Ambient Air Quality Monitoring Plan
Ridge Landfill Expansion

Waste Connections of Canada Inc.

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1.0 Introduction & Objectives

Waste Connections of Canada Inc. (Waste Connections) operates the Ridge Landfill site located at 20262 Erieau Road near Blenheim, Ontario (Site). On October 29, 2020, the Minister for Environment, Conservation, and Parks (MECP) approved Waste Connections' Environmental Assessment (EA) for the Ridge Landfill expansion. The expansion enables Waste Connections to continue to provide long-term residual waste disposal capacity to industrial, commercial, and institutional customers in southern and central Ontario, as well as the Municipality of Chatham-Kent for the next 20 years. The Site is currently comprised of the Old Landfill, West Landfill, and South Landfill fill areas. The landfill expansion will see the vertical expansion of the Old Landfill, and horizontal expansion of the West Landfill and South Landfill areas.

In 2014, an air monitoring program was completed at the Ridge Landfill for total suspended particulate matter (TSP) and volatile organic compounds (VOC) (2014 Air Monitoring Program). The results of the monitoring program showed that the Ridge Landfill can operate in compliance with MECP air quality criteria.

Condition 5(1) of the Environmental Compliance Approval (ECA) No. 2395-BVDTGX dated December 16, 2020, stipulates that Waste Connections shall:

1. Submit to the District Manager, not later than ninety (90) days after the date of this Approval, an ambient air quality monitoring program prepared in accordance with the Operations Manual for Air Quality Monitoring in Ontario dated May 2019 (Air Quality Monitoring Manual). The ambient air quality monitoring program shall include, but not limited to, the ambient air quality monitoring for the measurement of:
    1.1. Suspended particulate matter (TSP); and,
    1.2. Volatile Organic Compounds (VOC).
2. Implement the approved ambient air quality monitoring program within a time period acceptable to the District Manager.

Condition 9(2) of the approved Environmental Assessment (EA) No. 16019 dated September 24, 2020, stipulates that Waste Connections shall:

- Submit to the Director for approval at least 60 days before the start of Construction, an air quality monitoring plan for the Site. This plan should, at minimum, include the monitoring of total suspended particulate (TSP), particulate matter less than 10 microns in diameter (PM_{10}), and volatile organic compounds (VOC).

This air quality monitoring program (AQMP) has been prepared to satisfy Condition 5(1)a of ECA No. 2395-BVDTGX and Condition 9(2) of the EA approval.

2.0 Air Contaminants of Concern

The primary air contaminants of concern from the Site operations as identified in the application for ECA and the EA are suspended particulate matter (as TSP and PM_{10}) and volatile organic compounds (VOCs).

2.1 Particulate Matter

Airborne particulate matter emissions, including total suspended particulate (TSP) and coarse particulate matter (PM_{10}), can be generated and released into the atmosphere as fugitive dust emissions. The expected site operations with the potential to generate particulate emissions include the following:

- On-Site vehicle traffic on paved and unpaved roads;
- Material processing (crushing, screening, and conveying); and,
- Material handling (loading/unloading, and storage).

The monitoring of particulate matter at the Site boundary (fence line) will serve to evaluate the adequacy of the overall Facility dust management program, which includes particulate emission control equipment and fugitive dust prevention efforts.

The assessment criteria to be used in assessing the air monitoring results are Ontario's Ambient Air Quality Criteria (AAQC). Since the monitoring program is planned to be based on 24-hour samples, assessment criteria will be based on a 24-hour averaging period only (no annual average criteria will be considered).

The ambient air monitoring program will help determine whether planned dust mitigation measures are sufficient. This mitigation effectiveness assessment will occur after each monitoring event, in conjunction with an evaluation of the scope of the monitoring program and planning for subsequent monitoring. The effectiveness assessment will be included within a summary report after each monitoring event.

2.2 Volatile Organic Compounds

Volatile organic compounds (VOCs) are emitted to the atmosphere from the generation of landfill gas. Landfill gas is emitted from the active working face and the entire landfill footprint.

Waste Connections is proposing that the VOC subsets listed in the US EPA TO-15 volatile organics profile be assessed to account for subsets that are common constituents of landfill gas. This list includes all VOC contaminants previously sampled as part of the 2014 Air Monitoring Program completed at the Ridge Landfill. This list may be reduced for subsequent monitoring after the first monitoring event, based on the sampling results and/or updates to the AAQC and in consultation with the MECP.

The assessment criteria to be used in assessing the air monitoring results of VOCs are Ontario's AAQC. Since the monitoring program is planned to be based on 24-hour samples, assessment criteria will be based on a 24-hour averaging period only (no annual average criteria will be considered).

