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Landfill Expansion Emission Summary and Dispersion Modelling Report

St. Marys Future Solid Waste Disposal Needs Environmental Assessment

Town of St. Marys

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Definitions

St. Marys	Town of St. Marys
Site	1221 Water St. South, St. Marys, Ontario
AAQC	Ontario's Ambient Air Quality Criteria
BPIP	Building Profile Input Program – Part of the AERMOD air dispersion model
BMPP	Best Management Practice Plan
The ADMGO	"Air Dispersion Modelling Guideline for Ontario", PIBS: 5165e
CA	Composting Area
CAS#	Chemical Abstract Society reference number
CO	Carbon Monoxide
EC	Engineering Calculation
EF	Emission Factor
ESDM	Emissions Summary and Dispersion Model
g	Gram
h	Hour
Insignificant	Negligible
List of MOECC POI Limits	Schedule 3 of "SUMMARY of STANDARDS and GUIDELINES to support Ontario Regulation 419: Air Pollution – Local Air Quality (including Schedule 6 of O. Reg. 419 on UPPER RISK THRESHOLDS)" Dated April 2012, PIBS: 6569e01 And "Jurisdictional Screening Level (JSL) List, A Screening Tool for Ontario Regulation 419: Air Pollution – Local Air Quality", 6547e.pdf dated February 2008.
JSL	"Jurisdictional Screening Level (JSL) List, A Screening Tool for Ontario Regulation 419: Air Pollution – Local Air Quality", 6547e.pdf dated February 2008.
kg	Metric kilograms
km	Metric kilometre
lb	US pound
LFG	Landfill Gas
LST	Leachate Storage Tank
m	Metric metre
m^2	Metric square metre
m^3	Metric cubic metre
MB	Mass Balance

MOECC	Ontario Ministry of the Environment and Climate Change
mol	Moles
NAD83	North American Datum of 1983 used for UTM coordinates
NOx	Nitrogen Oxides
OU	Odour Unit – 1 OU = concentration at which 50 % of the population can detect an odour
PM	Particulate Matter
PM10	Particulate Matter with an aerodynamic diameter of 10 µm or less
PM2.5	Particulate Matter with an aerodynamic diameter of 2.5 µm or less
ppm	Parts per million
ppmv	Parts per million by volume
POI	Point of Impingement (Contaminant)
Products of Combustion	Contaminants emitted as a result of burning natural gas
s	Second
Significant	Non-negligible
Source ID	The alphanumeric string assigned to a discharge point otherwise known as a “source reference number” in the “Acme Example” PIBS: 5987e.pdf.
ST	Stockpile
ton	US ton = 2200 pounds
tonne	Metric tonne = 1000 kg
TSP	Total Suspended Particulate
UTM	Universal Transverse Mercator
VMT	Vehicle Mile Travelled
VKT	Vehicle Kilometre Travelled
VOC	Volatile Organic Compound
WF	Working Face
WS	Perth Road 123/Water Street

Executive Summary

The Town of St. Marys (St. Marys) operates a landfill, composting and public drop-off facility at 1221 Water St. South, St. Marys, Ontario (the "Site"). The Site is owned by St. Marys. The Site is located in an area zoned for extractive industrial and environmental constraint. The main processes are waste transfer, landfilling and composting.

This Emission Summary and Dispersion Modelling ("ESDM") report was prepared to assess the emissions currently being emitted by the Site and how those emissions will be different under the various *Alternative Methods* for the expansion of the landfill. St. Marys has compared all their emissions modelling results against AAQCs and Schedule 3 or JSL as appropriate.

The Site is expected to emit vehicle products of combustion, odour, and particulate matter (PM).

The maximum Point of Impingement (POI) concentrations were calculated based on the operating conditions where all significant sources are operating simultaneously at their individual maximum rates of production.

An estimated POI concentration for each significant contaminant emitted from the Site is based on the calculated emission rates and the output from the Air Dispersion Model; the results are presented in the Emissions Summary Tables (E4-1 through E4-4).

The POI concentrations listed in the Emissions Summary Table were compared against the Ontario Ambient Air Quality Criteria (AAQC), "SUMMARY of STANDARDS and GUIDELINES to support Ontario Regulation 419: Air Pollution – Local Air Quality (including Schedule 6 of O. Reg. 419 on UPPER RISK THRESHOLDS)" dated April 2012, PIBS: 6569e01 and "Jurisdictional Screening Level (JSL) List, A Screening Tool for Ontario Regulation 419: Air Pollution – Local Air Quality", PIBS: 6547e (List of MOECC POI Limits).

Of the contaminants listed in Tables E4-1 through E4-4 that have limits in the List of Ministry POI Limits, all the predicted POI concentrations are below the corresponding limits. For example, the 24 hour POI concentration for particulate matter (PM) is 114.5 µg/m3 at 95.4 % of the AAQC of 120 µg/m3. The next highest contaminant is the 1-hour nitrogen oxides (10102-44-0) at 91.1 % in Alternative Method 3.

1.0 Introduction and Site Description

This Emission Summary and Dispersion Modelling (ESDM) report was prepared to assess the impact of the current operation and five Alternative Methods proposed for landfill expansion.

For ease of review and to promote clarity, this ESDM report is structured to correspond to each of the items listed in the MOECC's ESDM Report Checklist.

1.1 Purpose and Scope of the ESDM Report

This ESDM report was prepared to assess the impact of the current operation and five Alternative Methods proposed for landfill expansion.

Town of St. Marys (St. Marys) operates a landfill, composting and public drop-off facility at 1221 Water St. South, St. Marys, Ontario

The Site is located in an area zoned for extractive industrial and environmental constraint.

The location of the Site is presented in Figure E1 – Site Location Plan and the land use designation of the Site and surrounding area is presented in Figure E2 – Land Use Zoning Designation Plan. The location of the discharges from each of the sources is presented in Figure E3 – Emission Points; the location of each source is labelled with the Source ID.

1.2 Description of Processes and NAICS Code

St. Marys operates a solid waste management facility at the site. The main processes are waste transfer, landfilling and composting. Many of these activities are performed continuously at the Site but some may be intermittent. The frequency of intermittent activities depends on necessity. See also Section 1.5.

The NAICS codes that apply to this facility are 562210 Waste treatment and disposal and 325314 Mixed fertilizer manufacturing. The NAICS industry group 5622 is listed in Schedule 5.

1.3 Description of Products and Raw Materials

Segregated waste is accepted at the site and directed to the appropriate disposal area (i.e., public drop-off depot, to the composting area, or for landfilling).

The main sources of contaminant emissions are dust from roads and landfill operations, products of combustion from diesel engines, and odour from garbage, compost, and the closed portions of the landfill.

Product usages and process information are provided in greater detail in Appendix EA – Supporting Calculations. Refer to Table E1 – Sources and Contaminants Identification Table, which tabulates the individual sources of emissions at the Site.

1.4 Process Flow Diagram

Since landfill operations are well known, process flow diagrams were not produced.

1.5 Operating Schedule

The landfill currently operates Tuesday, Wednesday, Friday between the hours of 8:00 a.m. and 4:30 p.m; and Saturday between the hours of 8:00 a.m. and 12:30 p.m.

Since odours and landfill gas are emitted continuously, the modelling assumes that the Site operates 24 hours a day, 7 days a week, all year.

2.0 Initial Identification of Sources and Contaminants

This section provides an initial identification of all of the sources and the contaminants emitted from the Site as required by sub paragraphs 2 to 4 of s.26 (1) of O. Reg. 419.

2.1 Sources and Contaminants Identification Table

Table E1 – Sources and Contaminants Identification Table tabulates all the emission sources at the Site, for example, EA-09 – Working face is identified as a source. Table E1 provides the details about all the sources.

The expected contaminants emitted from each source are also identified in Table E1; for example, the expected contaminants emitted from EA-09 – Working face are identified as Particulate, Landfill Gas (LFG), and Odour. Each of the identified sources has been assigned a Source ID, for example the Working Face source has been identified as "WF".

The location of each discharge point is presented in Figure E3 –Emission Points; the discharge point is labelled with its Source ID.

3.0 Assessment of the Significance of Contaminants and Sources

This section provides an explanation for each source and contaminant identified in Table E1 – Sources and Contaminants Identification Table. Of the processes listed on Table E1 all have been identified as significant. For example, EA-09 – Working Face is considered a significant process. These significant processes are included in the dispersion modelling for the Site.

3.1 Identification of Negligible Contaminants and Sources

Emission rate calculations and dispersion modelling have not been performed for emissions from negligible sources or for the emission of negligible contaminants from significant sources.

Table E1 lists all sources of emissions at the Site. Each emission point is identified as either significant or negligible. For example, Working Face (WF) has been labelled as significant and Leachate Storage Tank (LST) has been labelled as insignificant. The significant sources will be included in the dispersion modelling for the Site. The second section of the table lists the emission points. If a process listed in the first section results in emissions from a point listed in the second section, the “Rate / Rational” column will indicate the process that exhausts through this point. Otherwise the maximum emission is listed in this column.

All significant contaminants are listed in Table E4-1 through E4-4.

4.0 Operating Conditions, Emissions Estimating and Data Quality Emissions

This section provides a description of the operating conditions used in the calculation of the emission estimates and an assessment of the data quality of the emission estimates for each significant contaminant from the Site.

4.1 Description of Operating Conditions

As noted in Section 1.2, The NAICS codes that apply to this facility are 562210 Waste treatment and disposal and 325314 Mixed fertilizer manufacturing.

Section 10 of O. Reg. 419 states “A scenario that assumes operating conditions for the Facility that would result, for the relevant contaminant, in the highest concentration of the contaminant at a point of impingement that the Facility is capable of.” The operating condition described in this ESDM Report meets this requirement.

The averaging time for the operating condition is 10-minute, 1-hour, 24 hours, and annual as appropriate. The operating condition used for this Site that results in the maximum concentration at a POI is the scenario where all significant sources are operating simultaneously at their individual maximum rates of production. The individual maximum rates of production for each significant source of emissions correspond to the maximum emission rate during any 24 hour period. The individual maximum rates of production for each significant source of emissions are explicitly described in Appendix EA – Supporting Calculations.

The assessment of all operating conditions included transient, start-up, shut-down and continuous operation modes. Continuous operation is expected to provide the largest POI concentration estimate so that method is used as the basis of calculations in this assessment.

4.2 Explanation of the Method Used to Calculate Emission Rates

The maximum emission rates for each significant contaminant emitted from the significant sources were calculated.

The emission rate for each significant contaminant emitted from a significant source was estimated and the methodology for the calculation is documented in Table E2-1 through E2-4 – Source Summary Table. For example, the emission of Nitrogen Oxides was calculated using an emission factor (EF) technique.

4.3 Sample Calculations

The technical rationale, including sample calculations, required to substantiate the emission rates presented in Table E2-1 through E2-4 – Source Summary Table is documented in Appendix EA – Supporting Calculations.

4.4 Assessment of Data Quality

This section provides a description of the assessment of the data quality of the emission estimates for each significant contaminant from the Site.

The assessment of data quality of the emission rate estimates for each significant contaminant emitted from significant sources was performed. For example, the EF technique used to calculate the emissions from WF is based on the USEPA Tier 3 specification for Non-Road diesel engines. The data quality of that emission factor is "A" which is equivalent to the MOECC data Quality of "Above-Average".

Therefore, the emission rate estimate is not likely to be an underestimate of the actual emission rate and use of these emission rates will result in a calculated concentration at a POI greater than the actual concentrations. This source was documented as having a Data Quality of "Above-Average".

For each contaminant, the emission rate was estimated and the data quality of the estimate is documented in Table E2-1 through E2-4 – Source Summary Table. The assessment of data quality for each type of source listed in Table E2-1 through E2-4 is documented in Appendix EA – Supporting Calculations.

All the emission rates listed in Table E2-1 through E2-4 are documented as having between Above-Average and Marginal Data Quality and correspond to the operating scenario where all significant sources are operating simultaneously at their individual maximum rates averaged over the appropriate averaging time for that contaminant. Therefore, the emission rate estimates listed in Table E2-1 through E2-4 are not likely to be an underestimate of the actual emission rates and use of those emission rates will result in a calculated POI concentration greater than the actual concentrations.

5.0 Source Summary Table and Site Plan

5.1 Source Summary Table

The emission rate estimates for each source of significant contaminants are documented in Table E2-1 through E2-4 – Source Summary Table.

For each source of significant contaminants the following parameters are referenced:

- Contaminant name
- Chemical Abstract Society (CAS) reference number
- Source ID
- Source description
- Stack parameters (flow rate, exhaust temperature, diameter, height above grade, height above roof)
- Location referenced to a Cartesian coordinate system presented on Figure E3 – Site Plan and Roof Diagram
- Averaging period
- Emission estimating technique
- Estimation of data quality
- Percentage of overall emission

5.2 Site Plan

The locations of the emission sources listed in Table E2-1 through E2-4 – Source Summary Table are presented in Figure E3 –Emission Points; the location of each of the sources is specified with the Source ID. The location of the property line is indicated on Figure E3, with the end points of each section of the property line clearly referenced to a Cartesian coordinate system.

The location of each source is referenced to this Cartesian coordinate system under a column in Table E2-1 through E2-4 – Source Summary Table.

The heights of the structures that are part of the Site are labelled as “H” in Figure E3 – Roof Plan with Emission Points.

6.0 Dispersion Modelling

This section provides a description of how the dispersion modelling was conducted at the Site to calculate the maximum concentration at a POI.

Dispersion modelling was completed in accordance with the MOECC's "Air Dispersion Modelling Guideline for Ontario" PIBS 5165e (ADMGO). A general description of the input data used in the dispersion model is provided below and summarized in Table E3.

Since the AAQC, and Schedule 3 standards of O. Reg. 419/05 have been used, the modelled impact of contaminant emissions are assessed as 10-minute, one-hour, 24-hour, and annual maximum POI concentrations. The appropriate model to assess the maximum POI impact is the USEPA AERMOD model. The following dispersion model and pre-processors were used in the assessment:

- AERMOD dispersion model (v. AERMOD_MPI_Lakes_14134)
- AERMAP surface pre-processor (v. AERMAP_EPA_14134)
- BPIP building downwash pre-processor (v. 0474)

MOECC provided site specific meteorological data based on AERMOD v14134 was used for this assessment.

There is no child care facility, senior's residence, health care facility, long-term care facility, or educational facility located at the Site and no other tenant at the Site. As such, same structure contamination was not considered.

6.1 Meteorology and Land Use Data

A land use zoning plan is provided on Figure E2 – Land Use Zoning Designation Plan. Figure E2 also illustrates the extent of the Site property boundary and provides the zoning of adjacent land uses. The Site is located in an area partially zoned for Extractive Industrial and partially for Environmental Constraint. The area north and east of the site is zoned for Extractive Industrial. The area west of the site is zoned as agricultural. The area south of the site is zoned as Mineral Aggregate Resources and is currently used for agriculture.

The MOECC provided site specific meteorological datasets for use with dispersion modelling using AERMOD. The meteorological data covers the dates from January 1, 2009 to December 31, 2013. The hourly data includes many factors which affect the dispersion of air contaminants including wind speed, wind direction, temperature, ceiling height, and atmospheric stability. Based on the provided data, an average wind speed at the station is 3.98 m/s. The dominant wind direction is west. Wind rose depicting the

relative frequency of wind directions including wind speeds is provided in Figure E4 – Wind Rose.

6.2 Coordinate System

The Universal Transverse Mercator (UTM) coordinate system, as per Section 5.2.2 of the ADGMO, was used to specify model object sources, buildings, and receptors. All coordinates were defined in the North American Datum of 1983 (NAD83).

All source, building, and property line coordinates are shown in Figure E3 with exact coordinates in Table EC-1 (see Appendix EC).

6.3 Terrain

Section 16 of O. Reg. 419/05 sets out when terrain must be considered. In this assessment, terrain elevation contour data was downloaded from Ontario Digital Elevation Model Data set and processed using the AERMOD terrain processor AERMAP. AERMAP determines base terrain elevation using the DEM data for all sources, receptors and buildings, and provides the user with a suitable input file for use with AERMOD.

6.4 Dispersion Modelling Input Summary Table

A description of the way in which the approved dispersion model was performed is included in Table E3 – Dispersion Modelling Input Summary Table. This table follows the format provided in the ESDM Procedure Document.

The Site was modelled as area and line-volume sources, with the release height based on the equipment heights and the location of those sources. A summary of the AERMOD source input parameters is provided in Table E2-1 and E2-2. Property Boundary locations are listed in Table EC-1 found in Appendix EC. The location of all emission points are shown in Figure E3 – Emission Points. The location of the property-line in relation to the dispersion modelling sources is also presented in Figure E3 – Emission Points. To be conservative, the modelling assumed the property boundary was restricted to the major parcel of land upon which the landfill is located. As a result, the small parcel in the northwest corner is modelled as if it is not part of the landfill.

The emission rates used are at least as high as the maximum emission rate that the source of contaminant is reasonably capable of for the relevant contaminant. These emission rates are further described in Appendix EA – Supporting Calculations. A summary of the modelled emission rates for each point source is provided in Tables E2-1 and E2-2.

6.5 Building Downwash

The only buildings on site are small. They do not significantly impact dispersion so the USEPA Building Profile Input Program (BPIP) was not used.

6.6 Deposition

AERMOD has the capability to account for wet and dry deposition of substances that would reduce airborne concentrations. The deposition algorithm in the AERMOD model was not used for this assessment and therefore the predicted modelled POI concentrations are considered to be conservative.

6.7 Averaging Time and Conversions

The shortest time scale that AERMOD predicts is a 1-hour average value. AAQCs and Schedule 3 standards of O.Reg. 419/05 are being applied to this Site. Many of these standards are based on 1-hour and 24 hour averaging times, which are averaging times that are easily provided by AERMOD. In cases where a standard has an averaging period of less than 1-hour (e.g. 10 minutes for odour), a conversion to the appropriate averaging period was completed using the MOECC recommended conversion factors, as documented in the ADMGO.

6.8 Area of Modelling Coverage

Receptors were chosen based on recommendations provided in Section 7.1 of the ADGMO, which is in accordance with s.14 of O. Reg. 419/05. Specifically, a nested receptor grid, generally centred on the building, was placed as follows:

A bounding box was created that encompasses all the sources at the Site.
20 m spacing within 200 m of the edge of the bounding box;
50 m spacing from 200 m to 500 m;
100 m spacing from 500 to 1000 m;
200 m spacing from 1000 to 2000 m; and
500 m spacing from 2000 m to 5000 m.

In addition to using the nested grid, receptors were placed every 10 m along the property boundary. No receptors were placed inside the Site's property line.

Closest sensitive receptors were identified from aerial photographs and are summarized in table below:

Type	Name & Address	Direction
Residence	1025 Water Street South	West
Residence	1774 Water Street South	West
Residence	1827 Water Street South	West
Residence	4461 3 Line	West
Residence	1646 Perth Road 123	West
Residence	1579 Perth Road 123	West

6.9 Dispersion Modelling Input and Output Files

The information entered into the approved dispersion model is recorded in Appendix EC. AERMOD dispersion model data of all the contaminants is provided in electronic form on the CD in Appendix EC. As an illustration, a copy of the contour plot and the model output file for the contaminant Odour is also contained in Appendix EC.

7.0 Modelling Results

7.1 Emissions Summary Table

A POI concentration for each significant contaminant emitted from the Site was calculated based on the emission rates listed in Table E2 – Source Summary Table and the output from the approved dispersion model presented in Appendix EC. The results are presented in Table E4 – Emissions Summary Table. For each source of significant contaminants the following parameters are referenced:

- Contaminant name
- Chemical Abstract Society (CAS) reference number
- Total Site emission rate
- Approved dispersion model used
- Max POI concentration
- Averaging period for the dispersion modelling
- MOECC POI limit
- Indication of the limiting effect
- Schedule in O. Reg. 419/05, andThe percentage of standard or indication of the likelihood of an adverse effect.

The POI concentrations listed in Table E4 – Emission Summary Table are the highest concentrations calculated by the model with meteorological anomalies removed from consideration where noted. The POI concentrations listed in the Emissions Summary Table were compared against the Ontario Ambient Air Quality Criteria (AAQC), "SUMMARY of STANDARDS and GUIDELINES to support Ontario Regulation 419: Air Pollution – Local Air Quality (including Schedule 6 of O. Reg. 419 on UPPER RISK THRESHOLDS)" dated April 2012, PIBS: 6569e01 and "Jurisdictional Screening Level (JSL) List, A Screening Tool for Ontario Regulation 419: Air Pollution – Local Air Quality", PIBS: 6547e (List of MOECC POI Limits).

Of the contaminants listed in Tables E4-1 through E4-4 that have limits in the List of Ministry POI Limits, all the predicted POI concentrations are below the corresponding limits. For example, the 24 hour POI concentration for particulate matter (PM) is 114.5 µg/m3 at 95.4 % of the AAQC of 120 µg/m3. The next highest contaminant is the 1-hour nitrogen oxides (10102-44-0) at 91.1 % in Alternative Method 3.

7.2 Comparison of Alternative Methods

	Method	Description
1	Vertical Expansion of the Existing Landfill	This Method involves an expansion in the vertical direction within the existing footprint of the landfill.
2	Horizontal Expansion of the Existing Landfill	This involves an expansion outside of the existing landfill footprint.
3	A Combination of Vertical and Horizontal Expansion	This Method would involve partial vertical expansion along with some horizontal expansion of the landfill footprint, basically a mixture of Methods 1 and 2.
4	Development of a new landfill footprint at the site	This Method involves closure of the existing footprint and development of a new landfill footprint elsewhere on the site property
5	Vertical Expansion plus a new footprint	This option involves a combination of Methods 1 and 4.

The current situation and five Alternative Methods of landfill expansion are assessed in this report. In each case, the worst case impact was selected for investigation. The choice means that there are substantial periods of time when the activity will be substantially less than modelled and/or that activity will be further from the receptors than modelled so the impacts will be less than predicted.

The Current situation and Alternative Method 1 have the same worst case scenario so the modelling and results indicated as “Current” are the same as “Alternative Method 1”.

Similarly, “Alternative Method 5” has the same worst case scenario as “Alternative Method 3” and so was not modelled separately.

There are four categories of contaminants being emitted by the facility: nitrogen oxides, particulate matter, volatile organics, and odour.

Nitrogen oxides (NOx) are created as byproducts of combustion. They are created by the diesel engines of the vehicles on site. As expected, the largest source of those emissions is the vehicles that work at the facility.

Particulate matter is generated as byproducts of combustion and also road dust. The roads are the source of the majority of the emissions. The site has a Best Management Practice Plan (BMPP) to ensure that the road dust is kept to acceptable levels.

Landfills emit small amounts of a wide variety of volatile contaminants. The modelling indicates that the impact of these contaminants is below their various criteria. The contaminant with the largest off-property concentration is carbon monoxide at 0.9 % of the AAQC of 36,200 µg/m^3 under all Alternative Methods. The second highest concentration is vinyl chloride at 0.1 % of the Schedule 3 limit of 1.0 µg/m^3.

The most obvious emission from landfills is odour. Since odour is only an issue where people are there to smell it, the values along Perth Road 123 are the values of significance. The highest modelled concentration of odour is 99.4 OU; however, the highest modelled concentration of odour where people are expected to be is 10 OU along Perth Road 123. There is no published criterion for odour in general. A goal of the ministry is that the odour level be below 1 OU. As mentioned previously, while the values in this report are adequate for comparison between Alternative Methods, the absolute values need to be considered carefully. The most realistic method of assessing odours as they compare to the model is to compare the current simulation to observed impacts (see Section 9.2 below).

7.3 Nitrogen Oxides

All the modelled scenarios of the St. Marys Landfill emissions show compliance with the NOx criteria. Alternative Method 3 (and 5) is the closest to the limit for the 1-hour period and required outliers to be removed to show compliance. The highest off-property impact is created under Alternative Method 3 and the contaminant with the highest off-property concentration is nitrogen oxides (NOx) under the 1-hour averaging period, so that contour plot is shown in Figure E5: Nitrogen Oxides, Alternative Method 3, 1-hour.

The highest off-property impacts (1-hour basis) range from 86.5 % to 91.1 % as shown in Tables E4-1 through E4-4 and summarized in Table E5. The 24-hour and annual impacts are all lower even though they are modelled as if the worst case 1-hour occurs every hour of the day.

