Propanol (Isopropyl alcohol)	67630	60.1	1.8	4.42	98%	5.0E-05	8.9E-05	D
3,6-Dimethyloctane	15869940	142.28	0.785	4.57	98%	5.1E-05	9.2E-05	D
3-Ethyltoluene	620144	120.19	0.78	3.83	98%	4.3E-05	7.7E-05	D
3-Methyl-1-pentene	760203	84.16	0.00699	0.02	98%	2.7E-07	4.9E-07	D
3-Methylheptane	589811	114.23	0.763	3.56	98%	4.0E-05	7.2E-05	D
3-Methylhexane	589344	100.2	1.13	4.63	98%	5.2E-05	9.4E-05	D
3-Methylpentane	96140	86.18	0.74	2.61	98%	2.9E-05	5.3E-05	D
3-Methylthiophene	616444	98.17	0.0925	0.37	98%	4.2E-06	7.5E-06	E
4-Methyl-1-pentene	691372	84.16	0.0233	0.08	98%	9.0E-07	1.6E-06	E
4-Methyl-2-pentanone (MIBK)	108101	100.16	0.883	3.62	98%	4.1E-05	7.3E-05	C
4-Methylheptane	589537	114.23	0.249	1.16	98%	1.3E-05	2.3E-05	D
Acetaldehyde	75070	44.05	0.0774	0.14	98%	1.6E-06	2.8E-06	D
Acetone	67641	58.08	6.7	15.92	98%	1.8E-04	3.2E-04	C
Acetonitrile	75058	41.05	0.556	0.93	98%	1.0E-05	1.9E-05	A
Benzene	71432	78.11	2.4	7.67	98%	8.6E-05	1.5E-04	A
Benzyl chloride	100447	126.58	0.0181	0.09	98%	1.1E-06	1.9E-06	A
Bromodichloromethane	75274	163.83	0.00878	0.06	98%	6.6E-07	1.2E-06	E
Bromomethane (Methyl bromide)	74839	94.94	0.021	0.08	98%	9.1E-07	1.6E-06	C
Butane	106978	58.12	6.22	14.79	98%	1.7E-04	3.0E-04	C
Carbon disulfide	75150	76.14	0.147	0.46	98%	5.1E-06	9.2E-06	A
Carbon monoxide	630080	28.01	24.4	27.95	98%	3.1E-04	5.6E-04	C
Carbon tetrachloride	56235	153.82	0.00798	0.05	98%	5.6E-07	1.0E-06	A
Carbon tetrafluoride (Freon 14)	75730	88	0.151	0.54	98%	6.1E-06	1.1E-05	E
Carbonyl sulfide (Carbon oxysulfide)	463581	60.08	0.122	0.30	98%	3.4E-06	6.1E-06	A
Chlorobenzene	108907	112.56	0.484	2.23	98%	2.5E-05	4.5E-05	A
Chlorodifluoromethane (Freon 22)	75456	86.47	0.796	2.82	98%	3.2E-05	5.7E-05	D
Chloroethane (Ethyl chloride)	75003	64.51	3.95	10.42	98%	1.2E-04	2.1E-04	B
Chloromethane (Methyl chloride)	74873	50.49	0.244	0.50	98%	5.7E-06	1.0E-05	B
cis-1,2-Dichloroethene	156592	96.94	1.24	4.92	98%	5.5E-05	9.9E-05	B
cis-1,2-Dimethylcyclohexane	2207014	112.21	0.081	0.37	98%	4.2E-06	7.5E-06	D
cis-1,3-Dichloropropene	10061015	110.97	0.00303	0.01	98%	1.5E-07	2.8E-07	D
cis-1,3-Dimethylcyclohexane	638040	112.21	0.501	2.30	98%	2.6E-05	4.6E-05	D
cis-1,4-Dimethylcyclohexane	624293	112.21	0.248	1.14	98%	1.3E-05	2.3E-05	D
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	112.21	0.248	1.14	98%	1.3E-05	2.3E-05	D
cis-2-Butene	590181	56.11	0.105	0.24	98%	2.7E-06	4.9E-06	D
cis-2-Heptene	6443921	98.19	0.0245	0.10	98%	1.1E-06	2.0E-06	E
cis-2-Hexene	7688213	84.16	0.0172	0.06	98%	6.6E-07	1.2E-06	D
cis-2-Octene	7642048	112.21	0.22	1.01	98%	1.1E-05	2.0E-05	D
cis-2-Pentene	627203	70.13	0.0479	0.14	98%	1.5E-06	2.8E-06	D
cis-3-Methyl-2-pentene	922623	84.16	0.0179	0.06	98%	6.9E-07	1.2E-06	D
Cyclohexane	110827	84.16	1.01	3.48	98%	3.9E-05	7.0E-05	B
Cyclohexene	110838	82.14	0.0184	0.06	98%	6.9E-07	1.2E-06	D
Cyclopentane	287923	70.13	0.0221	0.06	98%	7.1E-07	1.3E-06	D
Cyclopentene	142290	68.12	0.0121	0.03	98%	3.8E-07	6.8E-07	D
Decane	124185	142.28	3.8	22.11	98%	2.5E-04	4.5E-04	D
Dibromochloromethane	124481	208.28	0.0151	0.13	98%	1.4E-06	2.6E-06	D
Dibromomethane (Methylene dibromide)	74953	173.84	0.000835	0.01	98%	6.7E-08	1.2E-07	E
Dichlorobenzene	106467	147	0.94	5.65	98%	6.3E-05	1.1E-04	A
Dichlorodifluoromethane (Freon 12)	75718	120.91	1.18	5.84	98%	6.5E-05	1.2E-04	B
Dichloromethane (Methylene chloride)	75092	84.93	6.15	21.36	98%	2.4E-04	4.3E-04	A
Diethyl sulfide	352932	90.19	0.0862	0.32	98%	3.6E-06	6.4E-06	E
Dimethyl disulfide	624920	94.2	0.137	0.53	98%	5.9E-06	1.1E-05	A
Dimethyl sulfide	75183	62.14	5.66	14.38	98%	1.6E-04	2.9E-04	A
Dodecane (n-Dodecane)	112403	170.33	0.221	1.54	98%	1.7E-05	3.1E-05	D
Ethane	74840	30.07	9.05	11.13	98%	1.2E-04	2.2E-04	D
Ethanol	64175	46.07	0.23	0.43	98%	4.9E-06	8.8E-06	D
Ethyl acetate	141786	88.11	1.88	6.77	98%	7.6E-05	1.4E-04	C
Ethyl mercaptan (Ethanediol)	75081	62.14	0.198	0.50	98%	5.6E-06	1.0E-05	A
Ethyl methyl sulfide	624895	76.16	0.0367	0.11	98%	1.3E-06	2.3E-06	E

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(%)	Flare 1	Flare 2	
Ethylbenzene	100414	106.17	4.86	21.10	98%	2.4E-04	4.3E-04	B
Formaldehyde	50000	30.03	0.0117	0.01	98%	1.6E-07	2.9E-07	D
Heptane	142825	100.2	1.34	5.49	98%	6.2E-05	1.1E-04	B
Hexane	110543	86.18	3.1	10.93	98%	1.2E-04	2.2E-04	B
Hydrogen sulfide	7783064	34.08	32	44.60	98%	5.0E-04	9.0E-04	A
Indane (2,3-Dihydroindene)	496117	34.08	0.0666	0.09	98%	1.0E-06	1.9E-06	D
Isobutane (2-Methylpropane)	75285	58.12	8.16	19.40	98%	2.2E-04	3.9E-04	D
Isobutylbenzene	538932	134.22	0.0407	0.22	98%	2.5E-06	4.5E-06	D
Isoprene (2-Methyl-1,3-butadiene)	78795	68.12	0.0165	0.05	98%	5.2E-07	9.3E-07	D
Isopropyl mercaptan	75332	76.16	0.175	0.55	98%	6.1E-06	1.1E-05	A
Isopropylbenzene (Cumene)	98828	120.19	0.43	2.11	98%	2.4E-05	4.3E-05	D
Mercury (total)	7439976	200.59	1.22E-04	1.00E-03	0%	5.6E-07	1.0E-06	B
Methanethiol (Methyl mercaptan)	74931	48.11	1.37	2.70	98%	3.0E-05	5.4E-05	A
Methyl tert-butyl ether (MTBE)	1634044	88.15	0.118	0.43	98%	4.8E-06	8.6E-06	D
Methylcyclohexane	108872	98.19	1.29	5.18	98%	5.8E-05	1.0E-04	D
Methylcyclopentane	96377	84.16	0.65	2.24	98%	2.5E-05	4.5E-05	D
Naphthalene	91203	128.17	0.107	0.56	98%	6.3E-06	1.1E-05	D
n-Butylbenzene	104518	134.22	0.068	0.37	98%	4.2E-06	7.5E-06	D
Nonane	111842	128.26	2.37	12.43	98%	1.4E-04	2.5E-04	D
n-Propylbenzene (Propylbenzene)	103651	120.19	0.413	2.03	98%	2.3E-05	4.1E-05	D
Octane	111659	114.23	1.08	5.05	98%	5.7E-05	1.0E-04	D
p-Cymene (1-Methyl-4-Isopropylbenzene)	99876	134.22	3.58	19.65	98%	2.2E-04	4.0E-04	D
Pentane	109660	72.15	4.46	13.16	98%	1.5E-04	2.7E-04	C
Propane	74986	44.1	15.5	27.96	98%	3.1E-04	5.6E-04	C
Propene	115071	42.08	3.32	5.71	98%	6.4E-05	1.2E-04	D
Propyne	74997	40.06	0.038	0.06	98%	7.0E-07	1.3E-06	E
sec-Butylbenzene	135988	134.22	0.0675	0.37	98%	4.2E-06	7.5E-06	D
Styrene (Vinylbenzene)	100425	104.15	0.411	1.75	98%	2.0E-05	3.5E-05	B
Tetrachloroethylene (Perchloroethylene)	127184	165.83	2.03	13.77	98%	1.5E-04	2.8E-04	A
Tetrahydrofuran (Diethylene oxide)	109999	72.11	0.969	2.86	98%	3.2E-05	5.8E-05	C
Thiophene	110021	84.14	0.349	1.20	98%	1.3E-05	2.4E-05	E
Toluene (Methyl benzene)	108883	92.14	29.5	111.17	98%	1.2E-03	2.2E-03	A
trans-1,2-Dichloroethene	156605	96.94	0.0287	0.11	98%	1.3E-06	2.3E-06	C
trans-1,2-Dimethylcyclohexane	6876239	112.21	0.404	1.85	98%	2.1E-05	3.7E-05	D
trans-1,3-Dichloropropene	10061026	110.97	0.00943	0.04	98%	4.8E-07	8.6E-07	D
trans-1,4-Dimethylcyclohexane	2207047	112.21	0.205	0.94	98%	1.1E-05	1.9E-05	D
trans-2-Butene	624646	56.11	0.104	0.24	98%	2.7E-06	4.8E-06	D
trans-2-Heptene	14686136	98.19	0.0025	0.01	98%	1.1E-07	2.0E-07	E
trans-2-Hexene	4050457	84.16	0.0206	0.07	98%	8.0E-07	1.4E-06	D
trans-2-Octene	13389429	112.21	0.241	1.11	98%	1.2E-05	2.2E-05	D
trans-2-Pentene	646048	70.13	0.0347	0.10	98%	1.1E-06	2.0E-06	D
trans-3-Methyl-2-pentene	616126	84.16	0.0155	0.05	98%	6.0E-07	1.1E-06	D
Tribromomethane (Bromoform)	75252	252.73	0.0124	0.13	98%	1.4E-06	2.6E-06	D
Trichloroethylene (Trichloroethene)	79016	131.39	0.828	4.45	98%	5.0E-05	9.0E-05	A
Trichlorofluoromethane (Freon 11)	91315616	137.37	0.248	1.39	98%	1.6E-05	2.8E-05	B
Trichloromethane (Chloroform)	67663	119.38	0.0708	0.35	98%	3.9E-06	7.0E-06	A
Undecane	1120214	156.31	1.67	10.68	98%	1.2E-04	2.2E-04	D
Vinyl acetate	85306269	86.09	0.248	0.87	98%	9.8E-06	1.8E-05	C
Vinyl chloride (Chloroethene)	75014	62.5	1.42	3.63	98%	4.1E-05	7.3E-05	A
Xylenes (o-, m-, p-, mixtures)	1330207	106.17	9.23	40.08	98%	4.5E-04	8.1E-04	A
Total Reduced Sulphur Compounds	n/a	-	-	67.7	98%	7.6E-04	1.4E-03	-

Table E4. Flares and Engines - Products of Combustion - Stages 1 to 5 - Alternative 2 Scenario A

Emissions of products of combustion were estimated based on emission factors given in Table 2.4-4, US EPA AP-42, 2.4 Municipal Solid Waste Landfills, 11/98, and the assumption that LFG is 50% methane (CH4).

Emissions of combustion gases from the siloxane flare (Flare 3) were deemed negligible because it represents less than 5% of combustion capacity.

Emissions of sulphur dioxide and hydrogen chloride were based on mass balance and the assumption that all sulphur and chlorine in LFG are converted to these compounds.

LFG Combustion Rate

Combustion Sources	LFG Combusted[1] (m^3/s)	CH4 Fraction in LFG	CH4 Combusted (m^3/s)	Percent of Total	Significant? (Yes or No)[2]
Engines (Gen1 to Gen 4) - Total	0.18	50%	0.09	22%	Yes
Flare 1	0.21	50%	0.11	26%	Yes
Flare 2	0.38	50%	0.19	48%	Yes
Flare 3 (Siloxane Flare)	0.029	50%	0.015	4%	No
Total	0.80		0.40		

1 See Table E1 for calculation of quantity combusted.

2. Sources that are Insignificant Relative to Total Emissions per section 7.2.2 of ESDM guidance document.

Emission Factors - US EPA AP-42, Table 2.4-4

Contaminant	CAS No.	IC Engines		Flares		Emission Factor Rating
		$kg/10^6$ dscm of CH_4	g/m^3 of CH4	$kg/10^6$ dscm of CH_4	g/m^3 of CH4	
Nitrogen Dioxide	10102-44-0	4000	4	650	0.65	C
Particulate Matter	N/A	770	0.77	270	0.27	D
Carbon Monoxide	630-08-0	7500	7.5	12000	12.00	C

No data on PM size distribution is provided in AP-42, Table 2.4-4; however, based on other gas-fired combustion sources, it is expected that most of the particulate matter is less than 2.5 microns. As such, it was assumed that PM=PM10=PM2.5

Emission rates - US EPA AP-42, Table 2.4-4

Contaminant	CAS No.	Emission Rate (g/s)		
		Engines	Flare 1	Flare 2
Nitrogen Dioxide	10102-44-0	0.36	0.068	0.123
Particulate Matter	N/A	0.069	0.03	0.05
Particulate Matter (PM10)	N/A	0.069	0.03	0.05
Particulate Matter (PM2.5)	N/A	0.069	0.03	0.05
Carbon Monoxide	630-08-0	0.67	1.26	2.27

Sample Calculation: (Particulate Matter, Engines)

PM Emission Rate = CH4 Combusted in Engines (m^3/s) * Emission Factor for IC Engines (g/m^3 of CH4)

= 0.32 (m^3/s) x 0.232 (g/m^3 of CH4)

= 0.068624471 (g/s)

Sulphur Dioxide Emission Factor (assumes all sulphur in LFG converts to sulphur dioxide)

Molecular Weight (MW) of Sulphur (S) = 32.1 g/mole

MW of Sulphur Dioxide (SO2) = 64.1 g/mole

Sulphur Concentration in LFG

Contaminant	**CAS No.**	**MW of Contaminant**	**Conc. Of Contaminant in LFG (mg/m^3)**	**No. of S per molecule**	**Conc. of S in LFG (mg/m^3)**
1-Propanethiol (n-Propyl mercaptan)	107-03-9	76.16	3.89E-01	1	0.16
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90.19	6.27E-01	1	0.22
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90.19	1.20E+00	1	0.43
Carbon disulfide	75150	76.14	4.57E-01	2	0.38
Carbonyl sulfide (Carbon oxysulfide)	463581	60.08	3.00E-01	1	0.16
Diethyl sulfide	352932	90.19	3.18E-01	1	0.11
Dimethyl disulfide	624920	94.2	5.27E-01	2	0.36
Dimethyl sulfide	75183	62.14	1.44E+01	1	7.40
Ethyl mercaptan (Ethanediol)	75081	62.14	5.03E-01	1	0.26
Ethyl methyl sulfide	624895	76.16	1.14E-01	1	0.05
Hydrogen sulfide	7783064	34.08	4.46E+01	1	41.85
Isopropyl mercaptan	75332	76.16	5.45E-01	1	0.23
Methanethiol (Methyl mercaptan)	74931	48.11	2.69E+00	1	1.79
				Total Sulphur Concentration in LFG	**53**

If all S is converted to SO2, the quantity of SO2 generated is:

SO2 Emission Factor = S concentration (mg/m^3 of LFG combusted) x MW of SO2 / MW (g/mole) of S (g/mole)

= 53.4 (mg/m^3 of LFG combusted) x 64.1 (g/mole) / 32.1 (g/mole)

= 106.7 mg/m^3 of LFG combusted

Hydrogen Chloride Emission Factor (assumes all sulphur in LFG converts to sulphur dioxide)

Molecular Weight (MW) of chlorine (Cl) = 35.5 g/mole

MW of hydrogen chloride (HCl) = 36.5 g/mole

Chlorine Concentration in LFG

Contaminant	CAS No.	MW of Contaminant	Conc. Of Contaminant in LFG (mg/m^3)	No of Cl	Cl content (mg/m^3)
1,1,1-Trichloroethane	71556	133.4	1.32E+00	3	1.06
1,1,2,2-Tetrachloroethane	79345	167.85	3.67E+00	4	3.10
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	260.76	3.72E-02	6	0.03
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187.37	5.15E-01	3	0.29
1,1,2-Trichloroethane	79005	133.4	8.61E-01	3	0.69
1,1-Dichloroethane	75343	98.96	8.41E+00	2	6.03
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	96.94	6.34E-01	2	0.46
1,2,4-Trichlorobenzene	120821	181.45	4.09E-02	3	0.02
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	170.92	7.40E-01	2	0.31
1,2-Dichloroethane (Ethylene dichloride)	107062	98.96	6.43E-01	2	0.46
1,2-Dichloroethene	540590	96.94	4.52E+01	2	33.04
1,2-Dichloropropane	78875	112.99	2.40E-01	2	0.15
Bromodichloromethane	75274	163.83	5.88E-02	1	0.01
Chlorobenzene	108907	112.56	2.23E+00	1	0.70
Chlorodifluoromethane (Freon 22)	75456	86.47	2.81E+00	1	1.15
Chloroethane (Ethyl chloride)	75003	64.51	1.04E+01	1	5.72
Chloromethane (Methyl chloride)	74873	50.49	5.04E-01	1	0.35
cis-1,2-Dichloroethene	156592	96.94	4.91E+00	2	3.59
cis-1,3-Dichloropropene	10061015	110.97	1.37E-02	2	0.01
Dibromochloromethane	124481	208.28	1.29E-01	2	0.04
Dichlorobenzene	106467	147	5.65E+00	2	2.72
Dichlorodifluoromethane (Freon 12)	75718	120.91	5.83E+00	2	3.42
Dichloromethane (Methylene chloride)	75092	84.93	2.13E+01	2	17.82
Tetrachloroethylene (Perchloroethylene)	127184	165.83	1.38E+01	4	11.77
trans-1,2-Dichloroethene	156605	96.94	1.14E-01	2	0.08
trans-1,3-Dichloropropene	10061026	110.97	4.28E-02	2	0.03
Trichloroethylene (Trichloroethene)	79016	131.39	4.45E+00	3	3.60
Trichlorofluoromethane (Freon 11)	91315616	137.37	1.39E+00	3	1.08
Trichloromethane (Chloroform)	67-66-3	119.38	3.45E-01	3	0.31
Vinyl chloride (Chloroethene)	75014	62.5	3.63E+00	1	2.06
				Total chlorine concentration in LFG	**100**

If all Cl is converted to HCl, the quantity of HCL generated is:

HCL Emission Factor = Cl concentration (mg/m^3 of LFG combusted) x MW of HCl / MW (g/mole) of Cl (g/mole)

= 100.1 (mg/m^3 of LFG combusted) x 36.2 (g/mole) / 35.5 (g/mole)

= 103.0 mg/m^3 of LFG combusted

Emission Rates - SO2, HCl

Contaminant	CAS No.	Emission Factor (mg/m^3 of LFG)	Emission Rate (g/s)		
			Engines	Flare 1	Flare 2
Sulfur Dioxide	7446-09-05	106.7	1.90E-02	2.24E-02	4.04E-02
Hydrogen Chloride	7647-01-0	103.0	1.84E-02	2.16E-02	3.90E-02

Sample Calculation: (Sulphur dioxide, Engines)

SO2 Emission Rate = LFG combusted in Engines (m^3/s) * SO2 Emission Factor (mg/m^3 of LFG) / 1000 (mg/g)

= 0.64 (m^3/s) x 106.7 (mg/m^3 of LFG) / 1000 (mg/g)

= 0.0190 (g/s)

Table E4. Flares and Engines - Products of Combustion - Stages 6 to 8 - Alternative 2 Scenario A

Emissions of products of combustion were estimated based on emission factors given in Table 2.4-4, US EPA AP-42, 2.4 Municipal Solid Waste Landfills, 11/98, and the assumption that LFG is 50% methane (CH4).

Emissions of combustion gases from the siloxane flare (Flare 3) were deemed negligible because it represents less than 5% of combustion capacity.

Emissions of sulphur dioxide and hydrogen chloride were based on mass balance and the assumption that all sulphur and chlorine in LFG are converted to these compounds.

