



**DILLON**  
CONSULTING

WASTE CONNECTIONS OF CANADA

**Climate Change Scope of Work for Ridge  
Landfill Expansion Environmental  
Assessment (EA) - Final**

Ridge Landfill Expansion EA

# Table of Contents

---

<b>1.0</b>	<b>Project and Work Plan Overview</b>	<b>1</b>
<b>2.0</b>	<b>Study Purpose and Objectives</b>	<b>4</b>
<b>3.0</b>	<b>Study Area</b>	<b>5</b>
<b>4.0</b>	<b>Scope of Work</b>	<b>6</b>
4.1	Task 1: Project Impacts on Climate Change (Climate Change Mitigation) .....	6
4.1.1	Baseline Conditions.....	6
4.1.2	Evaluation of Site Development Alternative Methods .....	6
4.1.3	Assessment of Preferred Alternative .....	6
4.1.4	EA Impact Assessment .....	7
4.2	Task 2: Climate Change Impacts on the Project (Climate Change Adaptation).....	7

## Project and Work Plan Overview

This Climate Change work plan has been prepared to support the environmental assessment (EA) for the Ridge Landfill expansion and is based on the commitments made in the final amended Terms of Reference (ToR) for the EA that was approved by the Ministry of the Environment, Conservation and Parks (MOECP, formerly the Ministry of the Environment and Climate Change) in May of 2018.

Waste Connections of Canada (Waste Connections) is proposing an expansion of the Ridge Landfill in order to continue to provide long-term residual disposal capacity for the company's large IC&I customer base and as a regional and inter-regional waste management facility to serve the projected increase in population and economic growth in southern and central Ontario.

The Ridge Landfill has been in operation since 1966 and was previously expanded in 1999. Waste Connections owns 340 hectares (ha) of land at the Ridge Landfill. The existing Landfill Site Area, which is permitted by an ECA from the MOECP for waste management and environmental work purposes, is 262 ha. The area within which waste disposal is permitted, called the Waste Fill Area, is 131 ha or half of the Landfill Site Area. As of December 2017, it is estimated that the existing Waste Fill Area at the Ridge Landfill site will provide waste disposal capacity until approximately 2021 at the current fill rate.

The current approved capacity for the Ridge Landfill is 21 million cubic metres (m<sup>3</sup>). The site is approved to accept a maximum of 1,300,000 tonnes of waste per year (the MOECP approved annual waste disposal rate). The EA does not propose to increase the maximum annual fill rate (this would remain as-is); however, Waste Connections is seeking the EA to increase the life of the facility for a 20 year planning period, from 2022-2041.

The waste being landfilled is approximately 98% IC&I waste and 2% residential waste. As part of the EA approval, Waste Connections would agree to reduce their IC&I service area from all of Ontario to just southern and central Ontario, and their residential service area from Chatham-Kent and the neighbouring counties of Essex, Lambton, Middlesex and Elgin, to only the Municipality of Chatham-Kent.

This climate change work plan outlines the tasks to support the evaluation of alternative methods, and to undertake an impact assessment once the preferred alternative method is determined. The following paragraphs provide a brief summary of the scope of the climate change work, including protocols and/or standards to be adhered to while work is undertaken. The climate change work plan is structured to include an assessment of climate change mitigation (Section 3.1) and climate change adaptation (Section 3.2).

The study areas to be considered for the climate change assessment are on-site (i.e., landfill footprint), and along the haul route. The study areas described above may be adjusted during the EA process to address the requirements of the climate change assessment.

This work plan has been developed with consideration of the commitments made for the project within the development of the Terms of Reference. These commitments are tabulated below.