Note that the AAQC for nitrogen dioxide is used but the emissions assume that all nitrogen oxides are emitted as nitrogen dioxide rather than assuming that some of the emission is as nitrogen oxide. This treatment is more conservative than it needs to be.

7.4 Particulate Matter

All the modelled scenarios show compliance with the Particulate criteria. Alternative Methods 3 and 5 are the closest to the limit.

The highest off-property impacts (24-hour basis) for total particulate matter range from 93.9 % to 95.4 % as shown in Tables E4-1 through E4-4 and summarized in Table E5. The annual impacts are all lower. PM10 and PM2.5 also have lower impacts.

7.5 VOCs

All the Alternative Methods show values far below criteria for these contaminants so none of the alternatives is any better than the other with respect to this contaminant.

The highest off-property impacts (24-hour basis) are all 0.1 % of criterion or less as shown in Tables E4-1 through E4-4 and summarized in Table E5.

7.6 Odour

Odour is typically the most contentious issue for residents surrounding landfills so more detail has been provided on this topic than the others. Figures E6 through E9 show the impact under the Current and Alternative Methods 2 through 4. As mentioned previously, the modelled scenario is the worst case which corresponds to the landfill filling the section closest to Perth Road 123/Water St. S.

The currently modelled values show off-property concentrations that may predict a few complaints a year. This appears to be confirmed by the odour complaints received in 2014 and 2015, as discussed later.

The Current scenario, being the same as Alternative Method 1, is shown in Figure E6: Odour Contours – Current/Method 1. The majority of the odour impacts are east of the site where people are not expected to be impacted. The area with the highest impact where people are expected to be is on Perth Road 123.

Alternative Method 2 (see Figure E7: Odour Contours - Alternative Method 2) shows the eastern odour impact move north to the St. Marys Cement property because the compost area moved in that direction. The affected area on Perth Road 123 is reduced from the current situation.

Alternative Methods 3 and 5 (see Figure E8: Odour Contours - Alternative Method 3 and 5) shows the eastern odour impact move north to the St. Marys Cement property because the compost area moved in that direction. The affected area on Perth Road 123 is the same as the current situation.

Alternative Method 4 (see Figure E9: Odour Contours - Alternative Method 4) shows the eastern odour impact is unchanged because the compost area was not moved. The affected area on Perth Road 123 is slightly larger as the working face is slightly closer to the property line.

Given the accuracy of the odour model, discussed below, all the Alternative Methods appear to have the same impact as the current situation.

8.0 Combined Impacts

To assess the combined impact of the contributions from both the local road, Perth Road 123, and the closest MOECC monitoring station, Stratford. Since the emissions are very conservative, the modelling is conservative, and the 90th Percentile values from the other local sources are all conservative values. The presented impact is much greater than that would be expected in reality.

Table E4-1 through E4-4 shows the maximum off-property impact of each contaminant. Two estimates of the background concentration are provided for comparison. The first value is the 90th percentile value recorded from measurements at the MOECC monitoring station in Stratford, ON. The second value is the modelled emissions from Perth Road 123 using standard emission rates calculated on Table EA-01: Off-Site Vehicle Emissions.

The following observations can be made about the presented data:

- There is no measured concentration of the VOCs so those values are unchanged from the landfill models. Since all the contaminants were less than 1 % of their respective criteria, these contaminants are not considered significant at this site.
- The nitrogen oxide concentration from the MOECC monitoring station accounts for approximately 10 % of the 1-hour AAQC and 20 % of the 24-hour AACQ. Despite this, the current scenario and all the alternative methods show that the worst case-off property concentration is below criteria.
- The MOECC measured particulate concentration is over 80 % of the criterion without any local contribution.
- The Alternative methods are less than the current situation but within 2 % of the current impact so they can be considered to be no worse than the current situation.

St. Marys Cement is also a significant source of particulate matter but the facility emissions are over 500 m from the northern most residence (1774 Water Street South) and over 750 m to the most impacted area near 1827 Water Street South.

9.0 Other Discussion

9.1 Conservative Assumptions

- The purpose of this Environmental Assessment is to determine the environmental impact of the proposed alternatives over the next 40 years in which the landfill could operate. In each case, the worst possible off-property impact was selected to ensure that the operation will meet criteria throughout its life. Many of the impacts appear to be close to the limit but the reader is encouraged to remember that the modelling was done in a very conservative manner. These conservative choices are:
- In general, the worst case hour is assumed to occur every hour of the day for contaminants with a 1-hour averaging period.
- Contaminants generated by on-site equipment are assumed to operate at the worst case hour for the entire work day.
- The operations are located at the closest point to Perth Road 123 that they will ever be in the 40 years the landfill operates.
- The composting area is assumed to have emissions 10 times the emission from the garbage; however, the Site only composts leaf and yard wastes so this assumption is very conservative. Expected odours are likely to be less than those from the landfill.
- The results reported from the model are the worst values in 5 years of modelled data.
- The results reported from the model are at the point where they are highest which is usually on the property boundary of the landfill property. The roadway (Perth Road 123) east of the landfill sees substantially lower concentrations than the property boundary 20 m away or more.
- The background values provided for comparison are the 90th percentile values which mean that the actual values are lower 9 times out of 10.
- Another proposal currently being considered by St. Marys is the option to change the traffic flow on Site. If the flow is redesigned, the dust emission will reduce significantly because the dust generated by vehicles travelling on the Site will be reduced substantially, by design. The entrance portion of the road is a significant length and so generates a significant amount of dust, it is also located close to the property boundary and so the dispersion from this source is limited before it leaves the property. The potential redesign of the traffic flow was not modelled to ensure that all the alternatives modelled in this report match all the other reports prepared as part of this environmental assessment and because the timing of the redesign is not clear.

9.2 Odour Complaints

Odour complaints have been received 9 times in the last three years[2]. They appear to occur after wet weather (wet site conditions) followed by winds from the east or north-east. Staff at the landfill indicate that the working face has been moving west over the last three years. As the working face moves closer to the receptors, the impact may increase. The current working face is 175 m to 200 m from the nearest sensitive receptor (immediately south of POR02).

Given the correlation between rain and wind direction, Burnside and the Town believe that the recent odour complaints, and future issues, can be solved through operational practises; improving grading at the tipping face, compaction of the waste, minimizing the open tipping area, and careful cover placement at the end of each operating day. St. Marys strives to operate their landfill in a manner that avoids all complaints.

9.3 Odour Model Accuracy

The odour model shows the highest impact near the south-east corner of the property as is expected with the highest odour emission being estimated from the compost area. Along Perth Road 123, the model predicts a maximum impact of approximately 10 OU.

An odour concentration of 1 OU is defined as the concentration at which half the population is able to detect (but not identify) the odour. 10 OU is then 10 times that level so you would take 1 volume of air and mix it with 9 volumes of clean air to get to a level where half the population can detect an odour. Because odour is not a normal linear relationship to chemical concentration, comparison to strength of the odour is difficult. For instance, if a sample were assessed to have an odour content of 10 OU, it is possible that if the sample were mixed with an equal volume of clean air, that mixture would be assessed to have an odour content of 8 OU. It is equally possible that that mixture would be assessed to have an odour content of 3 OU or 5 OU.

Complaints would be expected at odour levels similar to the modelled values (10 OU). As a result, it is believed that the results of the model are acceptable for comparison purposes. The absolute value may not be completely accurate but the level predicted under the current case can reasonably be compared to the levels in the Alternative Methods.

[2] 2013 – 1 complaint from resident on Line 3, odour
2014 – 2 complaints from residents on Perth Road 123, odour
2015 – 6 complaints from 2 residents on Perth Road 123 (5 directly from residents, 1 via MOECC) – all odour related

10.0 Conclusions

The emission rate estimates for each source of significant contaminants are documented in Tables EA-01 through EA-07. All the emission rates listed correspond to the operating scenario where all sources are operating simultaneously at their individual maximum rates of production. Therefore, these emission rate estimates are not likely to be an underestimate of the actual emission rates.

A POI concentration for each contaminant emitted from the Site was calculated based on the calculated emission rates and the output from the model; the results are presented in Table E4-1 through E4-4 for each Alternative Method.

The POI concentrations listed in the Emissions Summary Table were compared against the Ontario Ambient Air Quality Criteria (AAQC), "SUMMARY of STANDARDS and GUIDELINES to support Ontario Regulation 419: Air Pollution – Local Air Quality (including Schedule 6 of O. Reg. 419 on UPPER RISK THRESHOLDS)" dated April 2012, PIBS: 6569e01 and "Jurisdictional Screening Level (JSL) List, A Screening Tool for Ontario Regulation 419: Air Pollution – Local Air Quality", PIBS: 6547e (List of MOECC POI Limits).

The various alternatives when modelled present impacts which are the same or slightly better than the current conditions. Given that the Alternative Methods all show the worst case in 40 years, the results indicate that any impacts as a result of the expanded landfill will be no worse than the current filling operations within Cell 8.

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Tables

Table E1:
Sources and Contaminants Identification Table

Source Information			Expected Contaminants	Significant		Costing Assignment			
Process ID	Unit Name	Stack IDs	Contaminants	Yes or No?	Rate / Rationale	Contaminant Cost Code	Contaminant Cost Group	Noise Cost Code	Noise Cost Group
EA-01	Water St. Municipal Road	WS	NOx, CO, Particulate	No	Separate Model				
EA-02	AB - On-site road to scale	TRKAB	NOx, CO, Particulate	Yes	9.235 E-02 g/s				
EA-03	BC -On-site road to truck dump place	TRKBC	NOx, CO, Particulate	Yes	4.523 E-03 g/s				
EA-04	BD - On-site road to drop off area	TRKBD	NOx, CO, Particulate	Yes	3.141 E-02 g/s				
EA-05	DE - On-site road Drop off to stock pile	TRKDE	NOx, CO, Particulate	Yes	1.886 E-03 g/s				
EA-06	EF - On-site road to stock pile	TRKEF	NOx, CO, Particulate	Yes	2.491 E-03 g/s				
EA-07	EH - On-stie road to composting area	TRKEH	NOx, CO, Particulate	Yes	9.247 E-03 g/s				
EA-08	Stockpile	ST	Particulate	Yes	7.841 E-08 g/s				
EA-09	Working face	WF	Particulate, Odour	Yes	1.817 E00 OU/s				
EA-10	Composting area	CA	Particulate, Odour	Yes	1.651 E01 OU/s				
EA-11	Landfill Gas	ACL	LFG	Yes	1.328 E-06 g/s				
EA-12	Working Face Engines	CMPTR	NOx, CO, Particulate	Yes	6.490 E-02 g/s				

Source ID	Source Description	General Location	Contaminants	Yes or No?	Rate / Rationale	Contaminant Cost Code	Contaminant Cost Group	Noise Cost Code	Noise Cost Group
ACL	Active Covered Landfill Area	South Centre	LFG	Yes	See EA-11				
CA	Composting area	East side		Yes					
CMPTR	Compactor 1986 CAT 816D	West side	CO, NOx, Particulate	Yes	See EA-12				
ECL	Exhausted Covered Landfill Area	Cntre		No	No Emissions				
LDR	Loader 2013 CAT 938K	West side		No	CMPTR more conservative				
LST	Leachate storage tank			No	Not used anymore				
ST	Stockpile	Centre		Yes					
TRKAB	AB - On-site road to scale	West side	CO, NOx, Particulate	Yes	See EA-02				
TRKBC	BC -On-site road to truck dump place	North side	CO, NOx, Particulate	Yes	See EA-03				
TRKBD	BD - On-site road to drop off area	North west side	CO, NOx, Particulate	Yes	See EA-04				
TRKDE	DE - On-site road Drop off to stock pile	North side	CO, NOx, Particulate	Yes	See EA-05				
TRKEF	EF - On-site road to stock pile	North & east sides	CO, NOx, Particulate	Yes	See EA-06				
TRKEH	EH - On-stie road to composting area	North & east sides	CO, NOx, Particulate	Yes	See EA-07				
WF	Working face	West side	Odour, Particulate	Yes	See EA-09				
WS	Water St	West of site	CO, NOx, Particulate	Yes	See EA-01				

MSDS	Supplier	Product	Contaminants	Yes or No?	Rate / Rationale
2	Vehicles	Nitrogen oxides		Yes	
3	Vehicles	Carbon Monoxide		Yes	
4	Vehicles / Dust	TSP		Yes	
5	Vehicles / Dust	PM10		Yes	
6	Vehicles / Dust	PM2.5		Yes	
7	Landfill Gas	Methane		Yes	
8	Landfill Gas	Carbon Dioxide		Yes	
9	Landfill Gas	Vinyl Chloride		Yes	
10	Landfill Gas	Odour		Yes	
11	Landfill Gas	Chlorobenzene - HAP/VOC		Yes	
12	Landfill Gas	Dichlorofluoromethane - VOC		Yes	
13	Landfill Gas	Dimethyl sulfide (methyl sulfide) - VOC		Yes	

Source Summary Table by Contaminant

CAS	Contaminant Name	Averaging Period (h)	Source ID	Description	Emission Temperature (K)	Stack Location X	Stack Location Y	Estimation Method	Accuracy	Emission Rate (g/s)	Percent of total Emission (%)
0-02-2	PM10	24	CA	Composting area	293.15	487745.062	4787018.8	EF	Marginal	1.854E-09	0.00%
			CMPTR	Compactor 1986 CAT 816D	293.15	487266.43	4787065.72	EF	Average	0.0016398	3.55%
			ST	Stockpile	293.15	487412.63	4786999.02	EF	Average	3.709E-08	0.00%
			TRKAB	AB - On-site road to scale	293.15	487190.032	4786890.06	EF	Average	0.0294622	63.75%
			TRKBC	BC -On-site road to truck dump place	293.15	487221.018	4787130.06	EF	Average	0.0012477	2.70%
			TRKBD	BD - On-site road to drop off area	293.15	487222.349	4787123.14	EF	Average	0.0101071	21.87%
			TRKDE	DE - On-site road Drop off to stock pile	293.15	487409.272	4787155.86	EF	Average	0.0005244	1.13%
			TRKEF	EF - On-site road to stock pile	293.15	487463.903	4787104.88	EF	Average	0.0006926	1.50%
			TRKEH	EH - On-stie road to composting area	293.15	487474.524	4787101.69	EF	Average	0.0025445	5.51%
			WF	Working face	293.15	487266.43	4787065.72	EF	Average	8.69E-08	0.00%
0-03-3	PM2.5	24	CA	Composting area	293.15	487745.062	4787018.8	EF	Marginal	2.807E-10	0.00%
			CMPTR	Compactor 1986 CAT 816D	293.15	487266.43	4787065.72	EF	Average	0.0016398	12.60%
			ST	Stockpile	293.15	487412.63	4786999.02	EF	Average	5.616E-09	0.00%
			TRKAB	AB - On-site road to scale	293.15	487190.032	4786890.06	EF	Average	0.0079514	61.10%
			TRKBC	BC -On-site road to truck dump place	293.15	487221.018	4787130.06	EF	Average	0.0001546	1.19%
			TRKBD	BD - On-site road to drop off area	293.15	487222.349	4787123.14	EF	Average	0.0027975	21.50%
			TRKDE	DE - On-site road Drop off to stock pile	293.15	487409.272	4787155.86	EF	Average	6.967E-05	0.54%
			TRKEF	EF - On-site road to stock pile	293.15	487463.903	4787104.88	EF	Average	9.202E-05	0.71%
			TRKEH	EH - On-stie road to composting area	293.15	487474.524	4787101.69	EF	Average	0.0003087	2.37%
			WF	Working face	293.15	487266.43	4787065.72	EF	Average	1.316E-08	0.00%
0-04-4	Odour	0.1667	CA	Composting area	293.15	487745.062	4787018.8	EF	Marginal	16.514219	90.09%
			WF	Working face	293.15	487266.43	4787065.72	EF	Average	1.8165641	9.91%
74-82-8	Methane	24	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	4.842E-07	100.00%
75-01-4	Vinyl chloride	24	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	2.754E-11	100.00%
75-18-3	dimethyl sulphide	0.1667	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	2.926E-11	100.00%
75-43-4	Dichlorofluoromethane	24	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	1.615E-11	100.00%
108-90-7	Chlorobenzene	1	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	1.699E-12	100.00%
124-38-9	Carbon Dioxide	24	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	1.328E-06	100.00%
630-08-0	Carbon monoxide	1	CMPTR	Compactor 1986 CAT 816D	293.15	487266.43	4787065.72	EF	Average	0.0567906	51.93%
			TRKAB	AB - On-site road to scale	293.15	487190.032	4786890.06	EF	Average	0.0337729	30.88%
			TRKBC	BC -On-site road to truck dump place	293.15	487221.018	4787130.06	EF	Average	0.0002111	0.19%
			TRKBD	BD - On-site road to drop off area	293.15	487222.349	4787123.14	EF	Average	0.0173134	15.83%
			TRKDE	DE - On-site road Drop off to stock pile	293.15	487409.272	4787155.86	EF	Average	0.0001754	0.16%
			TRKEF	EF - On-site road to stock pile	293.15	487463.903	4787104.88	EF	Average	0.0002317	0.21%
			TRKEH	EH - On-stie road to composting area	293.15	487474.524	4787101.69	EF	Average	0.0008637	0.79%
10102-44-0	Nitrogen oxides	24	CMPTR	Compactor 1986 CAT 816D	293.15	487266.43	4787065.72	EF	Average	0.0649035	68.96%
			TRKAB	AB - On-site road to scale	293.15	487190.032	4786890.06	EF	Average	0.016623	17.66%
			TRKBC	BC -On-site road to truck dump place	293.15	487221.018	4787130.06	EF	Average	0.0005799	0.62%
			TRKBD	BD - On-site road to drop off area	293.15	487222.349	4787123.14	EF	Average	0.0085216	9.05%
			TRKDE	DE - On-site road Drop off to stock pile	293.15	487409.272	4787155.86	EF	Average	0.000482	0.51%
			TRKEF	EF - On-site road to stock pile	293.15	487463.903	4787104.88	EF	Average	0.0006366	0.68%
			TRKEH	EH - On-stie road to composting area	293.15	487474.524	4787101.69	EF	Average	0.0023731	2.52%
PM	Total particulate matter	24	CA	Composting area	293.15	487745.062	4787018.8	EF	Marginal	3.919E-09	0.00%
			CMPTR	Compactor 1986 CAT 816D	293.15	487266.43	4787065.72	EF	Average	0.0016398	1.14%
			ST	Stockpile	293.15	487412.63	4786999.02	EF	Average	7.841E-08	0.00%
			TRKAB	AB - On-site road to scale	293.15	487190.032	4786890.06	EF	Average	0.0923454	64.33%
			TRKBC	BC -On-site road to truck dump place	293.15	487221.018	4787130.06	EF	Average	0.0045234	3.15%
			TRKBD	BD - On-site road to drop off area	293.15	487222.349	4787123.14	EF	Average	0.031407	21.88%
			TRKDE	DE - On-site road Drop off to stock pile	293.15	487409.272	4787155.86	EF	Average	0.0018858	1.31%
			TRKEF	EF - On-site road to stock pile	293.15	487463.903	4787104.88	EF	Average	0.0024906	1.74%
			TRKEH	EH - On-stie road to composting area	293.15	487474.524	4787101.69	EF	Average	0.0092465	6.44%
			WF	Working face	293.15	487266.43	4787065.72	EF	Average	1.837E-07	0.00%

Source Summary Table by Contaminant

CAS	Contaminant Name	Averaging Period (h)	Source ID	Description	Emission Temperature (K)	Stack Location X	Stack Location Y	Estimation Method	Accuracy	Emission Rate (g/s)	Percent of total Emission (%)
0-02-2	PM10	24	CA	Composting area	293.15	487745.062	4787018.8	EF	Marginal	1.854E-09	0.00%
			CMPTR	Compactor 1986 CAT 816D	293.15	487266.43	4787065.72	EF	Average	0.0016398	2.68%
			ST	Stockpile	293.15	487412.63	4786999.02	EF	Average	3.709E-08	0.00%
			TRKAB	AB - On-site road to scale	293.15	487190.032	4786890.06	EF	Average	0.0294622	48.11%
			TRKBC	BC -On-site road to truck dump place	293.15	487221.018	4787130.06	EF	Average	0.0033422	5.46%
			TRKBD	BD - On-site road to drop off area	293.15	487222.349	4787123.14	EF	Average	0.0220308	35.97%
			TRKDE	DE - On-site road Drop off to stock pile	293.15	487409.272	4787155.86	EF	Average	0.0014837	2.42%
			TRKEF	EF - On-site road to stock pile	293.15	487463.903	4787104.88	EF	Average	0.0013515	2.21%
			TRKEH	EH - On-stie road to composting area	293.15	487474.524	4787101.69	EF	Average	0.0019292	3.15%
			WF	Working face	293.15	487266.43	4787065.72	EF	Average	8.69E-08	0.00%
0-03-3	PM2.5	24	CA	Composting area	293.15	487745.062	4787018.8	EF	Marginal	2.807E-10	0.00%
			CMPTR	Compactor 1986 CAT 816D	293.15	487266.43	4787065.72	EF	Average	0.0016398	9.81%
			ST	Stockpile	293.15	487412.63	4786999.02	EF	Average	5.616E-09	0.00%
			TRKAB	AB - On-site road to scale	293.15	487190.032	4786890.06	EF	Average	0.0079514	47.57%
			TRKBC	BC -On-site road to truck dump place	293.15	487221.018	4787130.06	EF	Average	0.0004142	2.48%
			TRKBD	BD - On-site road to drop off area	293.15	487222.349	4787123.14	EF	Average	0.0060979	36.48%
			TRKDE	DE - On-site road Drop off to stock pile	293.15	487409.272	4787155.86	EF	Average	0.0001971	1.18%
			TRKEF	EF - On-site road to stock pile	293.15	487463.903	4787104.88	EF	Average	0.0001795	1.07%
			TRKEH	EH - On-stie road to composting area	293.15	487474.524	4787101.69	EF	Average	0.0002341	1.40%
			WF	Working face	293.15	487266.43	4787065.72	EF	Average	1.316E-08	0.00%
0-04-4	Odour	0.1667	CA	Composting area	293.15	487745.062	4787018.8	EF	Marginal	16.514219	90.09%
			WF	Working face	293.15	487266.43	4787065.72	EF	Average	1.8165641	9.91%
74-82-8	Methane	24	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	4.842E-07	100.00%
75-01-4	Vinyl chloride	24	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	2.754E-11	100.00%
75-18-3	dimethyl sulphide	0.1667	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	2.926E-11	100.00%
75-43-4	Dichlorofluoromethane	24	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	1.615E-11	100.00%
108-90-7	Chlorobenzene	1	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	1.699E-12	100.00%
124-38-9	Carbon Dioxide	24	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	1.328E-06	100.00%
630-08-0	Carbon monoxide	1	CMPTR	Compactor 1986 CAT 816D	293.15	487266.43	4787065.72	EF	Average	0.0567906	43.53%
			TRKAB	AB - On-site road to scale	293.15	487190.032	4786890.06	EF	Average	0.0337729	25.89%
			TRKBC	BC -On-site road to truck dump place	293.15	487221.018	4787130.06	EF	Average	0.0005654	0.43%
			TRKBD	BD - On-site road to drop off area	293.15	487222.349	4787123.14	EF	Average	0.0377384	28.92%
			TRKDE	DE - On-site road Drop off to stock pile	293.15	487409.272	4787155.86	EF	Average	0.0004963	0.38%
			TRKEF	EF - On-site road to stock pile	293.15	487463.903	4787104.88	EF	Average	0.0004521	0.35%
			TRKEH	EH - On-stie road to composting area	293.15	487474.524	4787101.69	EF	Average	0.0006548	0.50%
10102-44-0	Nitrogen oxides	24	CMPTR	Compactor 1986 CAT 816D	293.15	487266.43	4787065.72	EF	Average	0.0649035	61.20%
			TRKAB	AB - On-site road to scale	293.15	487190.032	4786890.06	EF	Average	0.016623	15.67%
			TRKBC	BC -On-site road to truck dump place	293.15	487221.018	4787130.06	EF	Average	0.0015535	1.46%
			TRKBD	BD - On-site road to drop off area	293.15	487222.349	4787123.14	EF	Average	0.0185748	17.51%
			TRKDE	DE - On-site road Drop off to stock pile	293.15	487409.272	4787155.86	EF	Average	0.0013638	1.29%
			TRKEF	EF - On-site road to stock pile	293.15	487463.903	4787104.88	EF	Average	0.0012422	1.17%
			TRKEH	EH - On-stie road to composting area	293.15	487474.524	4787101.69	EF	Average	0.0017992	1.70%
PM	Total particulate matter	24	CA	Composting area	293.15	487745.062	4787018.8	EF	Marginal	3.919E-09	0.00%
			CMPTR	Compactor 1986 CAT 816D	293.15	487266.43	4787065.72	EF	Average	0.0016398	0.86%
			ST	Stockpile	293.15	487412.63	4786999.02	EF	Average	7.841E-08	0.00%
			TRKAB	AB - On-site road to scale	293.15	487190.032	4786890.06	EF	Average	0.0923454	48.16%
			TRKBC	BC -On-site road to truck dump place	293.15	487221.018	4787130.06	EF	Average	0.0121168	6.32%
			TRKBD	BD - On-site road to drop off area	293.15	487222.349	4787123.14	EF	Average	0.0684587	35.70%
			TRKDE	DE - On-site road Drop off to stock pile	293.15	487409.272	4787155.86	EF	Average	0.0053352	2.78%
			TRKEF	EF - On-site road to stock pile	293.15	487463.903	4787104.88	EF	Average	0.0048598	2.53%
			TRKEH	EH - On-stie road to composting area	293.15	487474.524	4787101.69	EF	Average	0.0070105	3.66%
			WF	Working face	293.15	487266.43	4787065.72	EF	Average	1.837E-07	0.00%