LFG Combustion Rate

Combustion Sources	LFG Combusted[1] (m^3/s)	CH4 Fraction in LFG	CH4 Combusted (m^3/s)	Percent of Total	Significant? (Yes or No)[2]
Engines (Gen1 to Gen 4) - Total	0.46	50%	0.23	22%	Yes
Flare 1	0.56	50%	0.28	27%	Yes
Flare 2	1.01	50%	0.50	49%	Yes
Flare 3 (Siloxane Flare)	0.029	50%	0.015	1%	No
Total	2.06		1.03		

1 See Table E1 for calculation of quantity combusted.

2. Sources that are Insignificant Relative to Total Emissions per section 7.2.2 of ESDM guidance document.

Emission Factors - US EPA AP-42, Table 2.4-4

Contaminant	CAS No.	IC Engines		Flares		Emission Factor Rating
		kg/10^6 dscm of CH_4	g/m³ of CH4	kg/10^6 dscm of CH_4	g/m³ of CH4	
Nitrogen Dioxide	10102-44-0	4000	4	650	0.65	C
Particulate Matter	N/A	770	0.77	270	0.27	D
Carbon Monoxide	630-08-0	7500	7.5	12000	12.00	C

No data on PM size distribution is provided in AP-42, Table 2.4-4; however, based on other gas-fired combustion sources, it is expected that most of the particulate matter is less than 2.5 microns. As such, it was assumed that PM=PM10=PM2.5

Emission rates - US EPA AP-42, Table 2.4-4

Contaminant	CAS No.	Emission Rate (g/s)		
		Engines	Flare 1	Flare 2
Nitrogen Dioxide	10102-44-0	0.92	0.182	0.328
Particulate Matter	N/A	0.178	0.08	0.14
Particulate Matter (PM10)	N/A	0.178	0.08	0.14
Particulate Matter (PM2.5)	N/A	0.178	0.08	0.14
Carbon Monoxide	630-08-0	1.73	3.37	6.06

Sample Calculation: (Particulate Matter, Engines)

PM Emission Rate = CH4 Combusted in Engines (m³/s) * Emission Factor for IC Engines (g/m³ of CH4)

= 0.32 (m³/s) x 0.232 (g/m³ of CH4)

= 0.177775529 (g/s)

Sulphur Dioxide Emission Factor (assumes all sulphur in LFG converts to sulphur dioxide)

Molecular Weight (MW) of Sulphur (S) = 32.1 g/mole

MW of Sulphur Dioxide (SO2) = 64.1 g/mole

Sulphur Concentration in LFG

Contaminant	**CAS No.**	**MW of Contaminant**	**Conc. Of Contaminant in LFG (mg/m^3)**	**No. of S per molecule**	**Conc. of S in LFG (mg/m^3)**
1-Propanethiol (n-Propyl mercaptan)	107-03-9	76.16	3.89E-01	1	0.16
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90.19	6.27E-01	1	0.22
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90.19	1.20E+00	1	0.43
Carbon disulfide	75150	76.14	4.57E-01	2	0.38
Carbonyl sulfide (Carbon oxysulfide)	463581	60.08	3.00E-01	1	0.16
Diethyl sulfide	352932	90.19	3.18E-01	1	0.11
Dimethyl disulfide	624920	94.2	5.27E-01	2	0.36
Dimethyl sulfide	75183	62.14	1.44E+01	1	7.40
Ethyl mercaptan (Ethanediol)	75081	62.14	5.03E-01	1	0.26
Ethyl methyl sulfide	624895	76.16	1.14E-01	1	0.05
Hydrogen sulfide	7783064	34.08	4.46E+01	1	41.85
Isopropyl mercaptan	75332	76.16	5.45E-01	1	0.23
Methanethiol (Methyl mercaptan)	74931	48.11	2.69E+00	1	1.79
				Total Sulphur Concentration in LFG	**53**

If all S is converted to SO2, the quantity of SO2 generated is:

SO2 Emission Factor = S concentration (mg/m³ of LFG combusted) x MW of SO2 / MW (g/mole) of S (g/mole)

= 53.4 (mg/m³ of LFG combusted) x 64.1 (g/mole) / 32.1 (g/mole)

= 106.7 mg/m³ of LFG combusted

Hydrogen Chloride Emission Factor (assumes all sulphur in LFG converts to sulphur dioxide)

Molecular Weight (MW) of chlorine (Cl) = 35.5 g/mole

MW of hydrogen chloride (HCl) = 36.5 g/mole

Chlorine Concentration in LFG

Contaminant	CAS No.	MW of Contaminant	Conc. Of Contaminant in LFG (mg/m^3)	No of Cl	Cl content (mg/m^3)
1,1,1-Trichloroethane	71556	133.4	1.32E+00	3	1.06
1,1,2,2-Tetrachloroethane	79345	167.85	3.67E+00	4	3.10
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	260.76	3.72E-02	6	0.03
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187.37	5.15E-01	3	0.29
1,1,2-Trichloroethane	79005	133.4	8.61E-01	3	0.69
1,1-Dichloroethane	75343	98.96	8.41E+00	2	6.03
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	96.94	6.34E-01	2	0.46
1,2,4-Trichlorobenzene	120821	181.45	4.09E-02	3	0.02
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	170.92	7.40E-01	2	0.31
1,2-Dichloroethane (Ethylene dichloride)	107062	98.96	6.43E-01	2	0.46
1,2-Dichloroethene	540590	96.94	4.52E+01	2	33.04
1,2-Dichloropropane	78875	112.99	2.40E-01	2	0.15
Bromodichloromethane	75274	163.83	5.88E-02	1	0.01
Chlorobenzene	108907	112.56	2.23E+00	1	0.70
Chlorodifluoromethane (Freon 22)	75456	86.47	2.81E+00	1	1.15
Chloroethane (Ethyl chloride)	75003	64.51	1.04E+01	1	5.72
Chloromethane (Methyl chloride)	74873	50.49	5.04E-01	1	0.35
cis-1,2-Dichloroethene	156592	96.94	4.91E+00	2	3.59
cis-1,3-Dichloropropene	10061015	110.97	1.37E-02	2	0.01
Dibromochloromethane	124481	208.28	1.29E-01	2	0.04
Dichlorobenzene	106467	147	5.65E+00	2	2.72
Dichlorodifluoromethane (Freon 12)	75718	120.91	5.83E+00	2	3.42
Dichloromethane (Methylene chloride)	75092	84.93	2.13E+01	2	17.82
Tetrachloroethylene (Perchloroethylene)	127184	165.83	1.38E+01	4	11.77
trans-1,2-Dichloroethene	156605	96.94	1.14E-01	2	0.08
trans-1,3-Dichloropropene	10061026	110.97	4.28E-02	2	0.03
Trichloroethylene (Trichloroethene)	79016	131.39	4.45E+00	3	3.60
Trichlorofluoromethane (Freon 11)	91315616	137.37	1.39E+00	3	1.08
Trichloromethane (Chloroform)	67-66-3	119.38	3.45E-01	3	0.31
Vinyl chloride (Chloroethene)	75014	62.5	3.63E+00	1	2.06
				Total chlorine concentration in LFG	**100**

If all Cl is converted to HCl, the quantity of HCL generated is:

HCL Emission Factor = Cl concentration (mg/m^3 of LFG combusted) x MW of HCl / MW (g/mole) of Cl (g/mole)

= 100.1 (mg/m^3 of LFG combusted) x 36.2 (g/mole) / 35.5 (g/mole)

= 103.0 mg/m^3 of LFG combusted

Emission Rates - SO2, HCl

Contaminant	CAS No.	Emission Factor (mg/m^3 of LFG)	Emission Rate (g/s)		
			Engines	Flare 1	Flare 2
Sulfur Dioxide	7446-09-05	106.7	4.93E-02	5.99E-02	1.08E-01
Hydrogen Chloride	7647-01-0	103.0	4.75E-02	5.78E-02	1.04E-01

Sample Calculation: (Sulphur dioxide, Engines)

SO2 Emission Rate = LFG combusted in Engines (m^3/s) * SO2 Emission Factor (mg/m^3 of LFG) / 1000 (mg/g)

= 0.64 (m^3/s) x 106.7 (mg/m^3 of LFG) / 1000 (mg/g)

= 0.0493 (g/s)

Table E5. Siloxanes for Stages 1 to 5 - Alternative 2 Scenario A

Siloxanes are trace constituents in LFG that are essentially non-combustable, and are not controlled through combustion in flares. Siloxanes have the potential to damage engines, and are removed from the LFG fuel stream to the the engines and purged to the siloxane flare (Flare 3). Thus, all silozanes in LGF are emitted uncontrolled, through Flares 1 to 3, or as fugitive emissions from the landfill surface.

Siloxane Emission Sources	LFG Release or Use Rate (m^3/s)
Stg1 to Stg5 (fugitive)	0.27
Flare 1	0.05
Flare 2	0.08
Flare 3 (Siloxane Flare) - includes engines	0.21
Total	0.6

* See Table E1 for calculation of quantity combusted.

Contaminant	CAS No.	Conc. in LFG mg/m^3	Emission Rate (g/s)			
			Stg 1 to 5 (fugitive)	Flare 1	Flare 2	Flare 3
Tetramethylsilane	75-76-3	0.001	2.7E-07	4.6E-08	8.4E-08	2.1E-07
Hexamethyldisiloxane	107-46-0	2.114	5.6E-04	9.8E-05	1.8E-04	4.4E-04
Octamethyltrisiloxane	107-51-7	0.22	5.8E-05	1.0E-05	1.8E-05	4.6E-05
Decamethyltetrasiloxane	141-62-8	0.027	7.2E-06	1.3E-06	2.3E-06	5.6E-06
Dodecamethylpentasiloxane	141-63-9	0.029	7.7E-06	1.3E-06	2.4E-06	6.0E-06
Trimethylsilyl Fluoride	420-56-4	0.546	1.4E-04	2.5E-05	4.6E-05	1.1E-04
Dodecamethylcyclohexasiloxane	540-97-6	0.029	7.7E-06	1.3E-06	2.4E-06	6.0E-06
Decamethylcyclopentasiloxane	541-02-6	4.264	1.1E-03	2.0E-04	3.6E-04	8.8E-04
Hexamethyltricyclosiloxane	541-05-9	0.528	1.4E-04	2.5E-05	4.4E-05	1.1E-04
Octamethylcyclotetrasiloxane	556-67-2	8.739	2.3E-03	4.1E-04	7.3E-04	1.8E-03
Trimethylsilanol	1066-40-6	10.521	2.8E-03	4.9E-04	8.8E-04	2.2E-03
Methoxytrimethylsilane	1825-61-2	0.351	9.3E-05	1.6E-05	2.9E-05	7.3E-05
Ethoxytrimethylsilane	1825-62-3	0.203	5.4E-05	9.4E-06	1.7E-05	4.2E-05
Propoxytrimethylsilane	1825-63-4	0.158	4.2E-05	7.3E-06	1.3E-05	3.3E-05
Isopropoxytrimethylsilane	1825-64-5	0.181	4.8E-05	8.4E-06	1.5E-05	3.8E-05
Butoxytrimethylsilane	1825-65-6	0.09	2.4E-05	4.2E-06	7.5E-06	1.9E-05
1-methylbutoxytrimethylsilane	1825-67-8	0.192	5.1E-05	8.9E-06	1.6E-05	4.0E-05

Sample Calculation: (Tetramethylsilane, Flare 1)

PM Emission Rate = LFG Use in Flare 1 (m^3/s) * Concentration in LFG (mg/m^3 of LFG) / 1000 (mg/g)
= 0.05 (m^3/s) x 0.001 (mg/m^3 of LFG) / 1000 (mg/g)
= 4.65E-08 (g/s)

Note:
1. Siloxane concentrations were measured by OBS Labs, 2011.

Table E5. Siloxanes for Stages 6 to 8 - Alternative 2 Scenario A

Siloxanes are trace constituents in LFG that are essentially non-combustable, and are not controlled through combustion in flares. Siloxanes have the potential to damage engines, and are removed from the LFG fuel stream to the the engines and purged to the siloxane flare (Flare 3). Thus, all silozanes in LGF are emitted uncontrolled, through Flares 1 to 3, or as fugitive emissions from the landfill surface.

Siloxane Emission Sources	LFG Release or Use Rate (m^3/s)
Stg6 to Stg8 (fugitive)	0.69
Flare 1	0.50
Flare 2	0.90
Flare 3 (Siloxane Flare) - includes engines	0.49
Total	2.6

* See Table E1 for calculation of quantity combusted.

Contaminant	CAS No.	Conc. in LFG mg/m^3	Emission Rate (g/s)			
			Stg 6 to 9 (fugitive)	Flare 1	Flare 2	Flare 3
Tetramethylsilane	75-76-3	0.001	6.9E-07	5.0E-07	9.0E-07	4.9E-07
Hexamethyldisiloxane	107-46-0	2.114	1.5E-03	1.1E-03	1.9E-03	1.0E-03
Octamethyltrisiloxane	107-51-7	0.22	1.5E-04	1.1E-04	2.0E-04	1.1E-04
Decamethyltetrasiloxane	141-62-8	0.027	1.9E-05	1.3E-05	2.4E-05	1.3E-05
Dodecamethylpentasiloxane	141-63-9	0.029	2.0E-05	1.4E-05	2.6E-05	1.4E-05
Trimethylsilyl Fluoride	420-56-4	0.546	3.8E-04	2.7E-04	4.9E-04	2.7E-04
Dodecamethylcyclohexasiloxane	540-97-6	0.029	2.0E-05	1.4E-05	2.6E-05	1.4E-05
Decamethylcyclopentasiloxane	541-02-6	4.264	2.9E-03	2.1E-03	3.8E-03	2.1E-03
Hexamethyltricyclosiloxane	541-05-9	0.528	3.6E-04	2.6E-04	4.7E-04	2.6E-04
Octamethylcyclotetrasiloxane	556-67-2	8.739	6.0E-03	4.4E-03	7.8E-03	4.3E-03
Trimethylsilanol	1066-40-6	10.521	7.2E-03	5.2E-03	9.4E-03	5.2E-03
Methoxytrimethylsilane	1825-61-2	0.351	2.4E-04	1.7E-04	3.1E-04	1.7E-04
Ethoxytrimethylsilane	1825-62-3	0.203	1.4E-04	1.0E-04	1.8E-04	1.0E-04
Propoxytrimethylsilane	1825-63-4	0.158	1.1E-04	7.9E-05	1.4E-04	7.8E-05
Isopropoxytrimethylsilane	1825-64-5	0.181	1.2E-04	9.0E-05	1.6E-04	8.9E-05
Butoxytrimethylsilane	1825-65-6	0.09	6.2E-05	4.5E-05	8.1E-05	4.4E-05
1-methylbutoxytrimethylsilane	1825-67-8	0.192	1.3E-04	9.6E-05	1.7E-04	9.4E-05

Sample Calculation: (Tetramethylsilane, Flare 1)

PM Emission Rate = LFG Use in Flare 1 (m^3/s) * Concentration in LFG (mg/m^3 of LFG) / 1000 (mg/g)
= 0.5 (m^3/s) x 0.001 (mg/m^3 of LFG) / 1000 (mg/g)
= 4.98E-07 (g/s)

Note:
1. Siloxane concentrations were measured by OBS Labs, 2011.

Table E6. Tailpipe Emissions from Non-Road Mobile Equipment

Tailpipe emissions from non-road mobile equipment were based on US EPA Tier 1 to 4 Nonroad Diesel Engine Standards and load factors from the US EPA NONROAD model. Speciation of VOC and NMHC was estimated based on Speciation Profiles and Toxic Emission Factors for Nonroad Diesel Engines (MOVES2014b document). All PM (TSP) was assumed to be entirely PM10. PM2.5 was assumed to be same fraction of PM10 as calculated from On-Road mobile emissions (Table E8).

Emission Rate (g/s) = Power × LF × EF x 1hr/3600 s
where: Power = Rated Power (hp)
LF = Load Factor (dimensionless) from NONROAD model.
EF = Emission Factor (g/hp-hr) from nonroad diesel emission standards

Source ID : LFG_NROAD (Equipment mainly associated with landfilling activities)

Equipment[1]	Tier [2]	Fuel Rate (gal/day)	Engine HP	Cycle Load Factors[2]	Emission Factors (g/hp-hr)[3]			Emission Rates (g/s)- 1hr avg				
					CO	NOx	PM	CO	NOx	PM	PM10	PM2.5
JD Excavator	4	33	140	0.53	3.7	0.3	0.015	0.08	0.01	0.0003	0.0003	0.0001
JD 844K Loader	4	55	380	0.48	2.6	0.3	0.015	0.13	0.02	0.0008	0.0008	0.0004
JD 644K Loader	4	44	232	0.48	2.6	0.3	0.015	0.08	0.01	0.0005	0.0005	0.0002
JD 250D rock truck	4	44	265	0.59	2.6	0.3	0.015	0.11	0.01	0.0007	0.0007	0.0003
JD 1050K Bulldozer	4	88	350	0.59	2.6	0.3	0.015	0.15	0.02	0.0009	0.0009	0.0004
Aljon 600 compactor	4	220	600	0.59	2.6	0.3	0.015	0.26	0.03	0.0015	0.0015	0.0007
Aljon 960 compactor	4	154	500	0.59	2.6	0.3	0.015	0.21	0.02	0.0012	0.0012	0.0006
Volvo A25D rock truck	4	44	310	0.59	2.6	0.3	0.015	0.13	0.02	0.0008	0.0008	0.0004
Caterpillar D6N Bulldozer	4	33	150	0.59	2.6	0.3	0.015	0.06	0.01	0.0004	0.0004	0.0002
Cat 725 rock truck	4	44	325	0.59	2.6	0.3	0.015	0.14	0.02	0.0008	0.0008	0.0004
							Total	**1.35**	**0.15**	**0.008**	**0.008**	**0.004**

Source ID : COMPOST_NROAD (Equipment mainly associated with raw material and compost handling)

Equipment[1]	Tier [2]	Fuel Rate (gal/day)	Engine HP	Cycle Load Factors[2]	Emission Factors (g/hp-hr)[3]			Emission Rates (g/s)- 1hr avg				
					CO	NOx	PM	CO	NOx	PM	PM10	PM2.5
Vermeer 6000 grinder	4	141	600	0.59	2.6	0.3	0.015	0.26	0.030	0.0015	0.0015	0.0007
Komptech top turn	4	94	400	0.59	2.6	0.3	0.015	0.17	0.020	0.0010	0.0010	0.0005
John Deer 544k loader	4	42	180	0.48	2.6	0.3	0.015	0.06	0.007	0.0004	0.0004	0.0002
John Deer 544k loader	4	42	180	0.48	2.6	0.3	0.015	0.06	0.007	0.0004	0.0004	0.0002
John Deer 444k loader	4	33	140	0.48	2.6	0.3	0.015	0.05	0.006	0.0003	0.0003	0.0001
Cat 938 loader	4	47	200	0.48	2.6	0.3	0.015	0.07	0.008	0.0004	0.0004	0.0002
Freightliner dump truck	4	94	400	0.59	2.6	0.3	0.015	0.17	0.020	0.0010	0.0010	0.0005
Mack dump truck	4	106	450	0.59	2.6	0.3	0.015	0.19	0.022	0.0011	0.0011	0.0005
International dump truck	4	118	500	0.59	2.6	0.3	0.015	0.21	0.025	0.0012	0.0012	0.0006
International dump truck	4	112	475	0.59	2.6	0.3	0.015	0.20	0.023	0.0012	0.0012	0.0006
Western Star tractor	4	94	400	0.59	2.6	0.3	0.015	0.17	0.020	0.0010	0.0010	0.0005
Western Star dump truck	4	94	400	0.59	2.6	0.3	0.015	0.17	0.020	0.0010	0.0010	0.0005
							Total	**1.79**	**0.21**	**0.010**	**0.010**	**0.005**

Note:

[1] The information regarding type of equipment, model year, engine size, operating hour, and fuel rate was provided by GFL, by email dated January 5,

[2] The cycle load factors were obtained from the EPA document, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling (NR-005d)

[3] Tier standard number and emission factors for NMHC, nitrogen oxide, and particulate matter were obtained from United States: Nonroad Diesel Engines, available at: https://dieselnet.com/standards/us/nonroad.php

[4] Emission factor for Non-Methane Hydrocarbons (NMHC), nitrogen oxide, and particulate matter were obtained from Tier 4 emission standards—Engines up to 560 kW, available at: https://dieselnet.com/standards/us/nonroad.php

Table E7. Emissions from On-site Truck Traffic - Road Dust - Alternative 2 Scenario A

Emissions of road dust from on-site truck traffic were estimated based emisison factors obtained from US EPA AP-42, Section 13.2.1 Paved Roads and Section 13.2.2 Unpaved Roads. The detailed calculations are shown below.

Trucking occurs over a 12 hour operating period each day. Dust is controlled through watering and sweeping of paved roads, watering and other dust suppression on unpaved roads, and use of coarse gravel on haul roads.

Emission factors based on US EPA AP-42, Section 13.2.1 Paved Roads and Section 13.2.2 Unpaved Roads

Number of Trucks	200	trucks/day	
Mean Vehicle Weight	25.0	tonnes/truck	data received from GFL in 2020

GFL has indicated that the site entrance and main onsite road network is paved.

Road Segment Traffic:

Source ID	Length (m)	No. Trucks	Condition
Unpaved_Road	0	200	Unpaved
Paved_Road	2850.0	200	Paved

Emission Factors:

For vehicles traveling on unpaved surfaces at industrial sites, emissions are estimated from the following equation

$E = k\,(s/12)^a \times (W/3)^b$ Industrial Roads (Equation 1a)

size-specific emission factor (E)		lb/VMT (multiply by 281.9 to convert to g/VKT)
surface material silt content (s)	4.8	% Table 13.2.2-1, Avg. silt content for Sand and Gravel Processing
mean vehicle weight (W)	27.5	short ton
surface material moisture content (M)	6.5	% Table 13.2.2-3, midpoint of range of source conditions
constants (k, a, b)	see below	

For vehicles traveling on paved surfaces, emissions are estimated from the following equation

$E = k \times (sL)^{0.91} \times (W)^{1.02}$

Road surface silt loading (sL)	8.2 g/m^2	Table 13.2.1-3, AP-42
Particle size multiplier (k)	see below	

Unpaved - Industrial Roads - AP-42, 13.2.2			
Constant	**PM**	**PM_{10}**	**$PM_{2.5}$**
k (lb/VMT)	4.9	1.5	0.15
a	0.7	0.9	0.9
b	0.45	0.45	0.45

Paved Roads (Equation 1a) - AP-42, 13.2.1			
	PM	**PM_{10}**	**$PM_{2.5}$**
k (lb/VMT)	0.011	0.0022	0.00054

Emission Factors (E) converted to g/VKT

Emission Source	Road Type	EF Ref.	PM	PM_{10}	$PM_{2.5}$	Units	Controls	Control Efficiency (%)
Unpaved_Road	Unpaved Road	AP-42, 13.2.2	1971	502	50	g/VKT	controlled	75
Paved_Road	Paved Road	AP-42, 13.2.1	618	124	30	g/VKT	controlled	75

* VKT = Vehicle Kilometers Traveled

Emission Rates

Source ID	Road Length (km)	Trucks per Hour	Emission Rates (g/s, 1-hour average)		
			PM	**PM_{10}**	**$PM_{2.5}$**
Unpaved_Road	0.0	17	0.0	0.00	0.000
Paved_Road	2.9	17	2.04	0.408	0.100
Total			2.0	0.41	0.100

Table E8. Emissions from On-site Truck Traffic - Tail Pipe - Alternative 2 Scenario A

Tailpipe emissions from highway truck traffic on on-site roads were estimated based on emission factors from the US EPA MOVES2014b model. Speciation profiles of on road diesel exhaust from MOVES Onroad Technical Reports document were used to estimate the emission rates of individual pollutants. Daily traffic and activities occur over the 11 hour period 6:30am to 6:30pm. The detailed calculations are shown below.

Highway Truck Traffic

Number of Trucks	200	trucks/day	this will occur over 11 hours
Total travel distance on-site (km)	6	km	

Road Segment Traffic:

Source ID	Length (m)	Trucks / day	Paved or Unpaved?
Unpaved_Road	0	200	Unpaved
Paved_Road	2850	200	Paved

Emission Factors:

The Emission Factors for VOC, PM and NOx were obtained from MOVES2014b model, inventory run for nation region, aggregated all road types and 2021 calendar year. All PM (TSP) was assumed to be PM10.

Emission Factors (E) converted to g/VKT

Emission Source	EF Ref.	PM	PM_{10}	$PM_{2.5}$	NOx	CO	Units
Unpaved_Road	MOVES 2014b Master	1.52E-01	1.52E-01	7.40E-02	1.95E+00	6.12E-01	g/VKT
Paved_Road	MOVES 2014b Master	1.52E-01	1.52E-01	7.40E-02	1.95E+00	6.12E-01	g/VKT

* VKT = Vehicle Kilometers Traveled

Emission Rates

Source ID	Road Length (km)	Trucks per Hour	Emission Rates (g/s, 1-hour average)				
			PM	PM_{10}	$PM_{2.5}$	NOx	CO
Unpaved_Road	0.0	18	0.0000	0.0000	0.0000	0.0000	0.0000
Paved_Road	2.9	18	0.0022	0.0022	0.0011	0.0281	0.0088
		Total	**0.0022**	**0.0022**	**0.0011**	**0.028**	**0.009**

Table E9. Emissions from Working and Construction - Dust

Dust is generated during dumping and handling of waste and cover at the working face, and dumping and handling of construction materials on cells under construction. Dust emissions were estimated from US EPA AP-42, Chapters 13.2.4, Aggregate Handling and Storage Piles, and 11.9 Western Surface Coal Mining.

Quantity of materials Handled

Misc. Fill (Waste materials)			
Unloading rate	3,100	Mg/day	
Operating hours	12	hr/day	
Waste Unloading rate (Misc. Fill)	**0.07**	Mg/s	
Cover:			
Cover rate	310	Mg/day	assuming a 10:1 ratio for waste:cover
Cover Application hours	1	hr/day	
Cover materials- movement rate:	**0.09**	Mg/s	
Clay (Construction materials):			
soil density	1700	kg/m3	
Bucket size	1	m3	
Bucket load	1700	kg	
lifts/min	2	lifts/min	
operating hours	8	hr/day	
Clay movement rate	1632	Mg/day	
Clay movement rate	**0.06**	Mg/s	assumes 30 s/lift; 8 hr/day of continuous work

a) Emissions from material drop (unloading) activities:

E = emission factor (kg/tonnes)
k = particle size multiplier (dimensionless) < 30 μm = 0.74 AP-42 13.2.4
k = particle size multiplier (dimensionless) < 10 μm = 0.35 AP-42 13.2.4
k = particle size multiplier (dimensionless) < 2.5 μm = 0.05 AP-42 13.2.4
U = mean wind speed, meters per second (m/s) = 5 regional wind speed
M = material moisture content (%)

$$E = k\,(0.0016) \times \frac{(\frac{U}{2.2})^{1.3}}{(M * 0.5)^{1.4}}$$

Typical moisture contents were obtained from Table 13.2.4-1, Municipal solid waste landfill industries, AP-42, Chapter 13.2.4 Aggregate Handling And Storage Piles. Misc. Fill materials and Clay/Dirt Mix were selected to represent landfill waste materials and construction materials,

Unloading Material		Moisture Content %	EF (kg/Mg)			Rating	Reference
			PM	PM 10	PM 2.5		
			k= 0.74	k= 0.35	k= 0.053		
Waste (Misc. Fill materials)	Working Face	11.00	3.16E-04	1.50E-04	2.27E-05	A	AP-42 13.2.4
Cover	Working Face	12.00	2.80E-04	1.33E-04	2.01E-05	A	AP-42 13.2.4
Construction Material (Clay/Dirt Mix)	Construction	14.00	2.26E-04	1.07E-04	1.62E-05	A	AP-42 13.2.4

* source: AP-42, Chapter 13.2.4 Aggregate Handling And Storage Piles . Available at: https://www3.epa.gov/ttn/chief/ap42/ch13/final/c13s0204.pdf

Source Description		Material Movement Rate (Mg/s)	Emission Rate (g/s)- 1 hour average		
			PM	PM 10	PM 2.5
Unloading Waste materials (Misc. Fill)	Working Face	0.07	0.023	0.011	0.002
Unloading Cover materials (Cover)	Working Face	0.09	0.024	0.011	0.002
Unloading Construction materials (Clay/D	Construction	0.06	0.013	0.006	0.001
		Total	0.060	0.028	0.004

b) Emissions from Bulldozing,Compacting and Construction

Emission factors for bulldozing/compacting and construction activities are estimated using Table 11.9-2 of AP 42, bulldozing of overburden.

		reference:
EF= emission factor of TSP (kg/hr/vehicle)		AP 42 11.9
M = material moisture content (%)		AP-42 13.2.4
S = silt content (%)		AP-42 13.2.4
Scaling factor for PM10	0.75	AP 42 11.9
Scaling factor for PM2.5	0.105	AP 42 11.9

$$EF_{TSP} = 2.6 \times S^{1.2}/M^{1.3}$$

Source Description	Silt Content %	Moisture Content %	EF (kg/hr)	EF (kg/hr)	EF (kg/hr)	Rating	Reference
			PM	PM10	PM2.5		
Bulldozing/Compacting of Waste (Misc. Fi	12	11.00	2.27	1.70	0.24	B,D,D	AP 42 11.9
Bulldozing/Compacting of Cover	9	12.00	1.44	1.08	0.15	B,D,D	AP 42 11.9
Construction of Clay/Dirt Mix	9.2	14.00	1.21	0.90	0.13	B,D,D	AP 42 11.9

* source : AP 42 11.9 Western Surface Coal Mining (epa.gov)

Source Description		Emission Rate (g/s)		
		PM	PM10	PM2.5
Bulldozing/Compacting of Waste (Misc. Fi	Working Face	0.631	0.473	0.066
Bulldozing/Compacting of Cover	Working Face	0.399	0.299	0.042
Construction of Clay/Dirt Mix	Construction	0.335	0.251	0.035
Total		1.365	1.024	0.143

c) Total Emissions from Material Handling (a + b)

Source ID	Source Description		PM Emission Rate (g/s)		
			PM	PM10	PM2.5
Working Face	Waste Materials	Working Face	0.653	0.484	0.068
	Cover	Working Face	0.423	0.311	0.044
	Construction Materials (clay)	Construction	0.348	0.257	0.036
Total			**1.424**	**1.052**	**0.148**

AP42 13.2.4 Aggregate Handling And Storage Piles (epa.gov)
AP 42 11.9 Western Surface Coal Mining (epa.gov)

Table E12. Landfill - Odour

Odour results from handling and placement of fresh waste, and from fugitive emissions of LFG

Odour from LFG
Fugitive, uncontrolled emissions of LFG contribute to odour. Odour emissions due to LFG are estimated based on the Interim Guide to Estimate and Assess Landfill Air Impacts (MOE 1992) default odour emission factor of 10,000 ou/m³ of landfill gas.