<b>Commitment</b>	<b>Reference to applicable section in EA or supporting document</b>
Waste Connections commits to ongoing consultation with the MOECP's Air Quality Specialist to determine the appropriate scope of air, greenhouse gas and odour assessment during the EA.	Climate Change work plan.
The EA will include studies related to odour and greenhouse gas emissions when considering the preferred site development alternative.	Climate Change work plan Section 3.1.1, 3.1.2, and 3.1.3. This will also be incorporated into the EA (section TBD).
For each alternative method, quantitative/qualitative indicators of air quality, odour, dust and GHGs will be used to evaluate the relative differences between alternative methods. Air Quality will be included as a criteria group as a component of the natural environment.	Climate Change work plan Section 3.1.2. This will also be incorporated into the EA (section TBD).
The estimation of GHGs from the preferred alternative method will be done using established emission factors (e.g., US EPA, Canadian NIR).	Climate Change work plan Section 3.1.3
GHGs from on-site vehicles and the haul route will be quantitatively assessed for the preferred alternative method. The preferred alternative method will have various stages of development over the lifetime of the site. GHG emissions will be estimated for the operational scenarios defined under the air quality analysis. These scenarios typically consider milestones in the development of the site and assess air emissions associated with those milestones. The average of these milestone scenarios will be provided as an estimate of the annual GHG emissions from the site. Additionally, post-closure GHGs will be estimated.	Climate Change work plan Section 3.1.3. This will also be incorporated into the EA (section TBD).
Waste Connections will identify and propose mitigation for the effects of the undertaking on climate change. Waste Connections will consider the climate change impacts of potential woodlot removal in the EA.	Climate Change work plan Section 3.1.3. This will also be incorporated into the EA (section TBD).

Commitment	Reference to applicable section in EA or supporting document
<p>Waste Connections will include an assessment on how the preferred project may contribute to greenhouse gas emissions. Waste Connections will develop a detailed work plan outlining how greenhouse gas emissions will be considered in the environmental assessment for site development activities including woodlot removal, on-site vehicles, the waste haul route as defined in the Terms of Reference, and landfill gas management for the preferred undertaking in consultation with Ministry of the Environment, Conservation and Parks staff. Waste Connections will also consider greenhouse gas emissions as an evaluation criterion for alternative methods. The assessment of landfill gas utilization alternatives will reflect the objective of reducing greenhouse gases from the waste sector as stated in the Climate Change Action Plan.</p>	<p>Climate Change work plan Section 3.1.3. This will also be incorporated into the EA (section TBD).</p>
<p>The EA will also consider how changing climate has the potential to impact the Project and how adaptive measures can be incorporated into the site design. This will be explored, specifically as it relates to the potential for extreme weather events to impact waste management infrastructure through power outages, physical damage, and stormwater management systems and reduced access to the site. Waste Connections will assess the potential effects of climate change on infrastructure components for the preferred undertaking and related potential risks to the environment resulting from these effects. The environmental assessment will include a consideration of climate change adaptation measures to reduce and manage such potential effects during the operation, construction, closure and post-closure phases of the undertaking. Waste Connections will use climate change assessment guidance documents that include, but are not limited to those issued by the Ministry of the Environment, Conservation and Parks in the environmental assessment. The EA will include studies related to odour and greenhouse gas emissions when considering the preferred site development alternative.</p>	<p>Climate Change work plan Task 2 (Section 3.2)</p>
<p>Waste Connections will consider how climate change has the potential to impact the project and how adaptive measures can be incorporated into the site design. Waste Connections will identify and propose mitigation for the effects of the undertaking on climate change, and the effects of climate change on the undertaking, as part of the EA. Discussion of this topic in the EA will consider the MOECP's guidance document, Consideration of Climate Change in Environmental Assessment in Ontario.</p>	<p>Climate Change work plan Tasks 1 and 2 (Sections 3.1 and 3.2)</p>

## 2.0

## Study Purpose and Objectives

The proposed expansion of the landfill has the potential to be impacted by changes in climate, as well as emit greenhouse gases (GHGs) which may have an impact on climate change. The former will be looked at through a climate change risk assessment that will inform the project development. The latter, which relates to the project's potential contribution to GHGs and therefore future climate change, will be addressed through quantification of GHGs and assessment of potential mitigation options (where applicable). The work will be completed in accordance with the approved amended ToR (May 2018), including the additional commitments made by Waste Connections throughout the stakeholder consultation process.