3.0 Methodology

3.1 Equipment

3.1.1 Particulate

To accommodate the proposed long-term monitoring events, as well as the electrical power supply constraints, we are proposing to use 24-hour hi-volume sampling systems. The sampling systems can operate connected to an electrical power supply or a DC battery system.

Specific equipment proposed for the monitoring program includes the following:

- BGI PQ100 Samplers (or equivalent[1]);
- Tripod including TSP/PM10 inlets;
- Filter media (meeting TSP and PM10 requirements); and,
- 12 Volt DC battery (if required).

This sampling equipment meets the US EPA requirements for manual ambient particulate sampling.

Sample media will be provided to an accredited third-party laboratory for analysis.

The sampling equipment performance, reliability, etc. will be assessed after the first monitoring event. Alternate sampling equipment/monitors may be chosen for subsequent monitoring as appropriate.

3.1.2 Volatile Organic Compounds

To accommodate the proposed long-term monitoring events, as well as the electrical power supply constraints, we are proposing to use a 24-hour evacuated canister sampling system. The sampling systems do not require an electrical power supply.

Specific equipment proposed for the monitoring program may include the following:

- Summa Canisters (or equivalent[2]); and,
- 24-hour regulators.

[1] An equivalent system would include any other discrete sampler that follows standard operating procedures as outlined in Sewction 6 of the Ontario Manual for Air QualityMonitoring dated May 14, 2019 (as amended). The discrete sampler must be designed to operate with a flow rate of 16.7 L/min.
[2] An equivalent system would include any other sampling container that meets the US EPA Compendium of Air Methods TO-15 collections, storage, and analysis of VOCs using treated air sampling canisters.

The US EPA TO-15 volatile organics profile list will be targeted to account for a variety of VOC subsets that are common constituents of landfill gas. The TO-15 VOC list is provided in Attachment A. Sampling canisters will be provided to an accredited third-party laboratory for analysis.

The sampling equipment performance, reliability, etc. will be assessed after the first monitoring event. Alternate sampling equipment/monitors may be chosen for subsequent monitoring as appropriate.

3.2 Equipment Calibration, Maintenance, & Inspections

The hi-volume particulate samplers will be factory-calibrated before being deployed for each long term sampling program. Periodically, sample flow rate checks will be completed using a DeltaCal calibration device (or equivalent) to ensure sample rates are within ±2% of the target value.

Other maintenance, will be completed per the schedule provided by the manufacturer.

The Summa Canister regulators will be factory calibrated before being deployed for each long term sampling program. During the sampling program, the initial and final pressures will be checked and recorded to ensure final pressure is not zero (i.e. still under vacuum). The final pressure of the canister will be validated and recorded upon receipt at an accredited laboratory.

3.3 Monitoring Duration

After reviewing the cell sequencing plans for the lifecycle of the landfill expansion, three (3) development phases were identified as worst-case air quality scenarios that were assessed in the documents supporting the applications for both the ECA and EA. These scenarios are considered milestones in the development of the site and reflect the development of the different expansion areas (vertical expansion of Old Landfill and horizontal expansions of the South and West Landfills) as they are brought “on-line”. The scenarios were chosen based on the following considerations:

- The proximity of the active working face to the property line;
- The length and volume of traffic volumes for the on-site haul routes; and,
- The predominant wind direction.

Scenario 1 for the expansion represents the worst-case operating condition during the vertical expansion of the Old Landfill. This scenario is anticipated to occur in the year 2022.

Scenario 2 for the expansion represents the worst-case operating condition during the horizontal expansion of the South Landfill (expansion area “B”). This scenario is anticipated to occur in the year 2028.

Scenario 3 for the expansion represents the worst-case operating condition during the horizontal expansion of the West Landfill (expansion area “A”). This scenario is anticipated to occur in the year 2033.

The monitoring events will occur during each of the three (3) scenarios operating years (2022, 2028, and 2033). Samples will be collected once every sixth day, starting in May and concluding in October.

Sampling will be coordinated to follow the National Air Pollution Surveillance (NAPS) Program schedule. Where sampling does not follow the NAPS schedule, the MECP will be notified (where possible, advanced notification will be provided).