Fugitive LFG Emission Rate	0.95	m³/s, See Table E1 for calculation
Odour Emission Factor	10,000	ou/m³ of LFG

Source	Odour Emission Rate (ou/s)
Landfill (Stg1 to Stg4)	**9,524**

Sample Calculation: (LFG)

Emission Rate = LFG Emission Rate (m³/s) x Emission Factor (ou/m³ of LFG)
= 0.98 m³/s x 10,000 (ou/m³)
= 9,524 (ou/s)

Odour from Working Face
Tipping, spreading and compaction of fresh waste contributes to odour emissions. On any given day, the area of exposed fresh waste is relatively small, and estimated at about 3,200m². Estimates of odour emissions from the working face were based on measurements of odour flux from the literature with respect to municipal landfills.

Source	Subject of Measurements	Odour Flux ou/s/m²
Sironi et al. (2005)	freshly tipped waste	59
Longhurst, P. (2007)	freshly tipped refuse	2
Environmental Alliances Pty (2015)	active tipping area	35.6
Card, T.R. et al. (2015)	active face	0.58
	Geometric mean	7.0

* Longhurst reported a range of 1 to 4 ou/s/m²

Near final completion of the landfill (~2045), the working face will be on Cells 1 and 2 of Stage 9 of the landfill.

Emission Source	Approx. Working Area m²	Odour Flux ou/s/m²	Odour Emission Rate ou/s
Working Face	**3,200**	**7.0**	**22,514**

Sample Calculation: (Working Face)

Emission Rate = Exposed Working Area (m²) x Odour Flux (ou/s/m²)
= 3,200 (m²) x 7.0 (ou/s/m²)
= 22,514 (ou/s)

Table E13. Composting Process - Biofilter

Composting of organics generates significant odour emissions. Composting at the facility is done entirely within the compost plant, a closed building maintained under negative pressure. All exhaust from the building is treated in a biofilter for odour control.

Odour emission rate from the biofilter was measured during a compliance source test program in 2010 (Envirosolve Report No. E10004).

An expansion of the plant in 2012 essentially doubled the capacity of the facility. Assuming that odour generated is proportional to production rate, and that odour removal efficiency remains constant, odour emission rate should also double.

Emission Source		**Gas Flow Rate**[1]	**Measured Odour Emission Rate**[2] **(2010)**	**Estimated Odour Emission Rate (post 2012)**
Source	**Cell or Bed**			
		m^3/s	ou/s	ou/s
Biofilter	BF1	17.5	302	603
	BF2	17.5	302	603
	BF3	17.5	302	603
	Total	52.4	905	1,810

References:
1. Rated flow rates provided by GFL via email on 2019-06-17.
2. Odour concentrations from measurements (Envirosolve Reort No. E10004, 2010).

Table E14. Compost Curing - Odour

Compost is cured in windrows on the the compost curing pad. Odour emissions are highest when compost is fresh, and falls off as the compost is cured. Emissions are also affected by seasonal temperature. Measurements of odour flux were made on three windrows by Consumage in March (winter) and June (summer), 2019. For the modelling assessment, odour fluxes for spring and fall were interpolated using the measured data.

Odour Flux

	Seasonal Odour Flux (ou/s/m³)			
Data source	Measurements	Interpolation	Measurements	Interpolation
Season	Winter	Spring	Summer	Fall
Months	Dec, Jan, Feb	Mar, Apr, May	Jun, July, Aug	Sept, Oct, Nov
Compost age				
Fresh	0.98	15.74	30.49	15.74
1 week old	0.28	4.71	9.15	4.71
3 months old	0.24	0.83	1.42	0.83

Storage piles (typical):	Number of windrows:	12	
	Windrow length:	75	m
	Windrow width:	4.5	m
	Windrow height:	2	m
	Effective surface area of each windrow:	450	m²
	Total effective surface area of all windro	5,399	m²

Curing Odour Emission Rate: Winter

Windrow	**Age** weeks	**Odour Flux** ou/s/m²	**Interpolated Odour Flux** ou/s/m²	**Windrow Surface Area** m²	**Emission Rate** ou/s
1	0 (fresh)	0.98		450	441
2	1	0.28		450	124
3	2		0.27	450	122
4	3		0.27	450	121
5	4		0.26	450	119
6	5		0.26	450	117
7	6		0.26	450	116
8	7		0.25	450	114
9	8		0.25	450	113
10	9		0.25	450	111
11	10		0.24	450	110
12	11	0.24		450	108
Total Winter Emission Rate from Curing					**1,715**

Curing Odour Emission Rate: Spring

Windrow	Age weeks	Odour Flux ou/s/m²	Interpolated Odour Flux ou/s/m²	Windrow Surface Area m²	Emission Rate ou/s
1	0 (fresh)	15.74		450	7,079
2	1	4.71		450	2,121
3	2		4.33	450	1,946
4	3		3.94	450	1,771
5	4		3.55	450	1,597
6	5		3.16	450	1,422
7	6		2.77	450	1,247
8	7		2.38	450	1,072
9	8		1.99	450	897
10	9		1.61	450	722
11	10		1.22	450	548
12	11	0.83		450	373
				Total Spring Emission Rate from Curing	**20,794**

Curing Odour Emission Rate: Summer

Windrow	Age weeks	Odour Flux ou/s/m²	Interpolated Odour Flux ou/s/m²	Windrow Surface Area m²	Emission Rate ou/s
1	0 (fresh)	30.49		450	13,717
2	1	9.15		450	4,118
3	2		8.38	450	3,770
4	3		7.61	450	3,422
5	4		6.83	450	3,074
6	5		6.06	450	2,726
7	6		5.29	450	2,378
8	7		4.51	450	2,030
9	8		3.74	450	1,682
10	9		2.96	450	1,334
11	10		2.19	450	986
12	11	1.42		450	637
				Total Summer Emission Rate from Curing	**39,874**

Curing Odour Emission Rate: Fall

Windrow	Age weeks	Odour Flux ou/s/m²	Interpolated Odour Flux ou/s/m²	Windrow Surface Area m²	Emission Rate ou/s
1	0 (fresh)	15.74		450	7,079
2	1	4.71		450	2,121
3	2		4.33	450	1,946
4	3		3.94	450	1,771
5	4		3.55	450	1,597
6	5		3.16	450	1,422
7	6		2.77	450	1,247
8	7		2.38	450	1,072
9	8		1.99	450	897
10	9		1.61	450	722
11	10		1.22	450	548
12	11	0.83		450	373
				Total Fall Emission Rate from Curing	**20,794**

Table E15. Leaf & Yard Waste Stockpiles - Odour

Leaf & yard waste is used as a bulking agent in compost, and is stockpiled outdoors until needed. With age, the stockpiles of organic materials can produce odour. Odour from undisturbed surfaces is low, but odour from freshly disturbed surfaces can be higher. Odour can also be affected by seasonal temperature. Odour flux from undisturbed and freshly disturbed surfaces of the stockpiles was measured by Consumage in March (winter) and June (summer), 2019. For the modelling assessment, odour fluxes for spring and fall were interpolated using the measured data.

Odour Flux

	Seasonal Odour Flux (ou/s/m²)			
Data source	Measurements	Interpolation	Measurements	Interpolation
Seasons	Winter	Spring	Summer	Fall
Months	Dec, Jan, Feb	Mar, Apr, May	Jun, July, Aug	Sept, Oct, Nov
Stockpile surface				
Undisturbed surface	0.52	0.45	0.37	0.45
Freshly disturbed surface	1.31	21.18	41.0	21.18

At time of measurement, there were six stockpiles, each 140m x 8m x 4m high. Of the total surface area, only a small area of fresh surface would be exposed.

Stockpiles piles (typical):

Number of piles:	6	
Pile length:	140	m
Pile width:	8	m
Pile height:	4	m
Effective surface area per pile:	2,240	m²
Total surface area of all piles:	13,440	m²
Total freshly opened surface area:	210	m²

Odour Emission Rate: Winter

Source	Surface Area of Piles m²	Odour Flux ou/s/m²	Total Odour Emission Rate ou/s	Individual Pile Odour Emission Rate ou/s
Freshly disturbed surface	13,440	0.52	7,002	1167
Undisturbed surface	210	1.31	274	46
Total Winter Emission Rate from Stockpiles			**7,277**	**1,213**

Odour Emission Rate: Spring

Source	Surface Area of Piles m²	Odour Flux ou/s/m²	Total Odour Emission Rate ou/s	Individual Pile Odour Emission Rate ou/s
Freshly disturbed surface	13,440	0.45	5,988	998
Undisturbed surface	210	21.18	4,447	741
Total Spring Emission Rate from Stockpiles			**10,434**	**1,739**

Odour Emission Rate: Summer

Source	Surface Area of Piles m²	Odour Flux ou/s/m²	Total Odour Emission Rate ou/s	Individual Pile Odour Emission Rate ou/s
Freshly disturbed surface	13,440	0.37	4,973	829
Undisturbed surface	210	41.04	8,619	1437
Total Summer Emission Rate from Stockpiles			**13,592**	**2,265**

Odour Emission Rate: Fall

Source	Surface Area of Piles m²	Odour Flux ou/s/m²	Total Odour Emission Rate ou/s	Individual Pile Odour Emission Rate ou/s
Freshly disturbed surface	13,440	0.45	5,988	998
Undisturbed surface	210	21.18	4,447	741
Total Fall Emission Rate from Stockpiles			**10,434**	**1,739**

Appendix E: Emission Estimates
Alternative 2 Scenario B

Calculation Sheet - Alternative 2 Scenario B

LFG Emissions from Gensets and Flares for Stages 1 to 5

The maximum quantity of LFG was estimated by using LandGEM Landfill Gas Emissions Model version 3.02, USEPA :

Max Quantity of LFG= 3.03E+07 m^3/year

It was assumed that the LFG collection system has a capture capacity of 75%. As such:

25% of LFG is emitted into the atmosphere as fugitive emissions:

=25% x 3.346e7 7.57E+06 m^3/year

75% of LFG is captured by LFG collection system and will be directed into the flares and generators.

=75% x 3.346e7 2.27E+07 m^3/year

The majority of collected LFG from collection system is directed into flare#1, and flare#2 (new flare). The remaining LFG will be directed into generators.

The LFG required to be filtered from siloxane compounds prior to combustion in generators in order to protect generators engines.

The purge gas from siloxane filter will be sent to flare 3 (siloxane filter) and will be combusted.

The amount of LFG combusted in flare #1 and #2 was estimated based on the following assumptions:

1. LFG quantity combusted in generators and siloxane flare was estimated based on actual quantity reported in 2019.
Approximately, 20,100,962 Sm3 and 891,340 Sm3 of total captured LFG was combusted in generators and siloxane flare, respectively.
2. The quantity of LFG combusted in generators and siloxane filter was subtract from total captured LFG to estimate the remaining quantity of LFG.
Quantity of remaining LFG =2.45e7 (m3/year) - 20,100,962 (m3/year) - 891,340 (m3/year)= 1.71E+06 m^3/year
3. The remaining quantity of LFG was splited between flare 1 and flare 2 based on their design capacity obtained from manufacturers.

Units	Design Capacity (cfm)	LFG Quantity
Flare 1	2500	6.11E+05
Flare 2	4500	1.10E+06

Source ID	LFG quantity[1,2]			No. of units	LFG quantity per unit	
	LFG Quantity (Sm^3/year)	hours/year	m^3/hr		m^3/hr	m^3/s
LFG Fugitive	7,567,500	8,760	864	-	864	0.24
Engines	20,100,962	8,760	2,295	4	574	0.16
Flare 1	610,785	8,760	70	1	70	0.02
Flare 2	1,099,413	8,760	126	1	126	0.03
Flare 3	891,340	8,760	102	1	102	0.03

1. LFG quantities combusted in generator engines and siloxane flare were provided by GFL and are based on 2019 calender year.
2. LFG quantities combusted in flare 1 and flare 2 were estimated based on design capacities obtained from manufacturers.

Control Efficiency (%) from Table 2.4-3, AP-42

LFG Emission Sources	LFG Quantity (Sm^3/year)	Capture Efficiency	LFG Emission Rate (m^3/yr)	LFG Emissions	Significant? (Yes or No)[1]
Fugitives	7,567,500	0.00%	7,567,500	92%	Yes
Engines	20,100,962	97.20%	562,827	7%	Yes
Flare 1	610,785	97.70%	14,048	0%	No
Flare 2	1,099,413	97.70%	25,286	0%	No
Flare 3 (Siloxane Flare)	891,340	97.70%	20,501	0%	No
		Total	8,190,162	100%	

1. Sources that are Insignificant Relative to Total Emissions per section 7.2.2 of ESDM guidance document.

Calculation Sheet - Alternative 2 Scenario B

LFG Emissions from Gensets and Flares for Stages 6 to 8

The maximum quantity of LFG was estimated by using LandGEM Landfill Gas Emissions Model version 3.02, USEPA :

Max Quantity of LFG= 9.28E+07 m^3/year

It was assumed that the LFG collection system has a capture capacity of 75%. As such:
25% of LFG is emitted into the atmosphere as fugitive emissions:

=25% x 8.668e7 2.32E+07 m^3/year

75% of LFG is captured by LFG collection system and will be directed into the flares and generators.

=75% x 8.668e7 6.96E+07 m^3/year

The majority of collected LFG from collection system is directed into flare#1, and flare#2 (new flare). The remaining LFG will be directed into generators.
The LFG required to be filtered from siloxane compounds prior to combustion in generators in order to protect generators engines.
The purge gas from siloxane filter will be sent to flare 3 (siloxane filter) and will be combusted.

The amount of LFG combusted in flare #1 and #2 was estimated based on the following assumptions:
1. LFG quantity combusted in generators and siloxane flare was estimated based on actual quantity reported in 2019.
Approximately, 20,100,962 Sm3 and 891,340 Sm3 of total captured LFG was combusted in generators and siloxane flare, respectively.
2. The quantity of LFG combusted in generators and siloxane filter was subtract from total captured LFG to estimate the remaining quantity of LFG.
Quantity of remaining LFG =6.96e7 (m3/year) - 20,100,962 (m3/year) - 891,340 (m3/year)= 4.86E+07 m^3/year
3. The remaining quantity of LFG was splited between flare 1 and flare 2 based on their design capacity obtained from manufacturers.

Units	Design Capacity (cfm)	LFG Quantity
Flare 1	2500	1.74E+07
Flare 2	4500	3.13E+07

Source ID	LFG quantity[1,2]			No. of units	LFG quantity per unit	
	LFG Quantity (Sm^3/year)	hours/year	m^3/hr		m^3/hr	m^3/s
LFG Fugitive	23,207,500	8,760	2,649	-	2649	0.74
Engines	20,100,962	8,760	2,295	4	574	0.16
Flare 1	17,367,928	8,760	1,983	1	1983	0.55
Flare 2	31,262,270	8,760	3,569	1	3569	0.99
Flare 3	891,340	8,760	102	1	102	0.03

1. LFG quantities combusted in generator engines and siloxane flare were provided by GFL and are based on 2019 calender year.
2. LFG quantities combusted in flare 1 and flare 2 were estimated based on design capacities obtained from manufacturers.

Control Efficiency (%) from Table 2.4-3, AP-42

LFG Emission Sources	LFG Quantity (Sm^3/year)	Capture Efficiency	LFG Emission Rate (m^3/yr)	LFG Emissions	Significant? (Yes or No)[1]
Fugitives	23,207,500	0.00%	23,207,500	93%	Yes
Engines	20,100,962	97.20%	562,827	2%	No
Flare 1	17,367,928	97.70%	399,462	2%	No
Flare 2	31,262,270	97.70%	719,032	3%	No
Flare 3 (Siloxane Flare)	891,340	97.70%	20,501	0%	No
		Total	24,909,322	100%	

1. Sources that are Insignificant Relative to Total Emissions per section 7.2.2 of ESDM guidance document.

Table E1. LFG Generation and Distribution for Stages 1 to 5 - Alternative 2 Scenario B

Landfill Gas (LFG) is generated by decomposition of organic materials within the landfill. The quantity of LFG generated per year was estimated using the US EPA LandGEM Landfill Gas Emissions Model version 3.02.

Model Inputs:

Inputs to the model were based on:

- 2019 and earlier - records of quantity of waste accepted annually (tonnes/year)
- 2020 to 2025 - assumed 755,000 tonnes/year of waste accepted
- Closure at end of 2025

Model Results

The LandGEM model estimates:

Maximum LFG generation rate: 30,270,000 m^3/year in 2045

LFG is assumed to be generated relatively uniformly through the year, so this equates to peak generation rate of:

30270000 (m^3/year) / 365 (days/year) / 24 (hours/day) / 3600 (seconds/hour)

LFG Generation Rate = 1.0 m^3/s

Distribution

The landfill has an LFG Collection System to capture LFG and route it to the LFG Utilization Facility. LFG that is not captured by the system is emitted to atmosphere through the landfill surface.

LFG Capture System Efficiency: 75%

LFG captured and combusted at the LFG Utilization facility:	1.0 (m^3/s) x 75% =	0.72	m^3/s
LFG not captured, and emitted from surface (e.g. fugitive):	1.0 (m^3/s) x (1-75%) =	0.24	m^3/s

At the LFG Utilization facility, LFG is used to fuel engines driving electrical generators (Gen1 to Gen4). Siloxanes are filtered from the engine fuel, and purge gas from the filter is mixed with LFG and combusted in an enclosed flare (Flare3). Excess LFG not used in Gen1 to Gen4 or Flare3 is combusted in two enclosed flares (Flare1 and Flare2). For the puroses of this analysis, LFG is assumed to be distributed between Flares1 and 2 proportional to their rated capacity.

Source	**LFG Combusted (m^3/s)**	
Engines (Gen1 to Gen 4)	0.16	m^3/s, capacity at rated power 0.64 m^3/s total (2019)
Siloxane Flare (Flare3)	0.029	m^3/s, at rated engine power (2019)
Flare 1	0.19	m^3/s (rated capacity 1.18 m^3/s)
Flare 2	0.34	m^3/s (rated capacity 2.12 m^3/s)
Total Combusted	0.72	m^3/s

Table E1. LFG Generation and Distribution for Stages 6 to 8 - Alternative 2 Scenario B

Landfill Gas (LFG) is generated by decomposition of organic materials within the landfill. The quantity of LFG generated per year was estimated using the US EPA LandGEM Landfill Gas Emissions Model version 3.02.

Model Inputs:

Inputs to the model were based on:

- 2026 to 2045 - assumed 755,000 tonnes/year of waste accepted
- Closure at end of 2045

Model Results

The LandGEM model estimates:

Maximum LFG generation rate: 92,830,000 m³/year in 2045

LFG is assumed to be generated relatively uniformly through the year, so this equates to peak generation rate of:

92830000 (m³/year) / 365 (days/year) / 24 (hours/day) / 3600 (seconds/hour)

LFG Generation Rate = 2.9 m³/s

Distribution

The landfill has an LFG Collection System to capture LFG and route it to the LFG Utilization Facility. LFG that is not captured by the system is emitted to atmosphere through the landfill surface.

LFG Capture System Efficiency: 75%

LFG captured and combusted at the LFG Utilization facility:	2.9 (m³/s) x 75% =	2.21	m³/s
LFG not captured, and emitted from surface (e.g. fugitive):	2.9 (m³/s) x (1-75%) =	0.74	m³/s

At the LFG Utilization facility, LFG is used to fuel engines driving electrical generators (Gen1 to Gen4). Siloxanes are filtered from the engine fuel, and purge gas from the filter is mixed with LFG and combusted in an enclosed flare (Flare3). Excess LFG not used in Gen1 to Gen4 or Flare3 is combusted in two enclosed flares (Flare1 and Flare2). For the puroses of this analysis, LFG is assumed to be distributed between Flares1 and 2 proportional to their rated capacity.

Source	**LFG Combusted (m³/s)**	
Engines (Gen1 to Gen 4)	0.48	m³/s, at rated power (2019)
Siloxane Flare (Flare3)	0.029	m³/s, at rated engine power (2019)
Flare 1	0.61	m³/s (rated capacity 1.18 m³/s)
Flare 2	1.09	m³/s (rated capacity 2.12 m³/s)
Total Combusted	2.21	m³/s

Table E2. Fugitive Emissions Of LFG for Stages 1 to 5 - Alternative 2 Scenario B

LFG that is not captured by the LFG Collection System is emitted from the surface of the landfill as fugitive. The previous landfill wass divided into five stages (STG1 to STG5). Fugitive LFG was assumed to to be emitted uniformly over the area of the five stages.

Concentrations of constituents of LFG are based on US EPA, AP-42, Table 2.4-1.