Source Summary Table by Contaminant

CAS	Contaminant Name	Averaging Period (h)	Source ID	Description	Emission Temperature (K)	Stack Location X	Stack Location Y	Estimation Method	Accuracy	Emission Rate (g/s)	Percent of total Emission (%)
0-02-2	PM10	24	CA	Composting area	293.15	487745.062	4787018.8	EF	Marginal	1.854E-09	0.00%
			CMPTR	Compactor 1986 CAT 816D	293.15	487266.43	4787065.72	EF	Average	0.0016398	3.79%
			ST	Stockpile	293.15	487412.63	4786999.02	EF	Average	3.709E-08	0.00%
			TRKAB	AB - On-site road to scale	293.15	487190.032	4786890.06	EF	Average	0.0294622	68.12%
			TRKBC	BC -On-site road to truck dump place	293.15	487221.018	4787130.06	EF	Average	0.0009921	2.29%
			TRKBD	BD - On-site road to drop off area	293.15	487222.349	4787123.14	EF	Average	0.0067012	15.49%
			TRKDE	DE - On-site road Drop off to stock pile	293.15	487409.272	4787155.86	EF	Average	0.0010187	2.36%
			TRKEF	EF - On-site road to stock pile	293.15	487463.903	4787104.88	EF	Average	0.0018796	4.35%
			TRKEH	EH - On-stie road to composting area	293.15	487474.524	4787101.69	EF	Average	0.0015549	3.60%
			WF	Working face	293.15	487266.43	4787065.72	EF	Average	8.69E-08	0.00%
0-03-3	PM2.5	24	CA	Composting area	293.15	487745.062	4787018.8	EF	Marginal	2.807E-10	0.00%
			CMPTR	Compactor 1986 CAT 816D	293.15	487266.43	4787065.72	EF	Average	0.0016398	13.50%
			ST	Stockpile	293.15	487412.63	4786999.02	EF	Average	5.616E-09	0.00%
			TRKAB	AB - On-site road to scale	293.15	487190.032	4786890.06	EF	Average	0.0079514	65.48%
			TRKBC	BC -On-site road to truck dump place	293.15	487221.018	4787130.06	EF	Average	0.0001229	1.01%
			TRKBD	BD - On-site road to drop off area	293.15	487222.349	4787123.14	EF	Average	0.0018548	15.27%
			TRKDE	DE - On-site road Drop off to stock pile	293.15	487409.272	4787155.86	EF	Average	0.0001353	1.11%
			TRKEF	EF - On-site road to stock pile	293.15	487463.903	4787104.88	EF	Average	0.0002497	2.06%
			TRKEH	EH - On-stie road to composting area	293.15	487474.524	4787101.69	EF	Average	0.0001887	1.55%
			WF	Working face	293.15	487266.43	4787065.72	EF	Average	1.316E-08	0.00%
0-04-4	Odour	0.1667	CA	Composting area	293.15	487745.062	4787018.8	EF	Marginal	16.514219	90.09%
			WF	Working face	293.15	487266.43	4787065.72	EF	Average	1.8165641	9.91%
74-82-8	Methane	24	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	4.842E-07	100.00%
75-01-4	Vinyl chloride	24	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	2.754E-11	100.00%
75-18-3	dimethyl sulphide	0.1667	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	2.926E-11	100.00%
75-43-4	Dichlorofluoromethane	24	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	1.615E-11	100.00%
108-90-7	Chlorobenzene	1	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	1.699E-12	100.00%
124-38-9	Carbon Dioxide	24	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	1.328E-06	100.00%
630-08-0	Carbon monoxide	1	CMPTR	Compactor 1986 CAT 816D	293.15	487266.43	4787065.72	EF	Average	0.0567906	54.76%
			TRKAB	AB - On-site road to scale	293.15	487190.032	4786890.06	EF	Average	0.0337729	32.57%
			TRKBC	BC -On-site road to truck dump place	293.15	487221.018	4787130.06	EF	Average	0.0001678	0.16%
			TRKBD	BD - On-site road to drop off area	293.15	487222.349	4787123.14	EF	Average	0.011479	11.07%
			TRKDE	DE - On-site road Drop off to stock pile	293.15	487409.272	4787155.86	EF	Average	0.0003408	0.33%
			TRKEF	EF - On-site road to stock pile	293.15	487463.903	4787104.88	EF	Average	0.0006288	0.61%
			TRKEH	EH - On-stie road to composting area	293.15	487474.524	4787101.69	EF	Average	0.0005278	0.51%
10102-44-0	Nitrogen oxides	24	CMPTR	Compactor 1986 CAT 816D	293.15	487266.43	4787065.72	EF	Average	0.0649035	37.51%
			TRKAB	AB - On-site road to scale	293.15	487190.032	4786890.06	EF	Average	0.016623	9.61%
			TRKBC	BC -On-site road to truck dump place	293.15	487221.018	4787130.06	EF	Average	0.0008637	0.50%
			TRKBD	BD - On-site road to drop off area	293.15	487222.349	4787123.14	EF	Average	0.0649035	37.51%
			TRKDE	DE - On-site road Drop off to stock pile	293.15	487409.272	4787155.86	EF	Average	0.016623	9.61%
			TRKEF	EF - On-site road to stock pile	293.15	487463.903	4787104.88	EF	Average	0.0005799	0.34%
			TRKEH	EH - On-stie road to composting area	293.15	487474.524	4787101.69	EF	Average	0.0085216	4.93%
PM	Total particulate matter	24	CA	Composting area	293.15	487745.062	4787018.8	EF	Marginal	3.919E-09	0.00%
			CMPTR	Compactor 1986 CAT 816D	293.15	487266.43	4787065.72	EF	Average	0.0016398	1.22%
			ST	Stockpile	293.15	487412.63	4786999.02	EF	Average	7.841E-08	0.00%
			TRKAB	AB - On-site road to scale	293.15	487190.032	4786890.06	EF	Average	0.0923454	68.67%
			TRKBC	BC -On-site road to truck dump place	293.15	487221.018	4787130.06	EF	Average	0.0035966	2.67%
			TRKBD	BD - On-site road to drop off area	293.15	487222.349	4787123.14	EF	Average	0.0208233	15.48%
			TRKDE	DE - On-site road Drop off to stock pile	293.15	487409.272	4787155.86	EF	Average	0.0036633	2.72%
			TRKEF	EF - On-site road to stock pile	293.15	487463.903	4787104.88	EF	Average	0.0067588	5.03%
			TRKEH	EH - On-stie road to composting area	293.15	487474.524	4787101.69	EF	Average	0.0056505	4.20%
			WF	Working face	293.15	487266.43	4787065.72	EF	Average	1.837E-07	0.00%

Source Summary Table by Contaminant

CAS	Contaminant Name	Averaging Period (h)	Source ID	Description	Emission Temperature (K)	Stack Location X	Stack Location Y	Estimation Method	Accuracy	Emission Rate (g/s)	Percent of total Emission (%)
0-02-2	PM10	24	CA	Composting area	293.15	487745.062	4787018.8	EF	Marginal	1.854E-09	0.00%
			CMPTR	Compactor 1986 CAT 816D	293.15	487266.43	4787065.72	EF	Average	0.0016398	3.45%
			ST	Stockpile	293.15	487412.63	4786999.02	EF	Average	3.709E-08	0.00%
			TRKAB	AB - On-site road to scale	293.15	487190.032	4786890.06	EF	Average	0.0294622	62.05%
			TRKBC	BC -On-site road to truck dump place	293.15	487221.018	4787130.06	EF	Average	0.0006798	1.43%
			TRKBD	BD - On-site road to drop off area	293.15	487222.349	4787123.14	EF	Average	0.0109711	23.11%
			TRKDE	DE - On-site road Drop off to stock pile	293.15	487409.272	4787155.86	EF	Average	0.0018208	3.83%
			TRKEF	EF - On-site road to stock pile	293.15	487463.903	4787104.88	EF	Average	0.0013353	2.81%
			TRKEH	EH - On-stie road to composting area	293.15	487474.524	4787101.69	EF	Average	0.0015694	3.31%
			WF	Working face	293.15	487266.43	4787065.72	EF	Average	8.69E-08	0.00%
0-03-3	PM2.5	24	CA	Composting area	293.15	487745.062	4787018.8	EF	Marginal	2.807E-10	0.00%
			CMPTR	Compactor 1986 CAT 816D	293.15	487266.43	4787065.72	EF	Average	0.0016398	12.31%
			ST	Stockpile	293.15	487412.63	4786999.02	EF	Average	5.616E-09	0.00%
			TRKAB	AB - On-site road to scale	293.15	487190.032	4786890.06	EF	Average	0.0079514	59.69%
			TRKBC	BC -On-site road to truck dump place	293.15	487221.018	4787130.06	EF	Average	8.424E-05	0.63%
			TRKBD	BD - On-site road to drop off area	293.15	487222.349	4787123.14	EF	Average	0.0030367	22.79%
			TRKDE	DE - On-site road Drop off to stock pile	293.15	487409.272	4787155.86	EF	Average	0.0002419	1.82%
			TRKEF	EF - On-site road to stock pile	293.15	487463.903	4787104.88	EF	Average	0.0001774	1.33%
			TRKEH	EH - On-stie road to composting area	293.15	487474.524	4787101.69	EF	Average	0.0001904	1.43%
			WF	Working face	293.15	487266.43	4787065.72	EF	Average	1.316E-08	0.00%
0-04-4	Odour	0.1667	CA	Composting area	293.15	487745.062	4787018.8	EF	Marginal	16.514219	90.09%
			WF	Working face	293.15	487266.43	4787065.72	EF	Average	1.8165641	9.91%
74-82-8	Methane	24	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	4.842E-07	100.00%
75-01-4	Vinyl chloride	24	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	2.754E-11	100.00%
75-18-3	dimethyl sulphide	0.1667	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	2.926E-11	100.00%
75-43-4	Dichlorofluoromethane	24	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	1.615E-11	100.00%
108-90-7	Chlorobenzene	1	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	1.699E-12	100.00%
124-38-9	Carbon Dioxide	24	ACL	Active Covered Landfill Area	293.15	487301.43	4786958.14	EC	Marginal	1.328E-06	100.00%
630-08-0	Carbon monoxide	1	CMPTR	Compactor 1986 CAT 816D	293.15	487266.43	4787065.72	EF	Average	0.0567906	51.13%
			TRKAB	AB - On-site road to scale	293.15	487190.032	4786890.06	EF	Average	0.0337729	30.41%
			TRKBC	BC -On-site road to truck dump place	293.15	487221.018	4787130.06	EF	Average	0.000115	0.10%
			TRKBD	BD - On-site road to drop off area	293.15	487222.349	4787123.14	EF	Average	0.0187933	16.92%
			TRKDE	DE - On-site road Drop off to stock pile	293.15	487409.272	4787155.86	EF	Average	0.0006091	0.55%
			TRKEF	EF - On-site road to stock pile	293.15	487463.903	4787104.88	EF	Average	0.0004467	0.40%
			TRKEH	EH - On-stie road to composting area	293.15	487474.524	4787101.69	EF	Average	0.0005327	0.48%
10102-44-0	Nitrogen oxides	24	CMPTR	Compactor 1986 CAT 816D	293.15	487266.43	4787065.72	EF	Average	0.0649035	67.99%
			TRKAB	AB - On-site road to scale	293.15	487190.032	4786890.06	EF	Average	0.016623	17.41%
			TRKBC	BC -On-site road to truck dump place	293.15	487221.018	4787130.06	EF	Average	0.000316	0.33%
			TRKBD	BD - On-site road to drop off area	293.15	487222.349	4787123.14	EF	Average	0.0092501	9.69%
			TRKDE	DE - On-site road Drop off to stock pile	293.15	487409.272	4787155.86	EF	Average	0.0016737	1.75%
			TRKEF	EF - On-site road to stock pile	293.15	487463.903	4787104.88	EF	Average	0.0012274	1.29%
			TRKEH	EH - On-stie road to composting area	293.15	487474.524	4787101.69	EF	Average	0.0014637	1.53%
PM	Total particulate matter	24	CA	Composting area	293.15	487745.062	4787018.8	EF	Marginal	3.919E-09	0.00%
			CMPTR	Compactor 1986 CAT 816D	293.15	487266.43	4787065.72	EF	Average	0.0016398	1.11%
			ST	Stockpile	293.15	487412.63	4786999.02	EF	Average	7.841E-08	0.00%
			TRKAB	AB - On-site road to scale	293.15	487190.032	4786890.06	EF	Average	0.0923454	62.57%
			TRKBC	BC -On-site road to truck dump place	293.15	487221.018	4787130.06	EF	Average	0.0024644	1.67%
			TRKBD	BD - On-site road to drop off area	293.15	487222.349	4787123.14	EF	Average	0.0340917	23.10%
			TRKDE	DE - On-site road Drop off to stock pile	293.15	487409.272	4787155.86	EF	Average	0.0065475	4.44%
			TRKEF	EF - On-site road to stock pile	293.15	487463.903	4787104.88	EF	Average	0.0048017	3.25%
			TRKEH	EH - On-stie road to composting area	293.15	487474.524	4787101.69	EF	Average	0.0057031	3.86%
			WF	Working face	293.15	487266.43	4787065.72	EF	Average	1.837E-07	0.00%

Table E3:
Dispersion Modeling Input Summary Table
(Rev1)

Relevant Section of the Regulation	Section Title	Description of How the Approved Dispersion Model Was Used
Section 6	Air Dispersion Model(s)	Site Specific Met Data by MOECC v14134 AERMET v14134 (incl. in Met Data) BPIP v. 0474 AERMAP v11103 AERMOD version 14134.
Section 8	Negligible sources	The sources deemed negligible are discussed in Section 3 and Appendix EB.
Section 9	Same Structure contamination	Not applicable.
Section 10	Operating Conditions	See Section 4 and Appendix EA of the Application
Section 11	Source of Contaminant Emission rates	See Section 3 and Appendix EA of the Application
Section 12	Combined effect of Assumptions for Operating Conditions and Emission Rates	Not applicable (no values exceed their respective criterion)
Section 13	Meteorological Conditions	The Preprocessed Site-Specific Meteorological Data provided by the MOECC (AERMOD v14134) was used.
Section 14	Area of Modelling Coverage	The entire grid specified by Section 14 of O.Reg.419/05 is used.
Section 15	Stack Height for Certain New Sources of Contaminant	No stack heights in this model (actual or modelled) exceed the restiction in Section 15 of O.Reg 419/05
Section 16	Terrain Data	Terrain elevation contour data used was downloaded from the MOECC website http://www.applications.ene.gov.on.ca/archive/dem/index.html
Section 17	Averaging Periods	Emission rates were calculated based on averaging periods that matched the averaging period of the respective AAQC or other criterion. See Section 6.7, Appendix EA and Appendix EC.

Table E4-1:
Emissions Summary Table - Current

CAS#	Contaminant	Total Emission Rate (g/s)	Max POI Value (µg/m³)	Location of		Averaging Period of Criterion (h)	Max POI Value Converted to Criterion Period (µg/m³)	Criteria (µg/m³)	Limiting Effect	Regulation Schedule #	Percentage of Criteria or Likelihood of adverse effect (%)	90th Percentile MOE Background (µg/m3)	Maximum Water St Modelled Background (µg/m³)	Maximum Impact (µg/m3)	Maximum Impact (%)
				X (m)	Y (m)										
0-04-4	Odour	18.3307828	99.3616	487760	4786974	0.1667	99.4							99.36	
74-82-8	Methane	4.8418E-07	18.859251	487546	4786941	24	18.9							18.86	
75-01-4	Vinyl chloride	2.7544E-11	0.00107288	487546	4786941	24	0.0	1	Health	Schedule 3	0.1%			0.00	0.1%
75-01-4	Vinyl chloride	2.7544E-11	0.00010554	487516	4786937	8760	0.0	0.2	Health	Schedule 3	0.1%			0.00	0.1%
75-18-3	dimethyl sulphide	2.9257E-11	0.002916	487565	4786944	0.1667	0.0	30	Odour	Guideline	0.0%			0.00	0.0%
75-43-4	Dichlorofluoromethane	1.6155E-11	0.00062925	487546	4786941	24	0.0				Neg			0.00	
108-90-7	Chlorobenzene	1.6988E-12	0.00016932	487565	4786944	0.1667	0.0	4500	Odour	Guideline	0.0%			0.00	0.0%
108-90-7	Chlorobenzene	1.6988E-12	0.00016932	487565	4786944	1	0.0	3500	Health	Guideline	0.0%			0.00	0.0%
124-38-9	Carbon Dioxide	1.3285E-06	51.745358	487546	4786941	24	51.7	21000	JSL	JSL	0.2%			51.75	0.2%
630-08-0	Carbon monoxide	0.1093588	325.522797	487171	4787073	1	325.5	36200	Health	AAQC	0.9%		68.81	394.33	1.1%
10102-44-0	Nitrogen oxides	0.09411988	349.58078	487171	4787073	1	349.6	400	Health	AAQC	87.4%	39.48	116.13	505.19	116.4%
10102-44-0	Nitrogen oxides	0.09411988	94.665428	487171	4787073	24	94.7	200	Health	AAQC	47.3%	36.58	29.18	160.43	65.6%
10102-44-0	Nitrogen oxides	0.09411988	12.838228	487172	4787063	8760	12.8	60	Health	AAQC	21.4%		0.50	13.34	22.2%
0-03-3	PM2.5	0.01301389	10.225765	487160	4787141	24	10.2	27		AAQC 2020	37.9%	24.36	2.39	36.98	128.1%
0-03-3	PM2.5	0.01301389	1.785585	487166	4787102	8760	1.8	8.8		AAQC 2020	20.3%		1.88	3.66	41.6%
0-02-2	PM10	0.04621861	36.817577	487160	4787141	24	36.8	50		AAQC	73.6%	45.11	8.90	90.84	163.9%
PM	Total particulate matter	0.14353897	114.512917	487160	4787141	24	114.5	120	Particulate	AAQC	95.4%	81.21	45.23	240.95	163.1%
PM	Total particulate matter	0.14353897	19.634407	487165	4787112	8760	19.6	60	Particulate	AAQC	32.7%		9.54	29.17	48.6%

1. PM10 and PM 90th Percentile values calculated from PM2.5 concentrations using ratios provided in Ramona Lali, Michaela Kendall, Kazuhiko Ito, and George D. Thurston, "Estimation of historical annual PM2.5 exposures for health effects assessments ", Atmospheric Environment, Volume 38, Issue 31, October 2004, Pages 5217-5226

Table E4-2:
Emissions Summary Table - Alternative Method 2

CAS#	Contaminant	Total Emission Rate (g/s)	Max POI Value (µg/m³)	Location of		Averaging Period of Criterion (h)	Max POI Value Converted to Criterion Period (µg/m³)	Criteria (µg/m³)	Limiting Effect	Regulation Schedule #	Percentage of Criteria or Likelihood of adverse effect (%)	90th Percentile MOE Background (µg/m3)	Maximum Water St Modelled Background (µg/m³)	Maximum Impact (µg/m3)	Maximum Impact (%)
				X (m)	Y (m)										
0-04-4	Odour	18.3307828	86.28549	487731	4787390	0.1667	86.3							86.29	
74-82-8	Methane	4.8418E-07	10.794784	487224	4787375	24	10.8							10.79	
75-01-4	Vinyl chloride	2.7544E-11	0.000614105	487224	4787375	24	0.0	1	Health	Schedule 3	0.1%			0.00	0.1%
75-01-4	Vinyl chloride	2.7544E-11	4.11519E-05	487198	4787336	8760	0.0	0.2	Health	Schedule 3	0.0%			0.00	0.0%
75-18-3	dimethyl sulphide	2.9257E-11	0.002786	487208	4787351	0.1667	0.0	30	Odour	Guideline	0.0%			0.00	0.0%
75-43-4	Dichlorofluoromethane	1.6155E-11	0.000360174	487224	4787375	24	0.0				Neg			0.00	
108-90-7	Chlorobenzene	1.6988E-12	0.000161766	487208	4787351	0.1667	0.0	4500	Odour	Guideline	0.0%			0.00	0.0%
108-90-7	Chlorobenzene	1.6988E-12	0.000161766	487208	4787351	1	0.0	3500	Health	Guideline	0.0%			0.00	0.0%
124-38-9	Carbon Dioxide	1.3285E-06	29.61846	487224	4787375	24	29.6	21000	JSL	JSL	0.1%			29.62	0.1%
630-08-0	Carbon monoxide	0.1093588	324.360565	487171	4787073	1	324.4	36200	Health	AAQC	0.9%		68.81	393.17	1.1%
10102-44-0	Nitrogen oxides	0.09411988	345.948883	487171	4787073	1	345.9	400	Health	AAQC	86.5%	39.48	116.13	501.55	115.5%
10102-44-0	Nitrogen oxides	0.09411988	92.246864	487171	4787073	24	92.2	200	Health	AAQC	46.1%	36.58	29.18	158.01	64.4%
10102-44-0	Nitrogen oxides	0.09411988	12.690555	487172	4787063	8760	12.7	60	Health	AAQC	21.2%		0.50	13.19	22.0%
0-03-3	PM2.5	0.01301389	9.786778	487240	4786894	24	9.8	27		AAQC 2020	36.2%	24.36	2.39	36.54	126.5%
0-03-3	PM2.5	0.01301389	1.739999	487161	4787131	8760	1.7	8.8		AAQC 2020	19.8%		1.88	3.62	41.1%
0-02-2	PM10	0.04621861	36.012573	487240	4786894	24	36.0	50		AAQC	72.0%	45.11	8.90	90.03	162.3%
PM	Total particulate matter	0.14353897	112.687958	487240	4786894	24	112.7	120	Particulate	AAQC	93.9%	81.21	45.23	239.12	161.6%
PM	Total particulate matter	0.14353897	19.593458	487161	4787131	8760	19.6	60	Particulate	AAQC	32.7%		9.54	29.13	48.6%

1. PM10 and PM 90th Percentile values calculated from PM2.5 concentrations using ratios provided in Ramona Lali, Michaela Kendall, Kazuhiko Ito, and George D. Thurston, "Estimation of historical annual PM2.5 exposures for health effects assessments ", Atmospheric Environment, Volume 38, Issue 31, October 2004, Pages 5217-5226