3.4 Monitoring Locations

3.4.1 Site Selection Considerations

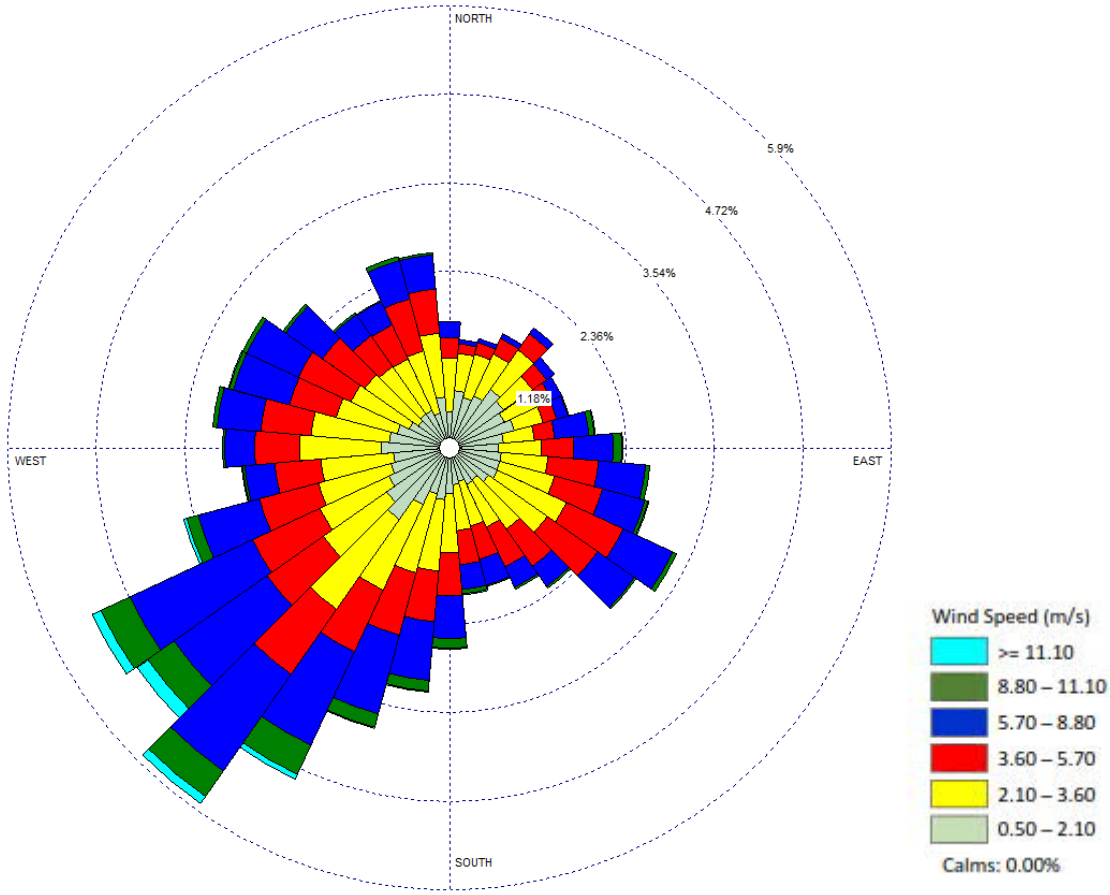
In general, ambient air monitoring stations should be in a location which provides an objective representation for the geographic area of interest. It is not possible for all sources or all receptors to be monitored, and as such, several criteria were considered in siting the monitors. Representative monitoring locations were selected with consideration of the following factors:

- Air dispersion modelling predicted location(s) of maximum particulate concentration(s);
- Site accessibility;
- Upwind/downwind data comparisons between multiple monitoring stations and separation between multiple monitoring stations that is appropriate to the spatial scale;
- Human and environmental receptors in proximity to the Site; and,
- Minimal local interferences from surrounding activities (e.g. avoidance of proximity to public roads).

In addition, the monitoring stations should be located along or close to the fence line. While there would be benefit to locating the monitors in close proximity to neighbourhood receptors, other factors must be considered such as access to monitors for set-up and maintenance, equipment security and contribution of other particulate matter or VOC emission sources located between the Site and the monitors (e.g. roadways, emissions from other industry, sewage treatment , etc.). Since, the dust emission sources are relatively low to the ground, any plume of particulate matter and VOC emissions are expected to track along the ground, with concentrations highest at the source and decreasing with distance. There is little potential for the plume to elevate and pass over the fence line monitors. For these reasons, fence line monitoring locations are preferred to measure the maximum particulate matter and VOC concentrations leaving the site for assessment against AAQC values. Additionally, there is no requirement to meet AAQCs at on-site locations.

Air quality assessments were required to support applications for both the ECA and EA including air dispersion modelling which used local meteorological data. The surface meteorological data, based on measurements at the Chatham-Kent Municipal Airport meteorological station, is presented in Figure 1. The wind speed and direction analysis (*wind rose*) demonstrates that winds are predominantly southwesterly (blowing from the southwest to the northeast) in the region of the Site.

