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Volume III

Environmental Assessment of the Proposed W12A Landfill Expansion, City of London

GOLDER

London
CANADA

Table of Contents

Volume III – Supporting Studies

Appendices

APPENDIX B
Work Plans

B.01 Atmospheric (Air and Noise) Work Plan
B.02 Groundwater Work Plan
B.03 Surface Water Work Plan
B.04 Biology Work Plan

APPENDIX C
2019 Updated Residual Waste Projections and Landfill Capacity Assessment

APPENDIX B

Work Plans

B.01 Atmospheric (Air and Noise) Work Plan
B.02 Groundwater Work Plan
B.03 Surface Water Work Plan
B.04 Biology Work Plan

B.01 Atmospheric (Air and Noise) Work Plan

December 19, 2019

ATMOSPHERE WORK PLAN – Revision 2

Environmental Assessment of the Proposed W12A Landfill Expansion
City of London

Submitted to:

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Distribution List

1 e-copy Ministry of the Environment, Conservation and Parks

Table of Contents

1.0 Introduction 1
2.0 Assessment Framework 1
2.1 Overall Approach 1
2.2 Project Team Organization 2
2.3 Study Areas 2
3.0 Assessment Criteria and Indicators 6
4.0 Detailed Workplan 7
4.1 Step 1: Characterize Existing Environmental Conditions 7
4.2 Step 2: Identify 'Alternative Methods' of Landfill Expansion 9
4.3 Step 3: Qualitative and Quantitative Evaluation of 'Alternative Methods' 9
4.4 Step 4: Compare the 'Alternative Methods' for Landfill Expansion and Identify the Preferred Alternative 10
4.5 Step 5: Refine Mitigation Measures and Determine Net Effects of the Preferred Alternative 11
4.6 Step 6: Describe the Preferred 'Alternative Method' for Landfill Expansion 14
4.7 Step 7: Consideration of Climate Change 14
4.8 Step 8: Cumulative Impact Assessment 15
4.9 Step 9: Preparation of EA Study Report 15

Tables

Table 1.0-1: Project Commitments from ToR Relevant to Work Plan Development 1
Table 2.3-1: Proposed Preliminary Study Areas for the Atmosphere Component 3
Table 3.0-1 Component Rationale and Indicators for the EA 6
Table 4.5-1: Relevant Ambient Air Quality Criteria for Indicator Compounds 12

Figures

Figure 2.3-1: Atmospheric Study Areas 5

Appendices

Appendix A
Design Concept Alternatives

1.0 Introduction

This document presents the proposed detailed work plan for the atmosphere component of the Environmental Assessment (EA) of the proposed W12A Landfill expansion (the Project). The work plan is being submitted for approval to the Ministry of the Environment, Conservation and Parks (MECP).

This work plan has been developed with consideration of the commitments made for the project within the development of the Terms of Reference (ToR). The relevant commitments are provided below in Table 1.0-1.

Table 1.0-1: Project Commitments from ToR Relevant to Work Plan Development

ID	Commitment
5	Where described in the ToR for the environmental components, detailed work plans for the technical studies will be prepared and provided to the appropriate GRT* agency for review and concurrence.
6	The City will share work plans with Indigenous Communities and post work plans on the project website.
10	During the EA, the preliminary criteria and indicators for each of the environmental components will be refined and described in the EA study report.
11	The preliminary Study Areas will be reviewed and confirmed during the EA and described in the EA study report.
12	A more detailed description of the environmental conditions will be prepared during the EA to reflect the confirmed Study Areas using a combination of sources of existing information and site-specific investigations and studies and provided in the EA study report.

Notes: * Government Review Team (GRT)

2.0 Assessment Framework

2.1 Overall Approach

It is proposed that the EA work will be undertaken in a series of nine steps (further details are provided in Section 4.0) as follows:

- Step 1 – Characterize existing environmental conditions;
- Step 2 – Identify the ‘Alternative Methods’ of landfill expansion;
- Step 3 – Qualitative evaluation of ‘Alternative Methods’;

- Step 4 – Compare the 'Alternative Methods' for landfill expansion and identify the preferred alternative;
- Step 5 – Refine the mitigation measures and determine the net effects of the preferred alternative;
- Step 6 – Describe the preferred 'Alternative Method';
- Step 7 – Consideration of climate change;
- Step 8 – Cumulative impact assessment; and
- Step 9 – Preparation of the EA Study Report.

Consultation with the public, Indigenous Communities, GRT members, City of London Advisory Committees, and other stakeholders will be ongoing throughout the EA process.

2.2 Project Team Organization

The project tasks will be organized to be completed by the following teams:

- The EA Management Team consists of the project director, project manager and project coordinator for the EA;
- The Design and Operations (D&O) Team consists of landfill design technical staff and AutoCAD technicians; and
- The EA Team consists of technical discipline leads for each of the specified environmental components.

2.3 Study Areas

Data for the EA will be collected and analyzed for preliminary generic study areas presented in the ToR. These will be confirmed and may be refined during the EA. These preliminary generic study areas are as follows:

Site Study Area – The existing W12A Landfill Site, located at 3502 Manning Drive and adjacent lands where landfill expansion may occur.

Site-vicinity Study Area – The lands in the area immediately adjacent to the Site Study Area that have the potential to be directly affected by the landfill expansion and activities with the Site Study Area. The extent of the Site-vicinity Study Area will be determined for each of the environmental components. For most environmental components, a Site-vicinity Study Area of 500 metres from the Site Study Area is appropriate.

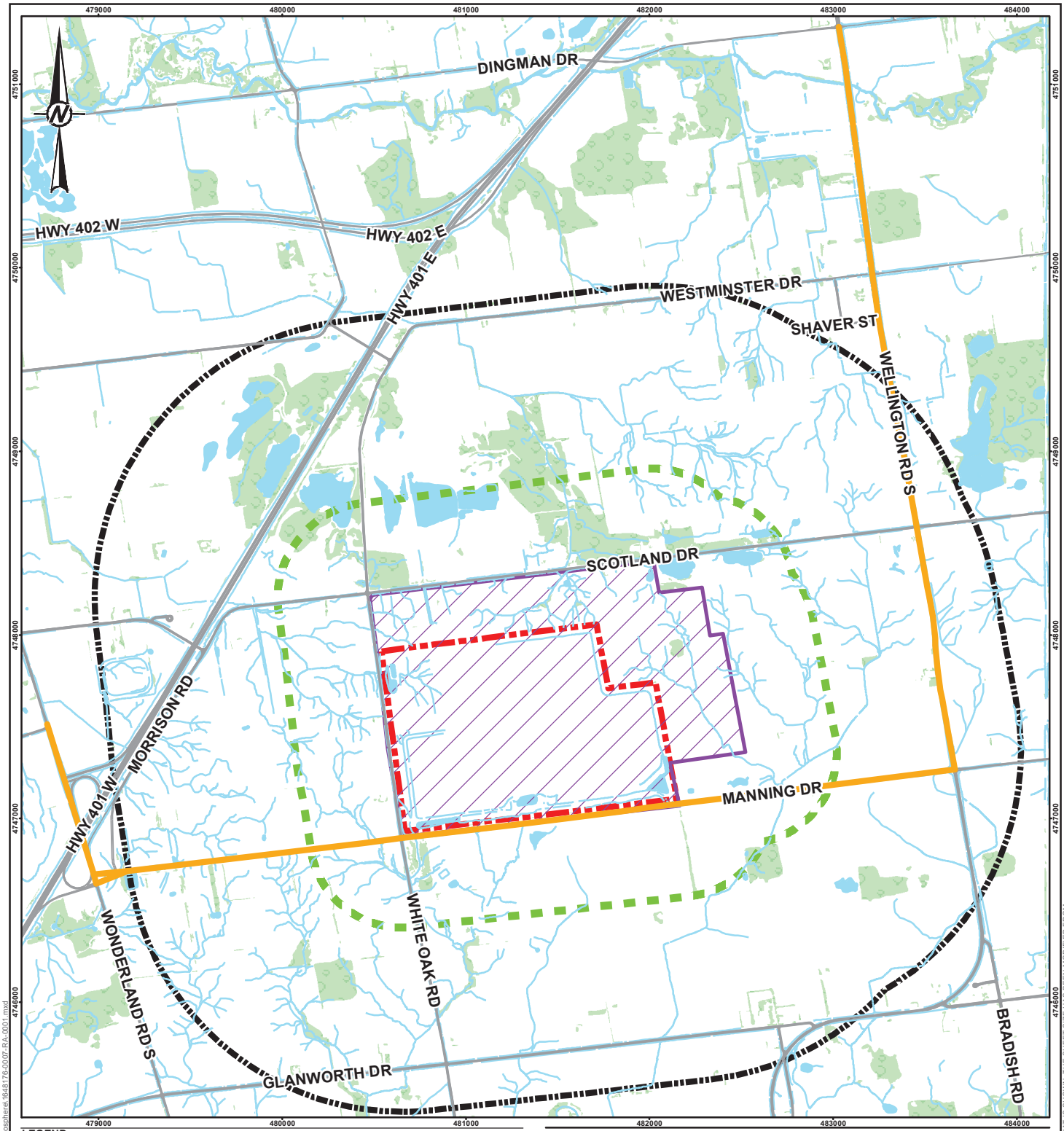
Wider Study Area – An area that takes on the broader community generally beyond the immediate site vicinity and for specific environmental components may include the entire Municipality.

The proposed preliminary study areas for the atmosphere component are presented in Table 2.3-1.

Table 2.3-1: Proposed Preliminary Study Areas for the Atmosphere Component

Environmental Component	Preliminary Area(s) to be Studied	Rationale
Atmosphere	Air Quality – health-related compounds and dust – Site and Site-vicinity	Air (health-related compounds) and dust emissions are required to meet provincial requirements at and beyond the landfill site boundary. Air dispersion modelling will be carried out in accordance with the MECP document "Air Dispersion Modelling Guideline for Ontario", date February 2017, which includes the use of a receptor grid that meets the requirements of s.14 of Ontario Regulation 419/05.
	Air Quality – Odour – Site and Site-vicinity	Odour emissions are required to meet provincial requirements at off-site sensitive points of reception (PORs). Odour emissions may travel further than 500 m but any effects are expected to be within 1.5 km of the Site Study Area. The locations of the closest PORs in all wind directions will be identified and reviewed for inclusion in the air dispersion model. Consideration will be given to PORs that are greater than 1.5 km from the Study Area but limited to the closest POR for a given wind direction.

Environmental Component	Preliminary Area(s) to be Studied	Rationale
Atmosphere	Noise – Site and Site-vicinity	Noise emissions are required to meet provincial requirements at off-site points of reception (PORs) from the landfill (which are within 500 m of the landfill) or along the haul routes. The haul routes are to consist of Manning Drive between Wellington Road South and Highway 401 and Wellington Road South between Dingman Drive and Manning Drive. Also, Wonderland Road South between Decker Drive and Manning Drive (as suggested by public feedback received during Open House #2). The Wonderland Road South and Manning Drive intersection / interchange ramps will also be evaluated as part of the EA study. The haul routes to be included in the Site-vicinity Study Area are shown on Figure 2.3-1.



LEGEND

- EXISTING W12A LANDFILL SITE BOUNDARY
- SITE STUDY AREA
- 500 m SITE VICINITY STUDY AREA
- 1500 m SITE VICINITY STUDY AREA
- HAUL ROUTES TO BE ASSESSED

0 300 600 1,200

1:30,000 METRES

REFERENCE(S)

1. DATA PROVIDED BY THE CITY OF LONDON.
2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83

CLIENT
CORPORATION OF THE CITY OF LONDON

PROJECT
ATMOSPHERIC WORKPLAN FOR THE ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION

TITLE
ATMOSPHERIC STUDY AREAS

CONSULTANT
GOLDER

YYYY-MM-DD	2019-08-27
DESIGNED	----
PREPARED	JEM
REVIEWED	TG
APPROVED	PAS

PROJECT NO.	CONTROL	REV.	FIGURE
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3.0 Assessment Criteria and Indicators

The atmosphere component will be assessed for the potential effects of the undertaking based on two criteria as follows.

The rationale, indicators and data sources for the proposed assessment sub-components are provided in the ToR and are presented in Table 3.0-1 below.

Table: 3.0-1 Component Rationale and Indicators for the EA

Sub-Component	Rationale	Indicator(s)	Data Sources
Air quality (health-related compounds and dust), odour, greenhouse gas [GHG])	Landfill expansion and associated operations can produce gases containing contaminants that degrade air quality if they are emitted to the atmosphere. Construction activities associated with landfill expansion and continued landfill operation can lead to levels of particulates (dust) in the air. Landfill operation can also result in odour effects.	• Predicted concentrations of air quality indicator compounds (selected regulated air contaminants to represent this type of project), including dust, at and beyond the property boundary [described further in Section 4.4]. • Expected site-related odour at sensitive receptors. • Expected GHG emissions.	• Environment Canada or MECP's regional air quality data, hourly meteorological data and climate normals. • Published emission factors (including odour). • Site-specific landfill gas (LFG) generation model. • Preferred 'Alternative Method' landfill phasing plan. • Odour complaints history. • Existing site-specific studies. • Applicable provincial regulations, standards and guidelines.

Sub-Component	Rationale	Indicator(s)	Data Sources
Noise	Landfill expansion and associated operations will generate noise that will be emitted into the atmosphere and could impact off-site points of reception (PORs).	• Noise Levels at off-site PORs, or vacant lots that may accommodate the future construction of PORs.	• Landfill equipment list and expected utilization. • Preferred 'Alternative Method' landfill phasing plan. • Existing site-specific noise studies. • Existing noise studies for facilities in the vicinity (if available). • Baseline field program • Manufacturer's noise data. • Consultant's database of similar noise studies. • Ministry of Transportation Ontario (MTO) / local municipal traffic count data or newer data collected to support this EA. • Applicable provincial guidelines (i.e., Noise Guidelines for Landfill Sites, October 1998, and Publication NPC-300, October 2013)

The criteria and indicators will be refined during the EA as necessary.

4.0 Detailed Workplan

4.1 Step 1: Characterize Existing Environmental Conditions

This section presents an overview of existing environmental conditions for the atmosphere component on and in the area of the W12A Landfill. As described in the *MECP Code of Practice* (MOECC, 2014a), the City of London will present a more detailed description of the environmental conditions in the EA Report. The following is an overview of existing conditions.

The atmosphere component comprises air quality (health-related compounds, dust, odour, GHG) and noise. Within the Site-Vicinity Study Area, the atmospheric environment is typical of southwestern Ontario with transportation and agricultural activities contributing to baseline air quality/odour and noise levels. Due to the proximity to Highway 401, Highway 401 activities are expected to be the dominant source of the existing atmospheric environment in terms of air quality health-related compounds, dust, GHG and noise. The ambient conditions also include current landfill operations, which is an existing source of air, odour, GHG, and noise emissions. It is expected, at times, the existing noise environment could be characterized as a rural setting. For a conservative assessment, to establish the applicable noise limits to assess compliance, the noise emissions of the existing landfill activities will be excluded.

In terms of odour, landfills can emit two types of odours: garbage odour and LFG odour. Garbage odour is generated by recently disposed waste, and LFG odour is generated during the anaerobic decomposition of organic material in the waste. In the general area, other sources of odour emissions include farming operations, waste management facilities (e.g., Orgaworld Canada composting facility, StormFisher Environmental anaerobic digester) and industrial operations (e.g., Ingredion Canada). In 2018, a total of 62 odour complaints were received by the City from local residents; this is higher than in recent years (19 in 2014, 21 in 2015, 17 in 2016 and 34 in 2017).

Ambient air quality data is available from Environment and Climate Change Canada (ECCC) and MECP maintained air monitoring stations located in London. The most recent five year ambient air quality data from the London station that has been reviewed by ECCC at the time of the assessment will be used to prepare a summary of background air quality for the identified indicator compounds. For indicator compounds that are not measured at the London station, or if data is insufficient, data from nearby stations will be used. Concentrations of TSP and PM_{10}, which are not monitored, will be estimated from $PM_{2.5}$ concentrations using typical ratios. For H_2S, the data in ECCC's draft Screening Assessment for H_2S may also be used if monitoring data is not available.

It is not proposed to collect site-specific data. A quantitative assessment of the existing conditions will also be completed for the preferred expansion alternative, as described in Section 4.5.

As part of assessing the existing conditions, historic odour complaints, the locations of the complaints, the recorded weather conditions and operational procedures from the day of the complaint will be reviewed. Based on this review, an assessment will be made in regard to the need for site-specific odour emission measurements to provide source information for the subsequent dispersion modelling work, and for use in assessing possible mitigation measures associated with the expansion. The rationale for and conclusions of this assessment will be documented in the EA study report (Section 4.9).

Existing noise conditions will be established through a combination of a noise field program completed in the vicinity of identified sensitive PORs and noise modelling of existing traffic along local and provincially regulated roadways and existing landfill operations.

4.2 Step 2: Identify 'Alternative Methods' of Landfill Expansion

During the initial stage of the EA, a reasonable range of expansion alternatives will be identified and described at a sufficient level of detail (i.e., conceptual designs) so that potential effects of the expanded landfill on each environmental component can be assessed and compared.

This task will involve developing the conceptual site design for the proposed expansion of the W12A Landfill, to gain an additional 25 years of disposal capacity. This task will be completed by the Design and Operations Team.

4.3 Step 3: Qualitative and Quantitative Evaluation of 'Alternative Methods'

Based on the conceptual site design, and considering mitigation measures, potential impacts of the proposed W12A Landfill expansion on the atmosphere component will be assessed. The atmosphere component technical discipline leads will evaluate each 'Alternative Method' qualitatively including:

- Identify the differences in potential air quality (health-related compounds and dust) and odour concentrations from emission sources based on their distance and direction relative to nearest receptors, the property boundary, and site characteristics such as proposed height of the expanded landfill alternatives that will influence dispersion. A limited modelling assessment will be carried out to support the evaluation of the 'Alternative Methods'. The only source that is expected to change between the different expansion alternatives is the landfill footprint. As a result, a screening assessment will be completed using vinyl chloride. Emission rates of vinyl chloride from the landfill will be modelled using the AERMOD dispersion model for each alternative and the predicted concentrations from each scenario will be compared quantitatively. As a point of reference, the current draft 'Alternative Methods' have been attached to this work plan in Appendix A to visually demonstrate the limited potential differences expected with vehicular on-site impacts. The draft Alternative Methods are all relatively similar in location and are not anticipated to change significantly during finalization.

- Qualitatively identify differences among the alternatives that will impact GHG generation such as the landfill configuration that may impact LFG collection efficiency and/or loss of forested area. This comparison will be done qualitatively using the landfill surface area noting that the type of waste accepted and waste acceptance rates will not vary between alternatives, and it is expected that LFG generation and collection efficiency for each landfill expansion 'Alternative Method' will not vary significantly; and therefore, neither will the volume of LFG flared. Also, off-site and on-site vehicular movements will be the same and similar, respectively.

- Identify existing and potential PORs in the vicinity of the landfill by means of aerial photographic mapping, zoning maps and site visits, as necessary.
- Identify potential differences in expected noise levels off-site based on the distance and potential line-of-sight exposure of the PORs to the landfilling equipment/activities.
- Review the direct interaction of the proposed alternative method footprints and existing/potential PORs.

In this step, each 'Alternative Method' of the W12A Landfill expansion will be examined by the EA Team to determine if it would ultimately be approvable under the Environmental Protection Act (EPA). This screening step is included to eliminate any alternative that would likely not be approvable. Should an alternative be found to not be approvable due to unacceptable net effects (i.e., no further refinement of mitigation is possible) or technical reasons, then the alternative would be eliminated from further consideration. At this point, the EA Management Team may consider additional 'Alternative Methods' for the project that may have been identified by the public or other parties during the EA process.

4.4 Step 4: Compare the 'Alternative Methods' for Landfill Expansion and Identify the Preferred Alternative

When the alternatives have been finalized, a comparative evaluation of the 'Alternative Methods' will be completed. The comparative evaluations would include evaluating the relative importance or ranking of the assessment criteria (i.e., although all criteria are relevant, certain criteria may be considered more important than others[1]).

The atmosphere component technical discipline leads will complete the following tasks:

- Rank each 'Alternative Method' based on air quality (health-related compounds, dust, odour and GHG) differences.
- Rank each 'Alternative Method' based on noise differences.
- Describe advantages and disadvantages of each 'Alternative Method'.

The EA Management Team will take each discipline's comparison and compile the overall comparison of 'Alternative Methods'.

[1] The public has been asked during the consultation oh the Terms of Reference and will be asked during consultation on the EA to provide input into the ranking of the relative importance of the components.

4.5 Step 5: Refine Mitigation Measures and Determine Net Effects of the Preferred Alternative

In this task, the EA Team will identify linkages between the environmental components (i.e., direct or indirect effects of the proposed expansion on the atmosphere component via another component) and prepare diagrams. The purpose of linkage diagrams, prepared by the technical discipline leads, is to facilitate an integrated assessment of effects.

The prediction of future potential environmental effects associated with the preferred 'Alternative Method' (with conceptual design mitigation measures in place) will be assessed by atmosphere component technical discipline leads.

Upon collection of data required for the assessment of air quality (health-related compounds and dust), odour and noise emissions, the following tasks will be completed:

Air quality and odour assessment – This study will assess emissions from two scenarios:

1. The existing conditions scenario (i.e., currently approved landfill); and
2. The preferred alternative for the expanded landfill.

Emissions will be assessed for the following indicator compounds: particulate matter, including suspended particulate matter [SPM], particles nominally smaller than 10 µm in diameter [PM_{10}] and particles nominally smaller than 2.5 µm in diameter [$PM_{2.5}$], nitrogen oxides [NOx], sulphur dioxide [SO2], carbon monoxide [CO], hydrogen sulphide [H_2S], vinyl chloride [C_2H_3Cl] and odour. Emissions will be estimated using a combination of published emission factors (e.g. US EPA AP42), US EPA MOVES (tailpipe emissions from haul trucks) and LandGEM modelling. The LandGEM model will be run using historical information on waste inputs to estimate landfill gas generation and emission rates of landfill gas constituents. The sources to be assessed will consist of the following:

1. Landfill gas emissions from the landfill mound;
2. Landfill gas combustion emissions from the flaring compound;
3. Fugitive dust emissions from material handling activities, on-site vehicle movements and stockpile wind erosion;
4. Tailpipe emissions from waste haul trucks and on-site mobile equipment; and
5. Odour from the Landfill and on-site activities, including active face and leachate collection systems.

The LandGEM will be used to identify the future year with the highest LFG generation for modelling. Up to three phases of development of the landfill expansion will be modelled to identify the worst-case emissions scenario for the preferred alternative.

Air dispersion modelling will be completed using an atmospheric dispersion model (AERMOD) to calculate predicted concentrations of relevant indicator compounds at and beyond the property line and at identified sensitive receptors (considered as off-site receptors). Dispersion

modelling will be completed in accordance with MECP's Air Dispersion Modelling Guideline for Ontario (February 2017). This will include using the current regulatory version of AERMOD at the time of the assessment, in addition to site specific meteorological data and regional terrain data, both obtained from MECP. Receptors will be identified in accordance with s. 14 of O. Reg. 419/05 with additional sensitive receptors identified for the assessment of odour.

The modelled predictions of NOx will be used to calculate the concentration of nitrogen dioxide (NO_2) using the Ozone Limiting Method (OLM) suggested by Cole and Summerhays (Cole et al. 1979).

The results of the air quality and odour modelling will be compared against relevant air quality standards and guidelines and used to assess the potential effects associated with the preferred alternative.

A summary of the applicable Ontario and federal objectives and criteria are listed in Table 4.5-1, below.

Table 4.5-1: Relevant Ambient Air Quality Criteria for Indicator Compounds

Compound	Averaging Period	Ontario Ambient Air Quality Criteria[1] (µg/m³)	National Ambient Air Quality Standards[2] (µg/m³)	National Ambient Air Quality Objectives[3]" Desirable (µg/m³)	National Ambient Air Quality Objectives[3] Acceptable (µg/m³)
SPM[4]	24-Hour	120	—	—	120
	Annual	60[++]	—	60	70
PM_{10}	24-Hour	**50**[5]	—	—	—
$PM_{2.5}$	24-Hour	30[6]	**27**[6]	—	—
	Annual	—	8.8	—	—
NO_X	1-Hour	400	**79**[6]	—	400
	24-Hour	**200**	—	—	200
	Annual	—	**22.5**	60	100
SO_2	10-min	**180**			
	1-Hour	**100**	170.3[7]	450	900
	24-Hour	—	—	**150**	300
	Annual	**10**	10.5	30	60
CO	1-Hour	36,200	—	**15,000**	35,000
	8-Hour	15,700	—	**6,000**	15,000
H_2S	10-minute	**13**	—	—	—
	24-hour	**7**	—	—	—

Compound	Averaging Period	Ontario Ambient Air Quality Criteria[1] (µg/m³)	National Ambient Air Quality Standards[2] (µg/m³)	National Ambient Air Quality Objectives[3]" Desirable (µg/m³)	National Ambient Air Quality Objectives[3] Acceptable (µg/m³)
Vinyl Chloride	24-Hour	**1**	—	—	—
	Annual	**0.2**	—	—	—

Notes:
(1) MECP 2018.
(2) NAAQS published in the Canada Gazette Volume 147, No. 21 - May 25, 2013 (Government of Canada 2013). The values presented in the table are for the 2020 phase-in date.
(3) CCME1999.
(4) SPM in Ontario is defined as Suspended Particulate Matter (less than 44 µm diameter).
(5) Interim Ambient Air Quality Criteria (MECP 2018).
(6) Based on the 98th percentile of the annual monitored data averaged over three years of measurements.
(7) The 3-year average of the annual 99th percentile of the SO_2 daily maximum 1-hour concentrations.
++ Geometric Mean Value.
— = No guideline available.
TEQ = Toxics Equivalents.
Bolded values represent the criteria that will be used in the assessment.

Odour impacts will be assessed following the guidance in the MECP Technical Bulletin *Methods for Modeling Assessments of Contaminants with 10-minute average standards and guidelines for Odour under O.Reg. 419/05 (September 2016)* and compared to the guideline of 1 OU/m³.

The air quality and odour assessment will also include the following qualitative component:

- It is anticipated that truck transportation along the haul route associated with the W12A landfill site will have insignificant impacts and will decrease compared to the truck traffic corresponding to the current approved annual maximum waste volumes. The air quality assessment will provide a rationale for the insignificance of truck transportation by comparing the truck traffic associated with the Site to existing daily traffic counts on the surrounding Haul routes.
- Noise assessment – This study will assess emissions from the preferred expansion alternative. Emissions from equipment and vehicles operating will be based on measurements from the existing landfill, manufacturer's or design data, or emissions data

from Golder's database of similar noise sources. This will be followed by the execution of a noise prediction model. The results of this study will be predicted worst-case hour operation for various activities associated with the proposed landfill operations. This study will focus on off-site sensitive PORs.

Assessment of potential effects associated with air quality, odour and noise will be done using appropriate objectives, standards, policies and regulations. The remaining net effects, if any, will be documented. Also, a qualitative and/or quantitative comparison will be made between the predicted effects of the preferred alternative and the existing scenario considering the indicators for the atmosphere component; the change in difference between the existing scenario and the preferred expansion Alternative Method can be provided. In addition, the preferred expansion alternative will be assessed and designed to demonstrate compliance with O. Reg. 419/05 and the MECP noise limits to support a future Environmental Compliance Approval amendment application.

4.6 Step 6: Describe the Preferred 'Alternative Method' for Landfill Expansion

A description of the preferred landfill expansion alternative will be detailed following the identification of appropriate mitigation measures. In addition, a leachate management assessment will be completed that will include:

- the quantity of leachate generated from the preferred landfill expansion alternative will be predicted;
- the quality of the leachate associated with the expansion and requiring treatment will be assessed;
- a high level assessment of the capability of the existing forcemain to continue to convey the collected leachate to the municipal sewer system will be completed; and
- a high level assessment of the capability of the Greenway Wastewater Treatment Plant to continue to treat the leachate will be carried out.

The results will be provided in the EA study report (Step 9).

4.7 Step 7: Consideration of Climate Change

Ways in which the project could reduce GHG emissions or remove GHG from the atmosphere will be considered.

The GHG emission estimates, where applicable, will follow quantification guidelines for both provincial and federal reporting:

- Federal reporting under Section 46 of the *Canadian Environmental Protection Act*, (CEPA), SC 1999: Greenhouse Gas Emissions Reporting Program (GHGRP); and

- Provincial reporting under Ontario's Greenhouse Gas Emissions: Quantification, Reporting, and Verification Regulation, O. Reg. 390/18.

The total estimated GHG emissions associated with the expanded landfill will be quantified and compared to the Ontario-wide emissions of GHGs as well as the existing baseline scenario of the existing landfill operation.

4.8 Step 8: Cumulative Impact Assessment

The EA Team will work to identify the predicted effects of other existing or known proposed projects in the area of the site. The atmosphere component technical discipline leads will consider any identified effects together with those predicted during the comparative evaluation of alternative methods to determine if there are any unacceptable predicted cumulative effects.

For air quality, predicted concentrations from the preferred alternative will be added to background concentrations identified as part of Step 1 to assess the cumulative impacts of the Project, relative to existing air quality criteria and guidelines.

For odour, a review of nearby odour sources and complaints filed with the MECP will be conducted. A windrose will be prepared for the area and the review will consider the locations of sensitive receptors relative to prevailing wind direction and historical complaints . This will be summarised to qualitatively assess the likelihood of cumulative impacts at the identified sensitive receptors.

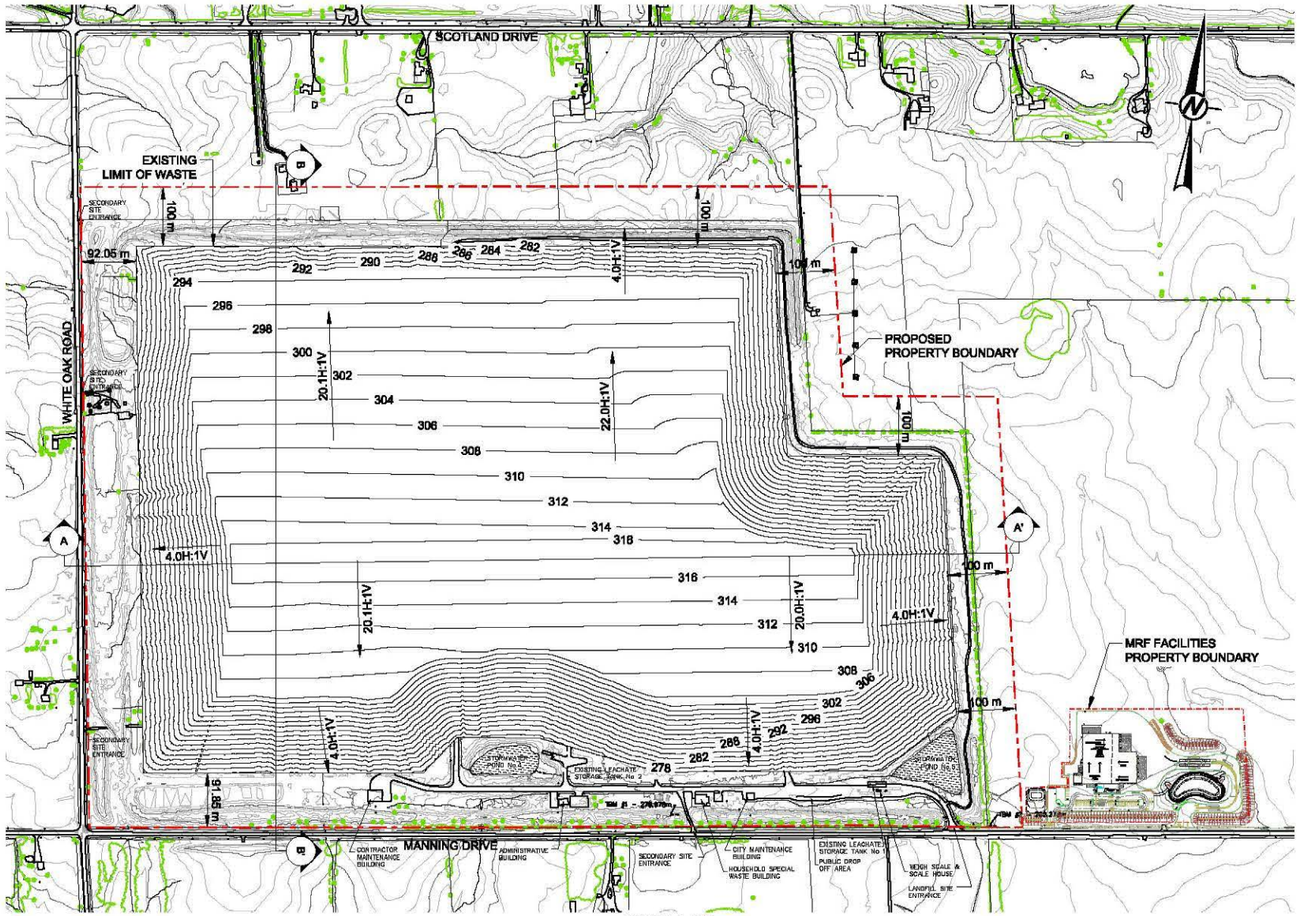
4.9 Step 9: Preparation of EA Study Report

In support of the completion of this task the atmosphere component technical discipline leads will carry out the following tasks:

- document the assessment results in an Atmospheric Supporting Document that will form an appendix to the EA submission;
- participate in meetings with the GRT including upfront consultations with the MECP during the EA to obtain pre-approval of tasks in the work plan, as required;
- support consultation events as required in development of presentation material and/or being at the event; and
- provide technical support during the review of the draft EA by the regulatory agencies and public.

Appendix A

Design Concept Alternatives



SITE PLAN
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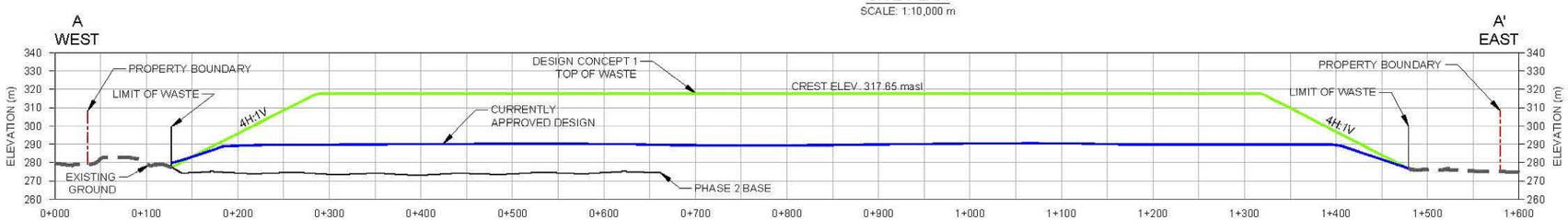
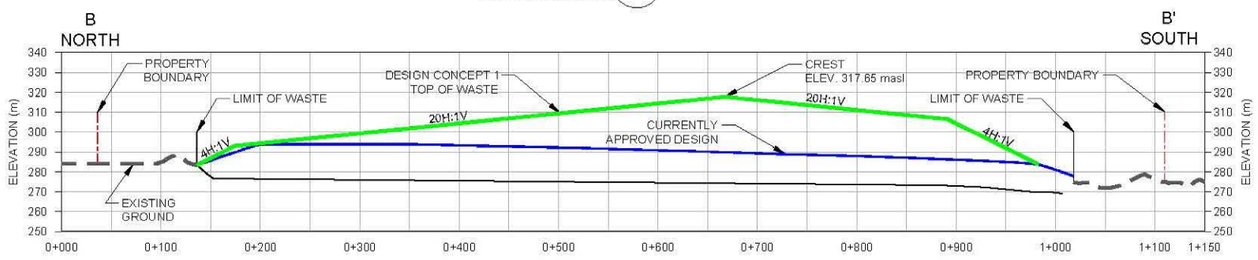
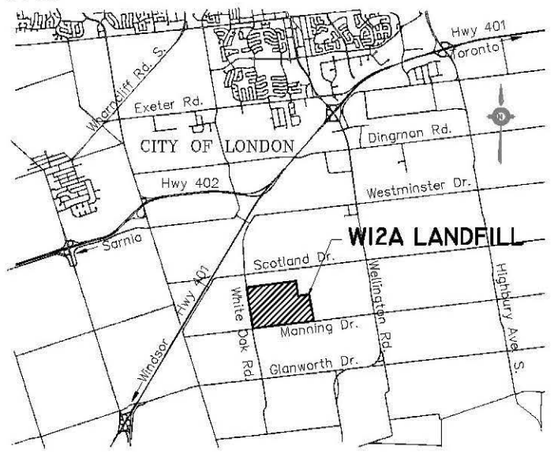


HORIZ. SCALE: 1:6,000 m
VERT. SCALE: 1:3,000 m
A-A' CROSS-SECTION



HORIZ. SCALE: 1:6,000 m
VERT. SCALE: 1:3,000 m
B-B' CROSS-SECTION

KEY MAP



NOTE(S)

1. ELEVATION CONTOURS SHOWN ARE TOP OF WASTE, masl.

REFERENCE(S)

BASE INFORMATION AND EXISTING CONTOURS AS PER CITY OF LONDON SURVEY DATED NOVEMBER 22, 2016.

NOT FOR CONSTRUCTION

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0 250 500
1:10,000 METRES

CLIENT
CITY OF LONDON
LONDON, ONTARIO
CANADA

PROJECT
INDIVIDUAL EA, RESIDUAL WASTE DISPOSAL STRATEGY
W12A LANDFILL WASTE MOUND CONCEPT DESIGN

TITLE
DESIGN CONCEPT 1 - VERTICAL EXPANSION OVER EXISTING FOOTPRINT

CONSULTANT
GOLDER

YYYY-MM-DD	2019-10-31
DESIGNED	MLF
PREPARED	MLF
REVIEWED	PS
APPROVED	PS

PROJECT NO.	CONTROL	REV.	DRAWING
1648176	1001	B	DC1

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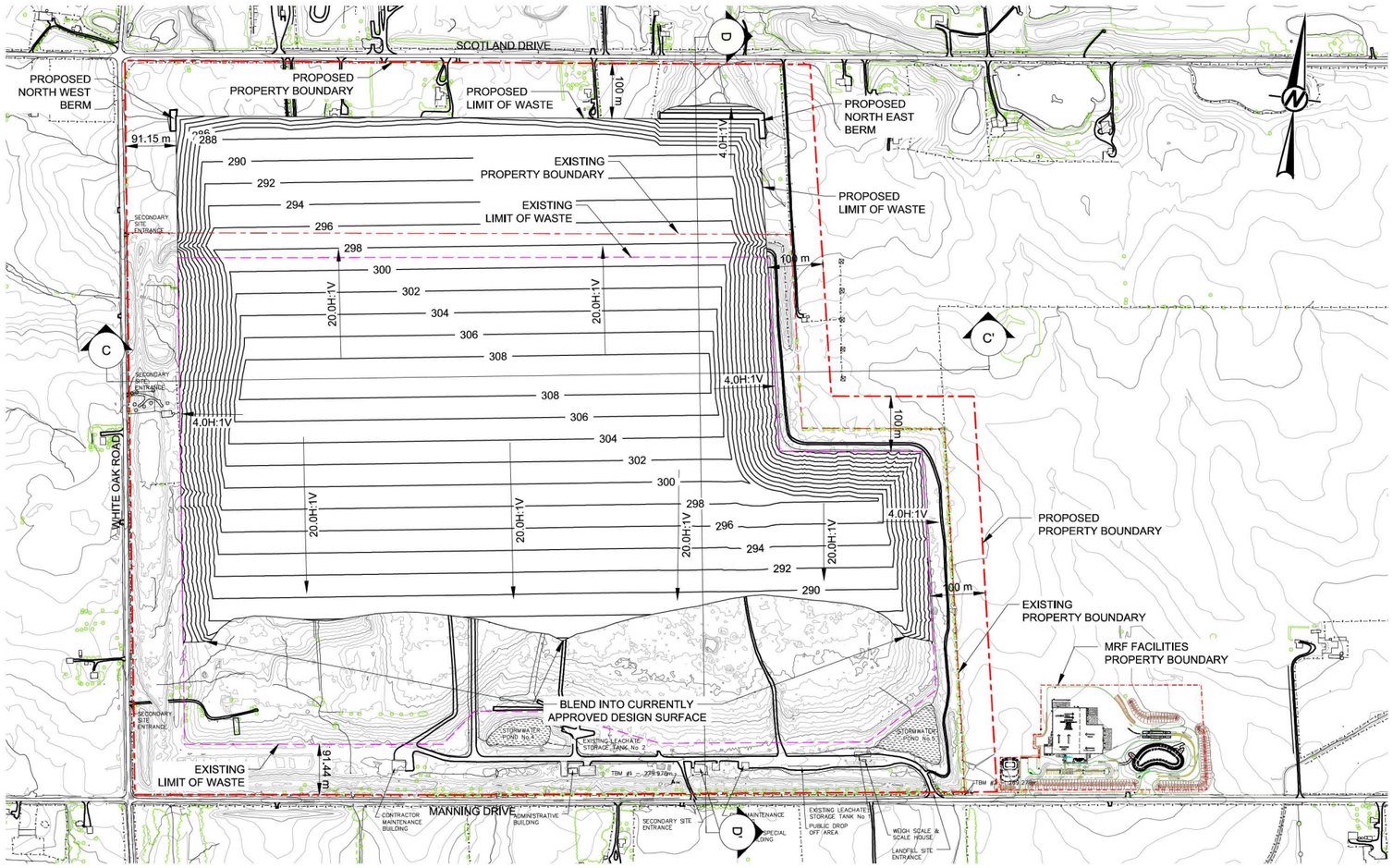

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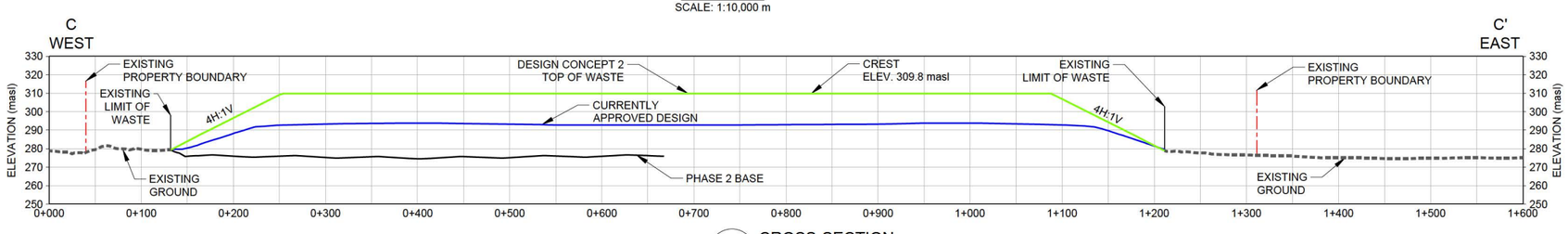

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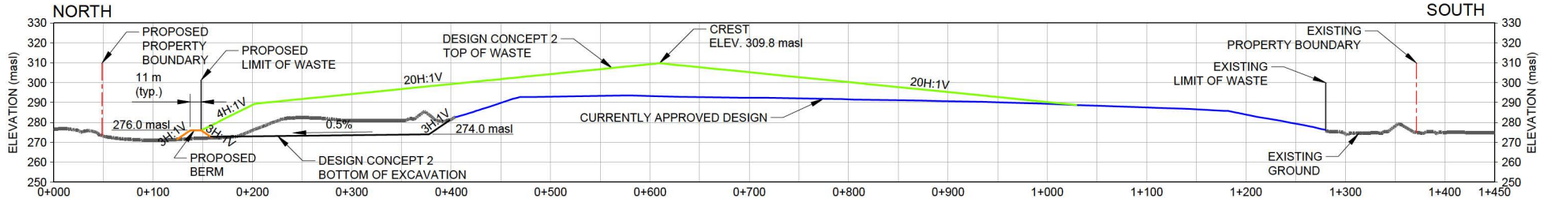

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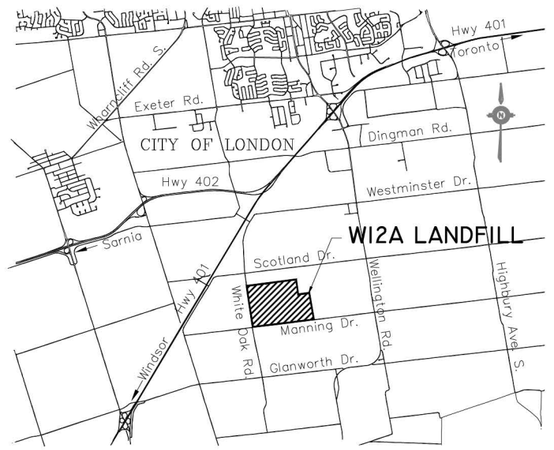

NOTE(S)

1. ELEVATION CONTOURS SHOWN ARE TOP OF WASTE, masl.

REFERENCE(S)

BASE INFORMATION AND EXISTING CONTOURS AS PER CITY OF LONDON SURVEY DATED NOVEMBER 22, 2016.

Cut/Fill Summary

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CLIENT
CITY OF LONDON
LONDON, ONTARIO
CANADA

PROJECT
INDIVIDUAL EA, OF THE PROPOSED
W12A LANDFILL EXPANSION

TITLE
DESIGN CONCEPT 2 - HORIZONTAL EXPANSION TO THE NORTH WITH VERTICAL EXPANSION OVER PART OF EXISTING FOOTPRINT

CONSULTANT
GOLDER

YYYY-MM-DD	2019-11-05
DESIGNED	MLF
PREPARED	MLF
REVIEWED	PS
APPROVED	PS

PROJECT NO.	CONTROL	REV.	DRAWING
1648176	0001	B	DC2

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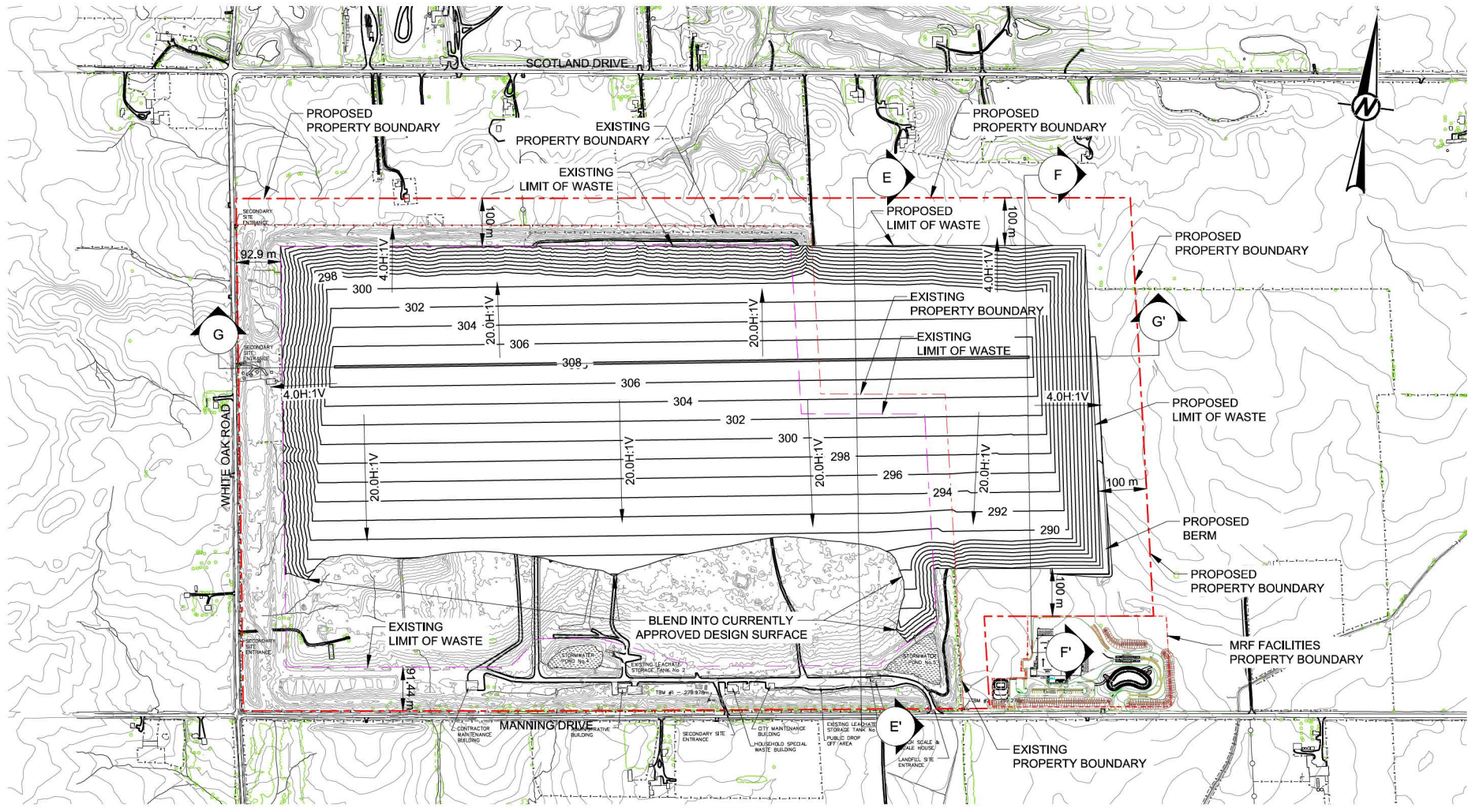

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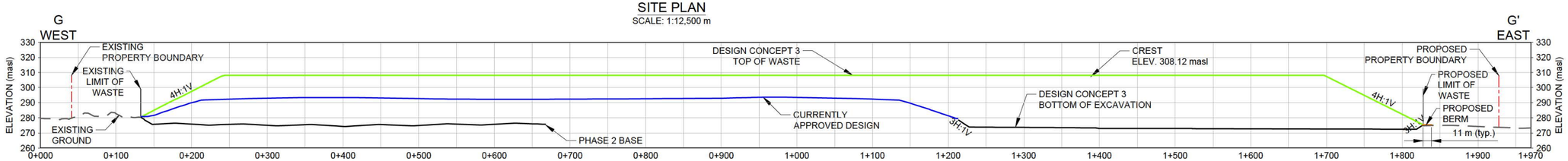

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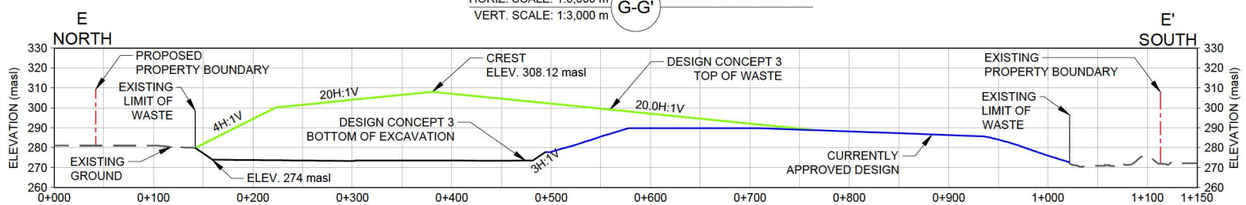

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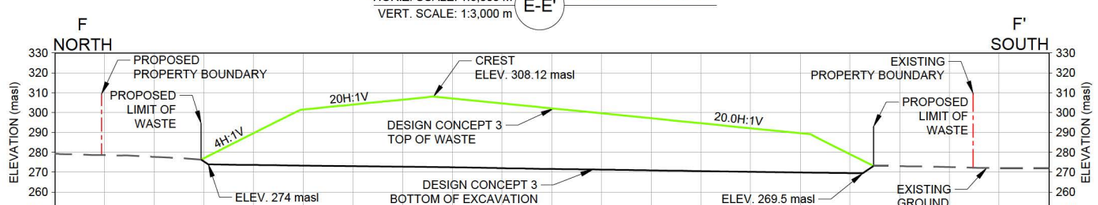

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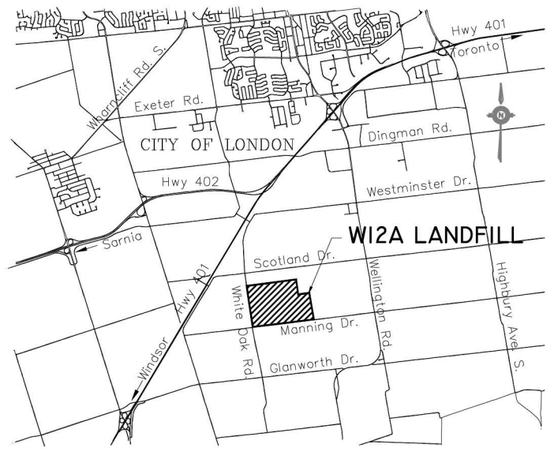
KEY MAP



NOTE(S)

1. ELEVATION CONTOURS SHOWN ARE TOP OF WASTE, masl.

REFERENCE(S)

BASE INFORMATION AND EXISTING CONTOURS AS PER CITY OF LONDON SURVEY DATED NOVEMBER 22, 2016.