## Study Area

For the purposes of the Climate Change Scope of Work, two impact study areas have been defined as follows:

- On-Site Study Area (“on-site”) – includes the property on which the current Ridge Landfill and proposed expansion is situated; and,
- Haul Route Study Area (“haul route”) – encompasses lands immediately adjacent to Communication Road, Drury Line and Erieau Road which are identified as the designated haul routes for the site.

The project’s potential impact on climate change will be driven from GHGs from the on-site activities and the haul route. An off-site study area is not applicable to this aspect of the analysis. Similarly, the potential impacts of climate change on the project would be through on-site and haul route impacts. Therefore an off-site study area is not applicable to this analysis either.

## 4.0

## Scope of Work

The following sections describe the approaches to be deployed in completing this assessment.

### 4.1 Task 1: Project Impacts on Climate Change (Climate Change Mitigation)

In order to characterize changes in greenhouse gases, the following will be completed:

#### 4.1.1 Baseline Conditions

Baseline GHGs will be determined from historical annual GHG calculations and reporting done by the site. GHGs are anticipated to have slight variations on an annual basis, so the average of the most recent 3 to 5 years of available data will be used.

#### 4.1.2 Evaluation of Site Development Alternative Methods

An analysis of potential GHGs will be completed using metrics that would be indicative of differences between each alternative method. The metrics to be used will include: anticipated differences in landfill gas and control equipment emissions with the indicator being daily/annual waste volume landfilled (where applicable), anticipated differences in levels of on-site vehicular activity (trucks and non-road equipment) with the indicator being the qualitative comparison of activities levels between alternatives and consideration of woodlot removal with the indicator being amount of woodlot proposed for removal.

The site development alternative methods all relate to the alternative development options for the landfill. The landfill will accept post-diversion residual waste, and therefore the site development alternative methods will not affect the diversion rate of the regional system (i.e. alternatives that enhance diversion within Waste Connection's system are not being considered as standalone alternative methods as part of the EA). The site's waste acceptance rate will remain the same with the possibility of changes in composition as improvements in diversion are achieved. These composition changes would equally affect all alternative methods, and would represent an improvement on current baseline conditions through enhanced diversion of waste and therefore potential reductions in landfill gas emissions. These improvements in diversion would be driven by provincial policy or regional scale activities, as opposed to the alternative site development methods proposed. As a result, there will not be any waste diversion related changes in GHGs between the site development alternative methods.

#### 4.1.3 Assessment of Preferred Alternative

Based on the fact that the daily waste acceptance rate of the landfill will not be increased, the greatest potential impact to air quality for the landfill expansion will be associated with on-site operations. However, there may be an increase in export soil truck traffic or changes to background traffic levels



along the haul route. Therefore the assessment of the preferred alternative will focus on the landfill operations itself, but will also consider changes to haul route traffic.

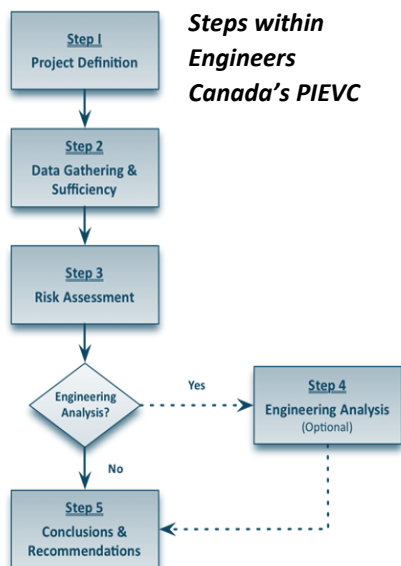
Estimation of GHGs (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O) from on-site activities (e.g., onsite equipment, LFG collection system, flare) will be done using emission factors from established resources including US EPA AP-42, Canada NIR and the LandGEM model. GHGs will be compared to regional (scaled based on population from provincial inventory) and provincial emissions to assess significance.

The preferred alternative method will have various stages of development over the lifetime of the site. GHGs will be estimated for the operational scenarios defined under the air quality analysis (based on peak site activity and peak landfill gas generation). These scenarios typically consider milestones in the development of the site and assess air emissions associated with those milestones. The average of these milestone scenarios will be provided as an estimate of the annual GHGs from the site. Additionally, post-closure GHGs will be estimated. Where applicable, mitigation measures will be identified for GHGs from the site.