Total Fugitive LFG Emission Rate: 0.24 m^3/s (see Table E1 for calculation)

Emission Sources	**Surface Area** (m^2)
STG1 - Stage 1	244,000
STG2 - Stage 2	244,000
STG3 - Stage 3	244,000
STG4 - Stage 4	342,000
STG5 - Stage 5	102,948
Total Surface Area	**1,176,948**

Sample Calculation (1,1,1-Trichloroethane)

Total emission rate = LFG Emission rate (m^3/s) x Concentration in LFG (mg/m^3) /1000 (mg/g)
= 0.24 (m^3/s) x 1.32 (mg/m^3) / 1000 (mg/g)
= 0.00032
Emission flux = Total emission rate (g/s) / Total surface area (m^2)
= 0.00031 / 1176948 (m^2)
= 2.70E-10

Aggregate Fugitive Emissions from Stages 1 to 5 (STG1 to STG5)

Constituent	CAS No.	MW (g/mole)	Concentration in LFG (ppmv)	Concentration in LFG (mg/m^3)	Total Emission Rate (g/s)	Total Emission Flux ($g/s/m^2$)	Emission Factor Rating
1,1,1-Trichloroethane	71556	133	2.43E-01	1.3	3.18E-04	2.70E-10	A
1,1,2,2-Tetrachloroethane	79345	168	5.35E-01	3.7	8.81E-04	7.48E-10	E
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	261	3.49E-03	0.0	8.93E-06	7.58E-12	D
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187	6.72E-02	0.5	1.23E-04	1.05E-10	C
1,1,2-Trichloroethane	79005	133	1.58E-01	0.9	2.07E-04	1.76E-10	D
1,1-Dichloroethane	75343	99	2.08E+00	8.4	2.02E-03	1.72E-09	A
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	97	1.60E-01	0.6	1.52E-04	1.29E-10	A
1,2,3-Trimethylbenzene	526738	120	3.59E-01	1.8	4.23E-04	3.60E-10	D
1,2,4-Trichlorobenzene	120821	181	5.51E-03	0.0	9.81E-06	8.33E-12	C
1,2,4-Trimethylbenzene	95636	120	1.37E+00	6.7	1.61E-03	1.37E-09	B
1,2-Dibromoethane (Ethylene dibromide)	106934	188	4.80E-03	0.0	8.84E-06	7.51E-12	B
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	171	1.06E-01	0.7	1.78E-04	1.51E-10	B
1,2-Dichloroethane (Ethylene dichloride)	107062	99	1.59E-01	0.6	1.54E-04	1.31E-10	A
1,2-Dichloroethene	540590	97	1.14E+01	45.2	1.08E-02	9.21E-09	E
1,2-Dichloropropane	78875	113	5.20E-02	0.2	5.76E-05	4.90E-11	D
1,2-Diethylbenzene	135013	134	1.99E-02	0.1	2.62E-05	2.23E-11	D
1,3,5-Trimethylbenzene	108678	120	6.23E-01	3.1	7.34E-04	6.24E-10	C
1,3-Butadiene (Vinyl ethylene)	106990	54	1.66E-01	0.4	8.81E-05	7.48E-11	C
1,3-Diethylbenzene	141935	134	6.55E-02	0.4	8.62E-05	7.33E-11	D
1,4-Diethylbenzene	105055	134	2.62E-01	1.4	3.45E-04	2.93E-10	D
1,4-Dioxane (1,4-Diethylene dioxide)	123911	88	8.29E-03	0.0	7.16E-06	6.09E-12	D
1-Butene	106989	56	1.22E+00	2.8	6.71E-04	5.70E-10	D
2-Methylbutene	513359	70	1.22E+00	3.5	8.39E-04	7.13E-10	D
1-Butene	106989	56	1.10E+00	2.5	6.05E-04	5.14E-10	E
2-Methylpropene	115117	56	1.10E+00	2.5	6.05E-04	5.14E-10	E
1-Ethyl-4-methylbenzene (4-Ethyl toluene)	622968	120	9.89E-01	4.9	1.17E-03	9.91E-10	C
1-Heptene	592767	98	6.25E-01	2.5	6.02E-04	5.11E-10	E
1-Hexene	592416	84	8.88E-02	0.3	7.33E-05	6.23E-11	D
2-Methyl-1-pentene	763291	84	8.88E-02	0.3	7.33E-05	6.23E-11	D
1-Methylcyclohexene	591491	96	2.27E-02	0.1	2.14E-05	1.82E-11	D
1-Methylcyclopentene	693890	82	2.52E-02	0.1	2.03E-05	1.72E-11	D
1-Pentene	109671	70	2.20E-01	0.6	1.51E-04	1.29E-10	D
1-Propanethiol (n-Propyl mercaptan)	107039	76	1.25E-01	0.4	9.34E-05	7.93E-11	D
2,2,3-Trimethylbutane	464062	100	9.19E-03	0.0	9.03E-06	7.67E-12	D
2,2,4-Trimethylpentane	540841	114	6.14E-01	2.9	6.88E-04	5.84E-10	A
2,2,5-Trimethylhexane	3522949	128	1.56E-01	0.8	1.96E-04	1.67E-10	D
2,2-Dimethylbutane	75832	86	1.56E-01	0.5	1.32E-04	1.12E-10	D
2,2-Dimethylpentane	590352	100	6.08E-02	0.2	5.97E-05	5.08E-11	D
2,2-Dimethylpropane	463821	72	2.74E-02	0.1	1.94E-05	1.65E-11	D

Constituent	CAS No.	MW	Concentration in LFG		Total Emission Rate	Total Emission Flux	Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(g/s)	(g/s/m²)	
2,3,4-Trimethylpentane	565753	114	3.12E-01	1.5	3.50E-04	2.97E-10	D
2,3-Dimethylbutane	79298	86	1.67E-01	0.6	1.41E-04	1.20E-10	E
2,3-Dimethylpentane	565593	100	3.10E-01	1.3	3.05E-04	2.59E-10	D
2,4-Dimethylhexane	589435	114	2.22E-01	1.0	2.49E-04	2.11E-10	D
2,4-Dimethylpentane	108087	100	1.00E-01	0.4	9.83E-05	8.35E-11	D
2,5-Dimethylhexane	592132	114	1.66E-01	0.8	1.86E-04	1.58E-10	D
2,5-Dimethylthiophene	638028	112	6.44E-02	0.3	7.09E-05	6.02E-11	D
2-Butanone (Methyl ethyl ketone)	78933	72	4.01E+00	11.8	2.84E-03	2.41E-09	D
2-Ethyl-1-butene	760214	84	1.77E-02	0.1	1.46E-05	1.24E-11	E
2-Ethylthiophene	872559	112	6.29E-02	0.3	6.92E-05	5.88E-11	C
2-Ethyltoluene	611143	120	3.23E-01	1.6	3.81E-04	3.23E-10	D
2-Hexanone (Methyl butyl ketone)	591786	100	6.13E-01	2.5	6.02E-04	5.12E-10	E
2-Methyl-1-butene	563462	70	1.79E-01	0.5	1.23E-04	1.05E-10	D
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90	1.70E-01	0.6	1.50E-04	1.28E-10	E
2-Methyl-2-butene	513359	70	3.03E-01	0.9	2.08E-04	1.77E-10	D
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90	3.25E-01	1.2	2.87E-04	2.44E-10	E
2-Methylbutane	78784	72	2.26E+00	6.7	1.60E-03	1.36E-09	D
2-Methylheptane	592278	114	7.16E-01	3.3	8.02E-04	6.82E-10	D
2-Methylhexane	591764	100	8.16E-01	3.3	8.02E-04	6.81E-10	D
2-Methylpentane	107835	86	6.88E-01	2.4	5.81E-04	4.94E-10	D
2-Propanol (Isopropyl alcohol)	67630	60	1.80E+00	4.4	1.06E-03	9.01E-10	D
3,6-Dimethyloctane	15869940	142	7.85E-01	4.6	1.10E-03	9.31E-10	D
3-Ethyltoluene	620144	120	7.80E-01	3.8	9.19E-04	7.81E-10	D
3-Methyl-1-pentene	760203	84	6.99E-03	0.0	5.77E-06	4.90E-12	D
3-Methylheptane	589811	114	7.63E-01	3.6	8.55E-04	7.26E-10	D
3-Methylhexane	589344	100	1.13E+00	4.6	1.11E-03	9.43E-10	D
3-Methylpentane	96140	86	7.40E-01	2.6	6.25E-04	5.31E-10	D
3-Methylthiophene	616444	98	9.25E-02	0.4	8.91E-05	7.57E-11	E
4-Methyl-1-pentene	691372	84	2.33E-02	0.1	1.92E-05	1.63E-11	E
4-Methyl-2-pentanone (MIBK)	108101	100	8.83E-01	3.6	8.67E-04	7.37E-10	C
4-Methylheptane	589537	114	2.49E-01	1.2	2.79E-04	2.37E-10	D
Acetaldehyde	75070	44	7.74E-02	0.1	3.34E-05	2.84E-11	D
Acetone	67641	58	6.70E+00	15.9	3.82E-03	3.24E-09	C
Acetonitrile	75058	41	5.56E-01	0.9	2.24E-04	1.90E-10	A
Benzene	71432	78	2.40E+00	7.7	1.84E-03	1.56E-09	A
Benzyl chloride	100447	127	1.81E-02	0.1	2.25E-05	1.91E-11	A
Bromodichloromethane	75274	164	8.78E-03	0.1	1.41E-05	1.20E-11	E
Bromomethane (Methyl bromide)	74839	95	2.10E-02	0.1	1.96E-05	1.66E-11	C
Butane	106978	58	6.22E+00	14.8	3.55E-03	3.01E-09	C
Carbon disulfide	75150	76	1.47E-01	0.5	1.10E-04	9.33E-11	A
Carbon monoxide	630080	28	2.44E+01	27.9	6.70E-03	5.70E-09	C
Carbon tetrachloride	56235	154	7.98E-03	0.1	1.20E-05	1.02E-11	A
Carbon tetrafluoride (Freon 14)	75730	88	1.51E-01	0.5	1.30E-04	1.11E-10	E
Carbonyl sulfide (Carbon oxysulfide)	463581	60	1.22E-01	0.3	7.19E-05	6.11E-11	A
Chlorobenzene	108907	113	4.84E-01	2.2	5.34E-04	4.54E-10	A
Chlorodifluoromethane (Freon 22)	75456	86	7.96E-01	2.8	6.75E-04	5.74E-10	D
Chloroethane (Ethyl chloride)	75003	65	3.95E+00	10.4	2.50E-03	2.12E-09	B
Chloromethane (Methyl chloride)	74873	50	2.44E-01	0.5	1.21E-04	1.03E-10	B
cis-1,2-Dichloroethene	156592	97	1.24E+00	4.9	1.18E-03	1.00E-09	B
cis-1,2-Dimethylcyclohexane	2207014	112	8.10E-02	0.4	8.91E-05	7.57E-11	D
cis-1,3-Dichloropropene	10061015	111	3.03E-03	0.0	3.30E-06	2.80E-12	D
cis-1,3-Dimethylcyclohexane	638040	112	5.01E-01	2.3	5.51E-04	4.68E-10	D
cis-1,4-Dimethylcyclohexane	624293	112	2.48E-01	1.1	2.73E-04	2.32E-10	D
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	112	2.48E-01	1.1	2.73E-04	2.32E-10	D
cis-2-Butene	590181	56	1.05E-01	0.2	5.78E-05	4.91E-11	D
cis-2-Heptene	6443921	98	2.45E-02	0.1	2.36E-05	2.00E-11	E
cis-2-Hexene	7688213	84	1.72E-02	0.1	1.42E-05	1.21E-11	D
cis-2-Octene	7642048	112	2.20E-01	1.0	2.42E-04	2.06E-10	D
cis-2-Pentene	627203	70	4.79E-02	0.1	3.29E-05	2.80E-11	D
cis-3-Methyl-2-pentene	922623	84	1.79E-02	0.1	1.48E-05	1.26E-11	D
Cyclohexane	110827	84	1.01E+00	3.5	8.34E-04	7.08E-10	B
Cyclohexene	110838	82	1.84E-02	0.1	1.48E-05	1.26E-11	D

Constituent	CAS No.	MW	Concentration in LFG		Total Emission Rate	Total Emission Flux	Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(g/s)	(g/s/m²)	
Cyclopentane	287923	70	2.21E-02	0.1	1.52E-05	1.29E-11	D
Cyclopentene	142290	68	1.21E-02	0.0	8.08E-06	6.87E-12	D
Decane	124185	142	3.80E+00	22.1	5.30E-03	4.51E-09	D
Dibromochloromethane	124481	208	1.51E-02	0.1	3.08E-05	2.62E-11	D
Dibromomethane (Methylene dibromide)	74953	174	8.35E-04	0.0	1.42E-06	1.21E-12	E
Dichlorobenzene	106467	147	9.40E-01	5.6	1.36E-03	1.15E-09	A
Dichlorodifluoromethane (Freon 12)	75718	121	1.18E+00	5.8	1.40E-03	1.19E-09	B
Dichloromethane (Methylene chloride)	75092	85	6.15E+00	21.3	5.12E-03	4.35E-09	A
Diethyl sulfide	352932	90	8.62E-02	0.3	7.62E-05	6.48E-11	E
Dimethyl disulfide	624920	94	1.37E-01	0.5	1.27E-04	1.08E-10	A
Dimethyl sulfide	75183	62	5.66E+00	14.4	3.45E-03	2.93E-09	A
Dodecane (n-Dodecane)	112403	170	2.21E-01	1.5	3.69E-04	3.14E-10	D
Ethane	74840	30	9.05E+00	11.1	2.67E-03	2.27E-09	D
Ethanol	64175	46	2.30E-01	0.4	1.04E-04	8.83E-11	D
Ethyl acetate	141786	88	1.88E+00	6.8	1.62E-03	1.38E-09	C
Ethyl mercaptan (Ethanediol)	75081	62	1.98E-01	0.5	1.21E-04	1.03E-10	A
Ethyl methyl sulfide	624895	76	3.67E-02	0.1	2.74E-05	2.33E-11	E
Ethylbenzene	100414	106	4.86E+00	21.1	5.06E-03	4.30E-09	B
Formaldehyde	50000	30	1.17E-02	0.0	3.45E-06	2.93E-12	D
Heptane	142825	100	1.34E+00	5.5	1.32E-03	1.12E-09	B
Hexane	110543	86	3.10E+00	10.9	2.62E-03	2.23E-09	B
Hydrogen sulfide	7783064	34	3.20E+01	44.6	1.07E-02	9.09E-09	A
Indane (2,3-Dihydroindene)	496117	34	6.66E-02	0.1	2.23E-05	1.89E-11	D
Isobutane (2-Methylpropane)	75285	58	8.16E+00	19.4	4.65E-03	3.95E-09	D
Isobutylbenzene	538932	134	4.07E-02	0.2	5.36E-05	4.55E-11	D
Isoprene (2-Methyl-1,3-butadiene)	78795	68	1.65E-02	0.0	1.10E-05	9.37E-12	D
Isopropyl mercaptan	75332	76	1.75E-01	0.5	1.31E-04	1.11E-10	A
Isopropylbenzene (Cumene)	98828	120	4.30E-01	2.1	5.07E-04	4.31E-10	D
Mercury (total)	7439976	201	1.22E-04	0.0	2.40E-07	2.04E-13	B
Methanethiol (Methyl mercaptan)	74931	48	1.37E+00	2.7	6.46E-04	5.49E-10	A
Methyl tert-butyl ether (MTBE)	1634044	88	1.18E-01	0.4	1.02E-04	8.67E-11	D
Methylcyclohexane	108872	98	1.29E+00	5.2	1.24E-03	1.06E-09	D
Methylcyclopentane	96377	84	6.50E-01	2.2	5.36E-04	4.56E-10	D
Naphthalene	91203	128	1.07E-01	0.6	1.34E-04	1.14E-10	D
n-Butylbenzene	104518	134	6.80E-02	0.4	8.95E-05	7.61E-11	D
Nonane	111842	128	2.37E+00	12.4	2.98E-03	2.53E-09	D
n-Propylbenzene (Propylbenzene)	103651	120	4.13E-01	2.0	4.87E-04	4.14E-10	D
Octane	111659	114	1.08E+00	5.0	1.21E-03	1.03E-09	D
p-Cymene (1-Methyl-4-Isopropylbenzene)	99876	134	3.58E+00	19.6	4.71E-03	4.00E-09	D
Pentane	109660	72	4.46E+00	13.2	3.16E-03	2.68E-09	C
Propane	74986	44	1.55E+01	27.9	6.70E-03	5.70E-09	C
Propene	115071	42	3.32E+00	5.7	1.37E-03	1.16E-09	D
Propyne	74997	40	3.80E-02	0.1	1.49E-05	1.27E-11	E
sec-Butylbenzene	135988	134	6.75E-02	0.4	8.89E-05	7.55E-11	D
Styrene (Vinylbenzene)	100425	104	4.11E-01	1.7	4.20E-04	3.57E-10	B
Tetrachloroethylene (Perchloroethylene)	127184	166	2.03E+00	13.8	3.30E-03	2.81E-09	A
Tetrahydrofuran (Diethylene oxide)	109999	72	9.69E-01	2.9	6.85E-04	5.82E-10	C
Thiophene	110021	84	3.49E-01	1.2	2.88E-04	2.45E-10	E
Toluene (Methyl benzene)	108883	92	2.95E+01	111.1	2.67E-02	2.26E-08	A
trans-1,2-Dichloroethene	156605	97	2.87E-02	0.1	2.73E-05	2.32E-11	C
trans-1,2-Dimethylcyclohexane	6876239	112	4.04E-01	1.9	4.45E-04	3.78E-10	D
trans-1,3-Dichloropropene	10061026	111	9.43E-03	0.0	1.03E-05	8.72E-12	D
trans-1,4-Dimethylcyclohexane	2207047	112	2.05E-01	0.9	2.26E-04	1.92E-10	D
trans-2-Butene	624646	56	1.04E-01	0.2	5.72E-05	4.86E-11	D
trans-2-Heptene	14686136	98	2.50E-03	0.0	2.41E-06	2.05E-12	E
trans-2-Hexene	4050457	84	2.06E-02	0.1	1.70E-05	1.44E-11	D
trans-2-Octene	13389429	112	2.41E-01	1.1	2.65E-04	2.25E-10	D
trans-2-Pentene	646048	70	3.47E-02	0.1	2.39E-05	2.03E-11	D
trans-3-Methyl-2-pentene	616126	84	1.55E-02	0.1	1.28E-05	1.09E-11	D
Tribromomethane (Bromoform)	75252	253	1.24E-02	0.1	3.07E-05	2.61E-11	D
Trichloroethylene (Trichloroethene)	79016	131	8.28E-01	4.4	1.07E-03	9.07E-10	A
Trichlorofluoromethane (Freon 11)	91315616	137	2.48E-01	1.4	3.34E-04	2.84E-10	B
Trichloromethane (Chloroform)	67663	119	7.08E-02	0.3	8.29E-05	7.04E-11	A
Undecane	1120214	156	1.67E+00	10.7	2.56E-03	2.18E-09	D
Vinyl acetate	85306269	86	2.48E-01	0.9	2.09E-04	1.78E-10	C
Vinyl chloride (Chloroethene)	75014	63	1.42E+00	3.6	8.70E-04	7.40E-10	A
Xylenes (o-, m-, p-, mixtures)	1330207	106	9.23E+00	40.1	9.61E-03	8.17E-09	A
Total Reduced Sulphur Compounds	n/a	-	-	67.7	1.63E-02	1.38E-08	-

Table E2. Fugitive Emissions Of LFG for Stages 6 to 8 - Alternative 2 Scenario B

LFG that is not captured by the LFG Collection System is emitted from the surface of the landfill as fugitive. The active portion of the landfill is divided into three stages (STG6 to STG8). Fugitive LFG was assumed to to be emitted uniformly over the area of the three stages.

Concentrations of constituents of LFG are based on US EPA, AP-42, Table 2.4-1.

Total Fugitive LFG Emission Rate: 0.74 m^3/s (see Table E1 for calculation)

Emission Sources	Surface Area (m²)
STG6 - Stage 6	570,062
STG7 - Stage 7	570,062
STG8 - Stage 8	240,403
Total Surface Area	**1,380,527**

Sample Calculation (1,1,1-Trichloroethane)

Total emission rate = LFG Emission rate (m³/s) x Concentration in LFG (mg/m³) /1000 (mg/g)
= 0.74 (m³/s) x 1.32 (mg/m³) / 1000 (mg/g)
= 0.00097
Emission flux = Total emission rate (g/s) / Total surface area (m²)
= 0.00097 / 1380527 (m²)
= 7.06E-10

Aggregate Fugitive Emissions from Stages 6 to 9 (STG6 to STG9)

Constituent	CAS No.	MW	Concentration in LFG		Total Emission Rate	Total Emission Flux	Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(g/s)	(g/s/m²)	
1,1,1-Trichloroethane	71556	133	2.43E-01	1.3	9.75E-04	7.06E-10	A
1,1,2,2-Tetrachloroethane	79345	168	5.35E-01	3.7	2.70E-03	1.96E-09	E
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	261	3.49E-03	0.0	2.74E-05	1.98E-11	D
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187	6.72E-02	0.5	3.79E-04	2.74E-10	C
1,1,2-Trichloroethane	79005	133	1.58E-01	0.9	6.34E-04	4.59E-10	D
1,1-Dichloroethane	75343	99	2.08E+00	8.4	6.19E-03	4.48E-09	A
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	97	1.60E-01	0.6	4.66E-04	3.38E-10	A
1,2,3-Trimethylbenzene	526738	120	3.59E-01	1.8	1.30E-03	9.40E-10	D
1,2,4-Trichlorobenzene	120821	181	5.51E-03	0.0	3.01E-05	2.18E-11	C
1,2,4-Trimethylbenzene	95636	120	1.37E+00	6.7	4.95E-03	3.59E-09	B
1,2-Dibromoethane (Ethylene dibromide)	106934	188	4.80E-03	0.0	2.71E-05	1.96E-11	B
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	171	1.06E-01	0.7	5.45E-04	3.95E-10	B
1,2-Dichloroethane (Ethylene dichloride)	107062	99	1.59E-01	0.6	4.73E-04	3.43E-10	A
1,2-Dichloroethene	540590	97	1.14E+01	45.2	3.32E-02	2.41E-08	E
1,2-Dichloropropane	78875	113	5.20E-02	0.2	1.77E-04	1.28E-10	D
1,2-Diethylbenzene	135013	134	1.99E-02	0.1	8.03E-05	5.82E-11	D
1,3,5-Trimethylbenzene	108678	120	6.23E-01	3.1	2.25E-03	1.63E-09	C
1,3-Butadiene (Vinyl ethylene)	106990	54	1.66E-01	0.4	2.70E-04	1.96E-10	C
1,3-Diethylbenzene	141935	134	6.55E-02	0.4	2.64E-04	1.92E-10	D
1,4-Diethylbenzene	105055	134	2.62E-01	1.4	1.06E-03	7.66E-10	D
1,4-Dioxane (1,4-Diethylene dioxide)	123911	88	8.29E-03	0.0	2.20E-05	1.59E-11	D
1-Butene	106989	56	1.22E+00	2.8	2.06E-03	1.49E-09	D
2-Methylbutene	513359	70	1.22E+00	3.5	2.57E-03	1.86E-09	D
1-Butene	106989	56	1.10E+00	2.5	1.86E-03	1.34E-09	E
2-Methylpropene	115117	56	1.10E+00	2.5	1.86E-03	1.34E-09	E
1-Ethyl-4-methylbenzene (4-Ethyl toluene)	622968	120	9.89E-01	4.9	3.58E-03	2.59E-09	C
1-Heptene	592767	98	6.25E-01	2.5	1.85E-03	1.34E-09	E
1-Hexene	592416	84	8.88E-02	0.3	2.25E-04	1.63E-10	D
2-Methyl-1-pentene	763291	84	8.88E-02	0.3	2.25E-04	1.63E-10	D
1-Methylcyclohexene	591491	96	2.27E-02	0.1	6.57E-05	4.76E-11	D
1-Methylcyclopentene	693890	82	2.52E-02	0.1	6.23E-05	4.51E-11	D
1-Pentene	109671	70	2.20E-01	0.6	4.64E-04	3.36E-10	D
1-Propanethiol (n-Propyl mercaptan)	107039	76	1.25E-01	0.4	2.86E-04	2.07E-10	D
2,2,3-Trimethylbutane	464062	100	9.19E-03	0.0	2.77E-05	2.01E-11	D
2,2,4-Trimethylpentane	540841	114	6.14E-01	2.9	2.11E-03	1.53E-09	A
2,2,5-Trimethylhexane	3522949	128	1.56E-01	0.8	6.02E-04	4.36E-10	D
2,2-Dimethylbutane	75832	86	1.56E-01	0.5	4.04E-04	2.93E-10	D
2,2-Dimethylpentane	590352	100	6.08E-02	0.2	1.83E-04	1.33E-10	D
2,2-Dimethylpropane	463821	72	2.74E-02	0.1	5.95E-05	4.31E-11	D

Constituent	CAS No.	MW	Concentration in LFG		Total Emission Rate	Total Emission Flux	Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m^3)	(g/s)	($g/s/m^2$)	
2,3,4-Trimethylpentane	565753	114	3.12E-01	1.5	1.07E-03	7.76E-10	D
2,3-Dimethylbutane	79298	86	1.67E-01	0.6	4.33E-04	3.14E-10	E
2,3-Dimethylpentane	565593	100	3.10E-01	1.3	9.34E-04	6.77E-10	D
2,4-Dimethylhexane	589435	114	2.22E-01	1.0	7.63E-04	5.52E-10	D
2,4-Dimethylpentane	108087	100	1.00E-01	0.4	3.01E-04	2.18E-10	D
2,5-Dimethylhexane	592132	114	1.66E-01	0.8	5.70E-04	4.13E-10	D
2,5-Dimethylthiophene	638028	112	6.44E-02	0.3	2.17E-04	1.57E-10	D
2-Butanone (Methyl ethyl ketone)	78933	72	4.01E+00	11.8	8.70E-03	6.30E-09	D
2-Ethyl-1-butene	760214	84	1.77E-02	0.1	4.48E-05	3.25E-11	E
2-Ethylthiophene	872559	112	6.29E-02	0.3	2.12E-04	1.54E-10	C
2-Ethyltoluene	611143	120	3.23E-01	1.6	1.17E-03	8.46E-10	D
2-Hexanone (Methyl butyl ketone)	591786	100	6.13E-01	2.5	1.85E-03	1.34E-09	E
2-Methyl-1-butene	563462	70	1.79E-01	0.5	3.78E-04	2.73E-10	D
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90	1.70E-01	0.6	4.61E-04	3.34E-10	E
2-Methyl-2-butene	513359	70	3.03E-01	0.9	6.39E-04	4.63E-10	D
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90	3.25E-01	1.2	8.82E-04	6.39E-10	E
2-Methylbutane	78784	72	2.26E+00	6.7	4.90E-03	3.55E-09	D
2-Methylheptane	592278	114	7.16E-01	3.3	2.46E-03	1.78E-09	D
2-Methylhexane	591764	100	8.16E-01	3.3	2.46E-03	1.78E-09	D
2-Methylpentane	107835	86	6.88E-01	2.4	1.78E-03	1.29E-09	D
2-Propanol (Isopropyl alcohol)	67630	60	1.80E+00	4.4	3.25E-03	2.36E-09	D
3,6-Dimethyloctane	15869940	142	7.85E-01	4.6	3.36E-03	2.43E-09	D
3-Ethyltoluene	620144	120	7.80E-01	3.8	2.82E-03	2.04E-09	D
3-Methyl-1-pentene	760203	84	6.99E-03	0.0	1.77E-05	1.28E-11	D
3-Methylheptane	589811	114	7.63E-01	3.6	2.62E-03	1.90E-09	D
3-Methylhexane	589344	100	1.13E+00	4.6	3.41E-03	2.47E-09	D
3-Methylpentane	96140	86	7.40E-01	2.6	1.92E-03	1.39E-09	D
3-Methylthiophene	616444	98	9.25E-02	0.4	2.73E-04	1.98E-10	E
4-Methyl-1-pentene	691372	84	2.33E-02	0.1	5.90E-05	4.27E-11	E
4-Methyl-2-pentanone (MIBK)	108101	100	8.83E-01	3.6	2.66E-03	1.93E-09	C
4-Methylheptane	589537	114	2.49E-01	1.2	8.55E-04	6.20E-10	D
Acetaldehyde	75070	44	7.74E-02	0.1	1.03E-04	7.43E-11	D
Acetone	67641	58	6.70E+00	15.9	1.17E-02	8.48E-09	C
Acetonitrile	75058	41	5.56E-01	0.9	6.86E-04	4.97E-10	A
Benzene	71432	78	2.40E+00	7.7	5.64E-03	4.08E-09	A
Benzyl chloride	100447	127	1.81E-02	0.1	6.89E-05	4.99E-11	A
Bromodichloromethane	75274	164	8.78E-03	0.1	4.33E-05	3.13E-11	E
Bromomethane (Methyl bromide)	74839	95	2.10E-02	0.1	6.00E-05	4.34E-11	C
Butane	106978	58	6.22E+00	14.8	1.09E-02	7.88E-09	C
Carbon disulfide	75150	76	1.47E-01	0.5	3.37E-04	2.44E-10	A
Carbon monoxide	630080	28	2.44E+01	27.9	2.06E-02	1.49E-08	C
Carbon tetrachloride	56235	154	7.98E-03	0.1	3.69E-05	2.67E-11	A
Carbon tetrafluoride (Freon 14)	75730	88	1.51E-01	0.5	4.00E-04	2.89E-10	E
Carbonyl sulfide (Carbon oxysulfide)	463581	60	1.22E-01	0.3	2.20E-04	1.60E-10	A
Chlorobenzene	108907	113	4.84E-01	2.2	1.64E-03	1.19E-09	A
Chlorodifluoromethane (Freon 22)	75456	86	7.96E-01	2.8	2.07E-03	1.50E-09	D
Chloroethane (Ethyl chloride)	75003	65	3.95E+00	10.4	7.66E-03	5.55E-09	B
Chloromethane (Methyl chloride)	74873	50	2.44E-01	0.5	3.71E-04	2.68E-10	B
cis-1,2-Dichloroethene	156592	97	1.24E+00	4.9	3.62E-03	2.62E-09	B
cis-1,2-Dimethylcyclohexane	2207014	112	8.10E-02	0.4	2.73E-04	1.98E-10	D
cis-1,3-Dichloropropene	10061015	111	3.03E-03	0.0	1.01E-05	7.33E-12	D
cis-1,3-Dimethylcyclohexane	638040	112	5.01E-01	2.3	1.69E-03	1.22E-09	D
cis-1,4-Dimethylcyclohexane	624293	112	2.48E-01	1.1	8.37E-04	6.06E-10	D
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	112	2.48E-01	1.1	8.37E-04	6.06E-10	D
cis-2-Butene	590181	56	1.05E-01	0.2	1.77E-04	1.28E-10	D
cis-2-Heptene	6443921	98	2.45E-02	0.1	7.24E-05	5.24E-11	E
cis-2-Hexene	7688213	84	1.72E-02	0.1	4.35E-05	3.15E-11	D
cis-2-Octene	7642048	112	2.20E-01	1.0	7.42E-04	5.38E-10	D
cis-2-Pentene	627203	70	4.79E-02	0.1	1.01E-04	7.32E-11	D
cis-3-Methyl-2-pentene	922623	84	1.79E-02	0.1	4.53E-05	3.28E-11	D
Cyclohexane	110827	84	1.01E+00	3.5	2.56E-03	1.85E-09	B
Cyclohexene	110838	82	1.84E-02	0.1	4.55E-05	3.29E-11	D
Cyclopentane	287923	70	2.21E-02	0.1	4.66E-05	3.38E-11	D
Cyclopentene	142290	68	1.21E-02	0.0	2.48E-05	1.80E-11	D