Cut/Fill Summary

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NOT FOR CONSTRUCTION

DRAFT

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1:6,000 METRES

0 250 500
1:12,500 METRES

CLIENT
CITY OF LONDON
LONDON, ONTARIO
CANADA

PROJECT
INDIVIDUAL EA OF THE PROPOSED
W12A LANDFILL EXPANSION

TITLE
DESIGN CONCEPT 3 - HORIZONTAL EXPANSION TO THE EAST WITH VERTICA

CONSULTANT
GOLDER

YYYY-MM-DD	2019-11-07
DESIGNED	MLF
PREPARED	MLF
REVIEWED	PS
APPROVED	PS

PROJECT NO.	CONTROL	REV.	DRAWING
1648176	0001	B	DC3

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B.02 Groundwater Work Plan

November 14, 2019

GROUNDWATER WORK PLAN

Environmental Assessment of the Proposed W12A Landfill Expansion
City of London

Submitted to:
City of London
300 Dufferin Avenue
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London Ontario
N6A 4L9

Submitted by:
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GOLDER

DILLON CONSULTING

London CANADA

Distribution List

1 e-copy Ministry of the Environment, Conservation and Parks

Table of Contents

1.0 Introduction 1
2.0 Assessment Framework 1
2.1 Overall Approach 1
2.2 Project Team Organization 2
2.3 Study Areas 2
3.0 Assessment Criteria and Indicators 3
4.0 Detailed Workplan 4
4.1 Step 1: Characterize Existing Environmental Conditions 4
4.1.1 Overview of Existing Conditions (Existing Documentation) 4
4.1.2 Additional Studies/Investigations 5
4.2 Step 2: Identify 'Alternative Methods' of Landfill Expansion 11
4.3 Step 3: Qualitative Evaluation of 'Alternative Methods' 12
4.4 Step 4: Compare the 'Alternative Methods' for Landfill Expansion and Identify the Preferred Alternative 12
4.5 Step 5: Refine Mitigation Measures and Determine Net Effects of the Preferred Alternative 13
4.6 Step 6: Describe the Preferred 'Alternative Method' for Landfill Expansion 13
4.7 Step 7: Consideration of Climate Change 14
4.8 Step 8: Cumulative Impact Assessment 14
4.9 Step 9: Preparation of EA Study Report 14

Tables

Table 1.0-1: Project Commitments from ToR Relevant to Work Plan Development 1
Table 2.3-1: Proposed Preliminary Study Areas for the Groundwater Component 3
Table 3.0-1: Component Rationale and Indicators for the EA 3
Table 4.2-1: Approximate Number and Type of Soil and Hydrogeological Tests 11

Figures

Figure 4.1-1: Surficial Aquitard Thickness 7
Figure 4.1-2: Hydrostratigraphic Units (north-south) 8
Figure 4.1-3: Vertical Gradient 8
Figure 4.1-4: Preliminary Drilling Locations 9

1.0 Introduction

This document presents the proposed detailed work plan for the groundwater component of the Environmental Assessment (EA) of the proposed W12A Landfill expansion (project). The work plan is being submitted for approval to the Ministry of the Environment, Conservation and Parks (MECP).

This work plan has been developed with consideration of the commitments made for the project within the development of the Terms of Reference (ToR). The relevant commitments are provided below in Table 1.0-1.

Table 1.0-1: Project Commitments from ToR Relevant to Work Plan Development

ID	Commitment
5	Where described in the ToR for the environmental components, detailed work plans for the technical studies will be prepared and provided to the appropriate GRT* agency for review and concurrence.
6	The City will share work plans with Indigenous Communities and post work plans on the project website.
10	During the EA, the preliminary criteria and indicators for each of the environmental components will be refined and described in the EA study report.
11	The preliminary Study Areas will be reviewed and confirmed during the EA and described in the EA study report.
12	A more detailed description of the environmental conditions will be prepared during the EA to reflect the confirmed Study Areas using a combination of sources of existing information and site-specific investigations and studies and provided in the EA study report.

* Government Review Team (GRT)

2.0 Assessment Framework

2.1 Overall Approach

It is proposed that the EA work will be undertaken in a series of nine steps (further details are provided in Section 4.0) as follows:

- Step 1 – Characterize existing environmental conditions;
- Step 2 – Identify the ‘Alternative Methods’ of landfill expansion;
- Step 3 – Qualitative evaluation of ‘Alternative Methods’;
- Step 4 – Compare the ‘Alternative Methods’ for landfill expansion and identify the preferred alternative;

- Step 5 – Refine the mitigation measures and determine the net effects of the preferred alternative;
- Step 6 – Describe the preferred 'Alternative Method';
- Step 7 – Consideration of climate change;
- Step 8 – Cumulative impact assessment; and
- Step 9 – Preparation of the EA Study Report.

Consultation with the public, Indigenous Communities, GRT members, City of London Advisory Committees, and other stakeholders will be ongoing throughout the EA process.

2.2 Project Team Organization

The project tasks will be organized to be completed by the following teams:

- The EA Management Team consists of the project director, project manager and project coordinator for the EA;
- The Design and Operations (D&O) Team consists of landfill design technical staff and AutoCAD technicians; and
- The EA Team consists of technical discipline leads for each of the specified environmental components.

2.3 Study Areas

Data for the EA will be collected and analyzed for preliminary generic study areas presented in the ToR. These will be confirmed and may be refined during the EA. These preliminary generic study areas are as follows:

Site Study Area – The existing W12A Landfill Site, located at 3502 Manning Drive and adjacent lands where landfill expansion may occur.

Site-vicinity Study Area – The lands in the area immediately adjacent to the Site Study Area that have the potential to be directly affected by the landfill expansion and activities with the Site Study Area. The extent of the Site-vicinity Study Area will be determined for each of the environmental components. For most environmental components, a Site-vicinity Study Area of 500 metres from the Site Study Area is appropriate.

Wider Study Area – An area that takes on the broader community generally beyond the immediate site vicinity and for specific environmental components may include the entire Municipality.

The proposed preliminary study area for the groundwater component is presented in Table 2.3-1.

Table 2.3-1: Proposed Preliminary Study Areas for the Groundwater Component

Environmental Component	Preliminary Area(s) to be Studied	Rationale
Geology and Hydrogeology	Site	Potential effects on groundwater quality have to comply with the MECP Reasonable Use Guideline at the landfill site boundary.

3.0 Assessment Criteria and Indicators

The Groundwater component will be assessed for the potential effects of the undertaking based on one criterion as follows.

The rationale, indicators and data sources for the proposed assessment sub-components are provided in the ToR, and are presented in Table 3.0-1 below.

Table 3.0-1: Component Rationale and Indicators for the EA

Sub-Component	Rationale	Indicator(s)	Data Sources
Groundwater quality	Contaminants associated with the landfill expansion and associated operations could enter the groundwater and impact off-site groundwater or surface water.	• Expected effect on groundwater quality at the property boundary.	• Published regional sources and data on regional geological and hydrogeological conditions such as the Middlesex-Elgin Groundwater Study, Source Protection Assessment Reports. • Review MNRF petroleum well records. • Provincial Quaternary and Bedrock Mapping. • Ontario Water Well Records (water supply wells are considered to be sensitive receptors in terms of potential impacts). • Landfill Annual Monitoring Reports. • Previous site characterization reports. • Borehole Logs. • Adjacent property assessment reports. • Additional intrusive studies/investigations (see section 4.1.2).

The criteria and indicators will be refined during the EA as necessary.

4.0 Detailed Workplan

4.1 Step 1: Characterize Existing Environmental Conditions

This section presents an overview of existing environmental conditions for the groundwater component on and in the area of the W12A Landfill. As described in the *MECP Code of Practice* (MOECC, 2014a), the City of London will present a more detailed description of the environmental conditions in the EA Report. The following is an overview of existing conditions.

4.1.1 Overview of Existing Conditions (Existing Documentation)

Previous investigations over the last 40 years has resulted in a thorough understanding of hydrogeology setting of the existing landfill. In terms of geological setting, the landfill is located on part of the Westminster moraine, which consists of low permeability till soils identified as the Port Stanley Till. Immediately north of the landfill site, gravel and gravelly sand were formed from the older Catfish Creek drift (located under the Port Stanley Till) or were deposited underneath the Port Stanley Till by subglacial streams.

Major hydrostratigraphic units are divided into aquitards and aquifers. An aquitard consists of low permeability soils that inhibit groundwater flow. An aquifer consists of permeable soils that can transmit large enough quantities of water such that when water wells are installed they produce usable quantities of water.

In terms of the hydrogeological setting, the site is underlain by an aquitard, consisting of low permeability Port Stanley Till, referred to as the Surficial Aquitard. The thickness of the Surficial Aquitard varies from as much as 20 m in the northwest corner of the existing W12A Landfill site, to 15 m or greater below much of the existing landfill, and to about 8 m at the southeast corner of the site along Manning Drive. Groundwater moves downward at an estimated velocity of 1 to 2 centimeters (cm) per year in the Surficial Aquitard. The upper portion of the Surficial Aquitard is weathered and fractured. The degree of significant fracturing decreases with depth such that the fractured till is much more hydraulically active than the lower less fractured till soil. Generally, regional studies have indicated that the tills are highly fractured to a depth of 3-4 m, a transitional zone occurs with beneath the highly weathered and fractured soil with isolated vertical fractures occurring at depths of approximately 6 m. The landfill cells will be excavated to depths that will remove most of the naturally weathered soils. Therefore, the landfill will be based on unfractured soil and will be protected from further desiccation and weathering by the overlying waste fill. Studies completed by Dillon and the University of Western Ontario in 2000 indicated that the depth of active fractures beneath the waste fill is less than 2 m and that desiccation fractures in till soils occurring during landfill cell construction are “self-healing”.

The next major hydrogeological feature in the region is an aquifer found beneath the Port Stanley Till, consisting of stratified sand and gravel soils, most likely part of the Catfish Creek Drift. These soil deposits comprise the White Oak Aquifer. The aquifer has an irregular vertical distribution with a maximum thickness of approximately 45 m just north of the landfill along Scotland Drive. Groundwater flow in the White Oak Aquifer is in a general north to south/southeast direction.

Some local aquifers consisting of sand and gravel soil layers within the low permeability till soils were probably formed by subglacial processes at the time that the till soils were deposited. One such local aquifer is present underneath the landfill (referred to as the Upper Aquifer) and separates the Port Stanley Till into the Surficial Aquitard and a Lower Aquitard, both of which are above the White Oak Aquifer. The Upper Aquifer is indicated not to be present north of Scotland Drive, but extends south of Manning Drive; groundwater flow in the Upper Aquifer is towards the southeast. These aquifers are not regionally extensive and generally thinner than the White Oak Aquifer.

Limestone bedrock is found approximately 80 to 90 m below the landfill and slopes downwards from north-northeast.

Municipal water is available to residences near the landfill on Manning Drive, White Oak Drive, Scotland Drive and Wellington Road South; however, some of the homeowners have not connected to the available municipal services. These residences, as well as residences and farms further away from the landfill area, rely on individual water supply wells for their water supply. Individual water supply wells in the vicinity of the landfill are monitored annually.

Source water protection studies were carried out for the watersheds in which the City of London is located. The resulting Source Water Protection Plans delineate source protection areas with respect to municipal drinking water supplies (Wellhead Protection Areas – WHPAs and Intake Protection Zones – IPZs) as well as groundwater recharge areas, assign vulnerability to these source protection areas and describe appropriate land use planning for their protection. The Thames-Sydenham & Region Drinking Water Source Protection Plan takes in the area of and surrounding the W12A Landfill. The primary source of drinking water for the City is surface water from Lake Huron and Lake Erie, with a stand-by backup supply from groundwater from the Hyde Park and Fanshawe well fields located in the northeast and west parts of the City. All of these sources are distant from the W12A Landfill. There are no source water protection areas identified on or in the area of the W12A Landfill. As such, neither the existing landfill nor the proposed expansion are influenced by planning considerations or requirements related to source water protection.

4.1.2 Additional Studies/Investigations

In addition to reviewing the data sources described in 3.0-1 and despite the thorough understanding of the hydrogeology setting of the existing landfill, there remains some potential areas for further field investigations to the north and east of the existing landfill, related to existing conditions but also landfill expansion.

Area North of Existing Landfill

The main issue at this location is the nature of the hydrogeological connection between the local Upper Aquifer and the regional White Oaks Aquifer. Integral to the connection is the presence and hydraulic conductivity of the till layer separating the aquifer hydrostratigraphic units.

An evaluation of this issue consisted of using a "multiple lines of evidence" approach where borehole data was used to develop physical localized hydrostratigraphic limits coupled with groundwater level data and hydrogeochemistry data. In addition, hydrogeological data that has been obtained over the operating period of the landfill obtained from hydrogeological studies completed on aggregate pits north of the landfill site (north of Scotland Drive) has been used to supplement the hydrogeological understanding of this area. Overall, these sources of information were used to further define aquifer units and identify data gaps that could be addressed by additional investigation.

Figure 4.1-1 (next page) shows the thickness of the Surficial Aquitard based both on borehole logs and water well records as well as surficial topography. The Surficial Aquitard is absent north of Scotland Drive where the gravel pits have intercepted the White Oaks Aquifer. The Upper Aquifer and Lower Aquitard are also absent north of Scotland Drive.

A cross section drawn north-to-south is shown on **Figure 4.1-2** (page 8). This section was drawn approximately 250 m east of White Oak Road and shows the interpreted extent of the major hydrostratigraphic units at the landfill site. This cross-section was developed by interpolating between boreholes and water well records.

There are currently six monitoring well locations located north of the landfill and are shown on **Figure 4.1-1**. At the southeast corner of Scotland Drive and White Oak Road there is a nested monitoring well location: 01-12b (Upper Aquifer monitoring well) and 01-12a (White Oaks Aquifer monitoring well). Also located near this location is 92-12 which is a White Oaks Aquifer monitoring well. Monitoring well 92-10 (a White Oaks Aquifer monitoring well) is on the south side of Scotland Drive, 200 m east of White Oak Road. Another White Oaks Aquifer monitoring well, 01-13, is located approximately 150 m south of 92-10. Monitoring well 92-11, which is installed in the Upper Aquifer, is located 110 m east of White Oak Road along the northern boundary of the current landfill site. Upper Aquifer monitoring well 82-6, located 660m east of 92-1 is also at the northern site boundary. At the northeast corner of the current site are Upper Aquifer monitoring well 01-14, in close vicinity to White Oaks Aquifer monitoring well 92-9.

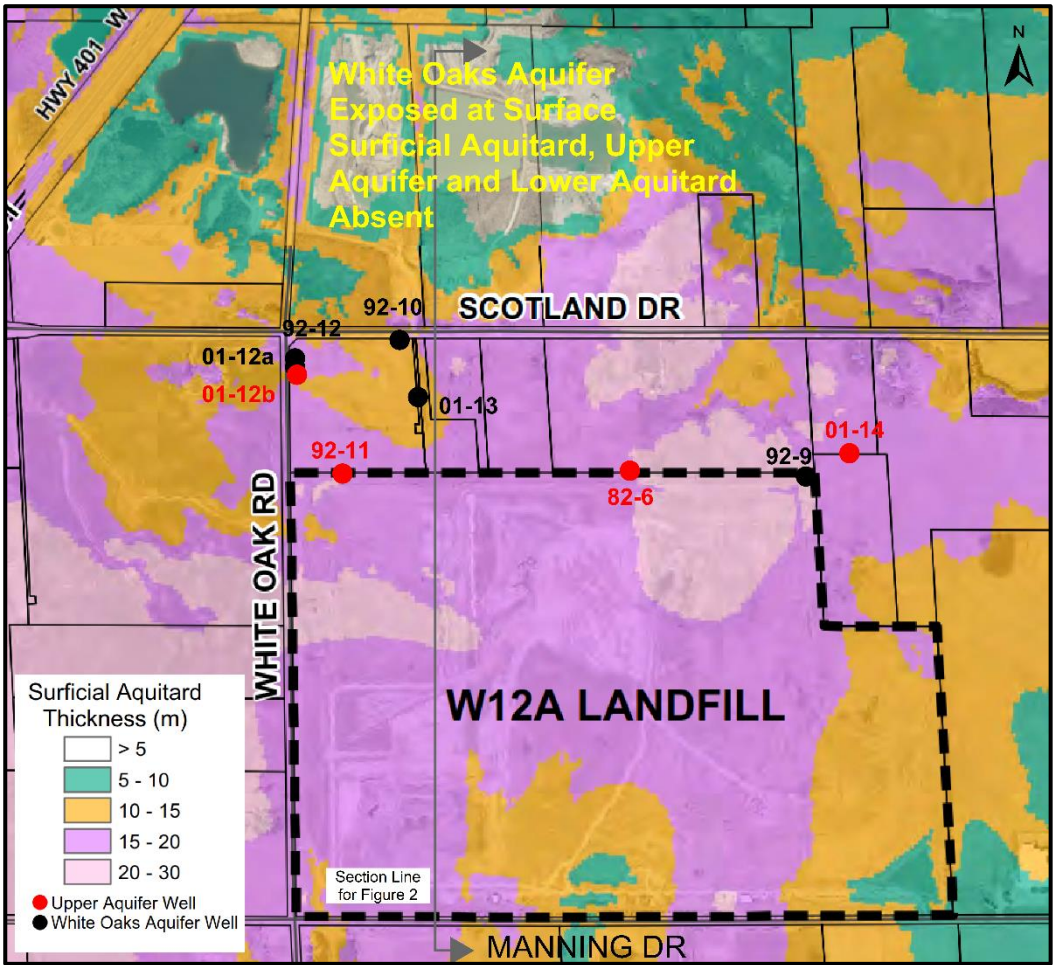

Figure 4.1-1: Surficial Aquitard Thickness

Water levels from nested monitoring wells can be used to determine vertical hydraulic gradients. **Figure 4.1-3** (next page) is an example of water levels of two nested monitoring wells located at the southeast corner of Scotland Drive and White Oak Road: 01-12a installed in the White Oaks Aquifer and 01-12b installed in the Upper Aquifer. Generally, water levels have increased (rebounded) from the effects of municipal groundwater taking in the White Oaks Aquifer until about 2012 where the water levels have levelled off. As shown on **Figure 4.1-3**, there is about a 2 m difference in water levels between the aquifers at this location.

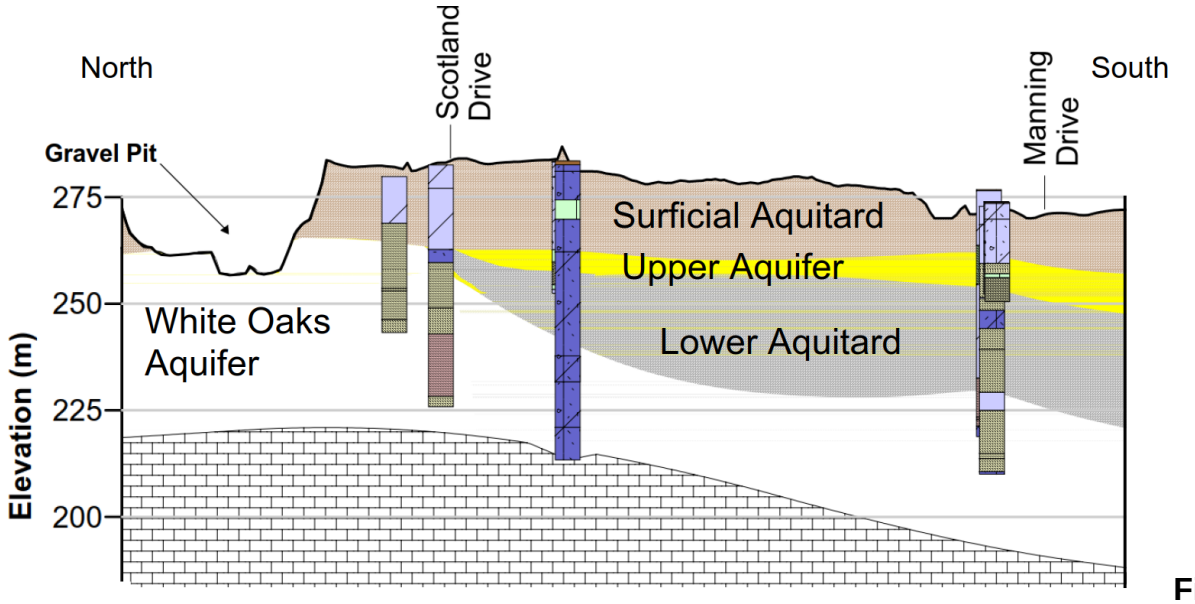

Figure 4.1-2: Hydrostratigraphic Units (north-south)

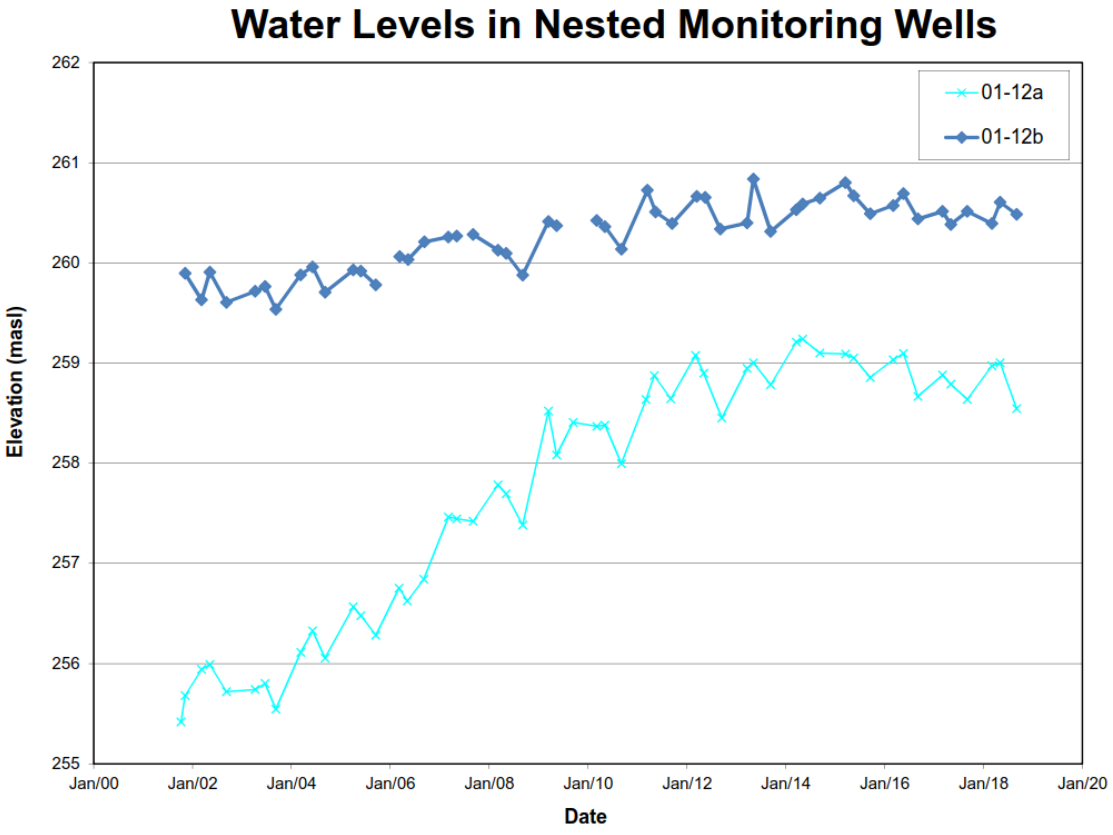

Figure 4.1-3: Vertical Gradient

From a data gap perspective, there is a lack of borehole locations along Scotland Drive as shown with the blue oval on **Figure 4.1-1**. This area has had exploratory water wells drilled (as part of municipal groundwater exploration in the 1950's and 1960's) and information from this source has been included in the hydrostratigraphical model. There is a need for boreholes / monitoring wells in this area to both determine lithology and groundwater levels, to understand existing conditions and also in case of lateral landfill expansion to the north of the existing landfill. Monitoring wells installed at the same location in different hydrostratigraphic units ("nested" monitoring wells) would be particularly useful.

Figure 4.1-4 shows tentative locations of monitoring well nests to address the identified data gap identified along Scotland Drive.

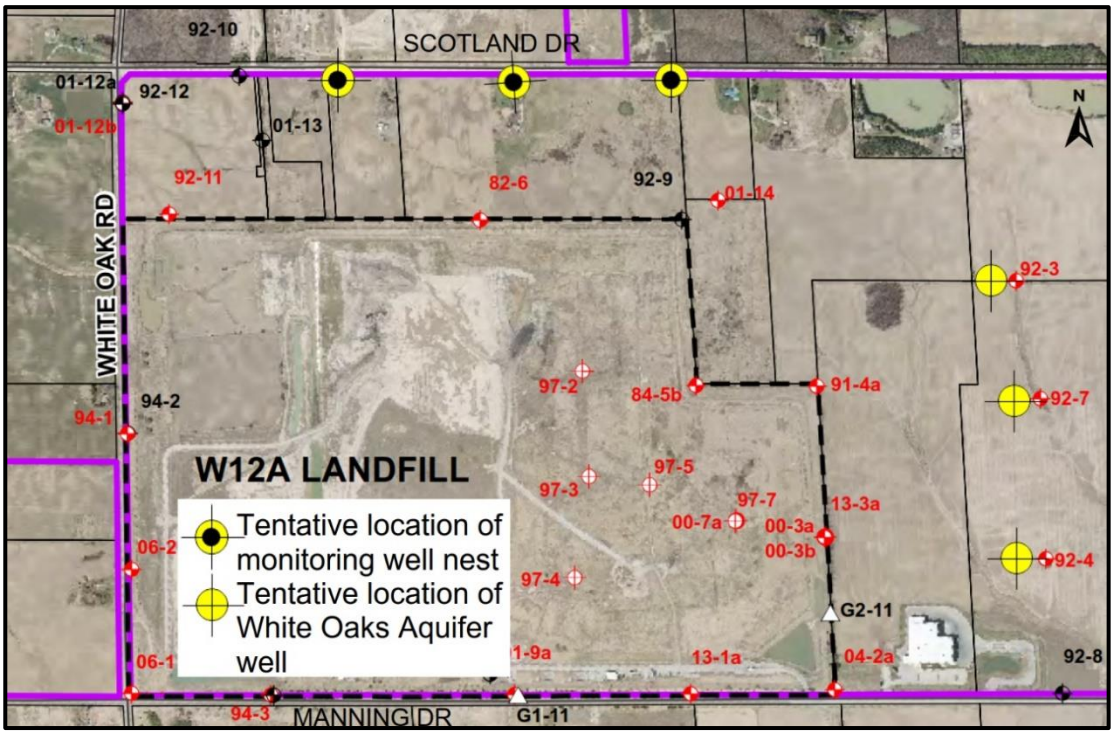

Figure 4.1-4: Preliminary Drilling Locations

At each monitoring well nest location, the deepest well should be drilled to an elevation of approximately 220 to 230 metres above sea level (~50 m deep). Drilling methods for the deep will include a Christenson Core Barrel (CP size) System or the CME Continuous Sample Tube System in order to recover good quality overburden soil cores of the clayey till aquitards at the site. The soil cores will be logged with particular focus on fracturing in the Surficial Aquitard. At each location a shallow monitoring well should be installed in the Upper Aquifer (where identified) or if the Upper Aquifer does not exist at a location, the shallow well should be installed at the top of the White Oak Aquifer. Split spoon sampling and standard penetration tests will be completed in the borehole of the shallow monitoring wells.

Soil samples from the Upper Aquitard, Upper Aquifer, Lower Aquitard and White Oak Aquifer will be collected and tested for various parameters as listed in Table 4.1-1. Data loggers for water levels will installed in each of the new monitoring wells and water samples collected to confirm water quality.

Area East of Existing Landfill

One of the proposed landfill development alternatives is possible expansion to the east of the present fill site. The hydrogeology east of the landfill is well understood but additional information of this area would be beneficial in assessing the area for possible future landfilling. Three monitoring well nests are proposed east of the present fill as shown on **Figure 4.1-4**. These nests would consist of existing wells 92-3, 92-4 and 92-7 screened in the Upper Aquifer and new wells at each location screened in the White Oaks Aquifer.

Drilling and sampling methods will be similar to methods used for the wells installed to the north of the landfill with a couple of exceptions including no split spoon sampling or standard penetration tests to be completed.

Soil and Hydrogeological Testing

Soil samples from the Surficial Aquitard, Upper Aquifer, Lower Aquitard and White Oak Aquifer will be collected and tested for various parameters as listed in Table 4.1-1 (next page). In addition, groundwater samples will be taken from the new monitoring wells and analyzed for conventional water quality analysis and isotopic analysis (selected wells only).

Presence of Fractures in the Surficial Aquitard

The presence of fractures within the surficial aquitard is a well known phenomenon. To evaluate the nature of the fractures and their potential to create a preferred pathway for leachate migration from the landfill expansion, a benched test pit measuring approximately 18m x 18 m in plan and 6 m in depth, or deeper if fractures are visible, is proposed. The test pit would give a good indication of fracture spacings and depths. Ideally, the location of the test pit should be outside of any potential future cell so that the aquitard is not disturbed and a preferential pathway for future leachate migration is not created. Tentatively the test pit is proposed on the east side of the existing landfill, but outside any contemplated areas for landfill expansion.

Upon excavation of the test pit, the vertical (1.2 m high) walls at the benched sideslopes will be cut into along apparent fractures using a hand trowel. This step is necessary in order to remove clay material smeared by the excavator bucket and fully expose the fractures for measurement of spacings and depths. The fracture network will be logged and photographs taken.

Once the test pit is complete the results will be evaluated and the need for any further monitoring wells within the surficial aquitard will be considered.

4.2 Step 2: Identify 'Alternative Methods' of Landfill Expansion

During the initial stage of the EA, a reasonable range of expansion alternatives will be identified and described at a sufficient level of detail (i.e., conceptual designs) so that potential effects of the expanded landfill on each environmental component can be assessed and compared.

This task will involve developing the conceptual site design for the proposed expansion of the W12A Landfill, to gain an additional 25 years of disposal capacity. This task will be completed by the Design and Operations Team.

Table 4.2-1: Approximate Number and Type of Soil and Hydrogeological Tests

Test	Hydrostratigraphic Unit			
	Surficial Aquitard	Upper Aquifer	Lower Aquitard	White Oaks Aquifer
Grain Size Analysis, Moisture Content	20	8	12	8
Fraction of Organic Carbon, Cation Exchange Capacity	6		3	
Geotechnical Parameters (Atterburg Limits)	6			
Triaxial Permeability	6			
Single Well Response Tests		6		6
X-Ray Diffraction	2			
Conventional Water Quality Analysis		6		6
Isotope Analysis (porewater extracted from aquitard soil cores, groundwater from monitoring wells installed in aquifers)	8	2	2	4

4.3 Step 3: Qualitative Evaluation of 'Alternative Methods'

Based on the conceptual site design, and considering mitigation measures, potential impacts of the proposed W12A Landfill expansion on the groundwater component will be assessed. The groundwater component technical discipline lead will evaluate each 'Alternative Method' qualitatively including:

- Identify the differences between the alternatives that will affect the potential impact on groundwater quality such as waste footprint configuration, direction of groundwater flow, landfill cover type. A comparative table outlining these differences will be developed.
- Estimate qualitatively how the differences will affect the groundwater quality.

In this step, each 'Alternative Method' of the W12A Landfill expansion will be examined by the EA Team to determine if it would ultimately be approvable under the Environmental Protection Act (EPA).

This screening step is included to eliminate any alternative that would likely not be approvable. Should an alternative be found to not be approvable due to unacceptable net effects (i.e., no further refinement of mitigation is possible) or technical reasons, then the alternative would be eliminated from further consideration. At this point, the EA Management Team may consider additional 'Alternatives Methods' for the project that may have been identified by the public or other parties during the EA process.

4.4 Step 4: Compare the 'Alternative Methods' for Landfill Expansion and Identify the Preferred Alternative

When the alternatives have been finalized, a comparative evaluation of the 'Alternative Methods' will be completed. The comparative evaluations would include evaluating the relative importance or ranking of the assessment criteria (i.e., although all criteria are relevant, certain criteria may be considered more important than others[1]).

The groundwater component technical discipline lead will complete the following tasks:

- Rank each 'Alternative Method' based on groundwater quality differences.
- Describe advantages and disadvantages of each 'Alternative Method'

Select the preferred 'Alternative Method' based on potential to affect groundwater quality.

The EA Management Team will take each disciplines comparison and compile the overall comparison of 'Alternative Methods'.

1 The public has been asked during the consultation on the Terms of Reference and will be asked during consultation on the EA to provide input into the ranking of the relative importance of the components.

4.5 Step 5: Refine Mitigation Measures and Determine Net Effects of the Preferred Alternative

In this task, the EA Team will identify linkages between the environmental components (i.e., direct or indirect effects of the proposed expansion on the groundwater component via another component) and prepare diagrams. The purpose of linkage diagrams, prepared by the technical discipline leads, is to facilitate an integrated assessment of effects.

The prediction of future environmental effects associated with the preferred 'Alternative Method' (with conceptual design mitigation measures in place) will be determined by groundwater component technical discipline lead. Predictive modelling of the preferred Alternative Method' performance (contaminant modelling) and contaminating lifespan as per Ontario Regulation (O.Reg.) 232/98 using selected key parameters of concern will be conducted. The key parameters are expected to include the parameters listed in O.Reg. 232/98 (chloride, benzene, dichloromethane, vinyl chloride, toluene, lead, 1,4-dichlorobenzene and cadmium) with chloride being the most conservative assessment parameter. Assessment of potential effects will be done using appropriate objectives, standards, policies and regulations. The remaining net effects, if any, will be documented.

Also, a quantitative comparison will be made between the predicted effects of the preferred alternative and the Do-Nothing alternative regarding groundwater quality.

4.6 Step 6: Describe the Preferred 'Alternative Method' for Landfill Expansion

A description of the preferred landfill expansion alternative will be detailed following the identification of appropriate mitigation measures. In addition, a leachate management assessment will be completed that will include;

- the quantity of leachate generated from the preferred landfill expansion alternative will be predicted,
- the quality of the leachate associated with the expansion and requiring treatment will be assessed,
- a high level assessment of the capability of the existing forcemain to continue to convey the collected leachate to the municipal sewer system will be completed; and,
- a high level assessment of the capability of the Greenway Wastewater Treatment Plant to continue to treat the leachate will be carried out.

The results provided in the EA study report (Task 9).

4.7 Step 7: Consideration of Climate Change

The potential effects of climate change on infrastructure associated with the site, as well as ways that the project could reduce greenhouse gas (GHG) emissions or remove GHG from the atmosphere will be considered by the air quality, surface water and geology and hydrogeology component technical discipline leads. As it relates to geology and hydrogeology the greatest potential affect relates to changes (increases) in precipitation events. These changes in precipitation have the potential to influence leachate generation at the site which will be considered.

4.8 Step 8: Cumulative Impact Assessment

The EA Team will work to identify the predicted effects of other existing or known proposed projects in the area of the site. The groundwater component technical discipline lead will consider any identified effects together with those predicted during the comparative evaluation of alternative methods to determine if there are any unacceptable predicted cumulative effects.

4.9 Step 9: Preparation of EA Study Report

In support of the completion of this task the groundwater component technical discipline lead will carry out the following tasks:

- Document the assessment results in a Groundwater Supporting Document that will form an appendix to the EA submission;
- Participate in meetings with the GRT including upfront consultations with the MECP during the EA to obtain pre-approval of tasks in the work plan, as required;
- Support consultation events as required in development of presentation material and/or being at the event; and,
- Provide technical support during the review of the draft EA by the regulatory agencies and public.

B.03 Surface Water Work Plan

August 2019

SURFACE WATER WORK PLAN

Environmental Assessment of the Proposed W12A Landfill Expansion
City of London

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Table of Contents

1.0 Introduction 1
2.0 Assessment Framework 1
2.1 Overall Approach 1
2.2 Project Team Organization 2
2.3 Study Areas 2
3.0 Assessment Criteria and Indicators 3
4.0 Detailed Workplan 4
4.1 Step 1: Characterize Existing Environmental Conditions 4
4.1.1 Overview of Existing Conditions (Existing Documentation) 5
4.1.2 Additional Studies/Investigations 5
4.2 Step 2: Identify ‘Alternative Methods’ of Landfill Expansion 7
4.3 Step 3: Qualitative Evaluation of ‘Alternative Methods’ 7
4.4 Step 4: Compare the ‘Alternative Methods’ for Landfill Expansionand Identify the Preferred Alternative 8
4.5 Step 5: Refine Mitigation Measures and Determine Net Effects ofthe Preferred Alternative 9
4.6 Step 6: Describe the Preferred ‘Alternative Method’ for LandfillExpansion.....10
4.7 Step 7: Consideration of Climate Change 10
4.8 Step 8: Cumulative Impact Assessment.....11
4.9 Step 9: Preparation of EA Study Report.....11

Tables

Table 1.0-1 Project Commitments from ToR Relevant to Work Plan Development 1

Table 2.3-1 Proposed Preliminary Study Areas for the Surface Water Component.....3

Table 3.0-1 Component Rationale and Indicators for the EA 3

Figures

Figure 4.1-1 Overview of Existing Environmental Conditions.....6

1.0 INTRODUCTION

This document presents the proposed detailed work plan for the surface water componentof the Environmental Assessment (EA) of the proposed W12A Landfill expansion (project). The work plan is being submitted for approval to the Minister of the Environment, Conservation and Parks (MECP) and Conservation Authorities.

This work plan has been developed with consideration of the commitments made for the project within the development of the Terms of Reference (ToR). The relevant commitments are provided below in Table 1.0-1.

Table 1.0-1: Project Commitments from ToR Relevant to Work Plan Development

ID	Commitment
5	Where described in the ToR for the environmental components, detailed work plans for the technical studies will be prepared and provided to theappropriate GRT* agency for review and concurrence.
6	The City will share work plans with Indigenous Communities and post workplans on the project website.
10	During the EA, the preliminary criteria and indicators for each of the environmental components will be refined and described in the EA study report.
11	The preliminary Study Areas will be reviewed and confirmed during the EAand described in the EA study report.
12	A more detailed description of the environmental conditions will be prepared during the EA to reflect the confirmed Study Areas using a combination of sources of existing information and site-specific investigations and studies and provided in the EA study report.

* Government Review Team (GRT)

2.0 ASSESSMENT FRAMEWORK

2.1 Overall Approach

It is proposed that the EA work will be undertaken in a series of nine steps (further details are provided in Section 4.0) as follows:

- Step 1 – Characterize existing environmental conditions;
- Step 2 – Identify the ‘Alternative Methods’ of landfill expansion;
- Step 3 – Qualitative evaluation of ‘Alternative Methods’;
- Step 4 – Compare the ‘Alternative Methods’ for landfill expansion and identify the preferred alternative;

- Step 5 – Refine the mitigation measures and determine the net effects of the preferred alternative;
- Step 6 – Describe the preferred 'Alternative Method';
- Step 7 – Consideration of climate change;
- Step 8 – Cumulative impact assessment; and
- Step 9 – Preparation of the EA Study Report.

Consultation with the public, Indigenous Communities, GRT members, City of London Advisory Committees, and other stakeholders will be ongoing throughout the EA process.

2.2 Project Team Organization

The project tasks will be organized to be completed by the following teams:

- The EA Management Team consists of the project director, project manager and project coordinator for the EA;
- The Design and Operations (D&O) Team consists of landfill design technical staff and AutoCAD technicians; and
- The EA Team consists of technical discipline leads for each of the specified environmental components.

2.3 Study Areas

Data for the EA will be collected and analyzed for preliminary generic study areas presented in the ToR. These will be confirmed and may be refined during the EA. These preliminary generic study areas are as follows:

Site Study Area – The existing W12A Landfill Site, located at 3502 Manning Drive and adjacent lands where landfill expansion may occur.

Site-vicinity Study Area – The lands in the area immediately adjacent to the Site Study Area that have the potential to be directly affected by the landfill expansion and activities with the Site Study Area. The extent of the Site-vicinity Study Area will be determined for each of the environmental components. For most environmental components, a Site-vicinity Study Area of 500 metres from the Site Study Area is appropriate.

Wider Study Area – An area that takes on the broader community generally beyond the immediate site vicinity and for specific environmental components may include the entire Municipality.

The proposed preliminary study area for the surface water component is presented in Table 2.3-1.

Table 2.3-1: Proposed Preliminary Study Areas for the Surface Water Component

Environmental Component	Preliminary Area(s) to be Studied	Rationale
Surface Water	Site and Site-vicinity	Necessary to include the drainage boundaries of the two subwatersheds within which the site is located.

3.0 ASSESSMENT CRITERIA AND INDICATORS

The surface water component will be assessed for the potential effects of the undertaking based on two criteria as follows.

The rationale, indicators and data sources for the proposed assessment sub-components are provided in the ToR, and are presented in Table 3.0-1 below.

Table 2.3-1: Proposed Preliminary Study Areas for the Surface Water Component

Sub-Component	Rationale	Indicator(s)	Data Sources
Surface water quality	Contaminants associated with the landfill expansion and associated operations couldseep or runoff into surface water and adversely affect water quality and aquatic life.	• Expected effect on surface water quality in the stormwater management system (SWMS) and within the site-vicinity.	• Topographic maps. • Air photos. • *Stormwater Management Master Plan* (Earth Tech, 2002). • *Surface Water Background Study* (Dillon, 2005). • Annual water quality Monitoring Reports. • Design and Operations Reports. • Surface water drainage mapping. • Agricultural farm drain mapping. • Watershed/subwatershed reports, including the Watershed Report Cards (2013 and 2018) and the 2008 Kettle Creek Watershed Characterization Report. • Local climate data. • Published water quantity and flow information from the MECP.

Sub-Component	Rationale	Indicator(s)	Data Sources
			• Environment Canada and local Conservation Authorities. • Site reconnaissance. • Flow observations during sampling program.
Surface water quantity	Operations associated with the landfill expansion couldalter runoff and peak flows.	• Expected changein peak flows (within the on-site SWMS and at the property boundary). • Expected degree of off-site effects on surface water within the site-vicinity.	• Topographic maps. • Air photos. • *Stormwater Management Master Plan* (Earth Tech, 2002). • *Surface Water Background Study* (Dillon, 2005). • Annual water quality Monitoring Reports. • Design and Operations Reports. • Surface water drainage mapping. • Agricultural farm drain mapping. • Watershed/subwatershed reports, including the Watershed Report Cards (2013 and 2018) and the 2008 Kettle Creek Watershed Characterization Report. • Local climate data. • Published water quantity and flow information from the MECP. • Environment Canada and local Conservation Authorities. • Site reconnaissance. • Flow observations during sampling program.

The criteria and indicators will be refined during the EA as necessary.

4.0 DETAILED WORKPLAN

4.1 Step 1: Characterize Existing Environmental Conditions

This section presents an overview of existing environmental conditions for the surface water component on and in the area of the W12A Landfill. As described in the *MECP Code*

of Practice (MOECC, 2014a), the City of London will present a more detailed description of the environmental conditions in the EA Report. The following is an overview of existing conditions.

4.1.1 Overview of Existing Conditions (Existing Documentation)

W12A Landfill is situated on the boundary between two subwatershed areas, Dingman Creek and Dodd Creek. Dingman Creek is a tributary of the Thames River (Lake St. Clair Basin) watershed and Dodd Creek is part of the Kettle Creek (Lake Erie Basin) watershed. The majority of the landfill property falls within the Dodd Creek watershed and a small northerly portion of the landfill falls within the Dingman Creek watershed. The watershed divide and other surface water features are shown on Figure 4.1-1.

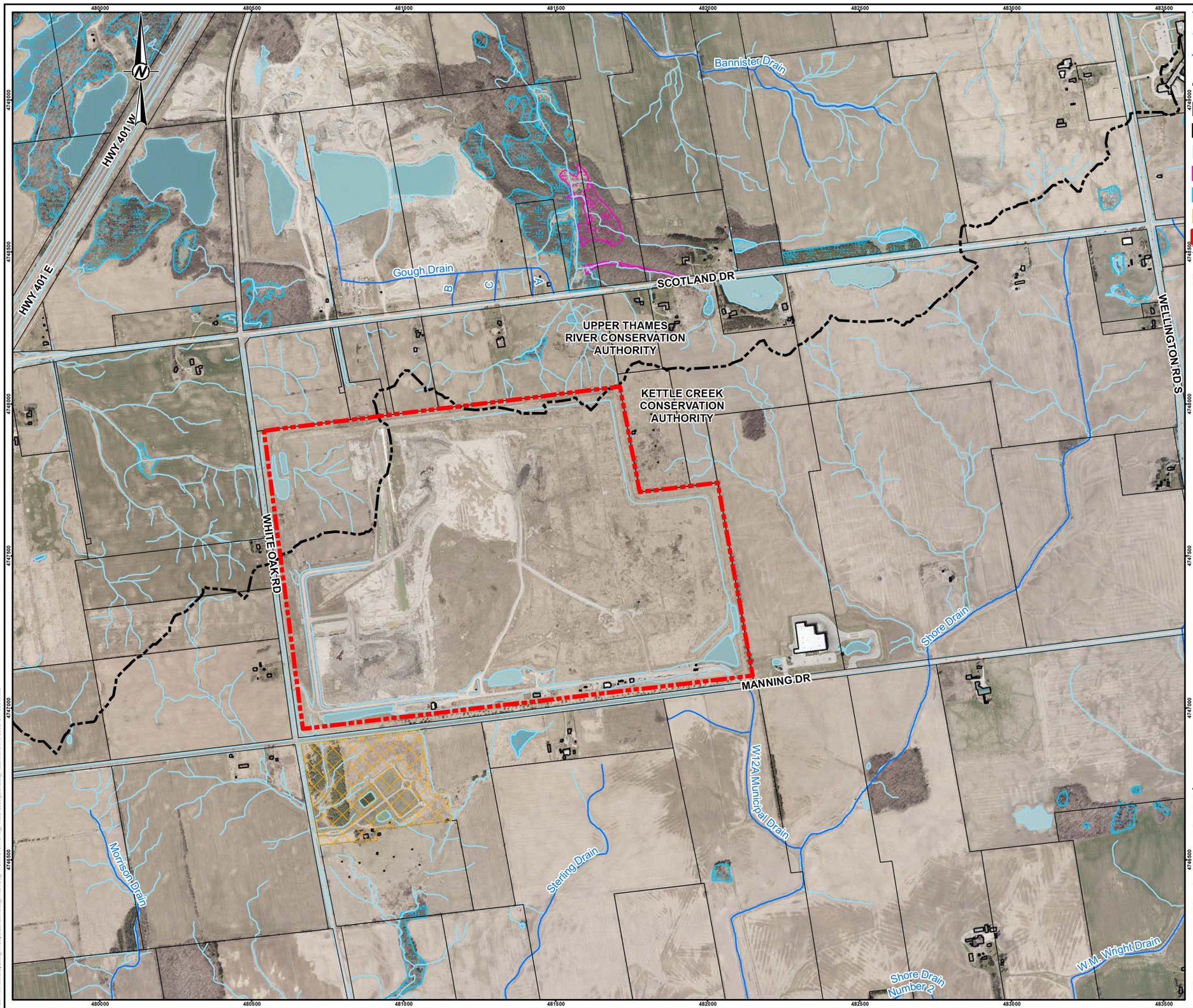
Three surface water features crossing Manning Drive convey runoff from the W12A Landfill property to downstream receiving water systems within the Dodd Creek watershed and one additional surface water feature crossing White Oak Road conveys runoff from the site to a tributary of Dingman Creek. All four tributaries are documented as being seasonally dry, intermittent watercourses with a majority of flow generated as a result of direct runoff during precipitation events.

The on-site drainage network is divided into four general areas with a system of berms, slopes and perimeter drainage ditches directing runoff generated within the W12A Landfill property envelope to four separate stormwater management ponds. Stormwater management ponds 2/3, 4 and 5 are located along the south side of the site and service approximately 130 ha of drainage area within the site. Stormwater management pond 1 is located at the northwest corner of the site and services approximately 15 ha of drainage area that falls within the Dingman Creek watershed area. All stormwater management ponds have been designed to provide stormwater quality and quantity control of surface water runoff leaving the W12A Landfill property, as per the requirements outlined by MECP and design criteria published in relevant Subwatershed Studies. The ponds have been designed, or have been retrofitted, to function as standard extended detention wet ponds with over-control of frequent rainfall events to protect downstream features from ongoing erosion and degradation. Three ponds (1, 2/3 and 5) also incorporate sediment forebay areas to aid in settling of suspended solids and improve ease of regularly scheduled maintenance.

Surface water quality is regularly monitored as part of an existing leachate collection system and stormwater management discharge monitoring program. Sampling from all stormwater management ponds is undertaken three times per year after significant rainfall events. Water quality monitoring samples are regularly compared to baseline samples, MECP water quality targets and the specific Provincial Water Quality Objectives included in the Dingman and Dodd Creek Subwatershed Reports or Conservation Authority Subwatershed report cards.

4.1.2 Additional Studies/Investigations

Characterization of the existing environmental conditions will include a comprehensive field investigation, which will focus on confirming overland flow routes, drainage boundaries and outlet locations of all surface water features.