Figure 1: **Wind Speed & Direction Windrose Diagram (2014-2018)**



Results of the air dispersion modelling assessment completed for the ECA and EA predicted maximum particulate and VOC concentrations along the east and north fence lines due to the location of particulate generating sources and active landfill operation during the expansion. The results also demonstrate that predicted concentrations are highest near the fence line and decreases as the distance from the Site increases.

3.4.2 Monitoring Station Locations

As the monitoring events are to take place over different development phases during the lifecycle of the landfill, the monitoring station locations will be subject to change for each event. There are three (3) monitoring station locations proposed (two downwind and one upwind) for each monitoring event.

Figures 2, 3, and 4 provide a site plan identifying the proposed monitoring station locations relative to the fence line for the three (3) monitoring events. If alternative monitoring locations are selected prior to deployment during any monitoring event, the MECP will be notified in advance.

Figure 2: Scenario 1 Old Landfill Vertical Expansion (Year 2022) Monitoring Station Locations

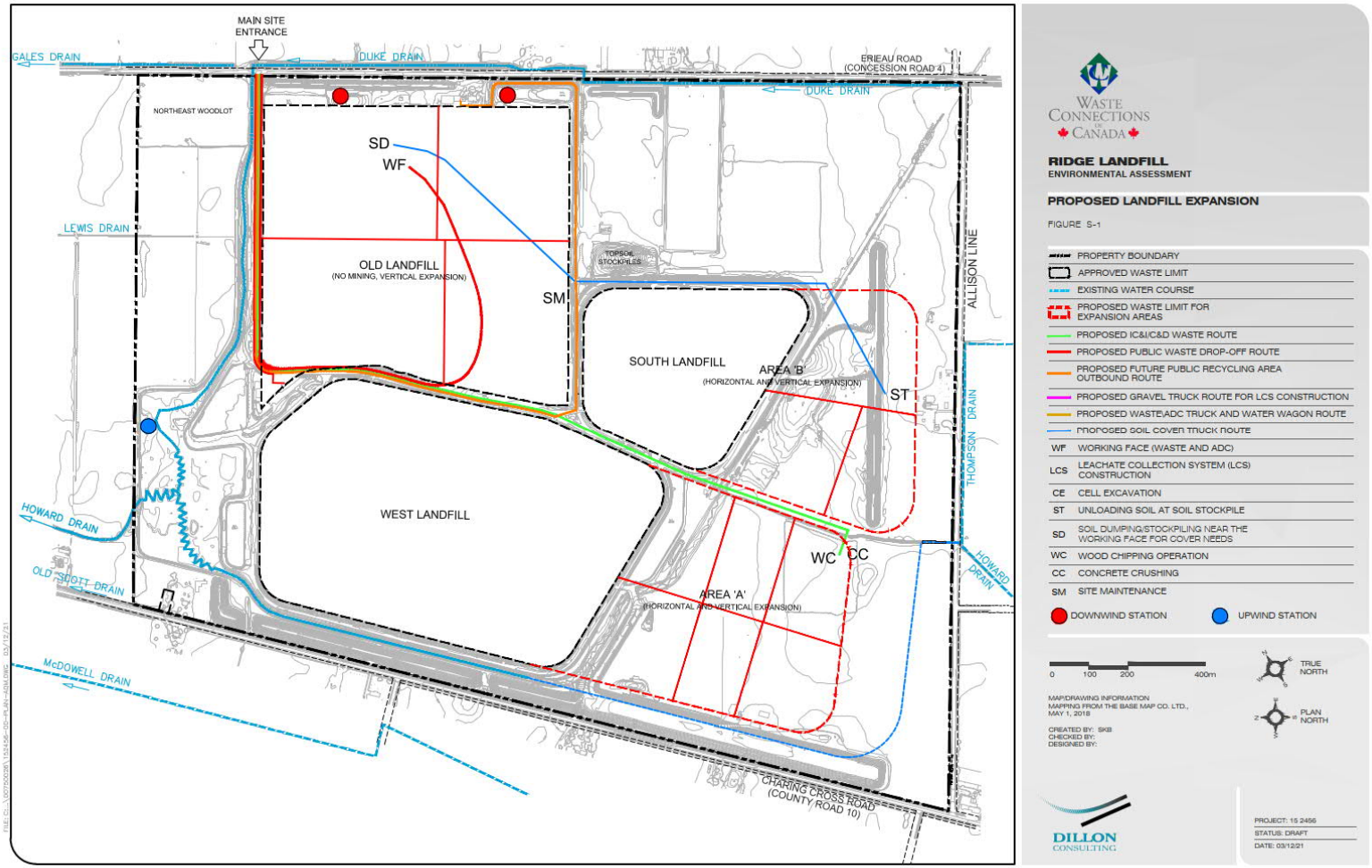


Figure 3: Scenario 2 South Landfill Expansion (Year 2028) Monitoring Station Locations