Constituent	CAS No.	MW	Concentration in LFG		Total Emission Rate	Total Emission Flux	Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m^3)	(g/s)	($g/s/m^2$)	
Decane	124185	142	3.80E+00	22.1	1.63E-02	1.18E-08	D
Dibromochloromethane	124481	208	1.51E-02	0.1	9.46E-05	6.85E-11	D
Dibromomethane (Methylene dibromide)	74953	174	8.35E-04	0.0	4.37E-06	3.16E-12	E
Dichlorobenzene	106467	147	9.40E-01	5.6	4.16E-03	3.01E-09	A
Dichlorodifluoromethane (Freon 12)	75718	121	1.18E+00	5.8	4.29E-03	3.11E-09	B
Dichloromethane (Methylene chloride)	75092	85	6.15E+00	21.3	1.57E-02	1.14E-08	A
Diethyl sulfide	352932	90	8.62E-02	0.3	2.34E-04	1.69E-10	E
Dimethyl disulfide	624920	94	1.37E-01	0.5	3.88E-04	2.81E-10	A
Dimethyl sulfide	75183	62	5.66E+00	14.4	1.06E-02	7.66E-09	A
Dodecane (n-Dodecane)	112403	170	2.21E-01	1.5	1.13E-03	8.20E-10	D
Ethane	74840	30	9.05E+00	11.1	8.18E-03	5.93E-09	D
Ethanol	64175	46	2.30E-01	0.4	3.19E-04	2.31E-10	D
Ethyl acetate	141786	88	1.88E+00	6.8	4.98E-03	3.61E-09	C
Ethyl mercaptan (Ethanediol)	75081	62	1.98E-01	0.5	3.70E-04	2.68E-10	A
Ethyl methyl sulfide	624895	76	3.67E-02	0.1	8.41E-05	6.09E-11	E
Ethylbenzene	100414	106	4.86E+00	21.1	1.55E-02	1.12E-08	B
Formaldehyde	50000	30	1.17E-02	0.0	1.06E-05	7.65E-12	D
Heptane	142825	100	1.34E+00	5.5	4.04E-03	2.93E-09	B
Hexane	110543	86	3.10E+00	10.9	8.04E-03	5.82E-09	B
Hydrogen sulfide	7783064	34	3.20E+01	44.6	3.28E-02	2.38E-08	A
Indane (2,3-Dihydroindene)	496117	34	6.66E-02	0.1	6.83E-05	4.94E-11	D
Isobutane (2-Methylpropane)	75285	58	8.16E+00	19.4	1.43E-02	1.03E-08	D
Isobutylbenzene	538932	134	4.07E-02	0.2	1.64E-04	1.19E-10	D
Isoprene (2-Methyl-1,3-butadiene)	78795	68	1.65E-02	0.0	3.38E-05	2.45E-11	D
Isopropyl mercaptan	75332	76	1.75E-01	0.5	4.01E-04	2.90E-10	A
Isopropylbenzene (Cumene)	98828	120	4.30E-01	2.1	1.55E-03	1.13E-09	D
Mercury (total)	7439976	201	1.22E-04	0.0	7.36E-07	5.33E-13	B
Methanethiol (Methyl mercaptan)	74931	48	1.37E+00	2.7	1.98E-03	1.44E-09	A
Methyl tert-butyl ether (MTBE)	1634044	88	1.18E-01	0.4	3.13E-04	2.27E-10	D
Methylcyclohexane	108872	98	1.29E+00	5.2	3.81E-03	2.76E-09	D
Methylcyclopentane	96377	84	6.50E-01	2.2	1.65E-03	1.19E-09	D
Naphthalene	91203	128	1.07E-01	0.6	4.12E-04	2.99E-10	D
n-Butylbenzene	104518	134	6.80E-02	0.4	2.75E-04	1.99E-10	D
Nonane	111842	128	2.37E+00	12.4	9.14E-03	6.62E-09	D
n-Propylbenzene (Propylbenzene)	103651	120	4.13E-01	2.0	1.49E-03	1.08E-09	D
Octane	111659	114	1.08E+00	5.0	3.71E-03	2.69E-09	D
p-Cymene (1-Methyl-4-lsopropylbenzene)	99876	134	3.58E+00	19.6	1.45E-02	1.05E-08	D
Pentane	109660	72	4.46E+00	13.2	9.68E-03	7.01E-09	C
Propane	74986	44	1.55E+01	27.9	2.06E-02	1.49E-08	C
Propene	115071	42	3.32E+00	5.7	4.20E-03	3.04E-09	D
Propyne	74997	40	3.80E-02	0.1	4.58E-05	3.32E-11	E
sec-Butylbenzene	135988	134	6.75E-02	0.4	2.72E-04	1.97E-10	D
Styrene (Vinylbenzene)	100425	104	4.11E-01	1.7	1.29E-03	9.33E-10	B
Tetrachloroethylene (Perchloroethylene)	127184	166	2.03E+00	13.8	1.01E-02	7.33E-09	A
Tetrahydrofuran (Diethylene oxide)	109999	72	9.69E-01	2.9	2.10E-03	1.52E-09	C
Thiophene	110021	84	3.49E-01	1.2	8.83E-04	6.40E-10	E
Toluene (Methyl benzene)	108883	92	2.95E+01	111.1	8.18E-02	5.92E-08	A
trans-1,2-Dichloroethene	156605	97	2.87E-02	0.1	8.37E-05	6.06E-11	C
trans-1,2-Dimethylcyclohexane	6876239	112	4.04E-01	1.9	1.36E-03	9.88E-10	D
trans-1,3-Dichloropropene	10061026	111	9.43E-03	0.0	3.15E-05	2.28E-11	D
trans-1,4-Dimethylcyclohexane	2207047	112	2.05E-01	0.9	6.92E-04	5.01E-10	D
trans-2-Butene	624646	56	1.04E-01	0.2	1.76E-04	1.27E-10	D
trans-2-Heptene	14686136	98	2.50E-03	0.0	7.38E-06	5.35E-12	E
trans-2-Hexene	4050457	84	2.06E-02	0.1	5.21E-05	3.78E-11	D
trans-2-Octene	13389429	112	2.41E-01	1.1	8.13E-04	5.89E-10	D
trans-2-Pentene	646048	70	3.47E-02	0.1	7.32E-05	5.30E-11	D
trans-3-Methyl-2-pentene	616126	84	1.55E-02	0.1	3.92E-05	2.84E-11	D
Tribromomethane (Bromoform)	75252	253	1.24E-02	0.1	9.43E-05	6.83E-11	D
Trichloroethylene (Trichloroethene)	79016	131	8.28E-01	4.4	3.27E-03	2.37E-09	A
Trichlorofluoromethane (Freon 11)	91315616	137	2.48E-01	1.4	1.02E-03	7.42E-10	B
Trichloromethane (Chloroform)	67663	119	7.08E-02	0.3	2.54E-04	1.84E-10	A
Undecane	1120214	156	1.67E+00	10.7	7.85E-03	5.69E-09	D
Vinyl acetate	85306269	86	2.48E-01	0.9	6.42E-04	4.65E-10	C
Vinyl chloride (Chloroethene)	75014	63	1.42E+00	3.6	2.67E-03	1.93E-09	A
Xylenes (o-, m-, p-, mixtures)	1330207	106	9.23E+00	40.1	2.95E-02	2.13E-08	A
Total Reduced Sulphur Compounds	n/a	-	-	67.7	4.98E-02	3.61E-08	-

Table E3.   Flares 1 and 2 - LFG Emissions - Stages 1 to 5 - Alternative 2 Scenario B

Combustible constituents of LFG will be combusted in the enclosed Flares 1 and 2 with a control efficiency of 98%. Residual LFG will be emitted.

Mercury and siloxanes are not combustible, so a control efficiency of 0% is assumed for these compounds.

Enclosed Flares	Quantity of LFG Combusted*	Control Efficiency
	m^3/s	%
Flare 1	0.19	98%
Flare 2	0.34	98%

* See Table E1 for calculation of quantity combusted.

The concentrations of constituents in LFG are based on AP-42, Table 2.4-1, AP-42, 2.4 Municipal Solid Waste Landfills, Draft Section - October 2008

Sample Calculation (1,1,1-Trichloroethane)

Concentration in LFG = Molecular Weight (g/mole) x Concentration (ppmv) / 24.45
= 133.4 (g/mole) x 0.243 (ppmv) / 24.45
= 1.33E+00 mg/m³

Emission Rate (Flare 1) = Quantity LFG Combusted (m³/s) x Concentration in LFG (mg/m³) x (1 - Control Efficiency) / 1000 (mg/g)
= 0.2 (m³/s) x 1.33 (mg/m³) x (1-0.98) /1000 (mg/g)
= 5.05E-06 g/s

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(%)	Flare 1	Flare 2	
1,1,1-Trichloroethane	71556	133.4	0.243	1.33	98%	5.1E-06	9.1E-06	A
1,1,2,2-Tetrachloroethane	79345	167.85	0.535	3.67	98%	1.4E-05	2.5E-05	E
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	260.76	0.00349	0.04	98%	1.4E-07	2.6E-07	D
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187.37	0.0672	0.51	98%	2.0E-06	3.5E-06	C
1,1,2-Trichloroethane	79005	133.4	0.158	0.86	98%	3.3E-06	5.9E-06	D
1,1-Dichloroethane	75343	98.96	2.08	8.42	98%	3.2E-05	5.8E-05	A
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	96.94	0.16	0.63	98%	2.4E-06	4.4E-06	A
1,2,3-Trimethylbenzene	526738	120.19	0.359	1.76	98%	6.7E-06	1.2E-05	D
1,2,4-Trichlorobenzene	120821	181.45	0.00551	0.04	98%	1.6E-07	2.8E-07	C
1,2,4-Trimethylbenzene	95636	120.19	1.37	6.73	98%	2.6E-05	4.6E-05	B
1,2-Dibromoethane (Ethylene dibromide)	106934	187.86	0.0048	0.04	98%	1.4E-07	2.5E-07	B
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	170.92	0.106	0.74	98%	2.8E-06	5.1E-06	B
1,2-Dichloroethane (Ethylene dichloride)	107062	98.96	0.159	0.64	98%	2.5E-06	4.4E-06	A
1,2-Dichloroethene	540590	96.94	11.4	45.20	98%	1.7E-04	3.1E-04	E
1,2-Dichloropropane	78875	112.99	0.052	0.24	98%	9.2E-07	1.6E-06	D
1,2-Diethylbenzene	135013	134.22	0.0199	0.11	98%	4.2E-07	7.5E-07	D
1,3,5-Trimethylbenzene	108678	120.19	0.623	3.06	98%	1.2E-05	2.1E-05	C
1,3-Butadiene (Vinyl ethylene)	106990	54.09	0.166	0.37	98%	1.4E-06	2.5E-06	C
1,3-Diethylbenzene	141935	134.22	0.0655	0.36	98%	1.4E-06	2.5E-06	D
1,4-Diethylbenzene	105055	134.22	0.262	1.44	98%	5.5E-06	9.9E-06	D
1,4-Dioxane (1,4-Diethylene dioxide)	123911	88.11	0.00829	0.03	98%	1.1E-07	2.0E-07	D
1-Butene	106989	56.11	1.22	2.80	98%	1.1E-05	1.9E-05	D
2-Methylbutene	513359	70.13	1.22	3.50	98%	1.3E-05	2.4E-05	D
1-Butene	106989	56.11	1.1	2.52	98%	9.6E-06	1.7E-05	E
2-Methylpropene	115117	56.11	1.1	2.52	98%	9.6E-06	1.7E-05	E
1-Ethyl-4-methylbenzene (4-Ethyl toluene)	622968	120.19	0.989	4.86	98%	1.9E-05	3.3E-05	C
1-Heptene	592767	98.19	0.625	2.51	98%	9.6E-06	1.7E-05	E
1-Hexene	592416	84.16	0.0888	0.31	98%	1.2E-06	2.1E-06	D
2-Methyl-1-pentene	763291	84.16	0.0888	0.31	98%	1.2E-06	2.1E-06	D
1-Methylcyclohexene	591491	96.17	0.0227	0.09	98%	3.4E-07	6.1E-07	D
1-Methylcyclopentene	693890	82.14	0.0252	0.08	98%	3.2E-07	5.8E-07	D
1-Pentene	109671	70.13	0.22	0.63	98%	2.4E-06	4.3E-06	D
1-Propanethiol (n-Propyl mercaptan)	107039	76.16	0.125	0.39	98%	1.5E-06	2.7E-06	D
2,2,3-Trimethylbutane	464062	100.2	0.00919	0.04	98%	1.4E-07	2.6E-07	D
2,2,4-Trimethylpentane	540841	114.23	0.614	2.87	98%	1.1E-05	2.0E-05	A
2,2,5-Trimethylhexane	3522949	128.26	0.156	0.82	98%	3.1E-06	5.6E-06	D
2,2-Dimethylbutane	75832	86.18	0.156	0.55	98%	2.1E-06	3.8E-06	D
2,2-Dimethylpentane	590352	100.2	0.0608	0.25	98%	9.5E-07	1.7E-06	D
2,2-Dimethylpropane	463821	72.15	0.0274	0.08	98%	3.1E-07	5.5E-07	D
2,3,4-Trimethylpentane	565753	114.23	0.312	1.46	98%	5.6E-06	1.0E-05	D
2,3-Dimethylbutane	79298	86.18	0.167	0.59	98%	2.2E-06	4.0E-06	E
2,3-Dimethylpentane	565593	100.2	0.31	1.27	98%	4.8E-06	8.7E-06	D

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(%)	Flare 1	Flare 2	
2,4-Dimethylhexane	589435	114.23	0.222	1.04	98%	4.0E-06	7.1E-06	D
2,4-Dimethylpentane	108087	100.2	0.1	0.41	98%	1.6E-06	2.8E-06	D
2,5-Dimethylhexane	592132	114.23	0.166	0.78	98%	3.0E-06	5.3E-06	D
2,5-Dimethylthiophene	638028	112.19	0.0644	0.30	98%	1.1E-06	2.0E-06	D
2-Butanone (Methyl ethyl ketone)	78933	72.11	4.01	11.83	98%	4.5E-05	8.1E-05	D
2-Ethyl-1-butene	760214	84.16	0.0177	0.06	98%	2.3E-07	4.2E-07	E
2-Ethylthiophene	872559	112.19	0.0629	0.29	98%	1.1E-06	2.0E-06	C
2-Ethyltoluene	611143	120.19	0.323	1.59	98%	6.1E-06	1.1E-05	D
2-Hexanone (Methyl butyl ketone)	591786	100.16	0.613	2.51	98%	9.6E-06	1.7E-05	E
2-Methyl-1-butene	563462	70.13	0.179	0.51	98%	2.0E-06	3.5E-06	D
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90.19	0.17	0.63	98%	2.4E-06	4.3E-06	E
2-Methyl-2-butene	513359	70.13	0.303	0.87	98%	3.3E-06	6.0E-06	D
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90.19	0.325	1.20	98%	4.6E-06	8.2E-06	E
2-Methylbutane	78784	72.15	2.26	6.67	98%	2.5E-05	4.6E-05	D
2-Methylheptane	592278	114.23	0.716	3.35	98%	1.3E-05	2.3E-05	D
2-Methylhexane	591764	100.2	0.816	3.34	98%	1.3E-05	2.3E-05	D
2-Methylpentane	107835	86.18	0.688	2.43	98%	9.2E-06	1.7E-05	D
2-Propanol (Isopropyl alcohol)	67630	60.1	1.8	4.42	98%	1.7E-05	3.0E-05	D
3,6-Dimethyloctane	15869940	142.28	0.785	4.57	98%	1.7E-05	3.1E-05	D
3-Ethyltoluene	620144	120.19	0.78	3.83	98%	1.5E-05	2.6E-05	D
3-Methyl-1-pentene	760203	84.16	0.00699	0.02	98%	9.2E-08	1.7E-07	D
3-Methylheptane	589811	114.23	0.763	3.56	98%	1.4E-05	2.4E-05	D
3-Methylhexane	589344	100.2	1.13	4.63	98%	1.8E-05	3.2E-05	D
3-Methylpentane	96140	86.18	0.74	2.61	98%	9.9E-06	1.8E-05	D
3-Methylthiophene	616444	98.17	0.0925	0.37	98%	1.4E-06	2.5E-06	E
4-Methyl-1-pentene	691372	84.16	0.0233	0.08	98%	3.1E-07	5.5E-07	E
4-Methyl-2-pentanone (MIBK)	108101	100.16	0.883	3.62	98%	1.4E-05	2.5E-05	C
4-Methylheptane	589537	114.23	0.249	1.16	98%	4.4E-06	8.0E-06	D
Acetaldehyde	75070	44.05	0.0774	0.14	98%	5.3E-07	9.6E-07	D
Acetone	67641	58.08	6.7	15.92	98%	6.1E-05	1.1E-04	C
Acetonitrile	75058	41.05	0.556	0.93	98%	3.6E-06	6.4E-06	A
Benzene	71432	78.11	2.4	7.67	98%	2.9E-05	5.3E-05	A
Benzyl chloride	100447	126.58	0.0181	0.09	98%	3.6E-07	6.4E-07	A
Bromodichloromethane	75274	163.83	0.00878	0.06	98%	2.2E-07	4.0E-07	E
Bromomethane (Methyl bromide)	74839	94.94	0.021	0.08	98%	3.1E-07	5.6E-07	C
Butane	106978	58.12	6.22	14.79	98%	5.6E-05	1.0E-04	C
Carbon disulfide	75150	76.14	0.147	0.46	98%	1.7E-06	3.1E-06	A
Carbon monoxide	630080	28.01	24.4	27.95	98%	1.1E-04	1.9E-04	C
Carbon tetrachloride	56235	153.82	0.00798	0.05	98%	1.9E-07	3.4E-07	A
Carbon tetrafluoride (Freon 14)	75730	88	0.151	0.54	98%	2.1E-06	3.7E-06	E
Carbonyl sulfide (Carbon oxysulfide)	463581	60.08	0.122	0.30	98%	1.1E-06	2.1E-06	A
Chlorobenzene	108907	112.56	0.484	2.23	98%	8.5E-06	1.5E-05	A
Chlorodifluoromethane (Freon 22)	75456	86.47	0.796	2.82	98%	1.1E-05	1.9E-05	D
Chloroethane (Ethyl chloride)	75003	64.51	3.95	10.42	98%	4.0E-05	7.1E-05	B
Chloromethane (Methyl chloride)	74873	50.49	0.244	0.50	98%	1.9E-06	3.5E-06	B
cis-1,2-Dichloroethene	156592	96.94	1.24	4.92	98%	1.9E-05	3.4E-05	B
cis-1,2-Dimethylcyclohexane	2207014	112.21	0.081	0.37	98%	1.4E-06	2.5E-06	D
cis-1,3-Dichloropropene	10061015	110.97	0.00303	0.01	98%	5.2E-08	9.4E-08	D
cis-1,3-Dimethylcyclohexane	638040	112.21	0.501	2.30	98%	8.8E-06	1.6E-05	D
cis-1,4-Dimethylcyclohexane	624293	112.21	0.248	1.14	98%	4.3E-06	7.8E-06	D
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	112.21	0.248	1.14	98%	4.3E-06	7.8E-06	D
cis-2-Butene	590181	56.11	0.105	0.24	98%	9.2E-07	1.7E-06	D
cis-2-Heptene	6443921	98.19	0.0245	0.10	98%	3.7E-07	6.7E-07	E
cis-2-Hexene	7688213	84.16	0.0172	0.06	98%	2.3E-07	4.1E-07	D
cis-2-Octene	7642048	112.21	0.22	1.01	98%	3.8E-06	6.9E-06	D
cis-2-Pentene	627203	70.13	0.0479	0.14	98%	5.2E-07	9.4E-07	D
cis-3-Methyl-2-pentene	922623	84.16	0.0179	0.06	98%	2.3E-07	4.2E-07	D
Cyclohexane	110827	84.16	1.01	3.48	98%	1.3E-05	2.4E-05	B
Cyclohexene	110838	82.14	0.0184	0.06	98%	2.4E-07	4.2E-07	D
Cyclopentane	287923	70.13	0.0221	0.06	98%	2.4E-07	4.3E-07	D
Cyclopentene	142290	68.12	0.0121	0.03	98%	1.3E-07	2.3E-07	D
Decane	124185	142.28	3.8	22.11	98%	8.4E-05	1.5E-04	D
Dibromochloromethane	124481	208.28	0.0151	0.13	98%	4.9E-07	8.8E-07	D
Dibromomethane (Methylene dibromide)	74953	173.84	0.000835	0.01	98%	2.3E-08	4.1E-08	E
Dichlorobenzene	106467	147	0.94	5.65	98%	2.2E-05	3.9E-05	A
Dichlorodifluoromethane (Freon 12)	75718	120.91	1.18	5.84	98%	2.2E-05	4.0E-05	B
Dichloromethane (Methylene chloride)	75092	84.93	6.15	21.36	98%	8.1E-05	1.5E-04	A
Diethyl sulfide	352932	90.19	0.0862	0.32	98%	1.2E-06	2.2E-06	E