LEGEND

- WATERCOURSE
- CONSTRUCTED DRAINAGE
- CONSERVATION AUTHORITY BOUNDARY (WATERSHED DIVIDE)
- PROPERTY FABRIC
- BUILDING FOOTPRINT
- WATERBODY
- LOCALLY SIGNIFICANT WETLAND
- UNEVALUATED WETLAND
- CEMETERY
- EXISTING W12A LANDFILL SITE BOUNDARY

REFERENCE(S)

1. DATA PROVIDED BY THE CITY OF LONDON.
2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: UTM ZONE 17 VERTICAL DATUM: CGVD28

0 125 250 500

1:12,500 METRES

CLIENT
CORPORATION OF THE CITY OF LONDON

PROJECT
SURFACE WATER WORK PLAN ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION

TITLE
OVERVIEW OF EXISTING ENVIRONMENTAL CONDITIONS

CONSULTANT

GOLDER

YYYY-MM-DD	2019-08-20
DESIGNED	----
PREPARED	JEM
REVIEWED	TG
APPROVED	PAS

PROJECT NO.	CONTROL	REV.	FIGURE
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An updated inventory of existing hydraulic structures, including the location, size, material and condition of drainage infrastructure, will be assembled through a field reconnaissance, measurements and GPS data gathering techniques. The characterization will also focus on the physical condition of the receiving water systems, noting changes to stream morphology and bank stability compared to conditions recorded in 2005.

Included in the existing conditions characterization will be an update of water quality and quantity parameters. The assessment will be undertaken to provide information that will be used to determine potential for impacts on water quality indicator parameters such as temperature, suspended sediment and nutrients and potential for impacts on site hydrology such as changes to downstream flooding levels, the timing and duration of peak flows, changes to the quantity of base flow and streambank erosion potential as a result of the proposed landfill expansion. The surface water quality and quantity assessment will be undertaken utilizing the City of London's surface water monitoring/sampling data and previously developed hydrologic modeling of the W12A site. Based on review of the existing information, an assessment will be made of the need to obtain additional water quantity and quality information to supplement the available information. If it is found that additional information is required, it will be obtained during the field program as part of Step 1.

Benthic (macro) Invertebrate surveys are being completed as part of the Biology assessment and the results will be available for the Surface Water assessment. Benthic (macro) Invertebrate Surveys will be completed at four primary sites within the Site and Site-vicinity Study Area. Benthic monitoring will be conducted following protocols established by Dr. Bob Baily (University of Western Ontario, 2001) and involve transversesweeps or 'kicks' across suitable habitats (i.e., riffles). Sampling will be done during the period between early June to late September avoiding spring and fall spawning activity."

4.2 Step 2: Identify 'Alternative Methods' of Landfill Expansion

During the initial stage of the EA, a reasonable range of expansion alternatives will be identified and described at a sufficient level of detail (i.e., conceptual designs) so that potential effects of the expanded landfill on each environmental component can be assessedand compared.

This task will involve developing the conceptual site design for the proposed expansion of the W12A Landfill, to gain an additional 25 years of disposal capacity. This task will be completed by the Design and Operations Team.

4.3 Step 3: Qualitative Evaluation of 'Alternative Methods'

Based on the conceptual site design, and considering mitigation measures, potential impacts of the proposed W12A Landfill expansion on the surface water component will be assessed. The surface water component technical discipline lead will evaluate each 'Alternative Method' qualitatively including:

- Identify the differences that may impact changes in surface water quality such asexpansion area and potential impacts on the existing SWMS.
- Assess any limitations to expand or build new SWM ponds based on landfill expansion designs.
- Identify the differences that may impact changes in surface water quantity such asexpansion area, proposed side slopes of the landfill, proposed landfill cover alternatives, potential changes to watershed divides, and potential impacts on the existing SWMS.

In this step, each 'Alternative Method' of the W12A Landfill expansion will be examinedby the EA Team to determine if it would ultimately be approvable under the Environmental Protection Act (EPA).

This screening step is included to eliminate any alternative that would likely not be approvable. Should an alternative be found to not be approvable due to unacceptable net effects (i.e., no further refinement of mitigation is possible) or technical reasons, then the alternative would be eliminated from further consideration. At this point, the EA Management Team may consider additional 'Alternatives Methods' for the project that may have been identified by the public or other parties during the EA process.

4.4 Step 4: Compare the 'Alternative Methods' for Landfill Expansionand Identify the Preferred Alternative

When the alternatives have been finalized, a comparative evaluation of the 'Alternative Methods' will be completed. The comparative evaluations would include evaluating the relative importance or ranking of the assessment criteria (i.e., although all criteria are relevant, certain criteria may be considered more important than others[1]).

The surface water component technical discipline lead will complete the following tasks:

- Rank each 'Alternative Method' based on surface water quality differences.
- Rank each 'Alternative Method' based on surface water quantity differences.
- Describe advantages and disadvantages of each 'Alternative Method'

The comparison of 'Alternative Methods' will focus on the incremental impacts each alternative is expected to have on the peak flow, runoff volume and base flow characteristics at each surface water outlet associated with the W12A site compared to the 'existing conditions' hydrologic characteristics. The preferred alternative will be selected on the basis of the alternative's expected ability to mitigate changes in the hydrologic flow regime.

[1] The public has been asked during the consultation of the Terms of Reference and will be asked during consultation on the EA to provide input into the ranking of the relative importance of the components.

The EA Management Team will take each disciplines comparison and compile the overall comparison of 'Alternative Methods'.

4.5 Step 5: Refine Mitigation Measures and Determine Net Effects ofthe Preferred Alternative

In this task, the EA Team will identify linkages between the environmental components (i.e., direct or indirect effects of the proposed expansion on the surface water component via another component) and prepare diagrams. The purpose of linkage diagrams, prepared by the technical discipline leads, is to facilitate an integrated assessment of effects.

The prediction of future environmental effects associated with the preferred 'Alternative Method' (with conceptual design mitigation measures in place) will be determined by the surface water component technical discipline lead. Assessment of potential effects will be done using appropriate objectives, standards, policies and regulations. The remaining net effects, if any, will be documented.

The surface water assessment will include detailed hydrologic modeling of the proposed stormwater management system design for the preferred 'Alternative Method' for the purpose of addressing conveyance and management of storm water runoff, suspended solids removal, flood hazards, riparian flow and erosion considerations. The specific tasks required to complete the evaluation will consist of:

- Development of a hydrologic model of the site and surrounding area to a reasonable point downstream of the discharge points. The modeling exercise will be undertaken to determine a range of flows and runoff volumes generated by existing land use conditions, topographic mapping, surface cover and surface drainage features. This task will include the current configuration of the site stormwater management facilities in the hydrologic model.
- A hydrologic models that reflects the preferred landfill expansion alternative in terms of land use, cover, stormwater management design and drainage characteristics.

Using up to date local rainfall information, the hydrologic model will be used to simulate a series of single-event rainfall scenarios (i.e., 2, 5, 10, 25, 50 and 100-year return periods) and the Regional storm event to calculate peak flows and runoff volumes at each of the respective outlet locations leaving the W12A site. The modelling results will be used to assess the potential impacts on off-site surface water quality and quantity and, if required, to refine the proposed stormwater management system design to mitigate these potential impacts. Also, a qualitative comparison will be made between the predicted effects of the preferred alternative and the Do-Nothing alternative considering the indicators for the surface water component.

4.6 Step 6: Describe the Preferred 'Alternative Method' for Landfill Expansion

A description of the preferred landfill expansion alternative will be detailed following the identification of appropriate mitigation measures. In addition, a leachate management assessment will be completed that will include;

- the quantity of leachate generated from the preferred landfill expansion alternative will be predicted,
- the quality of the leachate associated with the expansion and requiring treatment will be assessed,
- a high level assessment of the capability of the existing forcemain to continue to convey the collected leachate to the municipal sewer system will be completed; and,
- a high level assessment of the capability of the Greenway Wastewater Treatment Plant to continue to treat the leachate will be carried out.

The results will be provided in the EA study report (Task 9).

4.7 Step 7: Consideration of Climate Change

The potential effects of climate change on infrastructure associated with the site, as well as ways that the project could reduce greenhouse gas (GHG) emissions or remove GHG from the atmosphere will be considered by the air quality, surface water and geology and hydrogeology component technical discipline leads.

The manner in which climate change has the greatest potential to affect this project is in terms of changes (increases) in precipitation events and associated effects on the performance of the site's SWMS. It is proposed to conceptually design the SWMS for each of the landfill expansion alternatives in compliance with O. Reg. 232/98, which requires their SWMSs to be designed for the 100 year storm event. The City has developed a Climate Change resiliency strategy for use in assessing and designing municipal infrastructure, in particular those components of infrastructure related to flood control and management of storm runoff. For the preferred landfill expansion alternative, it is then proposed to conduct a sensitivity analysis in accordance with the City's resiliency strategy,to assess the performance of the stormwater management system under the 250-year storm event. Depending on the findings of the analysis, the preferred landfill expansion alternative's stormwater management design may then be modified accordingly and will take into consideration the impacts of climate change. Alternatively, if the SWMS design can be easily adapted in future and/or the potential effects of climate change can be acceptably mitigated, then the design may be left as per the O. Reg. 232/98 requirements.

4.8 Step 8: Cumulative Impact Assessment

a) The EA Team will work to identify the predicted effects of other existing or known proposed projects in the area of the site. The surface water component technical discipline lead will consider any identified effects together with those predicted for the preferred 'Alternative Method' to determine if there are any unacceptable predicted cumulative effects.

4.9 Step 9: Preparation of EA Study Report

In support of the completion of this task the surface water component technical discipline lead will carry out the following tasks:

- document the assessment results in a Surface Water Supporting Document that will form an appendix to the EA submission;
- participate in meetings with the GRT including upfront consultations with the MECP during the EA to obtain pre-approval of tasks in the work plan, as required;
- support consultation events as required in development of presentation material and/or being at the event; and,
- provide technical support during the review of the draft EA by the regulatory agencies and public.

B.04 Biology Work Plan

October 23, 2019

BIOLOGY WORK PLAN

Environmental Assessment of the Proposed W12A Landfill Expansion, City of London

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Table of Contents

page

1. Introduction 1

2. Assessment Framework 2

2.1 Overall Approach 2
2.2 Project Team Organization 2
2.3 Study Areas 3

3. Assessment Criteria and Indicators 5

4. Detailed Work Plan 7

4.1 Step 1: Characterize Existing Environmental Conditions 7
4.1.1 Overview of Existing Conditions (Existing Documentation) 7
4.1.2 Additional Studies/Investigations 8
4.2 Step 2: Identify 'Alternative Methods' of Landfill Expansion 12
4.2.1 Species at Risk 12
4.3 Step 3: Qualitative Evaluation of 'Alternative Methods' 13
4.4 Step 4: Compare the 'Alternative Methods' for Landfill Expansion and Identify the Preferred Alternative 14
4.5 Step 5: Refine Mitigation Measures and Determine Net Effects of the Preferred Alternative 14
4.6 Step 6: Describe the Preferred 'Alternative Method' for Landfill Expansion 15
4.7 Step 7: Consideration of Climate Change 15
4.8 Step 8: Cumulative Impact Assessment 15
4.9 Step 9: Preparation of Environmental Assessment Study Report 16

List of Figures

Figure 2-1: Study Area 4

List of Tables

Table 1-1: Project Commitments from Terms of Reference Relevant to Work Plan Development 1
Table 2-1: Proposed Preliminary Study Areas for the Biology Component 3
Table 3-1: Component Rationale and Indicators for the Environmental Assessment 5

Appendices

Appendix A. References

1. Introduction

This document presents the proposed detailed work plan for the Biology Component of the Environmental Assessment for the proposed W12A Landfill expansion (project) in London, Ontario. The work plan is being submitted for approval to the Ministry of Environment, Conservation and Parks and the Ministry of Natural Resources and Forestry.

This work plan has been developed with consideration of the commitments made for the project within the development of the Terms of Reference. The relevant commitments are provided below in **Table 1-1**.

Table 1-1: Project Commitments from Terms of Reference Relevant to Work Plan Development

ID	Commitment
5	Where described in the Terms of Reference for the environmental Components, detailed work plans for the technical studies will be prepared and provided to the appropriate GRT* agency for review and concurrence.
6	The City will share work plans with Indigenous Communities and post work plans on the project website.
10	During the Environmental Assessment, the preliminary criteria and indicators for each of the environmental Components will be refined and described in the Environmental Assessment study report.
11	The preliminary Study Areas will be reviewed and confirmed during the Environmental Assessment and described in the Environmental Assessment study report.
12	A more detailed description of the environmental conditions will be prepared during the Environmental Assessment to reflect the confirmed Study Areas using a combination of sources of existing information and site-specific investigations and studies and provided in the Environmental Assessment study report.

Note: * Government Review Team (GRT)

2. Assessment Framework

2.1 Overall Approach

It is proposed that the Environmental Assessment work will be undertaken in a series of nine steps (further details are provided in Section 4) as follows:

- Step 1 – Characterize existing environmental conditions;
- Step 2 – Identify the 'Alternative Methods' of landfill expansion;
- Step 3 – Qualitative evaluation of 'Alternative Methods';
- Step 4 – Compare the 'Alternative Methods' for landfill expansion and identify the preferred alternative;
- Step 5 – Refine the mitigation measures and determine the net effects of the preferred alternative;
- Step 6 – Describe the preferred 'Alternative Method';
- Step 7 – Consideration of climate change;
- Step 8 – Cumulative impact assessment; and
- Step 9 – Preparation of the Environmental Assessment Study Report.

Consultation with the public, Indigenous Communities, GRT members, City of London Advisory Committees, and other stakeholders will be ongoing throughout the Environmental Assessment process.

2.2 Project Team Organization

The project tasks will be organized to be completed by the following teams:

- The Environmental Assessment Management Team consists of the project director, project manager and project co-ordinator for the Environmental Assessment;
- The Design and Operations (D&O) Team consists of landfill design technical staff and AutoCAD technicians; and
- The Environmental Assessment Team consists of technical discipline leads for each of the specified environmental Components.

2.3 Study Areas

Data for the Environmental Assessment will be collected and analyzed for preliminary generic study areas presented in the Terms of Reference. These will be confirmed and may be refined during the Environmental Assessment. These preliminary generic study areas are as follows:

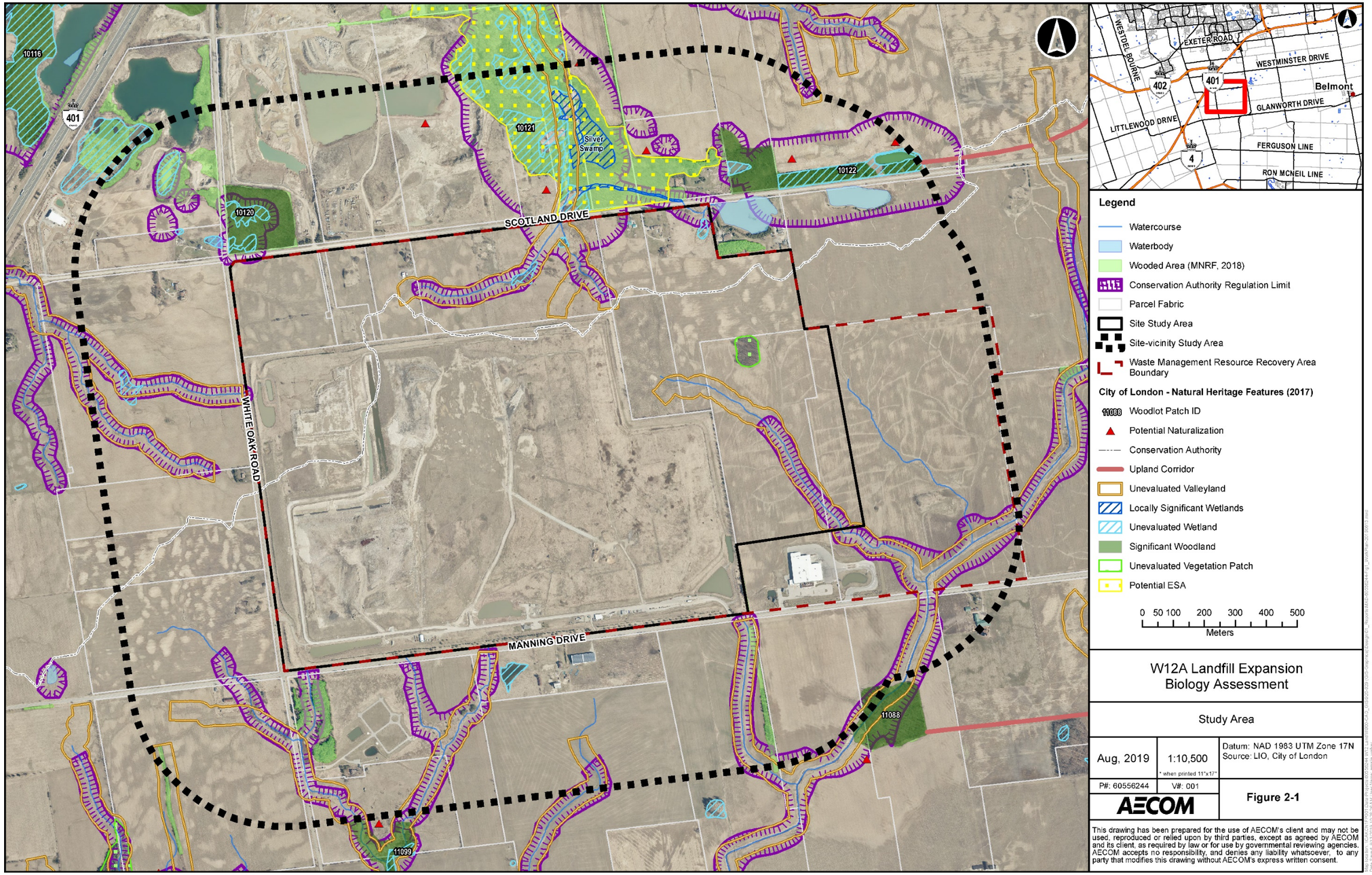
- **Site Study Area** – The existing W12A Landfill Site, located at 3502 Manning Drive and adjacent lands where landfill expansion may occur.
- **Site-vicinity Study Area** – The lands in the area immediately adjacent to the Site Study Area that have the potential to be directly affected by the landfill expansion and activities with the Site Study Area. The extent of the Site-vicinity Study Area will be determined for each of the environmental Components. For most environmental Components, a Site-vicinity Study Area of 500 metres from the Site Study Area is appropriate.
- **Wider Study Area** – An area that takes on the broader community generally beyond the immediate site vicinity and for specific environmental Components may include the entire Municipality.

The proposed preliminary study area for the Biology Component is presented in **Table 2-1**.

Table 2-1: Proposed Preliminary Study Areas for the Biology Component

Environmental Component	Preliminary Area(s) to be Studied	Rationale
Biology	Site and Site-vicinity	Potential effects on biological resources are expected to be limited to 500 m from the Site Study Area.

Figure 2-1: Study Area



3. Assessment Criteria and Indicators

The Biology Component will be assessed for the potential effects of the undertaking based on two criteria as follows.

The rationale, indicators and data sources for the proposed assessment sub-Components are provided in the Terms of Reference and are presented in **Table 3-1** below.

Table 3-1: Component Rationale and Indicators for the Environmental Assessment

Sub-Component	Rationale	Indicator(s)	Data Sources
Aquatic ecosystems	Landfill expansion could remove or disturb the functioning of natural aquatic habitats and species, including rare, threatened or endangered species.	▪ Expected change in surface water quality on-site and within the site-vicinity. ▪ Expected impact on aquatic habitat and biota, including rare, threatened or endangered species within on-site and within the site-vicinity.	▪ W12A Landfill Area Plan Study – Ecological Background Study and Natural Heritage Study (Earth Tech, 2005). ▪ Middlesex Natural Heritage Systems Study (Middlesex County, 2014). ▪ The London Plan (2016) ▪ City of London Inventory and Evaluation of Woodlands (North-South Environmental Inc. (2009). ▪ Dingman Creek Subwatershed Study (Aquafor Beech et.al., 1995) and Dingman Creek Subwatershed Study Update (Delcan, 2005). ▪ Dingman Creek Watershed Report Card (2012). ▪ Dodd Creek Subwatershed Strategy (Wilcox Betsy, 2005). ▪ Department of Fisheries and Oceans (DFO) Drain Classification and Fish Habitat Data from the Upper Thames River Conservation Authority (UTRCA) and Kettle Creek Conservation Authority (KCCA). ▪ Land Information Ontario (LIO). ▪ Ministry of Natural Resources and Forestry Species at Risk List. ▪ Natural Heritage Information Centre. ▪ DFO Drain Classification and Fish Habitat Data from the UTRCA and KCCA. ▪ Aquatic habitat and Benthic Water Quality ▪ Species at Risk screening & habitat assessment

Sub-Component	Rationale	Indicator(s)	Data Sources
Terrestrial ecosystems	Landfill expansion could remove or disturb the functioning of natural terrestrial habitats and vegetation, including rare, threatened or endangered species.	Expected impact on terrestrial vegetation communities, wildlife habitat, and wildlife, including rare, threatened or endangered species on-site and within the site-vicinity.	▪ W12A Landfill Area Plan Study – Ecological Background Study and Natural Heritage Study (Earth Tech, 2005). ▪ Middlesex Natural Heritage Systems Study (Middlesex County, 2014). ▪ The London Plan (2016). ▪ City of London Inventory and Evaluation of Woodlands (North-South Environmental Inc., 2009). ▪ Dingman Creek Subwatershed Study (Aquafor Beech et. al., 1995) and Dingman Creek Subwatershed Study Update (Delcan, 2005). ▪ Dingman Creek Watershed Report Card (2012). ▪ Dodd Creek Subwatershed Strategy (Wilcox Betsy, 2005). ▪ DFO Drain Classification and Fish Habitat Data from the UTRCA and KCCA. ▪ Land Information Ontario (LIO). ▪ Ministry of Natural Resources and Forestry Ontario Species at Risk List. ▪ Natural Heritage Ontario Reptile and Amphibian Atlas. ▪ Ontario Breeding Bird Atlas. ▪ Ontario Butterfly Atlas. ▪ Terrestrial and wetland vegetation community investigations, breeding birds surveys, herpetofauna (amphibians and salamanders) surveys, bat habitat surveys, snake cover board and area searches, lepidoptera and odonata (butterfly, dragonfly and damselfly) surveys and wildlife habitat surveys ▪ Complete Species at Risk screening & habitat assessment

The criteria and indicators will be refined during the Environmental Assessment as necessary.

4. Detailed Work Plan

4.1 Step 1: Characterize Existing Environmental Conditions

This section presents an overview of existing environmental conditions for the Biology Component on and in the area of the W12A Landfill based on existing documentation. As described in the Ministry of the Environment, Conservation and Parks *Code of Practice* (Ministry of Environment and Climate Control, 2014a), the City of London will complete additional studies/investigations to present a more detailed description of the environmental conditions in the Environmental Assessment Report.

4.1.1 Overview of Existing Conditions (Existing Documentation)

The Biology Component of this study is comprised of terrestrial, wetland and aquatic ecosystems.

Natural vegetation in the Middlesex region consists primarily of deciduous forest communities (Middlesex County, 2014) including Dry-fresh Deciduous Forest, Fresh-moist Sugar Maple Deciduous Forest and Fresh-moist Poplar-sassafras Deciduous Forest (North-South Environmental Inc., 2009).

Clay to silt textured soils are the predominant type in the Dingman Creek Subwatershed (Delcan, 2005) and areas of imperfect to poor drainage may contribute to the presence of wetlands in the general area. Several man-made or managed drains are also present. Unevaluated woodlands, unevaluated wetlands and a potential Environmentally Significant Area are located in the Site-vicinity Study Area, as well as some successional meadows and thickets.

Previous investigations identified several vegetation community types within the general area of the landfill site, including cultural, forest, marsh, open aquatic and swamp communities.

The primary terrestrial features found within the general area of the W12A Landfill as shown on **Figure 2-1** include:

- A potential Environmentally Significant Area on the north side of Scotland Drive (vegetation patch #10121)
- Significant Woodlands north of Scotland Drive (vegetation patches #10120 and #10122)
- Significant woodland south of Manning Drive (vegetation patch #11068)
- Unevaluated wetlands north of Scotland Drive
- Locally Significant Wetland north of Scotland Drive (Silver Swamp)

The primary aquatic features identified in the area include the Shore Drain, Sterling Drain, Bannister Johnson Drain and C.B. Smith Drain. Most of these watercourses have been altered (e.g., channelized) to facilitate drainage for surrounding land use.

Fish habitat has been identified as either Type 2 (generally important but not critical) or Type 3 (marginal/severely degraded). Fish species previously observed were ranked globally as G5 and provincially as S5 (in each case meaning very common and abundant). The benthic macroinvertebrate community is considered of poor quality and is indicative of shallow, eutrophic aquatic habitat.

Previous studies have identified several species of mammals, birds, amphibians and reptiles in the region. The background review has identified known records of several plant, bird, snake, and mammal Species at Risk and Species of Conservation Concern, and potential Significant Wildlife Habitat including features supporting bat maternity colonies, amphibian breeding, and habitat for Species of Conservation Concern. To determine the presence/absence of any significant species or features within the study areas, site-specific field investigations will be required.

A Biology Assessment (*W12A Landfill Area Plan Study – Ecological Background Study and Natural Heritage Study*) was undertaken in 2005 to fully describe the conditions that existed within the Site and Site-vicinity Study Area. Although a significant amount of field work was completed within the Site and Site-vicinity Study Area, the information is considered dated and requires updating. In addition, previous studies did not include habitat assessments and surveys for Species at Risk.

4.1.2 Additional Studies/Investigations

This work consists of a three season inventory of the natural heritage features within the Site and Site-vicinity Study Area and will follow City of London data collection guidelines as per the City of London Environmental Management Guidelines (2007).

Species at Risk Screening

To determine the potential for Species at Risk within the study area, a habitat screening will first be conducted whereby an Ecologist will review available background documents such as Ministry of Natural Resources and Forestry's online database, Amphibian and Reptiles Atlas, the Ontario Breeding Bird Atlas, Agency correspondence, etc. to create a complete list of potential Species at Risk within the area. The listed species habitat preferences will then be compared to habitat characteristics to determine if the Site and Site-vicinity study areas may potentially contain preferred habitat for the potential Species at Risk.

Aquatic Ecosystems Studies/Investigations

Aquatic habitat and benthic (macro) invertebrate studies will be required to further the understanding of existing conditions of the aquatic ecosystems. All of the studies described below were completed in 2018.

Aquatic Habitat Assessments

Aquatic biologists will conduct aquatic habitat assessments of the four watercourses within the Site-vicinity Study Area where property is access allowed. Investigations include the determination of drainage patterns and determination of the status of watercourses. Data collection includes:

- Channel type (natural or channelized)
- Channel morphology (width, depth)
- Flow characteristics
- Substrates
- Instream cover
- Specialized habitat present
- Bank and riparian community characteristics
- Valley form characteristics

Benthic (macro) Invertebrate Surveys

Benthic monitoring will be conducted using the BioMap Protocol which uses two quantitative samples and one qualitative sample. The quantitative samples each cover an area of 0.05 m^2 and the qualitative sample is a kick and sweep method covering all areas and substrate characteristics of the waterway. Samples will be identified to a set taxonomic level; mainly genus and species level. The BioMap protocol measures anthropogenic change as well as a set of metrics such as Family Biotic Index, Simpsons Diversity, Percent EPT etc.

Surveys are to be completed at four primary sites within the Site and Site-vicinity Study Areas. Sampling will be done during the period between early June to late September avoiding spring and fall spawning activity.

Terrestrial Ecosystem Studies/Investigations

Terrestrial and wetland vegetation community investigations, breeding birds surveys, herpetofauna (amphibians and salamanders) surveys, bat habitat surveys, snake cover board and area searches, lepidoptera and odonata (butterfly, dragonfly and damselfly)

surveys and wildlife habitat surveys will be completed to further the understanding of existing conditions of the terrestrial ecosystems.

Ecological Land Classification Confirmation & Floral Inventory

Vegetation communities will be delineated and assessed according to the protocols outlined in the Ecological Land Classification system for Southern Ontario (Lee et al., 1998) to Vegetation Community Type where possible. A three-season plant inventory will be completed to ensure that spring ephemerals and seasonally significant species are documented. Vegetation communities will be mapped and used to further refine the results of the Species at Risk and Significant Wildlife Habitat screening exercises.

Wetland Community Boundary Delineation

Where wetland communities are observed, wetland community boundaries and descriptions will be documented following protocols outlined in the Ontario Ministry of Natural Resources Ontario Wetland Evaluation System for Southern Ontario (Ministry of Natural Resources and Forestry, 2014).

Breeding Bird Surveys

Breeding bird surveys should typically be conducted over a minimum of two site visits during peak calling season and peak calling hours. However, given the identification of grassland bird Species at Risk species during the preliminary Species at Risk Screening, and the presence of candidate habitat, three rounds of surveys are required to satisfy survey requirements for Species at Risk grassland birds (i.e., Bobolink and Eastern Meadowlark). For the majority of Ontario's breeding birds this occurs between a half-hour before sunrise to approximately 10:00 a.m. from May 24th to July 10th. Birds observed exhibiting various breeding behaviours in suitable habitat on or adjacent to the Site-vicinity Study Area will be recorded. Incidental observations of other wildlife, including amphibians and mammals, will also be recorded on each field visit.

Herpetofauna Surveys

To survey for the presence of breeding amphibians and salamanders, daytime site visits will be conducted to examine the suitability of vegetation communities present within the Site and Site-vicinity Study Area for the presence of vernal pools. The following parameters will be used to identify potential viable vernal pools:

- Small, isolated pools (lacking the presence of fish populations);
- The potential to hold water at least until July;

- Have water depths of at least 30 cm in early spring to be considered suitable amphibian breeding habitat. The 30 cm depth criterion is consistent with the recommendations of Calhoun and deMaynadier (2004);
- Good surrounding upland forested habitat;
- Each viable vernal pool would be mapped and marked using Global Positioning System, as the identified pools will serve as the amphibian/salamander survey stations; and
- Water depth, classification of surrounding vegetation, in-water characteristics (i.e., % vegetation vs % open water), evidence of breeding amphibians (egg masses) would be recorded.

Following the identification of viable vernal pools, the following additional amphibian and salamander surveys will be conducted:

- Auditory Amphibian Surveys following the protocols as outlined in the Marsh Monitoring Protocol, the standardized field methodology for audio-surveying breeding frogs and toads. Amphibian surveys will be completed at each of the pre-determined survey stations established during the amphibian/salamander habitat surveys.
- Visual Amphibian/Salamander surveys will be conducted within suitable habitat identified during the vernal pool surveys. Area searches were conducted in conjunction with other surveys completed for the Site and Site-vicinity Study Area.

Bat Habitat Suitability Assessment

To survey for the presence of bat habitat, a bat habitat suitability assessment will be completed within the Site and Site-vicinity Study Area during the leaf-off and leaf-on period. This assessment will be conducted within identified Ecological Land Classification areas of candidate habitat (i.e., CUW, FOD, FOM, FOC, SWD, SWM and SWC) following the Ministry of Natural Resources and Forestry Survey Protocol for Species at Risk within Treed Habitats – Little Brown, Northern Myotis, and Tri-Colored Bat (April 2017).

Snake Cover Board and Area Searches

To survey for the presence of snakes and identify candidate habitat within the Site Area, a combination of cover board surveys and area searches will be completed. These surveys will be completed during daytime bat habitat assessments, Ecological Land Classification investigations, as well as breeding bird surveys. Five daytime searches

will be conducted, to survey potential habitat including hibernacula (rock or debris piles) and installed cover boards.

Lepidoptera and Odonata Surveys

Butterfly, dragonfly and damselfly surveys will be conducted in conjunction with Ecological Land Classification and Significant Wildlife Habitat surveys within the study area. These will be conducted by walking the entire Site and Site-vicinity Study Areas capturing and identifying species as they are seen. Once identified, the species will be released.

Significant Wildlife Habitat Surveys

A Significant Wildlife Habitat screening exercise will be conducted using the Wildlife Habitat Ecoregion Criteria Schedule 7E (OMNR 2015) to determine the presence of Candidate Significant Wildlife Habitat within the Site and Site-vicinity Study Areas. The presence of candidate habitat for all five Significant Wildlife Habitat categories will be determined by comparing existing conditions, based on Ecological Land Classification site investigations, to criterion listed within the 7E schedule.

4.2 Step 2: Identify 'Alternative Methods' of Landfill Expansion

During the initial stage of the Environmental Assessment, a reasonable range of expansion alternatives will be identified and described at a sufficient level of detail (i.e., conceptual designs) so that potential effects of the expanded landfill on each environmental Component can be assessed and compared.

This task will involve developing the conceptual site design for the proposed expansion of the W12A Landfill, to gain an additional 25 years of disposal capacity. This task will be completed by the Design and Operations Team.

4.2.1 Species at Risk

Alternatives will be considered in the context of the *Endangered Species Act* and Species at Risk with the intention to avoid impacts to Species at Risk through location of alternatives, methods of carrying out the alternatives, avoiding sensitive timelines for species, or other methods that avoid adverse effects on protected species or habitat. Where avoidance is not possible, early consideration of the Ministry of Environment, Conservation and Parks Avoidance Alternatives Form and its associated guide is recommended for activities that may require an overall benefit permit under clause 17(2)(c) of the act.

4.3 Step 3: Qualitative Evaluation of 'Alternative Methods'

Based on the conceptual site design, and considering mitigation measures, potential impacts of the proposed W12A Landfill expansion on the Biology Component will be assessed. The Biology Component technical discipline lead will evaluate each 'Alternative Method' qualitatively and quantitatively including:

- Identify differences in potential impacts to watercourses.
  - temperature,
  - sedimentation,
  - fish habitat: quality of fish habitat lost or affected; and area of fish habitat lost or affect ted
- Identify differences in the 'Alternative Methods' that will impact terrestrial features (removal of habitat, harm or harassment of species, sedimentation, dust, spills and potential contamination).
  - Woodlands: area of woodland lost or affected,
  - Significant Wildlife Habitat: area of habitat lost or affected ,
  - Species at Risk and their habitat: area of habitat lost or affected, and number of habitat features damaged or destroyed,
  - unevaluated wetlands: area of wetland lost or affected,
  - potential Environmentally Significant Area north of Scotland Drive,
  - locally significant wetland (Silver Swamp).

In this step, each 'Alternative Method' of the W12A Landfill expansion will be examined by the Environmental Assessment Team to determine if it would ultimately be approvable under the Environmental Protection Act.

This screening step is included to eliminate any alternative that would likely not be approvable. Should an alternative be found to not be approvable due to unacceptable net effects (i.e., no further refinement of mitigation is possible) or technical reasons, then the alternative would be eliminated from further consideration. At this point, the Environmental Assessment Management Team may consider additional 'Alternatives Methods' for the project that may have been identified by the public or other parties during the Environmental Assessment process.

4.4 Step 4: Compare the 'Alternative Methods' for Landfill Expansion and Identify the Preferred Alternative

A comparative evaluation of the 'Alternative Methods' will be completed and would consist of evaluating the relative importance or ranking of the assessment criteria (i.e., although all criteria are relevant, certain criteria may be considered more important than others[1]).

The Biology Component technical discipline lead will complete the following tasks:

- Rank each 'Alternative Method' based on aquatic ecosystem differences.
- Rank each 'Alternative Method' based on terrestrial ecosystem differences.
- Describe advantages and disadvantages of each 'Alternative Method'

The Environmental Assessment Management Team will take each discipline's comparison and compile the overall comparison of 'Alternative Methods'.

4.5 Step 5: Refine Mitigation Measures and Determine Net Effects of the Preferred Alternative

In this task, the Environmental Assessment Team will identify linkages between the environmental Components (i.e., direct or indirect effects of the proposed expansion on the Biology Component via another Component) and prepare diagrams. The purpose of linkage diagrams, prepared by the technical discipline leads, is to facilitate an integrated assessment of effects.

The prediction of future environmental effects associated with the preferred 'Alternative Method' (with conceptual design mitigation measures and beneficial actions in place) will be determined by the Biology Component technical discipline lead. Assessment of potential effects will be done using appropriate objectives, standards, policies and regulations. The remaining net effects, if any, will be documented.

Also, a qualitative comparison will be made between the predicted effects of the preferred alternative and the Do-Nothing alternative considering the indicators for the Biology Component.

1. The public has been asked during the consultation on the Terms of Reference and will be asked during consultation on the EA to provide input into the ranking of the relative importance of the Components.

4.6 Step 6: Describe the Preferred 'Alternative Method' for Landfill Expansion

A description of the preferred landfill expansion alternative will be detailed following the identification of appropriate mitigation measures. In addition, a leachate management assessment will be completed that will include;

- the quantity of leachate generated from the preferred landfill expansion alternative will be predicted,
- the quality of the leachate associated with the expansion and requiring treatment will be assessed,
- a high level assessment of the capability of the existing forcemain to continue to convey the collected leachate to the municipal sewer system will be completed; and,
- a high level assessment of the capability of the Greenway Wastewater Treatment Plant to continue to treat the leachate will be carried out.

The results will be provided in the Environmental Assessment study report (Task 9).

4.7 Step 7: Consideration of Climate Change

The potential effects of climate change on infrastructure associated with the site, as well as ways that the project could reduce greenhouse gas emissions or remove greenhouse gas from the atmosphere will be considered by the air quality, surface water and geology and hydrogeology Component technical discipline leads.

4.8 Step 8: Cumulative Impact Assessment

The Environmental Assessment Team will work to identify the predicted effects of other existing or known proposed projects in the area of the site. The Biology Component technical discipline lead will consider any identified effects together with those predicted during the comparative evaluation of 'Alternative Methods" to determine if there are any unacceptable predicted cumulative effects.

4.9 Step 9: Preparation of Environmental Assessment Study Report

In support of the completion of this task, the Biology Component technical discipline lead will carry out the following tasks:

- document the assessment results in a Biology Supporting Document that will form an appendix to the Environmental Assessment submission,
- participate in meetings with the GRT including upfront consultations with the Ministry of Natural Resources and Forestry during the Environmental Assessment to obtain pre-approval of tasks in the work plan, as required,
- support consultation events as required in development of presentation material and/or being at the event; and,
- provide technical support during the review of the draft Environmental Assessment by the regulatory agencies and public.

Appendix A – References

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APPENDIX C

2019 Updated Residual Waste Projections and Landfill Capacity Assessment

Environmental Assessment of the Proposed W12A Landfill Expansion

2019 Updated Residual Waste Projections & Landfill Capacity Assessment

Prepared by

City of London
300 Dufferin Avenue
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N6A 4L9

September 2021

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Table of Contents

Executive Summary ..... **v**

1.0 Introduction **1**

1.1 Rationale for Report Update 1

1.2 Development of Waste Quantity Projections 1

2.0 Background **3**

2.1 W12A Landfill Service Area 3

2.2 Strategy for a Waste-Free Ontario 6

2.3 Waste Diversion 7

2.4 Population Projections 12

3.0 Residual Waste from Existing Service Area **14**

3.1 General 14

3.2 Residential 16

3.3 Industrial, Commercial and Institutional (IC&I) Waste 19

3.4 Construction, Renovation and Demolition (CR&D) Waste 21

3.5 Sewage Sludge Ash 23

3.6 Biosolids 24

3.7 Street Sweepings/Road Works 25

3.8 Other Municipal Operations 26

3.9 Water Treatment Plant Process Residuals 27

3.10 Contaminated Soil 29

3.11 Residual Waste Quantity Projections from Existing Service Area 29

4.0 Residual Waste from Regional Service Area **31**

4.1 Potential to Export 31

4.2 Residual Waste Quantities 32

5.0 Landfill Capacity Assessment **39**

List of Tables

Table 1 – ToR Commitments 1
Table 2 – Provincial Waste Diversion Goals and Actual Rate 7
Table 3 – Existing Single Family Dwelling Organics Diversion 8
Table 4 – Projected Single Family Dwelling Organics Diversion after Implementation City's 60% Waste Diversion Action Plan 8
Table 5 – Waste Diversion in Municipalities with Green Bin Programs 9
Table 6 – IC&I Waste Diversion Rates 10
Table 7 – Population Projections 13
Table 8 – Waste Types 14
Table 9 – Residential Waste Assumptions 19
Table 10 – IC&I Waste Assumptions 20
Table 11 – Average Residual Waste CR&D Quantities from 2014 to 2018 21
Table 12 – CR&D Waste Assumptions 22
Table 13 – Sewage Sludge Ash Waste Assumptions 24
Table 14 – Biosolids Waste Assumptions 25
Table 15 – Street Sweepings/Road Works Waste Assumptions 26
Table 16 – Other Municipal Operations Waste Assumptions 27
Table 17 – Water Treatment Plant Waste Assumptions 28
Table 18 – Contaminated Soil Assumptions 29
Table 19 – Summary of Waste Generation and Diversion Rates 30
Table 20 - Residual Waste Generation Projections (Weight) 30
Table 21 – Residential Residual Waste Quantities by Municipality 35
Table 22 – Remaining Site Life of Landfills in Study Area 37
Table 23 – Waste Diversion Rate Scenarios 38
Table 24 – Summary of Residual Waste for Various Waste Diversion Scenarios 38

List of Figures

Figure 1 – 2018 Residual Waste 2
Figure 2 – Existing Service Area 4
Figure 3 – Proposed Service Area for Solid Non-Hazardous Waste 5
Figure 4 – 2018 Current Composition of Residual Waste by Waste Type 15
Figure 5 – 2018 Putrescible versus Non-putrescible Residual Waste 15
Figure 6 – 2018 City Controlled Residual Waste 16
Figure 7 – Composition of Residential Garbage (Single Family Homes) 17
Figure 8 – Composition of Residential Garbage (Multi-Residential Homes) 18
Figure 9 – CR&D Recycling Process Residuals 22
Figure 10 – Sewage Sludge Ash 23
Figure 11 – Water Treatment Plant Process Residuals 27

List of Appendices

Appendix A – Technical Jargon
Appendix B – Municipal Responses
Appendix C – Diversion Rates in Large Ontario Municipalities
Appendix D – Population Projections
Appendix E – Historical Data on Waste Generation, Disposal and Diversion Rates
Appendix F – How Residual Waste is Managed
Appendix G – Waste Generation Projections for the Existing Service Area
Appendix H – Calculation of Residual Waste from Proposed Regional Service Area

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Executive Summary

Overview

To plan for the future, the City of London is developing a long-term Resource Recovery Strategy and a Residual Waste Disposal Strategy. The Resource Recovery Strategy involves the development of a plan to maximize waste reduction, reuse, recycling, resource recovery, energy recovery and/or waste conversion in an economically viable and environmentally responsible manner. The Residual Waste Disposal Strategy involves the development of a long-term plan to manage the remaining Residual Waste and includes an environmental assessment (EA) for the proposed expansion of the W12A Landfill.

Key to developing a long-term Resource Recovery Strategy and a Residual Waste Disposal Strategy is understanding the types, quantities and composition of future resources and waste to be managed. This information was previously documented in *Residual Waste Projections & Landfill Capacity Assessment* (City of London, 2018).

The *Residual Waste Projections & Landfill Capacity Assessment* report also served as one of the supporting documents for the *Amended Terms of Reference for the Environmental Assessment of the Proposed W12A Landfill Expansion, City of London*. The Amended Terms of Reference (ToR) is the work plan for carrying out the EA and was submitted to the Ministry of Environment, Conservation and Parks (MECP) on February 7, 2019. The Amended ToR was approved by the Minister of Environment, Conservation and Parks on July 30, 2019.

The Amended ToR contained commitments to update the information in the report *Residual Waste Projections & Landfill Capacity Assessment* as part of the EA. These commitments are listed in Table E-1.

Table E-1 ToR Commitments

ID	ToR Commitment
8	During the EA, assumptions used in determining the projected Residual Waste from the existing service area will be refined and assessed. This will be described in the EA study report.
9	During the EA the proposed regional service area will be confirmed and further assessed. This will be described in the EA study report.

The information and assumptions in the *Residual Waste Projections & Landfill Capacity Assessment* have been reviewed and, where appropriate, updated in order to satisfy commitments 8 and 9 in the Amended ToR.

These updates are documented in this report and summarized in Table E-2 (next page).

Table E-2 Report Updates

Update	Comment
Change in the 25 year planning period for the landfill expansion from start of 2025 to end of 2049 to the start of 2024 to end of 2048.	An increase in the amount of waste coming to the W12A Landfill is expected to result in the landfill using its approved capacity sooner.
New population projections for the City of London	New population projections were approved by City Council in 2018. The new projections have faster population growth than the previous projections.
Inclusion of 2018 waste disposal and diversion data for the City of London and proposed regional service area.	The 2018 waste disposal and diversion data was used to update waste generation and diversion rates. In most cases the waste generation and diversion estimates are based on a five year average (2014 to 2018).
Municipalities in the proposed regional service area were contacted to determine if they were still interested in being included in the expanded regional service area for the W12A Landfill.	There were no changes proposed to the regional service area as a result of contacting municipalities.
Inclusion of additional details, data and analysis on how provincial waste diversion policies were taken into consideration in developing the Residual Waste forecasts.	Information provided to demonstrate consistency with relevant provincial policies including *Strategy for a Waste-Free Ontario Building a Circular Economy* (2017), *Ontario's Food and Organic Waste Policy Statement* (MECP, April 2018), *A Made-in-Ontario Environment Plan* (MECP, November 2018) and *The Discussion Paper on Reducing Waste and Litter in Our Communities* (MECP, March 2019).
Estimated remaining site life for landfills in the expanded service area were updated where changes had occurred.	Changes were made to the remaining site life for two landfills (West Elgin Landfill and Stratford Landfill).
Disposal locations for municipalities in the expanded regional service area were updated where changes had occurred.	Three landfills that service four municipalities have closed since 2018.

Existing Service Area of W12A Landfill

The report examines the different types of waste from the existing service area of the W12A Landfill. This includes waste that the City is responsible for as well as waste not controlled by the City but accepted at its landfill for disposal.

The waste has been broken down into nine types based on their characteristics. The nine waste types are residential; industrial, commercial & institutional (IC&I); construction, renovation & demolition (CR&D); sewage sludge ash; biosolids; street sweepings & road work waste; other municipal operations waste; water treatment plant process residuals; and contaminated soil.

Service Area

The service area is the area from which a landfill is legally allowed to accept waste. The existing service area for the City's W12A Landfill is the City of London, Municipality of Thames Centre, TRY Recycling's Facilities on Clarke Road, Lake Huron Primary Water Treatment Plant and Elgin Area Water Treatment Plant.

Current and future generation, diversion and disposal rates for each waste type from the *Residual Waste Projections & Landfill Capacity Assessment* report have been updated using the most recent (2018) waste quantity data.

Residual Waste quantity (by weight) projections were developed for the existing service area taking into account the City's updated population projections coupled with the projected generation and diversion rates for each of the waste types.

For the 25 year planning period, it is estimated that the expansion of the W12A Landfill may need to accommodate an average of approximately 376,000 tonnes per year of Residual Waste from the existing service area or 9,400,000 tonnes in total. This is 200,000 tonnes more in total than what was projected in the previous 2018 report.

Regional Service Area

The City approached nearby lower and upper tier municipalities in March 2017 to determine their interest in being included in the service area of the expanded W12A Landfill. Based on their responses, a service area consisting of the City of London plus Elgin County, Middlesex County, Huron County, Lambton County and Perth County was proposed in the Amended ToR.

Municipalities in the proposed regional service area were contacted in September 2019 to determine if they were still interested in being included in the expanded service area. There were no municipalities that requested to be removed from the regional service area and therefore there will be no changes to the previously proposed regional service area. The population of Elgin, Middlesex, Huron, Lambton and Perth Counties (including separated cities) is approximately 420,000, which is about the same as London's population. Only a fraction of the waste from this area is expected to be disposed of at the W12A Landfill in the future because of existing remaining capacity in their landfills, travel distance and other factors.

The site life of existing landfills within the proposed regional service area were confirmed and updated where changes had occurred (West Elgin Landfill and Stratford Landfill).

The Residual Waste disposal locations for municipalities within the proposed regional service area were confirmed and updated where changes had occurred. The disposal locations for four municipalities (Central Huron, Goderich, Huron East and Southwest Middlesex) were updated as the result of the closure of the Limerick Landfill, Trillium Drive Landfill and Mid-Huron Landfill in 2018.

It is estimated that the expansion of the W12A Landfill may need to accommodate approximately 500,000 tonnes of Residual Waste from the regional service area over the 25 year planning period. This is 100,000 tonnes less than what was projected in the previous 2018 report.

Required Additional Landfill Capacity for Expansion of the W12A Landfill

The volume of landfill airspace required to accommodate waste is typically calculated by multiplying the number of tonnes of waste to be disposed by the landfill utilization rate. The landfill utilization rate is the amount of space (cubic metres, m^3) needed to manage an average tonne of waste including daily and intermediate cover material. A landfill utilization rate of 0.72 tonnes/m^3 was determined to be appropriate for the proposed W12A Landfill expansion.

Daily/Intermediate Cover Material
Daily/intermediate cover material is the material placed on garbage at the end of the day to reduce odours and litter from a landfill. Cover material is typically soil but other materials can be used such as wood chips. Daily/intermediate cover material typically consumes 15% to 20% of the total disposal volume at a landfill.

There is a need for an additional disposal volume of 13,800,000 m^3 at the W12A Landfill site for the 25-year planning period (excluding final cover).

1.0 Introduction

1.1 Rationale for Report Update

This report is an update of *Residual Waste Projections & Landfill Capacity Assessment* (City of London, 2018). The *Residual Waste Projections & Landfill Capacity Assessment* report was part of the supporting documentation for the *Amended Terms of Reference for the Environmental Assessment of the Proposed W12A Landfill Expansion, City of London*. The Amended Terms of Reference (ToR) is the work plan for carrying out the environmental assessment (EA).

The Amended ToR contained commitments to update the information in the report *Residual Waste Projections & Landfill Capacity Assessment* as part of the EA. These commitments are listed in Table 1.

Table 1 – ToR Commitments

ID	ToR Commitment
8	During the EA, assumptions used in determining the projected Residual Waste from the existing service area will be refined and assessed. This will be described in the EA study report.
9	During the EA, the proposed regional service area will be confirmed and further assessed. This will be described in the EA study report.

The information and assumptions in the *Residual Waste Projections & Landfill Capacity Assessment* report have been reviewed and, where appropriate, updated in order to satisfy commitments 8 and 9 in the Amended ToR and to provide the most accurate information for use in the EA.

1.2 Development of Waste Quantity Projections

In the City of London, more than one tonne of waste is produced per person each year. This includes waste generated at home as well as waste generated by businesses. Much of this waste is diverted through numerous reduction, reuse, recycling and composting programs. The waste that remains is considered garbage or "Residual Waste".