CAS#	Contaminant	Total Emission Rate (g/s)	Max POI Value (µg/m³)	Location of		Averaging Period of Criterion (h)	Max POI Value Converted to Criterion Period (µg/m³)	Criteria (µg/m³)	Limiting Effect	Regulation Schedule #	Percentage of Criteria or Likelihood of adverse effect (%)	90th Percentile MOE Background (µg/m3)	Maximum Water St Modelled Background (µg/m³)	Maximum Impact (µg/m3)	Maximum Impact (%)	
				X (m)	Y (m)											
0-04-4	Odour	18.3307828	86.28549	487731	4787390	0.1667	86.3							86.29		
74-82-8	Methane	4.8418E-07	13.962737	487198	4787336	24	14.0							13.96		
75-01-4	Vinyl chloride	2.7544E-11	0.000794326	487198	4787336	24	0.0	1	Health	Schedule 3	0.1%			0.00	0.1%	
75-01-4	Vinyl chloride	2.7544E-11	6.46991E-05	487150	4787199	8760	0.0	0.2	Health	Schedule 3	0.0%			0.00	0.0%	
75-18-3	dimethyl sulphide	2.9257E-11	0.002915	487198	4787336	0.1667	0.0	30	Odour	Guideline	0.0%			0.00	0.0%	
75-43-4	Dichlorofluoromethane	1.6155E-11	0.000465874	487198	4787336	24	0.0				Neg			0.00		
108-90-7	Chlorobenzene	1.6988E-12	0.000169279	487198	4787336	0.1667	0.0	4500	Odour	Guideline	0.0%			0.00	0.0%	
108-90-7	Chlorobenzene	1.6988E-12	0.000169279	487198	4787336	1	0.0	3500	Health	Guideline	0.0%			0.00	0.0%	
124-38-9	Carbon Dioxide	1.3285E-06	38.310612	487198	4787336	24	38.3	21000	JSL	JSL	0.2%			38.31	0.2%	
630-08-0	Carbon monoxide	0.1093588	323.120453	487171	4787073	1	323.1	36200	Health	AAQC	0.9%		68.81	391.93	1.1%	
10102-44-0	Nitrogen oxides	0.09411988	364.49209	487198	4787336	1	364.5	400	Health	AAQC	91.1%	39.48	116.13	520.10	120.2%	*
10102-44-0	Nitrogen oxides	0.09411988	108.162155	487198	4787336	24	108.2	200	Health	AAQC	54.1%	36.58	29.18	173.92	72.4%	
10102-44-0	Nitrogen oxides	0.09411988	18.265863	487147	4787219	8760	18.3	60	Health	AAQC	30.4%		0.50	18.77	31.3%	
0-03-3	PM2.5	0.01301389	9.838122	487240	4786894	24	9.8	27		AAQC 2020	36.4%	24.36	2.39	36.59	126.7%	
0-03-3	PM2.5	0.01301389	1.654071	487196	4786917	8760	1.7	8.8		AAQC 2020	18.8%		1.88	3.53	40.1%	
0-02-2	PM10	0.04621861	36.200634	487240	4786894	24	36.2	50		AAQC	72.4%	45.11	8.90	90.22	162.6%	
PM	Total particulate matter	0.14353897	113.270485	487240	4786894	24	113.3	120	Particulate	AAQC	94.4%	81.21	45.23	239.71	162.1%	
PM	Total particulate matter	0.14353897	18.767654	487196	4786917	8760	18.8	60	Particulate	AAQC	31.3%		9.54	28.31	47.2%	

* Daytime only operation

1. PM10 and PM 90th Percentile values calculated from PM2.5 concentrations using ratios provided in Ramona Lali, Michaela Kendall, Kazuhiko Ito, and George D. Thurston, "Estimation of historical annual PM2.5 exposures for health effects assessments ", Atmospheric Environment, Volume 38, Issue 31, October 2004, Pages 5217-5226

Table E4-4:
Emissions Summary Table - Alternative Method 4

CAS#	Contaminant	Total Emission Rate (g/s)	Max POI Value (µg/m³)	Location of		Averaging Period of Criterion (h)	Max POI Value Converted to Criterion Period (µg/m³)	Criteria (µg/m³)	Limiting Effect	Regulation Schedule #	Percentage of Criteria or Likelihood of adverse effect (%)	90th Percentile MOE Background (µg/m3)	Maximum Water St Modelled Background (µg/m³)	Maximum Impact (µg/m3)	Maximum Impact (%)
				X (m)	Y (m)										
0-04-4	Odour	18.3307828	99.36028	487760	4786974	0.1667	99.4							99.36	
74-82-8	Methane	4.8418E-07	14.523505	487198	4787336	24	14.5							14.52	
75-01-4	Vinyl chloride	2.7544E-11	0.000826228	487198	4787336	24	0.0	1	Health	Schedule 3	0.1%			0.00	0.1%
75-01-4	Vinyl chloride	2.7544E-11	5.90908E-05	487149	4787209	8760	0.0	0.2	Health	Schedule 3	0.0%			0.00	0.0%
75-18-3	dimethyl sulphide	2.9257E-11	0.003245	487198	4787336	0.1667	0.0	30	Odour	Guideline	0.0%			0.01	0.0%
75-43-4	Dichlorofluoromethane	1.6155E-11	0.000484585	487198	4787336	24	0.0				Neg			0.00	
108-90-7	Chlorobenzene	1.6988E-12	0.000188421	487198	4787336	0.1667	0.0	4500	Odour	Guideline	0.0%			0.00	0.0%
108-90-7	Chlorobenzene	1.6988E-12	0.000188421	487198	4787336	1	0.0	3500	Health	Guideline	0.0%			0.00	0.0%
124-38-9	Carbon Dioxide	1.3285E-06	39.849232	487198	4787336	24	39.8	21000	JSL	JSL	0.2%			39.85	0.2%
630-08-0	Carbon monoxide	0.1093588	323.928284	487171	4787073	1	323.9	36200	Health	AAQC	0.9%		68.81	392.74	1.1%
10102-44-0	Nitrogen oxides	0.09411988	346.468842	487171	4787073	1	346.5	400	Health	AAQC	86.6%	39.48	116.13	502.07	115.6%
10102-44-0	Nitrogen oxides	0.09411988	92.200531	487171	4787073	24	92.2	200	Health	AAQC	46.1%	36.58	29.18	157.96	64.4%
10102-44-0	Nitrogen oxides	0.09411988	12.576183	487172	4787063	8760	12.6	60	Health	AAQC	21.0%		0.50	13.08	21.8%
0-03-3	PM2.5	0.01301389	9.939858	487240	4786894	24	9.9	27		AAQC 2020	36.8%	24.36	2.39	36.69	127.0%
0-03-3	PM2.5	0.01301389	1.666603	487196	4786917	8760	1.7	8.8		AAQC 2020	18.9%		1.88	3.54	40.3%
0-02-2	PM10	0.04621861	36.532642	487240	4786894	24	36.5	50		AAQC	73.1%	45.11	8.90	90.55	163.3%
PM	Total particulate matter	0.14353897	114.268829	487240	4786894	24	114.3	120	Particulate	AAQC	95.2%	81.21	45.23	240.70	162.9%
PM	Total particulate matter	0.14353897	18.923906	487196	4786917	8760	18.9	60	Particulate	AAQC	31.5%		9.54	28.46	47.4%

1. PM10 and PM 90th Percentile values calculated from PM2.5 concentrations using ratios provided in Ramona Lali, Michaela Kendall, Kazuhiko Ito, and George D. Thurston, "Estimation of historical annual PM2.5 exposures for health effects assessments ", Atmospheric Environment, Volume 38, Issue 31, October 2004, Pages 5217-5226

Table E5:
Emissions Summary from All Alternative Methods

CAS#	Contaminant	Averaging Period of Criterion (h)	Criteria (µg/m³)	Limiting Effect	Regulation Schedule #	Current		Alternative Method 2		Alternative Method 3		Alternative Method 4	
						Max POI (µg/m3)	% Criteria	Max POI (µg/m3)	% Criteria	Max POI (µg/m3)	% Criteria	Max POI (µg/m3)	% Criteria
0-02-2	PM10	24	50		AAQC	36.8	73.6%	36.2	72.0%	36.2	72.4%	36.5	73.1%
0-03-3	PM2.5	24	27		AAQC 2020	10.2	37.9%	9.8	36.2%	9.8	36.4%	9.9	36.8%
0-03-3	PM2.5	8760	8.8		AAQC 2020	1.8	20.3%	1.7	19.8%	1.7	18.8%	1.7	18.9%
0-04-4	Odour	0.1667				99.4		86.3		86.3		99.4	
74-82-8	Methane	24				18.9		14.0		14.0		14.5	
75-01-4	Vinyl chloride	24	1	Health	Schedule 3	0.0011	0.1%	0.0008	0.1%	0.0008	0.1%	0.0008	0.1%
75-01-4	Vinyl chloride	8760	0.2	Health	Schedule 3	0.0	0.1%	0.0	0.0%	0.0	0.0%	0.0	0.0%
75-18-3	dimethyl sulphide	0.1667	30	Odour	Guideline	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
75-43-4	Dichlorofluoromethane	24				0.0	Neg	0.0	Neg	0.0	Neg	0.0	Neg
108-90-7	Chlorobenzene	0.1667	4500	Odour	Guideline	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
108-90-7	Chlorobenzene	1	3500	Health	Guideline	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
124-38-9	Carbon Dioxide	24	21000	JSL	JSL	51.7	0.2%	38.3	0.1%	38.3	0.2%	39.8	0.2%
630-08-0	Carbon monoxide	1	36200	Health	AAQC	325.5	0.9%	323.1	0.9%	323.1	0.9%	323.9	0.9%
10102-44-0	Nitrogen oxides	1	400	Health	AAQC	349.6	87.4%	364.5	86.5%	364.5	91.1%	346.5	86.6%
10102-44-0	Nitrogen oxides	24	200	Health	AAQC	94.7	47.3%	108.2	46.1%	108.2	54.1%	92.2	46.1%
10102-44-0	Nitrogen oxides	8760	60	Health	AAQC	12.8	21.4%	18.3	21.2%	18.3	30.4%	12.6	21.0%
PM	Total particulate matter	24	120	Particulate	AAQC	114.5	95.4%	113.3	93.9%	113.3	94.4%	114.3	95.2%
PM	Total particulate matter	8760	60	Particulate	AAQC	19.6	32.7%	18.8	32.7%	18.8	31.3%	18.9	31.5%

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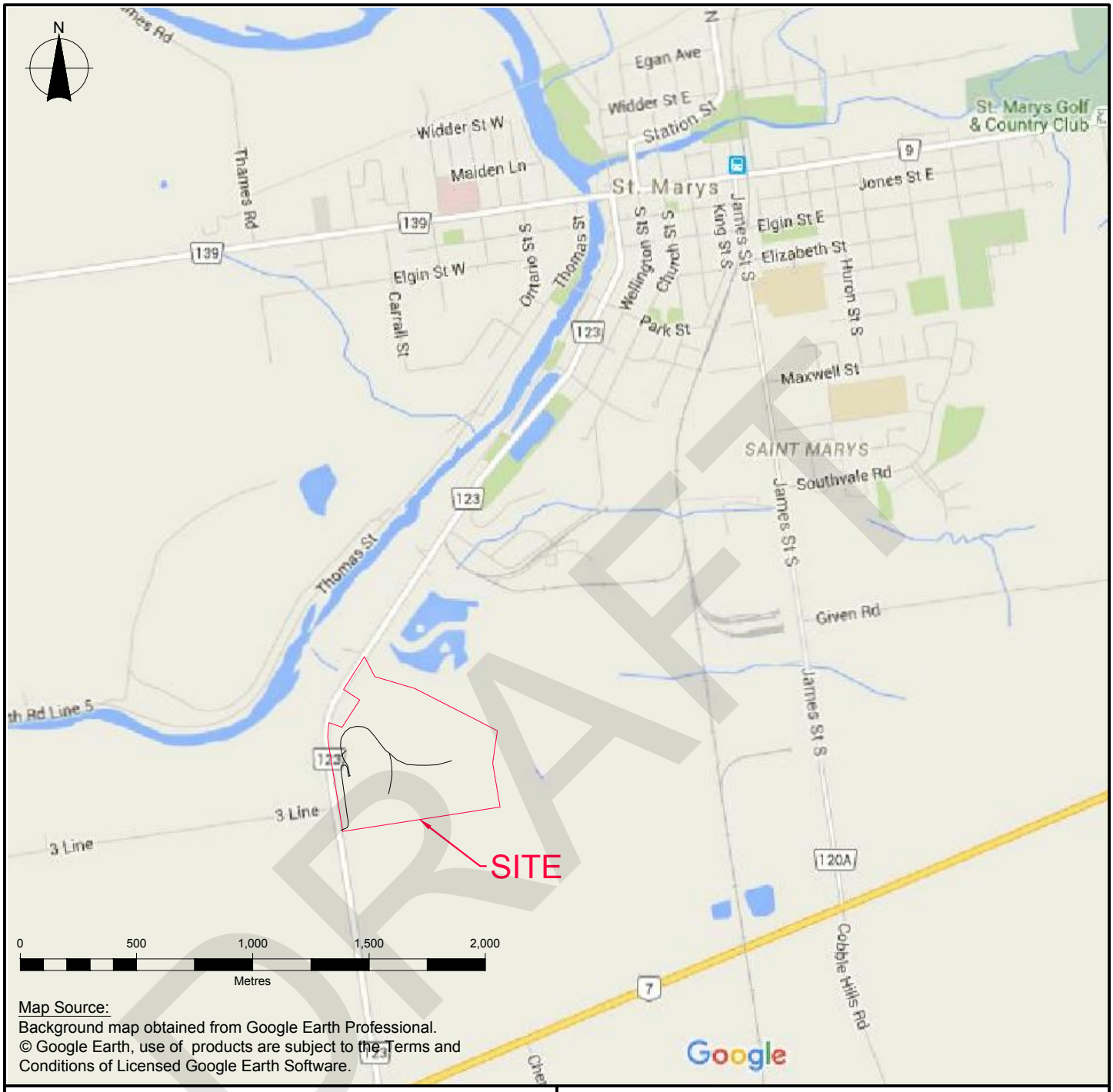
[THE DIFFERENCE IS OUR PEOPLE]

Figures



Map Source:
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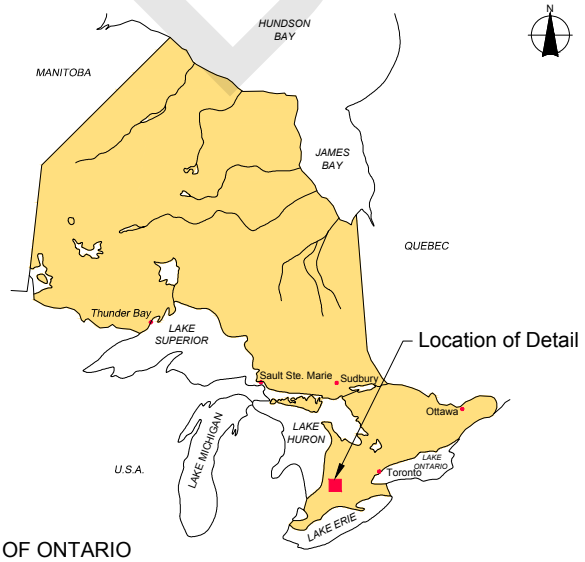

KEY MAP OF ONTARIO

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Client

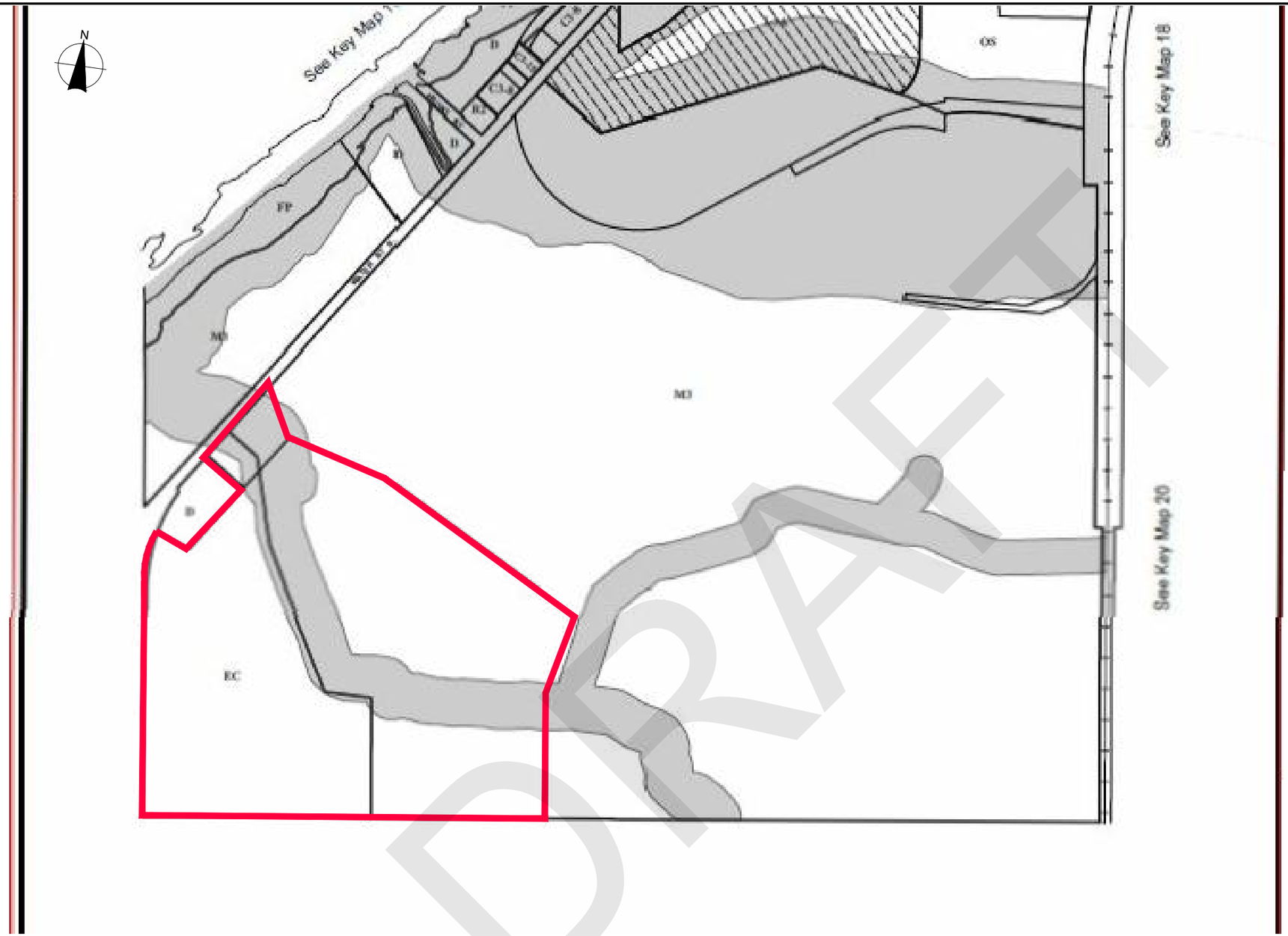
CORPORATION OF THE TOWN OF ST. MARYS

Figure Title

ENVIRONMENTAL ASSESSMENT

SITE LOCATION MAP

Drawn	Checked	Date	Figure No.
C.S.	H.W.	MARCH 2016	1
Scale		Project No.	
1:25,000		300032339	



Railway

Parcels

Zoning By-law Boundaries

Heritage Classified

UTRCA Regulation Limit

Document Path: S:\Department Shared Folders\GIS\GIS\Projects\ZoningByLawMaps\KeyMap18.mxd

LEGEND

APPROXIMATE SITE BOUNDARY

Zone	Zone Symbol
Agricultural Zone One	A1
Agricultural Zone Two	A2
Residential Zone One	R1
Residential Zone Two	R2
Residential Zone Three	R3
Residential Zone Four	R4
Residential Zone Five	R5
Residential Zone Six	R6
Residential Zone Seven	R7
Central Commercial Zone	C1
Limited Commercial Zone	C2
Highway Commercial Zone	C3
Special Commercial Zone	C4
Light Industrial Zone	M1
General Industrial Zone	M2
Extractive Industrial Zone	M3
Environmental Constraint Zone	EC
Institutional Zone	I
Open Space Zone	OS
Flood Plain Zone	FP
Special Policy Area Constraint Zone	-SPA
Holding Zone	-H
Development Zone	D or RD

0 100 200 400 600

Metres

Zoning Map Source:
Background zoning map obtained from the Corporation of the Town of St. Marys website. Zoning Map 19 from Zoning By-Law Z1-1997 consolidated through to January 15, 2015.

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CORPORATION OF THE TOWN OF ST. MARYS

Figure Title

ENVIRONMENTAL ASSESSMENT

ZONING LAND USE PLAN

Drawn	Checked	Date	Figure No.
C.S.	H.W.	MARCH 2016	2
Scale		Project No.	
1:7,500		300032339	

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LEGEND

- APPROXIMATE SITE BOUNDARY
- POINT OF NOISE RECEPTION
- POINT OF EMISSION
- BOUNDARY COORDINATES UTM NAD83
  X,Y = 568472
  4829089
- EXISTING ON-SITE ROADS
- EXISTING ON-SITE ROADS END POINTS

0 100 200 400 600
Metres

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Figure Title
ENVIRONMENTAL ASSESSMENT

SITE PLAN
CURRENT CONDITIONS

Drawn	Checked	Date	Figure No.
C.S.	H.W.	MARCH 2016	**3-Exist**
Scale		Project No.	
1:7,500		300032339	

Date Plotted: April 12, 2016 - 1:22 PM
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LEGEND

- APPROXIMATE SITE BOUNDARY
- POINT OF NOISE RECEPTION
- POINT OF EMISSION
- BOUNDARY COORDINATES UTM NAD83 (X,Y = 568472 4829089)
- EXISTING ON-SITE ROADS
- EXISTING ON-SITE ROADS END POINTS
- PROPOSED LANDFILL EXPANSION

0 100 200 400 600
Metres

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Figure Title
ENVIRONMENTAL ASSESSMENT

POTENTIAL WASTE FILL AREA
ALTERNATIVE #2

Drawn	Checked	Date	Figure No.
C.S.	H.W.	MARCH 2016	**3-M2**
Scale		Project No.	
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Date Plotted: April 12, 2016 - 1:22 PM
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LEGEND

- APPROXIMATE SITE BOUNDARY
- POINT OF NOISE RECEPTION
- POINT OF EMISSION
- BOUNDARY COORDINATES UTM NAD83 (X,Y = 568472 4829089)
- EXISTING ON-SITE ROADS
- EXISTING ON-SITE ROADS END POINTS
- PROPOSED LANDFILL EXPANSION

0 100 200 400 600
Metres

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Figure Title
ENVIRONMENTAL ASSESSMENT

POTENTIAL WASTE FILL AREA
ALTERNATIVE #3

Drawn	Checked	Date	Figure No.
C.S.	H.W.	MARCH 2016	**3-M3**
Scale		Project No.	
1:7,500		300032339	

Date Plotted: April 12, 2016 - 1:22 PM
File: \\MONTY\Shared\AirGroup_Projects\St Marys EA 300032339.0000\Drawing Set\032339 Environmental Assessment Drawing Set.dwg

LEGEND

- APPROXIMATE SITE BOUNDARY
- POINT OF NOISE RECEPTION
- POINT OF EMISSION
- BOUNDARY COORDINATES (X,Y = 568472 4829089) UTM NAD83
- EXISTING ON-SITE ROADS
- A - G — EXISTING ON-SITE ROADS END POINTS
- PROPOSED LANDFILL EXPANSION

0 100 200 400 600
Metres

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Figure Title
ENVIRONMENTAL ASSESSMENT

POTENTIAL WASTE FILL AREA
ALTERNATIVE #5

Drawn	Checked	Date	Figure No.
C.S.	H.W.	MARCH 2016	**3-M5**
Scale		Project No.	
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Date Plotted: April 12, 2016 - 1:22 PM