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(%)	Flare 1	Flare 2	
Dimethyl disulfide	624920	94.2	0.137	0.53	98%	2.0E-06	3.6E-06	A
Dimethyl sulfide	75183	62.14	5.66	14.38	98%	5.5E-05	9.9E-05	A
Dodecane (n-Dodecane)	112403	170.33	0.221	1.54	98%	5.9E-06	1.1E-05	D
Ethane	74840	30.07	9.05	11.13	98%	4.2E-05	7.6E-05	D
Ethanol	64175	46.07	0.23	0.43	98%	1.7E-06	3.0E-06	D
Ethyl acetate	141786	88.11	1.88	6.77	98%	2.6E-05	4.6E-05	C
Ethyl mercaptan (Ethanediol)	75081	62.14	0.198	0.50	98%	1.9E-06	3.5E-06	A
Ethyl methyl sulfide	624895	76.16	0.0367	0.11	98%	4.4E-07	7.8E-07	E
Ethylbenzene	100414	106.17	4.86	21.10	98%	8.0E-05	1.4E-04	B
Formaldehyde	50000	30.03	0.0117	0.01	98%	5.5E-08	9.9E-08	D
Heptane	142825	100.2	1.34	5.49	98%	2.1E-05	3.8E-05	B
Hexane	110543	86.18	3.1	10.93	98%	4.2E-05	7.5E-05	B
Hydrogen sulfide	7783064	34.08	32	44.60	98%	1.7E-04	3.1E-04	A
Indane (2,3-Dihydroindene)	496117	34.08	0.0666	0.09	98%	3.5E-07	6.4E-07	D
Isobutane (2-Methylpropane)	75285	58.12	8.16	19.40	98%	7.4E-05	1.3E-04	D
Isobutylbenzene	538932	134.22	0.0407	0.22	98%	8.5E-07	1.5E-06	D
Isoprene (2-Methyl-1,3-butadiene)	78795	68.12	0.0165	0.05	98%	1.8E-07	3.2E-07	D
Isopropyl mercaptan	75332	76.16	0.175	0.55	98%	2.1E-06	3.7E-06	A
Isopropylbenzene (Cumene)	98828	120.19	0.43	2.11	98%	8.1E-06	1.4E-05	D
Mercury (total)	7439976	200.59	1.22E-04	1.00E-03	0%	1.9E-07	3.4E-07	B
Methanethiol (Methyl mercaptan)	74931	48.11	1.37	2.70	98%	1.0E-05	1.8E-05	A
Methyl tert-butyl ether (MTBE)	1634044	88.15	0.118	0.43	98%	1.6E-06	2.9E-06	D
Methylcyclohexane	108872	98.19	1.29	5.18	98%	2.0E-05	3.6E-05	D
Methylcyclopentane	96377	84.16	0.65	2.24	98%	8.5E-06	1.5E-05	D
Naphthalene	91203	128.17	0.107	0.56	98%	2.1E-06	3.8E-06	D
n-Butylbenzene	104518	134.22	0.068	0.37	98%	1.4E-06	2.6E-06	D
Nonane	111842	128.26	2.37	12.43	98%	4.7E-05	8.5E-05	D
n-Propylbenzene (Propylbenzene)	103651	120.19	0.413	2.03	98%	7.7E-06	1.4E-05	D
Octane	111659	114.23	1.08	5.05	98%	1.9E-05	3.5E-05	D
p-Cymene (1-Methyl-4-lsopropylbenzene)	99876	134.22	3.58	19.65	98%	7.5E-05	1.3E-04	D
Pentane	109660	72.15	4.46	13.16	98%	5.0E-05	9.0E-05	C
Propane	74986	44.1	15.5	27.96	98%	1.1E-04	1.9E-04	C
Propene	115071	42.08	3.32	5.71	98%	2.2E-05	3.9E-05	D
Propyne	74997	40.06	0.038	0.06	98%	2.4E-07	4.3E-07	E
sec-Butylbenzene	135988	134.22	0.0675	0.37	98%	1.4E-06	2.5E-06	D
Styrene (Vinylbenzene)	100425	104.15	0.411	1.75	98%	6.7E-06	1.2E-05	B
Tetrachloroethylene (Perchloroethylene)	127184	165.83	2.03	13.77	98%	5.2E-05	9.4E-05	A
Tetrahydrofuran (Diethylene oxide)	109999	72.11	0.969	2.86	98%	1.1E-05	2.0E-05	C
Thiophene	110021	84.14	0.349	1.20	98%	4.6E-06	8.2E-06	E
Toluene (Methyl benzene)	108883	92.14	29.5	111.17	98%	4.2E-04	7.6E-04	A
trans-1,2-Dichloroethene	156605	96.94	0.0287	0.11	98%	4.3E-07	7.8E-07	C
trans-1,2-Dimethylcyclohexane	6876239	112.21	0.404	1.85	98%	7.1E-06	1.3E-05	D
trans-1,3-Dichloropropene	10061026	110.97	0.00943	0.04	98%	1.6E-07	2.9E-07	D
trans-1,4-Dimethylcyclohexane	2207047	112.21	0.205	0.94	98%	3.6E-06	6.5E-06	D
trans-2-Butene	624646	56.11	0.104	0.24	98%	9.1E-07	1.6E-06	D
trans-2-Heptene	14686136	98.19	0.0025	0.01	98%	3.8E-08	6.9E-08	E
trans-2-Hexene	4050457	84.16	0.0206	0.07	98%	2.7E-07	4.9E-07	D
trans-2-Octene	13389429	112.21	0.241	1.11	98%	4.2E-06	7.6E-06	D
trans-2-Pentene	646048	70.13	0.0347	0.10	98%	3.8E-07	6.8E-07	D
trans-3-Methyl-2-pentene	616126	84.16	0.0155	0.05	98%	2.0E-07	3.7E-07	D
Tribromomethane (Bromoform)	75252	252.73	0.0124	0.13	98%	4.9E-07	8.8E-07	D
Trichloroethylene (Trichloroethene)	79016	131.39	0.828	4.45	98%	1.7E-05	3.1E-05	A
Trichlorofluoromethane (Freon 11)	91315616	137.37	0.248	1.39	98%	5.3E-06	9.6E-06	B
Trichloromethane (Chloroform)	67663	119.38	0.0708	0.35	98%	1.3E-06	2.4E-06	A
Undecane	1120214	156.31	1.67	10.68	98%	4.1E-05	7.3E-05	D
Vinyl acetate	85306269	86.09	0.248	0.87	98%	3.3E-06	6.0E-06	C
Vinyl chloride (Chloroethene)	75014	62.5	1.42	3.63	98%	1.4E-05	2.5E-05	A
Xylenes (o-, m-, p-, mixtures)	1330207	106.17	9.23	40.08	98%	1.5E-04	2.7E-04	A
Total Reduced Sulphur Compounds	n/a	-	-	67.7	98%	2.6E-04	4.6E-04	-

Table E3. Flares 1 and 2 - LFG Emissions - Stages 6 to 8 - Alternative 2 Scenario B

Combustible constituents of LFG will be combusted in the enclosed Flares 1 and 2 with a control efficiency of 98%. Residual LFG will be emitted.

Mercury and siloxanes are not combustible, so a control efficiency of 0% is assumed for these compounds.

Enclosed Flares	Quantity of LFG Combusted*	Control Efficiency
	m^3/s	%
Flare 1	0.61	98%
Flare 2	1.09	98%

* See Table E1 for calculation of quantity combusted.

The concentrations of constituents in LFG are based on AP-42, Table 2.4-1, AP-42, 2.4 Municipal Solid Waste Landfills, Draft Section - October 2008

Sample Calculation (1,1,1-Trichloroethane)

Concentration in LFG = Molecular Weight (g/mole) x Concentration (ppmv) / 24.45
= 133.4 (g/mole) x 0.243 (ppmv) / 24.45
= 1.33E+00 mg/m³

Emission Rate (Flare 1) = Quantity LFG Combusted (m³/s) x Concentration in LFG (mg/m³) x (1 - Control Efficiency) / 1000 (mg/g)
= 0.61 (m³/s) x 1.33 (mg/m³) x (1-0.98) /1000 (mg/g)
= 1.61E-05 g/s

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(%)	Flare 1	Flare 2	
1,1,1-Trichloroethane	71556	133.4	0.243	1.33	98%	1.6E-05	2.9E-05	A
1,1,2,2-Tetrachloroethane	79345	167.85	0.535	3.67	98%	4.4E-05	8.0E-05	E
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	260.76	0.00349	0.04	98%	4.5E-07	8.1E-07	D
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187.37	0.0672	0.51	98%	6.2E-06	1.1E-05	C
1,1,2-Trichloroethane	79005	133.4	0.158	0.86	98%	1.0E-05	1.9E-05	D
1,1-Dichloroethane	75343	98.96	2.08	8.42	98%	1.0E-04	1.8E-04	A
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	96.94	0.16	0.63	98%	7.7E-06	1.4E-05	A
1,2,3-Trimethylbenzene	526738	120.19	0.359	1.76	98%	2.1E-05	3.8E-05	D
1,2,4-Trichlorobenzene	120821	181.45	0.00551	0.04	98%	5.0E-07	8.9E-07	C
1,2,4-Trimethylbenzene	95636	120.19	1.37	6.73	98%	8.2E-05	1.5E-04	B
1,2-Dibromoethane (Ethylene dibromide)	106934	187.86	0.0048	0.04	98%	4.5E-07	8.0E-07	B
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	170.92	0.106	0.74	98%	9.0E-06	1.6E-05	B
1,2-Dichloroethane (Ethylene dichloride)	107062	98.96	0.159	0.64	98%	7.8E-06	1.4E-05	A
1,2-Dichloroethene	540590	96.94	11.4	45.20	98%	5.5E-04	9.9E-04	E
1,2-Dichloropropane	78875	112.99	0.052	0.24	98%	2.9E-06	5.2E-06	D
1,2-Diethylbenzene	135013	134.22	0.0199	0.11	98%	1.3E-06	2.4E-06	D
1,3,5-Trimethylbenzene	108678	120.19	0.623	3.06	98%	3.7E-05	6.7E-05	C
1,3-Butadiene (Vinyl ethylene)	106990	54.09	0.166	0.37	98%	4.4E-06	8.0E-06	C
1,3-Diethylbenzene	141935	134.22	0.0655	0.36	98%	4.4E-06	7.8E-06	D
1,4-Diethylbenzene	105055	134.22	0.262	1.44	98%	1.7E-05	3.1E-05	D
1,4-Dioxane (1,4-Diethylene dioxide)	123911	88.11	0.00829	0.03	98%	3.6E-07	6.5E-07	D
1-Butene	106989	56.11	1.22	2.80	98%	3.4E-05	6.1E-05	D
2-Methylbutene	513359	70.13	1.22	3.50	98%	4.2E-05	7.6E-05	D
1-Butene	106989	56.11	1.1	2.52	98%	3.1E-05	5.5E-05	E
2-Methylpropene	115117	56.11	1.1	2.52	98%	3.1E-05	5.5E-05	E
1-Ethyl-4-methylbenzene (4-Ethyl toluene)	622968	120.19	0.989	4.86	98%	5.9E-05	1.1E-04	C
1-Heptene	592767	98.19	0.625	2.51	98%	3.0E-05	5.5E-05	E
1-Hexene	592416	84.16	0.0888	0.31	98%	3.7E-06	6.7E-06	D
2-Methyl-1-pentene	763291	84.16	0.0888	0.31	98%	3.7E-06	6.7E-06	D
1-Methylcyclohexene	591491	96.17	0.0227	0.09	98%	1.1E-06	1.9E-06	D
1-Methylcyclopentene	693890	82.14	0.0252	0.08	98%	1.0E-06	1.8E-06	D
1-Pentene	109671	70.13	0.22	0.63	98%	7.6E-06	1.4E-05	D
1-Propanethiol (n-Propyl mercaptan)	107039	76.16	0.125	0.39	98%	4.7E-06	8.5E-06	D
2,2,3-Trimethylbutane	464062	100.2	0.00919	0.04	98%	4.6E-07	8.2E-07	D
2,2,4-Trimethylpentane	540841	114.23	0.614	2.87	98%	3.5E-05	6.3E-05	A
2,2,5-Trimethylhexane	3522949	128.26	0.156	0.82	98%	9.9E-06	1.8E-05	D
2,2-Dimethylbutane	75832	86.18	0.156	0.55	98%	6.7E-06	1.2E-05	D
2,2-Dimethylpentane	590352	100.2	0.0608	0.25	98%	3.0E-06	5.4E-06	D
2,2-Dimethylpropane	463821	72.15	0.0274	0.08	98%	9.8E-07	1.8E-06	D
2,3,4-Trimethylpentane	565753	114.23	0.312	1.46	98%	1.8E-05	3.2E-05	D
2,3-Dimethylbutane	79298	86.18	0.167	0.59	98%	7.1E-06	1.3E-05	E
2,3-Dimethylpentane	565593	100.2	0.31	1.27	98%	1.5E-05	2.8E-05	D

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(%)	Flare 1	Flare 2	
2,4-Dimethylhexane	589435	114.23	0.222	1.04	98%	1.3E-05	2.3E-05	D
2,4-Dimethylpentane	108087	100.2	0.1	0.41	98%	5.0E-06	8.9E-06	D
2,5-Dimethylhexane	592132	114.23	0.166	0.78	98%	9.4E-06	1.7E-05	D
2,5-Dimethylthiophene	638028	112.19	0.0644	0.30	98%	3.6E-06	6.4E-06	D
2-Butanone (Methyl ethyl ketone)	78933	72.11	4.01	11.83	98%	1.4E-04	2.6E-04	D
2-Ethyl-1-butene	760214	84.16	0.0177	0.06	98%	7.4E-07	1.3E-06	E
2-Ethylthiophene	872559	112.19	0.0629	0.29	98%	3.5E-06	6.3E-06	C
2-Ethyltoluene	611143	120.19	0.323	1.59	98%	1.9E-05	3.5E-05	D
2-Hexanone (Methyl butyl ketone)	591786	100.16	0.613	2.51	98%	3.0E-05	5.5E-05	E
2-Methyl-1-butene	563462	70.13	0.179	0.51	98%	6.2E-06	1.1E-05	D
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90.19	0.17	0.63	98%	7.6E-06	1.4E-05	E
2-Methyl-2-butene	513359	70.13	0.303	0.87	98%	1.1E-05	1.9E-05	D
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90.19	0.325	1.20	98%	1.5E-05	2.6E-05	E
2-Methylbutane	78784	72.15	2.26	6.67	98%	8.1E-05	1.5E-04	D
2-Methylheptane	592278	114.23	0.716	3.35	98%	4.1E-05	7.3E-05	D
2-Methylhexane	591764	100.2	0.816	3.34	98%	4.1E-05	7.3E-05	D
2-Methylpentane	107835	86.18	0.688	2.43	98%	2.9E-05	5.3E-05	D
2-Propanol (Isopropyl alcohol)	67630	60.1	1.8	4.42	98%	5.4E-05	9.6E-05	D
3,6-Dimethyloctane	15869940	142.28	0.785	4.57	98%	5.5E-05	1.0E-04	D
3-Ethyltoluene	620144	120.19	0.78	3.83	98%	4.6E-05	8.4E-05	D
3-Methyl-1-pentene	760203	84.16	0.00699	0.02	98%	2.9E-07	5.2E-07	D
3-Methylheptane	589811	114.23	0.763	3.56	98%	4.3E-05	7.8E-05	D
3-Methylhexane	589344	100.2	1.13	4.63	98%	5.6E-05	1.0E-04	D
3-Methylpentane	96140	86.18	0.74	2.61	98%	3.2E-05	5.7E-05	D
3-Methylthiophene	616444	98.17	0.0925	0.37	98%	4.5E-06	8.1E-06	E
4-Methyl-1-pentene	691372	84.16	0.0233	0.08	98%	9.7E-07	1.7E-06	E
4-Methyl-2-pentanone (MIBK)	108101	100.16	0.883	3.62	98%	4.4E-05	7.9E-05	C
4-Methylheptane	589537	114.23	0.249	1.16	98%	1.4E-05	2.5E-05	D
Acetaldehyde	75070	44.05	0.0774	0.14	98%	1.7E-06	3.0E-06	D
Acetone	67641	58.08	6.7	15.92	98%	1.9E-04	3.5E-04	C
Acetonitrile	75058	41.05	0.556	0.93	98%	1.1E-05	2.0E-05	A
Benzene	71432	78.11	2.4	7.67	98%	9.3E-05	1.7E-04	A
Benzyl chloride	100447	126.58	0.0181	0.09	98%	1.1E-06	2.0E-06	A
Bromodichloromethane	75274	163.83	0.00878	0.06	98%	7.1E-07	1.3E-06	E
Bromomethane (Methyl bromide)	74839	94.94	0.021	0.08	98%	9.9E-07	1.8E-06	C
Butane	106978	58.12	6.22	14.79	98%	1.8E-04	3.2E-04	C
Carbon disulfide	75150	76.14	0.147	0.46	98%	5.5E-06	1.0E-05	A
Carbon monoxide	630080	28.01	24.4	27.95	98%	3.4E-04	6.1E-04	C
Carbon tetrachloride	56235	153.82	0.00798	0.05	98%	6.1E-07	1.1E-06	A
Carbon tetrafluoride (Freon 14)	75730	88	0.151	0.54	98%	6.6E-06	1.2E-05	E
Carbonyl sulfide (Carbon oxysulfide)	463581	60.08	0.122	0.30	98%	3.6E-06	6.5E-06	A
Chlorobenzene	108907	112.56	0.484	2.23	98%	2.7E-05	4.9E-05	A
Chlorodifluoromethane (Freon 22)	75456	86.47	0.796	2.82	98%	3.4E-05	6.1E-05	D
Chloroethane (Ethyl chloride)	75003	64.51	3.95	10.42	98%	1.3E-04	2.3E-04	B
Chloromethane (Methyl chloride)	74873	50.49	0.244	0.50	98%	6.1E-06	1.1E-05	B
cis-1,2-Dichloroethene	156592	96.94	1.24	4.92	98%	6.0E-05	1.1E-04	B
cis-1,2-Dimethylcyclohexane	2207014	112.21	0.081	0.37	98%	4.5E-06	8.1E-06	D
cis-1,3-Dichloropropene	10061015	110.97	0.00303	0.01	98%	1.7E-07	3.0E-07	D
cis-1,3-Dimethylcyclohexane	638040	112.21	0.501	2.30	98%	2.8E-05	5.0E-05	D
cis-1,4-Dimethylcyclohexane	624293	112.21	0.248	1.14	98%	1.4E-05	2.5E-05	D
cis-1,4-Dimethylcyclohexane/trans1,3-Dimethylcyclohexane	2207036	112.21	0.248	1.14	98%	1.4E-05	2.5E-05	D
cis-2-Butene	590181	56.11	0.105	0.24	98%	2.9E-06	5.3E-06	D
cis-2-Heptene	6443921	98.19	0.0245	0.10	98%	1.2E-06	2.1E-06	E
cis-2-Hexene	7688213	84.16	0.0172	0.06	98%	7.2E-07	1.3E-06	D
cis-2-Octene	7642048	112.21	0.22	1.01	98%	1.2E-05	2.2E-05	D
cis-2-Pentene	627203	70.13	0.0479	0.14	98%	1.7E-06	3.0E-06	D
cis-3-Methyl-2-pentene	922623	84.16	0.0179	0.06	98%	7.5E-07	1.3E-06	D
Cyclohexane	110827	84.16	1.01	3.48	98%	4.2E-05	7.6E-05	B
Cyclohexene	110838	82.14	0.0184	0.06	98%	7.5E-07	1.3E-06	D
Cyclopentane	287923	70.13	0.0221	0.06	98%	7.7E-07	1.4E-06	D
Cyclopentene	142290	68.12	0.0121	0.03	98%	4.1E-07	7.4E-07	D
Decane	124185	142.28	3.8	22.11	98%	2.7E-04	4.8E-04	D
Dibromochloromethane	124481	208.28	0.0151	0.13	98%	1.6E-06	2.8E-06	D
Dibromomethane (Methylene dibromide)	74953	173.84	0.000835	0.01	98%	7.2E-08	1.3E-07	E
Dichlorobenzene	106467	147	0.94	5.65	98%	6.8E-05	1.2E-04	A
Dichlorodifluoromethane (Freon 12)	75718	120.91	1.18	5.84	98%	7.1E-05	1.3E-04	B
Dichloromethane (Methylene chloride)	75092	84.93	6.15	21.36	98%	2.6E-04	4.7E-04	A
Diethyl sulfide	352932	90.19	0.0862	0.32	98%	3.9E-06	6.9E-06	E

Constituent	CAS No.	MW	Concentration in LFG		Control Efficiency	Emission Rate (g/s)		Emission Factor Rating
		(g/mole)	(ppmv)	(mg/m³)	(%)	Flare 1	Flare 2	
Dimethyl disulfide	624920	94.2	0.137	0.53	98%	6.4E-06	1.2E-05	A
Dimethyl sulfide	75183	62.14	5.66	14.38	98%	1.7E-04	3.1E-04	A
Dodecane (n-Dodecane)	112403	170.33	0.221	1.54	98%	1.9E-05	3.4E-05	D
Ethane	74840	30.07	9.05	11.13	98%	1.3E-04	2.4E-04	D
Ethanol	64175	46.07	0.23	0.43	98%	5.3E-06	9.5E-06	D
Ethyl acetate	141786	88.11	1.88	6.77	98%	8.2E-05	1.5E-04	C
Ethyl mercaptan (Ethanediol)	75081	62.14	0.198	0.50	98%	6.1E-06	1.1E-05	A
Ethyl methyl sulfide	624895	76.16	0.0367	0.11	98%	1.4E-06	2.5E-06	E
Ethylbenzene	100414	106.17	4.86	21.10	98%	2.6E-04	4.6E-04	B
Formaldehyde	50000	30.03	0.0117	0.01	98%	1.7E-07	3.1E-07	D
Heptane	142825	100.2	1.34	5.49	98%	6.7E-05	1.2E-04	B
Hexane	110543	86.18	3.1	10.93	98%	1.3E-04	2.4E-04	B
Hydrogen sulfide	7783064	34.08	32	44.60	98%	5.4E-04	9.7E-04	A
Indane (2,3-Dihydroindene)	496117	34.08	0.0666	0.09	98%	1.1E-06	2.0E-06	D
Isobutane (2-Methylpropane)	75285	58.12	8.16	19.40	98%	2.3E-04	4.2E-04	D
Isobutylbenzene	538932	134.22	0.0407	0.22	98%	2.7E-06	4.9E-06	D
Isoprene (2-Methyl-1,3-butadiene)	78795	68.12	0.0165	0.05	98%	5.6E-07	1.0E-06	D
Isopropyl mercaptan	75332	76.16	0.175	0.55	98%	6.6E-06	1.2E-05	A
Isopropylbenzene (Cumene)	98828	120.19	0.43	2.11	98%	2.6E-05	4.6E-05	D
Mercury (total)	7439976	200.59	1.22E-04	1.00E-03	0%	6.1E-07	1.1E-06	B
Methanethiol (Methyl mercaptan)	74931	48.11	1.37	2.70	98%	3.3E-05	5.9E-05	A
Methyl tert-butyl ether (MTBE)	1634044	88.15	0.118	0.43	98%	5.2E-06	9.3E-06	D
Methylcyclohexane	108872	98.19	1.29	5.18	98%	6.3E-05	1.1E-04	D
Methylcyclopentane	96377	84.16	0.65	2.24	98%	2.7E-05	4.9E-05	D
Naphthalene	91203	128.17	0.107	0.56	98%	6.8E-06	1.2E-05	D
n-Butylbenzene	104518	134.22	0.068	0.37	98%	4.5E-06	8.1E-06	D
Nonane	111842	128.26	2.37	12.43	98%	1.5E-04	2.7E-04	D
n-Propylbenzene (Propylbenzene)	103651	120.19	0.413	2.03	98%	2.5E-05	4.4E-05	D
Octane	111659	114.23	1.08	5.05	98%	6.1E-05	1.1E-04	D
p-Cymene (1-Methyl-4-lsopropylbenzene)	99876	134.22	3.58	19.65	98%	2.4E-04	4.3E-04	D
Pentane	109660	72.15	4.46	13.16	98%	1.6E-04	2.9E-04	C
Propane	74986	44.1	15.5	27.96	98%	3.4E-04	6.1E-04	C
Propene	115071	42.08	3.32	5.71	98%	6.9E-05	1.2E-04	D
Propyne	74997	40.06	0.038	0.06	98%	7.5E-07	1.4E-06	E
sec-Butylbenzene	135988	134.22	0.0675	0.37	98%	4.5E-06	8.1E-06	D
Styrene (Vinylbenzene)	100425	104.15	0.411	1.75	98%	2.1E-05	3.8E-05	B
Tetrachloroethylene (Perchloroethylene)	127184	165.83	2.03	13.77	98%	1.7E-04	3.0E-04	A
Tetrahydrofuran (Diethylene oxide)	109999	72.11	0.969	2.86	98%	3.5E-05	6.2E-05	C
Thiophene	110021	84.14	0.349	1.20	98%	1.5E-05	2.6E-05	E
Toluene (Methyl benzene)	108883	92.14	29.5	111.17	98%	1.3E-03	2.4E-03	A
trans-1,2-Dichloroethene	156605	96.94	0.0287	0.11	98%	1.4E-06	2.5E-06	C
trans-1,2-Dimethylcyclohexane	6876239	112.21	0.404	1.85	98%	2.2E-05	4.0E-05	D
trans-1,3-Dichloropropene	10061026	110.97	0.00943	0.04	98%	5.2E-07	9.3E-07	D
trans-1,4-Dimethylcyclohexane	2207047	112.21	0.205	0.94	98%	1.1E-05	2.1E-05	D
trans-2-Butene	624646	56.11	0.104	0.24	98%	2.9E-06	5.2E-06	D
trans-2-Heptene	14686136	98.19	0.0025	0.01	98%	1.2E-07	2.2E-07	E
trans-2-Hexene	4050457	84.16	0.0206	0.07	98%	8.6E-07	1.5E-06	D
trans-2-Octene	13389429	112.21	0.241	1.11	98%	1.3E-05	2.4E-05	D
trans-2-Pentene	646048	70.13	0.0347	0.10	98%	1.2E-06	2.2E-06	D
trans-3-Methyl-2-pentene	616126	84.16	0.0155	0.05	98%	6.5E-07	1.2E-06	D
Tribromomethane (Bromoform)	75252	252.73	0.0124	0.13	98%	1.6E-06	2.8E-06	D
Trichloroethylene (Trichloroethene)	79016	131.39	0.828	4.45	98%	5.4E-05	9.7E-05	A
Trichlorofluoromethane (Freon 11)	91315616	137.37	0.248	1.39	98%	1.7E-05	3.0E-05	B
Trichloromethane (Chloroform)	67663	119.38	0.0708	0.35	98%	4.2E-06	7.5E-06	A
Undecane	1120214	156.31	1.67	10.68	98%	1.3E-04	2.3E-04	D
Vinyl acetate	85306269	86.09	0.248	0.87	98%	1.1E-05	1.9E-05	C
Vinyl chloride (Chloroethene)	75014	62.5	1.42	3.63	98%	4.4E-05	7.9E-05	A
Xylenes (o-, m-, p-, mixtures)	1330207	106.17	9.23	40.08	98%	4.9E-04	8.7E-04	A
Total Reduced Sulphur Compounds	n/a	-	-	67.7	98%	8.2E-04	1.5E-03	-

Table E4. Flares and Engines - Products of Combustion - Stages 1 to 5 - Alternative 2 Scenario B

Emissions of products of combustion were estimated based on emission factors given in Table 2.4-4, US EPA AP-42, 2.4 Municipal Solid Waste Landfills, 11/98, and the assumption that LFG is 50% methane (CH4).