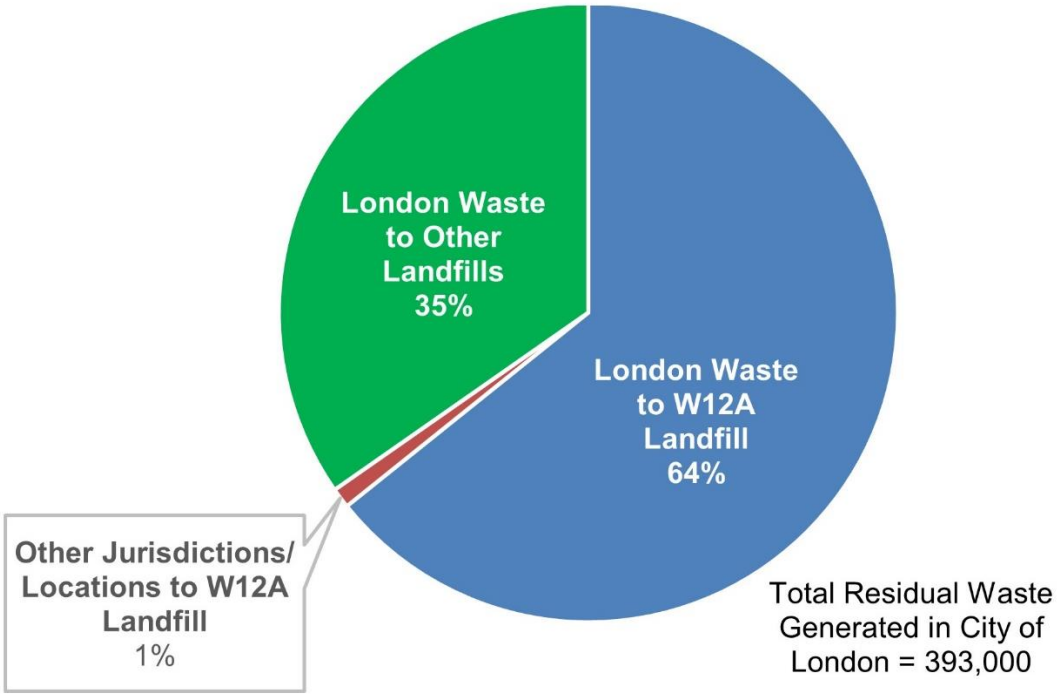
All of the Residual Waste generated from households and some of the Residual Waste generated by businesses is disposed of at the City's W12A Landfill Site. There is also a small amount of waste from outside of London that is delivered to London's landfill, while some of London's business waste is taken to landfills located outside of the City for disposal.

Technical Jargon

Our commitment to you is to do our best to provide information in easy-to-understand words. We will try to minimize the use of technical words but some will be necessary to address the requirements of the provincial government and other approval agencies to ensure legislation, regulations and policies are being met.

"Technical jargon" used in this report has the first letter capitalized and a definition can be found in the Glossary (Appendix A).

Figure 1 – 2018 Residual Waste



London's landfill site is located in the south end of the city at 3502 Manning Drive. The landfill opened in 1977 and is expected to reach capacity early in 2024, based on the current amount of waste being received. To plan for the future, the City is undertaking an EA for the proposed expansion of the W12A Landfill. The EA is based on:

- managing Residual Waste until the end of 2048 (25 years beyond the current approved capacity);
- expanding the service area of the landfill to include municipalities in County of Huron, County of Perth, County of Elgin, County of Lambton, and County of Middlesex;
- limiting the amount of waste that the landfill can accept to 500,000 tonnes/year; and,
- setting a goal to increase London's residential waste diversion rate to 60% by the end of 2022 from the current rate of 44%, including achieving 70% diversion of organic and food waste from single family dwellings as per the requirements identified in *Ontario's Food and Organic Waste Policy Statement* (MECP, April 2018).

Key to undertaking an EA for the proposed expansion of the W12A Landfill is understanding the types, quantities and composition of future resources and waste to be managed. This information has been developed by taking into account:

- population growth;
- existing and proposed provincial waste diversion targets;
- approved provincial legislation (*Waste-Free Ontario Act*) that is expected to result in significant changes to how recyclables, organics and garbage would be managed in Ontario;
- relevant provincial policies including *Strategy for a Waste-Free Ontario Building a Circular Economy* (2017), *Ontario's Food and Organic Waste Policy Statement* (MECP, April 2018), *A Made-in-Ontario Environment Plan* (MECP, November 2018) and *The Discussion Paper on Reducing Waste and Litter in Our Communities* (MECP, March 2019);
- availability of waste disposal facilities in neighbouring municipalities;
- recent waste audit data; and, changing waste technologies.

2.0 Background

2.1 W12A Landfill Service Area

The W12A Landfill is approved by the Ministry of the Environment, Conservation and Parks (MECP) to accept:

- solid, non-hazardous waste for disposal from London, Thames Centre and three service points (Lake Huron Primary Water Treatment Plant, Elgin Area Water Treatment Plant and Try Recycling Facilities on Clarke Road just north of the City); and,
- Municipal Hazardous and Special Waste (MHSW) from London, Middlesex County and Elgin County at the HSW Depot located at the W12A Landfill for transfer to appropriate recycling/processing sites.

The location of the W12A Landfill and its approved service area (area from which it can accept materials) is shown on Figure 2. In addition to seeking approval to expand the W12A Landfill, the City is also seeking approval to establish a regional service area for the W12A Landfill. The benefits of a regional service area include: consistency with the *Strategy for Waste-Free Ontario* (see discussion in Section 2.2); addressing a portion of the provincial shortfall in disposal capacity; providing a public disposal option for nearby organizations and municipalities; ensuring that competitive waste disposal pricing is available for municipalities; and providing a financial benefit to the City.

In the fall of 2017, the City approached nearby lower and upper tier municipalities to determine their interest in being included in the service area of the W12A Landfill. Only municipalities that expressed an interest in using the W12A Landfill were included in the proposed regional service area. The correspondence sent to municipalities asking about their interest in being included in a regional service area and their responses are provided in Appendix B. Based on their responses, a service area consisting of the City of London plus Elgin County, Middlesex County, Huron County, Lambton County and Perth County was proposed. The population of Elgin, Middlesex, Huron, Lambton and Perth Counties (including separated cities) is approximately 420,000. The proposed service area is shown in Figure 3.

In September 2019, the City contacted municipalities who had expressed an interested in using the W12A Landfill to re-confirm their earlier interest. All municipalities confirmed their interest in being included in the service area of the W12A Landfill, therefore no changes to the proposed regional service area are proposed. The correspondence that was sent to municipalities asking if they continued to have an interest in a regional service area and the responses from the municipalities are provided in Appendix B.

It must be noted that having available Residual Waste disposal capacity for municipalities outside of London does not mean that London is obligated to accept waste from these municipalities in the future. City Council will have the authority to determine which, if any, municipalities or businesses outside of London can use any City facilities and under what conditions they are allowed to do so. For example, the City may require municipalities and businesses to demonstrate that their diversion rate matches or exceeds the City of London's diversion rate in order to dispose of Residual Waste at the W12A Landfill.

Figure 2 – Existing Service Area

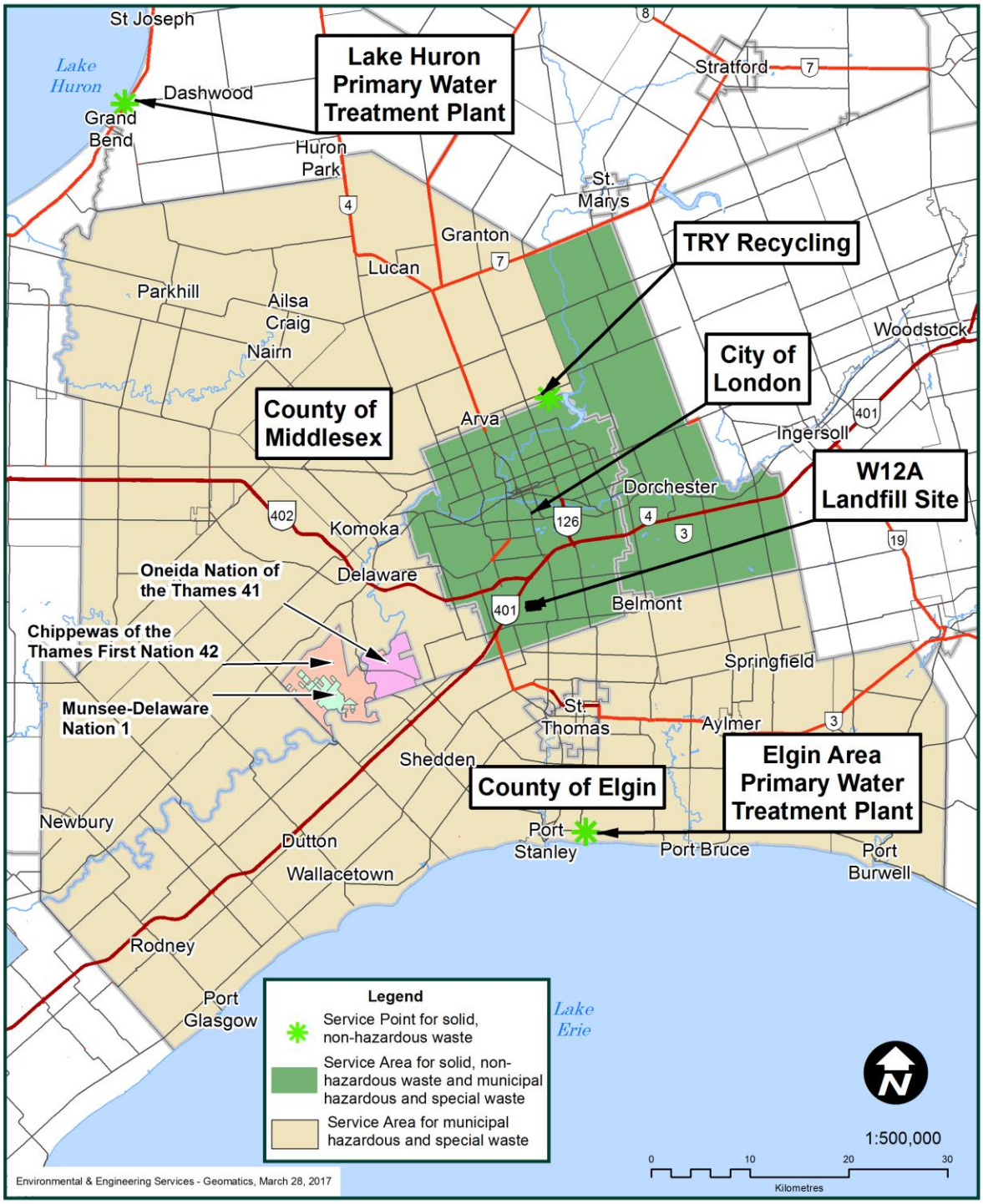
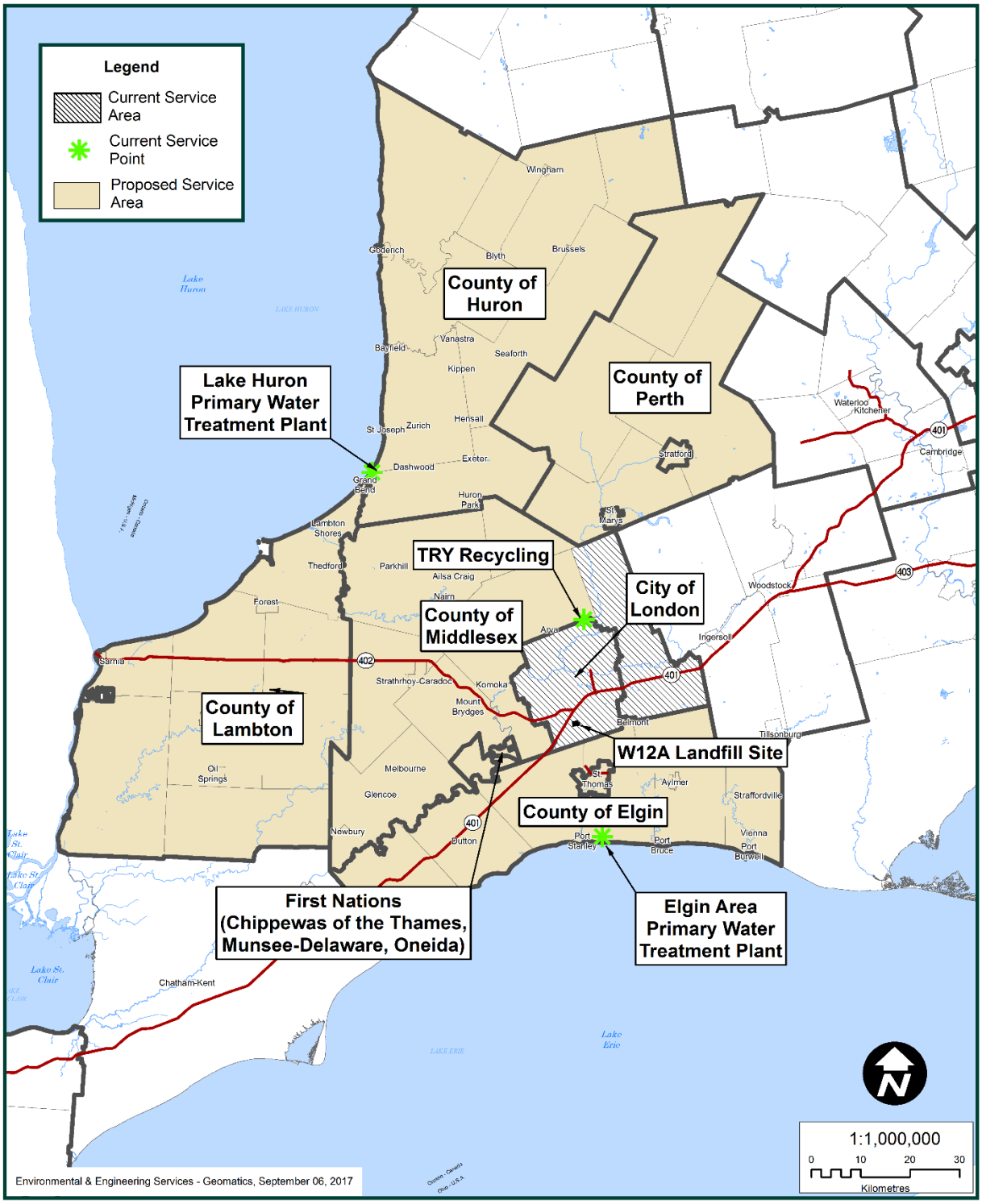


Figure 3 – Proposed Service Area for Solid Non-Hazardous Waste



2.2 Strategy for a Waste-Free Ontario

The proposed expansion of the service area for the W12A Landfill aligns with the Ontario government's policy goals under the *Strategy for a Waste-Free Ontario* by:

- **Minimizing the need for the development of landfills** - There are over twenty operating landfills in the proposed W12A Landfill regional service area. The majority of these are small landfills. Providing a local, cost effective, well maintained and environmentally sound disposal alternative will encourage municipalities with small landfills not to expand their landfill after it reaches capacity. This will reduce the number of landfills in the proposed service area in the long term. It is also noted that municipalities wishing to use the W12A Landfill will be encouraged to achieve similar diversion objectives as the City of London.

- **Ensuring existing landfills are well maintained –** As noted above, the majority of the over twenty landfills in the proposed regional service area are smaller landfills. Only four landfills, including the W12A Landfill, have landfill gas collection and flaring systems. Most of the landfills do not have engineered controls for leachate management and some do not have regular groundwater or surface water monitoring programs. The W12A Landfill has a landfill gas collection and flaring system, is located in a favourable hydrogeological setting (e.g., thick deposit of clayey till soils), has a leachate collection system and has landfill gas, surface water and groundwater monitoring programs. In general, waste coming to the W12A Landfill from other locations within the proposed regional service area will come to a landfill that is well maintained and offers a high level of environmental protection.

- **Reducing Greenhouse Gas (GHG) Emissions -** As noted above, only four landfills in the proposed regional service area have landfill gas and collection systems. Having more waste go the W12A Landfill, which has a landfill gas collection and flaring system, will reduce GHG emissions.

  Expanding the service area has the potential to reduce GHG emissions by approximately 117,000 tonnes carbon dioxide equivalents (CO_{2e}) over the 25 year planning period based on the following:

  - The average tonne of garbage produces approximately 0.46 tonnes $CO_{2e.}$ (EPA WARM Model), which is released to the atmosphere at landfills that do not have gas collection and flaring systems;
  - It is estimated that the expanded W12A Landfill will have a landfill gas capture rate of 85% or higher (more than 0.40 tonnes CO_{2e} of GHG per tonne of garbage buried);
  - The GHG emissions to transport a tonne of waste to the W12A Landfill from within the proposed regional service area is less than 0.01 tonnes CO_{2e};
  - The net GHG reduction for waste that comes to the W12A Landfill instead of a landfill without a landfill gas collection flaring system is 0.39 tonnes CO_{2e} per tonne of garbage (0.40 CO_{2e} - 0.01 tonnes CO_{2e}); and,
  - It is estimated that approximately 300,000 tonnes of waste could come to the W12A Landfill from landfills without gas collection systems from within the proposed regional service area over the 25 year planning period.

2.3 Waste Diversion

Provincial Total Waste Diversion Goals

The Province has established two "visionary goals" for solid waste; that are to achieve zero waste and zero greenhouse gas emissions. The Province also established interim goals for total solid waste diversion (consisting of residential; IC&I; and CR&D waste streams) of 30% by 2020, 50% by 2030 and 80% by 2050. The Provincial waste diversion goals are aggressive (aspirational) targets. There are many unknowns associated with implementation of these goals, which will require major changes to how business is done in Ontario including moving to a Circular Economy.

The existing goals as well as the previous waste diversion goals set by the Province are presented in Table 2.

Table 2 – Provincial Total Waste Diversion Goals and Actual Rate

Year	Total Diversion Goal/Rate	Comment
1989[1]	• 25% by 1992 • 50% by 2000	goal applied to all waste
2004[2]	• 60% by 2009	goal applied to residential, IC&I and CR&D sectors individually
2015[3]	• 25% (actual)	overall rate achieved
2017[4]	• 30% by 2022 • 50% by 2030 • 80% by 2050	goal applied to all sectors combined energy from waste and alternative fuels are permitted but these methods do not count towards diversion

Notes

1. *A Brief History of Waste Diversion in Ontario* (Canadian Institute for Environmental Law and Policy, 2008)
2. *Ontario's 60% Waste Diversion Goal - A Discussion Paper (MOE, 2004)*
3. *Strategy for a Waste Free Ontario: Building the Circular Economy* (MOECC, 2017)
4. *Strategy for a Waste Free Ontario Building a Circular Economy* (MOECC, 2017)

Data from the Province indicates that the current diversion rate is approximately 45% to 50% for residential waste and about 25% for all waste (residential, IC&I and CR&D combined). According to information provided in the *Strategy for a Waste Free Ontario: Building the Circular Economy* (MOECC, 2017) Ontario's waste diversion rate has stalled at 25 percent over the last decade. This means the province has not been able to meet any of the previous targets except for the 25% waste diversion (by 1989). Meeting this target took over two decades longer than proposed.

Considering the above, long term Residual Waste quantity projections should take into consideration Provincial policies and the interim solid waste diversion goals but there should be an allowance to accommodate some additional Residual Waste if the interim waste diversion goals are not met.

Residential Waste Diversion

In October 2018, the City approved the *60% Waste Diversion Action Plan* that contained programs and initiatives to be phased in between 2019 and 2022 to achieve 60% total waste diversion. The total diversion rate in 2018 was 44%.

The key initiative of the *60% Waste Diversion Action Plan* is implementation of a Green Bin program for single family dwellings This, along with other food and organic waste diversion initiatives for single family dwellings (bi-weekly garbage collection coupled with weekly Green Bin collection to increase Green Bin participation, food waste reduction strategy, promotion of home composting, reduced cost for composters sold at EnviroDepots and financial support to community groups or environmental organizations that want to set up a community composting program), is expected to increase food and organic waste diversion from about 55% (42% + 15%) to about 80% (64% + 16%) as shown in Tables 3 and 4 below.

Table 3 – Existing (Estimated) Single Family Dwelling Organics Diversion

Material	Residual Waste	City Managed Diversion	On-site Reduction[a]	Total
Food Waste	22,100	0	5,700	27,800
Yard Materials	1,600	26,300	3,600	31,500
Tissue/towelling	3,200	0	0	3,200
Total	26,900	26,300	9,300	62,500
Percent	43%	**42%**	**15%**	100%

Notes: a) Existing on-site reduction measures include home composting and grasscycling (grass collection ban)
b) Data from *60% Waste Diversion Action Plan* which used 2017 waste quantities.

Table 4 – Projected Single Family Dwelling Organics Diversion after Implementation of City's 60% Waste Diversion Action Plan

Material	Residual Waste	City Managed Diversion	On-site Reduction	Total
Food Waste	9,100	12,400	6,300	27,800
Yard Materials	1,600	26,300	3,600	31,500
Tissue/towelling	1,600	1,600	0	3,200
Total	12,300	40,300	9,900	62,500
Percent	20%	**64%**	**16%**	

Although the City of London does not have direct responsibility for achieving organic and food waste diversion from multi-unit residential buildings, the *60% Diversion Action Plan* also includes actions to assist multi-unit residential buildings meet their obligation under the *Ontario's Food and Organic Waste Policy Statement* of 50% waste reduction and resource recovery of food and organic waste generated by 2025. In addition to continuing to educate and encourage multi-unit residential buildings to first reduce then divert food and organic waste, the City will fund a mixed waste pilot processing program for multi-unit residential buildings and/or assist with a source separation pilot project for food waste.

A review of the larger municipalities/recycling boards in Ontario (excluding London) indicates that 60% residential total diversion is a practical upper limit for large municipalities with a Green Bin program (see Appendix C) with existing, proven technologies and processes. Nine of the ten largest municipalities (i.e., Essex-Windsor does not have a Green Bin program) have Green Bin programs and their total diversion rates for 2016 and 2017 are presented in Table 5. Total diversion rates for 2018 were not available at the time this report was being prepared.

The City of Guelph is also included in the table as a comparator city as they have a University (as does London) and a Green Bin program.

Total diversion rates varied from 41% to 68% with an average total diversion rate of 55% in 2017. Six jurisdictions (Durham, Waterloo, Guelph, Halton, Niagara and York) achieved a total diversion rate greater than 55%. Without a Green Bin program, the practical upper limit for residential total diversion for a large municipality is approximately 50%.

As shown in Table 5, there was a minor increase in total waste diversion from 2016 to 2017 in most municipalities. In general, increases in composting and other programs are being offset by decreases in recycling (e.g. fewer newspapers, cans, etc.).

Table 5 – Total Waste Diversion in Municipalities with Green Bin Programs

Municipality	Total Waste Diversion[1] 2016	Total Waste Diversion[1] 2017
Ottawa	44%	41%
Hamilton	45%	44%
Peel	50%	49%
Toronto	51%	52%
Waterloo	52%	56%
Halton	57%	56%
Niagara	56%	57%
Guelph	59%	58%
Durham	55%	65%
York	66%	68%
Average	54%	55%

Notes

1. From www.RPRA,ca/Library/WDO-Historical/Municipal-Information.

Some municipalities have set aggressive (aspirational) total waste diversion targets higher than 60% based on a general strategy but without specific plans on how they will reach these targets. It is likely residential total diversion rates will increase beyond 60% in the future but will require the use of technologies that are currently not practical or economically justified.

The *60% Waste Diversion Action Plan* is part of the City's overall Resource Recovery Strategy which is still under development. and will look at the use of newer technologies (e.g., mixed waste processing, chemical recycling) to go beyond 60% total waste diversion. The Resource Recovery Strategy involves the development of a plan to maximize waste reduction, reuse, recycling, resource recovery, energy recovery and/or waste conversion in an economically viable and environmentally responsible manner. A key component in the development of the Resource Recovery Strategy has been the establishment of the London Waste to Resources Innovation Centre (2019).

It should be noted that multi-residential units have much lower total diversion rates compared to single family homes. In London, the average total diversion rate for single family homes is 50% compared to 20% for multi-residential units. London has a higher percentage of multi-residential units (i.e., apartments buildings) compared to many other large municipalities. Approximately one in three housing units in London is multi-residential. The percentage of multi-residential units is expected to increase in the future due to intensification (as per The London Plan), which will make it more difficult to increase total diversion rates.

The proposed Residual Waste quantities that the City will need to manage are estimated by assuming that the current London household (single family dwelling and multi-unit residential buildings combined) total waste diversion rate of 44% will increase to 60% by the end of 2022. To reach this target single family dwellings and multi-unit residential buildings combined will achieve greater than 70% food and organics diversion. It is possible that further increases in residential waste diversion may occur after 2022, but for planning purposes it is not appropriate to rely on higher diversion rates at this time.

IC&I Waste Diversion

As previously noted, the Province has established aggressive (aspirational) targets; achieving them will require major changes to how business is done in Ontario. These targets along with estimated existing IC&I total diversion rates are presented in Table 6.

It was also previously noted that Ontario has not come close to meeting any of the previous targets for IC&I, including the province's first target of 25% total waste diversion by 1989.

Table 6 – IC&I Total Waste Diversion Rates

Year	Total Diversion Goal/Rate	Comment
Existing IC&I total diversion rate London[1]	20%	-
Existing IC&I total diversion rate Provincial[2]	10 to 15%	-

Notes

1. Estimated from data provided by local waste management companies
2. *Strategy for a Waste Free Ontario Building a Circular Economy* (MECP, 2017)

To encourage waste diversion, including diversion of food and organic waste, in the IC&I sector, the City will:

- Continue to directly prevent food waste from grocery stores through a food rescue program called Community ReFresh, in partnership wit the London Food Bank and more than 20 grocery stores. The program was started as a pilot project in 2017.

- Continue to promote the circular economy, waste diversion, resource recovery, technology pilot projects and assessments and economic development for material and resources from both the residential and the ICI&I sectors through the London Waste to Resource Innovation Centre.

- Continue to be a member and support Green Economy London (GEL) which focuses on waste reduction, energy reduction, water reduction and environmental stewardship for London's businesses. The City of London was a founding partner in 2019. There are currently 40 business members.

- Continue to participate in developing and commenting on provincial waste diversion initiatives for the IC&I sector through City's participation with the Regional Public Works Commissioners of Ontario (RPWCO) Waste Subcommittee (London is the Co-Chair) and through the Municipal 3Rs Collaborative (M3RCs – London is one of several representatives from RPWCO). This includes work on the potential of an organics landfill ban.

- Continue to address, promote and help educate landfill customers about waste prevention and reduction, regulatory changes and resource recovery initiatives as they are brought to the City's attention.

- In 2023, to coincide with the completion of Resource Recovery Strategy, establish an awareness program to promote waste reduction, waste diversion and resource recovery to support provincial initiatives including upcoming target dates.

In selecting an IC&I total waste diversion rate for planning purposes, a balance must be achieved between not picking a rate that is too low and therefore having excess capacity and conversely not picking an ICI&I total waste diversion rate that is too high and therefore not having enough Residual Waste disposal capacity to accommodate all the waste that is generated in the future. The rate selected must also be consistent with the IC&I sector meeting its obligations under the various provincial policies including *Ontario's Food and Organic Waste Policy Statement.*

The proposed Residual Waste quantities the City will need to manage are estimated by assuming an IC&I total waste diversion rate of 25% by 2025 and 50% by 2050. It is not possible at this time to break the IC&I total diversion rate down further as there is insufficient data in London however to accomplish such a significant increase in total diversion it is assumed that a large component must be coming from food and organic waste diversion from food retail, restaurants and food manufacturing.

CR&D Diversion

CR&D waste, which has minimal organics in its composition, is banned from the W12A Landfill because there are local recycling options available. CR&D recycling process residuals from these facilities are accepted for disposal at the W12A Landfill. Approximately 50% to 60% of the material going to CR&D waste recycling facilities is diverted to beneficial uses while the remaining 40% to 50% becomes process Residual Waste that is sent for disposal.

The proposed Residual Waste quantities the City will need to manage are estimated by assuming a CR&D waste diversion rate of 55%. It is possible that further increases in CR&D waste diversion may occur but for planning purposes it is not appropriate that higher diversion rates be relied on.

2.4 Population Projections

For many types of waste, the quantity generated is directly proportional to the population of an area. As the population increases, the quantity of waste increases and conversely the quantity of waste decreases if the population decreases. For this reason, population projections were developed for the 25 year planning period.

The most recent population projections for the City of London are contained in the report *City of London, Population, Housing and Employment Growth Forecast, 2016 to 2044* prepared by Watson & Associates Economists Ltd., 2018 for the City of London. This report provides population estimates for years 2016, 2021, 2026, 2031, 2036, 2041 and 2044 for low growth, reference growth and high growth scenarios. The “reference growth” scenario was used for estimating population growth. This growth scenario has a higher rate of population growth than the population projections used in the *Residual Waste Projections & Landfill Capacity Assessment* (London, 2018).

For the period 2016 to 2044, the “reference growth” scenario population estimates were used for the years that a population estimate existed. For other years between 2016 and 2044, the population was estimated by linear interpolation (equally sized increases). For the period 2045 to 2048, it was assumed the rate of population growth would be the same as the period 2041 to 2044.

Seasonal population projections were developed to account for the large number of out of town students living off campus and attending the University of Western Ontario and Fanshawe College. It was assumed that each student living off campus would generate two thirds of the garbage of a permanent resident since they typically attend school for 8 months of the year. The growth in the number of students was assumed to match the growth in permanent population.

The population projections for the city of London for the period 2016 to 2048 are summarized in Table 7. More detailed tables and information on the population projections are presented in Appendix D.

Table 7 – Population Projections

Year	Permanent Population	Equivalent Seasonal Population	Total	Average Growth for next 5 years
2016	394,300	22,100	416,400	1.21%
2021	418,700	24,300	443,000	1.29%
2026	445,700	26,400	472,100	0.91%
2031	465,900	28,600	494,500	0.63%
2036	480,700	30,700	511,400	0.60%
2041	495,200	32,800	528,000	0.60%
2044	504,200	34,100	538,300	0.60%
2048	516,500	35,800	552,300	-

3.0 Residual Waste from Existing Service Area

3.1 General

This section of the report looks at the different types of waste from the existing service area of the W12A Landfill. This includes waste that the City is responsible for, as well as waste not controlled by the City but accepts at its landfill for disposal. Current and future generation, diversion and disposal rates were developed for each waste type.

The waste has been broken into nine types based on their characteristics as outlined in Table 8 below. Each waste type is further described and quantified in its own subsection in this section.

Table 8 – Waste Types

Type	Composition[1]	Putrescible[2]	City Control[3]
Residential	Mixture	Yes	Yes[7]
IC&I	Mixture	Yes	No
CR&D	Mixture	Yes[6]	No
Sewage Sludge Ash	Uniform	No	Yes
Biosolids	Uniform	Yes	Yes
Street Sweepings/Road Works[4]	Uniform	No	Yes
Other Municipal Operations[4]	Mixture	Yes	Yes
Water Treatment Plant Process Residuals[4]	Uniform	No	Yes
Contaminated Soil[5]	Uniform	No	No

Notes

1. Mixture refers to waste that is heterogeneous (contains a variety of different materials). Uniform refers to waste that is homogeneous (contains similar material).
2. Putrescible refers to solid waste that contains organic matter that generates odours as it decomposes.
3. City controls directly or indirectly where the waste will be disposed.
4. Waste from Street Sweepings/ Road Works and Other Municipal Operations is institutional waste but not included in IC&I projections because it has different characteristics compared to typical IC&I waste.
5. Contaminated soil is industrial waste but not included in IC&I projections because it has different characteristics compared to typical IC&I waste.
6. CR&D waste contains drywall that has sulphur compounds that can create hydrogen sulphide (H_2S) gas when decomposing in landfills.
7. City only controls single family dwelling waste and not multi-residential buildings. The city does provide waste collection and recycling services to multi-residential buildings.

The split in waste is based on waste type, putrescible and City control for 2018 is presented in Figures 4, 5 and 6, respectively. The percentages shown on these figures are on a tonnage basis.

Historical data on the waste generation, disposal and diversion rates for these materials is presented in Appendix E. The previous report Residual Waste Projections & Landfill Capacity Assessment (City of London, 2018) had data up to the year 2017. This report contains 2018 data.

Figure 4 – 2018 Composition of Residual Waste by Waste Type

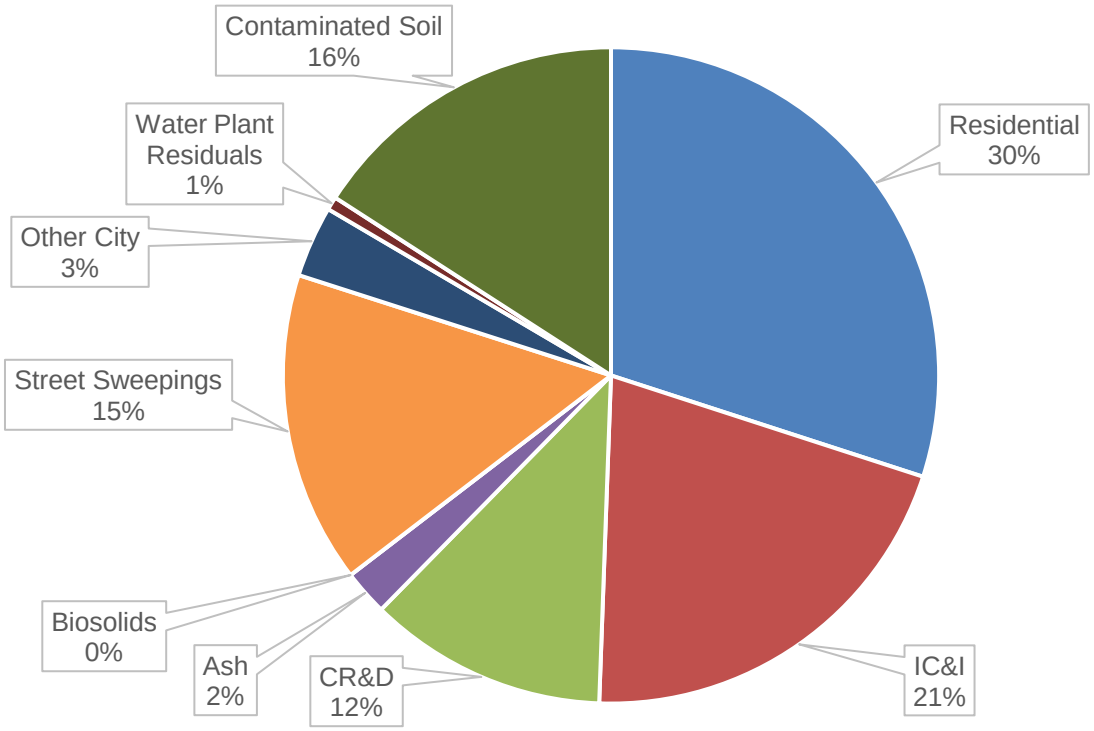


Figure 5 – 2018 Putrescible versus Non-putrescible Residual Waste

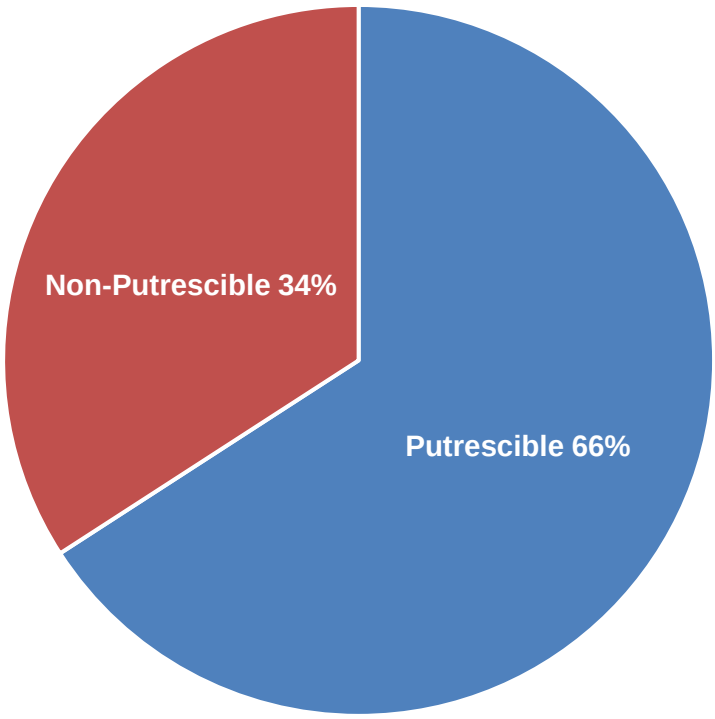
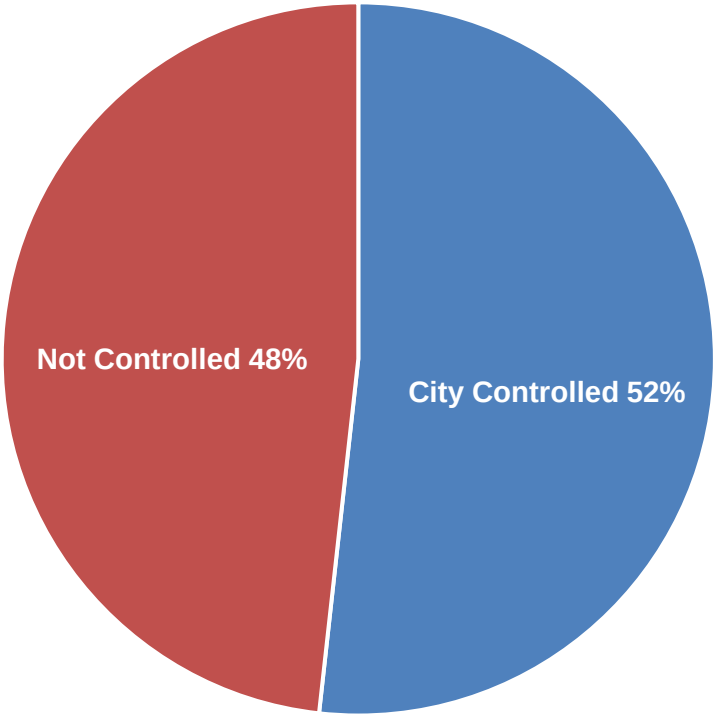


Figure 6 – 2018 City Controlled Residual Waste



3.2 Residential

General

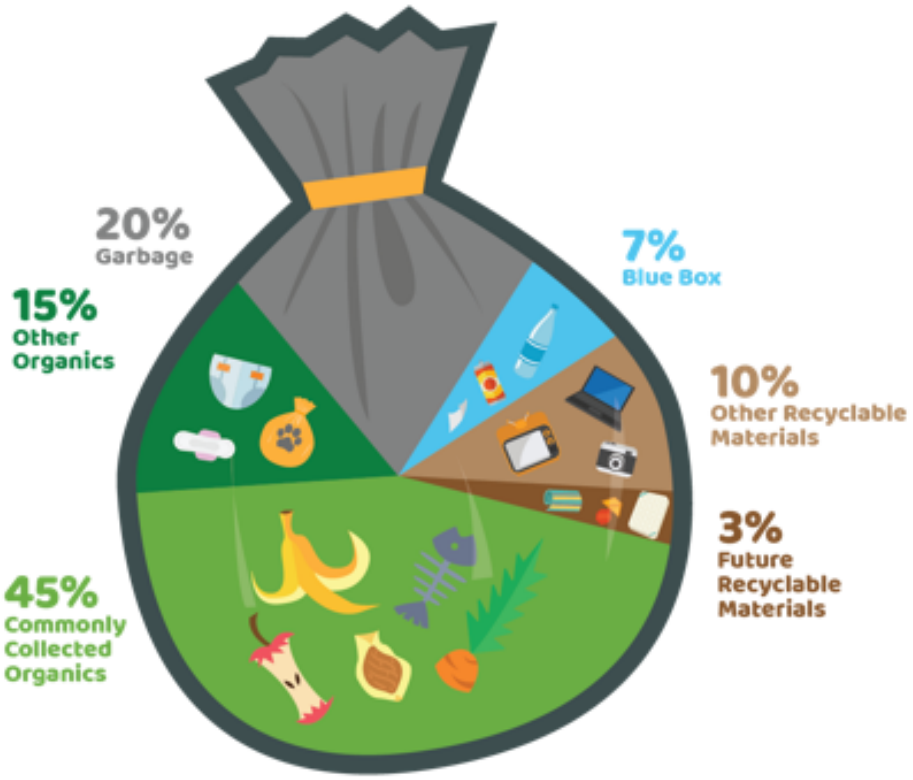
Residential waste refers to waste generated from all single family, multi-family, high-rise and low-rise buildings. This category also includes small amounts of commercial and institutional waste collected on residential garbage routes. It does not include residuals generated from recycling or composting residentially collected materials. The W12A Landfill receives residential waste from the City of London and from the Municipality of Thames Centre.

London

In general, over the last 15 years there has been no change in residential waste generation, an increase in waste diversion and a decrease in waste disposal. Currently Londoners generate approximately 400 kilograms/year per person of residential waste (includes about 20 kilograms/year per person of light IC&I) with 44% of the residential waste being diverted through various programs. The breakdown of the 56% of residential waste that is disposed of in the W12A Landfill is presented in Figures 7 and 8. Further details on the composition of residential waste in London and how it is currently managed are presented in Appendix F.

The assumptions used to estimate the amount of residential Residual Waste to be managed in the future are presented in Table 9.

Figure 7 – Composition of Residential Garbage (Single Family Homes)



Commonly Collected Organics

Organics that are easily composted. They include food waste and non-recyclable paper (soiled paper, tissues, paper towels).

Other Organics

Pet waste and sanitary products (e.g., diapers) which typically require pre-processing to remove the plastic bag that contains the pet waste and plastic covering of the diaper.

Blue Box

Items that were placed in the garbage but should have gone in the Blue Box.

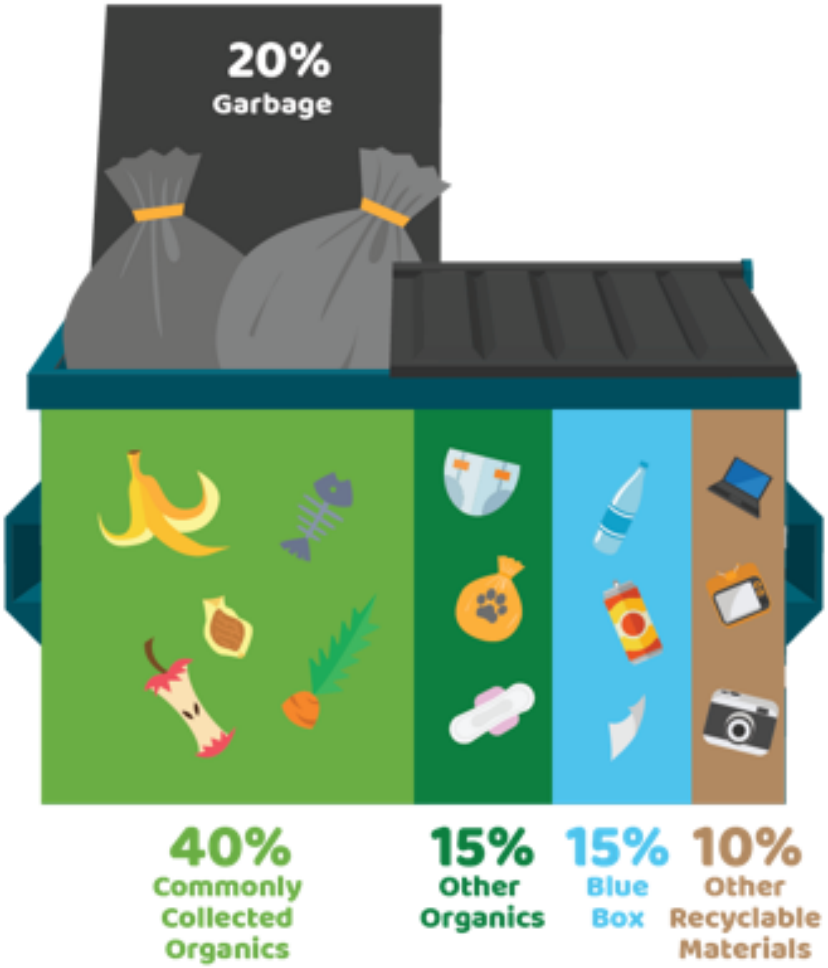
Other Recyclable Materials

Items that were placed in the garbage but should have been dropped off at a depot or returned to retailer for recycling such as textiles, scrap metal, electronics, renovation materials and plastic bags.

Future Recyclable Materials

Items that may have local recycling options in the future such as carpets, mattresses and furniture.

Figure 8 – Composition of Residential Garbage (Multi-Residential Homes)



Commonly Collected Organics

Organics that are easily composted. They include food waste and non-recyclable paper (soiled paper, tissues, paper towels).

Other Organics

Pet waste and sanitary products (e.g., diapers) which typically require pre-processing to remove the plastic bag that contains the pet waste and plastic covering of the diaper.

Blue Box

Items that were placed in the garbage but should have gone in the Blue Box.

Other Recyclable Materials

Items that were placed in the garbage but should have been dropped off at a depot or returned to retailer for recycling such as textiles, scrap metal, electronics, renovation materials and plastic bags.

Table 9 – Residential Waste Assumptions

Assumption	Rationale
Residential waste generation will be 400 kilograms/year per person in 2019.	Average generation rate for the last five years. Includes light commercial.
There will be no change in the generation rate[1] in future years.	No significant change in generation rate for over last 20 years.
The residential total diversion rate will be 45% (or 180 kilograms) in 2019.	Marginal increase in total diversion rate from 2018.
The residential total diversion rate would increase to 60% (or 240 kilograms/year per person) by 2022 and remain steady.[2]	Proposed diversion goal for the London. It is possible that further increases in residential waste diversion may occur after 2022 but for planning purposes it is not appropriate to rely on higher diversion rates at this time.

Notes

1. The waste generation rate will not be decreased to show waste reduction initiatives. Instead future waste reduction initiatives are shown as a separate amount (waste reduction rate) and included in the calculation of the overall diversion rate.
2. This goal includes a built-in food and organic waste diversion for single-family dwellings and multi-unit residential buildings combined of over 70%.

Thames Centre

The City has an agreement with Thames Centre to accept municipally collected residential garbage during winter months (so that the Thames Centre Landfill can close in the winter months and reduce operating costs) and the City has the option of disposing of an equivalent amount of residential garbage in the Thames Centre Landfill in the summer. Thames Centre disposes of approximately 1,100 tonnes of waste at the W12A Landfill during the winter months.

For the purposes of this study, it is assumed that the W12A Landfill will receive 1,100 tonnes of garbage from Thames Centre. This amount will increase at the same rate as residential waste in London increases and London will not use the Thames Centre Landfill.

3.3 Industrial, Commercial and Institutional (IC&I) Waste

IC&I waste consists of:

- Industrial waste, which is generated by manufacturing and primary and secondary industries and is managed off-site from the manufacturing operation;
- Commercial waste generated by commercial operations such as shopping malls, offices, etc.; and,
- Institutional waste generated by institutional facilities such as schools, hospitals government facilities, universities, etc.

The majority of IC&I waste is handled by the private sector, although a small amount of commercial and institutional waste is managed by the City and primarily limited to small businesses and offices on residential garbage routes and City facilities. IC&I waste generation, disposal and total diversion rates are difficult to determine because there is no

ongoing data collection or central warehouse for this data as it is privately held information.

Items that should be considered when looking at future IC&I disposal and total diversion rates include:

- Estimates of IC&I waste generation vary from 400 kilograms/year per person (estimated from available 2013 to 2015 local waste management facility data) to 530 kilograms/year per person (estimated provincial average in 2005) and are presented in Table E-7 in Appendix E;
- The majority of IC&I waste is currently exported from London while some is taken to the W12A Landfill for disposal;
- Available 2013 to 2015 local waste management facility data suggests that approximately 20% of IC&I waste is currently diverted;
- Information on provincial IC&I diversion rates are presented in Section 2.2; and,
- Over the last 5 years, an average of 40,000 tonnes of IC&I waste was disposed of at the W12A Landfill or about 100 kilograms/year per person. This represents approximately 25% of the IC&I waste generated.

The IC&I disposal rate in the future will depend on a number of factors that are outside the control of the municipality and have the potential to result in dramatically different amounts of waste that will have to be managed by the City.

Currently some IC&I waste is exported to private landfills in southwestern Ontario or Michigan. Some or all of this waste could come to the W12A Landfill if private tipping fees rates are increased; access to landfills in Michigan is restricted; or tipping fees for IC&I waste are reduced at the W12A Landfill.

Waste Export

Some IC&I waste from London is exported to

- private landfills in southwestern Ontario (e.g., Twin Creeks Landfill in Warwick, Ridge Landfill in Chatham-Kent)
- private landfills in Michigan (more than 3 million tonnes of IC&I waste was shipped in 2017 to Michigan from Ontario)

Alternatively, regulations under the *Waste-Free Ontario Act* have the potential to reduce the amount of waste going to the W12A Landfill for disposal by increasing the amount of IC&I waste that is required to be diverted. Higher tipping fees at the landfill could also reduce the amount of IC&I waste received at the landfill.

The assumptions used to estimate the amount of IC&I Residual Waste to be managed in the future are presented in Table 10.

Table 10 – IC&I Waste Assumptions

Assumption	Rationale
IC&I waste generation will be 420 kilograms per person in 2019.	Reasonable rate based on existing range of estimated rates (less than average of estimates).
There will be no change in the generation rate[1] in future years.	Limited historical information but what exists suggests no change over last several years.

Assumption	Rationale
All IC&I waste from London will come to the W12A Landfill by 2024.	Potential for future waste export depends on a number of factors that are outside the control of the municipality. City must be prepared to provide affordable waste disposal if export options become less viable.
The IC&I total diversion rate will increase to 25% by 2025 and 50% by 2050.	Assumes significant increase in IC&I diversion rates but lower than the proposed interim goals in *Strategy for a Waste Free Ontario Building a Circular Economy* (80% by 2050).

Notes

1. The waste generation rate will not be decreased to show waste reduction initiatives. Instead, future waste reduction initiatives will be shown as a separate amount (waste reduction rate) and included in the calculation of the overall diversion rate

3.4 Construction, Renovation and Demolition (CR&D) Waste

CR&D waste refers to waste generated by construction, renovation and demolition activities and generally includes brick, wood, drywall, metal, asphalt singles, insulation, doors, windows, etc. For the purposes of this report, it excludes materials like asphalt and concrete that can be diverted from landfill for reuse at no or minimal cost.

CR&D waste comes from a diverse range of sources and like IC&I waste is not under municipal control. This makes getting information about CR&D waste difficult and presents challenges for the calculation of waste generation, disposal and diversion rates.

CR&D waste is banned from the W12A Landfill because there are local recycling options available. CR&D recycling process residuals from these facilities are accepted for disposal at the W12A Landfill.

The majority of CR&D waste from London goes to one of the three local CR&D recycling facilities with a small amount exported for disposal. CR&D waste going to these facilities averaged approximately 340 kilograms/year per person over the last five years (2014 to 2018). Approximately 50% to 60% of the material going to CR&D recycling facilities is diverted to beneficial uses while the remaining 40% to 50% becomes process Residual Waste that is sent for disposal.

The amount of Residual Waste coming from the three local CR&D recycling facilities is approximately 150 kilograms/year per person (presented in Table 11). It is noted that these facilities process a small amount of material that originates from outside London. This is estimated to be less than 10% of the total waste processed. The W12A Landfill is licensed to receive residuals from these facilities.

Table 11 – Average Residual Waste CR&D Quantities from 2014 to 2018

Facility	Residuals (tonnes)
Green Valley Recycling[1]	21,000
Try Recycling – Dingman[1]	8,000
Try Recycling – Clarke Road[1]	36,000
Total	65,000

Notes 1.From Annual Report to the MECP.