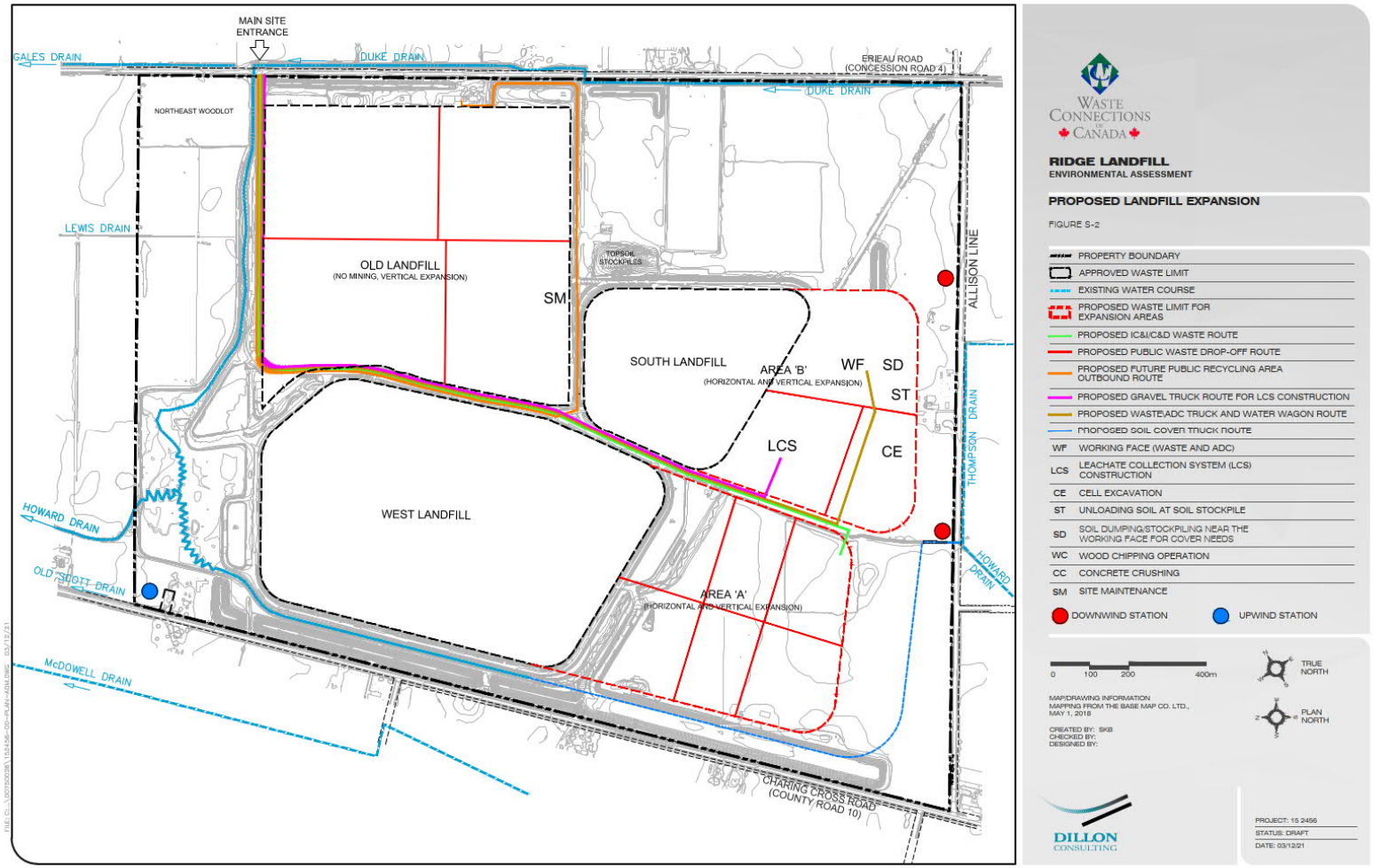