Emissions of combustion gases from the siloxane flare (Flare 3) were deemed negligible because it represents less than 5% of combustion capacity.

Emissions of sulphur dioxide and hydrogen chloride were based on mass balance and the assumption that all sulphur and chlorine in LFG are converted to these compounds.

LFG Combustion Rate

Combustion Sources	LFG Combusted[1] (m^3/s)	CH4 Fraction in LFG	CH4 Combusted (m^3/s)	Percent of Total	Significant? (Yes or No)[2]
Engines (Gen1 to Gen 4) - Total	0.16	50%	0.08	22%	Yes
Flare 1	0.19	50%	0.10	26%	Yes
Flare 2	0.34	50%	0.17	48%	Yes
Flare 3 (Siloxane Flare)	0.029	50%	0.015	4%	No
Total	0.72		0.36		

1 See Table E1 for calculation of quantity combusted.

2. Sources that are Insignificant Relative to Total Emissions per section 7.2.2 of ESDM guidance document.

Emission Factors - US EPA AP-42, Table 2.4-4

Contaminant	CAS No.	IC Engines		Flares		Emission Factor Rating
		$kg/10^6$ dscm of CH_4	g/m^3 of CH4	$kg/10^6$ dscm of CH_4	g/m^3 of CH4	
Nitrogen Dioxide	10102-44-0	4000	4	650	0.65	C
Particulate Matter	N/A	770	0.77	270	0.27	D
Carbon Monoxide	630-08-0	7500	7.5	12000	12.00	C

No data on PM size distribution is provided in AP-42, Table 2.4-4; however, based on other gas-fired combustion sources, it is expected that most of the particulate matter is less than 2.5 microns. As such, it was assumed that PM=PM10=PM2.5

Emission rates - US EPA AP-42, Table 2.4-4

Contaminant	CAS No.	Emission Rate (g/s)		
		Engines	Flare 1	Flare 2
Nitrogen Dioxide	10102-44-0	0.31	0.062	0.111
Particulate Matter	N/A	0.061	0.03	0.05
Particulate Matter (PM10)	N/A	0.061	0.03	0.05
Particulate Matter (PM2.5)	N/A	0.061	0.03	0.05
Carbon Monoxide	630-08-0	0.59	1.14	2.06

Sample Calculation: (Particulate Matter, Engines)

PM Emission Rate = CH4 Combusted in Engines (m^3/s) * Emission Factor for IC Engines (g/m^3 of CH4)

= 0.32 (m^3/s) x 0.232 (g/m^3 of CH4)

= 0.06058918 (g/s)

Sulphur Dioxide Emission Factor (assumes all sulphur in LFG converts to sulphur dioxide)

Molecular Weight (MW) of Sulphur (S) = 32.1 g/mole

MW of Sulphur Dioxide (SO2) = 64.1 g/mole

Sulphur Concentration in LFG

Contaminant	CAS No.	MW of Contaminant	Conc. Of Contaminant in LFG (mg/m^3)	No. of S per molecule	Conc. of S in LFG (mg/m^3)
1-Propanethiol (n-Propyl mercaptan)	107-03-9	76.16	3.89E-01	1	0.16
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90.19	6.27E-01	1	0.22
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90.19	1.20E+00	1	0.43
Carbon disulfide	75150	76.14	4.57E-01	2	0.38
Carbonyl sulfide (Carbon oxysulfide)	463581	60.08	3.00E-01	1	0.16
Diethyl sulfide	352932	90.19	3.18E-01	1	0.11
Dimethyl disulfide	624920	94.2	5.27E-01	2	0.36
Dimethyl sulfide	75183	62.14	1.44E+01	1	7.40
Ethyl mercaptan (Ethanediol)	75081	62.14	5.03E-01	1	0.26
Ethyl methyl sulfide	624895	76.16	1.14E-01	1	0.05
Hydrogen sulfide	7783064	34.08	4.46E+01	1	41.85
Isopropyl mercaptan	75332	76.16	5.45E-01	1	0.23
Methanethiol (Methyl mercaptan)	74931	48.11	2.69E+00	1	1.79
Total Sulphur Concentration in LFG					**53**

If all S is converted to SO2, the quantity of SO2 generated is:

SO2 Emission Factor = S concentration (mg/m³ of LFG combusted) x MW of SO2 / MW (g/mole) of S (g/mole)

= 53.4 (mg/m³ of LFG combusted) x 64.1 (g/mole) / 32.1 (g/mole)

= 106.7 mg/m³ of LFG combusted

Hydrogen Chloride Emission Factor (assumes all sulphur in LFG converts to sulphur dioxide)

Molecular Weight (MW) of chlorine (Cl) = 35.5 g/mole

MW of hydrogen chloride (HCl) = 36.5 g/mole

Chlorine Concentration in LFG

Contaminant	CAS No.	MW of Contaminant	Conc. Of Contaminant in LFG (mg/m^3)	No of Cl	Cl content (mg/m^3)
1,1,1-Trichloroethane	71556	133.4	1.32E+00	3	1.06
1,1,2,2-Tetrachloroethane	79345	167.85	3.67E+00	4	3.10
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	260.76	3.72E-02	6	0.03
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187.37	5.15E-01	3	0.29
1,1,2-Trichloroethane	79005	133.4	8.61E-01	3	0.69
1,1-Dichloroethane	75343	98.96	8.41E+00	2	6.03
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	96.94	6.34E-01	2	0.46
1,2,4-Trichlorobenzene	120821	181.45	4.09E-02	3	0.02
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	170.92	7.40E-01	2	0.31
1,2-Dichloroethane (Ethylene dichloride)	107062	98.96	6.43E-01	2	0.46
1,2-Dichloroethene	540590	96.94	4.52E+01	2	33.04
1,2-Dichloropropane	78875	112.99	2.40E-01	2	0.15
Bromodichloromethane	75274	163.83	5.88E-02	1	0.01
Chlorobenzene	108907	112.56	2.23E+00	1	0.70
Chlorodifluoromethane (Freon 22)	75456	86.47	2.81E+00	1	1.15
Chloroethane (Ethyl chloride)	75003	64.51	1.04E+01	1	5.72
Chloromethane (Methyl chloride)	74873	50.49	5.04E-01	1	0.35
cis-1,2-Dichloroethene	156592	96.94	4.91E+00	2	3.59
cis-1,3-Dichloropropene	10061015	110.97	1.37E-02	2	0.01
Dibromochloromethane	124481	208.28	1.29E-01	2	0.04
Dichlorobenzene	106467	147	5.65E+00	2	2.72
Dichlorodifluoromethane (Freon 12)	75718	120.91	5.83E+00	2	3.42
Dichloromethane (Methylene chloride)	75092	84.93	2.13E+01	2	17.82
Tetrachloroethylene (Perchloroethylene)	127184	165.83	1.38E+01	4	11.77
trans-1,2-Dichloroethene	156605	96.94	1.14E-01	2	0.08
trans-1,3-Dichloropropene	10061026	110.97	4.28E-02	2	0.03
Trichloroethylene (Trichloroethene)	79016	131.39	4.45E+00	3	3.60
Trichlorofluoromethane (Freon 11)	91315616	137.37	1.39E+00	3	1.08
Trichloromethane (Chloroform)	67-66-3	119.38	3.45E-01	3	0.31
Vinyl chloride (Chloroethene)	75014	62.5	3.63E+00	1	2.06
				Total chlorine concentration in LFG	**100**

If all Cl is converted to HCl, the quantity of HCL generated is:

HCL Emission Factor = Cl concentration (mg/m^3 of LFG combusted) x MW of HCl / MW (g/mole) of Cl (g/mole)

= 100.1 (mg/m^3 of LFG combusted) x 36.2 (g/mole) / 35.5 (g/mole)

= 103.0 mg/m^3 of LFG combusted

Emission Rates - SO2, HCl

Contaminant	CAS No.	Emission Factor (mg/m^3 of LFG)	Emission Rate (g/s)		
			Engines	Flare 1	Flare 2
Sulfur Dioxide	7446-09-05	106.7	1.68E-02	2.03E-02	3.66E-02
Hydrogen Chloride	7647-01-0	103.0	1.62E-02	1.96E-02	3.53E-02

Sample Calculation: (Sulphur dioxide, Engines)

SO2 Emission Rate = LFG combusted in Engines (m^3/s) * SO2 Emission Factor (mg/m^3 of LFG) / 1000 (mg/g)

= 0.64 (m^3/s) x 106.7 (mg/m^3 of LFG) / 1000 (mg/g)

= 0.0168 (g/s)

Table E4. Flares and Engines - Products of Combustion - Stages 6 to 8 - Alternative 2 Scenario B

Emissions of products of combustion were estimated based on emission factors given in Table 2.4-4, US EPA AP-42, 2.4 Municipal Solid Waste Landfills, 11/98, and the assumption that LFG is 50% methane (CH4).

Emissions of combustion gases from the siloxane flare (Flare 3) were deemed negligible because it represents less than 5% of combustion capacity.

Emissions of sulphur dioxide and hydrogen chloride were based on mass balance and the assumption that all sulphur and chlorine in LFG are converted to these compounds.

LFG Combustion Rate

Combustion Sources	LFG Combusted[1] (m^3/s)	CH4 Fraction in LFG	CH4 Combusted (m^3/s)	Percent of Total	Significant? (Yes or No)[2]
Engines (Gen1 to Gen 4) - Total	0.48	50%	0.24	22%	Yes
Flare 1	0.61	50%	0.30	27%	Yes
Flare 2	1.09	50%	0.55	49%	Yes
Flare 3 (Siloxane Flare)	0.029	50%	0.015	1%	No
Total	2.21		1.10		

1 See Table E1 for calculation of quantity combusted.
2. Sources that are Insignificant Relative to Total Emissions per section 7.2.2 of ESDM guidance document.

Emission Factors - US EPA AP-42, Table 2.4-4

Contaminant	CAS No.	IC Engines		Flares		Emission Factor Rating
		$kg/10^6$ dscm of CH_4	g/m^3 of CH4	$kg/10^6$ dscm of CH_4	g/m^3 of CH4	
Nitrogen Dioxide	10102-44-0	4000	4	650	0.65	C
Particulate Matter	N/A	770	0.77	270	0.27	D
Carbon Monoxide	630-08-0	7500	7.5	12000	12.00	C

No data on PM size distribution is provided in AP-42, Table 2.4-4; however, based on other gas-fired combustion sources, it is expected that most of the particulate matter is less than 2.5 microns. As such, it was assumed that PM=PM10=PM2.5

Emission rates - US EPA AP-42, Table 2.4-4

Contaminant	CAS No.	Emission Rate (g/s)		
		Engines	Flare 1	Flare 2
Nitrogen Dioxide	10102-44-0	0.97	0.197	0.354
Particulate Matter	N/A	0.186	0.08	0.15
Particulate Matter (PM10)	N/A	0.186	0.08	0.15
Particulate Matter (PM2.5)	N/A	0.186	0.08	0.15
Carbon Monoxide	630-08-0	1.81	3.63	6.54

Sample Calculation: (Particulate Matter, Engines)

PM Emission Rate = CH4 Combusted in Engines (m^3/s) * Emission Factor for IC Engines (g/m^3 of CH4)
= 0.32 (m^3/s) x 0.232 (g/m^3 of CH4)
= 0.18581082 (g/s)

Sulphur Dioxide Emission Factor (assumes all sulphur in LFG converts to sulphur dioxide)

Molecular Weight (MW) of Sulphur (S) = 32.1 g/mole

MW of Sulphur Dioxide (SO2) = 64.1 g/mole

Sulphur Concentration in LFG

Contaminant	**CAS No.**	**MW of Contaminant**	**Conc. Of Contaminant in LFG (mg/m^3)**	**No. of S per molecule**	**Conc. of S in LFG (mg/m^3)**
1-Propanethiol (n-Propyl mercaptan)	107-03-9	76.16	3.89E-01	1	0.16
2-Methyl-1-propanethiol (Isobutyl mercaptan)	513440	90.19	6.27E-01	1	0.22
2-Methyl-2-propanethiol (tert- Butylmercaptan)	75661	90.19	1.20E+00	1	0.43
Carbon disulfide	75150	76.14	4.57E-01	2	0.38
Carbonyl sulfide (Carbon oxysulfide)	463581	60.08	3.00E-01	1	0.16
Diethyl sulfide	352932	90.19	3.18E-01	1	0.11
Dimethyl disulfide	624920	94.2	5.27E-01	2	0.36
Dimethyl sulfide	75183	62.14	1.44E+01	1	7.40
Ethyl mercaptan (Ethanediol)	75081	62.14	5.03E-01	1	0.26
Ethyl methyl sulfide	624895	76.16	1.14E-01	1	0.05
Hydrogen sulfide	7783064	34.08	4.46E+01	1	41.85
Isopropyl mercaptan	75332	76.16	5.45E-01	1	0.23
Methanethiol (Methyl mercaptan)	74931	48.11	2.69E+00	1	1.79
				Total Sulphur Concentration in LFG	**53**

If all S is converted to SO2, the quantity of SO2 generated is:

SO2 Emission Factor = S concentration (mg/m^3 of LFG combusted) x MW of SO2 / MW (g/mole) of S (g/mole)

= 53.4 (mg/m^3 of LFG combusted) x 64.1 (g/mole) / 32.1 (g/mole)

= 106.7 mg/m^3 of LFG combusted

Hydrogen Chloride Emission Factor (assumes all sulphur in LFG converts to sulphur dioxide)

Molecular Weight (MW) of chlorine (Cl) = 35.5 g/mole

MW of hydrogen chloride (HCl) = 36.5 g/mole

Chlorine Concentration in LFG

Contaminant	CAS No.	MW of Contaminant	Conc. Of Contaminant in LFG (mg/m^3)	No of Cl	Cl content (mg/m^3)
1,1,1-Trichloroethane	71556	133.4	1.32E+00	3	1.06
1,1,2,2-Tetrachloroethane	79345	167.85	3.67E+00	4	3.10
1,1,2,3,4,4-Hexachloro-1,3-butadiene (Hexachlorobutadiene)	87683	260.76	3.72E-02	6	0.03
1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	187.37	5.15E-01	3	0.29
1,1,2-Trichloroethane	79005	133.4	8.61E-01	3	0.69
1,1-Dichloroethane	75343	98.96	8.41E+00	2	6.03
1,1-Dichloroethene (1,1- Dichloroethylene)	75354	96.94	6.34E-01	2	0.46
1,2,4-Trichlorobenzene	120821	181.45	4.09E-02	3	0.02
1,2-Dichloro-1,1,2,2- tetrafluoroethane (Freon 114)	76142	170.92	7.40E-01	2	0.31
1,2-Dichloroethane (Ethylene dichloride)	107062	98.96	6.43E-01	2	0.46
1,2-Dichloroethene	540590	96.94	4.52E+01	2	33.04
1,2-Dichloropropane	78875	112.99	2.40E-01	2	0.15
Bromodichloromethane	75274	163.83	5.88E-02	1	0.01
Chlorobenzene	108907	112.56	2.23E+00	1	0.70
Chlorodifluoromethane (Freon 22)	75456	86.47	2.81E+00	1	1.15
Chloroethane (Ethyl chloride)	75003	64.51	1.04E+01	1	5.72
Chloromethane (Methyl chloride)	74873	50.49	5.04E-01	1	0.35
cis-1,2-Dichloroethene	156592	96.94	4.91E+00	2	3.59
cis-1,3-Dichloropropene	10061015	110.97	1.37E-02	2	0.01
Dibromochloromethane	124481	208.28	1.29E-01	2	0.04
Dichlorobenzene	106467	147	5.65E+00	2	2.72
Dichlorodifluoromethane (Freon 12)	75718	120.91	5.83E+00	2	3.42
Dichloromethane (Methylene chloride)	75092	84.93	2.13E+01	2	17.82
Tetrachloroethylene (Perchloroethylene)	127184	165.83	1.38E+01	4	11.77
trans-1,2-Dichloroethene	156605	96.94	1.14E-01	2	0.08
trans-1,3-Dichloropropene	10061026	110.97	4.28E-02	2	0.03
Trichloroethylene (Trichloroethene)	79016	131.39	4.45E+00	3	3.60
Trichlorofluoromethane (Freon 11)	91315616	137.37	1.39E+00	3	1.08
Trichloromethane (Chloroform)	67-66-3	119.38	3.45E-01	3	0.31
Vinyl chloride (Chloroethene)	75014	62.5	3.63E+00	1	2.06
Total chlorine concentration in LFG					**100**

If all Cl is converted to HCl, the quantity of HCL generated is:

HCL Emission Factor = Cl concentration (mg/m³ of LFG combusted) x MW of HCl / MW (g/mole) of Cl (g/mole)

= 100.1 (mg/m³ of LFG combusted) x 36.2 (g/mole) / 35.5 (g/mole)

= 103.0 mg/m³ of LFG combusted

Emission Rates - SO2, HCl

Contaminant	CAS No.	Emission Factor (mg/m³ of LFG)	Emission Rate (g/s)		
			Engines	Flare 1	Flare 2
Sulfur Dioxide	7446-09-05	106.7	5.15E-02	6.46E-02	1.16E-01
Hydrogen Chloride	7647-01-0	103.0	4.97E-02	6.24E-02	1.12E-01

Sample Calculation: (Sulphur dioxide, Engines)

SO2 Emission Rate = LFG combusted in Engines (m³/s) * SO2 Emission Factor (mg/m³ of LFG) / 1000 (mg/g)

= 0.64 (m³/s) x 106.7 (mg/m³ of LFG) / 1000 (mg/g)

= 0.0515 (g/s)

Table E5. Siloxanes for Stages 1 to 5 - Alternative 2 Scenario B

Siloxanes are trace constituents in LFG that are essentially non-combustable, and are not controlled through combustion in flares. Siloxanes have the potential to damage engines, and are removed from the LFG fuel stream to the the engines and purged to the siloxane flare (Flare 3). Thus, all silozanes in LGF are emitted uncontrolled, through Flares 1 to 3, or as fugitive emissions from the landfill surface.

Siloxane Emission Sources	LFG Release or Use Rate (m^3/s)
Stg1 to Stg5 (fugitive)	0.24
Flare 1	0.02
Flare 2	0.03
Flare 3 (Siloxane Flare) - includes engines	0.19
Total	0.5

* See Table E1 for calculation of quantity combusted.

Contaminant	CAS No.	Conc. in LFG mg/m³	Emission Rate (g/s)			
			Stg 1 to 5 (fugitive)	Flare 1	Flare 2	Flare 3
Tetramethylsilane	75-76-3	0.001	2.4E-07	1.9E-08	3.5E-08	1.9E-07
Hexamethyldisiloxane	107-46-0	2.114	5.1E-04	4.1E-05	7.4E-05	3.9E-04
Octamethyltrisiloxane	107-51-7	0.22	5.3E-05	4.3E-06	7.7E-06	4.1E-05
Decamethyltetrasiloxane	141-62-8	0.027	6.5E-06	5.2E-07	9.4E-07	5.0E-06
Dodecamethylpentasiloxane	141-63-9	0.029	7.0E-06	5.6E-07	1.0E-06	5.4E-06
Trimethylsilyl Fluoride	420-56-4	0.546	1.3E-04	1.1E-05	1.9E-05	1.0E-04
Dodecamethylcyclohexasiloxane	540-97-6	0.029	7.0E-06	5.6E-07	1.0E-06	5.4E-06
Decamethylcyclopentasiloxane	541-02-6	4.264	1.0E-03	8.3E-05	1.5E-04	7.9E-04
Hexamethyltricyclosiloxane	541-05-9	0.528	1.3E-04	1.0E-05	1.8E-05	9.8E-05
Octamethylcyclotetrasiloxane	556-67-2	8.739	2.1E-03	1.7E-04	3.0E-04	1.6E-03
Trimethylsilanol	1066-40-6	10.521	2.5E-03	2.0E-04	3.7E-04	2.0E-03
Methoxytrimethylsilane	1825-61-2	0.351	8.4E-05	6.8E-06	1.2E-05	6.5E-05
Ethoxytrimethylsilane	1825-62-3	0.203	4.9E-05	3.9E-06	7.1E-06	3.8E-05
Propoxytrimethylsilane	1825-63-4	0.158	3.8E-05	3.1E-06	5.5E-06	2.9E-05
Isopropoxytrimethylsilane	1825-64-5	0.181	4.3E-05	3.5E-06	6.3E-06	3.4E-05
Butoxytrimethylsilane	1825-65-6	0.09	2.2E-05	1.7E-06	3.1E-06	1.7E-05
1-methylbutoxytrimethylsilane	1825-67-8	0.192	4.6E-05	3.7E-06	6.7E-06	3.6E-05

Sample Calculation: (Tetramethylsilane, Flare 1)

PM Emission Rate = LFG Use in Flare 1 (m^3/s) * Concentration in LFG (mg/m^3 of LFG) / 1000 (mg/g)
= 0.02 (m^3/s) x 0.001 (mg/m^3 of LFG) / 1000 (mg/g)
= 1.94E-08 (g/s)

Note:
1. Siloxane concentrations were measured by OBS Labs, 2011.

Table E5.   Siloxanes for Stages 6 to 8 - Alternative 2 Scenario B

Siloxanes are trace constituents in LFG that are essentially non-combustable, and are not controlled through combustion in flares. Siloxanes have the potential to damage engines, and are removed from the LFG fuel stream to the the engines and purged to the siloxane flare (Flare 3). Thus, all silozanes in LGF are emitted uncontrolled, through Flares 1 to 3, or as fugitive emissions from the landfill surface.

Siloxane Emission Sources	LFG Release or Use Rate (m^3/s)
Stg6 to Stg8 (fugitive)	0.74
Flare 1	0.55
Flare 2	0.99
Flare 3 (Siloxane Flare) - includes engines	0.51
Total	2.8

* See Table E1 for calculation of quantity combusted.

Contaminant	CAS No.	Conc. in LFG mg/m^3	Emission Rate (g/s)			
			Stg 6 to 9 (fugitive)	Flare 1	Flare 2	Flare 3
Tetramethylsilane	75-76-3	0.001	7.4E-07	5.5E-07	9.9E-07	5.1E-07
Hexamethyldisiloxane	107-46-0	2.114	1.6E-03	1.2E-03	2.1E-03	1.1E-03
Octamethyltrisiloxane	107-51-7	0.22	1.6E-04	1.2E-04	2.2E-04	1.1E-04
Decamethyltetrasiloxane	141-62-8	0.027	2.0E-05	1.5E-05	2.7E-05	1.4E-05
Dodecamethylpentasiloxane	141-63-9	0.029	2.1E-05	1.6E-05	2.9E-05	1.5E-05
Trimethylsilyl Fluoride	420-56-4	0.546	4.0E-04	3.0E-04	5.4E-04	2.8E-04
Dodecamethylcyclohexasiloxane	540-97-6	0.029	2.1E-05	1.6E-05	2.9E-05	1.5E-05
Decamethylcyclopentasiloxane	541-02-6	4.264	3.1E-03	2.3E-03	4.2E-03	2.2E-03
Hexamethyltricyclosiloxane	541-05-9	0.528	3.9E-04	2.9E-04	5.2E-04	2.7E-04
Octamethylcyclotetrasiloxane	556-67-2	8.739	6.4E-03	4.8E-03	8.7E-03	4.5E-03
Trimethylsilanol	1066-40-6	10.521	7.7E-03	5.8E-03	1.0E-02	5.4E-03
Methoxytrimethylsilane	1825-61-2	0.351	2.6E-04	1.9E-04	3.5E-04	1.8E-04
Ethoxytrimethylsilane	1825-62-3	0.203	1.5E-04	1.1E-04	2.0E-04	1.0E-04
Propoxytrimethylsilane	1825-63-4	0.158	1.2E-04	8.7E-05	1.6E-04	8.1E-05
Isopropoxytrimethylsilane	1825-64-5	0.181	1.3E-04	1.0E-04	1.8E-04	9.3E-05
Butoxytrimethylsilane	1825-65-6	0.09	6.6E-05	5.0E-05	8.9E-05	4.6E-05
1-methylbutoxytrimethylsilane	1825-67-8	0.192	1.4E-04	1.1E-04	1.9E-04	9.8E-05

Sample Calculation: (Tetramethylsilane, Flare 1)

PM Emission Rate = LFG Use in Flare 1 (m^3/s) * Concentration in LFG (mg/m^3 of LFG) / 1000 (mg/g)
= 0.56 (m^3/s) x 0.001 (mg/m^3 of LFG) / 1000 (mg/g)
= 5.51E-07 (g/s)

Note:
1. Siloxane concentrations were measured by OBS Labs, 2011.