The CR&D processed Residual Waste is (see Figure 9) solid non-hazardous waste consisting of film plastic, insulation, flat roofing, and other materials that cannot be recycled for a variety of reasons (e.g., too dirty, not economical to clean up, etc.).

In 2018, the W12A Landfill received 38,000 tonnes of CR&D process residuals or about 90 kilograms per person. This represents approximately 60% of all potential CR&D recycling process residuals from London.

Figure 9 – CR&D Recycling Process Residuals

It should be noted that limited CR&D residuals from Try Recycling – Clarke Road were disposed of at the W12A Landfill in 2018. This facility is located just outside London but was included in the service area of the landfill when the service area was expanded in 2016. The majority of CR&D waste processed at this facility comes from the City of London.

The amount of CR&D waste generated each year will vary based on the strength of the economy and the housing market. The assumptions used to estimate the amount of Residual CR&D waste to be managed in the future are presented in Table 12.

Table 12 – CR&D Waste Assumptions

Assumption	Rationale
CR&D waste generation will be 340 kilograms/year per person in 2019.	Based on average of data from annual reports submitted to MECP by local CR&D recycling facilities for 2014 to 2018.
There will be no change in the generation rate in future years.	Limited historical information but what exists suggests no change over the last several years.
All CR&D Residual Waste from London will come to the W12A Landfill by 2025.	Potential for future waste export depends on a number of factors that are outside the control of the municipality. City must be prepared to provide affordable waste disposal if export options become less viable.
The CR&D diversion rate will be 55% (or 190 kilograms/year per person) in 2019 and not change in future years.	Data from local CR&D recycling facilities for 2014 to 2018. No change in diversion rate in recent years.

3.5 Sewage Sludge Ash

Sewage sludge is nutrient-rich organic material that is a by-product from wastewater treatment plants. The City operates six wastewater treatment plants of which the Greenway Wastewater Treatment Plant (Greenway) is the largest. Greenway receives all of the residual sewage sludge produced in the City, where it is dewatered.

Dewatered Sewage Sludge
• Approximately 25% solids and 75% water • 60,000 to 65,000 tonnes generated per year • 90 to 95% incinerated • 90% to 95% weight reduction when incinerated

Until 1988, all sewage sludge was landfilled. Beginning in 1988, sewage sludge was incinerated at Greenway and landfilled when the incinerator was down for repairs or maintenance.

Incineration of the sewage sludge destroys organic matter resulting in an inorganic ash that is a non-hazardous solid waste. The ash is red in colour and consists of silt/clay size particles (see Figure 10).

The average amount of sewage sludge ash generated over the last five years is approximately 5,500 tonnes per year or 13 kilograms per person per year.

Until 2008, sewage sludge ash was taken to the W12A Landfill for disposal. Between 2008 and 2014, some or all of the ash each year was taken to St. Marys Cement where the ash was incorporated into the cement making process. In 2015, St. Marys Cement stopped taking the ash and has advised the City that it is "*very unlikely that we will resume use of this ash in the foreseeable future*" because the variation in ash makes it difficult to incorporate into the cement making process.

Figure 10 – Sewage Sludge Ash

The report *Greenway PCP Solids Options Study* (R.V. Anderson, 2011) considered sewage sludge projections and the capacity of the incinerator. The report concluded that the incinerator would have capacity lasting beyond 2070.

The assumptions used to estimate the amount of sewage sludge ash to be managed in the future are presented in Table 13 (next page).

Table 13 – Sewage Sludge Ash Waste Assumptions

Assumption	Rationale
Sewage sludge ash waste generation will be 13 kilograms per person in 2019.	Average generation rate for the last five years excluding 2015. A large quantity of historical ash stored at Greenway was removed and disposed of in 2015.
There will be no change in the generation rate in future years.	Historical information shows changing quantities over the years but no increasing or decreasing trend.
Sewage sludge ash waste generation would increase at the same rate as population growth.	Increasing sewage sludge ash waste will be proportional to increase in population.
The Greenway incinerator will have sufficient capacity until at least 2070.	Based on the findings in the report *Greenway PCP Solids Options Study* (R.V. Anderson, 2011).
No sewage sludge ash would be managed by St. Marys Cement.	Based on communications with St. Marys Cement.

3.6 Biosolids

As noted in the previous section, approximately 90% to 95% of the City's sewage sludge is incinerated at Greenway. Until 2006, raw sewage sludge was landfilled when the incinerator was down for maintenance or repairs (5% to 10% of the time). Beginning in 2007, the sewage sludge was treated by lime stabilization before being landfilled (treated sewage sludge is referred to as Biosolids).

The average amount of Biosolids generated over the last ten years is approximately 5,300 tonnes per year or 13 kilograms per person per year. The City is currently looking at two options for managing Biosolids when the incinerator is down instead of landfilling.

In 2008 to 2010, the City looked at using the lime stabilized Biosolids as an agricultural amendment. The Biosolids contain beneficial levels of nitrogen, ammonia, potassium and calcium. Application of the Biosolids to agricultural land is restricted to certain times of the year when the material is required, while production of the Biosolids can occur at any time because of the need for unexpected repairs or maintenance of the incinerator. The inability to find a storage solution for the Biosolids when agricultural land was not available made this option impractical. This option will be explored again given the passage of time.

Lime Stabilized Biosolids

- Approximately 37% solids and 63% water
- Produced by adding approximately 20% (by weight) lime to the sewage sludge
- Lime raises pH to 12 or higher, which kills bacteria or viruses
- Reduced odours

The Province introduced new Composting Guidelines in 2012, which allow for adding sewage sludge Biosolids as feedstock material in the production of Category A or B compost but not for Category AA (highest quality compost). Sewage Biosolids are limited to a maximum of 25% of the feedstock blend (on a dry weight basis). This option is currently being explored.

The assumptions used to estimate the amount of Biosolids to be managed in the future are presented in Table 14.

Table 14 – Biosolids Waste Assumptions

Assumption	Rationale
Sewage sludge ash waste generation will be 13 kilograms per person in 2019.	Average generation rate for the last five years.
There will be no change in the generation rate in future years.	Historical information shows changing quantities over the years but no increasing or decreasing trend.
Biosolids generation will increase at the same rate as population growth.	Increasing Biosolids will be proportional to increase in population.
Biosolids will continue to be landfilled.	This assumption may change if the City is successful in finding another option for the management of Biosolids.

3.7 Street Sweepings/Road Works

Each year, the City removes the sand, salt, leaves and debris left on roads from the winter season through its street sweeping program. London, like most municipalities in Ontario, landfills street sweepings because of the debris, salt and other potential contaminants.

Consideration of various management options for street sweepings suggests that using this material as landfill cover is the most practical use at this time. Sometimes this is not possible because of the time of the year (e.g., already excess cover material available), weather conditions (e.g., dry and windy resulting in dust from the stockpiles) or the amount of debris in the street sweepings. It is estimated that approximately 50% of the street sweepings is used as cover material and 50% is disposed of as waste.

Consideration of Other Management Options for Street Sweepings

Screen and Reuse as Winter Sand

- Sand loses its sharp edges after being used
- Does not provide sufficient traction compared to new sand

Screen and Reuse as Fill

- Contamination from salt and other compounds generally prevents reuse
- Litter and other debris in street sweepings would have to be removed before reuse

Process for Commercial Uses

- Historically it has not been practical to re-process to use as foundry sand, in cement making or as sandblasting sand

The City also often has excess soil from road, sewer or water main maintenance and repairs. Like street sweepings, this material often needs to come to the landfill because of debris or potential contaminants such as road salt.

The amount of street sweepings can vary wildly from year to year because the amount generated is directly linked to the length and severity of the winter. The amount of road work material depends on the number of projects and what is encountered.

Over the last five years the annual quantity of street sweepings/road works has varied from 46,000 tonnes to 57,000 tonnes with an average of 51,000 tonnes (120 kilograms per person per year).

The assumptions used to estimate the amount of street sweepings and road works waste to be managed in the future are presented in Table 15.

Table 15 – Street Sweepings/Road Works Waste Assumptions

Assumption	Rationale
Street sweepings/road works waste generation will be 120 kilograms per person in 2019.	Average generation rate for the last five years.
The amount of street sweepings/road works waste generated per person is not expected to increase or decrease in the future.	The quantity generated per person is highly variable year to year but does not appear to be increasing or decreasing over the long term.
Street sweepings/road works waste generation will increase at the same rate as population growth.	Increase in roads (and therefore street sweepings/road works waste) will be proportional to increase in population.
Street sweepings/road works will continue to go to the landfill in the future with 50% being used as cover material.	Expected to continue existing practices for the foreseeable future.

3.8 Other Municipal Operations

Other Municipal Operations consist of waste generated by City operations excluding street sweepings, biosolids and sewage sludge ash. This includes non-recyclable waste from City parks, residuals from the City's material recovery facility and grit from pollution control plants.

Over the last five years the annual quantity of waste from Other Municipal Operations has varied from 7,800 tonnes to 11,300 tonnes with an average of 9,300 tonnes (22 kilograms per person per year). There is limited opportunities to divert this material from disposal.

The assumptions used to estimate the amount of waste from Other Municipal Operations to be managed in the future are presented in Table 16.

Table 16 – Other Municipal Operations Waste Assumptions

Assumption	Rationale
Other Municipal Operations waste generation will be 22 kilograms per person in 2019.	Average generation rate for the last five years.
The amount of Other Municipal Operations waste generated per person is not expected to increase or decrease in the future.	The quantity generated per person is highly variable year to year but does not appear to be increasing or decreasing over the long term.
Other Municipal Operations waste generation will increase at the same rate as population growth.	Increase in Other Municipal Operations will be proportional to increase in population.
Other Municipal Operations waste will continue to go to the landfill in the future.	Expected to continue existing practices for the foreseeable future.

3.9 Water Treatment Plant Process Residuals

This waste is generated when turbid water from the lakes is pumped into the water treatment plants and the suspended solids causing the turbidity are removed. The residuals are generated from filtered backwash wastewater and other intermittent plant process waste streams. This process residual is soil-like in nature (i.e., suspended sediment from turbid lake water).

A picture of the water treatment plant process residuals and the water treatment plant process residuals being loaded onto a truck for transport is shown below (Figure 11).

Figure 11 – Water Treatment Plant Process Residuals

The City received approval in May 2016 to accept water treatment plant process residuals from the Lake Huron and Elgin Area water treatment plants at the W12A Landfill for disposal. It is estimated that these facilities generate approximately 13,000 tonnes per year of process residuals. The Elgin Area residuals are disposed of at the W12A Landfill while the Lake Huron residuals are currently being managed at other locations. It is

expected these other locations will no longer be able to accommodate the Lake Huron process residuals in the next couple of years.

The City will look at the potential for the process residuals to be used as cover material and thereby not consume any landfill space. The City can consider this because the material has few to no odours and chemical testing of the material shows that it generally meets soil quality standards for industrial land use. However, the high moisture content and fine uniform nature of the sediment may make it difficult to spread over the waste and limit its effectiveness as cover material. It may also be more difficult to use in the winter because of freezing due to the high water content of the material. Blending the process residuals with other cover material may address these practical limitations. For the purpose of estimating future Residual Waste quantities, it will be assumed that the process residuals cannot be used as cover material.

Rules for Using Non-Soil Material as Landfill Cover

- No offensive odours
- Can be spread in 150 mm layers
- Chemical testing demonstrates it meets soil quality standards for industrial land use (does not have to meet residential or agricultural land use standards)

The assumptions used to estimate the amount of waste from water treatment plant operations to be managed in the future are presented in Table 17.

Table 17 – Water Treatment Plant Waste Assumptions

Assumption	Rationale
The W12A Landfill will receive all water treatment plant process residuals by 2025 (or earlier).	Elgin Area Treatment Plant residuals are disposed of at the W12A Landfill. Lake Huron Treatment Plant residuals expected to come to the W12A Landfill in the future.
Water treatment plant process residuals generation will be 13,000 tonnes (30 kilograms per person per year) in 2019;	Based on combination of design information and weighted quantities.
Water treatment plant process residuals will increase at the same rate as population growth.	Amount of water processed for use is assumed to be directly proportional to population.

3.10 Contaminated Soil

The W12A Landfill is licensed to accept contaminated soil. Depending on the level of contamination, the soil is either buried as waste or used as cover material.

The quantity of material being received at the W12A Landfill has changed over time. Beginning in 2002, the landfill started to receive more contaminated soil when it lowered the tipping fee for this material. Prior to 2002, most contaminated soil was exported to other landfills in Southern Ontario or Michigan. More recently the amount of contaminated soil being accepted at the W12A Landfill has decreased with the opening of a nearby contaminated soil processing facility by Green for Life (GFL) in Thames Centre in 2013.

On average, the landfill received 20,000 tonnes per year over the last five years and 30,000 tonnes per year in the five years prior to the GFL facility opening. It is believed that prior to the opening of the GFL facility, the W12A Landfill received the majority of contaminated soil generated in London, with an unknown amount exported to nearby landfills.

The assumptions used to estimate the amount of contaminated soil to be managed in the future are presented in Table 18.

Table 18 – Contaminated Soil Assumptions

Assumption	Rationale
The W12A Landfill will receive approximately 48 kg/person of contaminated soil in 2019.	Average generation rate since the opening of the GFL contaminated soil processing facility.
The amount of contaminated soil generated per person is not expected to increase or decrease in the future.	The quantity generated is highly variable year to year but does not seem to be increasing or decreasing over the long term.
60% of the material will be used as cover material and 40% of the material will be buried as waste	Based on historical trends. Expect to continue existing practices for managing contaminated soil for the foreseeable future.

3.11 Residual Waste Quantity Projections from Existing Service Area

Residual Waste quantity (by weight) projections were developed for the existing service area taking into account the City's population projections (Appendix D) coupled with the projected generation and diversion rates (Table 19) for each of the waste type. These calculations are presented in Appendix G and summarized in Table 20.

Table 19 – Summary of Waste Generation and Diversion Rates

Waste Type	2018 Generation Rate (kg/person)	Diversion Rate 2018	Diversion Rate 2025	Diversion Rate 2030	Diversion Rate 2050	Comments
Residential	400	45%	60%	60%	60%	Reach 60% by end of 2022
IC&I	420	20%	25%	30%	50%	No export by 2025
CR&D	340	55%	55%	55%	55%	No export by 2025
Sewage Sludge Ash	13	-	-	-	-	
Biosolids	13	-	-	-	-	
Street Sweepings	120	50%	50%	50%	50%	50% used as cover
Other Municipal	22	-	-	-	-	
WTP Residuals	30	-	-	-	-	
Contaminated Soil	48	60%	60%	60%	60%	60% used as cover
Total	1406					

Table 20 - Residual Waste Generation Projections (Weight)

Year	New Landfill Years	Annual Quantity (tonnes)	Running Total (tonnes)	Running Total After 2023 (tonnes)
2019	-	289,000	-	-
2024	0	362,000	2,000,000	362,000
2028	5	371,000	3,400,000	1,800,000
2033	10	377,000	5,200,000	3,700,000
2038	15	378,000	7,200,000	5,600,000
2043	20	380,000	9,200,000	7,500,000
2048	25	380,000	11,000,000	9,400,000

4.0 Residual Waste from Regional Service Area

As discussed in Section 2.0, the Amended ToR proposes a regional service area for the W12A Landfill. The regional service area would consist of the City of London plus Elgin County, Middlesex County, Huron County, Lambton County and Perth County.

Regional Service Area
• Approximately 185,000 households • Disposed of 86,000 tonnes of residual residential waste in 2017 • Diverted 52,000 tonnes of waste for an average diversion rate of 38% in 2017

4.1 Potential to Export

As noted in the *Strategy for a Waste-Free Ontario* (page 25) - *"while Ontario strives for a waste-free future, there will still be a need for landfill space as we work towards this goal*". Currently Ontario has a lack of landfill capacity to meet its needs and there are limited options available for municipalities within the proposed service area to manage their Residual Waste should their current disposal location not be available.

- **Ontario has a Landfill Capacity Deficit** - Ontario has a net deficit of landfill capacity for Residual Waste with over 2 million tonnes of solid non-hazardous waste from Ontario being exported to the U.S. annually. Waste projections suggest this deficit will continue for the foreseeable future.

- **Limited Disposal Options outside of the Proposed Regional Service Area -** As small landfills in the proposed regional service area close, the municipalities will need a place to dispose of their Residual Waste. There are only three landfills in the Province outside of the proposed regional service area that are approved to accept their waste.

  All these landfills are located some distance away (Moose Creek Landfill in eastern Ontario, Niagara Waste Systems in Niagara Region and the Essex-Windsor Landfill in Essex County). Their distant location increases the cost and GHG emissions of managing waste from the proposed regional service area. In addition, the Niagara Waste Systems landfill already receives its maximum annual waste allowed and cannot take on new customers; the Moose Creek landfill receives close to its maximum annual waste allowed (within 10%) and has limited ability to take on new customers; and the Essex-Windsor landfill can only accept waste from a portion of the proposed regional service area (Lambton County and Elgin County).

- **Limited Disposal Options within the Proposed Regional Service Area –** There are two larger landfills located within the proposed regional service area (Green Lane Landfill owned by the City of Toronto and Twin Creeks Landfill owned by Waste Management) that accept waste from other municipalities. Toronto is discouraging waste from new locations to come to the Green Lane landfill. This leaves only one local operating landfill within the proposed regional service area that is likely to accept waste from municipalities who are seeking Residual Waste disposal capacity.

4.2 Residual Waste Quantities

Calculation of the amount of waste that could come to the W12A Landfill from the proposed regional service area is presented in Appendix H and summarized below:

- Residential Residual Waste quantities for each municipality in the proposed regional service area were updated with data from the 2017 Resource Productivity and Resource Authority (RPRA) Datacall and presented in Table 21. The previous report *Residual Waste Projections & Landfill Capacity Assessment* (City of London, 2018) used the 2016 RPRC Datacall.
- IC&I waste quantities were assumed to be equal to residential waste quantities as there is limited public data on IC&I Residual Waste quantities within the proposed regional service area. It is noted that the Province as a whole generates more IC&I Residual Waste than residential Residual Waste.
- It was assumed that there is no increase in population or per capita waste generation rate in the future.
- Information on the operating landfills within the proposed regional service area was confirmed. Three landfills included in the previous report were closed in 2018. The remaining site life of the 21 operating landfills (see Table 22) within the proposed regional study area were obtained from public sources (e.g., MECP, annual report, website, etc.) or by contacting the owner of the landfill.
- Disposal locations for municipalities in the expanded service area were updated where changes had occurred. The three landfills that closed serviced four municipalities, which had to find new disposal locations. The disposal locations of all municipalities in the proposed regional service area are presented in Appendix H (Tables H-3 to H-6).
- It was assumed larger landfills within the expanded service area (Twin Creeks Landfill and City of Stratford Landfill) would be expanded when their current capacity is exhausted and therefore no waste would come to the W12A Landfill from municipalities using these landfills.
- It was assumed that the St. Marys Landfill that is currently going through an EA will be expanded and therefore no waste would come to the W12A Landfill from St. Marys.
- It was assumed that the Green Lane Landfill owned by the City of Toronto will continue to accept waste from local municipalities until the current capacity is exhausted and then close.
- Four total waste diversion scenarios were considered ranging from no increase in total waste diversion to meeting the interim total waste diversion goals in *Strategy for a Waste-Free Ontario* (see Table 23).

The results of the four scenarios are presented in Appendix H and summarized in Table 24. They show Residual Waste quantities ranging from 0.4 million to 0.9 million tonnes.

As noted earlier in Section 2.3:

- The interim total waste diversion goals in *Strategy for a Waste-Free Ontario* are aggressive (aspirational) targets.

- There are many unknowns associated with implementation of these goals, which will require major changes to how business is done in Ontario including moving to a Circular Economy.
- The province has not been able to meet any of the previous targets except for the 25% waste diversion (by 1989), but meeting this target took over two decades longer than proposed.

Considering the above, the Residual Waste quantity projections from the proposed regional service area should take into consideration the Provincial policies and the interim total solid waste diversion goals, but there should be an allowance to accommodate some additional Residual Waste if the total interim waste diversion goals are not met.

It should be noted that City has a waste diversion relationship with many of the municipalities in the regional service area. This includes:

- development and operation of the Manning Drive Regional Material Recovery Facility that provides recycling services to several area municipalities. This facility has allowed these municipalities to increase the amount and number of residential materials they recycle.
- operation of a Household Special Waste Depot that is licensed to receive MHSW from municipalities in Middlesex County and Elgin County. This is the only location for residents and small waste generators in some of these municipalities to take their MHSW.
- involvement of nearby municipalities in waste management planning in the past (e.g., London-Middlesex Waste Management Master Plan).
- continue to participate in developing and commenting on provincial waste diversion initiatives through City's participation with the RPWCO Waste Subcommittee (London is the Co-Chair) and through the Municipal 3Rs Collaborative (M3RCs – London is one of several representatives from RPWCO). This includes work on regional solutions to increase waste diversion, enhance environmental protection and contain/lower costs.
- recently approaching municipalities in the regional service area to determine their interest in being part of a long-term resource recovery strategy that includes a focus on new, emerging and next generation energy recovery and/or waste conversion technologies that typically benefit from having a larger service area to attract materials for processing (i.e., beyond existing recycling and waste diversion programs).

To encourage waste diversion, including food and organic waste, from the regional service area and help municipalities meet their obligations under the various provincial waste management policies, including *Ontario's Food and Organic Waste Policy Statement,* the City will assist municipalities by continuing the abovementioned initiatives, as well as addressing, promoting and helping to educate landfill customers about waste prevention and reduction, regulatory changes and resource recovery initiatives.

The City will also consider requiring waste generators from the regional service area to demonstrate that they have programs and diversion rates consistent with provincial policies, or the intention to have them in place, before being allowed to use the W12A Landfill.

In selecting a total waste diversion rate for planning purposes, a balance must be achieved between not picking a rate that is too low and therefore having excess capacity and conversely not picking a total waste diversion rate for the regional service area that is too high and therefore not having enough Residual Waste disposal capacity to accommodate waste that is generated in the future. The rate selected must also be consistent with the municipalities and other waste generators in the regional service area meeting their obligations under the various provincial policies including *Ontario's Food and Organic Waste Policy Statement*.

It is proposed that Residual Waste quantities from the proposed regional service area will be estimated by assuming diversion rates achieve 80% of the interim waste diversion goals in *Strategy for a Waste-Free Ontario,* resulting in 0.5 million tonnes of Residual Waste received at the W12A Landfill over the 25-year planning period. This is achieved by growing existing total diversion from approximately 29% in 2020 to approximately 66% in 2050. It is not possible to break the regional service area total diversion rate down further as there is insufficient data however to accomplish such a significant increase in total diversion it is assumed that a large component must be coming from food and organic waste diversion.

It is noted that this estimate of Residual Waste quantities is for planning purposes and there are many uncertainties in addition to the assumptions used in the calculations. Some of these uncertainties include:

- Some smaller landfills may not be able to use all their disposal capacity due to environmental considerations. For example, the two landfills owned by the Township of Southwest Middlesex were closed in 2018 because of environmental performance upgrades required by MECP. One has been permanently closed and the other may or may not reopen in the future.
- The City of Toronto is sending some of its waste to other landfills to extend the life of the Green Lane Landfill to 2040. Green Lane Landfill would close sooner if Toronto sends all of its waste to Green Lane Landfill. In addition, Toronto is discouraging waste from new locations from coming to the Green Lane landfill. There is the possibility Toronto could discourage existing local customers from using the landfill in the future.
- The on-going provincial waste disposal capacity deficit may allow private landfills accepting waste from within the proposed regional service area to seek out other waste for which they can charge higher tipping fees, especially if there is any disruption in the export option.

Table 21 – Residential Residual Waste Quantities by Municipality

Municipality	Expressed Interest in Using W12A Landfill[a]	Residential Residual Waste[b] (2017, tonnes)	Total Residential Waste Diverted[b] (2017, tonnes)	Total (tonnes)
City of St. Thomas	yes	10,179	7,672	17,851
Town of Aylmer	yes	1,916	561	2,477
Municipality of Bayham	yes	1,024	642	1,666
Municipality of Central Elgin	yes	3,383	1,070	4,453
Municipality of Dutton/Dunwich	yes	896	339	1,235
Municipality of West Elgin	yes	833	392	1,225
Township of Malahide	yes	1,614	586	2,200
Township of Southwold	No response	862	322	1,184
Municipality of Adelaide Metcalfe	yes	402	256	658
Municipality of Lucan Biddulph	yes	708	450	1,159
Municipality of Middlesex Centre	yes	2,366	1,505	3,870
Municipality of North Middlesex	yes	924	588	1,512
Municipality of Southwest Middlesex	yes	861	619	1,480
Municipality of Strathroy-Caradoc	yes	3,258	2,072	5,330
Municipality of Thames Centre	yes	3,344	1,150	4,494
Village of Newbury	yes	47	49	96
Township of Ashfield-Colborne-Wawanosh	yes	1,274	838	2,112
Municipality of Bluewater	yes	1,746	1,111	2,857
Municipality of Central Huron	yes	1,473	937	2,410
Town of Goderich	yes	1,453	866	2,318
Township of Howick	yes	420	387	807
Municipality of Huron East	yes	305	901	1,205

Municipality	Expressed Interest in Using W12A Landfill[a]	Residential Residual Waste[b] (2017, tonnes)	Total Residential Waste Diverted[b] (2017, tonnes)	Total (tonnes)
Municipality of Morris-Turnberry	yes	498	296	794
Township of North Huron	yes	1,126	1,431	2,557
Township of South Huron	yes	1,789	1,138	2,927
City of Stratford	yes	7,315	5,241	12,556
Town of St. Marys	yes	1,192	758	1,950
Municipality of North Perth	yes	2,058	1,309	3,367
Township of Perth East	yes	1,573	1,000	2,573
Township of Perth South	yes	551	351	902
Municipality of West Perth	yes	1,348	858	2,206
Municipality of Brooke-Alvinston	yes	383	244	627
Township of Dawn-Euphemia	yes	324	207	531
Township of Enniskillen	yes	286	245	531
Municipality of Lambton Shores	yes	2,701	1,718	4,418
Village of Oil Springs	yes	110	70	180
Town of Petrolia	yes	1,546	621	2,167
Town of Plympton-Wyoming	yes	1,782	556	2,338
Village of Point Edward	yes	135	223	358
City of Sarnia	yes	17,030	10,639	27,669
Township of St. Clair	yes	4,653	1,346	5,999
Township of Warwick	yes	552	351	903
Total	**-**	**86,238**	**51,915**	**138,153**

Notes a) Responses from municipalities are provided in Appendix B.
b) From the Resource Productivity and Resource Authority Datacall.

Table 22 – Remaining Site Life of Landfills in Study Area

Landfill	Projected Closing Date	Comment
Morris Ward Landfill	2023	
W12A Landfill	2024	
Howick Landfill	2026	
West Elgin Landfill	2026	
Kellam Road Landfill	2032	
School Road Landfill	2032	
Dawn Landfill	2034	
Twin Creeks	2034	Assume landfill is expanded in the future.
Green Lane (Toronto)	2040	
Stanley Landfill	2044	
Stratford Landfill	2047	Assume landfill is expanded in the future.
St. Marys Landfill	2058	Assume proposed 40-year expansion is approved.
Ashefield Landfill	2062	
Thames Centre Landfill	2075	
Elam Landfill	2100	
South Easthope Landfill	2100	
Mitchell Landfill	2115	
Dutton/Dunwich Landfill	2133	
Wingham Landfill	>2090	
Perth South Landfill	>2100	
South Huron Landfill	>2100	

Table 23 – Total Waste Diversion Rate Scenarios

Scenario	2018	2020	2030	2050
No increase in total waste diversion rates	25%	25%	25%	25%
Increase in total diversion rates half way towards MECP diversion targets[a]	25%	28%	38%	53%
Increase in total diversion rates 75% of the way towards MECP diversion targets[a]	25%	29%	44%	66%
Increase in total diversion rates 100% of the way towards MECP diversion targets[a]	25%	30%	52%	80%

Notes a) Interim waste diversion goals from *Strategy for a Waste-Free Ontario Building a Circular Economy* (MOECC, 2017) (2017)

Table 24 – Summary of Residual Waste for Various Total Waste Diversion Scenarios

Scenario	Residual Waste (millions)	Total Diversion Rate in 2050	Percentage of MECP goal
No increase in total waste diversion rates	0.9	25%	30%
Increase in total diversion rates half way towards MECP diversion targets	0.7	53%	66%
Increase in total diversion rates 75% of the way towards MECP diversion targets	0.5	66%	80%
Achieve 100% of MECP total diversion targets	0.4	80%	100%

5.0 Landfill Capacity Assessment

As previously noted, the landfill expansion will need to accommodate approximately 9.4 million tonnes from the existing service area and approximately 0.5 million tonnes from the proposed regional service area for a total of 9.9 million tonnes of disposal capacity between 2024 and 2048. The volume of landfill airspace required to accommodate waste is typically calculated by multiplying the number of tonnes of waste to be disposed by the landfill utilization rate. The landfill utilization rate is the amount of space (cubic metres, m^3) needed to manage an average tonne of waste including daily and intermediate cover material.

The W12A Landfill has received 9,098,000 tonnes since it opened through the end of 2018 and has used 10,950,000 m^3 of space (excluding final cover) for a historical landfill utilization rate of 0.8 tonnes/m^3. This is equivalent to approximately 80% of the landfill volume being consumed by waste with an average compacted waste density of 1 tonne/m^3 and 20% of the landfill volume being consumed by cover material (approximately 4 to 1 waste to soil cover ratio).

There is a range of average waste density and waste to cover ratios used in converting tonnage to volume for the purpose of estimating the required airspace for new or expanding landfills. For expanding landfills, where data is available, it is considered appropriate to use information available from the existing site, assuming that in the future the nature of the materials to be disposed and the method of placement and compaction will not change significantly from current operations. Typical average compacted densities can range from 0.80 to 1.1 tonnes/ m^3 and a 4 to 1 waste to cover ratio is often assumed, with corresponding utilization rates of about 0.64 to 0.9 tonnes/ m^3.

The higher utilization rate achieved by the W12A Landfill is directly attributable to the significant quantity of ash, contaminated soils and other heavier and more densely compactible materials that the landfill has received in the past. It is anticipated the utilization rate will be lower in the future because the proportion of “denser” materials will decrease (e.g., less ash in the future as the historical ash quantities included Energy From Waste (EFW) ash, less contaminated soil in the future because of the contaminated soil processing facility opened by GFL in Dorchester in 2013; more residential and IC&I waste because of the expanded regional service area).

For the purpose of estimating future disposal needs, a landfill utilization rate of 0.72 tonnes/m^3 has been used, which is the midway point between 0.80 tonnes/m^3 (current rate) and 0.64 tonnes/m^3 (low end of range for landfill utilization rates).

For the 25 year planning period, the expansion of the W12A Landfill should consider the need for an additional disposal volume of 13,800,000 m^3 based on a landfill utilization rate of 0.72 tonnes/m^3.

Appendix A
Technical Jargon

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Acronym/Term	Definition
(the) Site	(the) W12A Landfill located at 3502 Manning Drive, London, Ontario.
(the) undertaking	The activities associated with the Environmental Assessment for the proposed expansion of the W12A Landfill.
CR&D	Construction, Renovation and Demolition (waste).
Council	The municipal council for the City of London.
Diversion Rate	The total amount of waste diverted from disposal (by reduction, reuse, recycling and organics management programs) divided by the total amount of waste generated expressed as a percentage.
Environmental Assessment (EA)	Environmental assessment is a study, which assesses the potential environmental effects (positive or negative) of a proposal. Key components of an environmental assessment include consultation with government agencies and the public; consideration and evaluation of alternatives; and the management of potential environmental effects. Conducting an environmental assessment promotes good environmental planning before decisions are made about proceeding with a proposal. This is also referred to as an “individual” environmental assessment.
***Environmental Assessment Act* (EAA)**	The *Environmental Assessment Act* is a provincial statute that sets out a planning and decision making process to evaluate the potential environmental effects of a proposed undertaking. Proponents wishing to proceed with an undertaking must document their planning and decision making process and submit the results from their environmental assessment to the Minister of Environment, Conservation and Parks for approval.
Environmental Compliance Approval (ECA)	An approval issued by the Ministry of the Environment, Conservation and Parks for the establishment and operation of a waste management site/facility.
Golder	Golder Associates Ltd. The consultant used for the project.
Green Bin Program	Collection of source separated organics from residential properties. Commonly collected organics include food waste and non-recyclable paper (e.g., paper towels). Some programs include sanitary products (e.g., diapers) and pet waste.
IC&I	Industrial, Commercial and Institutional (waste).
Minister	Minister of the Environment, Conservation and Parks.
MECP	Ministry of the Environment, Conservation and Parks.

Acronym/Term	Definition
Municipal Hazardous and Special Waste (MHSW)	Municipal Hazardous and Special Waste consist of programs that are typically more toxic and require special handling and disposal. Many of these products can be recycled/reused (e.g., paint, oil, etc.).
Residual Waste	Waste that cannot be reduced, reused, recycled or composted is considered Residual Waste (waste that remains after all these activities).
Residual Waste Disposal Strategy	Strategy being developed by the City of London on how to manage Residual Waste until 2048 and involves completion of an Individual Environmental Assessment (EA) as prescribed by the Ministry of Environment, Conservation and Parks (MECP). The Individual EA requires approval by the Minister of Environment, Conservation and Parks and Cabinet.
Resource Recovery Strategy	Strategy being developed by the City of London on how to maximize waste reduction, reuse, recycling and resource recovery in an economical viable and environmentally responsible manner.
Site Life	The period of time during which the W12A landfill can continue to accept wastes.
Strategy for a Waste-Free Ontario	Document produced by the Ministry of Environment, Conservation and Parks in 2017 that sets the general direction (vision and goals) for managing waste in Ontario.
Terms of Reference	A document prepared by the proponent and submitted to the Ministry of the Environment, Conservation and Parks for approval. The Terms of Reference document sets out the framework for the planning and decision making process to be followed by the proponent during the preparation of an EA. In other words, it is the City of London's (the proponent's) work plan for what is going to be studied. If approved, the EA must be prepared according to this TOR. The TOR also provides the framework for evaluating the EA.
ToR	Terms of Reference.

Appendix B
Municipal Responses to Using W12A Landfill

Table B-1 Responses from Municipalities in 2017
about Participation in Regional Service Area

Table B-2 Responses from Municipalities in 2019
Confirming Participation in Regional Service Area

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Table B-1 Responses from Municipalities in 2017 About Participation in Regional Service Area

Municipality	Support for Regional Service Area	Comments
Huron County	Yes	Responsibility for waste management planning and waste disposal is at the upper tier (County) level.
Township of Ashfield-Colborne-Wawanosh	no response	-
Municipality of Bluewater	interested/ may use	Also part of Bluewater Recycling Association (BRA) BRA supports regional service area.
Municipality of Central Huron[a]	interested/ may use	Also part of BRA. BRA supports regional service area.
Town of Goderich[a]	interested/ may use	Also part of BRA. BRA supports regional service area.
Township of Howick	no response	-
Municipality of Huron East[a]	interested/ may use	Also part of BRA. BRA supports regional service area.
Municipality of Morris-Turnberry	interested	Also part of BRA. BRA supports regional service area.
Township of North Huron	no response	-
Township of South Huron	no response	Part of BRA. BRA supports regional service area.
Lambton County	Yes	Responsibility for waste management planning is at the upper tier (County) level.
Municipality of Brooke-Alvinston[a]	no response	Part of BRA. BRA supports regional service area.
Township of Dawn-Euphemia	directed to County	Part of BRA. BRA supports regional service area.
Township of Enniskillen	no response	
Municipality of Lambton Shores	no response	Part of BRA. BRA supports regional service area.
Village of Oil Springs	no response	Part of BRA. BRA supports regional service area.
Town of Petrolia	no response	
Town of Plympton-Wyoming	no response	
Village of Point Edward	no response	
City of Sarnia	no response	
Township of St. Clair	interested/unlikely to use	
Township of Warwick	no response	Part of BRA. BRA supports regional service area.

Municipality	Support for Regional Service Area	Comments
Elgin County		No responsibility for waste management
Alymer	Yes	
Bayham	Yes	
Central Elgin	n.a.	Did not response to 2017 request
Dutton Dunwich	Yes	
Malahide	Yes	
Southwold	n.a.	Did not response to 2017 request
St. Thomas	Yes	
West Elgin	Yes	
Perth		No responsibility for waste management
North Perth	Yes	
Perth East	Yes	
Perth South	Yes	
West Perth	Yes	
St. Marys	Yes	
Stratford	Yes	
Middlesex		No responsibility for waste management
Adelaide Metcalfe	Yes	Directed decision to BRA. BRA supports regional service area.
Lucan Biddulph	Yes	Directed decision to BRA. BRA supports regional service area.
Middlesex Centre	Yes	Part of BRA. BRA supports regional service area.
Newbury	n.a.	Did not response to 2017 request
North Middlesex	Yes	Directed decision to BRA. BRA supports regional service area.
South-west Middlesex	Yes	
Strathroy-Caradoc	Yes	Directed decision to BRA. BRA supports regional service area.
Thames Centre	Yes	Already part of service area

Notes a) Member of Mid-Huron Site Board and have shared waste disposal facilities.

Table B-2 Responses from Municipalities in 2019 Confirming Participation in Regional Service Area

Municipality	Confirmed Support for Regional Service Area	Comments
Huron County	Yes	Responsibility for waste management planning is at the upper tier (County) level.
Lambton County	Yes	Responsibility for waste management planning is at the upper tier (County) level
Elgin County		No responsibility for waste management
Alymer	Yes	
Bayham	Yes	
Central Elgin	n.a.	Did not response to 2017 request
Dutton Dunwich	Yes	
Malahide	Yes	
Southwold	n.a.	Did not response to 2017 request
St. Thomas	Yes	
West Elgin	Yes	
Perth		No responsibility for waste management
North Perth	Yes	
Perth East	Yes	
Perth South	Yes	
West Perth	Yes	
St. Marys	Yes	
Stratford	Yes	
Middlesex		No responsibility for waste management
Adelaide Metcalfe	Yes	Previously directed decision to BRA. BRA continues to support regional service area.
Lucan Biddulph	Yes	Previously directed decision to BRA. BRA continues to support regional service area.
Middlesex Centre	Yes	Previously did not respond but is part of BRA
Newbury	n.a.	Did not response to 2017 request
North Middlesex	Yes	Previously directed decision to BRA. BRA continues to support regional service area.
South-west Middlesex	Yes	
Strathroy-Caradoc	Yes	Previously directed decision to BRA. BRA continues to support regional service area.
Thames Centre	Yes	Already part of service area

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Appendix C
Diversion Rates in Large Ontario Municipalities

The following appendices contain scanned documents and materials are from various sources and programs. We have endeavored to make this document as accessible as possible but realize that there may be limitations in this area. We are happy to provide you with detailed information and description about any of the materials in the appendices of the document. For a description of these materials for accessibility purposes, please contact Wesley Abbott, wabbott@london.ca, 226-376-2311 who will help provide you with the details you require.

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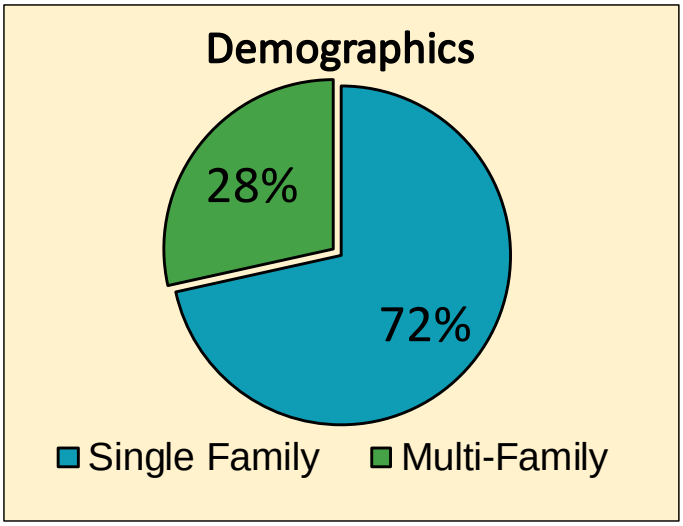
Essex-Windsor Solid Waste Authority (EWSWA)

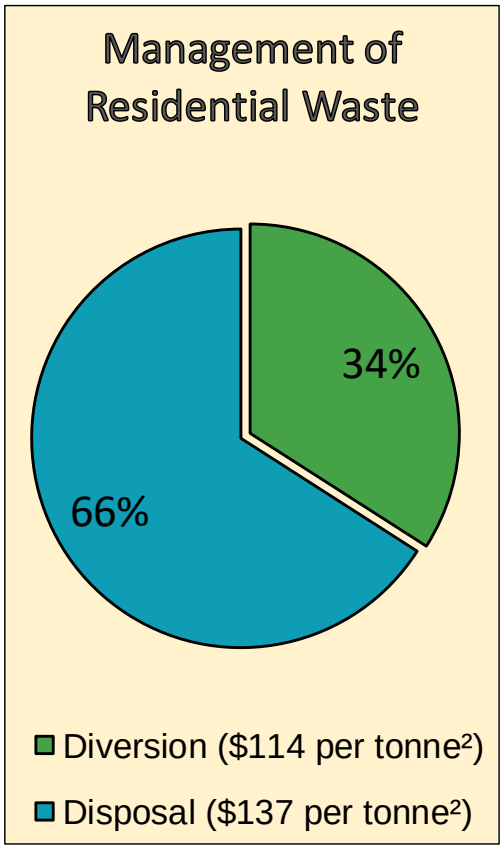
Demographics (2017)[1]		
Household Type	Number	%
Single Family	139,500	83
Multi-Family	28,700	33
Total	168,200	100

[1] Source: rpra.ca/programs/about-the-datacall/



Management of Residential Waste (2017)			
Category	Quantity[1] (tonnes)	Per Household	
		Kg/hhld	%
Diversion ($114 per tonne [2])			
Blue Box Recycling	23,500	140	15
Other Recycling	4,000	20	3
Green Bin	0	0	0
Leaf/Yard Materials	19,100	110	12
On-site	5,300	30	3
Other Programs	2,800	20	2
Subtotal	54,700	320	***34***
Disposal ($137 per tonne [2])			
Landfill	106,400	630	66
EFW	0	0	0
Subtotal	106,400	630	***66***
Total	161,100	950	100

[1] Source: rpra.ca/programs/about-the-datacall/
[2] Source: http://mbncanada.ca/app/uploads/2018/11/Waste-Management_2017.pdf



Explanation of above terms:

Other Recycling: wood (from construction, renovation and demolition materials), scrap metal, tires, electronics, etc.

On-site: on the property such as backyard composting

Other Programs: bottle deposit program, reuse, Municipal Household Special Waste, etc.

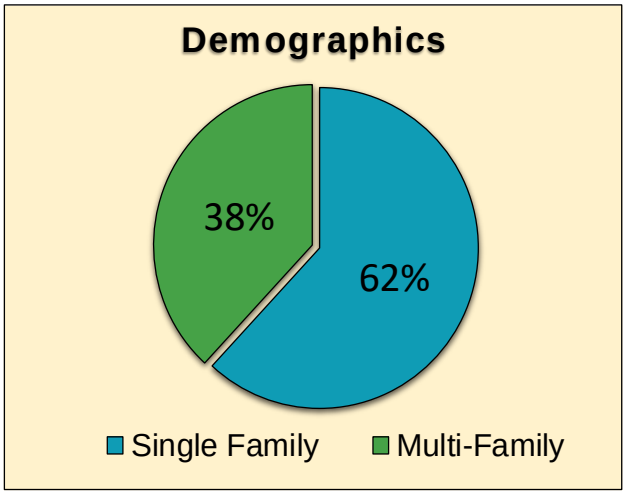
EFW: Energy-from-Waste

Long Term Waste Management Strategy/Plan
Planning Process • Essex-Windsor Solid Waste Authority's (EWSWA) Solid Waste Management Master Plan was released in 2011 (http://www.ewswa.org/wp-content/uploads/2011/03/Essex-Windsor-SWMMP-Update-APR-11-corrections_DRAFT.pdf).
Diversion • Goal is to reach a 60% diversion rate by 2019. • EWSWA intends to increase its current diversion rate of 38% through increasing outreach programs and looking at organic management options. • Undertook a study (Food and Kitchen Waste Diversion Feasibility Report) in 2013 which outlined potential strategies for organics management and concluded to "*not proceed with the collection and processing of residential food and kitchen waste since the program would not be ...economically sound at this time*".
Disposal • Continue to dispose of waste at its regional landfill (owned and operated by the EWSWA).
New, Emerging, and Next Generation Technologies • No recent investigations of new, emerging, and next generation technologies.

City of Guelph

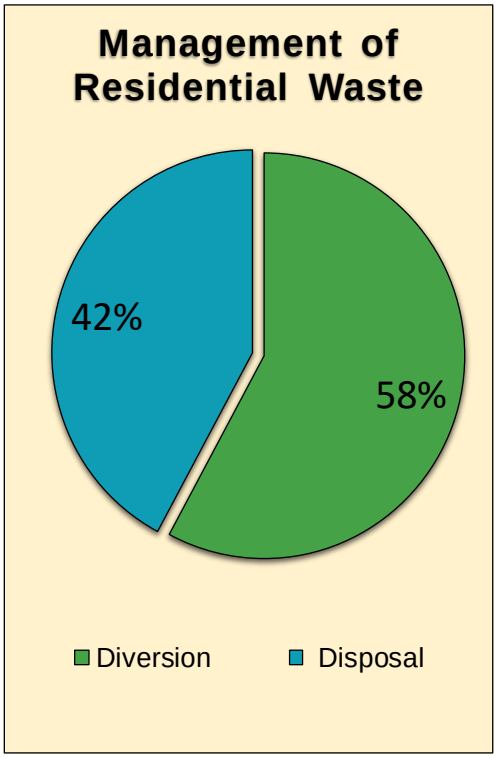
Demographics (2017)[1]		
Household Type	Number	%
Single Family	30,403	54
Multi-Family	26,409	33
Total	56,812	100

[1] Source: rpra.ca/programs/about-the-datacall/



Management of Residential Waste (2017)			
Category	Quantity[1] (tonnes)	Per Household	
		Kg/hhld	%
Diversion			
Blue Box Recycling	8,400	150	15
Other Recycling	4,700	80	8
Green Bin	10,200	180	18
Leaf/Yard Materials	6,900	120	12
On-site	2,300	40	4
Other Programs	1,000	20	2
Subtotal	33,500	590	**58**
Disposal			
Landfill	24,700	430	42
EFW	0	0	0
Subtotal	24,700	430	***42***
Total	58,200	1,020	100

[1] *Source: rpra.ca/programs/about-the-datacall/*



Explanation of above terms:

Other Recycling: wood (from construction, renovation and demolition materials), scrap metal, tires, electronics, etc.

On-site: on the property such as backyard composting

Other Programs: bottle deposit program, reuse, Municipal Household Special Waste, etc.

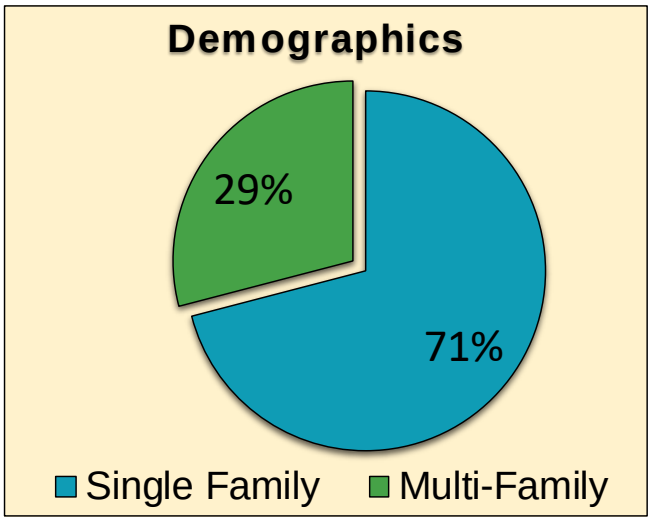
EFW: Energy-from-Waste

Long Term Waste Management Strategy/Plan
Planning Process • The solid waste master plan, a 25-year strategy, was approved in 2008 (http://guelph.ca/plans-and-strategies/solid-waste-management-master-plan/2008-solid-waste-management-master-plan/). • A review/update of the plan was completed in 2014 to provide strategic direction for the next 20 years (http://guelph.ca/plans-and-strategies/solid-waste-management-master-plan/).
Diversion • Goal is to reach a diversion rate of 70% by 2021. • Guelph is looking to increase its diversion through waste minimization programming, multi-residential recycling, reuse centre programming, open space and special event recycling, and residential construction and demolition waste recycling.
Disposal • Continue to export waste to landfill in the short term. Waste currently goes to Twin Creeks Landfill in Watford (signed a 10 year contract with Waste Management in 2013). • Waste disposal options including contractual arrangements and municipal partnerships will be explored in the long term.
New, Emerging, and Next Generation Technologies • At appropriate times in agreements and waste disposal contract cycles; explore alternatives to landfill, including Energy-from-Waste (EFW) technologies.

Regional Municipality of Halton

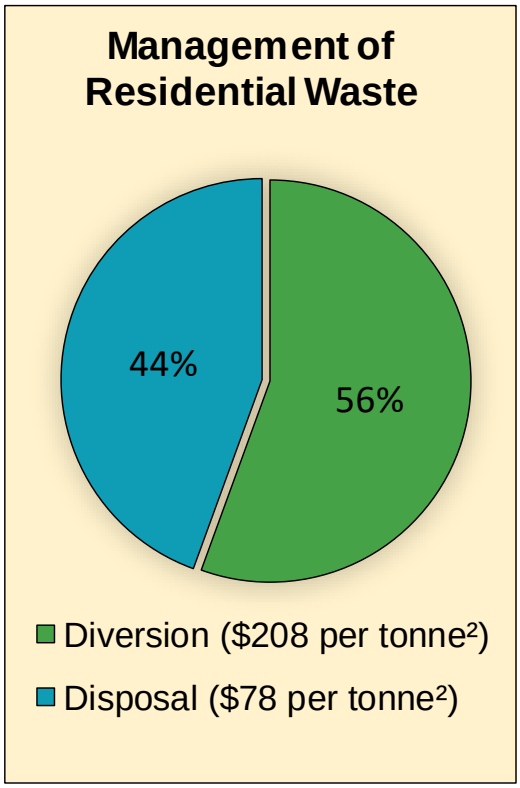
Demographics (2017)[1]		
Household Type	Number	%
Single Family	170,211	81
Multi-Family	41,049	33
Total	211,260	100

[1] Source: rpra.ca/programs/about-the-datacall/



Management of Residential Waste (2017)			
Category	Quantity[1] (tonnes)	Per Household	
		Kg/hhld	%
Diversion ($208 per tonne [2])			
Blue Box Recycling	43,700	210	21
Other Recycling	9,400	40	4
Green Bin	28,700	140	14
Leaf/Yard Materials	21,700	100	10
On-site	8,900	40	4
Other Programs	3,800	20	2
Subtotal	116,200	550	***56***
Disposal ($78 per tonne [2])			
Landfill	93,000	440	44
EFW	0	0	0
Subtotal	93,000	440	***44***
Total	209,200	990	100

[1] *Source: rpra.ca/programs/about-the-datacall/*
[2] *Source http://mbncanada.ca/app/uploads/2018/11/Waste-Management_2017.pdf*



Explanation of above terms:

Other Recycling: wood (from construction, renovation and demolition materials), scrap metal, tires, electronics, etc.