#### 4.1.4 EA Impact Assessment

The results of the GHG analysis, described in detail in the previous section, will be used to characterize the project's contribution to the GHG profile of the region or the province.

## 4.2 Task 2: Climate Change Impacts on the Project (Climate Change Adaptation)



There are a number of methodologies/ frameworks that can be applied to assess and prioritize potential climate change impacts on the Project. One of the more recognized methodologies in Canada and Ontario is the Engineers Canada Public Infrastructure Engineering Vulnerability Committee (PIEVC) Protocol for climate change risk assessment.

The principles of this methodology will be deployed for the Project's major components, to characterize potential climate change risks on the Project. This methodology is a 5 step process as shown in the Figure to the left.

Step 4 within the process is optional, depending on the results of the assessment and the desired outcome.

The preferred alternative will be assessed to identify key components (infrastructure, systems). Selection of components will be guided by their importance to design, construction, management, operation and maintenance of the site. Where possible, similar infrastructure components will be grouped to streamline the analysis.

Components will include those related to:

- Electrical systems (i.e., power lines)
- Stormwater management
- Leachate management
- Landfill gas management
- Landfill cap
- Site access (i.e., roads)

Climate analytics will be completed for the site, and this will be done by Risk Sciences International (RSI).

The climate analytics will involve:

1. Extreme rainfall analyses to develop data for variables focusing on impacts to landfill areas such as management of ponds, leachate from solid waste areas, erosion, and site drainage. This includes:
  - IDF (extreme rates)
  - Future IDF (via Clausius-Clapeyron relationship)
  - Accumulated Precipitation (daily, and over 3, 5 and 7-day accumulations)
2. Moderate Winds. This parameter relates to landfill gas management and odour management considerations with site operations. RSI will identify historic ranges and trends using nearby airport stations. Localized projections of wind conditions are not specifically available here, but more regionalized projections from previous literature will be used to provide basis for future wind conditions.
3. High/Extreme Winds - Tornado, Thunderstorm Winds. This parameter relates to danger to site personnel, damage to buildings, wind-carried debris from site, and loss of site access due to downed trees and powerlines. Airport wind data records will be analysed in conjunction with the tornado database. As is the case for moderate winds, projected values are not as reliable for extreme winds from projection models due to the scale (spatial and temporal) and local topographic effects. Research literature for southern Ontario will be used for extreme wind projections.
4. Wildfire Risk/Drought - RSI will review Canadian Wildfire database and summer precipitation deficit frequency and historical/projected water deficits.
5. Higher Average Summer Temperatures - RSI will analyse maximum temperature trends, historical and projected, to support risk assessment impact considerations including: pests and insects, equipment impacts, waste decomposition rate changes, and occupational exposure considerations.

6. Large Hail - to support assessment of exposed fleet vehicles, metal siding/cladding on site buildings and risk to site personnel.
7. Ice Storm - an extreme event that can result in loss of electrical supply.
8. Extreme Snow Events - an extreme event that can result in loss or degradation of access to the landfill facility.
9. Lightning - hazard posing fire risk to landfill site and occupational hazard to staff exposed to lightning events.

The outcome of the climate analytics will be climate hazard **probability** scores for use within the risk assessment.

The risk assessment will look at how the climate hazards identified potentially interact with infrastructure components at the site. Where potential interactions occur, the **severity** of these interactions will be rated by Dillon staff. The risk assessment will be conducted using Dillon staff who have operational and design experience with the site, and will focus on defining **severity** ratings within the PIEVC risk assessment worksheets.

The **severity** ratings will be combined with the probability scores to yield an overall **risk** rating (i.e. Risk = Probability x Severity).

The severity ratings, and overall risk ratings, will be validated through a facilitated PIEVC workshop with site staff. Once this is completed, the highest ranked risk will be identified for consideration of engineered adaptive measures. Within this step, any detailed engineering that may be required will be done under a separate scope of work.

The results of the risk assessment, including the identification of adaptive measures will be documented within a climate change risk assessment report for the preferred alternative.