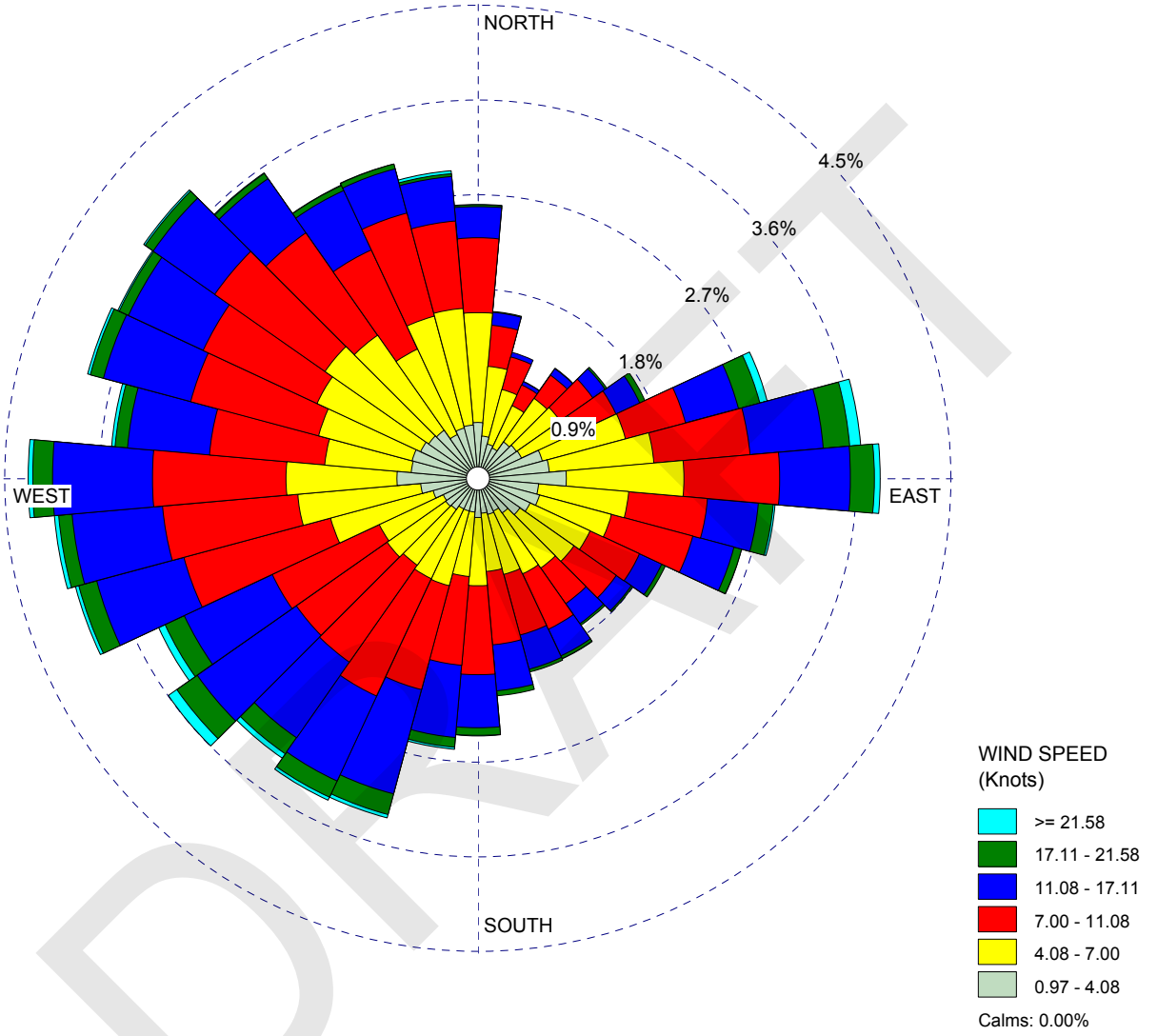
File: \\MONTY\Shared\AirGroup_Projects\St Marys EA 300032339.0000\Drawing Set\032339 Environmental Assessment Drawing Set.dwg

WIND ROSE PLOT:

St Marys Landfill
Wind Rose (2009 - 2013)

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD: **Start Date: 1/1/2009 - 00:00** **End Date: 12/31/2013 - 23:00**	COMPANY NAME: **R.J. Burnside & Associates Limited**	
		MODELER: **H. Watson**	
	CALM WINDS: **0.00%**	TOTAL COUNT: **43734 hrs.**	
	AVG. WIND SPEED: **7.73 Knots**	DATE: **3/16/2016**	PROJECT NO.: **300032239.0000**

PROJECT TITLE:

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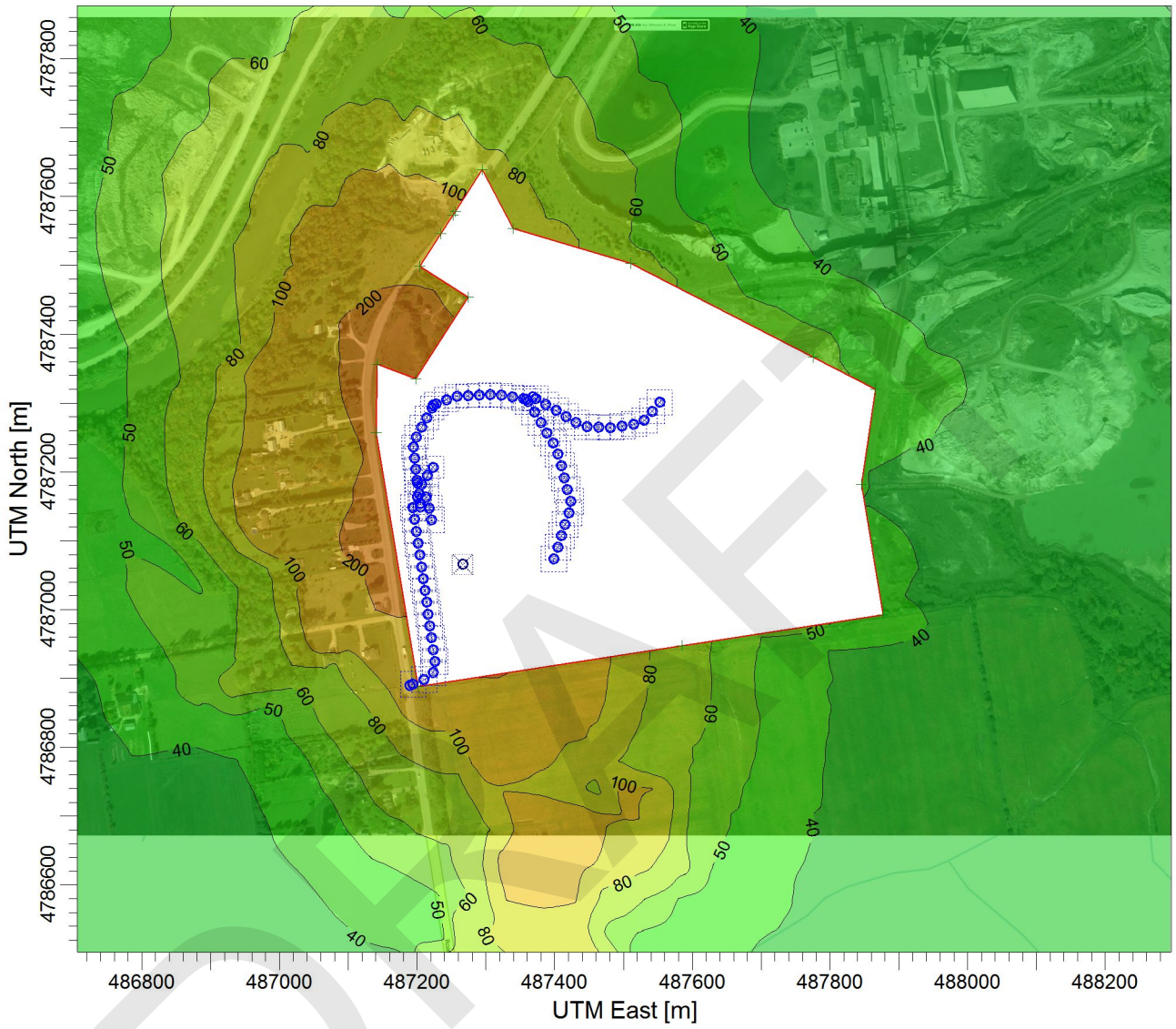

PLOT FILE OF HIGH 1ST HIGH 1-HR VALUES FOR SOURCE GROUP: ALL

ug/m^3

Max: 404 [ug/m^3] at (487198.22, 4787335.65)

4 5 6 8 10 20 40 50 60 80 100 200 400 404

COMMENTS: Figure E5: Nitrogen Oxides, Alternative Method 3, 1-hour	SOURCES: **7**	COMPANY NAME: **R. J. Burnside & Associates Limited**	
	RECEPTORS: **4483**	MODELER: **Harvey Watson**	
	OUTPUT TYPE: **Concentration**	SCALE: 1:10,000 0 0.3 km	
	MAX: **404 ug/m^3**	DATE: **3/22/2016**	PROJECT NO.: **300032339.0000**

PROJECT TITLE:

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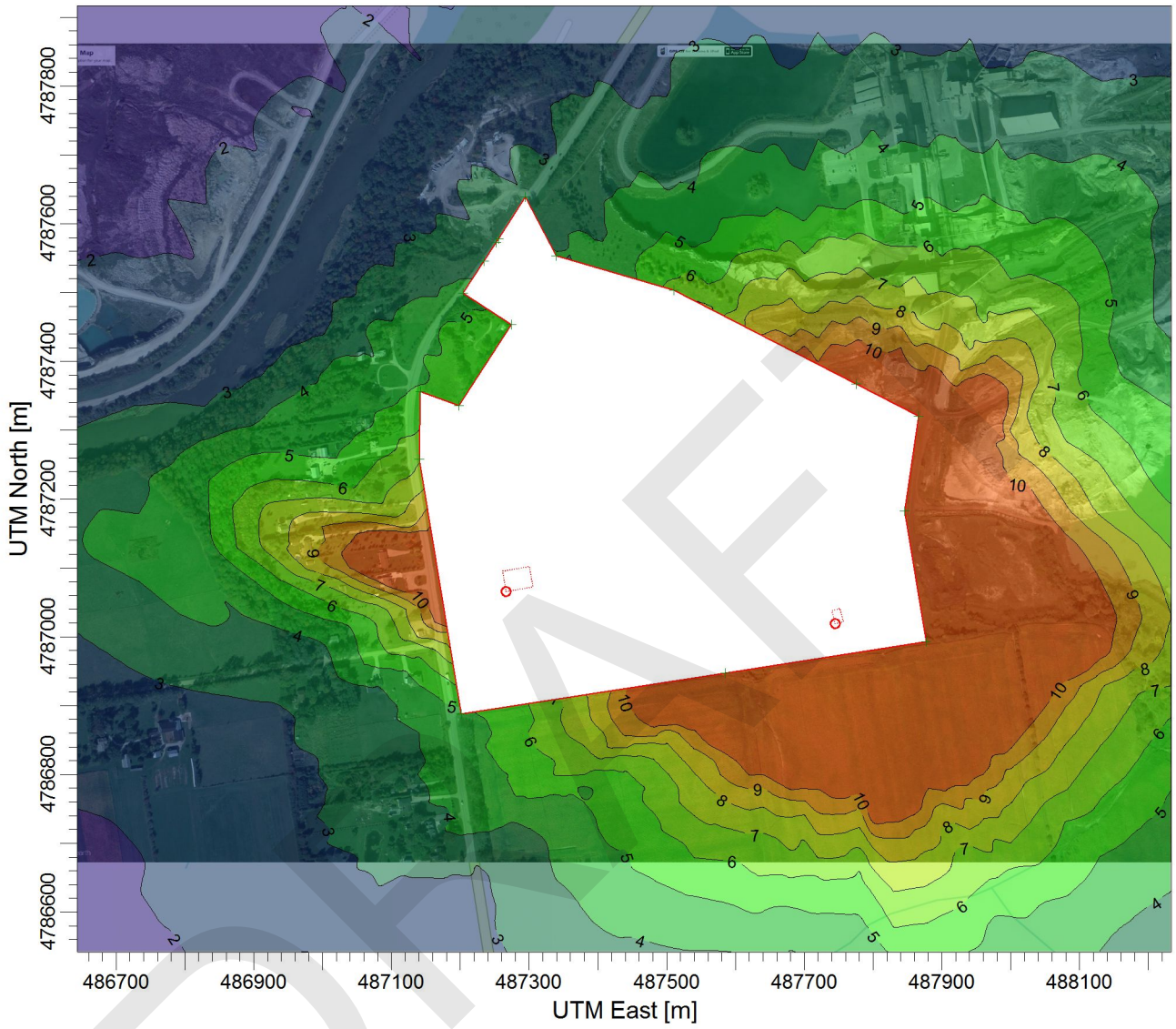

PLOT FILE OF HIGH 1ST HIGH 1-HR VALUES FOR SOURCE GROUP: ALL OU/M**3

Max: 99.36 [OU/M**3] at (487760.29, 4786974.47)

0.00 1.00 2.00 3.00 4.00 5.00 6.00 7.00 8.00 9.00 10.00 99.36

COMMENTS: Figure E6: Odour Contours - Current	SOURCES: **2**	COMPANY NAME: **R. J. Burnside & Associates Limited**	
	RECEPTORS: **4483**	MODELER: **Harvey Watson**	
	OUTPUT TYPE: **Concentration**	SCALE: 1:10,000 0 0.3 km	
	MAX: **99.36 OU/M**3**	DATE: **3/22/2016**	PROJECT NO.: **300032339.0000**

PROJECT TITLE:

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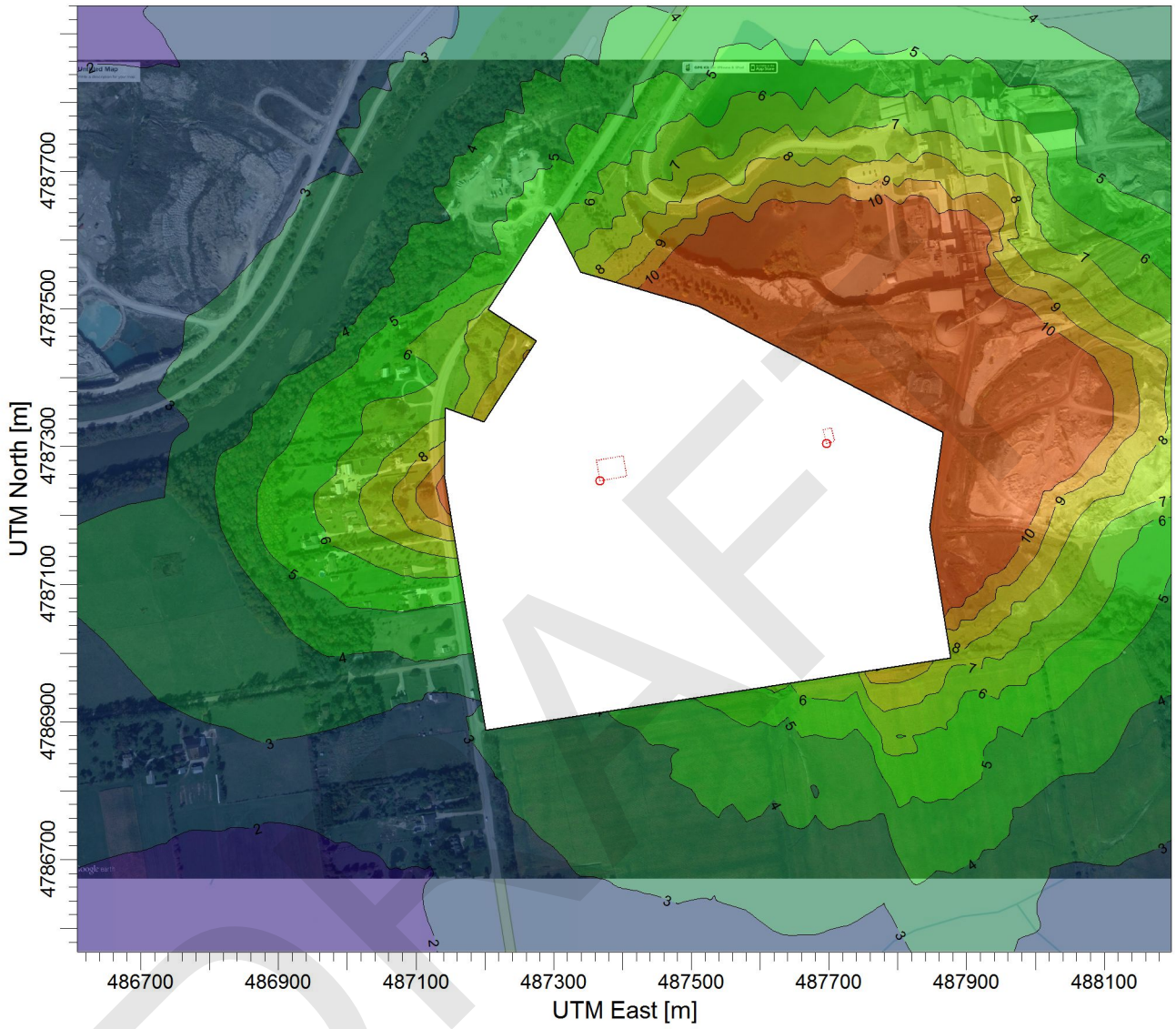
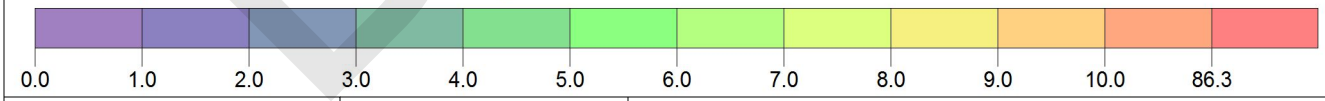


PLOT FILE OF HIGH 1ST HIGH 1-HR VALUES FOR SOURCE GROUP: ALL

OU/M**3

Max: 86.3 [OU/M**3] at (487731.35, 4787389.59)



COMMENTS: Figure E7: Odour Contours - Alternative Method 2	SOURCES: **2**	COMPANY NAME: **R. J. Burnside & Associates Limited**	
	RECEPTORS: **4483**	MODELER: **Harvey Watson**	
	OUTPUT TYPE: **Concentration**	SCALE: 1:10,000 0 0.3 km	
	MAX: **86.3 OU/M**3**	DATE: **3/22/2016**	PROJECT NO.: **300032339.0000**

PROJECT TITLE:

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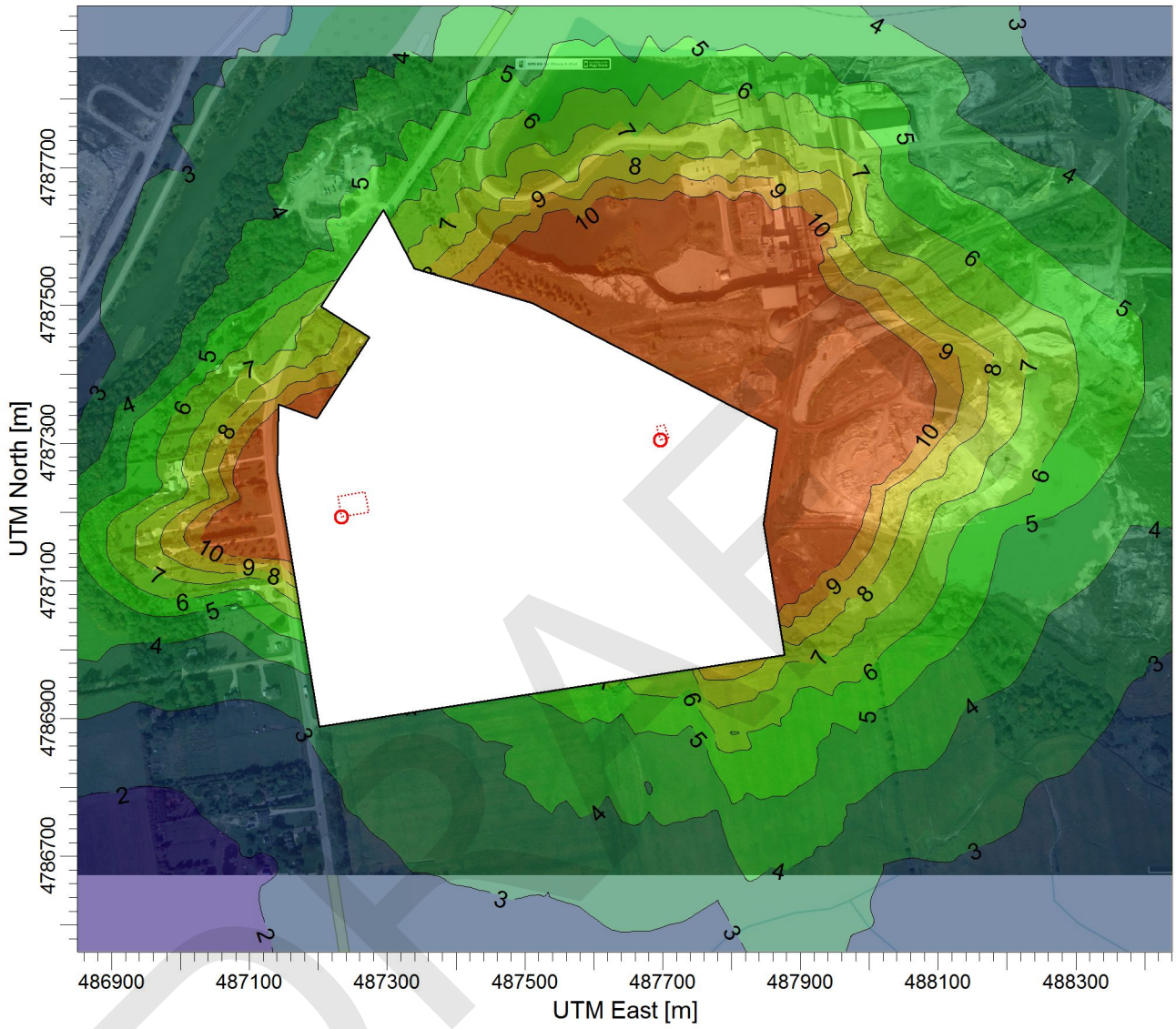
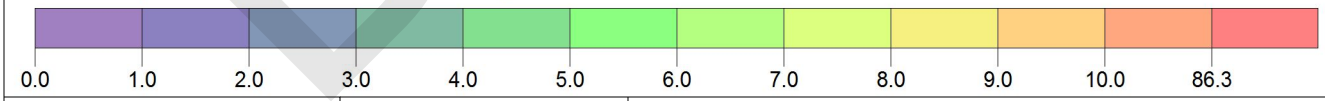