On-site: on the property such as backyard composting

Other Programs: bottle deposit program, reuse, Municipal Household Special Waste, etc.

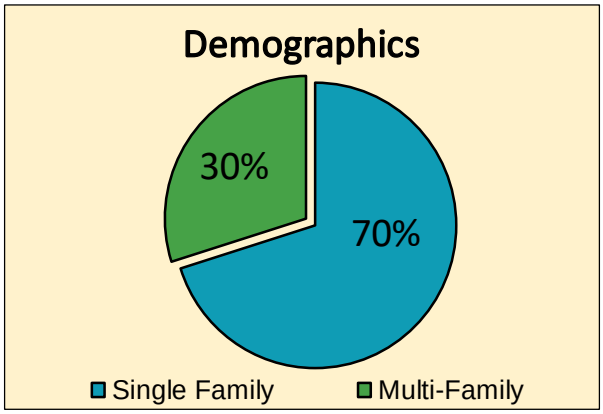
EFW: Energy-from-Waste

Long Term Waste Management Strategy/Plan
Planning Process
• The Regions "Rethinking our Waste" report was developed in 2011 and was created to manage solid waste from 2012-2016) http://www.halton.ca/cms/one.aspx?objectId=59887).
Diversion
• Goal is to reach a diversion rate of 65% by 2016. • To increase diversion the Region plans to enhance promotion, education, and outreach.
Disposal
• Continue to dispose of waste at the Halton Waste Management Site (owned and operated by the Region).
New, Emerging, and Next Generation Technologies
• Study completed in 2007 looking at EFW and thermal waste conversion technologies (pyrolysis and gasification). Region decided not to pursue this option. (http://www.halton.ca/cms/One.aspx?portalId=8310&pageId=27829).

City of Hamilton

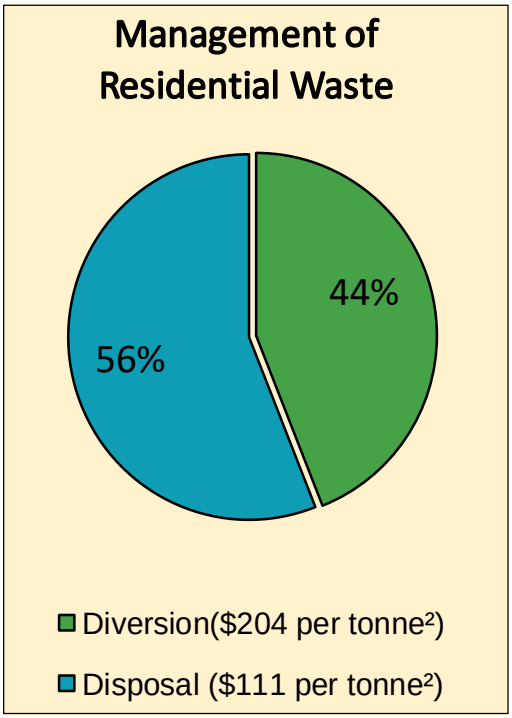
Demographics (2017)[1]		
Household Type	Number	%
Single Family	173,557	77
Multi-Family	50,572	33
Total	224,129	100

[1] Source: rpra.ca/programs/about-the-datacall/



Management of Residential Waste (2017)			
Category	Quantity[1] (tonnes)	Per Household	
		Kg/hhld	%
Diversion($204 per tonne[2])			
Blue Box Recycling	35,500	160	16
Other Recycling	4,300	20	2
Green Bin	31,000	140	14
Leaf/Yard Materials	17,000	80	7
On-site	9,000	40	4
Other Programs	3,900	20	1
Subtotal	100,700	460	***44***
Disposal ($111 per tonne[2])			
Landfill	127,000	570	55
EFW	0	0	0
Subtotal	127,000	570	***55***
Total	227,700	1,030	100

[1] Source: rpra.ca/programs/about-the-datacall/
[2] Source http://mbncanada.ca/app/uploads/2018/11/Waste-Management_2017.pdf



Explanation of above terms:

Other Recycling: wood (from construction, renovation and demolition materials), scrap metal, tires, electronics, etc.

On-site: on the property such as backyard composting

Other Programs: bottle deposit program, reuse, Municipal Household Special Waste, etc.

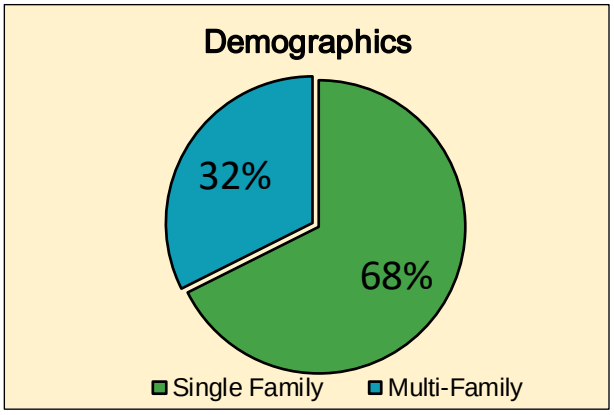
EFW: Energy-from-Waste

Long Term Waste Management Strategy/Plan
Planning Process   • Multi-year process resulted in approval of Solid Waste Management Master Plan in 2012. (*https://www.hamilton.ca/city-planning/master-plans-class-eas/solid-waste-management-master-plan*).   • The original Solid Waste Management Master Plan was developed and approved in 2001.
Diversion   • The status quo waste diversion programs should achieve a 55% waste diversion rate by 2021.   • The City's goal is to achieve a 65% waste diversion target using enhanced waste diversion programs. The opportunities to improve the City's waste diversion programs include targeted education, multi-residential waste diversion, adding materials to the recycling program where feasible, and extended producer responsibility.
Disposal   • Continue landfilling in the short term (at least five years).   • Partnered with the Niagara Region to complete a stabilized landfill review in 2007 (https://www.niagararegion.ca/government/works/wasteplan/Stabilized%20Landfill%20Report.pdf).
New, Emerging and Next Generation Technologies   • Hamilton, in partnership with Niagara Region, looked at long term residual waste management alternatives from 2003 to 2008 (https://www.niagararegion.ca/government/works/wasteplan/); plan originally recommended thermal technology with the recovery of recyclables as a preferred option, however because of changing circumstances coupled with sufficient landfill capacity both Niagara Region and Hamilton continue to landfill residual waste.   • Will examine alternative disposal technologies in the next Solid Waste Management Master Plan review scheduled for 2017.

City of London

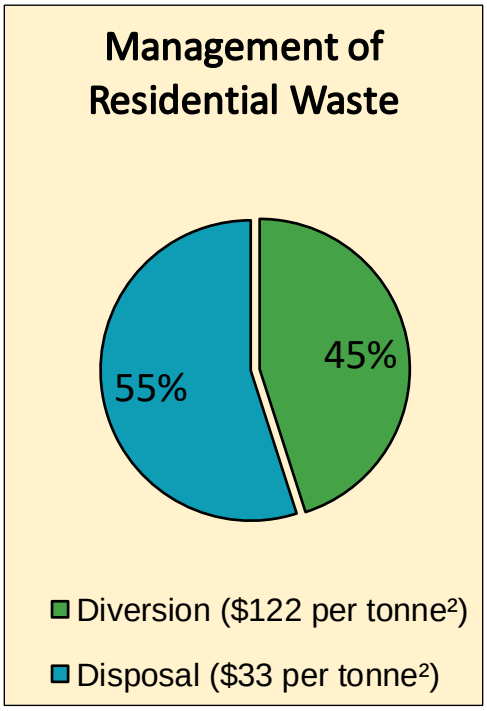
Demographics (2017)[1]		
Household Type	Number	%
Single Family	123,780	69
Multi-Family	55,920	33
Total	179,700	100

[1] Source: rpra.ca/programs/about-the-datacall/



Management of Residential Waste (2017)			
Category	Quantity (tonnes)[1]	Per Household	
		Kg/hhld	%
Diversion ($122 per tonne[2])			
Blue Box Recycling	22,800	130	14
Other Recycling	8,700	50	5
Green Bin	0	0	0
Leaf/Yard Materials	27,600	150	16
On-site	9,200	60	7
Other Programs	3,900	20	2
Subtotal	72,200	410	***45***
Disposal ($33 per tonne[2])			
Landfill	89,800	500	55
EFW	0	0	0
Subtotal	89,800	500	***55***
Total	162,000	910	100

[1] Source: rpra.ca/programs/about-the-datacall/
[2] Source http://mbncanada.ca/app/uploads/2018/11/Waste-Management_2017.pdf



Explanation of above terms:

Other Recycling: wood (from construction, renovation and demolition materials), scrap metal, tires, electronics, etc.

On-site: on the property such as backyard composting

Other Programs: bottle deposit program, reuse, Municipal Household Special Waste, etc.

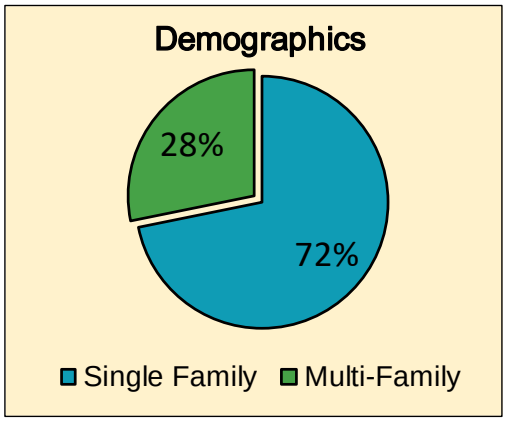
EFW: Energy-from-Waste

Long Term Waste Management Strategy/Plan
Planning Process
• The City's most recent diversion strategy (*Road Map 2.0 The Road to Increase Resource Recovery and Zero Waste* , December 2013) outlined a number of initiatives and programs that have the potential to increase residential waste diversion to 60%. (http://www.london.ca/residents/Garbage-Recycling/waste-management-planning/Pages/Road-Map-to-Waste-Diversion.aspx).
Diversion
• The City's does not have a specific diversion target but uses the principle of continuous improvement to maximize waste diversion. Recent initiatives implemented from the City's waste diversion strategy include a reduction in the waste container limit, curbside collection of Christmas trees and new pilot programs (e.g., community composting, food waste avoidance).
Disposal
• The City disposes of garbage at the W12A Landfill site which is owned and operated by the City of London. The W12A Landfill will reach capacity in 2025 based on the current amount of waste being received.
New, Emerging, and Next Generation Technologies
• Will be investigating new, emerging and next generation technologies during development of the new Resource Recovery Strategy.

Regional Municipality of Niagara

Demographics (2017)[1]		
Household Type	Number	%
Single Family	167,300	84
Multi-Family	31,700	33
Seasonal	0	0
Total	199,000	100

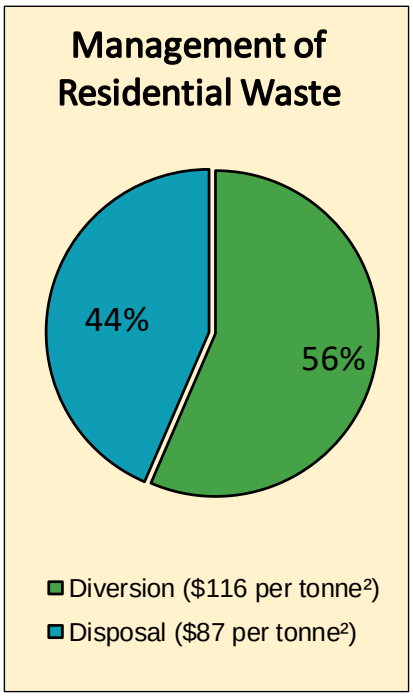
[1] Source: rpra.ca/programs/about-the-datacall/



Management of Residential Waste (2017)			
Category	Quantity (tonnes)[1]	Per Household	
		Kg/hhld	%
Diversion ($116 per tonne[2])			
Blue Box Recycling	36,700	180	18
Other Recycling	14,100	70	7
Green Bin	12,600	60	6
Leaf/Yard Materials	35,000	180	17
On-site	10,400	60	5
Other Programs	4,900	20	2
Subtotal	113,700	570	***56***
Disposal ($87 per tonne[2])			
Landfill	87,600	440	44
EFW	0	0	0
Subtotal	87,600	440	***44***
Total	201,300	1,010	100

[1] Source: rpra.ca/programs/about-the-datacall/

[2] Source http://mbncanada.ca/app/uploads/2018/11/Waste-Management_2017.pdf



Explanation of above terms:

Other Recycling: wood (from construction, renovation and demolition materials), scrap metal, tires, electronics, etc.

On-site: on the property such as backyard composting

Other Programs: bottle deposit program, reuse, Municipal Household Special Waste, etc.

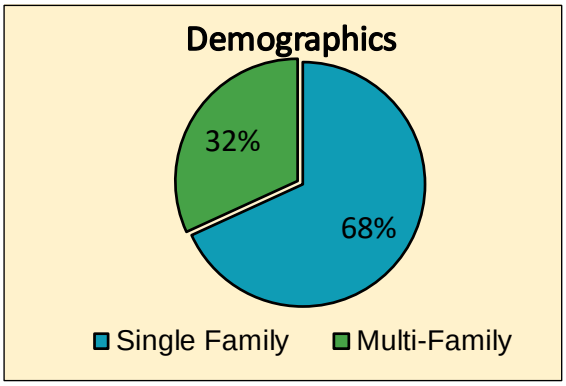
EFW: Energy-from-Waste

Long Term Waste Management Strategy/Plan
Planning Process   • Niagara Region does not currently have a Long Term Waste Management Strategy as they are currently waiting on Bill 151 implications. They are planning on starting work on their Long Term Waste Management Strategy in 2017.   • Niagara Region currently have their Blue Box Recycling plan for 2011-2015, and are in the process of updating this document. (*http://cif.wdo.ca/projects/documents/648.11-Niagara_Final_Report.pdf).*
Diversion   • Goal is to reach a diversion rate of 65% by 2021.   • To increase diversion the Region plans to expand and improve existing programs and increase public education, awareness and outreach as well as enforcement activities.
Disposal   • Continue to dispose of garbage using its two landfills, Welland Humberstone and West Lincoln (both owned and operated by the Region) as well as a private landfill (Walker Industries).   • Expansion of the Humberstone Landfill was approved in 2016.   • Partnered with the City of Hamilton to complete a stabilized landfill review in 2007. (https://www.niagararegion.ca/government/works/wasteplan/Stabilized%20Landfill%20Report.pdf).
New, Emerging, and Next Generation Technologies   • Niagara Region, in partnership with Hamilton, looked at long term residual waste management alternatives from 2003 to 2008 (https://www.niagararegion.ca/government/works/wasteplan/); plan originally recommended thermal technology with the recovery of recyclables as a preferred option, however because of changing circumstances coupled with sufficient landfill capacity both Niagara Region and Hamilton continue to landfill residual waste.   • Quarterly staff report updates on alternative waste management technologies.

City of Ottawa

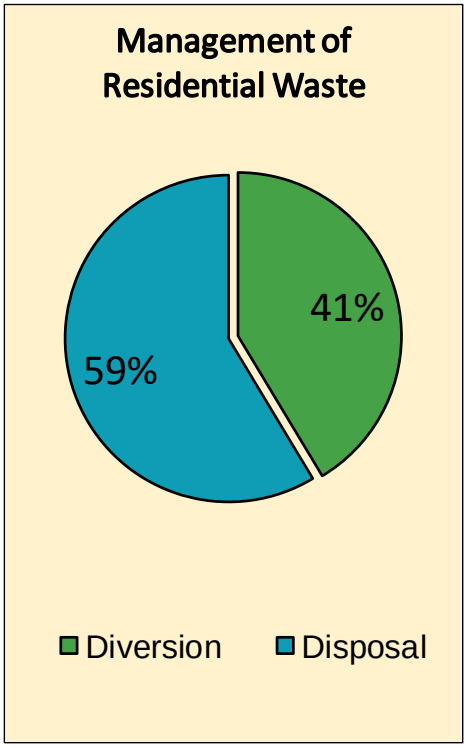
Demographics (2017)[1]		
Household Type	Number	%
Single Family	288,800	71
Multi-Family	119,900	33
Total	408,700	100

[1] Source: rpra.ca/programs/about-the-datacall/



Management of Residential Waste (2017)			
Category	Quantity[1] (tonnes)	Per Household	
		Kg/hhld	%
Diversion			
Blue Box Recycling	59,700	150	17
Other Recycling	7,800	20	2
Green Bin	58,600	140	16
Leaf/Yard Materials	6,600	20	2
On-site	8,200	20	2
Other Programs	5,900	10	1
Subtotal	146,800	360	***41***
Disposal			
Landfill	207,400	510	59
EFW	0	0	0
Subtotal	207,400	510	**59**
Total	354,200	870	100

[1] Source: rpra.ca/programs/about-the-datacall/



Explanation of above terms:

Other Recycling: wood (from construction, renovation and demolition materials), scrap metal, tires, electronics, etc.

On-site: on the property such as backyard composting

Other Programs: bottle deposit program, reuse, Municipal Household Special Waste, etc.

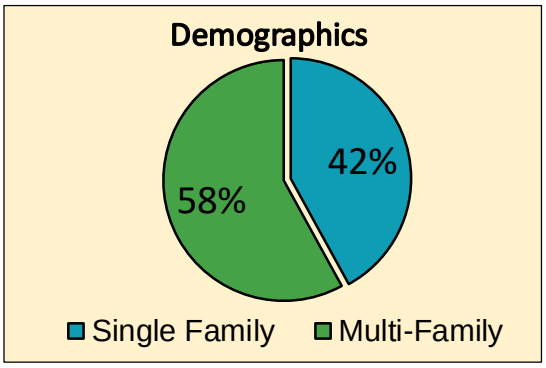
EFW : Energy-from-Waste

Long Term Waste Management Strategy/Plan
Planning Process
• Development of the Ottawa Waste Plan is ongoing. Planning and Policy elements of the plan was approved by Council in 2011 (http://ottawa.ca/en/residents/garbage-and-recycling/solid-waste-data-reports/waste-plan).
Diversion
• No overall waste diversion goal but there are established target capture rates by material type. • Improve the cost effectiveness of the recycling program, maximize the use of the existing MRF, increase tipping fees and storage capacity for current and future material volumes.
Disposal
• Continue to landfill waste at the Trail Road Waste Landfill (City owned).
New, Emerging and Next Generation Technologies
• Plasco Energy Group had an agreement with Ottawa allowing it to construct and operate a 75 tonne/day plasma gasification pilot project at the City's Trail Road Landfill. The facility began operation in 2008 but only ever processed a fraction of its rated throughout. In 2015 Plasco Environmental filed for creditor protection and the facility was decommissioned.

City of Toronto

Demographics (2017)[1]		
Household Type	Number	%
Single Family	461,600	41
Multi-Family	663,100	33
Total	1,124,700	74

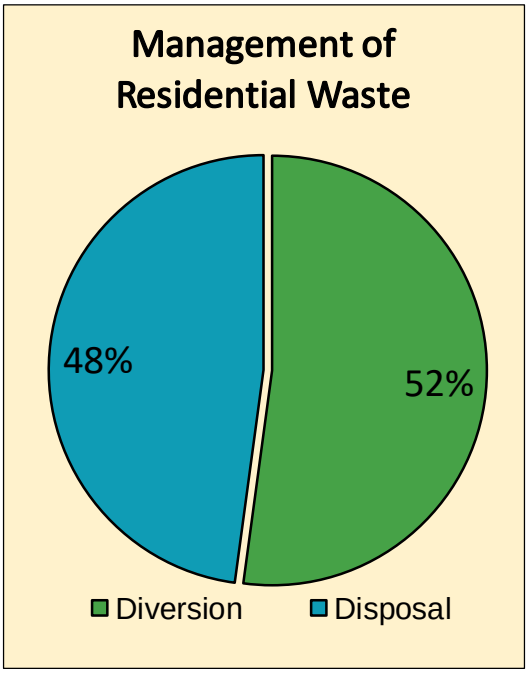
[1] Source: rpra.ca/programs/about-the-datacall/



Management of Residential Waste (2017)			
Category	Quantity[1] (tonnes)	Per Household	
		Kg/hhld	%
Diversion ($388 per tonne[2])			
Blue Box Recycling	120,700	110	16
Other Recycling	2,000	0	0
Green Bin	147,000	130	13
Leaf/Yard Materials	83,000	70	12
On-site	33,100	30	4
Other Programs	17,300	20	3
Subtotal	**403,100**	**360**	**52**
Disposal ($137 per tonne[2])			
Landfill	377,500	330	48
EFW	0	0	0
Subtotal	**377,500**	**330**	**48**
Total	**780,600**	**690**	**100**

[1]source: rpra.ca/programs/about-the-datacall/

[2] Source http://mbncanada.ca/app/uploads/2018/11/Waste-Management_2017.pdf



Explanation of above terms:

Other Recycling: wood (from construction, renovation and demolition materials), scrap metal, tires, electronics, etc.

On-site: on the property such as backyard composting

Other Programs: bottle deposit program, reuse, Municipal Household Special Waste, etc.

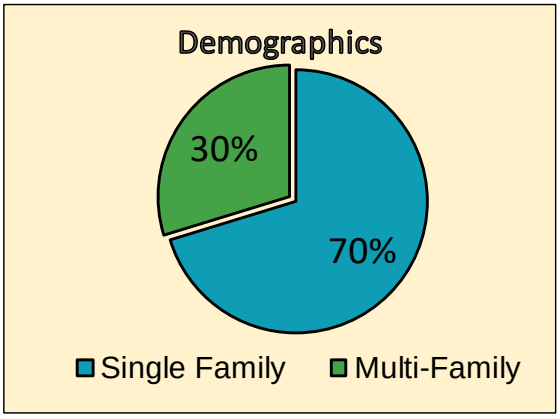
EFW: Energy-from-Waste

Long Waste Management Strategy/Plan
Planning Process   • Finalized *Long Term Waste Management Strategy* in summer 2016 (2 year process) (www1.toronto.ca/wps/portal/contentonly?vgnextoid=98fc8005b7ae7410VgnVCM10000071d60f89RCRD).   • strategy will guide waste management in Toronto for the next 30-50 years
Diversion   • Waste Diversion Target of 70% by 2026; to reach this a number of initiatives focused on improving existing and establishing new programs and outreach, Toronto's waste strategy identifies an aspirational goal of zero waste over the longer term.
Disposal   • Continue to landfill until approximately 2040 at Green Lane Landfill (owned by the City).
New, Emerging and Next Generation Technologies   • New, emerging and next generation technologies not at this time.   • Will look at viability of mixed waste processing in 5 years.

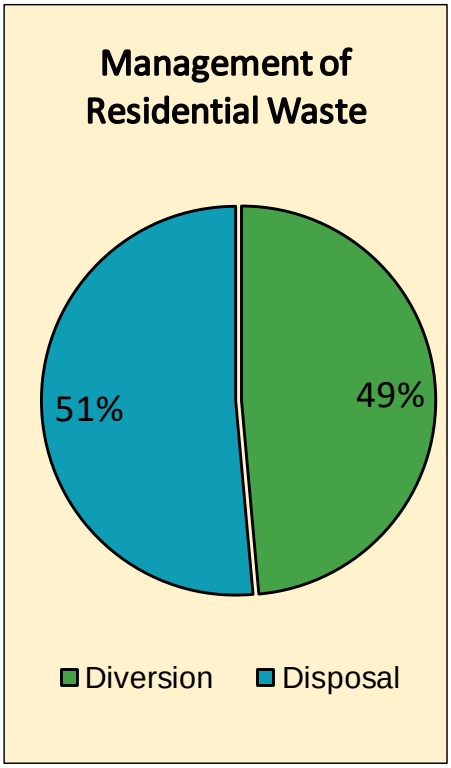
Regional Municipality of Peel

Demographics (2017)[1]		
Household Type	Number	%
Single Family	338,600	78
Multi-Family	100,800	33
Total	439,400	100

[1] Source: rpra.ca/programs/about-the-datacall/



Management of Residential Waste (2017)			
Category	Quantity[1] (tonnes)	Per Household	
		Kg/hhld	%
Diversion			
Blue Box Recycling	82,100	190	16
Other Recycling	33,100	80	6
Green Bin	62,200	70	12
Leaf/Yard Materials	44,700	100	9
On-site	16,700	40	3
Other Programs	9,900	20	2
Subtotal	248,700	500	**49**
Disposal			
Landfill	263,300	600	51
EFW	0	0	0
Subtotal	263,300	600	**51**
Total	512,000	1,100	100



[1] Source: rpra.ca/programs/about-the-datacall/

Explanation of above terms:

Other Recycling: wood (from construction, renovation and demolition materials), scrap metal, tires, electronics, etc.

On-site: on the property such as backyard composting

Other Programs: bottle deposit program, reuse, Municipal Household Special Waste, etc.

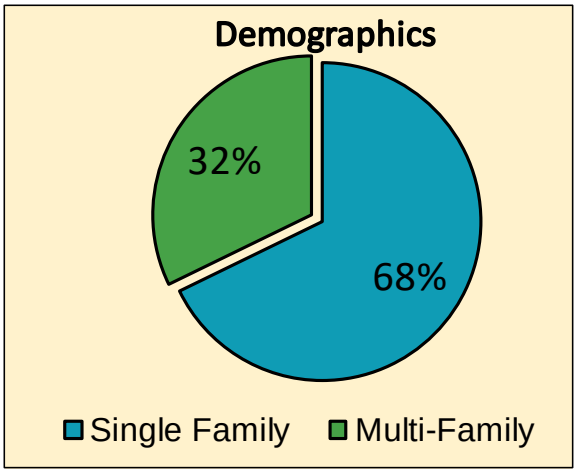
EFW : Energy-from-Waste

Long Term Waste Management Strategy/Plan
Planning Process   • Council adopted the Region of Peel Long Term Waste Management Plan in 2014. (https://www.peelregion.ca/planning/officialplan/pdfs/Discussion_Paper_-_Peel_Integrated_Waste_Management_Feb.2009.pdf).
Diversion   • Waste Diversion Target of 60% diversion by changing curbside, CRC (Community Recycling Centre), and multi-residential policies, as well as developing communication and education plans. Peel plans to develop a reduction, reuse, and ABCDs (agencies, boards, committees, departments) plan which will help refine the Blue Box program and will see the organics program expand.   • Diversion rate goal revised from 60% of 75% in 2015. Peel is currently updating their diversion plan to meet new target.
Disposal   • Waste will continue to be transported to the Twin Creeks Landfill (privately owned) until 2042.   • Had started approvals and procurement process for 300,000 tonne per year EFW facility. Project was cancelled in 2015 because revised diversion targets resulted in insufficient garbage for the facility.
New, Emerging, and Next Generation Technologies   • Currently undertaking research on mixed waste processing facilities.

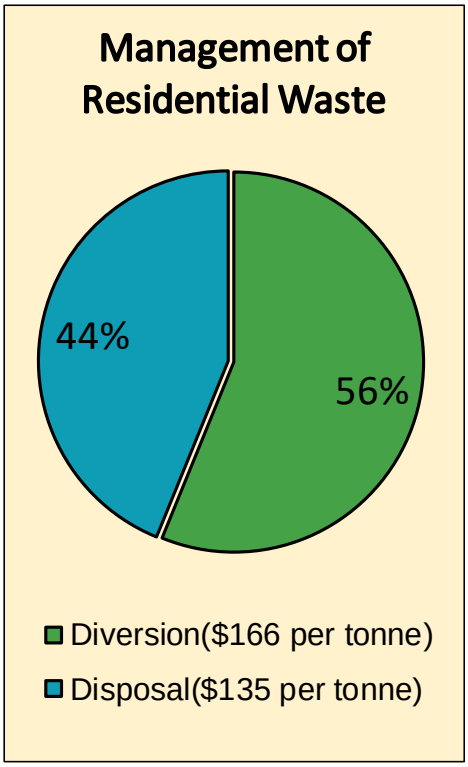
Regional Municipality of Waterloo

Demographics (2017)[1]		
Household Type	Number	%
Single Family	148,200	69
Multi-Family	65,100	33
Total	213,300	100

[1] Source: rpra.ca/programs/about-the-datacall/



Management of Residential Waste (2017)			
Category	Quantity (tonnes)[1]	Per Household	
		Kg/hhld	%
Diversion($166 per tonne)			
Blue Box	36,100	170	18
Other Recycling	5,800	30	3
Green Bin	21,300	100	11
Leaf/Yard Materials	31,200	150	16
On-site	11,400	50	6
Other Programs	3,900	20	2
Subtotal	109,700	520	***56***
Disposal($135 per tonne)			
Landfill	85,600	400	44
EFW	0	0	0
Subtotal	85,600	400	***44***
Total	195,300	920	100



[1] Source: rpra.ca/programs/about-the-datacall/

[2] Source http://mbncanada.ca/app/uploads/2018/11/Waste-Management_2017.pdf

Explanation of above terms:

Other Recycling: wood (from construction, renovation and demolition materials), scrap metal, tires, electronics, etc.

On-site: on the property such as backyard composting

Other Programs: bottle deposit program, reuse, Municipal Household Special Waste, etc.

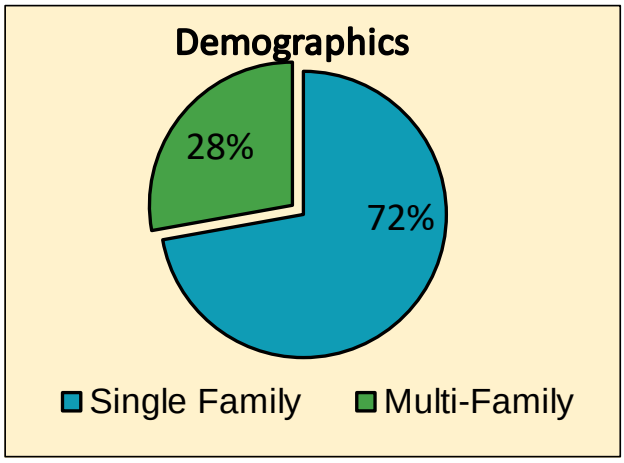
EFW: Energy-from-Waste

Long Term Waste Management Strategy/Plan
Planning Process
• Finalized Waste Management Master Plan in 2013, to establish a strategy to guide waste management services over the next 20 plus years (http://www.regionofwaterloo.ca/en/aboutTheEnvironment/resources/FinalWMMPreport.pdf).
Diversion
• No specific waste diversion target yet determined. • Master Plan recommendations include implementing collection policy changes (e.g., bag limits, biweekly garbage collection, etc.) and adopting a waste hierarchy that includes "Recovery" as the 4th R and consider recovery of energy and resources above waste disposal. • The Region has established an inter-municipal working group to explore potential partnership opportunities.
Disposal
• Continue to landfill at the Waterloo Waste Management Site (owned and operated by the Region) which has 15 to 20 years of capacity.
New, Emerging, and Next Generation Technologies
• Master Plan recommended investigating thermal technology (EFW, gasification, etc.) options. • Study investigating thermal technology options completed in 2016 and recommended no further action related to pursuing thermal technology to manage residual waste at this time.

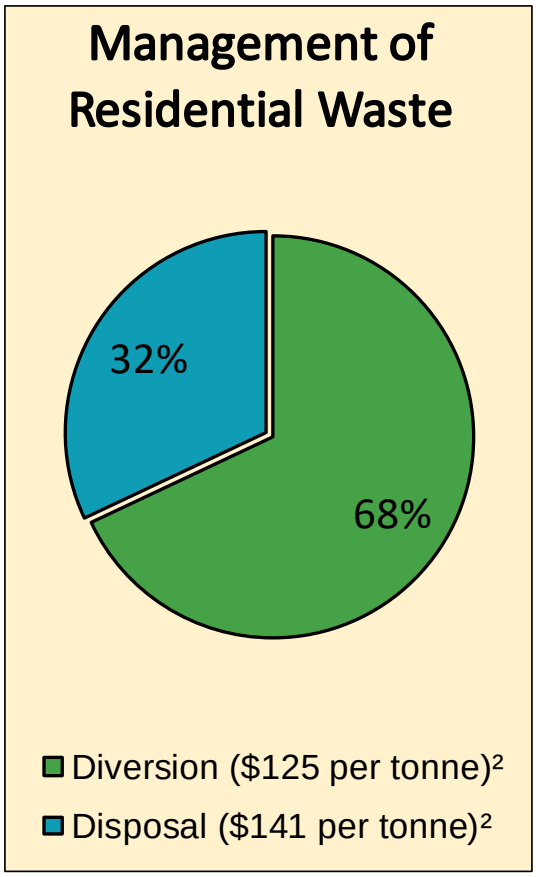
Regional Municipality of York

Demographics (2017)[1]		
Household Type	Number	%
Single Family	321,900	86
Multi-Family	52,600	33
Seasonal	1,700	< 1
Total	376,200	100

[1] Source: rpra.ca/programs/about-the-datacall/



Management of Residential Waste (2017)			
Category	Quantity (tonnes)[1]	Per Household	
		Kg/hhld	%
Diversion ($125 per tonne) [2]			
Blue Box Recycling	65,700	170	17
Other Recycling	31,200	80	8
Green Bin	97,900	260	26
Leaf/Yard Materials	39,500	100	10
On-site	15,700	40	4
Other Programs	8,000	20	2
Subtotal	258,000	670	***68***
Disposal ($141 per tonne) [2]			
Landfill	61,500	160	16
EFW	59,900	160	16
Subtotal	121,400	320	***32***
Total	379,400	990	100



[1] *Source: rpra.ca/programs/about-the-datacall/*

[2] *Source http://mbncanada.ca/app/uploads/2018/11/Waste-Management_2017.pdf*

Explanation of above terms:

Other Recycling: wood (from construction, renovation and demolition materials), scrap metal, tires, electronics, etc.

On-site: on the property such as backyard composting

Other Programs: bottle deposit program, reuse, Municipal Household Special Waste, etc.

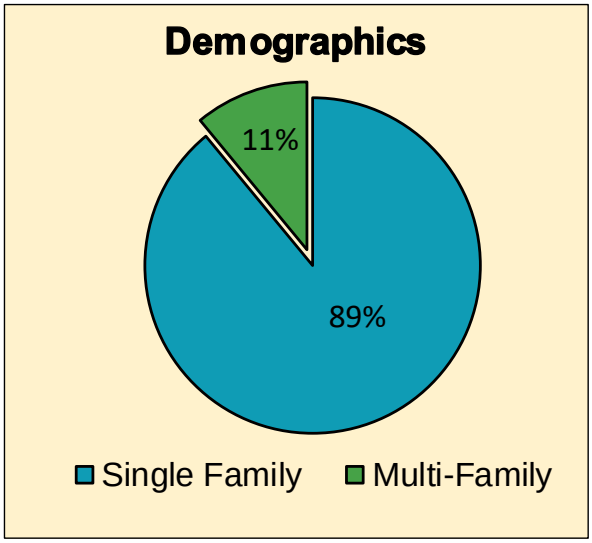
EFW: Energy-from-Waste

Long Term Waste Management Strategy/Plan
Planning Process   • The Smart Living Plan, approved in 2013, sets the course for waste management in the region for the next 25-40 years (https://www.york.ca/wps/wcm/connect/yorkpublic/10ba5c8d-5f7f-4e49-a06b-ab270c563fb0/SM4RT_Living_Plan_Nov_28_2014.pdf?MOD=AJPERES).
Diversion   • York Region's Regional Official Plan target is 90 per cent diversion from landfill (including energy-from-waste tonnage) by 2016 .   • The Smart Living Plan will be based on improving and increasing targets for already existing programs.
Disposal   • York Region, in partnership with the Regional Municipality of Durham, constructed the Durham York Energy Centre (www.durhamyorkwaste.ca), an EFW facility that began operations in 2016. This EFW facility can process up to 140,000 tonnes of non-hazardous municipal solid waste per year.   • The Region landfills bulky materials that are typically not suitable for energy recovery.   • Landfill contracts are in place with the City of Toronto Green Lane Landfill in Southwold, Ontario, Walker South Landfill in Thorold, Ontario and Waste Management Incorporated Twin Creeks Landfill in Watford, Ontario.
New, Emerging, and Next Generation Technologies   • Currently undertaking research on feasibility of different Source Separated Organics processing technologies.

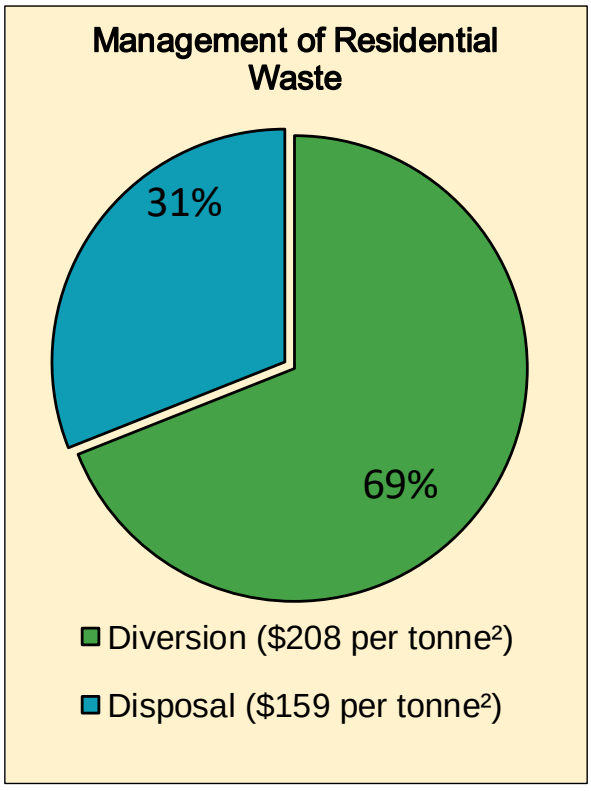
Regional Municipality of Durham

Demographics (2017)[1]		
Household Type	Number	%
Single Family	202,818	89
Multi-Family	24,702	11
Total	227,520	100

[1] Source: rpra.ca/programs/about-the-datacall/



Management of Residential Waste (2017)			
Category	Quantity[1] (tonnes)	Per Household	
		Kg/hhld	%
Diversion ($208 per tonne [2])			
Blue Box Recycling	85,900	380	29
Other Recycling	12,000	50	4
Green Bin	52,500	230	18
Leaf/Yard Materials	27,500	120	9
On-site	13,200	60	5
Other Programs	11,200	50	4
Subtotal	162,600	890	***69***
Disposal ($159 per tonne [2])			
Landfill	33,000	150	12
EFW	55,900	250	19
Subtotal	88,900	400	***31***
Total	251,500	1,290	100



[1] *Source: rpra.ca/programs/about-the-datacall/*
[2] *Source http://mbncanada.ca/app/uploads/2018/11/Waste-Management_2017.pdf*

Explanation of above terms:

Other Recycling: wood (from construction, renovation and demolition materials), scrap metal, tires, electronics, etc.

On-site: on the property such as backyard composting

Other Programs: bottle deposit program, reuse, Municipal Household Special Waste, etc.

EFW : Energy-from-Waste

Long Term Waste Management Strategy/Plan
Planning Process
• The Region of Durham, adopted the Long Term Waste Management Strategy Plan in 1999 to encompass a strategy for 2000-2020. (http://www.durham.ca/departments/works/waste/reports/ltwmsp.pdf).
Diversion
• Goal was to reach a diversion rate of 50% by 2007 or earlier • Region enhanced existing programs (e.g., Blue Box), increased outreach/promotion and implemented a Green Bin program.
Disposal
• Durham used existing landfills until they reached capacity and then exported waste. • Plan recommended looking at EFW for disposal of residual waste. • Durham Region, in partnership with the Regional Municipality of York, created the Durham York Energy Centre (www.durhamyorkwaste.ca), an EFW facility that began operation in 2015. This EFW facility processes 140,000 tonnes of garbage per year. • Durham currently sends all residential waste to EFW and exports the resulting ash to landfill for disposal.
New, Emerging, and Next Generation Technologies
• Currently undertaking research and developing a business case for mixed waste processing and anaerobic digestion of the residual waste prior to EFW.

Appendix D
Population Projections

Table D -1 Seasonal Student Population

Table D -2 Historical Population

Table D -3 Population Projections for the City of London

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Table D-1 Seasonal Student Population

Year	Western Enrollment[1]	Fanshawe Enrollment[1]	Western Equivalent Population	Fanshawe Equivalent Population	Total Population[2]
1977	18,000	5,400	8,320	1,600	9,920
1978	18,250	5,500	8,430	1,630	10,060
1979	18,500	5,800	8,550	1,720	10,270
1980	18,750	5,900	8,660	1,750	10,410
1981	19,000	5,900	8,780	1,750	10,530
1982	19,250	6,400	8,890	1,900	10,790
1983	19,500	6,700	9,010	1,990	11,000
1984	19,750	6,900	9,120	2,050	11,170
1985	20,000	6,700	9,240	1,990	11,230
1986	20,250	6,500	9,360	1,930	11,290
1987	20,500	6,700	9,470	1,990	11,460
1988	20,750	6,700	9,590	1,990	11,580
1989	21,000	6,900	9,700	2,050	11,750
1990	21,250	7,600	9,820	2,260	12,080
1991	21,500	8,300	9,930	2,470	12,400
1992	21,750	8,600	10,050	2,550	12,600
1993	22,000	8,600	10,160	2,550	12,710
1994	22,250	9,400	10,280	2,790	13,070
1995	22,500	9,600	10,400	2,850	13,250
1996	22,750	9,700	10,510	2,880	13,390
1997	23,000	9,800	10,630	2,910	13,540
1998	23,250	10,000	10,740	2,970	13,710
1999	23,500	10,500	10,860	3,120	13,980
2000	23,750	10,600	10,970	3,150	14,120
2001	24,000	10,900	11,090	3,240	14,330
2002	26,000	12,200	12,010	3,620	15,630
2003	28,000	12,800	12,940	3,800	16,740
2004	29,000	13,200	13,400	3,920	17,320
2005	29,300	13,800	13,540	4,100	17,640
2006	29,600	14,200	13,680	4,220	17,900
2007	29,900	14,800	13,810	4,400	18,210
2008	30,200	15,500	13,950	4,600	18,550
2009	30,700	16,000	14,180	4,750	18,930
2010	31,300	16,500	14,460	4,900	19,360
2011	31,900	17,000	14,740	5,050	19,790
2012	32,500	17,500	15,020	5,200	20,220
2013	33,100	18,000	15,290	5,350	20,640
2014	33,700	18,500	15,570	5,490	21,060
2015	34,300	19,300	15,850	5,730	21,580
2016	34,900	20,100	16,120	5,970	22,090
2017	35,400	21,000	16,350	6,240	22,590
2018	36,000	21,500	16,630	6,390	23,000

Notes

1. Enrollment from Western and Fanshawe registry up to 2008. Enrollment in 2017 from www.univcan.ca/universities /facts-and-stats/enrolment-by-university/.
2. The equivalent population was calculated using the following assumptions: a) 70% of Western students are from out of town and live off campus; b) 45% of Fanshawe students are from out of town and live off campus and c) they live in London for 8 months or 66% of the year. Estimates of percentage of students living off campus are based on information provided by the Western Housing Office.

Table D-2
Historical Population

Year	London[1]	Westminster[2]	Seasonal[3]	Total
1977	249,700	5,950	9,920	265,600
1978	252,500	5,950	10,060	268,500
1979	255,400	5,950	10,270	271,600
1980	258,300	5,950	10,410	274,700
1981	261,200	5,950	10,530	277,700
1982	264,260	5,950	10,790	281,000
1983	267,320	5,940	11,000	284,300
1984	270,380	5,940	11,170	287,500
1985	273,440	5,940	11,230	290,600
1986	276,500	5,930	11,290	293,700
1987	283,480	6,100	11,460	301,000
1988	290,460	6,270	11,580	308,300
1989	297,440	6,450	11,750	315,600
1990	304,420	6,640	12,080	323,100
1991	311,400	6,830	12,400	330,600
1992	316,020	7,030	12,600	335,700
1993	320,640	0	12,710	333,400
1994	325,260	0	13,070	338,300
1995	329,880	0	13,250	343,100
1996	334,500	0	13,390	347,900
1997	336,700	0	13,540	350,200
1998	338,900	0	13,710	352,600
1999	341,100	0	13,980	355,100
2000	343,300	0	14,120	357,400
2001	345,700	0	14,330	360,000
2002	349,000	0	15,630	364,600
2003	352,300	0	16,740	369,000
2004	355,600	0	17,320	372,900
2005	358,900	0	17,640	376,500
2006	362,300	0	17,900	380,200
2007	365,100	0	18,210	383,300
2008	367,900	0	18,550	386,500
2009	370,700	0	18,930	389,600
2010	373,500	0	19,360	392,900
2011	376,100	0	19,790	395,900
2012	379,700	0	20,220	399,900
2013	383,300	0	20,640	403,900
2014	386,900	0	21,060	408,000
2015	390,500	0	21,580	412,100
2016	394,300	0	22,090	416,400
2017	399,200	0	22,590	421,800
2018	404,100	0	23,000	427,100

Notes

1. From City of London Planning Department documents.
2. Population includes the Township of Westminster prior to 1993. In 1993 the Township of Westminster became part of the City of London.
3. Equivalent seasonal population (students) is calculated in Table D-1.

Table D-3
Population Projections for the City of London

Year	Permanent[1,2]	Equivalent Seasonal[3,4]	Total
2019	409,000	23,400	432,400
2020	413,900	23,900	437,800
2021	418,700	24,300	443,000
2022	424,100	24,700	448,800
2023	429,500	25,200	454,700
2024	434,900	25,600	460,500
2025	440,300	26,000	466,300
2026	445,700	26,400	472,100
2027	449,700	26,900	476,600
2028	453,700	27,300	481,000
2029	457,700	27,700	485,400
2030	461,700	28,100	489,800
2031	465,900	28,600	494,500
2032	468,900	29,000	497,900
2033	471,900	29,400	501,300
2034	474,900	29,800	504,700
2035	477,900	30,300	508,200
2036	480,700	30,700	511,400
2037	483,600	31,100	514,700
2038	486,500	31,500	518,000
2039	489,400	32,000	521,400
2040	492,300	32,400	524,700
2041	495,200	32,800	528,000
2042	498,200	33,200	531,400
2043	501,200	33,700	534,900
2044	504,200	34,100	538,300
2045	507,200	34,500	541,700
2046	510,300	34,900	545,200
2047	513,400	35,400	548,800
2048	516,500	35,800	552,300

Notes

1. Population projections for the period 2006 to 2044 from City of London Employment, Population, Housing and Employment Growth Forecast, 2016 to 2044 (Watson and Associates Economists Ltd., 2018).
2. Population projections beyond 2044 were extrapolated by assuming the same rate of growth rate after 2044 as immediately prior to 2044.
3. Equivalent seasonal population (students) is calculated assuming 66% of students enrolled in post-secondary education are out of town students living off-campus for eight months of the year. Therefore, each actual student represents 44% "equivalent" garbage of a permanent resident
4. Growth in post-secondary enrollment is assumed to match population growth.