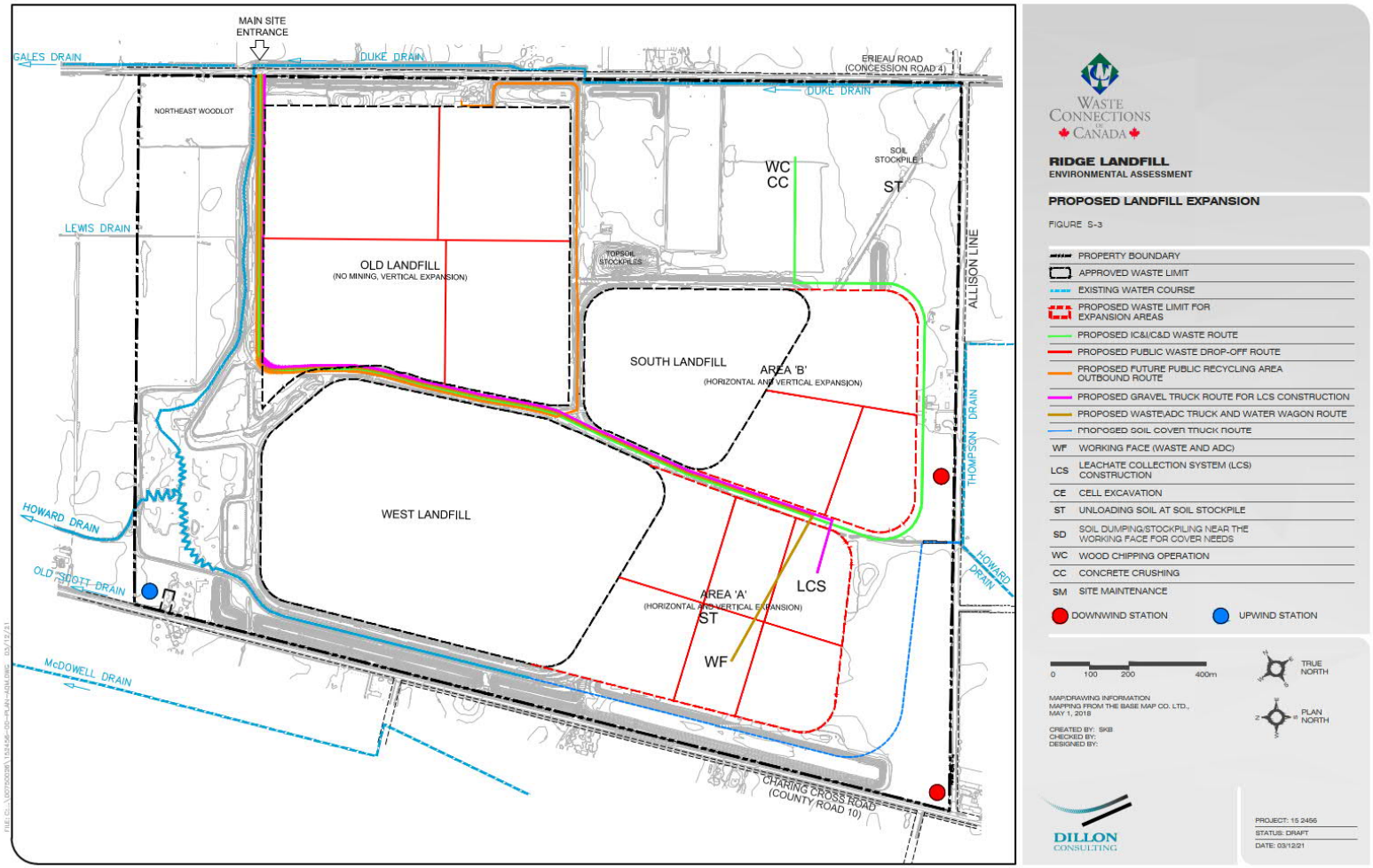