PLOT FILE OF HIGH 1ST HIGH 1-HR VALUES FOR SOURCE GROUP: ALL

OU/M**3

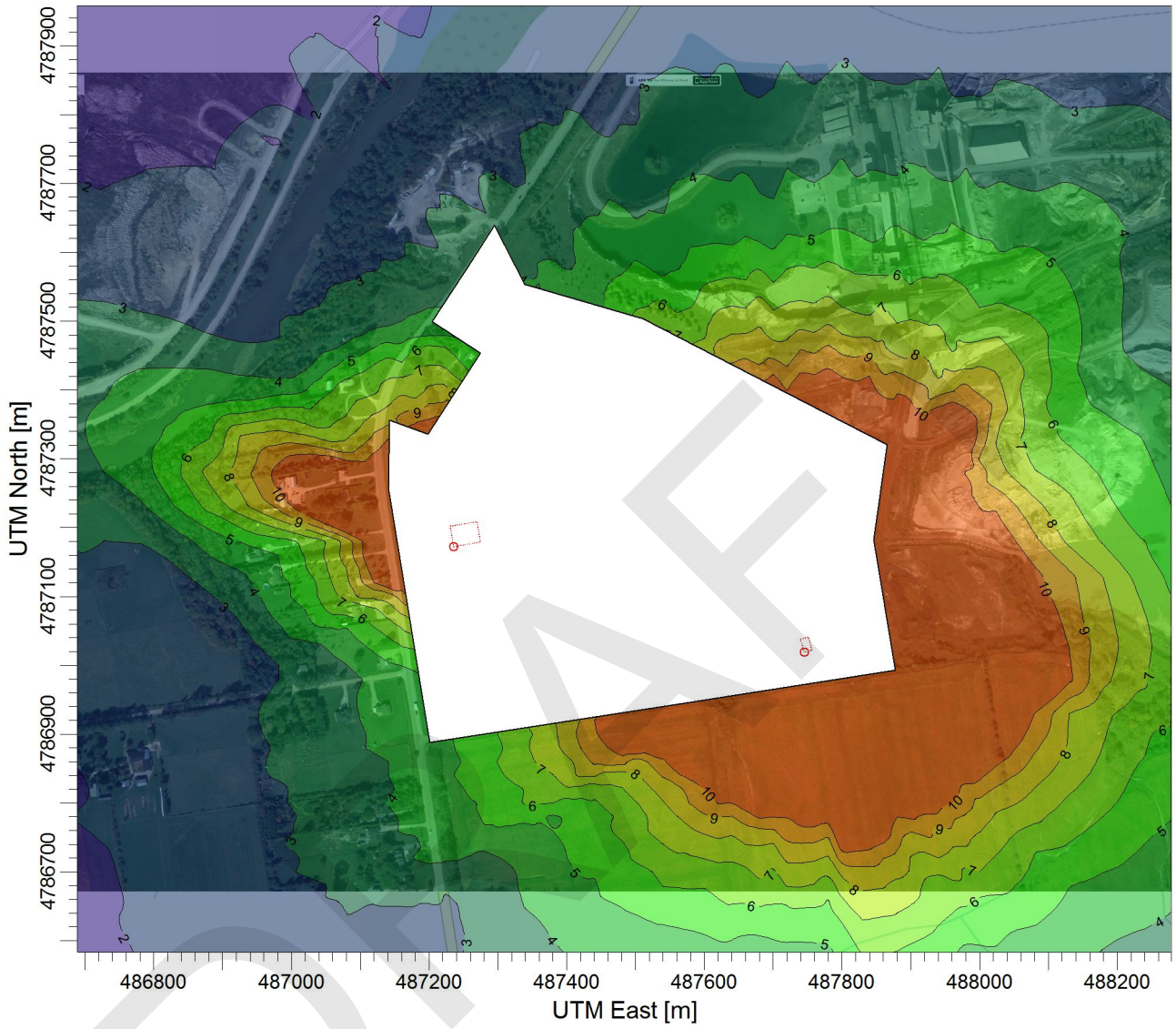
Max: 86.3 [OU/M**3] at (487731.35, 4787389.59)



COMMENTS: Figure E8: Odour Contours - Alternative Method 3	SOURCES: **2**	COMPANY NAME: **R. J. Burnside & Associates Limited**	
	RECEPTORS: **4483**	MODELER: **Harvey Watson**	
	OUTPUT TYPE: **Concentration**	SCALE: 1:10,000 0 0.3 km	
	MAX: **86.3 OU/M**3**	DATE: **3/22/2016**	PROJECT NO.: **300032339.0000**

PROJECT TITLE:

C:\AERMOD\St Marys\032339\Rev1\Multichem\St Mays.isc



PLOT FILE OF HIGH 1ST HIGH 1-HR VALUES FOR SOURCE GROUP: ALL

OU/M**3

Max: 99.36 [OU/M**3] at (487760.29, 4786974.47)

0.00 1.00 2.00 3.00 4.00 5.00 6.00 7.00 8.00 9.00 10.00 99.36

COMMENTS: Figure E9: Odour Contours - Alternative Method 4	SOURCES: **2**	COMPANY NAME: **R. J. Burnside & Associates Limited**	
	RECEPTORS: **4483**	MODELER: **Harvey Watson**	
	OUTPUT TYPE: **Concentration**	SCALE: 1:10,000 0 0.3 km	
	MAX: **99.36 OU/M**3**	DATE: **3/22/2016**	PROJECT NO.: **300032339.0000**

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix EA

Supporting Calculations

Appendix EA
Supporting Calculations

1.0 Usage Rates

Please see Table E1 for maximum usage rates and list of combustion equipment corresponding to the operating conditions that would result in the maximum emission rate in accordance with s.10 and s.11 of O. Reg. 419/05.

2.0 Combustion Equipment:

Combustion equipment on Site is restricted to the compactor and loader. Scale house heat is provided by electric heaters.

3.0 Equipment Emissions

Emission Rates are calculated to match the averaging period of the contaminant so particulate emission rates are averaged over 24 hours while NOx and CO are averaged over 1 hour. As a result, the 24-hour NOx impact is based on 24 hours of operation at the 1 hour maximum rate and is a vast overestimate of the actual impact.

3.1 Perth Road 123/Water Street South, WS

Perth Road 123 runs north-south on the west side of the landfill. Water Street South begins at the point where the road bends to the east. The speed limit for Perth Road 123 is 80 km/h. The speed limit drops to 50 km/h on Water Street South.

Road emissions, considering only Perth Road 123 due to its higher speed limit, are Nitrogen Oxides (NOx), particulate matter (PM, PM10, and PM2.5), and carbon monoxide (CO).

All contaminant emission rates were calculated using the US EPA's MOVES emission model.

The emission Calculations are shown in Table EA-01: Off-Site Vehicle Emissions.

Methodology: Emission Factor ("EF")

The Annual Average Daily Traffic (AADT) for 2012 Perth Road 123/Water Street South was obtained from Perth County and is shown in the section of Table EA-01 titled "Traffic on Perth Road 123 (Weekday) – AADT" along with their vehicle weights.

The distance travelled is the length of the road in the Air Dispersion Model. The number of vehicles per day is calculated by multiplying the Total (AADT) by the % of vehicles of that type. The number of vehicles per hour is calculated by dividing the vehicles per day by 5 (assume that the worst case hour sees 20 % of the daily total. Values are rounded to the nearest whole number.

A summary of the MOECC measurement data for NOx and PM2.5 is shown under the heading "Measured Data (MOECC Stn 15026 – London ON)". The values presented are the minimum, 10th percentile, 50th percentile (median), 90th percentile, and maximum. The 90th Percentile value is used as part of the background.

MOVES was used to provide the emission factors for NOx, CO, PM2.5, PM10, and TSP (PM). The inputs to MOVES are listed below:

Time Span Year 2015
Month January
Days Weekdays
Hours 00:00-23:59
On Road Vehicles Equipment
Diesel Fuel Single Unit Short-haul Truck
Gasoline - Passenger Car
Gasoline - Passenger Truck
Road Type Rural Unrestricted
Pollutants CO Running Exhaust only
NOx Running Exhaust only
PM2.5 Running Exhaust only
PM10 Running Exhaust only
Vehicle Speed
80 km/h

The output from MOVES is shown in the section of Table EA-01 titled "MOVES Emission Rates (g/VMT)".

Road dust entrained by passing vehicles is calculated using the methodology described in “"USEPA TTN CHIEF, AP-42, Fifth Edition, Volume I, Chapter 13, Section 13.2.1, Draft Section - June 10, 2010”.

Sample Calculation:

The “Distance travelled” in metres is the length of the road segment in the air dispersion model = 2394.3 m.

The “Distance travelled” in miles is the “Distance travelled” in m / 1609 = 2394.3 m/ 1609 = 1.488 miles.

The “Number of pick-up trucks” (per Day) is the Total * “% Pick-up Trucks” = 2189 * 2 % = 44 vehicles per day. The “Number of pick-up trucks” (per hour) is the “Number of pick-up trucks” (per Day) / 5 = 44 / 5 = 9 vehicles per hour. The “Total vehicles” is the sum of the three types of vehicles. The Total VKT is the “Total vehicles” * “Distance travelled (m)” / 1000 m/km = 2394.3 m * 438 / 1000 m/km = 1048 km.

The values in the table “Emission (g/time)” are calculated for NOx and CO by multiplying the number of vehicles per hour by the MOVES Emission Rates (g/VMT) for the appropriate vehicle type * “Distance travelled”. For NOx, 0.591 g/VMT * 9 vehicles/h * 1.488 miles/vehicle = 7.698 g/h. The “Total (g/time)” is the sum of the three vehicle emissions = 7.698 + 263.287 + 161.549 = 432.534 g/h. The “Max (g/s) – 1h” = “Total (g/time)” / 3600 s/h = 432.534 g/h / 3600 g/s = 0.1201 g/s.

The values in the table “Emission (g/time)” are calculated for PM2.5, PM10, and TSP by multiplying the number of vehicles per day by the MOVES Emission Rates (g/VMT) for the appropriate vehicle type * “Distance travelled”. For PM2.5, 0.013 g/VMT * 44 vehicles/h * 1.488 miles/vehicle = 0.851 g/h. The “Total (g/time)” is the sum of the three vehicle emissions = 0.851 + 50.344 + 33.687 = 84.881 g/day. The “Average (g/s) – 24h” = “Total (g/time)” / 3600s/h = 84.881 g/h / (3600*24) g/s = 0.000982 g/s.

Particulate matter entrained by passing vehicles is calculated as described in the US EPA TTN CHIEF section of AP-42.

sL = 0.2 g/m^2 is typical loading for paved roads

W = 2.25 * 2 % + 30 * 12 % + 1.75 * 86 % = 5.2 tons (fraction of each vehicle type times the weight of those vehicles)

S = 80 km/h / 1.609 km/mile = 49.7 miles per hour

P = 117.7 is the number of days with at least 0.245 mm (0.01 inches) of rain at the Stratford WWTP. Data at the London Airport was also examined but the number of days

was larger at London Airport and the airport is farther from the site so the Stratford data was used[3].

N = 365 for annual

The calculation of the values in the Road Dust Emission Rates table is described at the bottom of Table EA-01.

The "Total Average (g/s) – 24h" is the sum of "Average (g/s) - 24h" and "Rate (g/s)". For PM2.5, Total Average (g/s) – 24h = 0.000982 + 0.0425 = 0.04348.

The bold values are used as the emission rates from the WS – Perth Road 123/Water Street source to determine the local background particulate, NOx and CO concentrations.

Data Quality: Above-Average

Data quality for this calculation is best characterized by the following paragraph from Section 8.3.2 of the ESDM Procedure Document titled "Above-Average Data Quality" Emission Estimating Techniques:

> *Emission Factors: Emission rate estimates that are developed from tests on a moderate to large number of sources where the source category population is sufficiently specific to minimize variability (e.g., US EPA, AP-42, emission factor quality rating of A or B) are anticipated to provide above-average quality of emission rate estimates.*

Operating Condition, Individual Maximum Rates of Production:

3.2 On-Site Road Dust, TRKAB, TRKBC, TRKBD, TRKDE, TRKEF, and TRKEH

Vehicles traveling on gravel roads cause dust to be transported into the air. Particulate emissions, NOx and CO are also emitted by those vehicles as they consume fuel. This section calculates the amount of each contaminant from each source.

The emission calculations for this source are shown on Table EA-02: On-Site Road Emissions.

[3] "Climate Normals for London 1981 to 2010 - normals-6148105-1981-2010.csv" and "Climate Normals for Stratford 1981 to 2010 -6148105-1981-2010.csv" downloaded from "http://climate.weather.gc.ca/climate_normals/index_e.html".

Methodology: Emission Factor ("EF")

Based on the traffic study, the number of each kind of vehicle for weekdays and Saturdays was calculated. Because there are many more vehicles on Saturday but most of those vehicles are cars, it was not clear which day would result in the highest emission rate so both cases were examined for road dust. Upon finding that the maximum occurred during weekdays, the NOx, CO and particulate from vehicles were calculated for that same time period.

The road dust emission is calculated as recommended in AP-42 for industrial unpaved roads. The surface silt content is estimated at 6.4 % based on the median value provided in the AP-42 document for Municipal Solid Waste Landfills[4]. The other variables are taken from the same guidance documents[5].

The engine emissions are taken from the MOVES program output above except that the vehicle speed is 20 km/h.

Sample Calculation:

On weekdays, the peak number of vehicles per hour is 10 (8 leaving north, 1 leaving south, 1 entering landfill)[6]. The daily traffic is assumed to be 10 times the maximum hourly traffic during the week and 5 times the maximum hourly traffic on Saturday multiplied by 2 as all the vehicles will be entering and leaving the Site the same day. These estimates are very conservative because the landfill is open 8 hours per day on the weekdays (but permitted for 12), and 4 hours on Saturdays. The values above assume that the maximum hourly vehicles occur every hour the landfill is open.

In the section titled "Weekdays:" each road segment is listed in Figure E3-1: Road Segment Designation – Current. The length of each segment is shown in the next column. The number of trips per day is dependent on where various vehicles are expected to go. Every vehicle enters and leaves the site so the "# Trips per day" for segment AB is the total for the day. That total number of trips is split between the three vehicle types based on the % Med. Trucks, % Heavys and % Cars shown at the top of the page. For A-B, Cars = Trips * % cars = 200 * 91 % = 182.

The value in "W: Mean vehicle weight (ton)" is the value assigned to the variable "W" in the emission equation. The value is calculated as the Average Vehicle Weight above times the "Number of Trips" for each type of vehicle divided by the total number of vehicles. For segment A-B, 0 * 2.25 ton + 18 * 30 ton + 182 * 1.75 ton = 4.3 ton.

[4] https://www3.epa.gov/ttnchie1/ap42/ch13/final/c13s0202.pdf, Table 13.2.2-1 (p. 3 of 20)
[5] https://www3.epa.gov/ttnchie1/ap42/ch13/final/c13s0202.pdf, Table 13.2.2-2 (p. 5 of 20)
[6] 032339_TIS_Report.pdf Figure A4.

The Vehicle km Travelled (VKT) = Segment Length * # Trips per day = 356 m * 200 vehicles/day /1000 m/km = 71.2 km.

The Vehicle Miles Travelled (VMT) = VKT / 1.609 = 71.2 / 1.609 = 44 miles.

The “E: Emission Rates (lb/VMT)” for PM2.5 = $k(s/12)^a*(W/3)^b$ = 0.15 * $(6.4 /12)^{0.9}$ * $(4.3/3)^{0.45}$ = 0.1001 lb/VMT.

The “"Emission Rates (g/s) (24 h day)" =(44 VMT*0.1001)/ 2.2 lb/kg * 1000 g/kg / (3600 s/h * 24 h/day) = 0.0233 g/s.

The same process was used to assess the Saturday emissions which showed that the weekday emissions were much larger.

On the second page of Table EA-02, the data retrieved from MOVES is shown. The values in the table “Engine non-Particulate Emissions” are calculated in the same way as the same values on the first page except that the maximum number of vehicles per hour is used instead of total vehicles per day and The “Hourly E-Rate (g/h)” is calculated as the Emission Rate (g/mile)(from MOVES) * VMT.

For instance for NOx, “Hourly E-Rate (g/h)”= 2 * 2.5 * 9.776581 + 9 * 2.5 * 0.528953 = 59.84 g/h.

“Emission Rates (g/s) (1-h Max)” = “Hourly E-Rate (g/h)” /3600 s/h = 59.84 g/h / 3600 s/h = 0.0166 g/s.

“Engine Particulate Emissions:” is calculated the same way except that the total for the day is calculated and average over the day. Also, BMPP reduction of 90% was assumed for road dust.

“Total Particulate Emissions:” is the total of the various particulate emissions. For instance for PM2.5, “Emission Rates (g/s) (24-h Average)” = “Emission Rates (g/s) (24 h day)” from weekdays + “Emission Rates (g/s) (24 h day)” from “Engine Particulate Emissions:” = 0.0233 g/s * (1 - 0.9) + 0.0056 g/s = 0.0080 g/s.

The last page of this table scales the emissions for each segment based on the new length under the appropriate Alternative Method.

Data Quality: Above-Average

Data quality for this calculation is best characterized by the following paragraph from Section 8.3.2 of the ESDM Procedure Document titled “Above-Average Data Quality” Emission Estimating Techniques states:

> *Emission Factors: Emission rate estimates that are developed from tests on a moderate to large number of sources where the source category population is sufficiently specific to minimize variability (e.g., US EPA, AP-42, emission factor quality rating of A or B) are anticipated to provide above-average quality of emission rate estimates.*

The US EPA data quality is listed as “B”.

Operating Condition, Individual Maximum Rates of Production:

The emission rate calculations for these sources are based on the maximum number of vehicles per hour for every hour of operation.

3.3 On-Site Non-Road Dust, ST, WF, and CA

Dust can be emitted when soil is disturbed by equipment moving the soil. This section calculates the emissions from the Stockpile (ST), Working Face (WF), and Composting Area (CA).

The emission calculations for this source are shown on Table EA-03: On-Site Non-Road Dust.

Methodology: Emission Factor (“EF”)

The emissions from these sources is calculated from the "USEPA TTN CHIEF, AP-42, Fifth Edition, Volume I, Chapter 13, Equation 13.2.4.(1). The table of “Particle size” and “k” is taken from the same document.

The wind speed “U” is taken from the meteorological data provided by the MOECC.

The Stockpile holds soil used to cover the waste after it has been compacted. The waste is covered every operating day at the end of the day, including Saturdays. Under ideal operating conditions, if St. Marys was doing everything possible to extend the life of the landfill, they could also remove approximately half of the cover the next morning before adding new waste.

Because the cover material is stored for an extended period of time, the moisture content is estimated to be 5 %. The material is clay/dirt and 1 transfer location. The cover is estimate to be up to 2 tons per day so recovery the next morning would be 1 ton for a total of 3 ton. The area of the source is 3.14 m^2.

The AP-42 methodology is used to estimate the total particulate emission in each size fraction and then divided by the area to give an emission rate/m^2 for use in AERMOD.

The estimate for the working face is calculated in the same way except that some of the inputs are different. Municipal solid waste is estimate to be approximately 20 % moisture so 15 % was used to be conservative. The waste is closer to sand than dirt although this parameter is not used in the calculation. The facility can receive up to 62.5 tonnes/day of waste although it will rarely exceed half that amount and the working face is estimated to be 1200 m^2.

The estimate for the Composting Area is calculated in the same way except that some of the inputs are different. Compost is quite wet, with moisture content between 40 % and 60 %. 40 % was used to be conservative. The waste is a clay/dirt mix although this parameter is not used in the calculation. The facility can receive up to 25 tonnes/day of compostable material although it will rarely exceed half that amount and the active area of the composting pad is estimated to be 5700 m^2.

The calculations are described in detail on the bottom of the page.

Sample Calculation:

The "Emission Factor" for PM2.5 = k x 0.0016 x (U/2.2)^1.3 / (M/2)^1.4 = 0.053 * 0.0016 * ((3.98/2.2)^1.3) / ((5/2)^1.4) = 0.00005081 kg /MG.

Emission Rates (kg/day) = Transfer points * Daily Turnover (T/0) * Emission Factor = 0.00005081 * 3 * 1 = 0.0001524 kg/day

Emission Rates (g/s) = Emission Rates (kg/day) *1000 g/kg / (24 h/day * 3600 s/h) = =0.0001524 kg/day * 1000 g/kg /(24*3600) = 1.764E-06 g/s

Emission Rates (g/s/m^2) = Emission Rates (g/s)/area = 1.764E-06 g/s / 314.16 m^2 = 5.616E-09 g/s m^2.

Data Quality: Average

Data quality for this calculation is best characterized by the following paragraph from Section 8.3.3 of the ESDM Procedure Document titled "Average Data Quality" Emission Estimating Techniques states:

> *Emission Factors: Emission rate estimates that are developed from tests on a reasonable number of facilities where the source category population is sufficiently specific to minimize variability (e.g., US EPA, AP-42, emission factor quality rating of C) are anticipated to provide average quality emission rate estimates.*

See Data Quality Rating discussion at the bottom of the page.

Operating Condition, Individual Maximum Rates of Production:

The emission rate calculations for these sources are based on the largest amount of material passing through each group in 1 day.

3.4 On-Site Vehicle Emissions, CMPTR

There are two vehicles that work at the site, the loader and the compactor. It is possible for both vehicles to be on site at the same time but unlikely working. It is estimated that the total time spend in both vehicles is less than 20 minutes an hour. To be conservative, the compactor (higher emission rate) was assumed to be that vehicle for the entire hour.

The emission calculations for this source are shown on Table EA-04: On-Site Vehicle Emissions.

Methodology: Emission Factor ("EF")

The engines are expected to meet US EPA Tier 3 emission standards.

Sample Calculation:

The vehicle power rating is shown in hp and kW. There is 1 unit of each. For the NOx and CO (1 hour averaging) the largest machine is assumed to operate for 20 minutes of the hour. Over the working day, each machine will not exceed 2 hours of operation.

The Emission Factor is retrieved from the table at the bottom of the page. This table is constructed from the information at https://www.dieselnet.com/standards/us/nonroad.php.

The Hourly Emission for NOx for the compactor = 175.2 kW * 1 unit * 33% * 1 h * 4 g/kW-h = 233.65 g/h.

The Emission Rate for NOx = 233.65 g/h / 3600 s/h = 0.06490 g/s.

Since the model uses an emission rate in g/s m^2, the total emission is divided by the area. NOx (g/s m^2) = NOx (g/s) / area = 0.06490 g/s / 1200 m^2 = 5.4086 * 10^{-5} g/s m^2.

The calculation for particulate is the same as NOx except the factors are different, and the emission is averaged over the 24 hour day because the particulate averaging period is 24 hours.

Data Quality: Above-Average

Data quality for this calculation is best characterized by the following paragraph from Section 8.3.2 of the ESDM Procedure Document titled "Above-Average Data Quality" Emission Estimating Techniques states:

> *Engineering Calculations/Judgement: Emission rate estimates derived from fundamental scientific and engineering principles; and/or relevant empirical data can be considered above-average quality estimates if it is clear (e.g., the approach is recommended through MOECC documentation) that the estimating technique will result in relatively conservative predictions.*

The emissions are the maximum emission allowed under the standard so they will exceed actual emissions.

3.5 Contaminant Screening

Table EA-05: Contaminant Screening assesses the relative impact of the contaminants to predict which contaminants should be investigated. The Table EA-05 is divided into 2 sections: top and bottom. The top section assesses products of combustion while the bottom assesses Landfill Gas (LFG). In each case, the emission rate (or concentration) is divided by the criterion for that contaminant for each averaging period which produces a Ratio. The Ratios in each averaging period are ranked with the highest value assigned 1. From each section, the highest ranked contaminants will show the highest fraction of their criterion when modelled. Therefore, modelling the highest ranked contaminants will ensure that the lower ranked contaminants meet criteria if the higher ranked contaminants meet criteria.

For instance, in the top section, the emission factor for nitrogen oxides from the loader and compactor is 4.0 g/kW-h. The maximum Emission Factor for CO is 5 g/kW-h and particulate matter is 0.3 g/kW-h. The standard limits Sulphur to 500 ppm in the source fuel so the Sulphur dioxide will be much less than 0.03 g/kW-h. For the 1-hour averaging period, the criteria are 400 µg/m^3 for NOx, 36,200 µg/m^3 for CO and 690 µg/m^3 for Sulphur dioxide. Dividing the first value by the second gives respectively (as shown in "Ratio - Emission Factor/Criterion" for "1hr") 1.0E-02 for NOx, 1.4E-04 for CO, and 4.3E-05 for SOx. Therefore NOx is ranked 1, CO is Ranked 2 and SOx is ranked 3. The top ranked contaminant is selected for modelling (highlighted green in Table). In some cases, the second ranked contaminant is also included (and highlighted).

CO has been added because it is typically a contaminant of concern in similar assessments. PM (total, PM10 and PM2.5) has been added because there are sources that emit only particulate so this methodology won't work for the particulate emissions.

Sulphur dioxide is not included despite typically being a contaminant of concern in similar assessments because the CO assessment will prove that the impact of CO is less than NOx so SOX will also be less then NOx.

The bottom portion of the table shows the emission rate of all landfill gas constituents (calculated on Table EA-06). The process is the same as described above.

The 1 hour ranking shows chlorobenzene as the highest ranked contaminant because the negligible limit was assigned to this contaminant because there is no published limit for this contaminant. As a result, vinyl chloride was added to the 1 hour because it has a published limit and it is generally a contaminant of concern from landfills. Only the highest ranked contaminants were selected for the remainder.

3.6 Landfill Gas, ACL

Table EA-06: Landfill Gas calculates the emission rate of landfill gas (LFG) components from the landfill. By using the LandGEM calculated emission rate and a sample of LFG from another Ontario Landfill.

Methodology: Engineering Calculation ("EC")

The LandGem (version 3.02) calculated emission of LFG from the facility is 1,800,000 m^3/yr. The contaminants listed are the contaminants detected in a sample of LFG from another site in Ontario. The concentrations are expected to be representative.