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Appendix E
Historical Data on Waste Generation Disposal and Diversion Rates

Table E-1 City of London Historical Residential Waste Diversion Quantities

Table E-2 City of London Historical Residential Waste Quantities Disposed of at Private Facilities

Table E-3 City of London Historical Sewage Sludge Ash Quantities Disposed of at St. Marys Cement

Table E-4 City of London Waste Quantities Disposed of at W12A Landfill

Table E-5 Total Waste Quantities Managed by the City

Table E-6 Historical Unit Generation Rates

Table E-7 Estimated IC&I and CR&D Rates from Various Sources

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Table E-1
City of London
Historical Residential Waste Diversion Quantities

Year	Blue Box Curbside[1] (tonnes)	Blue Box Multi[1]-Residential (tonnes)	Blue Box Depot[1,2] (tonnes)	Blue Box Public Space[1] (tonnes)	**Blue Box Subtotal (tonnes)**	Home Composting[3] (tonnes)	Home Grass-cycling[4] (tonnes)	Yard Material[1] (tonnes)	Collection Depot[5] (tonnes)	Fall Leaf Collection[1] (tonnes)	Christmas Trees[6] (tonnes)	**Organics Subtotal (tonnes)**	WEEE Ban[7] (tonnes)	WEEE Electronics[1] (tonnes)	WEE Appliances[1] (tonnes)	Tires[8] (tonnes)	Scrap Metal[9] (tonnes)	Wood/ C&D[9] (tonnes)	Textile/ Small Item Reuse (tonnes)	HSW Depot[10] (tonnes)	Brewers Retail[11] (tonnes)	**Other Subtotal (tonnes)**	**Total Residential Diversion (tonnes)**
1977	0	0	0	0	**0**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	0	0	0	**0**	**0**
1978	0	0	0	0	**0**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	0	0	0	**0**	**0**
1979	0	0	0	0	**0**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	0	0	0	**0**	**0**
1980	0	0	0	0	**0**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	0	0	0	**0**	**0**
1981	4,900	0	0	0	**4,900**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	0	0	0	**0**	**4,900**
1982	5,000	0	0	0	**5,000**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	0	0	0	**0**	**5,000**
1983	5,100	0	0	0	**5,100**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	0	0	0	**0**	**5,100**
1984	5,200	0	0	0	**5,200**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	0	0	0	**0**	**5,200**
1985	5,300	0	0	0	**5,300**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	0	0	0	**0**	**5,300**
1986	5,400	0	0	0	**5,400**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	0	0	0	**0**	**5,400**
1987	5,500	0	0	0	**5,500**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	0	0	0	**0**	**5,500**
1988	5,750	0	0	0	**5,750**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	0	10	0	**10**	**5,760**
1989	5,500	0	0	0	**5,500**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	0	20	0	**20**	**5,520**
1990	10,650	0	0	0	**10,650**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	0	40	0	**40**	**10,690**
1991	11,800	0	190	0	**11,990**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	0	50	0	**50**	**12,040**
1992	12,330	0	190	0	**12,520**	0	0	0	0	0	60	**60**	0	0	0	0	0	0	0	60	0	**60**	**12,640**
1993	12,480	0	210	0	**12,690**	1,300	0	0	0	0	110	**1,410**	0	0	0	0	0	0	0	60	0	**60**	**14,160**
1994	13,460	0	300	0	**13,760**	2,800	0	0	0	1,250	100	**4,150**	0	0	0	0	0	0	0	70	0	**70**	**17,980**
1995	14,110	0	460	0	**14,570**	4,800	2,000	0	4,650	2,950	110	**14,510**	1,140	0	0	2,200	0	0	0	100	0	**3,440**	**32,520**
1996	15,250	10	490	0	**15,750**	5,500	3,500	3,520	3,400	3,170	130	**19,220**	1,160	0	0	2,220	0	0	0	100	0	**3,480**	**38,450**
1997	16,030	200	450	0	**16,680**	5,600	3,500	4,800	5,220	4,230	120	**23,470**	1,180	0	0	1,800	0	0	0	110	0	**3,090**	**43,240**
1998	16,890	1,000	460	0	**18,350**	5,700	3,700	4,600	2,440	3,460	130	**20,030**	1,210	0	0	1,820	0	0	0	110	0	**3,140**	**41,520**
1999	17,310	1,000	380	0	**18,690**	5,700	3,700	6,200	1,540	3,710	130	**20,980**	1,230	0	0	1,850	0	0	0	120	0	**3,200**	**42,870**
2000	17,220	1,780	370	0	**19,370**	5,300	3,700	5,550	2,400	3,120	140	**20,210**	1,240	0	0	1,870	410	2,570	0	100	900	**7,090**	**46,670**
2001	17,480	2,120	380	0	**19,980**	5,300	3,700	5,110	2,190	5,100	140	**21,540**	1,250	0	0	1,870	420	2,650	0	110	910	**7,210**	**48,730**
2002	18,800	2,250	450	0	**21,500**	5,300	3,750	3,910	2,850	5,120	150	**21,080**	1,260	0	0	1,940	450	2,670	0	140	920	**7,380**	**49,960**
2003	20,110	2,370	390	20	**22,890**	5,300	3,800	5,050	2,750	4,260	100	**21,260**	1,270	10	0	1,970	450	2,710	0	140	950	**7,500**	**51,650**
2004	21,220	2,440	270	30	**23,960**	5,300	3,800	5,350	4,470	4,010	140	**23,070**	1,280	10	0	2,000	460	2,750	0	160	950	**7,610**	**54,640**
2005	21,470	2,560	170	50	**24,250**	5,300	3,850	4,510	4,450	4,290	150	**22,550**	1,290	20	0	2,030	490	2,980	0	150	960	**7,920**	**54,720**
2006	24,850	2,820	170	50	**27,890**	5,300	3,850	5,830	5,520	4,730	130	**25,360**	1,290	20	0	2,050	500	3,490	0	160	980	**8,490**	**61,740**
2007	24,200	2,770	180	50	**27,200**	5,310	3,950	4,540	5,390	4,930	130	**24,250**	1,300	50	0	2,070	530	3,730	0	210	1,970	**9,860**	**61,310**
2008	24,270	3,090	200	50	**27,610**	5,340	3,950	5,300	6,420	6,420	130	**27,560**	1,300	50	0	2,090	600	4,110	0	240	2,090	**10,480**	**65,650**
2009	22,570	3,080	280	50	**25,980**	5,360	3,950	7,270	8,290	6,200	130	**31,200**	1,300	50	0	2,110	790	4,290	0	220	2,100	**10,860**	**68,040**
2010	22,110	3,150	220	50	**25,530**	5,420	3,950	5,450	7,170	3,150	120	**25,260**	1,030	280	0	2,100	740	4,510	0	220	2,090	**10,970**	**61,760**
2011	22,520	3,290	310	50	**26,170**	5,440	3,950	5,000	10,610	3,630	120	**28,750**	810	460	30	1,930	730	4,650	0	370	2,140	**11,120**	**66,040**
2012	22,960	3,290	370	50	**26,670**	5,460	3,950	4,540	9,920	4,680	120	**28,670**	640	560	100	2,600	720	4,530	400	370	2,140	**12,060**	**67,400**
2013	22,420	3,370	460	50	**26,300**	5,490	3,020	5,230	11,160	4,130	120	**29,150**	780	430	90	2,610	720	4,520	1,770	420	2,150	**13,490**	**68,940**
2014	21,500	3,350	500	50	**25,400**	5,510	3,880	6,150	15,200	4,820	120	**35,680**	0	340	60	2,770	710	4,410	1,830	450	2,150	**12,720**	**73,800**
2015	19,780	2,940	650	50	**23,420**	5,540	3,330	6,620	15,650	4,150	120	**35,410**	0	300	60	2,770	700	4,420	1,340	470	2,150	**12,210**	**71,040**
2016	20,110	3,330	560	50	**24,050**	5,600	3,330	5,490	15,500	4,620	120	**34,660**	0	270	70	2,810	750	4,160	1,510	510	2,180	**12,260**	**70,970**

Year	Blue Box Curbside[1] (tonnes)	Blue Box Multi[1]-Residential (tonnes)	Blue Box Depot[1,2] (tonnes)	Blue Box Public Space[1] (tonnes)	**Blue Box Subtotal (tonnes)**	Home Composting[3] (tonnes)	Home Grass-cycling[4] (tonnes)	Yard Material[1] (tonnes)	Collection Depot[5] (tonnes)	Fall Leaf Collection[1] (tonnes)	Christmas Trees[6] (tonnes)	**Organics Subtotal (tonnes)**	WEEE Ban[7] (tonnes)	WEEE Electronics[1] (tonnes)	WEE Appliances[1] (tonnes)	Tires[8] (tonnes)	Scrap Metal[9] (tonnes)	Wood/ C&D[9] (tonnes)	Textile/ Small Item Reuse (tonnes)	HSW Depot[10] (tonnes)	Brewers Retail[11] (tonnes)	**Other Subtotal (tonnes)**	**Total Residential Diversion (tonnes)**
2017	18,670	3,270	840	50	**22,830**	5,680	3,590	5,200	16,240	4,800	100	**35,610**	0	210	60	2,880	760	5,070	1,710	540	2,190	**14,030**	**71,870**
2018	17,280	3,020	1,140	30	**21,470**	5,770	3,760	5,460	16,200	5,920	120	**37,230**	0	190	70	3,030	810	4,700	1,690	490	2,350	**12,820**	**71,890**
Totals	587,500	56,500	11,040	730	**655,770**	134,420	87,460	120,680	179,630	106,850	3,290	**632,330**	21,960	3,250	540	53,400	11,740	72,320	10,250	6,320	32,270	**212,130**	**1,500,000**

Notes and Assumptions:

1. Weighed quantities.
2. Current City EnviroDepot locations area Clarke Road, Oxford Street, TRY Recycling-Clarke Road (contracted location) and the W12A Landfill.
3. Estimate based on number of units sold through City program. From 1993 to 1999, it is assumed that 80% of the units are being used and these units divert 135 kg per unit. Beginning in 2000 it is assumed each composter diverts 100 kg/year (GAP guidelines).
4. Estimate assumes curbside grass ban introduced in 1995 reduces grass generation by 50%. Beginning in 2013, grass diverted by ban estimated using WDO “GAP” guidelines.
5. Includes materials, fall leaves, fall pumpkins and pay per bag grass clippings.
6. Estimate based on the actual number of trees to fill a truck x # of trucks filled x 8 kg per tree.
7. Estimate based on generation rate of 12 kg per household per year. Curbside collection ban of white goods/large metal items in effect as of 1995. Starting in 2010, amount diverted by Ban reduced by quantities collected at Depots. Starting 2014, as per WDO “GAP” guidelines.
8. Estimate based on one tire/person/year and 110 tires per tonne. It was assumed the recovery rate was 75% from 1995 to 1996 and 60% after 1997 (local tire recycler closed in 1997). Beginning in 2012, as WDO Datacall “GAP” guidelines (7.1 kg diverted/person).
9. Estimate based on 80% of weighed materials to City depots (assume 20% process residuals) plus 50% of available material taken to City depots. Generation rate of scrap metal is estimated to be 2.4 kg/person/yr. Generation rate of wood/C&D waste is estimated to be 15 kg/person/yr.
10. Estimates up to 1999 based on 1.5 kg/litre collected, 3 kg/compressed cylinder collected at the HSW Depot. Estimates from 2000 to 2010 use various conversion factors (GAP guidelines). Estimates from 2011 onwards from Steward Ontario Datacall for MHSW.
11. Brewers Retail deposit return reported effective 2001 as per WDO “GAP” process.

Table E-2
City of London
Historical Residential Waste Quantities Disposed of at Private Facilities

Year	EFW[1] (tonnes)	Export via Transfer Station[2] (tonnes)	Export direct to Landfill[3,4] (tonnes)	Total (tonnes)
1977	0	0	0	0
1978	0	0	0	0
1979	0	0	0	0
1980	0	0	0	0
1981	0	0	0	0
1982	0	0	0	0
1983	0	0	0	0
1984	0	0	0	0
1985	0	0	0	0
1986	0	0	0	0
1987	10,534	0	0	10,534
1988	61,670	0	0	61,670
1989	59,250	0	0	59,250
1990	65,197	0	0	65,197
1991	27,573	0	0	27,573
1992	29,508	0	0	29,508
1993	31,473	0	0	31,473
1994	36,717	0	0	36,717
1995	38,554	0	0	38,554
1996	49,702	0	0	49,702
1997	49,002	0	0	49,002
1998	54,162	0	0	54,162
1999	47,229	1,895	0	49,124
2000	0	5,777	0	5,777
2001	0	0	4,626	4,626
2002	0	0	0	0
2003	0	0	0	0
2004	0	0	0	0
2005	0	0	0	0
2006	0	0	0	0
2007	0	0	0	0
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0
2013	0	0	0	0
2014	0	0	0	0

Year	EFW[1] (tonnes)	Export via Transfer Station[2] (tonnes)	Export direct to Landfill[3,4] (tonnes)	Total (tonnes)
2015	0	0	1,608	1,608
2016	0	0	0	0
2017	0	0	0	0
2018	0	0	0	0
Total	560,570	7,672	6,234	574,476

Notes and Assumptions

1. EFW refers to the London Health Sciences Centre Energy from Waste facility. This facility closed in October 1999
2. From 1999 to 2001, following closure of the EFW, waste collected at night was taken to the Waste Management Transfer Station on Exeter Road and shipped to private landfills for disposal. Night garbage collection was discontinued in 2001
3. A work stoppage by City of London outside workers in July/August 2001 resulted in the City collecting 3,726 tonnes of garbage at numerous drop-off locations. This waste was taken to several different disposal facilities. In addition, some multi-residential building owners contracted garbage collection to private firms during the work stoppage (estimated to be 900 tonnes)
4. A work stoppage by City of London inside workers in May-June 2015 resulted in London shipping some waste to the Thames Centre landfill and the Waste Management Twin Creeks landfill for disposal

Table E-3
City of London
Historical Sewage Sludge Ash Quantities
Disposed of at St. Marys Cement

Year	St. Marys Cement (tonnes)
1977	0
1978	0
1979	0
1980	0
1981	0
1982	0
1983	0
1984	0
1985	0
1986	0
1987	0
1988	0
1989	0
1990	0
1991	0
1992	0
1993	0
1994	0
1995	0
1996	0
1997	0
1998	0
1999	0
2000	0
2001	0
2002	0
2003	0
2004	0
2005	0
2006	0
2007	0
2008	3,527
2009	3,521
2010	0

Year	St. Marys Cement (tonnes)
2011	4,474
2012	3,105
2013	5,378
2014	1,874
2015	0
2016	0
2017	0
2018	0
Total	21,879

Table E-4
City of London
Waste Quantities Disposed of at W12A Landfill

Year	Residential[1] (tonnes)	IC&I[2] (tonnes)	C,R&D[3] Recycling Residuals (tonnes)	Ash[4] (tonnes)	Biosolids (tonnes)	Street Sweepings/ Road Work (tonnes)	"Other" Municipal[5] (tonnes)	WTP[6] Process Residuals (tonnes)	Cont. Soil Waste (tonnes)	Cont. Soil Cover (tonnes)	Total Waste Landfilled (tonnes)
1977	20,123	32,093	0	0	3,806	0	0	0	0	0	56,022
1978	58,722	81,687	0	0	26,516	0	0	0	0	0	166,925
1979	71,955	69,874	0	0	30,861	0	0	0	0	0	172,690
1980	89,995	70,721	0	0	52,083	0	0	0	0	0	212,799
1981	100,810	71,451	0	0	47,888	0	0	0	0	0	220,150
1982	110,249	71,267	0	0	44,273	0	0	0	0	0	225,788
1983	113,247	72,616	0	0	36,745	0	1,096	0	0	0	223,705
1984	122,438	80,522	0	0	51,445	0	5,247	0	0	0	259,653
1985	125,460	90,263	0	0	43,000	0	2,935	0	0	0	261,657
1986	134,801	101,816	0	0	49,386	0	2,275	0	0	0	288,278
1987	123,205	114,928	0	0	67,046	0	1,465	0	0	0	306,644
1988	75,674	126,943	0	33,349	16,886	0	2,711	0	0	0	255,564
1989	81,410	141,954	0	33,752	15,272	0	3,677	0	0	0	276,065
1990	73,790	125,027	0	30,142	7,366	0	8,161	0	0	0	244,485
1991	97,133	109,099	0	14,180	8,745	0	27,110	0	0	0	256,266
1992	97,708	58,516	0	15,386	8,643	0	32,318	0	0	0	212,571
1993	93,397	37,191	0	14,404	11,389	0	33,923	0	0	0	190,303
1994	86,300	32,007	0	15,875	14,359	0	34,015	0	0	0	182,556
1995	70,041	13,154	0	16,422	12,840	0	63,243	0	0	0	175,700

Year	Residential[1] (tonnes)	IC&I[2] (tonnes)	C,R&D[3] Recycling Residuals (tonnes)	Ash[4] (tonnes)	Biosolids (tonnes)	Street Sweepings/ Road Work (tonnes)	"Other" Municipal[5] (tonnes)	WTP[6] Process Residuals (tonnes)	Cont. Soil Waste (tonnes)	Cont. Soil Cover (tonnes)	Total Waste Landfilled (tonnes)
1996	51,096	6,118	0	22,194	11,190	0	44,756	0	0	0	135,354
1997	49,063	4,294	0	21,677	12,973	0	42,404	0	0	0	130,410
1998	44,034	3,588	0	21,548	16,042	0	39,367	0	0	0	124,579
1999	49,622	2,192	0	19,373	7,861	0	57,925	0	0	0	136,973
2000	91,306	2,355	0	5,394	29,402	0	107,177	0	0	0	235,635
2001	92,856	2,436	0	4,093	6,620	0	38,716	0	0	0	144,721
2002	97,771	3,732	0	5,746	15,993	35,529	19,736	0	5,556	851	184,914
2003	102,194	4,120	0	5,176	5,861	42,491	28,374	0	263	0	188,479
2004	98,477	21,378	0	3,867	6,601	34,073	9,912	0	468	3,019	177,795
2005	102,559	36,947	0	5,351	2,913	30,674	8,727	0	10,054	12,355	209,580
2006	100,206	47,921	0	6,069	6	37,034	8,808	0	5,423	23	205,490
2007	100,404	47,346	0	6,001	0	37,769	23,984	0	9,925	5,004	230,433
2008	101,437	64,178	0	2,956	23,851	43,040	26,941	0	4,689	17,300	284,392
2009	97,720	69,742	0	0	0	43,000	26,907	0	17,626	18,883	273,878
2010	93,898	72,436	0	6,067	4,121	29,697	11,551	0	6,185	42,410	266,365
2011	94,435	75,008	10,236	0	10,317	22,371	9,595	0	15,800	13,187	250,949
2012	91,638	54,445	23,403	0	4,747	26,554	5,623	0	18,528	4,511	229,449
2013	93,172	45,954	18,991	1,904	4,633	23,062	8,946	0	3,590	1,269	201,521
2014	93,569	40,314	24,155	4,163	5,994	42,748	8,511	0	2,473	1,073	223,000
2015	91,339	13,614	33,936	12,953	2,577	47,181	8,594	0	4,757	3,656	218,606
2016	93,151	24,245	35,332	4,166	14,268	51,512	7,762	0	6,954	21,137	258,528
2017	94,438	56,992	44,317	6,551	3,639	49,273	10,600	2,109	5,756	3,742	277,417
2018	96,462	66,193	37,865	7,178	0	49,421	11,269	2,108	16,732	34,370	321,598

Year	Residential[1] (tonnes)	IC&I[2] (tonnes)	C,R&D[3] Recycling Residuals (tonnes)	Ash[4] (tonnes)	Biosolids (tonnes)	Street Sweepings/ Road Work (tonnes)	"Other" Municipal[5] (tonnes)	WTP[6] Process Residuals (tonnes)	Cont. Soil Waste (tonnes)	Cont. Soil Cover (tonnes)	Total Waste Landfilled (tonnes)
Total	3,767,000	2,267,000	228,000	346,000	738,000	669,000	784,000	4,000	135,000	183,000	9,122,000
Percent[7]	41%	25%	2%	4%	8%	7%	9%	0%	1.5%	2.0%	

Notes:

1. “Residential” waste includes curbside, bulk bin and depot garbage collected by the City from residential and light commercial sources.
2. “IC&I” is an abbreviation for Industrial, Commercial & Institutional waste collected by the private sector.
3. “CR&D recycling residuals” is an abbreviation for Construction, Renovation & Demolition recycling residuals. Prior to 2011, CR&D recycling residuals were included with IC&I.
4. “Ash” includes sewage sludge ash (since 1998) and residential waste ash (1988 to 1999).
5. “Other Municipal” includes material recovery facility residuals, waste from City parks and grit from water pollution control plants.
6. “WTP process residuals” is an abbreviation for water treatment plant process residuals.
7. May not add to 100 due to rounding.

Table E-5
Total Waste Quantities Managed by the City

Year	R&LC[2] Disposal (tonne/ person/yr)	R&LC[2] Diversion (tonne/ person/yr)	R&LC[2] Total (tonne/ person/yr)	IC&I[2] Disposal (tonnes)	CR&D[3] Recycling Residuals (tonnes)	Ash[4] (tonnes)	Biosolids Disposal (tonnes)	Street Sweepings/ Road Work (tonnes)	"Other" Municipal[5] Disposal (tonnes)	WTP[6] Process Residuals (tonnes)	Cont. Soil[7] Disposal (tonnes)	Total (tonnes)
1977	113,200	0	113,200	32,100	0	0	18,500	0	0	0	0	163,800
1978	117,700	0	117,700	81,700	0	0	45,700	0	0	0	0	245,100
1979	125,800	0	125,800	69,900	0	0	55,000	0	0	0	0	250,700
1980	122,900	0	122,900	70,700	0	0	54,400	0	0	0	0	248,000
1981	115,600	4,900	120,500	71,500	0	0	47,900	0	0	0	0	239,900
1982	110,200	5,000	115,200	71,300	0	0	44,300	0	0	0	0	230,800
1983	113,200	5,100	118,300	72,600	0	0	36,700	1,100	0	0	0	228,700
1984	122,400	5,200	127,600	80,500	0	0	51,400	5,200	0	0	0	264,700
1985	125,500	5,300	130,800	90,300	0	0	43,000	2,900	0	0	0	267,000
1986	134,800	5,400	140,200	101,800	0	0	49,400	2,300	0	0	0	293,700
1987	133,700	5,500	139,200	114,900	0	0	67,000	1,500	0	0	0	322,600
1988	137,300	5,800	143,100	126,900	0	33,300	16,900	2,700	0	0	0	322,900
1989	140,700	5,500	146,200	142,000	0	33,800	15,300	3,700	0	0	0	341,000
1990	139,000	10,700	149,700	125,000	0	30,100	7,400	8,200	0	0	0	320,400
1991	124,700	12,000	136,700	109,100	0	14,200	8,700	27,100	0	0	0	295,800
1992	127,200	12,600	139,800	58,500	0	15,400	8,600	32,300	0	0	0	254,600
1993	124,900	14,200	139,100	37,200	0	14,400	11,400	33,900	0	0	0	236,000
1994	123,000	18,000	141,000	32,000	0	15,900	14,400	34,000	0	0	0	237,300
1995	108,600	32,500	141,100	13,200	0	16,400	12,800	63,200	0	0	0	246,700
1996	100,800	38,500	139,300	6,100	0	22,200	11,200	44,800	0	0	0	223,600
1997	98,100	43,200	141,300	4,300	0	21,700	13,000	42,400	0	0	0	222,700

Year	R&LC[2] Disposal (tonne/ person/yr)	R&LC[2] Diversion (tonne/ person/yr)	R&LC[2] Total (tonne/ person/yr)	IC&I[2] Disposal (tonnes)	CR&D[3] Recycling Residuals (tonnes)	Ash[4] (tonnes)	Biosolids Disposal (tonnes)	Street Sweepings/ Road Work (tonnes)	"Other" Municipal[5] Disposal (tonnes)	WTP[6] Process Residuals (tonnes)	Cont. Soil[7] Disposal (tonnes)	Total (tonnes)
1998	98,200	41,500	139,700	3,600	0	21,500	16,000	39,400	0	0	0	220,200
1999	98,700	42,900	141,600	2,200	0	19,400	7,900	57,900	0	0	0	229,000
2000	97,100	46,700	143,800	2,400	0	5,400	29,400	107,200	0	0	0	288,200
2001	97,500	48,700	146,200	2,400	0	4,100	6,600	38,700	0	0	0	198,000
2002	97,800	50,000	147,800	3,700	0	5,700	16,000	55,300	5,600	0	6,400	234,900
2003	102,200	51,700	153,900	4,100	0	5,200	5,900	70,900	300	0	300	240,300
2004	98,500	54,600	153,100	21,400	0	3,900	6,600	44,000	500	0	3,500	232,500
2005	102,600	54,700	157,300	36,900	0	5,400	2,900	39,400	10,100	0	22,400	264,300
2006	100,200	61,700	161,900	47,900	0	6,100	0	45,800	5,400	0	5,400	267,100
2007	100,400	61,300	161,700	47,300	0	6,000	0	61,800	9,900	0	14,900	291,700
2008	101,400	65,700	167,100	64,200	0	6,500	23,900	70,000	4,700	0	22,000	353,700
2009	97,700	68,000	165,700	69,700	0	3,500	0	69,900	17,600	0	36,500	345,300
2010	93,900	61,800	155,700	72,400	0	6,100	4,100	41,200	11,800	0	48,600	328,100
2011	94,400	66,000	160,400	75,000	10,200	4,500	10,300	32,000	17,100	0	29,000	321,400
2012	91,600	67,400	159,000	54,400	23,400	3,100	4,700	32,200	20,000	0	23,000	299,800
2013	93,200	68,900	162,100	46,000	19,000	7,300	4,600	32,000	5,600	0	4,900	275,900
2014	93,600	73,800	167,400	40,300	24,200	6,000	6,000	51,300	5,900	0	3,500	298,700
2015	92,900	71,000	163,900	13,600	33,900	13,000	2,600	55,800	14,700	0	8,400	291,200
2016	93,200	71,000	164,200	24,200	35,300	4,200	14,300	51,500	7,800	0	28,100	329,600
2017	94,400	72,500	166,900	57,000	44,300	6,600	3,600	49,300	10,600	2,100	9,500	349,900
2018	96,500	71,500	168,000	66,200	37,900	7,200	0	49,400	11,300	2,108	51,100	393,200

Notes:

1. “R&LC” is an abbreviation for Residential and Light Commercial and includes curbside, bulk bin and depot garbage collected by the City from residential and light commercial sources.
2. “IC&I” is an abbreviation for Industrial, Commercial & Institutional waste collected by the private sector.
3. “CR&D recycling residuals” is an abbreviation for Construction, Renovation & Demolition recycling residuals. Prior to 2011, CR&D recycling residuals were included with IC&I.
4. “Ash” includes sewage sludge ash (since 1998) and residential waste ash (1988 to 1999).
5. “Other Municipal” includes material recovery facility residuals, waste from City parks and grit from water pollution control plants.
6. “WTP process residuals” is an abbreviation for water treatment plant process residuals.
7. Includes Contaminated Soil that is buried as waste and used as cover material at the landfill.

Table E-6
Unit Disposal Rates

Year	Population[1]	R&LC[2] Disposal tonne/ person/yr	R&LC[2] Diversion tonne/ person/yr	R&LC[2] Total tonne/ person/yr	IC&I[3] Disposal tonne/ person/yr	C,R&D[4] Residuals tonne/ person/yr	Ash tonne/ person/yr	Biosolids tonne/ person/yr	Street Sweepings/ Road Work (tonnes)	"Other" Municipal[2] tonne/ person/yr	WTP[5] Residuals tonne/ person/yr	Cont. Soil[6] Disposal tonne/ person/yr	Total Disposal tonne/ person/yr
1977	265,570	0.43	0.00	0.43	0.12	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.62
1978	268,510	0.44	0.00	0.44	0.30	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.91
1979	271,620	0.46	0.00	0.46	0.26	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.92
1980	274,660	0.45	0.00	0.45	0.26	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.90
1981	277,680	0.42	0.02	0.43	0.26	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.85
1982	281,000	0.39	0.02	0.41	0.25	0.00	0.00	0.16	0.00	0.00	0.00	0.00	0.80
1983	284,260	0.40	0.02	0.42	0.26	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.79
1984	287,490	0.43	0.02	0.44	0.28	0.00	0.00	0.18	0.02	0.00	0.00	0.00	0.90
1985	290,610	0.43	0.02	0.45	0.31	0.00	0.00	0.15	0.01	0.00	0.00	0.00	0.90
1986	293,720	0.46	0.02	0.48	0.35	0.00	0.00	0.17	0.01	0.00	0.00	0.00	0.98
1987	301,040	0.44	0.02	0.46	0.38	0.00	0.00	0.22	0.00	0.00	0.00	0.00	1.05
1988	308,310	0.45	0.02	0.46	0.41	0.00	0.11	0.05	0.01	0.00	0.00	0.00	1.03
1989	315,640	0.45	0.02	0.46	0.45	0.00	0.11	0.05	0.01	0.00	0.00	0.00	1.06
1990	323,140	0.43	0.03	0.46	0.39	0.00	0.09	0.02	0.03	0.00	0.00	0.00	0.96
1991	330,630	0.38	0.04	0.41	0.33	0.00	0.04	0.03	0.08	0.00	0.00	0.00	0.86
1992	335,650	0.38	0.04	0.42	0.17	0.00	0.05	0.03	0.10	0.00	0.00	0.00	0.72
1993	333,350	0.37	0.04	0.42	0.11	0.00	0.04	0.03	0.10	0.00	0.00	0.00	0.67
1994	338,330	0.36	0.05	0.42	0.09	0.00	0.05	0.04	0.10	0.00	0.00	0.00	0.65
1995	343,130	0.32	0.09	0.41	0.04	0.00	0.05	0.04	0.18	0.00	0.00	0.00	0.62
1996	347,890	0.29	0.11	0.40	0.02	0.00	0.06	0.03	0.13	0.00	0.00	0.00	0.53
1997	350,240	0.28	0.12	0.40	0.01	0.00	0.06	0.04	0.12	0.00	0.00	0.00	0.51
1998	352,610	0.28	0.12	0.40	0.01	0.00	0.06	0.05	0.11	0.00	0.00	0.00	0.51
1999	355,100	0.28	0.12	0.40	0.01	0.00	0.05	0.02	0.16	0.00	0.00	0.00	0.52
2000	357,400	0.27	0.13	0.40	0.01	0.00	0.02	0.08	0.30	0.00	0.00	0.00	0.68

Year	Population[1]	R&LC[2] Disposal tonne/ person/yr	R&LC[2] Diversion tonne/ person/yr	R&LC[2] Total tonne/ person/yr	IC&I[3] Disposal tonne/ person/yr	C,R&D[4] Residuals tonne/ person/yr	Ash tonne/ person/yr	Biosolids tonne/ person/yr	Street Sweepings/ Road Work (tonnes)	"Other" Municipal[2] tonne/ person/yr	WTP[5] Residuals tonne/ person/yr	Cont. Soil[6] Disposal tonne/ person/yr	Total Disposal tonne/ person/yr
2001	360,000	0.27	0.14	0.41	0.01	0.00	0.01	0.02	0.11	0.00	0.00	0.00	0.41
2002	364,600	0.27	0.14	0.41	0.01	0.00	0.02	0.04	0.15	0.02	0.00	0.02	0.52
2003	369,000	0.28	0.14	0.42	0.01	0.00	0.01	0.02	0.19	0.00	0.00	0.00	0.51
2004	372,900	0.26	0.15	0.41	0.06	0.00	0.01	0.02	0.12	0.00	0.00	0.01	0.48
2005	376,500	0.27	0.15	0.42	0.10	0.00	0.01	0.01	0.10	0.03	0.00	0.06	0.58
2006	380,200	0.26	0.16	0.43	0.13	0.00	0.02	0.00	0.12	0.01	0.00	0.01	0.55
2007	383,300	0.26	0.16	0.42	0.12	0.00	0.02	0.00	0.16	0.03	0.00	0.04	0.63
2008	386,500	0.26	0.17	0.43	0.17	0.00	0.02	0.06	0.18	0.01	0.00	0.06	0.76
2009	389,600	0.25	0.17	0.43	0.18	0.00	0.01	0.00	0.18	0.05	0.00	0.09	0.76
2010	392,900	0.24	0.16	0.40	0.18	0.00	0.02	0.01	0.10	0.03	0.00	0.12	0.71
2011	395,900	0.24	0.17	0.41	0.19	0.03	0.01	0.03	0.08	0.04	0.00	0.07	0.69
2012	399,900	0.23	0.17	0.40	0.14	0.06	0.01	0.01	0.08	0.05	0.00	0.06	0.63
2013	403,900	0.23	0.17	0.40	0.11	0.05	0.02	0.01	0.08	0.01	0.00	0.01	0.53
2014	408,000	0.23	0.18	0.41	0.10	0.06	0.01	0.01	0.13	0.01	0.00	0.01	0.57
2015	412,100	0.23	0.17	0.40	0.03	0.08	0.03	0.01	0.14	0.04	0.00	0.02	0.57
2016	416,400	0.22	0.17	0.39	0.06	0.08	0.01	0.03	0.12	0.02	0.00	0.07	0.62
2017	421,800	0.22	0.17	0.39	0.14	0.11	0.02	0.01	0.12	0.03	0.01	0.02	0.66
2018	427,100	0.23	0.17	0.39	0.15	0.09	0.02	0.00	0.12	0.03	0.00	0.12	0.75
Avg. 14-18		0.23	0.17	0.40	0.10	0.08	0.018	0.01	0.12	0.02	0.00	0.05	0.63

Notes:

1. Population includes the allowance for Township of Westminster prior to 1993 and for out-of-town post-secondary students. In 1993 the Township of Westminster became part of the City of London.
2. “R&LC” is an abbreviation for Residential and Light Commercial and includes curbside, bulk bin and depot garbage collected by the City from residential and light commercial sources.
3. “IC&I” is an abbreviation for Industrial, Commercial & Institutional waste collected by the private sector.
4. “CR&D recycling residuals” is an abbreviation for Construction, Renovation & Demolition recycling residuals. Prior to 2011, CR&D recycling residuals were included with IC&I.
5. “Ash” includes sewage sludge ash (since 1998) and residential waste ash (1988 to 1999).
6. “Other Municipal” includes material recovery facility residuals, waste from City parks and grit from water pollution control plants.
7. “WTP process residuals” is an abbreviation for water treatment plant process residuals.
8. Includes Contaminated Soil that is buried as waste and used as cover material at the landfill.

Table E-7
Estimated IC&I and C,R&D Rates from Various Sources

Description	Generation or Diversion or Disposal Rate Tonnes/ Person/Year	Comments
Combined IC&I and CR,&D		
IC&I and C,R&D Waste Disposal Rate at the W12A Landfill, 1989	0.46	Calculated from Landfill Weigh Scale Records; 1989 represents a year in which the local economy was strong and there were no/limited waste export options
IC&I and C,R&D Waste Diversion Rate Ontario, 2012	0.08	Estimated from diversion rate of 13% (Statistics Canada, Waste Management Industry Survey, 2012) and generation rate of 0.6 tonne per person per year
IC&I		
IC&I Waste Generation Rate, London, 1994	0.48	*Final Task 1 Report The Problem or Opportunity* (London, 1997)
IC&I Waste Generation Rate, Ontario, 2002	0.53	*The Private Sector IC&I Waste Management System in Ontario* (RIS International, 2005)
IC&I Waste Diversion Rate, Ontario, 2002	0.11	*The Private Sector IC&I Waste Management System in Ontario* (RIS International, 2005)
IC&I Waste Disposal Rate, Ontario, 2002	0.42	*The Private Sector IC&I Waste Management System in Ontario* (RIS International, 2005)
IC&I Waste Diversion Rate, London 2004	0.07	*Estimate of "Blue Box" Recyclables Generated by the IC&I Sector in the City of London* (2cg, 2005)
IC&I Waste Generation Rate, London, 3 year average for 2013, 2014 and 2015	0.405	*Data provided by local MRF and Transfer Stations*

Description	Generation or Diversion or Disposal Rate Tonnes/ Person/Year	Comments
IC&I Waste Diversion Rate, London, 3 year average for 2013, 2014 and 2015	0.089	*Data provided by local MRF and Transfer Stations*
IC&I Waste Disposal Rate, London, 3 year average for 2013, 2014 and 2015	0.316	*Data provided by local MRF and Transfer Stations*
CR&D		
CR&D Waste Generation Rate, London, 1994	0.18	*Final Task 1 Report The Problem or Opportunity* (London, 1997)
CR&D Waste Generation Rate, Ontario, 2002	0.01	*The Private Sector IC&I Waste Management System in Ontario* (RIS International, 2005)
CR&D Waste Diversion Rate, Ontario, 2002	0.09	*The Private Sector IC&I Waste Management System in Ontario* (RIS International, 2005)
CR&D Waste Disposal Rate, Ontario, 2002	0.09	*The Private Sector IC&I Waste Management System in Ontario* (RIS International, 2005)
CR&D Waste Generation Rate, London, 5 year average from 2014 to 2018	0.34	*Data provided by local CR&D recycling facilities*
CR&D Waste Diversion Rate, London, 5 year average from 2014 to 2018	0.19	*Data provided by local CR&D recycling facilities*
CR&D Waste Disposal Rate, London, 5 year average from 2014 to 2018	0.15	*Data provided by local CR&D recycling facilities*

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Appendix F
How Residential Waste is Managed

Table F-1 2018 City of London Residential Waste Management Programs–
Estimated Tonnes Diverted

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This appendix provides a description of the City's various waste diversion programs and the quantity of material diverted by each program in 2018.

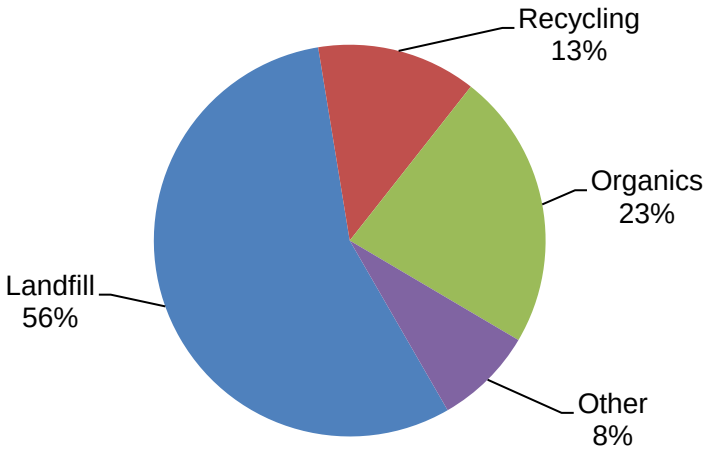
This data is summarized in Table F-1 and Figure F-1.

Table F-1: 2018 CITY OF LONDON RESIDENTIAL WASTE MANAGEMENT PROGRAMS – ESTIMATED TONNES DIVERTED

PROGRAMS	Single Family Households	Multi-Residential Households	Total Tonnes
Recycling			
a) Curbside Recycling Program	17,280	-	17,280
b) Multi-Residential Recycling Program	-	3,030	3,030
c) City Depots (EnviroDepots, W12A)	800	330	1,130
d) Public Space Recycling (estimate)	20	10	30
Subtotal	18,100	3,370	21,470
Organics Management			
e) Home Composting Program (estimate)	5,770	-	5,770
f) Grasscycling (estimate)	3,760	-	3,760
g) Curbside Yard Waste Collection	5,460	-	5,460
h) Depot Yard Waste Collection	16,200	-	16,200
i) Fall Leaf Collection	5,920	-	5,920
j) Christmas Tree Recycling	120	-	120
Subtotal	37,230	-	37,230
Other Programs			
k) Waste Electronics & Electrical Equipment	190	70	260
l) Tire Recycling	2,430	600	3,030
m) Wood Waste/ Construction, Renovation & Demolition Waste	4,700	-	4,700
n) Scrap Metal	720	80	800
o) Textile/Small Household Item Reuse	1,350	340	1,690
p) Municipal Household Special Waste	390	100	490
q) Brewers Retail Container Recycling	1,890	470	2,360
Subtotal	11,670	1,660	13,330
Total Waste Diverted	67,000	5,030	72,030
Total Waste Disposed[1]	66,250	24,500	90,750
Total Waste	133,250	29,530	162,780
Diversion Rate	50%	17%	44%

Notes 1. Includes process residuals from recycling and composting programs.

Figure F-1 - 2018 Waste Diversion



Blue Box Recycling Programs

Curbside Recycling – 17,280 tonnes

The City collects a wide range of recyclables from all curbside households as part of its Blue Box Recycling program. The materials collected in 2018 were newsprint & flyers; household paper; magazines, catalogues & books; paper egg cartons & boxes; cardboard boxes; glass bottles & jars; aluminum food & beverage cans; steel food & beverage cans; foil containers & foil; empty metal paint cans; empty aerosol cans; plastic bottles, jugs, plant pots/trays, large pails & tubs; milk & juice cartons; drink boxes and cardboard cans.

Materials collected were taken to the City's Manning Drive Regional Material Recovery Facility (MRF) for processing and subsequent shipping to various end markets. This facility also receives recyclables from other City programs and other municipalities. Material is weighed upon entering and leaving the MRF.

A portion of this material is allotted to each program (curbside, multi-residential, other municipalities) equal to the percentage of incoming recyclables from each source. In 2018, 19,870 tonnes of materials were collected curbside of which approximately 2,590 tonnes would become process residuals.

Multi-Residential Recycling – 3,030 tonnes

The City collects the same range of recyclables at the majority of multi-residential buildings. The property owner is responsible for purchasing and providing 360 litre carts for residents to sort their recyclables. As a result, a few multi-residential buildings do not have recycling because the property owner has not provided carts. In 2018, approximately 53,100 multi-residential units had access to on-site recycling and 3,800 units did not. Residents from buildings without on-site recycling must take their recyclables to one of four City EnviroDepots. City staff have made numerous attempts to further reduce the number of units without on-site access to recycling.

The materials collected, how they are processed and calculation of the quantity recycled is the same as the curbside Blue Box program. In 2018, 3,270 tonnes of materials were collected from multi-residential buildings of which approximately 240 tonnes would become process residuals.

Depot Recycling – 1,130 tonnes

As noted above, the City operates four EnviroDepots (Oxford Street, Clarke Road, Try – Clarke Road and W12A Landfill) that accept a range of materials including Blue Box recyclables. The Blue Box materials collected, how they are processed and calculation of the quantity recycled is the same as the curbside Blue Box program.

The Blue Box materials accepted are the same as the curbside Blue Box program.

In 2018, 1,300 tonnes of materials were collected from multi-residential buildings of which approximately 170 tonnes would become process residuals.

Public Space Recycling – 30 tonnes

The City has over 40 EnviroBins located throughout the Downtown, Old East Village, Richmond Row and Wortley Village, for use by the residents when they are out shopping or going to restaurants and/or for the residents that live above some commercial establishments. Each EnviroBin has three compartments: containers, paper and garbage.

The Blue Box materials accepted are the same as the curbside Blue Box program.

Organic Programs

Home Composting – 5,770 tonnes

The City sells composters at cost at its Oxford Street and Clarke Road EnviroDepots. In the 1990's the City also sold composters at "truck load sale events". Over the years the City has sold 56,800 composters including approximately 860 in 2018. The *Manual on Generally Accepted Principles (GAP) for Calculating Municipal Solid Waste System Flow* recommends that municipalities assume each composter sold diverts 100 kilograms per year.

Grasscycling – 3,760 tonnes

The City stopped collecting grass clippings in 1995 and started promoting grasscycling. Grasscycling refers to leaving grass clippings on the lawn when mowing.

Because grass consists largely of water (80% or more), contains little lignin, and has high nitrogen content, grass clippings easily break down and return to the soil within one to two weeks, acting primarily as a fertilizer supplement and, to a much smaller degree, a mulch. Grasscycling can provide 15-20% or more of a lawn's yearly nitrogen requirements.

The amount of grass diverted in 2018 was estimated to be approximately 30 kilograms per curbside household or 3,760 tonnes in total.

Curbside Yard Waste Collection – 5,460 tonnes

The City provides curbside collection of yard materials. This includes plant trimmings, brush and branches up to 10 cm in diameter. In 2018 yard materials were collected on a six week cycle and each home received five collections.

The collected yard materials are transported to TRY Recycling's composting facility for processing. The incoming material is weighed. On average about five percent of the incoming material becomes process residuals and 95% is either consumed during the composting process or is made into compost and sold. In 2018, 5,750 tonnes of yard

materials were collected curbside of which approximately 290 tonnes would become process residuals.

Curbside Fall Leaf Collection – 5,920 tonnes

The City provides curbside collection of fall leaves beginning in mid-October. Yard materials are also collected with the fall leaves. In 2018 fall leaves were collected on a three week cycle and each home received three collections.

The collected yard materials are transported to TRY Recycling's composting facility for processing. Approximately 6,220 tonnes were collected. On average about 5% of incoming material becomes residue (or about 300 tonnes). How they are processed and the calculation of the quantity composted is the same as for yard materials.

Depot Yard Material Collection – 16,200 tonnes

Residents can drop off yard materials at the City EnviroDepots year round. The collected yard materials are transported to TRY Recycling's composting facility for processing. Approximately 17,100 tonnes were collected. How they are processed and the calculation of the quantity composted is the same as for yard materials. There was assumed to be 5% residue from processing or about 900 tonnes.

Christmas Tree Collection – 120 tonnes

In 2018, the City offered Christmas tree curbside collection during the first week in January. All four EnviroDepots were also accepting Christmas trees for composting. The trees were chipped on-site at the Depot locations and trees collected curbside were taken to TRY Recycling where they were chipped and composted.

Other Programs

Waste Electronics and Electrical Equipment Recycling – 260 tonnes

Waste Electronics and Electrical Equipment (WEEE) recycling is made up of two components. The first component is electronics collected at the EnviroDepots and shipped for recycling. In 2018 the EnviroDepots collected 200 tonnes of material and electronics were shipped through the Ontario Electronic Stewardship (OES) program. The second component is appliances collected at the EnviroDepots and recycled. In 2018, 60 tonnes of appliances were collected and recycled. This does not include WEEE that is delivered by Londoners to other drop-off locations in the city.

Tire Recycling – 3,330 tonnes

The annual Municipal Datacall administered by the Resource Productivity & Recovery Authority (RPRA) compiles information on materials diverted and disposed by Ontario municipalities. Most of the information used by the RPRA is provided by the local municipality but some of information comes from programs administered by provincial organizations. In the case of tires, information on the quantity of tires recycled in a community is provided by the Ontario Tire Stewardship. This organization looks after the Used Tires Program in Ontario and ensures tires are reused or recycled.

The 2018 Datacall estimate is 3,330 tonnes of tires were recycled/reused in the City of London. Included in this total is 40 tonnes of tires collected at the three City EnviroDepots as part of the Used Tire Program.

Construction, Renovation and Demolition Material Recycling – 4,700 tonnes

The City banned the collection of construction renovation and demolition waste in the 1980's. At the time the average household produced about 15 kilograms of wood waste and renovation material waste each year. At the time of the ban it was assumed about half of this material would be recycled and about half would likely continue to be landfilled as residents would hide small amounts wood waste and renovation materials in their garbage bags for collection.

Beginning in 2004, the City's EnviroDepots began to accept wood waste and renovation materials (including shingles) for recycling. The material is taken to TRY Recycling for processing where approximately 50% to 60% is made into useable products and 40% to 50% becomes residual and is landfilled. The City also accepts wood at the W12A Landfill, which is made into wood chips for on-site use.

In 2018, the EnviroDepots received 2,300 tonnes of wood waste and renovation materials. Approximately 2,100 tonnes of this material was recycled and 200 tonnes became Residual Waste and was landfilled. A further 920 tonnes of wood waste was recycled at the W12A Landfill.

It was assumed that approximately half of the residential renovation materials not taken to the EnviroDepots (1,700 tonnes) was taken to private construction, renovation and demolition waste recycling companies (TRY Recycling and Green Valley Recycling) and recycled, while the other 50% (1,700 tonnes) was residue from recycling, hidden in the residential garbage or disposed of privately.

Scrap Metal Recycling – 800 tonnes

The City stopped the collection of scrap metal (e.g., barbeques, bicycles, etc.) and appliances in the 1990's. At the time the average person produced about 2.5 kilograms of scrap metal each year. At the time of the ban it was assumed about half of this material would be recycled and about half would likely continue to be landfilled as residents would hide small amounts of metal in their garbage bags for collection.

Beginning in 2004, the City's EnviroDepots began to accept scrap metal for recycling. The material is taken to Zubick's for processing. It is assumed 100% of the metal is recycled. In 2018, the EnviroDepots received 540 tonnes of scrap metal.

It was assumed that approximately half the residential scrap metal not taken to the EnviroDepots (260 tonnes) was taken to other scrap metal dealers and recycled while the other 50% (260 tonnes) was placed in the garbage.

Textile/Small Household Item Reuse/Recycling – 1,690 tonnes

In 2018, residents could take textiles, books and small household items to a Goodwill drop off located at the Oxford Street and Clarke Road EnviroDepots. Goodwill has estimated that they received 490 tonnes of material at these locations.

The City offers free disposal of materials to not-for-profit reuse organizations (e.g., Goodwill) to encourage and support these programs. The RPRA Datacall estimates that reuse/recycling organizations given free disposal increase their diversion efforts by 10% and this incremental increase is part of a municipality's diversion estimate.

Approximately 12,000 tonnes of materials were diverted from landfill in 2018 through reuse/recycling organizations receiving free disposal, which translates into an additional 1,200 tonnes toward municipal diversion.

MHSW Recycling – 490 tonnes

The City collects all forms of Municipal Hazardous and Special Waste (MHSW) at the HSW depot at the W12A Landfill including paints, solvents, pesticides, oil filters, used oil, antifreeze, batteries, florescent bulbs, compressed cylinders and oil & antifreeze containers. Some of these materials (batteries, florescent bulbs, compressed cylinders and oil & antifreeze container) are also collected at the Oxford Street and Clarke Road EnviroDepots.

The materials are shipped to various processing facilities across Ontario licensed to accept this material. The majority of the material is recycled including paint, antifreeze and oil.

The estimate of the weight of material diverted is based on a combination of actual weights for some materials and estimated weights based on the volume shipped for other materials.

Brewer's Retail /LCBO Bottle Recycling/Reuse – 2,360 tonnes

The 2018 RPRA Datacall shows 2,360 tonnes of Brewer's Retail and Liquor Control Board of Ontario (LCBO) containers being recycled/reused in the City of London.

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Appendix G
Waste Generation Projections for the Existing Service Area

Table G-1 Waste Quantity Projections

Table G-2 Waste Diversion Projections

Table G-3 Residual Waste Projections

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Table G-1
Waste Quantity Projections[1]

Year	Resid. London (tonnes)	Resid. Thames Centre (tonnes)	IC&I[2] (tonnes)	CR&D[3] (tonnes)	Sewage Sludge Ash (tonnes)	Bio-solids (tonnes)	Street Sweep. (tonnes)	"Other" Municipal[4] (tonnes)	WTP[5] Residuals (tonnes)	Cont. Soil[6] (tonnes)	Total (tonnes)	Running Total (tonnes)
2019	173,000	1,100	181,600	147,000	5,600	5,600	51,900	9,500	13,000	20,800	609,100	609,100
2020	175,100	1,200	183,900	148,900	5,700	5,700	52,500	9,600	13,100	21,000	616,700	1,225,800
2021	177,200	1,200	186,100	150,600	5,800	5,800	53,200	9,700	13,300	21,300	624,200	1,850,000
2022	179,500	1,200	188,500	152,600	5,800	5,800	53,900	9,900	13,500	21,500	632,200	2,482,200
2023	181,900	1,200	191,000	154,600	5,900	5,900	54,600	10,000	13,600	21,800	640,500	3,122,700
2024	184,200	1,200	193,400	156,600	6,000	6,000	55,300	10,100	13,800	22,100	648,700	3,771,400
2025	186,500	1,200	195,800	158,500	6,100	6,100	56,000	10,300	14,000	22,400	656,900	4,428,300
2026	188,800	1,200	198,300	160,500	6,100	6,100	56,700	10,400	14,200	22,700	665,000	5,093,300
2027	190,600	1,300	200,200	162,000	6,200	6,200	57,200	10,500	14,300	22,900	671,400	5,764,700
2028	192,400	1,300	202,000	163,500	6,300	6,300	57,700	10,600	14,400	23,100	677,600	6,442,300
2029	194,200	1,300	203,900	165,000	6,300	6,300	58,200	10,700	14,600	23,300	683,800	7,126,100
2030	195,900	1,300	205,700	166,500	6,400	6,400	58,800	10,800	14,700	23,500	690,000	7,816,100
2031	197,800	1,300	207,700	168,100	6,400	6,400	59,300	10,900	14,800	23,700	696,400	8,512,500
2032	199,200	1,300	209,100	169,300	6,500	6,500	59,700	11,000	14,900	23,900	701,400	9,213,900
2033	200,500	1,300	210,500	170,400	6,500	6,500	60,200	11,000	15,000	24,100	706,000	9,919,900
2034	201,900	1,300	212,000	171,600	6,600	6,600	60,600	11,100	15,100	24,200	711,000	10,630,900
2035	203,300	1,300	213,400	172,800	6,600	6,600	61,000	11,200	15,200	24,400	715,800	11,346,700
2036	204,600	1,400	214,800	173,900	6,600	6,600	61,400	11,300	15,300	24,500	720,400	12,067,100
2037	205,900	1,400	216,200	175,000	6,700	6,700	61,800	11,300	15,400	24,700	725,100	12,792,200
2038	207,200	1,400	217,600	176,100	6,700	6,700	62,200	11,400	15,500	24,900	729,700	13,521,900
2039	208,600	1,400	219,000	177,300	6,800	6,800	62,600	11,500	15,600	25,000	734,600	14,256,500
2040	209,900	1,400	220,400	178,400	6,800	6,800	63,000	11,500	15,700	25,200	739,100	14,995,600
2041	211,200	1,400	221,800	179,500	6,900	6,900	63,400	11,600	15,800	25,300	743,800	15,739,400
2042	212,600	1,400	223,200	180,700	6,900	6,900	63,800	11,700	15,900	25,500	748,600	16,488,000
2043	214,000	1,400	224,700	181,900	7,000	7,000	64,200	11,800	16,000	25,700	753,700	17,241,700
2044	215,300	1,400	226,100	183,000	7,000	7,000	64,600	11,800	16,100	25,800	758,100	17,999,800

Year	Resid. London (tonnes)	Resid. Thames Centre (tonnes)	IC&I[2] (tonnes)	CR&D[3] (tonnes)	Sewage Sludge Ash (tonnes)	Bio-solids (tonnes)	Street Sweep. (tonnes)	"Other" Municipal[4] (tonnes)	WTP[5] Residuals (tonnes)	Cont. Soil[6] (tonnes)	Total (tonnes)	Running Total (tonnes)
2045	216,700	1,400	227,500	184,200	7,000	7,000	65,000	11,900	16,300	26,000	763,000	18,762,800
2046	218,100	1,400	229,000	185,400	7,100	7,100	65,400	12,000	16,400	26,200	768,100	19,530,900
2047	219,500	1,400	230,500	186,600	7,100	7,100	65,900	12,100	16,500	26,300	773,000	20,303,900
2048	220,900	1,500	232,000	187,800	7,200	7,200	66,300	12,200	16,600	26,500	778,200	21,082,100
2019-2023	886,700	5,900	931,100	753,700	28,800	28,800	266,100	48,700	66,500	106,400	3,122,700	
2024-2048	5,099,800	33,600	5,354,800	4,334,600	165,800	165,800	1,530,300	280,700	382,100	611,900	17,959,400	

Notes

1. Waste quantity projections were estimated by multiplying population projections by the appropriate waste generation rate.
2. IC&I is an abbreviation for Industrial, Commercial & Institutional waste.
3. CR&D is an abbreviation for Construction, Renovation and Demolition waste.
4. Other Municipal includes recycling residuals from the City's Material Recovery Facility, etc.
5. "WTP process residuals" is an abbreviation for water treatment plant process residuals.
6. Includes Contaminated Soil buried as waste and Contaminated Soil used as cover material. Assumes 50% used as cover.
7. Waste generation rates used to calculate projected waste quantities are summarized in table G-1a below.
8. It was assumed that the unit generation rate will not change during the study period.