Table E6. Tailpipe Emissions from Non-Road Mobile Equipment

Tailpipe emissions from non-road mobile equipment were based on US EPA Tier 1 to 4 Nonroad Diesel Engine Standards and load factors from the US EPA NONROAD model. Speciation of VOC and NMHC was estimated based on Speciation Profiles and Toxic Emission Factors for Nonroad Diesel Engines (MOVES2014b document). All PM (TSP) was assumed to be entirely PM10. PM2.5 was assumed to be same fraction of PM10 as calculated from On-Road mobile emissions (Table E8).

Emission Rate (g/s) = Power × LF × EF x 1hr/3600 s

where: Power = Rated Power (hp)

LF = Load Factor (dimensionless) from NONROAD model.

EF = Emission Factor (g/hp-hr) from nonroad diesel emission standards

Source ID : LFG_NROAD (Equipment mainly associated with landfilling activities)

Equipment[1]	Tier [2]	Fuel Rate (gal/day)	Engine HP	Cycle Load Factors[2]	Emission Factors (g/hp-hr)[3]			Emission Rates (g/s)- 1hr avg				
					CO	NOx	PM	CO	NOx	PM	PM10	PM2.5
JD Excavator	4	33	140	0.53	3.7	0.3	0.015	0.08	0.01	0.0003	0.0003	0.0001
JD 844K Loader	4	55	380	0.48	2.6	0.3	0.015	0.13	0.02	0.0008	0.0008	0.0004
JD 644K Loader	4	44	232	0.48	2.6	0.3	0.015	0.08	0.01	0.0005	0.0005	0.0002
JD 250D rock truck	4	44	265	0.59	2.6	0.3	0.015	0.11	0.01	0.0007	0.0007	0.0003
JD 1050K Bulldozer	4	88	350	0.59	2.6	0.3	0.015	0.15	0.02	0.0009	0.0009	0.0004
Aljon 600 compactor	4	220	600	0.59	2.6	0.3	0.015	0.26	0.03	0.0015	0.0015	0.0007
Aljon 960 compactor	4	154	500	0.59	2.6	0.3	0.015	0.21	0.02	0.0012	0.0012	0.0006
Volvo A25D rock truck	4	44	310	0.59	2.6	0.3	0.015	0.13	0.02	0.0008	0.0008	0.0004
Caterpillar D6N Bulldozer	4	33	150	0.59	2.6	0.3	0.015	0.06	0.01	0.0004	0.0004	0.0002
Cat 725 rock truck	4	44	325	0.59	2.6	0.3	0.015	0.14	0.02	0.0008	0.0008	0.0004
							Total	**1.35**	**0.15**	**0.008**	**0.008**	**0.004**

Source ID : COMPOST_NROAD (Equipment mainly associated with raw material and compost handling)

Equipment[1]	Tier [2]	Fuel Rate (gal/day)	Engine HP	Cycle Load Factors[2]	Emission Factors (g/hp-hr)[3]			Emission Rates (g/s)- 1hr avg				
					CO	NOx	PM	CO	NOx	PM	PM10	PM2.5
Vermeer 6000 grinder	4	141	600	0.59	2.6	0.3	0.015	0.26	0.030	0.0015	0.0015	0.0007
Komptech top turn	4	94	400	0.59	2.6	0.3	0.015	0.17	0.020	0.0010	0.0010	0.0005
John Deer 544k loader	4	42	180	0.48	2.6	0.3	0.015	0.06	0.007	0.0004	0.0004	0.0002
John Deer 544k loader	4	42	180	0.48	2.6	0.3	0.015	0.06	0.007	0.0004	0.0004	0.0002
John Deer 444k loader	4	33	140	0.48	2.6	0.3	0.015	0.05	0.006	0.0003	0.0003	0.0001
Cat 938 loader	4	47	200	0.48	2.6	0.3	0.015	0.07	0.008	0.0004	0.0004	0.0002
Freightliner dump truck	4	94	400	0.59	2.6	0.3	0.015	0.17	0.020	0.0010	0.0010	0.0005
Mack dump truck	4	106	450	0.59	2.6	0.3	0.015	0.19	0.022	0.0011	0.0011	0.0005
International dump truck	4	118	500	0.59	2.6	0.3	0.015	0.21	0.025	0.0012	0.0012	0.0006
International dump truck	4	112	475	0.59	2.6	0.3	0.015	0.20	0.023	0.0012	0.0012	0.0006
Western Star tractor	4	94	400	0.59	2.6	0.3	0.015	0.17	0.020	0.0010	0.0010	0.0005
Western Star dump truck	4	94	400	0.59	2.6	0.3	0.015	0.17	0.020	0.0010	0.0010	0.0005
							Total	**1.79**	**0.21**	**0.010**	**0.010**	**0.005**

Note:

1. The information regarding type of equipment, model year, engine size, operating hour, and fuel rate was provided by GFL, by email dated January 5, 2021.
2. The cycle load factors were obtained from the EPA document, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling (NR-005d)
3. Tier standard number and emission factors for NMHC, nitrogen oxide, and particulate matter were obtained from United States: Nonroad Diesel Engines, available at: https://dieselnet.com/standards/us/nonroad.php
4. Emission factor for Non-Methane Hydrocarbons (NMHC), nitrogen oxide, and particulate matter were obtained from Tier 4 emission standards—Engines up to 560 kW, available at: https://dieselnet.com/standards/us/nonroad.php

Table E7. Emissions from On-site Truck Traffic - Road Dust - Alternative 2 Scenario B

Emissions of road dust from on-site truck traffic were estimated based emisison factors obtained from US EPA AP-42, Section 13.2.1 Paved Roads and Section 13.2.2 Unpaved Roads. The detailed calculations are shown below.

Trucking occurs over a 12 hour operating period each day. Dust is controlled through watering and sweeping of paved roads, watering and other dust suppression on unpaved roads, and use of coarse gravel on haul roads.

Emission factors based on US EPA AP-42, Section 13.2.1 Paved Roads and Section 13.2.2 Unpaved Roads

Number of Trucks	200	trucks/day
Mean Vehicle Weight	25.0	tonnes/truck

data received from GFL in 2020

GFL has indicated that the site entrance and main onsite road network is paved.

Road Segment Traffic:

Source ID	Length (m)	No. Trucks	Condition
Unpaved_Road	0	200	Unpaved
Paved_Road	4413.4	200	Paved

Emission Factors:

For vehicles traveling on unpaved surfaces at industrial sites, emissions are estimated from the following equation

$E = k\,(s/12)^a \times (W/3)^b$ Industrial Roads (Equation 1a)

size-specific emission factor (E)		lb/VMT (multiply by 281.9 to convert to g/VKT)	
surface material silt content (s)	4.8	%	Table 13.2.2-1, Avg. silt content for Sand and Gravel Processing
mean vehicle weight (W)	27.5	short ton	
surface material moisture content (M)	6.5	%	Table 13.2.2-3, midpoint of range of source conditions
constants (k, a, b)	see below		

For vehicles traveling on paved surfaces, emissions are estimated from the following equation

$E = k \times (sL)^{0.91} \times (W)^{1.02}$

Road surface silt loading (sL)	8.2	g/m^2	Table 13.2.1-3, AP-42
Particle size multiplier (k)	see below		

Unpaved - Industrial Roads - AP-42, 13.2.2			
Constant	**PM**	**PM_{10}**	**$PM_{2.5}$**
k (lb/VMT)	4.9	1.5	0.15
a	0.7	0.9	0.9
b	0.45	0.45	0.45

Paved Roads (Equation 1a) - AP-42, 13.2.1			
	PM	**PM_{10}**	**$PM_{2.5}$**
k (lb/VMT)	0.011	0.0022	0.00054

Emission Factors (E) converted to g/VKT

Emission Source	Road Type	EF Ref.	PM	PM_{10}	$PM_{2.5}$	Units	Controls	Control Efficiency (%)
Unpaved_Road	Unpaved Road	AP-42, 13.2.2	1971	502	50	g/VKT	controlled	75
Paved_Road	Paved Road	AP-42, 13.2.1	618	124	30	g/VKT	controlled	75

* VKT = Vehicle Kilometers Traveled

Emission Rates

Source ID	Road Length (km)	Trucks per Hour	Emission Rates (g/s, 1-hour average)		
			PM	**PM_{10}**	**$PM_{2.5}$**
Unpaved_Road	0.0	17	0.0	0.00	0.000
Paved_Road	4.4	17	3.16	0.632	0.155
Total			3.2	0.63	0.155

Table E8. Emissions from On-site Truck Traffic - Tail Pipe - Alternative 2 Scenario B

Tailpipe emissions from highway truck traffic on on-site roads were estimated based on emission factors from the US EPA MOVES2014b model. Speciation profiles of on road diesel exhaust from MOVES Onroad Technical Reports document were used to estimate the emission rates of individual pollutants. Daily traffic and activities occur over the 11 hour period 6:30am to 6:30pm. The detailed calculations are shown below.

Highway Truck Traffic

Number of Trucks	200	trucks/day
Total travel distance on-site (km)	6	km

this will occur over 11 hours

Road Segment Traffic:

Source ID	Length (m)	Trucks / day	Paved or Unpaved?
Unpaved_Road	0	200	Unpaved
Paved_Road	4413.4	200	Paved

Emission Factors:

The Emission Factors for VOC, PM and NOx were obtained from MOVES2014b model, inventory run for nation region, aggregated all road types and 2021 calendar year. All PM (TSP) was assumed to be PM10.

Emission Factors (E) converted to g/VKT

Emission Source	EF Ref.	PM	PM_{10}	$PM_{2.5}$	NOx	CO	Units
Unpaved_Road	MOVES 2014b Master	1.52E-01	1.52E-01	7.40E-02	1.95E+00	6.12E-01	g/VKT
Paved_Road	MOVES 2014b Master	1.52E-01	1.52E-01	7.40E-02	1.95E+00	6.12E-01	g/VKT

* VKT = Vehicle Kilometers Traveled

Emission Rates

Source ID	Road Length (km)	Trucks per Hour	Emission Rates (g/s, 1-hour average)				
			PM	PM_{10}	$PM_{2.5}$	NOx	CO
Unpaved_Road	0.0	18	0.0000	0.0000	0.0000	0.0000	0.0000
Paved_Road	4.4	18	0.0034	0.0034	0.0016	0.0435	0.0136
		Total	**0.0034**	**0.0034**	**0.0016**	**0.044**	**0.014**

Table E9. Emissions from Working and Construction - Dust

Dust is generated during dumping and handling of waste and cover at the working face, and dumping and handling of construction materials on cells under construction. Dust emissions were estimated from US EPA AP-42, Chapters 13.2.4, Aggregate Handling and Storage Piles, and 11.9 Western Surface Coal Mining.

Quantity of materials Handled

Misc. Fill (Waste materials)			
Unloading rate	3,100	Mg/day	
Operating hours	12	hr/day	
Waste Unloading rate (Misc. Fill)	**0.07**	Mg/s	
Cover:			
Cover rate	310	Mg/day	assuming a 10:1 ratio for waste:cover
Cover Application hours	1	hr/day	
Cover materials- movement rate:	**0.09**	Mg/s	
Clay (Construction materials):			
soil density	1700	kg/m3	
Bucket size	1	m3	
Bucket load	1700	kg	
lifts/min	2	lifts/min	
operating hours	8	hr/day	
Clay movement rate	1632	Mg/day	
Clay movement rate	**0.06**	Mg/s	assumes 30 s/lift; 8 hr/day of continuous work

a) Emissions from material drop (unloading) activities:

E = emission factor (kg/tonnes)

k = particle size multiplier (dimensionless) < 30 µm =	0.74	AP-42 13.2.4
k = particle size multiplier (dimensionless) < 10 µm =	0.35	AP-42 13.2.4
k = particle size multiplier (dimensionless) < 2.5 µm =	0.05	AP-42 13.2.4
U = mean wind speed, meters per second (m/s) =	5	regional wind speed

M = material moisture content (%)

$$E = k\,(0.0016) \times \frac{\left(\frac{U}{2.2}\right)^{1.3}}{(M * 0.5)^{1.4}}$$

Typical moisture contents were obtained from Table 13.2.4-1, Municipal solid waste landfill industries, AP-42, Chapter 13.2.4 Aggregate Handling And Storage Piles. Misc. Fill materials and Clay/Dirt Mix were selected to represent landfill waste materials and construction materials,

Unloading Material		**Moisture Content %**	**EF (kg/Mg)**			**Rating**	**Reference**
			PM	**PM 10**	**PM 2.5**		
			k= 0.74	**k= 0.35**	**k= 0.053**		
Waste (Misc. Fill materials)	Working Face	11.00	3.16E-04	1.50E-04	2.27E-05	A	AP-42 13.2.4
Cover	Working Face	12.00	2.80E-04	1.33E-04	2.01E-05	A	AP-42 13.2.4
Construction Material (Clay/Dirt Mix)	Construction	14.00	2.26E-04	1.07E-04	1.62E-05	A	AP-42 13.2.4

* source: AP-42, Chapter 13.2.4 Aggregate Handling And Storage Piles . Available at: https://www3.epa.gov/ttn/chief/ap42/ch13/final/c13s0204.pdf

Source Description		**Material Movement Rate (Mg/s)**	**Emission Rate (g/s)- 1 hour average**		
			PM	**PM 10**	**PM 2.5**
Unloading Waste materials (Misc. Fill)	Working Face	0.07	0.023	0.011	0.002
Unloading Cover materials (Cover)	Working Face	0.09	0.024	0.011	0.002
Unloading Construction materials (Clay/D	Construction	0.06	0.013	0.006	0.001
		Total	0.060	0.028	0.004

b) Emissions from Bulldozing,Compacting and Construction

Emission factors for bulldozing/compacting and construction activities are estimated using Table 11.9-2 of AP 42, bulldozing of overburden.

		reference:
EF= emission factor of TSP (kg/hr/vehicle)		AP 42 11.9
M = material moisture content (%)		AP-42 13.2.4
S = silt content (%)		AP-42 13.2.4
Scaling factor for PM10	0.75	AP 42 11.9
Scaling factor for PM2.5	0.105	AP 42 11.9

$$EF_{TSP} = 2.6 \times S^{1.2}/M^{1.3}$$

Source Description	**Silt Content %**	**Moisture Content %**	**EF (kg/hr)**	**EF (kg/hr)**	**EF (kg/hr)**	**Rating**	**Reference**
			PM	**PM10**	**PM2.5**		
Bulldozing/Compacting of Waste (Misc. Fi	12	11.00	2.27	1.70	0.24	B,D,D	AP 42 11.9
Bulldozing/Compacting of Cover	9	12.00	1.44	1.08	0.15	B,D,D	AP 42 11.9
Construction of Clay/Dirt Mix	9.2	14.00	1.21	0.90	0.13	B,D,D	AP 42 11.9

* source : AP 42 11.9 Western Surface Coal Mining (epa.gov)

Source Description		**Emission Rate (g/s)**		
		PM	**PM10**	**PM2.5**
Bulldozing/Compacting of Waste (Misc. Fi	Working Face	0.631	0.473	0.066
Bulldozing/Compacting of Cover	Working Face	0.399	0.299	0.042
Construction of Clay/Dirt Mix	Construction	0.335	0.251	0.035
Total		1.365	1.024	0.143

c) Total Emissions from Material Handling (a + b)

Source ID	**Source Description**		**PM Emission Rate (g/s)**		
			PM	**PM10**	**PM2.5**
Working Face	Waste Materials	Working Face	0.653	0.484	0.068
	Cover	Working Face	0.423	0.311	0.044
	Construction Materials (clay)	Construction	0.348	0.257	0.036
		Total	**1.424**	**1.052**	**0.148**

AP42 13.2.4 Aggregate Handling And Storage Piles (epa.gov)
AP 42 11.9 Western Surface Coal Mining (epa.gov)

Table E12. Landfill - Odour

Odour results from handling and placement of fresh waste, and from fugitive emissions of LFG

Odour from LFG
Fugitive, uncontrolled emissions of LFG contribute to odour. Odour emissions due to LFG are estimated based on the Interim Guide to Estimate and Assess Landfill Air Impacts (MOE 1992) default odour emission factor of 10,000 ou/m³ of landfill gas.

Fugitive LFG Emission Rate	0.98	m³/s, See Table E1 for calculation
Odour Emission Factor	10,000	ou/m³ of LFG

Source	Odour Emission Rate (ou/s)
Landfill (Stg1 to Stg4)	**9,759**

Sample Calculation: (LFG)

Emission Rate = LFG Emission Rate (m³/s) x Emission Factor (ou/m³ of LFG)
= 0.98 m³/s x 10,000 (ou/m³)
= 9,759 (ou/s)

Odour from Working Face
Tipping, spreading and compaction of fresh waste contributes to odour emissions. On any given day, the area of exposed fresh waste is relatively small, and estimated at about 3,200m². Estimates of odour emissions from the working face were based on measurements of odour flux from the literature with respect to municipal landfills.

Source	Subject of Measurements	Odour Flux ou/s/m²
Sironi et al. (2005)	freshly tipped waste	59
Longhurst, P. (2007)	freshly tipped refuse	2
Environmental Alliances Pty (2015)	active tipping area	35.6
Card, T.R. et al. (2015)	active face	0.58
	Geometric mean	7.0

* Longhurst reported a range of 1 to 4 ou/s/m²

Near final completion of the landfill (~2045), the working face will be on Cells 1 and 2 of Stage 9 of the landfill.

Emission Source	Approx. Working Area m²	Odour Flux ou/s/m²	Odour Emission Rate ou/s
Working Face	**3,200**	**7.0**	**22,514**

Sample Calculation: (Working Face)

Emission Rate = Exposed Working Area (m²) x Odour Flux (ou/s/m²)
= 3,200 (m²) x 7.0 (ou/s/m²)
= 22,514 (ou/s)

Table E13. Composting Process - Biofilter

Composting of organics generates significant odour emissions. Composting at the facility is done entirely within the compost plant, a closed building maintained under negative pressure. All exhaust from the building is treated in a biofilter for odour control.

Odour emission rate from the biofilter was measured during a compliance source test program in 2010 (Envirosolve Report No. E10004).

An expansion of the plant in 2012 essentially doubled the capacity of the facility. Assuming that odour generated is proportional to production rate, and that odour removal efficiency remains constant, odour emission rate should also double.

Emission Source		**Gas Flow Rate**[1]	**Measured Odour Emission Rate**[2] **(2010)**	**Estimated Odour Emission Rate (post 2012)**
Source	**Cell or Bed**			
		m^3/s	ou/s	ou/s
Biofilter	BF1	17.5	302	603
	BF2	17.5	302	603
	BF3	17.5	302	603
	Total	52.4	905	1,810

References:
1. Rated flow rates provided by GFL via email on 2019-06-17.
2. Odour concentrations from measurements (Envirosolve Reort No. E10004, 2010).

Table E14. Compost Curing - Odour

Compost is cured in windrows on the the compost curing pad. Odour emissions are highest when compost is fresh, and falls off as the compost is cured. Emissions are also affected by seasonal temperature. Measurements of odour flux were made on three windrows by Consumage in March (winter) and June (summer), 2019. For the modelling assessment, odour fluxes for spring and fall were interpolated using the measured data.

Odour Flux

	Seasonal Odour Flux (ou/s/m^2)			
Data source	Measurements	Interpolation	Measurements	Interpolation
Season	Winter	Spring	Summer	Fall
Months	Dec, Jan, Feb	Mar, Apr, May	Jun, July, Aug	Sept, Oct, Nov
Compost age				
Fresh	0.98	15.74	30.49	15.74
1 week old	0.28	4.71	9.15	4.71
3 months old	0.24	0.83	1.42	0.83

Storage piles (typical):	Number of windrows:	12	
	Windrow length:	75	m
	Windrow width:	4.5	m
	Windrow height:	2	m
	Effective surface area of each windrow:	450	m²
	Total effective surface area of all windro	5,399	m²

Curing Odour Emission Rate: Winter

Windrow	Age weeks	Odour Flux ou/s/m²	Interpolated Odour Flux ou/s/m²	Windrow Surface Area m²	Emission Rate ou/s
1	0 (fresh)	0.98		450	441
2	1	0.28		450	124
3	2		0.27	450	122
4	3		0.27	450	121
5	4		0.26	450	119
6	5		0.26	450	117
7	6		0.26	450	116
8	7		0.25	450	114
9	8		0.25	450	113
10	9		0.25	450	111
11	10		0.24	450	110
12	11	0.24		450	108
Total Winter Emission Rate from Curing					**1,715**

Curing Odour Emission Rate: Spring

Windrow	Age weeks	Odour Flux ou/s/m²	Interpolated Odour Flux ou/s/m²	Windrow Surface Area m²	Emission Rate ou/s
1	0 (fresh)	15.74		450	7,079
2	1	4.71		450	2,121
3	2		4.33	450	1,946
4	3		3.94	450	1,771
5	4		3.55	450	1,597
6	5		3.16	450	1,422
7	6		2.77	450	1,247
8	7		2.38	450	1,072
9	8		1.99	450	897
10	9		1.61	450	722
11	10		1.22	450	548
12	11	0.83		450	373
Total Spring Emission Rate from Curing					**20,794**

Curing Odour Emission Rate: Summer

Windrow	Age weeks	Odour Flux ou/s/m²	Interpolated Odour Flux ou/s/m²	Windrow Surface Area m²	Emission Rate ou/s
1	0 (fresh)	30.49		450	13,717
2	1	9.15		450	4,118
3	2		8.38	450	3,770
4	3		7.61	450	3,422
5	4		6.83	450	3,074
6	5		6.06	450	2,726
7	6		5.29	450	2,378
8	7		4.51	450	2,030
9	8		3.74	450	1,682
10	9		2.96	450	1,334
11	10		2.19	450	986
12	11	1.42		450	637
Total Summer Emission Rate from Curing					**39,874**

Curing Odour Emission Rate: Fall

Windrow	Age weeks	Odour Flux ou/s/m²	Interpolated Odour Flux ou/s/m²	Windrow Surface Area m²	Emission Rate ou/s
1	0 (fresh)	15.74		450	7,079
2	1	4.71		450	2,121
3	2		4.33	450	1,946
4	3		3.94	450	1,771
5	4		3.55	450	1,597
6	5		3.16	450	1,422
7	6		2.77	450	1,247
8	7		2.38	450	1,072
9	8		1.99	450	897
10	9		1.61	450	722
11	10		1.22	450	548
12	11	0.83		450	373
Total Fall Emission Rate from Curing					**20,794**

Table E15. Leaf & Yard Waste Stockpiles - Odour

Leaf & yard waste is used as a bulking agent in compost, and is stockpiled outdoors until needed. With age, the stockpiles of organic materials can produce odour. Odour from undisturbed surfaces is low, but odour from freshly disturbed surfaces can be higher. Odour can also be affected by seasonal temperature. Odour flux from undisturbed and freshly disturbed surfaces of the stockpiles was measured by Consumage in March (winter) and June (summer), 2019. For the modelling assessment, odour fluxes for spring and fall were interpolated using the measured data.

Odour Flux

	Seasonal Odour Flux (ou/s/m³)			
Data source	Measurements	Interpolation	Measurements	Interpolation
Seasons	Winter	Spring	Summer	Fall
Months	Dec, Jan, Feb	Mar, Apr, May	Jun, July, Aug	Sept, Oct, Nov
Stockpile surface				
Undisturbed surface	0.52	0.45	0.37	0.45
Freshly disturbed surface	1.31	21.18	41.0	21.18

At time of measurement, there were six stockpiles, each 140m x 8m x 4m high. Of the total surface area, only a small area of fresh surface would be exposed.

Stockpiles piles (typical):	Number of piles:	6	
	Pile length:	140	m
	Pile width:	8	m
	Pile height:	4	m
	Effective surface area per pile:	2,240	m²
	Total surface area of all piles:	13,440	m²
	Total freshly opened surface area:	210	m²

Odour Emission Rate: Winter

Source	Surface Area of Piles m²	Odour Flux ou/s/m²	Total Odour Emission Rate ou/s	Individual Pile Odour Emission Rate ou/s
Freshly disturbed surface	13,440	0.52	7,002	1167
Undisturbed surface	210	1.31	274	46
Total Winter Emission Rate from Stockpiles			**7,277**	**1,213**

Odour Emission Rate: Spring

Source	Surface Area of Piles m²	Odour Flux ou/s/m²	Total Odour Emission Rate ou/s	Individual Pile Odour Emission Rate ou/s
Freshly disturbed surface	13,440	0.45	5,988	998
Undisturbed surface	210	21.18	4,447	741
Total Spring Emission Rate from Stockpiles			**10,434**	**1,739**

Odour Emission Rate: Summer

Source	Surface Area of Piles m²	Odour Flux ou/s/m²	Total Odour Emission Rate ou/s	Individual Pile Odour Emission Rate ou/s
Freshly disturbed surface	13,440	0.37	4,973	829
Undisturbed surface	210	41.04	8,619	1437
Total Summer Emission Rate from Stockpiles			**13,592**	**2,265**

Odour Emission Rate: Fall

Source	Surface Area of Piles m²	Odour Flux ou/s/m²	Total Odour Emission Rate ou/s	Individual Pile Odour Emission Rate ou/s
Freshly disturbed surface	13,440	0.45	5,988	998
Undisturbed surface	210	21.18	4,447	741
Total Fall Emission Rate from Stockpiles			**10,434**	**1,739**