The amount of gas times the concentration will give the emission rate.

No concentration was provided for Total landfill gas, Methane, or Carbon dioxide. Obviously, the Total Landfill Gas will be 100 %of the total landfill gas. Methane and carbon dioxide are also substantial fractions but since the concentration wasn't supplied, the LFG was assumed to be 50 % (500,000 ppm)[7] for both of these contaminants. This is a reasonable assumption.

The contaminants selected on Table EA-05 are highlighted in green for easy reference.

Sample Calculation:

The first three columns in the table are Compound Name, Concentration (ppmv), and Molecular Weight (g/mol). The Total Moles in 1 m^3 is n=PV/RT = 101.325 kPA * 1 L /(8.314 kPa L/ g-mol K * 298.15 K) = 0.0409 mol.

For NMOC, the Moles of Contaminant (mol/m^3)= concentration / 1,000,000 * Total Moles in 1 m^3 = 4,000 / 1,000,000 * 0.0409 mol = 0.00016351 mol/m^3.

[7] https://www3.epa.gov/lmop/faq/landfill-gas.html

The Mass of Contaminant (g/m^3) = Moles of Contaminant (mol/m^3) * Molecular Weight (g/mol) = 0.00016351 mol/m^3 * 86.18 g/mol = 0.01409 g/m^3.

Flow Rate (m^3/s) = Total LFG emission converted to m^3/s = 1,800,000 m^3/yr / 365 days/yr / 24 h/day / 3600 s/h = 0.05717 m^3/s.

Mass Emission Rate (g/s) = Mass of Contaminant (g/m^3) * Flow Rate (m^3/s) = 0.01409 g/m^3 * 0.05717 m^3/s = 0.00081 g/s.

Mass Emission Rate ($g/s/m^2$) = Mass Emission Rate (g/s/) / Landfill Area = 0.00081 g/s / (244.340*158.430) m^2 = 2.0811E-08 $g/s/m^2$.

Data Quality: Marginal

Data quality for this calculation is best characterized by the following paragraph from Section 8.3.4 of the ESDM Procedure Document titled “Marginal” or “Uncertain Data Quality” Emission Estimating Techniques states:

> *Calculations/Judgement: Emission rate estimates derived from calculations where the scientific/technical integrity of the approach is uncertain are considered to have uncertain data quality. In many cases, the use of emission rate estimating methodologies that are classified as Marginal or Uncertain Data Quality may be the only available method. Where the maximum POI concentration is not approaching the MOECC POI Limit (i.e., the POI concentration is less than 10% of the respective limit), emission rate estimates of*

This source information for this calculation is data from another location. Conservative assumptions have been used to account for the uncertainty.

Operating Condition, Individual Maximum Rates of Production:

The emission rate calculations for these sources are based on the samples of LFG from another Ontario Landfill.

3.7 Odour, WF, CA

Table EA-07: Odour shows the parameters related to the odour emissions at the Site. The Odour emission rate at the working face is taken from another Ontario Landfill, “Ridge Landfill Environmental Screening [BFI Canada Inc.], Appendix E - Site Vicinity Air (Dust and Odour) Impact Assessment”, Table 9 (p. 34 of 43).

Methodology: Engineering Calculation (EC)

Emission rates from the Ridge Landfill (1.1 OU/m^2) area assumed to be emitted from the working face. To be conservative, the emission rate from the compost area is assumed to be (10 OU/m^2). These values were adjusted prior to use in AERMOD to show the 10-minute average values instead of the 1-hour averages for comparison to the odour criteria.

Sample Calculation:

The working face modelled emission rate = 1-hour emission * conversion factor = 1.1 OU/m^2 * 1.65 = 1.816 OU/m^2.

Similarly, the composting area modelled emission rate = 1-hour emission * conversion factor = 10 OU/m^2 * 1.65 = 16.5 OU/m^2.

Data Quality: Marginal

Data quality for this calculation is best characterized by the following paragraph from Section 8.3.4 of the ESDM Procedure Document titled “Marginal” or “Uncertain Data Quality” Emission Estimating Techniques states:

> *Calculations/Judgement: Emission rate estimates derived from calculations where the scientific/technical integrity of the approach is uncertain are considered to have uncertain data quality. In many cases, the use of emission rate estimating methodologies that are classified as Marginal or Uncertain Data Quality may be the only available method. Where the maximum POI concentration is not approaching the MOECC POI Limit (i.e., the POI concentration is less than 10% of the respective limit), emission rate estimates of*

This source information for this calculation is data from another location. Conservative assumptions have been used to account for the uncertainty.

Operating Condition, Individual Maximum Rates of Production:

The emission rate calculations for these sources are based on the samples of LFG from another Ontario Landfill.

Water St Emissions (background)

Traffic on Perth Road 123 (Weekday) - AADT

AADT	Total	% Pick-up Trucks	% Heavys	% Cars
2015	2189	2%	12%	86%
Average weights (tons)		2.25	30	1.75

Road description:	Paved Road	
Distance travelled:	987.9	m
Distance travelled:	0.614	miles

	per Hour	per Day
Number of pick-up trucks:	9	44
Number of trucks:	53	263
Number of cars:	377	1883
Total vehicles:	438	2189
Total VKT	433	2163

Measured Data (MOECC Stn 15026 - London ON)

	NOx		PM2.5	
Min	0	ppb	0	µg/m3
10%	3	ppb	1	µg/m3
50%	8	ppb	5	µg/m3
90%	21	ppb	15	µg/m3
Max	208	ppb	74	µg/m3

MOVES Emission Rates (g/VMT)

Vehicle	NOx	CO	PM2.5	PM10	TSP
Pick-up	0.591	2.688	0.013	0.015	0.015
Short Haul Truck	3.368	1.362	0.129	0.140	0.140
Car	0.288	1.568	0.012	0.014	0.014

Emission (g/time):

Pick-up	3.176	14.451	0.351	0.397	0.397
Short Haul Truck	108.634	43.945	20.772	22.578	22.578
Car	66.656	362.460	13.899	15.712	15.712
Total (g/time):	178.466	420.857	35.022	38.688	38.688
Max (g/s) -1h:	**0.0496**	**0.1169**			
Average (g/s) - 24h:			0.000405	0.000448	0.000448

Road Dust Emissions

sL =	**0.2**	g/m2 (road surface silt loading)
W =	**5.2**	tons (mean vehicle weight)
S =	**49.7**	average speed (mph) of the vehicles traveling the road
P =	**117.7**	Number of days with at least 0.245 mm (0.01 in.) of precipitaion per year
N =	**365**	number of days in the averaging period (e.g., 365 for annual, 91 for seasonal, 30 for monthly)

Road Dust Emission Rates:	PM2.5	PM10	PM30
k (g/VKT):	1.05	4.22	21.96
Factor (g/VKT) See Eqn 2:	0.1	0.6	3.1
Rate (g/s):	0.0037	0.0147	0.0764
Total Average (g/s) - 24h:	**0.00406**	**0.01513**	**0.07684**

Source:
Emissions calculated using "USEPA TTN CHIEF, AP-42, Fifth Edition, Volume I, Chapter 13, Section 13.2.1, Draft Section - June 10, 2010
Equation (2): E = [k x (sL/2)^0.98 x (W/3)^0.53 x (S/30)^0.16] x (1-P/(4xN))
1) Equation (2) accounts for precipitation on a daily basis
3) Use p = 150 (Buffalo, NY) as default value in the absence of site-specific information
4) TPM is assumed to be PM-30, as particles larger that 30 microns are assumed to fall back within property boundaries.
E = particulate emission factor in g/VKT
k = particle size multiplier in g/VKT

Quality rating:		**If using site specific silt loading and**
PM10 and TPM:	A	Silt Loading: 0.03 - 400 g/m2
PM2.5	D	MV Weight 2.0 - 42 tons
		MV Speed 1 - 55 mph

If using silt loading value from Table 13.2.1-2, quality rating reduced by 2 levels.

Recommended dafault silt loading (g/m2) values for public paved roads

Table 13.2.1-2				
ADT category	<500	500-5,000	5,000-10,000	>10,000
Ubiquitous Baseline g/m2	0.6	0.2	0.06	0.03 0.015 limited access
Ubiquitous Winter Baseline	X4	X3	X2	X1
Initial peak additive contribution	2	2	2	2
Days to return to baseline conditions	7	3	1	0.5

The winter baseline is represented as a multiple of the non-winter baseline, depending on the ADT value for the road in question.
As shown, a multiplier of 4 is applied for low volume roads (< 500 ADT) to obtain a wintertime baseline silt loading of 4 X 0.6 = 2.4 g/m2.

Max Hourly Vehicles:

	2015 Vehicles	Trips	% Med. Trucks	% Heavys	% Cars
Weekday	10	10	0%	9%	91%
Saturday	26	26	8%	0%	92%

Daily On-site traffic:

	2015	Trips	% Med.	% Heavys	% Cars	
Weekday	100	200	0%	9%	91%	*Obtained by multiplying a.m. OR p.m. peak hour (whichever is higher) volumes by 10*
Saturday	130	260	8%	0%	92%	*Obtained by multiplying a.m. peak hour volumes by 5*
Average Vehicle Weight			2.25	30	1.75 tons	

Road description: Unpaved - Gravel

$E=k(s/12)^a*(W/3)^b$

S: Surface material silt content: 6.4 %

https://www3.epa.gov/ttnchie1/ap42/ch13/final/c13s0202.pdf, Table 13.2.2-1

https://www3.epa.gov/ttnchie1/ap42/ch13/final/c13s0202.pdf, Table 13.2.2-2

Constant	PM2.5	PM10	PM-30
k (lb/VMT)	0.15	1.5	4.9
a	0.9	0.9	0.7
b	0.45	0.45	0.45
Quality Rating	B	B	B

Weekdays:

Road Segment	Segment Length (m)	# of Trips per Day	Number of Trips			W: Mean Vehicle Weight (ton)	VKT (km)	VMT (mi)	E: Emission Rates (lb/VMT)			Emission Rates (g/s) (24 h day)		
			Med Trucks	Heavy Trucks	Cars				PM2.5	PM10	TPM	PM2.5	PM10	TPM
A-B	356	200	0	18	182	4.3	71.2	44	0.1001	1.0009	3.7077	0.0233	0.2325	0.8614
B-C	85.9	18		18		30.0	1.5	1	0.2401	2.4010	8.8940	0.0012	0.0121	0.0449
B-D	182.5	184	0	2	182	2.1	33.6	21	0.0719	0.7189	2.6629	0.0079	0.0788	0.2918
D-E	71.4	9		9		30.0	0.6	0	0.2401	2.4010	8.8940	0.0005	0.0050	0.0186
E-F	94.3	9		9		30.0	0.8	1	0.2401	2.4010	8.8940	0.0007	0.0066	0.0246
E-H	351.5	9		9		30.0	3.2	2	0.2401	2.4010	8.8940	0.0025	0.0248	0.0918

Saturdays:

Emission Rates

Road Segment	Segment Length (m)	# of Trips per Day	Number of Trips			W: Mean Vehicle Weight (ton)	VKT (km)	VMT (mi)	Emission Rates (lb/VMT)			Emission Rates (g/s) (24 h day)		
			Med Trucks	Heavy Trucks	Cars				PM2.5	PM10	TPM	PM2.5	PM10	TPM
A-B	356	260	21	0	239	1.8	92.6	58	0.0675	0.6753	2.5014	0.0204	0.2039	0.7554
B-C	85.9	0		0		0.0	-	-	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
B-D	182.5	260	21	0	239	1.8	47.5	29	0.0675	0.6753	2.5014	0.0105	0.1045	0.3873
D-E	71.4	0		0		0.0	-	-	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
E-F	94.3	0		0		0.0	-	-	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
E-H	351.5	0		0		0.0	-	-	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

VKT - Vehicle Kilometres Travelled
VMT - Vehicle Miles Travelled

Source:
Emissions calculated using "USEPA TTN CHIEF, AP-42, Fifth Edition, Volume I, Chapter 13, 13.2.2, Draft Section - March 22, 2006
Equation 1a: E = [k x (s/12)^a x (W/3)^b]
Table 13.2.2-1 contains values for typical silt content

Emission Rate (g/mile) (from MOVES)

	NOx	CO	PM2.5	PM10	TSP
Car	0.379021	3.637447917	0.02349	0.026553	0.026553
Pick-up	0.678885	5.67886	0.022779	0.02575	0.02575
Truck	9.776581	3.55821	0.376363	0.409092	0.409092
Ave. Passe	0.528953	4.658153958	0.023134	0.026152	0.026152

Engine non-Particulate Emissions:

Road Segment	Segment Length (m)	# of Trips per Hour	Max Number of Vehicles/h			Mean Vehicle Weight, ton	VKT (km)	VMT (mi)	Hourly E-Rate (g/h)		Emission Rates (g/s) (1-h Max)	
			Med Trucks	Heavy Trucks	Cars				NOx	CO	NOx	CO
A-B	356	11	0	2	9	6.8	4.0	2.5	59.84	121.58	**0.0166**	**0.0338**
B-C	85.9	2		2		30.0	0.2	0.1	2.09	0.76	**0.0006**	**0.0002**
B-D	182.5	11	0	2	9	6.8	2.0	1.3	30.68	62.33	**0.0085**	**0.0173**
D-E	71.4	2		2		30.0	0.1	0.1	1.74	0.63	**0.0005**	**0.0002**
E-F	94.3	2		2		30.0	0.2	0.1	2.29	0.83	**0.0006**	**0.0002**
E-H	351.5	2		2		30.0	0.7	0.4	8.54	3.11	**0.0024**	**0.0009**

Engine Particulate Emissions:

Road Segment	Segment Length (m)	# of Trips per Day	Number of			Mean Vehicle Weight, ton	VKT (km)	VMT (mi)	Daily Emission Rate (g/day)			Emission Rates (g/s) (24-h Average)		
			Med Trucks	Heavy Trucks	Cars				PM2.5	PM10	TSP	PM2.5	PM10	TSP
A-B	356	200	0	18	182	4.3	71.2	44	486.10	536.47	536.47	0.0056	0.0062	0.0062
B-C	85.9	12		12		30.0	1.0	1	2.89	3.14	3.14	0.0000	0.0000	0.0000
B-D	182.5	192	0	10	182	3.2	35.0	22	173.66	192.74	192.74	0.0020	0.0022	0.0022
D-E	71.4	10		10		30.0	0.7	0	1.67	1.82	1.82	0.0000	0.0000	0.0000
E-F	94.3	10		10		30.0	0.9	1	2.21	2.40	2.40	0.0000	0.0000	0.0000
E-H	351.5	8		8		30.0	2.8	2	5.26	5.72	5.72	0.0001	0.0001	0.0001

Total Particulate Emissions:

Road Segment	Segment Length (m)	# of Trips per Day	Number of			Mean Vehicle Weight, ton	VKT (km)	VMT (mi)	BMPP Reduction			Emission Rates (g/s) (24-h Average)		
			Med Trucks	Heavy Trucks	Cars				PM2.5	PM10	TSP	PM2.5	PM10	TSP
A-B	356	200	0	18	182	4.3	71.2	44	0.90	0.90	0.90	**0.0080**	**0.0295**	**0.0923**
B-C	85.9	24		24		30.0	2.1	1	0.90	0.90	0.90	**0.0002**	**0.0012**	**0.0045**
B-D	182.5	190	0	8	182	2.9	34.7	22	0.90	0.90	0.90	**0.0028**	**0.0101**	**0.0314**
D-E	71.4	9		9		30.0	0.6	0	0.90	0.90	0.90	**0.0001**	**0.0005**	**0.0019**
E-F	94.3	9		9		30.0	0.8	1	0.90	0.90	0.90	**0.0001**	**0.0007**	**0.0025**
E-H	351.5	9		9		30.0	3.2	2	0.90	0.90	0.90	**0.0003**	**0.0025**	**0.0092**

Alternative Method 2 Emission Rates

Road Segment	Segment Length (m)	Emission Rates (g/s) (1-h Max)		Emission Rates (g/s) (24-h Average)		
		NOx	CO	PM2.5	PM10	TSP
A-B	356	0.0166	0.0338	0.0080	0.0295	0.0923
B-C	230.1	0.0016	0.0006	0.0004	0.0033	0.0121
B-D	397.8	0.0186	0.0377	0.0061	0.0220	0.0685
D-E	202	0.0014	0.0005	0.0002	0.0015	0.0053
E-F	184	0.0012	0.0005	0.0002	0.0014	0.0049
E-H	266.5	0.0018	0.0007	0.0002	0.0019	0.0070

Alternative Method 3 Emission Rates

Road Segment	Segment Length (m)	Emission Rates (g/s) (1-h Max)		Emission Rates (g/s) (24-h Average)		
		NOx	CO	PM2.5	PM10	TSP
A-B	356	0.0166	0.0338	0.0080	0.0295	0.0923
B-C	68.3	0.0005	0.0002	0.0001	0.0010	0.0036
B-D	121	0.0056	0.0115	0.0019	0.0067	0.0208
D-E	138.7	0.0009	0.0003	0.0001	0.0010	0.0037
E-F	255.9	0.0017	0.0006	0.0002	0.0019	0.0068
E-H	214.8	0.0015	0.0005	0.0002	0.0016	0.0057

Alternative Method 4 Emission Rates

Road Segment	Segment Length (m)	Emission Rates (g/s) (1-h Max)		Emission Rates (g/s) (24-h Average)		
		NOx	CO	PM2.5	PM10	TSP
A-B	356	0.0166	0.0338	0.0080	0.0295	0.0923
B-C	46.8	0.0003	0.0001	0.0001	0.0007	0.0025
B-D	198.1	0.0093	0.0188	0.0030	0.0110	0.0341
D-E	247.9	0.0017	0.0006	0.0002	0.0018	0.0065
E-F	181.8	0.0012	0.0004	0.0002	0.0013	0.0048
E-H	216.8	0.0015	0.0005	0.0002	0.0016	0.0057

Particulate Emissions from Stockpile

Particle size	k
< 30 um	0.74
< 15 um	0.48
< 10 um	0.35
< 5 um	0.2
< 2.5 um	0.053

Particle Size Multiplier (dimensionless)

U = 3.98 Mean wind speed (m/s)
M = 5 Material moisture content (%)

Type of pile: **Clay/dirt mix**
Transfer points: 1.00
Daily Turnover (T/0): 3.0 tonnes/day
Area: 314.159265 m2

Emission factor:

	kg PM / Mg of Material
PM2.5	5.081E-05
PM10	3.356E-04
TPM	7.095E-04

Emission Rates:

	kg PM/day	g/s	g/s/m2
PM2.5	1.5E-04	**1.764E-06**	**5.6E-09**
PM10	1.0E-03	**1.165E-05**	**3.7E-08**
TPM	2.1E-03	**2.463E-05**	**7.8E-08**

Table 1: Range of Source Conditions

Silt Content %	Moisture Content %	Wind Speed m/s	Wind Speed mph
0.44 - 19	0.25 - 4.8	0.6 - 6.7	1.3 - 15

Particulate Emissions from Working Face Operations
based on storage pile approach

M = 15 Material moisture content (%)

Type of pile: **Sand**
Transfer points: 2.00
Daily Turnover (T/0): 62.5 tonnes/day
Area: 1200 m2

Emission factor:

	kg PM / Mg of Material
PM2.5	1.1E-05
PM10	7.2E-05
TPM	1.5E-04

Emission Rates:

	kg PM/day	g/s	g/s/m2
PM2.5	1.4E-03	**1.6E-05**	**1.3E-08**
PM10	9.0E-03	**1.0E-04**	**8.7E-08**
TPM	1.9E-02	**2.2E-04**	**1.8E-07**

Particulate Emissions from Compost
based on storage pile approach

M = 40 Material moisture content (%)

Type of pile: **Clay/dirt mix**
Transfer points: 2.00
Daily Turnover (T/0): 25.0 tonnes/day
Area: 5700 m2

Emission factor:

	kg PM / Mg of Material
PM2.5	2.8E-06
PM10	1.8E-05
TPM	3.9E-05

Emission Rates:

	kg PM/day	g/s	g/s/m2
PM2.5	1.4E-04	**1.6E-06**	**2.8E-10**
PM10	9.1E-04	**1.1E-05**	**1.9E-09**
TPM	1.9E-03	**2.2E-05**	**3.9E-09**

Source:
Emissions calculated using "USEPA TTN CHIEF, AP-42, Fifth Edition, Volume I, Chapter 13, Equation 13.2.4.(1)
Emission Factor (Equation 1a): E = k x 0.0016 x (U/2.2)^1.3 / (M/2)^1.4
If no site-specific data are available, use default values from Table 13.2.4-1 for silt content (%) and moisture content (%)
E (kg PM/day) = EF (kg PM/Mg Material) x T/O (Mg Material/day)
E (g/s) = E (kg/day) x 1000 g/kg / 8 hr/day / 3600 s/hr
E (kg/year) = EF (kg PM/Mg Material) x AU (Mg Material/year)

Quality rating - A, but:
(1) Quality rating reduced by 1 letter if using mean from Table 13.2.4-1
(2) Quality rating reduced by 1 letter if any source condition falls outside the values listed in Table 1 above

Total dust emissions from aggregate storage piles result from several distinct source activities within the storage cycle:
1. Loading of aggregate onto storage piles (batch or continuous drop operations).
2. Equipment traffic in storage area.
3. Wind erosion of pile surfaces and ground areas around piles.
4. Loadout of aggregate for shipment or for return to the process stream (batch or continuous drop operations

Off-Road Vehicle Emissions						Emission Factor		Hourly Emission		Average Emission	
Vehicle Type	Gross Power Rating (hp)	Gross Power Rating (kW)	# units	Hourly Load Factor	Hours of Operation	NOx (g/kW-h)	CO (g/kw-h)	NOx (g/h)	CO (g/h)	NOx (g/s)	CO (g/s)
Loader	160	119.312	1	0%	1	4	5	0	0	0	0
Compactor	235	175.2395	1	33%	1	4	3.5	233.6526	204.446048	0.064903507	0.056791

*Assume Equipment meets Tier 3 emission standards (2006)

Working Face Area: 1200 m2

									Daily Emission			Daily Average Emission		
Vehicle Type	Gross Power Rating (hp)	Gross Power Rating (kW)	# units	Daily Load Factor	Hours of Operation	PM2.5 (g/kW-h)	PM10 (g/kW-h)	TSP (g/kW-h)	PM2.5 (g/day)	PM10 (g/day)	TSP (g/day)	PM2.5 (g/s)	PM10 (g/s)	TSP (g/s)
Loader	160	119.312	1	25%	8	0.3	0.3	0.3	71.5871877	71.58718771	71.58719	0.000828555	0.000829	0.000829
Compactor	235	175.2395	1	25%	8	0.2	0.2	0.2	70.095788	70.09578797	70.09579	0.000811294	0.000811	0.000811

https://www.dieselnet.com/standards/us/nonroad.php

Tier 2 or 3 Lookup (2 if no Tier 3)

Engine Power Lower Range	Engine Power Upper Range	Year	CO	HC	NMHC + NOx	NOx	PM
0	8	2005	8.0		7.5		0.8
8	19	2005	6.6		7.5		0.8
19	37	2004	5.5		7.5		0.6
37	75	2008	5.0		4.7		0.4
75	130	2007	5.0		4.0		0.3
130	225	2006	3.5		4.0		0.2
225	450	2006	3.5		4.0		0.2
450	560	2006	3.5		4.0		0.2
560	1.00E+06	2006	3.5		6.4		0.2

Contaminant	CAS	Emission factor (g/kW-h)	Source	Criterion (µg/m3)				Source	Limiting Effect	Ratio - Emission Factor/Criterion				Ranking			
				10 min	1hr	24hr	annual			10 min	1hr	24hr	annual	10 min	1hr	24hr	annual
Nitrogen Oxides	10102-44-0	4.00	(6)		400	200	60	(2)	Health		1.0E-02	2.0E-02	6.7E-02		1	1	1
Carbon Monoxide	630-08-0	5.00	(6)		36,200			(2)	Health		1.4E-04				2		
Sulphur Dioxide	7446-09-5	0.03			690	275	55	(2)	Health & Vegetation		4.3E-05	1.1E-04	5.5E-04		3	3	3
Particulate Matter	-	0.30	(6)			120.00	60.00	(2)	Visibility			2.5E-03	5.0E-03			2	2