Table G-1a Waste Generation Rates

Category	Generation Rate[7,8] (tonne/capita/yr)
Residential	0.400
IC&I Waste	0.420
CR&D Residual	0.340
Sewage Sludge Ash	0.013
Biosolids	0.013
Street Sweeping	0.120
"Other" Municipal	0.022
WTP Residual	0.030
Contaminated Soil	0.048

Table G-2
Waste Diversion Projections

Year	Residential Diverted[3]		IC&I[1] Exported[4]		IC&I[1] Diverted[5]		CR&D[2,6]		Street Sweepings		Contaminated Soil[7]		Total	Running Total
	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	(tonnes)	(tonnes)
2019	45%	77,900	46%	83,200	21%	37,600	55%	80,900	50%	26,000	60%	12,500	279,600	279,600
2020	50%	87,600	37%	67,400	21%	39,400	55%	81,900	50%	26,300	60%	12,600	276,300	555,900
2021	55%	97,500	28%	51,200	22%	41,200	55%	82,800	50%	26,600	60%	12,800	272,700	828,600
2022	60%	107,700	18%	34,600	23%	43,100	55%	83,900	50%	27,000	60%	12,900	269,300	1,097,900
2023	60%	109,100	9%	17,500	24%	45,000	55%	85,000	50%	27,300	60%	13,100	256,600	1,354,500
2024	60%	110,500	0%	0	24%	47,000	55%	86,100	50%	27,700	60%	13,300	243,600	1,598,100
2025	60%	111,900	0%	0	25%	49,000	55%	87,200	50%	28,000	60%	13,400	248,100	1,846,200
2026	60%	113,300	0%	0	26%	51,600	55%	88,300	50%	28,400	60%	13,600	253,200	2,099,400
2027	60%	114,400	0%	0	27%	54,100	55%	89,100	50%	28,600	60%	13,700	257,600	2,357,000
2028	60%	115,400	0%	0	28%	56,600	55%	89,900	50%	28,900	60%	13,900	261,900	2,618,900
2029	60%	116,500	0%	0	29%	59,100	55%	90,800	50%	29,100	60%	14,000	266,400	2,885,300
2030	60%	117,500	0%	0	30%	61,700	55%	91,600	50%	29,400	60%	14,100	270,800	3,156,100

Year	Residential Diverted[3]		IC&I[1] Exported[4]		IC&I[1] Diverted[5]		CR&D[2,6]		Street Sweepings		Contaminated Soil[7]		Total	Running Total
	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	(tonnes)	(tonnes)
2031	60%	118,700	0%	0	31%	64,400	55%	92,500	50%	29,700	60%	14,200	275,600	3,431,700
2032	60%	119,500	0%	0	32%	66,900	55%	93,100	50%	29,900	60%	14,300	279,500	3,711,200
2033	60%	120,300	0%	0	33%	69,500	55%	93,700	50%	30,100	60%	14,500	283,500	3,994,700
2034	60%	121,100	0%	0	34%	72,100	55%	94,400	50%	30,300	60%	14,500	287,600	4,282,300
2035	60%	122,000	0%	0	35%	74,700	55%	95,000	50%	30,500	60%	14,600	291,700	4,574,000
2036	60%	122,800	0%	0	36%	77,300	55%	95,600	50%	30,700	60%	14,700	295,700	4,869,700
2037	60%	123,500	0%	0	37%	80,000	55%	96,300	50%	30,900	60%	14,800	299,800	5,169,500
2038	60%	124,300	0%	0	38%	82,700	55%	96,900	50%	31,100	60%	14,900	303,900	5,473,400
2039	60%	125,200	0%	0	39%	85,400	55%	97,500	50%	31,300	60%	15,000	308,100	5,781,500
2040	60%	125,900	0%	0	40%	88,200	55%	98,100	50%	31,500	60%	15,100	312,200	6,093,700
2041	60%	126,700	0%	0	41%	90,900	55%	98,700	50%	31,700	60%	15,200	316,300	6,410,000
2042	60%	127,600	0%	0	42%	93,700	55%	99,400	50%	31,900	60%	15,300	320,700	6,730,700
2043	60%	128,400	0%	0	43%	96,600	55%	100,000	50%	32,100	60%	15,400	325,000	7,055,700
2044	60%	129,200	0%	0	44%	99,500	55%	100,700	50%	32,300	60%	15,500	329,400	7,385,100
2045	60%	130,000	0%	0	45%	102,400	55%	101,300	50%	32,500	60%	15,600	333,700	7,718,800
2046	60%	130,900	0%	0	46%	105,300	55%	102,000	50%	32,700	60%	15,700	338,200	8,057,000
2047	60%	131,700	0%	0	47%	108,300	55%	102,600	50%	33,000	60%	15,800	342,600	8,399,600
2048	60%	132,500	0%	0	48%	111,400	55%	103,300	50%	33,200	60%	15,900	347,200	8,746,800

Notes

1. IC&I is an abbreviation for Industrial, Commercial & Institutional waste
2. CR&D is an abbreviation for Construction, Renovation and Demolition residuals
3. Residential waste diversion is assumed to increase from 45% (current rate) to 60% by 2022.
4. In order to be able to accommodate all Residual Waste generated in London it is assumed that IC&I waste export stops by 2025.
5. IC&I waste diversion is assumed to increase from 20% (current rate) to 25% by 2025, 30% by 2030 and 50% by 2050.
6. CR&D waste diversion is assumed to stay at 55% (current rate) until 2050.
7. 60% of contaminated soil is used as cover material and does not consume any landfill capacity.

Table G-3
Residual Waste Projections (tonnes)

Year	Residential (tonnes)	IC&I[1] (tonnes)	CR&D[2] Residual (tonnes)	Sewage Sludge Ash (tonnes)	Biosolids (tonnes)	Street Sweepings (tonnes)	"Other"[3] Municipal (tonnes)	WTP[4] Residuals (tonnes)	Cont. Soil (tonnes)	Total (tonnes)	Running Total (tonnes)
2019	96,200	58,600	66,100	5,600	5,600	25,900	9,500	13,000	8,300	288,800	288,800
2020	88,700	74,800	67,000	5,700	5,700	26,200	9,600	13,100	8,400	299,200	588,000
2021	80,900	91,500	67,800	5,800	5,800	26,600	9,700	13,300	8,500	309,900	897,900
2022	73,000	108,400	68,700	5,800	5,800	26,900	9,900	13,500	8,600	320,600	1,218,500
2023	74,000	126,000	69,600	5,900	5,900	27,300	10,000	13,600	8,700	341,000	**1,559,500**
2024	74,900	144,000	70,500	6,000	6,000	27,600	10,100	13,800	8,800	361,700	361,700
2025	75,800	144,400	71,300	6,100	6,100	28,000	10,300	14,000	9,000	365,000	726,700
2026	76,700	144,200	72,200	6,100	6,100	28,300	10,400	14,200	9,100	367,300	1,094,000
2027	77,500	144,200	72,900	6,200	6,200	28,600	10,500	14,300	9,200	369,600	1,463,600
2028	78,300	143,600	73,600	6,300	6,300	28,800	10,600	14,400	9,200	371,100	1,834,700
2029	79,000	142,900	74,200	6,300	6,300	29,100	10,700	14,600	9,300	372,400	2,207,100
2030	79,700	142,200	74,900	6,400	6,400	29,400	10,800	14,700	9,400	373,900	2,581,000
2031	80,400	141,300	75,600	6,400	6,400	29,600	10,900	14,800	9,500	374,900	2,955,900
2032	81,000	140,800	76,200	6,500	6,500	29,800	11,000	14,900	9,600	376,300	3,332,200
2033	81,500	139,600	76,700	6,500	6,500	30,100	11,000	15,000	9,600	376,500	3,708,700
2034	82,100	138,400	77,200	6,600	6,600	30,300	11,100	15,100	9,700	377,100	4,085,800
2035	82,600	137,300	77,800	6,600	6,600	30,500	11,200	15,200	9,800	377,600	4,463,400
2036	83,200	136,100	78,300	6,600	6,600	30,700	11,300	15,300	9,800	377,900	4,841,300
2037	83,800	134,800	78,700	6,700	6,700	30,900	11,300	15,400	9,900	378,200	5,219,500
2038	84,300	133,500	79,200	6,700	6,700	31,100	11,400	15,500	10,000	378,400	5,597,900
2039	84,800	132,200	79,800	6,800	6,800	31,300	11,500	15,600	10,000	378,800	5,976,700
2040	85,400	130,800	80,300	6,800	6,800	31,500	11,500	15,700	10,100	378,900	6,355,600
2041	85,900	129,500	80,800	6,900	6,900	31,700	11,600	15,800	10,100	379,200	6,734,800
2042	86,400	128,100	81,300	6,900	6,900	31,900	11,700	15,900	10,200	379,300	7,114,100
2043	87,000	126,600	81,900	7,000	7,000	32,100	11,800	16,000	10,300	379,700	7,493,800

Year	Residential (tonnes)	IC&I[1] (tonnes)	CR&D[2] Residual (tonnes)	Sewage Sludge Ash (tonnes)	Biosolids (tonnes)	Street Sweepings (tonnes)	"Other"[3] Municipal (tonnes)	WTP[4] Residuals (tonnes)	Cont. Soil (tonnes)	Total (tonnes)	Running Total (tonnes)
2044	87,500	125,200	82,300	7,000	7,000	32,300	11,800	16,100	10,300	379,500	7,873,300
2045	88,100	123,700	82,900	7,000	7,000	32,500	11,900	16,300	10,400	379,800	8,253,100
2046	88,600	122,200	83,400	7,100	7,100	32,700	12,000	16,400	10,500	380,000	8,633,100
2047	89,200	120,700	84,000	7,100	7,100	32,900	12,100	16,500	10,500	380,100	9,013,200
2048	89,900	119,100	84,500	7,200	7,200	33,100	12,200	16,600	10,600	380,400	**9,393,600**
2019-2023	412,800	459,300	339,200	28,800	28,800	132,900	48,700	66,500	42,500	**1,559,500**	
2024-2048	2,073,600	3,365,400	1,950,500	165,800	165,800	764,800	280,700	382,100	244,900	**9,393,600**	

Notes

1. IC&I is an abbreviation for Industrial, Commercial & Institutional waste.
2. CR&D Residuals is an abbreviation for Construction, Renovation and Demolition recycling process residuals.
3. “Other” Municipal includes recycling residuals from the City's Material Recovery Facility, waste from City projects, waste from City parks and grit from wastewater treatment plants.
4. ”WTP process residuals" is an abbreviation for water treatment plant process residuals.
5. Disposal quantity calculated by subtracting the amount diverted (Table G2) from the total waste generated (Table G1).

Appendix H
Calculation of Residual Waste from Proposed Regional Service Area

Table H-1: Data Sources

Table H-2: Residual Waste Diversion Rates

Table H-3 Residual Waste Quantities for Scenario 1

Table H-4 Residual Waste Quantities for Scenario 2

Table H-5 Residual Waste Quantities for Scenario 3

Table H-6 Residual Waste Quantities for Scenario 4

We have endeavored to make this document as accessible as possible but realize that there may be limitations in this area. We are happy to provide you with detailed information and description about any of the materials in the appendices of the document. For a description of these materials for accessibility purposes, please contact Wesley Abbott, wabbott@london.ca, 226-376-2311 who will help provide you with the details you require.

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Residual Waste quantity projections were developed for four scenarios for the proposed regional service area for the W12A Landfill expansion. Data sources used to develop the Residual Waste quantity projections are presented in Table H-1.

Diversion rates used in projecting the Residual Waste quantity projections for the four scenarios are presented in Table H-2.

Calculation of the amount of Residual Waste that could come to the W12A Landfill from the proposed regional service area for the four scenarios are presented in Tables H-3, H-4, H-5 and H-6.

Table H-1: Data Sources

Factor	Data Source
Projected Landfill Closure Date	• Landfill closure dates came from public sources (e.g., annual report, MECP, website, etc.) or by contacting the owner of the landfill.
Waste Quantity Projections	• Residential residual and diversion waste quantities for each municipality in the proposed regional service area were obtained from the Resource Productivity and Resource Authority Datacall. • IC&I waste quantities for each municipality were assumed to be equal to residential waste quantities as there is limited public data on IC&I waste quantities within the proposed service area. It is noted that the Province as a whole generates more IC&I waste than residential waste. • It was assumed that the waste quantities in future years would not change (i.e., no increases in population or per capita waste generation rate).
Municipalities that would use the W12A Landfill	• The City approached nearby lower and upper tier municipalities (Elgin County, Middlesex County, Huron County, Lambton County, Perth County and Oxford County) to determine their interest in being included in the service area of the W12A Landfill. Based on their responses, a service area consisting of the City of London plus Elgin County, Middlesex County, Huron County, Lambton County and Perth County is proposed. • Responses are summarized in Appendix B. • Oxford County was excluded from the proposed regional service area as they indicated they had no interest in using the W12A Landfill in the future.

Table H-2: Residual Waste Diversion Rates

	Scenario	2019	2020	2030	2050
1	No increase in waste diversion rates	25%	25%	25%	25%
2	Increase in diversion rates half way towards MECP diversion targets	25%	28%	38%	53%
3	Increase in diversion rates 75% of the way towards MECP diversion targets	25%	29%	44%	66%
4	Achieve 100% of MECP diversion targets	25%	30%	50%	80%

Table H-3 Site Capacity Planning - Residual Waste Quantities for Scenario 1 (No change in municipal diversion rates) (Diversion Rate by Year)

Municipality	Interested in Using W12A Landfill	Landfill Currently Using	Projected Closure Date	Years between Closure and 2048	Residential Waste (2017, tonnes)	Total Waste[a] (2017, tonnes)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	Total
							25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	
City of St. Thomas	Yes	Green Lane (Toronto)	2040	8	17,851	35,700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26,800	26,800	26,800	26,800	26,800	26,800	26,800	26,800	26,800	241,200
Town of Aylmer[r]	Yes	Green Lane (Toronto)	2040	8	2,477	5,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,800	3,800	3,800	3,800	3,800	3,800	3,800	3,800	3,800	34,200
Municipality of Bayham	Yes	Green Lane (Toronto)	2040	8	1,666	3,300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	22,500
Municipality of Central Elgin[d]	Yes	Green Lane (Toronto)	2040	8	4,453	8,900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6,700	6,700	6,700	6,700	6,700	6,700	6,700	6,700	6,700	60,300
Municipality of Dutton/Dunwich[d]	Yes	Dutton/Dunwich Landfill	2133	0	1,235	2,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Municipality of West Elgin	Yes	West Elgin Landfill	1532	22	1,225	2,500	0	0	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	43,700
Township of Malahide	Yes	Green Lane (Toronto)	2040	8	2,200	4,400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,300	3,300	3,300	3,300	3,300	3,300	3,300	3,300	3,300	29,700
Township of Southwold[d]	No (no response)	Green Lane (Toronto)	2040	10	1,184	2,400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
County of Elgin						**64,700**	**0**	**0**	**1,900**	**1,900**	**1,900**	**1,900**	**1,900**	**1,900**	**1,900**	**1,900**	**1,900**	**1,900**	**1,900**	**1,900**	**1,900**	**1,900**	**45,000**	**45,000**	**45,000**	**45,000**	**45,000**	**45,000**	**45,000**	**45,000**	**45,000**	**431,600**
Municipality of Adelaide Metcalfe[a]	Yes	Kellam Road Landfill & School Road Landfill	2032	16	593	1,200		0	0	0	0	0	0	0	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	15,300
Municipality of Lucan Biddulph[a]	Yes	Twin Creeks (WM)	2034	14	1,045	2,100	0	0	0	0	0	0	0	0	0	0	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	24,000
Municipality of Middlesex Centre[a]	Yes	Twin Creeks (WM)	2034	14	3,489	7,000	0	0	0	0	0	0	0	0	0	0	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	79,500
Municipality of North Middlesex[a]	Yes	Twin Creeks (WM)	2034	14	1,363	2,700	0	0	0	0	0	0	0	0	0	0	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	30,000
Municipality of Southwest Middlesex[d]	Yes	Twin Creeks (WM)	2034	14	1,408	2,800	0	0	0	0	0	0	0	0	0	0	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	31,500
Municipality of Strathroy- Caradoc[a]	Yes	Twin Creeks (WM)	2034	14	4,805	9,600	0	0	0	0	0	0	0	0	0	0	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	108,000
Municipality of Thames Centre[d]	Yes	Thames Centre Landfill	2075	0	4,494	9,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Village of Newbury[d]	Yes	Twin Creeks (WM)	2034	14	96	200	0	0	0	0	0	0	0	0	0	0	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	3,000
County of Middlesex						**34,600**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**900**	**900**	**19,300**	**19,300**	**19,300**	**19,300**	**19,300**	**19,300**	**19,300**	**19,300**	**19,300**	**19,300**	**19,300**	**19,300**	**19,300**	**19,300**	**19,300**	**291,300**
Township of Ashfield-Colborne-Wawanosh	Yes	Ashefield Landfill	2062	0	2,112	4,200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Municipality of Bluewater[a]	Yes	Stanley Landfill	2044	4	2,575	5,200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,900	3,900	3,900	3,900	3,900	3,900	3,900	19,500
Municipality of Central Huron[ab]	Yes	Twin Creeks (WM)	2034	14	2,173	4,300	0	0	0	0	0	0	0	0	0	0	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	48,000
Town of Goderich[ab]	Yes	Twin Creeks (WM)	2034	14	2,090	4,200	0	0	0	0	0	0	0	0	0	0	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	48,000
Township of Howick[d]	Yes	Howick Landfill	2026	22	807	1,600	0	0	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	27,600
Municipality of Huron East[ab]		Twin Creeks (WM)	2034	14	1,087	2,200	0	0	0	0	0	0	0	0	0	0	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	25,500
Municipality of Morris-Turnberry[a]	Yes	Morris Ward Landfill	2023	24	716	1,400	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	26,400
Township of North Huron	Yes	Wingham Landfill	2110/2093	0	2,557	5,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of South Huron[a]	Yes	South Huron Landfill	>2100	0	2,639	5,300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
County of Huron						**33,500**	**1,100**	**1,100**	**2,300**	**2,300**	**2,300**	**2,300**	**2,300**	**2,300**	**2,300**	**2,300**	**10,400**	**10,400**	**10,400**	**10,400**	**10,400**	**10,400**	**10,400**	**10,400**	**10,400**	**10,400**	**14,300**	**14,300**	**14,300**	**14,300**	**14,300**	**195,000**
City of Stratford	Yes/Unlikely	Stratford Landfill	2037	13	12,556	25,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Town of St. Marys[a]	Yes/Unlikely	St. Marys Landfill	2058	0	1,758	3,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Municipality of North Perth[a]	Yes	Elam Landfill	2100	0	3,035	6,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of Perth East[a]	Yes	South Easthope Landfill	2100	0	2,319	4,600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of Perth South[a]	Yes	Perth South Landfill	>2100	0	813	1,600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Municipality of West Perth[a]	Yes/Unlikely	Mitchell Landfill	2115	0	1,989	4,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
County of Perth						**44,900**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Municipality of Brooke-Alvinston[a]	Yes/Unlikely	Twin Creeks (WM)	2034	16	565	1,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of Dawn-Euphemia[a]	Yes/Unlikely	Dawn Landfill and Twin Creeks Landfill	2034	16	479	1,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of Enniskillen[d]	Yes/Unlikely	Twin Creeks (WM)	2034	16	531	1,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Municipality of Lambton Shores[a]	Yes/Unlikely	Twin Creeks (WM)	2034	16	3,983	8,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Village of Oil Springs[a]	Yes/Unlikely	Twin Creeks (WM)	2034	16	162	300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Town of Petrolia	Yes/Unlikely	Twin Creeks (WM)	2034	16	2,167	4,300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Town of Plympton-Wyoming	Yes/Unlikely	Twin Creeks (WM)	2034	16	2,338	4,700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Village of Point Edward[d]	Yes/Unlikely	Twin Creeks (WM)	2034	16	358	700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
City of Sarnia	Yes/Unlikely	Twin Creeks (WM)	2034	16	27,669	55,300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of St. Clair[d]	Yes/Unlikely	Twin Creeks (WM)	2034	16	5,999	12,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of Warwick[a]	Yes/Unlikely	Twin Creeks (WM)	2034	16	814	1,600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
County of Lambton						**90,100**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Totals					**133,875**	**267,800**	**1,100**	**1,100**	**4,200**	**4,200**	**4,200**	**4,200**	**4,200**	**4,200**	**5,100**	**5,100**	**31,600**	**31,600**	**31,600**	**31,600**	**31,600**	**31,600**	**74,700**	**74,700**	**74,700**	**74,700**	**78,600**	**78,600**	**78,600**	**78,600**	**78,600**	**917,900**

Notes:
a). Member of Bluewater Recycling Association (BRA). Residual waste estimated from dividing municipality population by # of all municipalities in the BRA and multiplying by the total residual waste from BRA.
b). Member of Mid-Huron Site Board and have shared waste disposal facilities.
c). 2047 is the expected lifespan if Twin Creeks continues at their currently set fill rate. They are looking to add the soon closing Petrolia Landfills' waste to their stream. This would reduce the lifespan year to 2034.
d). 2017 data not available in waste quantities report, used 2016 values.

Table H-4 Site Capacity Planning - Residual Waste Quantities for Scenario 2 (Municipalities increase diversion rates 50% of the way towards the MECP diversion target) (Diversion Rate by Year)

Municipality	Interested in Using W12A Landfill	Landfill Currently Using	Projected Closure Date	Years between Closure and 2048	Residential Waste (2017, tonnes)	Total Waste[a] (2017, tonnes)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	Total
							33%	34%	35%	36%	37%	38%	38%	39%	40%	41%	41%	42%	43%	44%	44%	45%	46%	47%	47%	48%	49%	50%	50%	51%	25%	
City of St. Thomas	Yes	Green Lane (Toronto)	2040	8	17,851	35,700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19,400	19,100	18,800	18,600	18,300	18,000	17,800	17,500	26,800	174,300
Town of Aylmer [c]	Yes	Green Lane (Toronto)	2040	8	2,477	5,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,700	2,700	2,600	2,600	2,600	2,500	2,500	2,500	3,800	24,500
Municipality of Bayham	Yes	Green Lane (Toronto)	2040	8	1,666	3,300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,800	1,800	1,700	1,700	1,700	1,700	1,600	1,600	2,500	16,100
Municipality of Central Elgin [d]	Yes	Green Lane (Toronto)	2040	8	4,453	8,900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,800	4,800	4,700	4,600	4,600	4,500	4,400	4,400	6,700	43,500
Municipality of Dutton/Dunwich [d]	Yes	Dutton/Dunwich Landfill	2133	0	1,235	2,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Municipality of West Elgin	Yes	West Elgin Landfill	1532	22	1,225	2,500	0	0	1,600	1,600	1,600	1,600	1,500	1,500	1,500	1,500	1,500	1,500	1,400	1,400	1,400	1,400	1,400	1,300	1,300	1,300	1,300	1,300	1,200	1,200	1,900	33,200
Township of Malahide	Yes	Green Lane (Toronto)	2040	8	2,200	4,400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,400	2,400	2,300	2,300	2,300	2,200	2,200	2,200	3,300	21,600
Township of Southwold [d]	No (no response)	Green Lane (Toronto)	2040	10	1,184	2,400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
County of Elgin						**64,700**	**0**	**0**	**1,600**	**1,600**	**1,600**	**1,600**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,400**	**1,400**	**1,400**	**1,400**	**32,500**	**32,100**	**31,400**	**31,100**	**30,800**	**30,200**	**29,700**	**29,400**	**45,000**	**313,200**
Municipality of Adelaide Metcalfe [a]	Yes	Kellam Road Landfill & School Road Landfill	2032	16	593	1,200		0	0	0	0	0	0	0	700	700	700	700	700	700	700	700	700	600	600	600	600	600	600	600	900	11,400
Municipality of Lucan Biddulph [a]	Yes	Twin Creeks (WM)	2034	14	1,045	2,100	0	0	0	0	0	0	0	0	0	0	1,200	1,200	1,200	1,200	1,200	1,200	1,100	1,100	1,100	1,100	1,100	1,100	1,000	1,000	1,600	17,400
Municipality of Middlesex Centre [a]	Yes	Twin Creeks (WM)	2034	14	3,489	7,000	0	0	0	0	0	0	0	0	0	0	4,100	4,100	4,000	4,000	3,900	3,900	3,800	3,700	3,700	3,600	3,600	3,500	3,500	3,400	5,300	58,100
Municipality of North Middlesex [a]	Yes	Twin Creeks (WM)	2034	14	1,363	2,700	0	0	0	0	0	0	0	0	0	0	1,600	1,600	1,500	1,500	1,500	1,500	1,500	1,400	1,400	1,400	1,400	1,400	1,300	1,300	2,000	22,300
Municipality of Southwest Middlesex [d]	Yes	Twin Creeks (WM)	2034	14	1,408	2,800	0	0	0	0	0	0	0	0	0	0	1,600	1,600	1,600	1,600	1,600	1,500	1,500	1,500	1,500	1,500	1,400	1,400	1,400	1,400	2,100	23,200
Municipality of Strathroy- Caradoc [a]	Yes	Twin Creeks (WM)	2034	14	4,805	9,600	0	0	0	0	0	0	0	0	0	0	5,600	5,600	5,500	5,400	5,400	5,300	5,200	5,100	5,100	5,000	4,900	4,800	4,800	4,700	7,200	79,600
Municipality of Thames Centre [d]	Yes	Thames Centre Landfill	2075	0	4,494	9,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Village of Newbury [d]	Yes	Twin Creeks (WM)	2034	14	96	200	0	0	0	0	0	0	0	0	0	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	200	1,600
County of Middlesex						**34,600**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**700**	**700**	**14,900**	**14,900**	**14,600**	**14,500**	**14,400**	**14,200**	**13,900**	**13,500**	**13,500**	**13,300**	**13,100**	**12,900**	**12,700**	**12,500**	**19,300**	**213,600**
Township of Ashfield-Colborne-Wawanosh	Yes	Ashefield Landfill	2062	0	2,112	4,200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Municipality of Bluewater [a]	Yes	Stanley Landfill	2044	4	2,575	5,200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,700	2,600	2,600	2,500	3,900	14,300
Municipality of Central Huron [ab]	Yes	Twin Creeks (WM)	2034	14	2,173	4,300	0	0	0	0	0	0	0	0	0	0	2,500	2,500	2,500	2,400	2,400	2,400	2,300	2,300	2,300	2,200	2,200	2,200	2,200	2,100	3,200	35,600
Town of Goderich [ab]	Yes	Twin Creeks (WM)	2034	14	2,090	4,200	0	0	0	0	0	0	0	0	0	0	2,500	2,400	2,400	2,400	2,300	2,300	2,300	2,200	2,200	2,200	2,200	2,200	2,100	2,100	3,200	34,900
Township of Howick [d]	Yes	Howick Landfill	2026	22	807	1,600	0	0	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	900	900	900	900	900	900	900	900	800	800	800	800	800	800	1,200	21,200
Municipality of Huron East [ab]		Twin Creeks (WM)	2034	14	1,087	2,200	0	0	0	0	0	0	0	0	0	0	1,300	1,300	1,300	1,200	1,200	1,200	1,200	1,200	1,200	1,100	1,100	1,100	1,100	1,100	1,700	18,300
Municipality of Morris-Turnberry [a]	Yes	Morris Ward Landfill	2023	24	716	1,400	900	900	900	900	900	900	900	900	800	800	800	800	800	800	800	800	700	700	700	700	700	700	700	700	1,100	19,500
Township of North Huron	Yes	Wingham Landfill	2110/2093	0	2,557	5,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of South Huron [a]	Yes	South Huron Landfill	>2100	0	2,639	5,300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
County of Huron						**33,500**	**900**	**900**	**1,900**	**1,900**	**1,900**	**1,900**	**1,900**	**1,900**	**1,800**	**1,800**	**8,000**	**7,900**	**7,900**	**7,700**	**7,600**	**7,600**	**7,500**	**7,300**	**7,200**	**7,000**	**9,700**	**9,500**	**9,400**	**9,300**	**14,300**	**143,800**
City of Stratford	Yes/Unlikely	Stratford Landfill	2037	13	12,556	25,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Town of St. Marys [a]	Yes/Unlikely	St. Marys Landfill	2058	0	1,758	3,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Municipality of North Perth [a]	Yes	Elam Landfill	2100	0	3,035	6,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of Perth East [a]	Yes	South Easthope Landfill	2100	0	2,319	4,600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of Perth South [a]	Yes	Perth South Landfill	>2100	0	813	1,600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Municipality of West Perth [a]	Yes/Unlikely	Mitchell Landfill	2115	0	1,989	4,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
County of Perth						**44,900**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Municipality of Brooke-Alvinston [a]	Yes/Unlikely	Twin Creeks (WM)	2034	16	565	1,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of Dawn-Euphemia [a]	Yes/Unlikely	Dawn Landfill and Twin Creeks Landfill	2034	16	479	1,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of Enniskillen [d]	Yes/Unlikely	Twin Creeks (WM)	2034	16	531	1,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Municipality of Lambton Shores [a]	Yes/Unlikely	Twin Creeks (WM)	2034	16	3,983	8,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Village of Oil Springs [a]	Yes/Unlikely	Twin Creeks (WM)	2034	16	162	300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Town of Petrolia	Yes/Unlikely	Twin Creeks (WM)	2034	16	2,167	4,300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Town of Plympton-Wyoming	Yes/Unlikely	Twin Creeks (WM)	2034	16	2,338	4,700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Village of Point Edward [d]	Yes/Unlikely	Twin Creeks (WM)	2034	16	358	700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
City of Sarnia	Yes/Unlikely	Twin Creeks (WM)	2034	16	27,669	55,300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of St. Clair [d]	Yes/Unlikely	Twin Creeks (WM)	2034	16	5,999	12,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of Warwick [a]	Yes/Unlikely	Twin Creeks (WM)	2034	16	814	1,600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
County of Lambton						**90,100**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Totals					**133,875**	**267,800**	**900**	**900**	**3,500**	**3,500**	**3,500**	**3,500**	**3,400**	**3,400**	**4,000**	**4,000**	**24,400**	**24,300**	**23,900**	**23,600**	**23,400**	**23,200**	**53,900**	**52,900**	**52,100**	**51,400**	**53,600**	**52,600**	**51,800**	**51,200**	**78,600**	**670,600**

Notes:
a). Member of Bluewater Recycling Association (BRA). Residual waste estimated from dividing municipality population by # of all municipalities in the BRA and multiplying by the total residual waste from BRA.
b). Member of Mid-Huron Site Board and have shared waste disposal facilities.
c). 2047 is the expected lifespan if Twin Creeks continues at their currently set fill rate. They are looking to add the soon closing Petrolia Landfills' waste to their stream. This would reduce the lifespan year to 2034.
d). 2017 data not available in waste quantities report, used 2016 values.

Table H-5 Site Capacity Planning - Residual Waste Quantities for Scenario 3 (Municipalities increase diversion rates 75% of the way towards the MECP diversion target) (Diversion Rate by Year)

Municipality	Interested in Using W12A Landfill	Landfill Currently Using	Projected Closure Date	Years between Closure and 2048	Residential Waste (2017, tonnes)	Total Waste[a] (2017, tonnes)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	Total
							36%	38%	40%	42%	43%	44%	45%	46%	47%	48%	49%	51%	52%	53%	54%	55%	56%	57%	58%	60%	61%	62%	63%	64%	65%	
City of St. Thomas	Yes	Green Lane (Toronto)	2040	8	17,851	35,700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15,700	15,300	14,900	14,500	14,100	13,700	13,300	12,900	12,500	126,900
Town of Aylmer [c]	Yes	Green Lane (Toronto)	2040	8	2,477	5,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,200	2,100	2,100	2,000	2,000	1,900	1,900	1,800	1,800	17,800
Municipality of Bayham	Yes	Green Lane (Toronto)	2040	8	1,666	3,300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,400	1,400	1,400	1,300	1,300	1,300	1,200	1,200	1,200	11,700
Municipality of Central Elgin [d]	Yes	Green Lane (Toronto)	2040	8	4,453	8,900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,900	3,800	3,700	3,600	3,500	3,400	3,300	3,200	3,100	31,500
Municipality of Dutton/Dunwich [d]	Yes	Dutton/Dunwich Landfill	2133	0	1,235	2,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Municipality of West Elgin	Yes	West Elgin Landfill	1532	22	1,225	2,500	0	0	1,500	1,500	1,400	1,400	1,400	1,400	1,300	1,300	1,300	1,200	1,200	1,200	1,200	1,100	1,100	1,100	1,000	1,000	1,000	1,000	900	900	900	27,300
Township of Malahide	Yes	Green Lane (Toronto)	2040	8	2,200	4,400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,900	1,900	1,800	1,800	1,700	1,700	1,600	1,600	1,500	15,500
Township of Southwold [d]	No (no response)	Green Lane (Toronto)	2040	10	1,184	2,400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
County of Elgin						**64,700**	**0**	**0**	**1,500**	**1,500**	**1,400**	**1,400**	**1,400**	**1,400**	**1,300**	**1,300**	**1,300**	**1,200**	**1,200**	**1,200**	**1,200**	**1,100**	**26,200**	**25,600**	**24,900**	**24,200**	**23,600**	**23,000**	**22,200**	**21,600**	**21,000**	**230,700**
Municipality of Adelaide Metcalfe [a]	Yes	Kellam Road Landfill & School Road Landfill	2032	16	593	1,200		0	0	0	0	0	0	0	600	600	600	600	600	600	600	500	500	500	500	500	500	500	400	400	400	8,900
Municipality of Lucan Biddulph [a]	Yes	Twin Creeks (WM)	2034	14	1,045	2,100	0	0	0	0	0	0	0	0	0	0	1,100	1,000	1,000	1,000	1,000	900	900	900	900	900	800	800	800	800	700	13,500
Municipality of Middlesex Centre [a]	Yes	Twin Creeks (WM)	2034	14	3,489	7,000	0	0	0	0	0	0	0	0	0	0	3,500	3,500	3,400	3,300	3,200	3,200	3,100	3,000	2,900	2,800	2,800	2,700	2,600	2,500	2,500	45,000
Municipality of North Middlesex [a]	Yes	Twin Creeks (WM)	2034	14	1,363	2,700	0	0	0	0	0	0	0	0	0	0	1,400	1,300	1,300	1,300	1,200	1,200	1,200	1,200	1,100	1,100	1,100	1,000	1,000	1,000	900	17,300
Municipality of Southwest Middlesex [d]	Yes	Twin Creeks (WM)	2034	14	1,408	2,800	0	0	0	0	0	0	0	0	0	0	1,400	1,400	1,400	1,300	1,300	1,300	1,200	1,200	1,200	1,100	1,100	1,100	1,000	1,000	1,000	18,000
Municipality of Strathroy- Caradoc [a]	Yes	Twin Creeks (WM)	2034	14	4,805	9,600	0	0	0	0	0	0	0	0	0	0	4,900	4,800	4,600	4,500	4,400	4,300	4,200	4,100	4,000	3,900	3,800	3,700	3,600	3,500	3,400	61,700
Municipality of Thames Centre [d]	Yes	Thames Centre Landfill	2075	0	4,494	9,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Village of Newbury [d]	Yes	Twin Creeks (WM)	2034	14	96	200	0	0	0	0	0	0	0	0	0	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	1,500
County of Middlesex						**34,600**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**600**	**600**	**13,000**	**12,700**	**12,400**	**12,100**	**11,800**	**11,500**	**11,200**	**11,000**	**10,700**	**10,400**	**10,200**	**9,900**	**9,500**	**9,300**	**9,000**	**165,900**
Township of Ashfield-Colborne-Wawanosh	Yes	Ashefield Landfill	2062	0	2,112	4,200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Municipality of Bluewater [a]	Yes	Stanley Landfill	2044	4	2,575	5,200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,000	2,000	1,900	1,900	1,800	9,600
Municipality of Central Huron [ab]	Yes	Twin Creeks (WM)	2034	14	2,173	4,300	0	0	0	0	0	0	0	0	0	0	2,200	2,100	2,100	2,000	2,000	1,900	1,900	1,800	1,800	1,700	1,700	1,600	1,600	1,500	1,500	27,400
Town of Goderich [ab]	Yes	Twin Creeks (WM)	2034	14	2,090	4,200	0	0	0	0	0	0	0	0	0	0	2,100	2,100	2,000	2,000	1,900	1,900	1,800	1,800	1,700	1,700	1,700	1,600	1,600	1,500	1,500	26,900
Township of Howick [d]	Yes	Howick Landfill	2026	22	807	1,600	0	0	1,000	900	900	900	900	900	800	800	800	800	800	800	700	700	700	700	700	600	600	600	600	600	600	17,400
Municipality of Huron East [ab]		Twin Creeks (WM)	2034	14	1,087	2,200	0	0	0	0	0	0	0	0	0	0	1,100	1,100	1,100	1,000	1,000	1,000	1,000	900	900	900	900	800	800	800	800	14,100
Municipality of Morris-Turnberry [a]	Yes	Morris Ward Landfill	2023	24	716	1,400	900	900	800	800	800	800	800	800	700	700	700	700	700	700	600	600	600	600	600	600	600	500	500	500	500	16,100
Township of North Huron	Yes	Wingham Landfill	2110/2093	0	2,557	5,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of South Huron [a]	Yes	South Huron Landfill	>2100	0	2,639	5,300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
County of Huron						**33,500**	**900**	**900**	**1,800**	**1,700**	**1,700**	**1,700**	**1,700**	**1,700**	**1,500**	**1,500**	**6,900**	**6,800**	**6,700**	**6,500**	**6,200**	**6,100**	**6,000**	**5,800**	**5,700**	**5,500**	**7,500**	**7,100**	**7,000**	**6,800**	**6,700**	**111,500**
City of Stratford	Yes/Unlikely	Stratford Landfill	2037	13	12,556	25,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Town of St. Marys [a]	Yes/Unlikely	St. Marys Landfill	2058	0	1,758	3,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Municipality of North Perth [a]	Yes	Elam Landfill	2100	0	3,035	6,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of Perth East [a]	Yes	South Easthope Landfill	2100	0	2,319	4,600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of Perth South [a]	Yes	Perth South Landfill	>2100	0	813	1,600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Municipality of West Perth [a]	Yes/Unlikely	Mitchell Landfill	2115	0	1,989	4,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
County of Perth						**44,900**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Municipality of Brooke-Alvinston [a]	Yes/Unlikely	Twin Creeks (WM)	2034	16	565	1,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of Dawn-Euphemia [a]	Yes/Unlikely	Dawn Landfill and Twin Creeks Landfill	2034	16	479	1,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of Enniskillen [d]	Yes/Unlikely	Twin Creeks (WM)	2034	16	531	1,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Municipality of Lambton Shores [a]	Yes/Unlikely	Twin Creeks (WM)	2034	16	3,983	8,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Village of Oil Springs [a]	Yes/Unlikely	Twin Creeks (WM)	2034	16	162	300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Town of Petrolia	Yes/Unlikely	Twin Creeks (WM)	2034	16	2,167	4,300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Town of Plympton-Wyoming	Yes/Unlikely	Twin Creeks (WM)	2034	16	2,338	4,700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Village of Point Edward [d]	Yes/Unlikely	Twin Creeks (WM)	2034	16	358	700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
City of Sarnia	Yes/Unlikely	Twin Creeks (WM)	2034	16	27,669	55,300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of St. Clair [d]	Yes/Unlikely	Twin Creeks (WM)	2034	16	5,999	12,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of Warwick [a]	Yes/Unlikely	Twin Creeks (WM)	2034	16	814	1,600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
County of Lambton						**90,100**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Totals					**133,875**	**267,800**	**900**	**900**	**3,300**	**3,200**	**3,100**	**3,100**	**3,100**	**3,100**	**3,400**	**3,400**	**21,200**	**20,700**	**20,300**	**19,800**	**19,200**	**18,700**	**43,400**	**42,400**	**41,300**	**40,100**	**41,300**	**40,000**	**38,700**	**37,700**	**36,700**	**508,100**

Notes:
a). Member of Bluewater Recycling Association (BRA). Residual waste estimated from dividing municipality population by # of all municipalities in the BRA and multiplying by the total residual waste from BRA.
b). Member of Mid-Huron Site Board and have shared waste disposal facilities.
c). 2047 is the expected lifespan if Twin Creeks continues at their currently set fill rate. They are looking to add the soon closing Petrolia Landfills' waste to their stream. This would reduce the lifespan year to 2034.
d). 2017 data not available in waste quantities report, used 2016 values.

Table H-6 Site Capacity Planning - Residual Waste Quantities for Scenario 4 (Municipalities increase diversion rates 100% of the way towards the MECP diversion targets) (Diversion Rate by Year)

Municipality	Interested in Using W12A Landfill	Landfill Currently Using	Projected Closure Date	Years between Closure and 2048	Residential Waste (2017, tonnes)	Total Waste[a] (2017, tonnes)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	Total
							40%	42%	44%	46%	48%	50%	52%	53%	55%	56%	58%	59%	61%	62%	64%	65%	67%	68%	70%	71%	73%	74%	76%	77%	
City of St. Thomas	Yes	Green Lane (Toronto)	2040	8	17,851	35,700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12,500	12,000	11,400	10,900	10,400	9,800	9,300	8,700	8,200	93,200
Town of Aylmer [c]	Yes	Green Lane (Toronto)	2040	8	2,477	5,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,800	1,700	1,600	1,500	1,500	1,400	1,300	1,200	1,200	13,200
Municipality of Bayham	Yes	Green Lane (Toronto)	2040	8	1,666	3,300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,200	1,100	1,100	1,000	1,000	900	900	800	800	8,800
Municipality of Central Elgin[d]	Yes	Green Lane (Toronto)	2040	8	4,453	8,900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,100	3,000	2,800	2,700	2,600	2,400	2,300	2,200	2,000	23,100
Municipality of Dutton/Dunwich[d]	Yes	Dutton/Dunwich Landfill	2133	0	1,235	2,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Municipality of West Elgin	Yes	West Elgin Landfill	1532	22	1,225	2,500	0	1,500	1,400	1,400	1,300	1,300	1,200	1,200	1,100	1,100	1,100	1,000	1,000	1,000	900	900	800	800	800	700	700	600	600	600	23,000
Township of Malahide	Yes	Green Lane (Toronto)	2040	8	2,200	4,400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,500	1,500	1,400	1,300	1,300	1,200	1,100	1,100	1,000	11,400
Township of Southwold[d]	No (no response)	Green Lane (Toronto)	2040	10	1,184	2,400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
County of Elgin						**64,700**	**0**	**1,500**	**1,400**	**1,400**	**1,300**	**1,300**	**1,200**	**1,200**	**1,100**	**1,100**	**1,100**	**1,000**	**1,000**	**1,000**	**900**	**21,000**	**20,100**	**19,100**	**18,200**	**17,500**	**16,400**	**15,500**	**14,600**	**13,800**	**172,700**
Municipality of Adelaide Metcalfe[a]	Yes	Kellam Road Landfill & School Road Landfill	2032	16	593	1,200	0	0	0	0	0	0	0	600	500	500	500	500	500	500	400	400	400	400	400	300	300	300	300	300	7,100
Municipality of Lucan Biddulph[a]	Yes	Twin Creeks (WM)	2034	14	1,045	2,100	0	0	0	0	0	0	0	0	0	900	900	900	800	800	800	700	700	700	600	600	600	500	500	500	10,500
Municipality of Middlesex Centre[a]	Yes	Twin Creeks (WM)	2034	14	3,489	7,000	0	0	0	0	0	0	0	0	0	3,100	3,000	2,900	2,800	2,700	2,600	2,500	2,300	2,200	2,100	2,000	1,900	1,800	1,700	1,600	35,200
Municipality of North Middlesex[a]	Yes	Twin Creeks (WM)	2034	14	1,363	2,700	0	0	0	0	0	0	0	0	0	1,200	1,100	1,100	1,100	1,000	1,000	900	900	900	800	800	700	700	700	600	13,500
Municipality of Southwest Middlesex[d]	Yes	Twin Creeks (WM)	2034	14	1,408	2,800	0	0	0	0	0	0	0	0	0	1,200	1,200	1,100	1,100	1,100	1,000	1,000	900	900	900	800	800	700	700	600	14,000
Municipality of Strathroy- Caradoc[a]	Yes	Twin Creeks (WM)	2034	14	4,805	9,600	0	0	0	0	0	0	0	0	0	4,200	4,100	3,900	3,800	3,600	3,500	3,400	3,200	3,100	2,900	2,800	2,600	2,500	2,400	2,200	48,200
Municipality of Thames Centre[d]	Yes	Thames Centre Landfill	2075	0	4,494	9,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Village of Newbury[d]	Yes	Twin Creeks (WM)	2034	14	96	200	0	0	0	0	0	0	0	0	0	100	100	100	100	100	100	100	100	100	100	100	100	100	0	0	1,300
County of Middlesex						**34,600**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**600**	**500**	**11,200**	**10,900**	**10,500**	**10,200**	**9,800**	**9,400**	**9,000**	**8,500**	**8,300**	**7,800**	**7,400**	**7,000**	**6,600**	**6,300**	**5,800**	**129,800**
Township of Ashfield-Colborne-Wawanosh	Yes	Ashefield Landfill	2062	0	2,112	4,200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Municipality of Bluewater[a]	Yes	Stanley Landfill	2044	4	2,575	5,200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,500	1,400	1,400	1,300	1,200	6,800
Municipality of Central Huron[ab]	Yes	Twin Creeks (WM)	2034	14	2,173	4,300	0	0	0	0	0	0	0	0	0	1,900	1,800	1,800	1,700	1,600	1,600	1,500	1,400	1,400	1,300	1,200	1,200	1,100	1,100	1,000	21,600
Town of Goderich[ab]	Yes	Twin Creeks (WM)	2034	14	2,090	4,200	0	0	0	0	0	0	0	0	0	1,800	1,800	1,700	1,700	1,600	1,500	1,500	1,400	1,300	1,300	1,200	1,200	1,100	1,000	1,000	21,100
Township of Howick[d]	Yes	Howick Landfill	2026	22	807	1,600	0	900	900	900	800	800	800	800	700	700	700	700	600	600	600	600	500	500	500	500	400	400	400	400	14,700
Municipality of Huron East[ab]		Twin Creeks (WM)	2034	14	1,087	2,200	0	0	0	0	0	0	0	0	0	1,000	900	900	900	800	800	800	700	700	700	600	600	600	500	500	11,000
Municipality of Morris-Turnberry[a]	Yes	Morris Ward Landfill	2023	24	716	1,400	800	800	800	800	700	700	700	700	600	600	600	600	600	500	500	500	500	400	400	400	400	400	300	300	13,600
Township of North Huron	Yes	Wingham Landfill	2110/2093	0	2,557	5,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of South Huron[a]	Yes	South Huron Landfill	>2100	0	2,639	5,300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
County of Huron						**33,500**	**800**	**1,700**	**1,700**	**1,700**	**1,500**	**1,500**	**1,500**	**1,500**	**1,300**	**6,000**	**5,800**	**5,700**	**5,500**	**5,100**	**5,000**	**4,900**	**4,500**	**4,300**	**4,200**	**5,400**	**5,200**	**5,000**	**4,600**	**4,400**	**88,800**
City of Stratford	Yes/Unlikely	Stratford Landfill	2037	13	12,556	25,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Town of St. Marys[a]	Yes/Unlikely	St. Marys Landfill	2058	0	1,758	3,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Municipality of North Perth[a]	Yes	Elam Landfill	2100	0	3,035	6,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of Perth East[a]	Yes	South Easthope Landfill	2100	0	2,319	4,600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of Perth South[a]	Yes	Perth South Landfill	>2100	0	813	1,600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Municipality of West Perth[a]	Yes/Unlikely	Mitchell Landfill	2115	0	1,989	4,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
County of Perth						**44,900**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Municipality of Brooke-Alvinston[a]	Yes/Unlikely	Twin Creeks (WM)	2034	16	565	1,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of Dawn-Euphemia[a]	Yes/Unlikely	Dawn Landfill and Twin Creeks Landfill	2034	16	479	1,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of Enniskillen[d]	Yes/Unlikely	Twin Creeks (WM)	2034	16	531	1,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Municipality of Lambton Shores[a]	Yes/Unlikely	Twin Creeks (WM)	2034	16	3,983	8,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Village of Oil Springs[a]	Yes/Unlikely	Twin Creeks (WM)	2034	16	162	300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Town of Petrolia	Yes/Unlikely	Twin Creeks (WM)	2034	16	2,167	4,300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Town of Plympton-Wyoming	Yes/Unlikely	Twin Creeks (WM)	2034	16	2,338	4,700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Village of Point Edward[d]	Yes/Unlikely	Twin Creeks (WM)	2034	16	358	700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
City of Sarnia	Yes/Unlikely	Twin Creeks (WM)	2034	16	27,669	55,300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of St. Clair[d]	Yes/Unlikely	Twin Creeks (WM)	2034	16	5,999	12,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Township of Warwick[a]	Yes/Unlikely	Twin Creeks (WM)	2034	16	814	1,600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
County of Lambton						**90,100**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Totals						**267,800**	**800**	**3,200**	**3,100**	**3,100**	**2,800**	**2,800**	**2,700**	**3,300**	**2,900**	**18,300**	**17,800**	**17,200**	**16,700**	**15,900**	**15,300**	**34,900**	**33,100**	**31,700**	**30,200**	**30,300**	**28,600**	**27,100**	**25,500**	**24,000**	**391,300**

Notes:
a). Member of Bluewater Recycling Association (BRA). Residual Waste estimated from dividing municipality population by # of all municipalities in the BRA and multiplying by the total Residual Waste from BRA.
b). Member of Mid-Huron Site Board and have shared waste disposal facilities.
c). 2047 is the expected lifespan if Twin Creeks continues at their currently set fill rate. They are looking to add the soon closing Petrolia Landfills' waste to their stream. This would reduce the lifespan year to 2034.
d). 2017 data not available in waste quantities report, used 2016 values.