Figure 4: Scenario 3 West Landfill Expansion (Year 2033) Monitoring Station Locations



The monitors will be positioned based on the requirements of the Air Quality Monitoring Manual. If based on Site observations by field staff during monitor deployment or checks, alternate monitoring locations are deemed more appropriate to capturing site particulate and VOC emissions, and evaluating dust mitigation measures effectiveness, the monitoring locations may be adjusted.

4.0 Results Analysis and Interpretation

4.1 Data Usage & Management

At the end of each monitoring event, the results obtained from the accredited third-party laboratory will be compiled into tabular and/or graphic formats. The daily average results will be compared to the relevant AAQC for each contaminant.

Assessment of daily meteorological conditions over the monitoring period will be completed and consideration of upwind versus downwind results will be given to assist in determining potential regional or upwind sources contributing to the results. Meteorological data is available online and will be based on the Chatham-Kent Municipal Airport meteorological station.

Requests for processing (e.g. waste receipt) data and/or comment on potential incidents or circumstances at the facility that could relate to elevated particulate or VOC emissions over the monitoring period will be made on a weekly basis. Correlation of measured particulate concentrations to Site operations will be made as appropriate.

4.2 Reporting

4.2.1 Data Download & Analysis

At the end of each monitoring event for the AQMP, the data will be compiled for analysis. Data summary analyses will include the following for each contaminant:

- 24-hour average concentrations;
- Maximum and minimum 24-hour average concentrations;
- Instances of AAQC exceedances (including % of criteria); and,
- Summary of equipment downtime/invalid data.

4.2.2 AAQC Exceedances

It should be noted that results from the monitoring program may not entirely be attributable to activities at the Site.

For example, particulate concentrations in the ambient air may increase regionally due to agricultural activity (e.g. harvesting), nearby industrial emissions, dry/windy conditions, forest or agricultural fires, traffic on nearby public gravel roads, and/or other influences outside of the control of the Site. As such,

where exceedances are identified, the first step in the data assessment will be to determine the predominant wind direction over the 24-hour period, and compare the upwind and downwind monitoring results.

Where both upwind and downwind concentrations are elevated or exceeding standards, there is a high probability of an off-Site, regional emission source that is causing the high concentrations. In these instances, justification for why an exceedance may have been attributed to off-Site activities or regional emission sources may be added to the summary report.

Where the upwind/downwind results do not suggest an external or regional source of particulate or VOC emissions, consideration of Site operating conditions will be made in an attempt to identify potential causes of the exceedance. Where linkages are identified, this will allow Waste Connections to investigate short term mitigation options that could be implemented, or identify where longer-term investments are needed to improve the control of particulate or VOC emissions from their operations.

Sampling results that exceed the AAQC will not be reported immediately to the MECP. Rather, a summary of each AQMP event (Year 2022, 2028, and 2033) results (and AAQC exceedances, if applicable) will be prepared and maintained on-Site. Notes on regional conditions and/or neighbouring activities will also be included to provide context as to the Site's potential contribution to the airborne particulate and VOC concentrations at the time of the exceedance(s).

4.2.3 Ambient Air Quality Summary Report

The Site is proposing to submit a written summary report for each AQMP event (Year 2022, 2028, and 2033) to the MECP (District Manager and Director) within three (3) months of completion of the monitoring event. The reports will be prepared and maintained on-Site and will include a summary of the monitoring results such as:

- Maximum, minimum, and average concentrations as compared to AAQCs; and,
- Summary of AAQCs exceedances including:
  - Date, time, and duration of exceedance;
  - A map showing the monitoring locations and wind roses of each exceedance;
  - Expected primary cause (internal or external);
  - Mitigation actions taken; and,
  - Other relevant information.
- Summary of significant monitoring equipment outages or period of invalid data;
- Supplementary documentation for the particulate and VOC samples including Dillon field sample log sheets and chain of custody forms, certificate of analysis from an accredited laboratory; and,
- An assessment of the Facility's overall dust mitigation effectiveness based on the events monitoring data.

Attachment A

TO-15 VOC Subset List

Table A.1 - TO-15 VOC Subset List

Compound	CAS No.
Methyl chloride (chloromethane); CH3Cl	74-87-3
Carbonyl sulfide; COS	463-58-1
Vinyl chloride (chloroethene); C2H3Cl	75-01-4
Diazomethane; CH2N2	334-88-3
Formaldehyde; CH2O	50-00-0
1,3-Butadiene; C4H6	106-99-0
Methyl bromide (bromomethane); CH3Br	74-83-9
Phosgene; CCl2O	75-44-5
Vinyl bromide (bromoethene); C2H3Br	593-60-2
Ethylene oxide; C2H4O	75-21-8
Ethyl chloride (chloroethane); C2H5Cl	75-00-3
Acetaldehyde (ethanal); C2H4O	75-07-0
Vinylidene chloride (1,1-dichloroethylene); C2H2Cl2	75-35-4
Propylene oxide; C3H6O	75-56-9
Methyl iodide (iodomethane); CH3I	74-88-4
Methylene chloride; CH2Cl2	75-09-2
Methyl isocyanate; C2H3NO	624-83-9
Allyl chloride (3-chloropropene); C3H5Cl	107-05-1
Carbon disulfide; CS2	75-15-0
Methyl tert-butyl ether; C5H12O	1634-04-4
Propionaldehyde; C2H5CHO	123-38-6
Ethylidene dichloride (1,1-dichloroethane); C2H4Cl2	75-34-3
Chloroprene (2-chloro-1,3-butadiene); C4H5Cl	126-99-8
Chloromethyl methyl ether; C2H5ClO	107-30-2
Acrolein (2-propenal); C3H4O	107-02-8
1,2-Epoxybutane (1,2-butylene oxide); C4H8O	106-88-7
Chloroform; CHCl3	67-66-3
Ethyleneimine (aziridine); C2H5N	151-56-4
1,1-Dimethylhydrazine; C2H8N2	57-14-7
Hexane; C6H14	110-54-3
1,2-Propyleneimine (2-methylaziridine); C3H7N	75-55-8
Acrylonitrile (2-propenenitrile); C3H3N	107-13-1
Methyl chloroform (1,1,1-trichloroethane); C2H3Cl3	71-55-6
Methanol; CH4O	67-56-1
Carbon tetrachloride; CCl4	56-23-5
Vinyl acetate; C4H6O2	108-05-4
Methyl ethyl ketone (2-butanone); C4H8O	78-93-3
Benzene; C6H6	71-43-2
Acetonitrile (cyanomethane); C2H3N	75-05-8
Ethylene dichloride (1,2-dichloroethane); C2H4Cl2	107-06-2