Contaminant	CAS	Emission Rate (g/s)	Source	Criterion (µg/m3)				Source	Limiting Effect	Ratio - Emission Factor/Criterion				Ranking			
				10 min	1hr	24hr	annual			10 min	1hr	24hr	annual	10 min	1hr	24hr	annual
1,1,1-Trichloroethane (methyl chloroform) - H	71-55-6	3.86597E-12	(1)			115,000		(2)	Health			3.4E-17				39	
1,1,2,2-Tetrachloroethane - HAP/VOC	79-34-5	1.11466E-11	(1)			40		(3)				2.8E-13				19	
1,1-Dichloroethane (ethylidene dichloride) - H	75-34-3	1.43398E-11	(1)			165		(2)	Health			8.7E-14				21	
1,1-Dichloroethene (vinylidene chloride) - HA	75-35-4	1.17047E-12	(1)			10		(2)	Health			1.2E-13				20	
1,2-Dichloroethane (ethylene dichloride) - HA	107-06-2	2.44947E-12	(1)			2	0.4	(2)	Health			1.2E-12	6.1E-12			17	
1,2-Dichloropropane (propylene dichloride) -	78-87-5	1.22784E-12	(1)			2,400		(2)	Odour			5.1E-16				38	
2-Propanol (isopropyl alcohol) - VOC	67-63-0	1.81445E-10	(1)			7,300		(2)	Health			2.5E-14				28	
Acetone	67-64-1	2.45445E-11	(1)			11,800		(2)	Health			2.1E-15				35	
Acrylonitrile - HAP/VOC	107-13-1	2.45445E-11	(1)			0.6	0.12	(2)	Health			4.1E-11	2.0E-10			10	2
Benzene - Co-disposal - HAP/VOC	71-43-2	8.95961E-12	(1)			2.3	0.45	(2)	Health			3.9E-12	2.0E-11			16	
Bromodichloromethane - VOC	75-27-4	5.18714E-11	(1)			0.1		(5)				5.2E-10				4	
Butane - VOC	106-97-8	3.06608E-11	(1)			7600						4.0E-15				33	
Carbon disulfide - HAP/VOC	75-15-0	1.75438E-11	(1)			330		(2)	Odour			5.3E-14				23	
Carbon monoxide	630-08-0	2.66571E-12	(1)		36,200			(2)	Health		7.4E-17				2		
Carbon tetrachloride - HAP/VOC	56-23-5	2.36739E-10	(1)			2.4		(2)	Health			9.9E-11				8	
Carbonyl sulfide - HAP/VOC	463-58-1	3.71499E-14	(1)			3.2		(3)				1.2E-14				29	
Chlorobenzene - HAP/VOC	108-90-7	1.77698E-12	(1)	4,500	3,500			(2)	Health (1 hr)	3.9E-16	5.1E-16			4	1		
Chlorodifluoromethane	75-45-6	1.69884E-12	(1)			350,000		(2)	Health			4.9E-18				40	
Chloroethane (ethyl chloride) - HAP/VOC	75-00-3	6.78637E-12	(1)			5,600		(2)	Health			1.2E-15				36	
Chloroform - HAP/VOC	67-66-3	5.06368E-12	(1)			1	0.2	(2)	Health			5.1E-12	2.5E-11			14	
Chloromethane - VOC	74-87-3	2.16231E-13	(1)			320		(2)	Health			6.8E-16				37	
Dichlorobenzene - (HAP for para isomer/VO	106-46-7	3.65776E-12	(1)			95		(2)	Health			3.9E-14				25	
Dichlorodifluoromethane	75-71-8	1.86366E-12	(1)			500,000		(2)	Health			3.7E-18				41	
Dichlorofluoromethane - VOC	75-43-4	1.16791E-10	(1)			0.1		(5)				1.2E-09				1	
Dichloromethane (methylene chloride) - HAP	75-09-2	1.61548E-11	(1)			220	44	(2)	Health			7.3E-14	3.7E-13			22	
Dimethyl sulfide (methyl sulfide) - VOC	75-18-3	7.17909E-11	(1)	30				(2)	Odour	2.4E-12				1			
Ethane	74-84-0	2.92567E-11	(1)			0.1		(5)				2.9E-10				5	
Ethanol - VOC	622-08-2	1.61567E-09	(1)			148		(3)				1.1E-11				12	
Ethyl mercaptan (ethanethiol) - VOC	75-08-1	7.51113E-11	(1)			0.1		(5)				7.5E-10				3	
Ethylbenzene - HAP/VOC	100-41-4	8.62697E-12	(1)	1,900		1,000		(2)	Odour/Health	4.5E-15		8.6E-15		3		30	
Ethylene dibromide - HAP/VOC	106-93-4	2.94814E-11	(1)			3		(2)	Health			9.8E-12				13	
Fluorotrichloromethane - VOC	75-69-4	1.13425E-14	(1)			6000		(2)	Health			1.9E-18				43	
Hexane - HAP/VOC	110-54-3	6.30327E-12	(1)			2,500		(2)	Health			2.5E-15				34	
Hydrogen sulfide	7783-06-4	3.43383E-11	(1)			7		(4)				4.9E-12				15	
Mercury (total) - HAP	7439-97-6	7.40681E-11	(1)			0.5		(2)	Health			1.5E-10				6	
Methyl ethyl ketone - HAP/VOC	78-93-3	3.5122E-15	(1)			1000		(2)	Health			3.5E-18				42	
Methyl isobutyl ketone - HAP/VOC	108-10-1	3.09088E-11	(1)			1,200		(2)	Odour			2.6E-14				27	
Methyl mercaptan - VOC	74-93-1	1.14889E-11	(1)			0.1		(5)				1.1E-10				7	
Pentane - VOC	109-66-0	7.26113E-12	(1)			0.1		(5)				7.3E-11				9	
Perchloroethylene (tetrachloroethylene) - HA	127-18-4	1.43741E-11	(1)			360		(2)	Health			4.0E-14				24	
Propane - VOC	74-98-6	3.70419E-11	(1)			7200		(3)				5.1E-15				32	
t-1,2-Dichloroethene - VOC	156-60-5	2.92794E-11	(1)			105		(2)	Health			2.8E-13				18	
Toluene - No or Unknown Co-disposal - HAP	108-88-3	1.63866E-11	(1)			2,000		(2)	Odour			8.2E-15				31	
Trichloroethylene (trichloroethene) - HAP/VC	79-01-6	2.16917E-10	(1)			12	2.3	(2)	Health			1.8E-11	9.4E-11			11	3
Vinyl chloride - HAP/VOC	75-01-4	9.45538E-10	(1)			1	0.2	(2)	Health			9.5E-10	4.7E-09			2	1
Xylenes - HAP/VOC	1330207	2.22117E-11	(1)	3,000		730		(2)	Health/Odou	7.4E-15		3.0E-14		2		26	

Sources

1. Analytical Results of LFG from Municipal Landfill - Provided by Kent (at RJB)
2. Ministry of the Environment (MOE) 2012. Ontario's Ambient Air Quality Criteria (PIBS#6570e01). Standards Development Branch, April.
3. Ministry of the Environment (MOE) 2008. Jurisdictional Screening Level (JSL) List, a Screening Tool for Ontario Regulation 419/05: Air Pollution – Local Air Quality (PIBS#6547e). Standards Development Branch, February.
4. Ministry of the Environment (MOE). Environmental Protection Act Ontario Regulation 419/05 - Air Pollution Local Air Quality, Schedule 3
5. contaminants did not have assigned limits. Negligable limit of 0.1 was assigned
6. See Table EA-04

Gas / Pollutant Default Parameters:

LFG Emission Rate: 1.80E+06 m3/yr
Landfill Active Area: 38,711 m2

Compound Name	Concentration (*ppmv*)	Molecular Weight (g/mol)	Total Moles in 1m3	Moles of Contaminant (mol/m3)	Mass of Contaminant (g/m3)	Flow Rate (m3/s)	Mass Emission Rate (g/s)	Mass Emission Rate (g/s/m2)
Total landfill gas	1,000,000	30.03	0.04087632	0.04087632	1.22731147	0.05717275	0.07016878	1.81264E-06
Methane	500,000	16.04	0.04087632	0.02043816	0.32782808	0.05717275	0.01874283	**4.84176E-07**
Carbon dioxide	500,000	44.01	0.04087632	0.02043816	0.8994834	0.05717275	0.05142594	**1.32847E-06**
NMOC	4,000	86.18	0.04087632	0.00016351	0.01409088	0.05717275	0.00080561	2.08111E-08
1,1,1-Trichloroethane (methyl chloroform) - HAP	0.48	133.41	0.04087632	1.9621E-08	2.6176E-06	0.05717275	1.4965E-07	3.86597E-12
1,1,2,2-Tetrachloroethane - HAP/VOC	1.1	167.85	0.04087632	4.4964E-08	7.5472E-06	0.05717275	4.3149E-07	1.11466E-11
1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	2.4	98.97	0.04087632	9.8103E-08	9.7093E-06	0.05717275	5.5511E-07	1.43398E-11
1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.20	96.94	0.04087632	8.1753E-09	7.9251E-07	0.05717275	4.531E-08	1.17047E-12
1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.41	98.96	0.04087632	1.6759E-08	1.6585E-06	0.05717275	9.4821E-08	2.44947E-12
1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.18	112.99	0.04087632	7.3577E-09	8.3135E-07	0.05717275	4.7531E-08	1.22784E-12
2-Propanol (isopropyl alcohol) - VOC	50	60.11	0.04087632	2.0438E-06	0.00012285	0.05717275	7.0239E-06	1.81445E-10
Acetone	7.0	58.08	0.04087632	2.8613E-07	1.6619E-05	0.05717275	9.5014E-07	2.45445E-11
Acetone	7.0	58.08	0.04087632	2.8613E-07	1.6619E-05	0.05717275	9.5014E-07	2.45445E-11
Benzene - No or Unknown Co-disposal - HAP/VOC	1.9	78.11	0.04087632	7.7665E-08	6.0664E-06	0.05717275	3.4683E-07	8.95961E-12
Benzene - Co-disposal - HAP/VOC	11	78.11	0.04087632	4.4964E-07	3.5121E-05	0.05717275	2.008E-06	5.18714E-11
Bromodichloromethane - VOC	3.1	163.83	0.04087632	1.2672E-07	2.076E-05	0.05717275	1.1869E-06	3.06608E-11
Butane - VOC	5.0	58.12	0.04087632	2.0438E-07	1.1879E-05	0.05717275	6.7914E-07	1.75438E-11
Carbon disulfide - HAP/VOC	0.58	76.13	0.04087632	2.3708E-08	1.8049E-06	0.05717275	1.0319E-07	2.66571E-12
Carbon monoxide	140	28.01	0.04087632	5.7227E-06	0.00016029	0.05717275	9.1644E-06	2.36739E-10
Carbon tetrachloride - HAP/VOC	4.0E-03	153.84	0.04087632	1.6351E-10	2.5154E-08	0.05717275	1.4381E-09	3.71499E-14
Carbonyl sulfide - HAP/VOC	0.49	60.07	0.04087632	2.0029E-08	1.2032E-06	0.05717275	6.8788E-08	1.77698E-12
Chlorobenzene - HAP/VOC	0.25	112.56	0.04087632	1.0219E-08	1.1503E-06	0.05717275	6.5764E-08	**1.69884E-12**
Chlorodifluoromethane	1.3	86.47	0.04087632	5.3139E-08	4.5949E-06	0.05717275	2.6271E-07	6.78637E-12
Chloroethane (ethyl chloride) - HAP/VOC	1.3	64.52	0.04087632	5.3139E-08	3.4285E-06	0.05717275	1.9602E-07	5.06368E-12
Chloroform - HAP/VOC	0.03	119.39	0.04087632	1.2263E-09	1.4641E-07	0.05717275	8.3705E-09	2.16231E-13
Chloromethane - VOC	1.2	50.49	0.04087632	4.9052E-08	2.4766E-06	0.05717275	1.4159E-07	3.65776E-12
Dichlorobenzene - (HAP for para isomer/VOC)	0.21	147	0.04087632	8.584E-09	1.2619E-06	0.05717275	7.2144E-08	1.86366E-12
Dichlorodifluoromethane	16	120.91	0.04087632	6.5402E-07	7.9078E-05	0.05717275	4.5211E-06	1.16791E-10
Dichlorofluoromethane - VOC	2.6	102.92	0.04087632	1.0628E-07	1.0938E-05	0.05717275	6.2537E-07	**1.61548E-11**
Dichloromethane (methylene chloride) - HAP	14	84.94	0.04087632	5.7227E-07	4.8608E-05	0.05717275	2.7791E-06	7.17909E-11
Dimethyl sulfide (methyl sulfide) - VOC	7.8	62.13	0.04087632	3.1884E-07	1.9809E-05	0.05717275	1.1325E-06	**2.92567E-11**
Ethane	890	30.07	0.04087632	3.638E-05	0.00109394	0.05717275	6.2544E-05	1.61567E-09
Ethanol - VOC	27	46.08	0.04087632	1.1037E-06	5.0857E-05	0.05717275	2.9076E-06	7.51113E-11
Ethyl mercaptan (ethanethiol) - VOC	2.3	62.13	0.04087632	9.4016E-08	5.8412E-06	0.05717275	3.3396E-07	8.62697E-12
Ethylbenzene - HAP/VOC	4.6	106.16	0.04087632	1.8803E-07	1.9961E-05	0.05717275	1.1412E-06	2.94814E-11
Ethylene dibromide - HAP/VOC	1.0E-03	187.88	0.04087632	4.0876E-11	7.6798E-09	0.05717275	4.3908E-10	1.13425E-14
Fluorotrichloromethane - VOC	0.76	137.38	0.04087632	3.1066E-08	4.2678E-06	0.05717275	2.44E-07	6.30327E-12
Hexane - HAP/VOC	6.6	86.18	0.04087632	2.6978E-07	2.325E-05	0.05717275	1.3293E-06	3.43383E-11
Hydrogen sulfide	36	34.08	0.04087632	1.4715E-06	5.015E-05	0.05717275	2.8672E-06	7.40681E-11
Mercury (total) - HAP	2.9E-04	200.61	0.04087632	1.1854E-11	2.3781E-09	0.05717275	1.3596E-10	3.5122E-15
Methyl ethyl ketone - HAP/VOC	7.1	72.11	0.04087632	2.9022E-07	2.0928E-05	0.05717275	1.1965E-06	3.09088E-11
Methyl isobutyl ketone - HAP/VOC	1.9	100.16	0.04087632	7.7665E-08	7.7789E-06	0.05717275	4.4474E-07	1.14889E-11
Methyl mercaptan - VOC	2.5	48.11	0.04087632	1.0219E-07	4.9164E-06	0.05717275	2.8108E-07	7.26113E-12
Pentane - VOC	3.3	72.15	0.04087632	1.3489E-07	9.7324E-06	0.05717275	5.5643E-07	1.43741E-11
Perchloroethylene (tetrachloroethylene) - HAP	3.7	165.83	0.04087632	1.5124E-07	2.5081E-05	0.05717275	1.4339E-06	3.70419E-11
Propane - VOC	11	44.09	0.04087632	4.4964E-07	1.9825E-05	0.05717275	1.1334E-06	2.92794E-11
t-1,2-Dichloroethene - VOC	2.8	96.94	0.04087632	1.1445E-07	1.1095E-05	0.05717275	6.3434E-07	1.63866E-11
Toluene - No or Unknown Co-disposal - HAP/VOC	39	92.13	0.04087632	1.5942E-06	0.00014687	0.05717275	8.397E-06	2.16917E-10
Toluene - Co-disposal - HAP/VOC	170	92.13	0.04087632	6.949E-06	0.00064021	0.05717275	3.6603E-05	9.45538E-10
Trichloroethylene (trichloroethene) - HAP/VOC	2.8	131.40	0.04087632	1.1445E-07	1.5039E-05	0.05717275	8.5983E-07	2.22117E-11
Vinyl chloride - HAP/VOC	7.3	62.50	0.04087632	2.984E-07	1.865E-05	0.05717275	1.0663E-06	**2.75443E-11**
Xylenes - HAP/VOC	12	106.16	0.04087632	4.9052E-07	5.2073E-05	0.05717275	2.9772E-06	7.69079E-11

Source	Quantity	Area (m2)	Emission Flux Rate (OU/s m2)	Emission Flux Rate (OU/s m2)	Emission Rate (OU/s)
Working Face	1	3168	1.1	**1.817**	5754.875
Composting Facility	1	240	10	**16.514**	3963.412

Working Face Emission Flux Rate from Ridge Landfill Environmental Screening [BFI Canada Inc.], Appendix E - Site Vicinity Air (Dust and Odour) Impact Assessment, Table 9 (p. 34 of 43)

BURNSIDE

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Appendix EB

Supporting Information for Assessment of Negligibility

Appendix EB
Supporting Information for Assessment of Negligibility

Sources were screened for negligibility using the following screening protocols listed in the ESDM Procedure Document.

The results of the screening are discussed in greater detail in the following text.

1.0 Fugitive Dust Emissions

Fugitive dust emissions from on-site roadways and storage piles (ESDM Procedure Document Section 7.4):

The Site is not listed in Table 7-2 but is listed on Table 7-3 of Section 7.4 of the ESDM Procedure Document, NAICS 562210 and 325314 - Waste treatment and disposal and 325314 Mixed fertilizer manufacturing. Emissions from on-site roadways and storage piles are included in this assessment.

2.0 Combustion of Natural Gas and Propane

Combustion of natural gas and propane (ESDM Procedure Document Section 7.1.1):

The Site does not have any natural gas or propane fired equipment.

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Appendix EC

Dispersion Modelling Printouts

Appendix EC
Dispersion Modelling

The property boundary point coordinates are listed in Table EC-1. The emission rates for the current case organized by emission point are found in Table E2-1. The emission rates for the current case organized by contaminant are found in Table E2-2.

1.0 Nitrogen Oxides

The 1 hour nitrogen oxide simulation was performed separately for Alternative Method 3 because the initial simulation showed an exceedence. The longer time periods for Alternative Method 3 and all time periods for all other simulations were calculated in the Multi Contaminant Run.

2.0 Multi Contaminant Run

The other contaminant simulations were done using Lakes' "Multi-Chemical Run…" option. This simulation uses the entire site and all emission points are simulated as point sources, area sources or volume sources. The first highest predicted values are reported in Table E4-1 through E4-4.

3.0 Site-Specific Meteorological Data

Because this assessment is an environmental assessment and one of the contaminants is odour, the MOECC was requested to provide and provided Site-Specific Meteorological Data.

	UTM Coordinates	
Property Coordinates	**X (m)**	**Y (m)**
Property Boundary	487355.11	4787574.03
Property Boundary	487204.81	4787355.06
Property Boundary	487148.33	4787379.20
Property Boundary	487141.11	4787332.45
Property Boundary	487142.98	4787287.07
Property Boundary	487199.56	4786895.33
Property Boundary	487877.26	4786979.09
Property Boundary	487851.67	4787179.33
Property Boundary	487547.79	4787504.28

```
** Lakes Environmental AERMOD MPI
**
**************************************
**
** AERMOD INPUT PRODUCED BY:
** AERMOD VIEW VER. 9.0.0
** LAKES ENVIRONMENTAL SOFTWARE INC.
** DATE: 3/22/2016
** FILE: C:\AERMOD\ST. MARYS\032339\REV1\NOX SITE 1H\ST MAYS.ADI
**
**************************************
**
**
**************************************
** AERMOD CONTROL PATHWAY
**************************************
**
**
CO STARTING
   TITLEONE C:\AERMOD\ST MARYS\032339\REV1\MULTICHEM\ST MAYS.ISC
   MODELOPT DFAULT CONC
   AVERTIME 1
   POLLUTID MULTI
   RUNORNOT RUN
   ERRORFIL "ST MAYS.ERR"
CO FINISHED
**
**************************************
** AERMOD SOURCE PATHWAY
**************************************
**
**
SO STARTING
** SOURCE LOCATION **
** SOURCE ID - TYPE - X COORD. - Y COORD. **
** ------------------------------------------------------------------------
** LINE SOURCE REPRESENTED BY SEPARATED VOLUME SOURCES
** LINE VOLUME SOURCE ID = TRKAB
** DESCRSRC ENTRY ROAD
** PREFIX
** LENGTH OF SIDE = 9.00
** CONFIGURATION = SEPARATED
** EMISSION RATE = 0.016623023
** VERTICAL DIMENSION = 4.76
** SZINIT = 2.21
** NODES = 7
** 487190.032, 4786890.057, 322.70, 2.38, 8.07
** 487219.440, 4786902.060, 322.94, 2.38, 8.07
** 487227.242, 4786915.864, 322.91, 2.38, 8.07
** 487193.633, 4787152.323, 320.09, 2.38, 8.07
** 487204.436, 4787169.127, 320.00, 2.38, 8.07
** 487215.239, 4787161.925, 320.00, 2.38, 8.07
** 487221.840, 4787125.916, 321.00, 2.38, 8.07
** ------------------------------------------------------------------------
   LOCATION L0000629     VOLUME   487194.199 4786891.758 322.76
   LOCATION L0000630     VOLUME   487210.263 4786898.315 322.72
   LOCATION L0000631     VOLUME   487223.101 4786908.537 322.38
   LOCATION L0000632     VOLUME   487225.984 4786924.710 322.00
   LOCATION L0000633     VOLUME   487223.543 4786941.888 322.00
   LOCATION L0000634     VOLUME   487221.101 4786959.067 322.00
   LOCATION L0000635     VOLUME   487218.660 4786976.246 322.00
   LOCATION L0000636     VOLUME   487216.218 4786993.424 321.76
   LOCATION L0000637     VOLUME   487213.776 4787010.603 321.53
```

*** THE SUMMARY OF HIGHEST 1-HR RESULTS ***

** CONC OF MULTI IN MICROGRAMS/M**3 **

GROUP ID		AVERAGE CONC	DATE (YYMMDDHH)	RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG)	OF TYPE	NETWORK GRID-ID
TRKAB	HIGH 1ST HIGH VALUE IS	45.42281	ON 10020708:	AT (487240.49, 4786894.15, 322.86, 322.86, 0.00)	DC	
TRKBC	HIGH 1ST HIGH VALUE IS	4.27100	ON 10010719:	AT (487158.15, 4787150.73, 320.00, 320.00, 0.00)	DC	
TRKBD	HIGH 1ST HIGH VALUE IS	301.03073	ON 09010418:	AT (487203.30, 4787343.51, 320.00, 320.00, 0.00)	DC	
TRKDE	HIGH 1ST HIGH VALUE IS	66.40812	ON 11011617:	AT (487198.22, 4787335.65, 320.00, 320.00, 0.00)	DC	
TRKEF	HIGH 1ST HIGH VALUE IS	0.92977	ON 09121209:	AT (487259.16, 4787429.96, 317.06, 317.06, 0.00)	DC	
TRKEH	HIGH 1ST HIGH VALUE IS	14.17213	ON 13121619:	AT (487223.61, 4787374.95, 320.00, 320.00, 0.00)	DC	
ROADS	HIGH 1ST HIGH VALUE IS	339.20600	ON 09010418:	AT (487203.30, 4787343.51, 320.00, 320.00, 0.00)	DC	
CMPTR	HIGH 1ST HIGH VALUE IS	326.80662	ON 09020210:	AT (487170.89, 4787072.90, 321.00, 321.00, 0.00)	DC	
ALL	HIGH 1ST HIGH VALUE IS	392.42596	ON 11020507:	AT (487198.22, 4787335.65, 320.00, 320.00, 0.00)	DC	

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
DC = DISCCART
DP = DISCPOLR

*** Message Summary : AERMOD Model Execution ***

--------- Summary of Total Messages --------

A Total of 0 Fatal Error Message(s)
A Total of 0 Warning Message(s)
A Total of 399 Informational Message(s)

A Total of 43824 Hours Were Processed

A Total of 0 Calm Hours Identified

A Total of 399 Missing Hours Identified (0.91 Percent)

******** FATAL ERROR MESSAGES ********
*** NONE ***

******** WARNING MESSAGES ********
*** NONE ***

****
*** AERMOD Finishes Successfully ***
****