Compound	CAS No.
Triethylamine; C6H15N	121-44-8
Methylhydrazine; CH6N2	60-34-4
Propylene dichloride (1,2-dichloropropane); C3H6Cl2	78-87-5
2,2,4-Trimethyl pentane C8H18	540-84-l
1,4-Dioxane (1,4-Diethylene oxide); C4H8O2	123-91-1
Bis(chloromethyl) ether; C2H4Cl2O	542-88-1
Ethyl acrylate; C5H8O2	140-88-5
Methyl methacrylate; C5H8O2	80-62-6
Methyl methacrylate; C5H8O2	80-62-101
1,3-Dichloropropene; C3H4Cl2 (cis)	542-75-6
Toluene; C7H8	108-88-3
Trichloroethylene; C2HCl3	79-01-6
1,1,2-Trichloroethane; C2H3Cl3	79-00-5
Tetrachloroethylene; C2Cl4	127-18-4
Epichlorohydrin (1-chloro-2,3-epoxy propane); C3H5ClO	106-89-8
Ethylene dibromide (1,2-dibromoethane); C2H4Br2	106-93-4
N-Nitroso-N-methylurea; C2H5N3O2	684-93-5
2-Nitropropane; C3H7NO2	79-46-9
Chlorobenzene; C6H5Cl	108-90-7
Ethylbenzene; C8H10	100-41-4
Xylenes (isomer & mixtures); C8H10	1330-20-7
Styrene; C8H8	100-42-5
p-Xylene; C8H10	106-42-3
m-Xylene; C8H10	108-38-3
Methyl isobutyl ketone (hexone); C6H12O	108-10-1
Bromoform (tribromomethane); CHBr3	75-25-2
l,l,2,2-Tetrachloroethane; C2H2Cl4	79-34-5
o-Xylene; C8H10	95-47-6
Dimethylcarbamyl chloride; C3H6ClNO	79-44-7
N-Nitrosodimethylamine; C2H6N2O	62-75-9
Beta-Propiolactone; C3H4O2	57-57-8
Cumene (isopropylbenzene); C9HI2	98-82-8
Cumene (isopropylbenzene); C9H12	98-82-8
Acrylic acid; C3H4O2	79-10-7
N,N-Dimethylformamide; C3H7NO	68-12-2
1,3-Propane sultone; C3H6O3S	1120-71-4
Acetophenone; C8H8O	98-86-2
Dimethyl sulfate; C2H6O4S	77-78-1
Benzyl chloride (a-chlorotoluene); C7H7Cl	100-44-7
1,2-Dibromo-3-chloropropane; C3H5Br2Cl	96-12-8
Bis(2-Chloroethyl)ether; C4H8Cl2O	111-44-4

Compound	CAS No.
Chloroacetic acid; C2H3ClO2	79-11-8
Aniline (aminobenzene); C6H7N	62-53-3
1,4-Dichlorobenzene (p-); C6H4Cl2	106-46-7
Ethyl carbamate (urethane); C3H7NO2	51-79-6
Acrylamide; C3H5NO	79-06-1
N,N-Dimethylaniline; C8H11N	121-69-7
Hexachloroethane; C2Cl6	67-72-1
Hexachlorobutadiene; C4Cl6	87-68-3
Isophorone; C9H14O	78-59-1
N-Nitrosomorpholine; C4H8N2O2	59-89-2
Styrene oxide; C8H8O	96-09-3
Diethyl sulfate; C4H10O4S	64-67-5
Cresylic acid (cresol isomer mixture);C7H8O	1319-77-3
o-Cresol; C7H8O	95-48-7
Catechol (o-hydroxyphenol); C6H6O2	120-80-9
Phenol; C6H6O	108-95-2
Catechol (o-hydroxyphenol); C6H6O2	120-80-9
Phenol; C6H6O	108-95-2
1,2,4-Trichlorobenzene; C6H3Cl3	120-82-1
nitrobenzene; C6H5NO2	98-95-3