

Agriculture Assessment

Southwestern Landfill Environmental Assessment

Prepared for

Walker Environmental Group Inc.

Prepared by

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Appendix A: Glossary of Terms**Appendix B: Environmental Assessment Criteria and Studies****Appendix C: Common Receptors**

1. Introduction

An Environmental Assessment (“EA”) is being prepared by Walker Environmental Group Inc. (“Walker”) under Ontario’s *Environmental Assessment Act* (“Act”) for the ‘*provision of future landfill capacity at the Carmeuse Lime (Canada) Ltd. (Carmeuse) site in Oxford County for solid, non-hazardous waste generated in the Province of Ontario*’.

This is one in a series of technical studies that have been completed by qualified experts to examine the potential effects of the proposed landfill site on the environment, all in accordance with the requirements set out in the *Approved Amended Terms of Reference* (“ToR”) dated May 10, 2016. This report accompanies and supports the *Environmental Assessment Report* prepared by Walker.

Note that Walker has carried out extensive consultation with government agencies, Indigenous groups and interested members of the public regarding this study; details are provided separately in the EA report.

2. Purpose & Objectives

The **purpose** of this study is to complete an agricultural assessment of the landfill proposed by Walker.

The overall **objectives** of the study are listed below, in general accordance with the requirements for the assessment of an undertaking as set out in Section 6.1(2)(c) of the *Environmental Assessment Act*, and as specifically detailed in Section 8.1 of the ToR:

- (a) Describe the **environment potentially affected** by the proposed undertaking, including both the existing environment as well as the environment that would otherwise be likely to exist in the future without the proposed undertaking.
- (b) Carry out an evaluation of the **environmental effects** of the proposed undertaking, using the relevant environmental assessment criteria set out in the ToR (see Appendix B).
- (c) Carry out an evaluation of any additional impact management actions that may be necessary to **prevent, change or mitigate any (negative) environmental effects**.
- (d) Prepare a description and evaluation of the **environmental advantages and disadvantages** of the proposed undertaking, based on the net environmental effects that will result following mitigation.
- (e) Prepare monitoring, contingency and impact management plans to **remedy the environmental effects** of the proposed undertaking.

3. The Proposed Undertaking

The landfill proposed by Walker is described in detail in the *Environmental Assessment Report*. Following is a brief summary for the benefit of the reader, highlighting aspects of the proposal most relevant to this study.

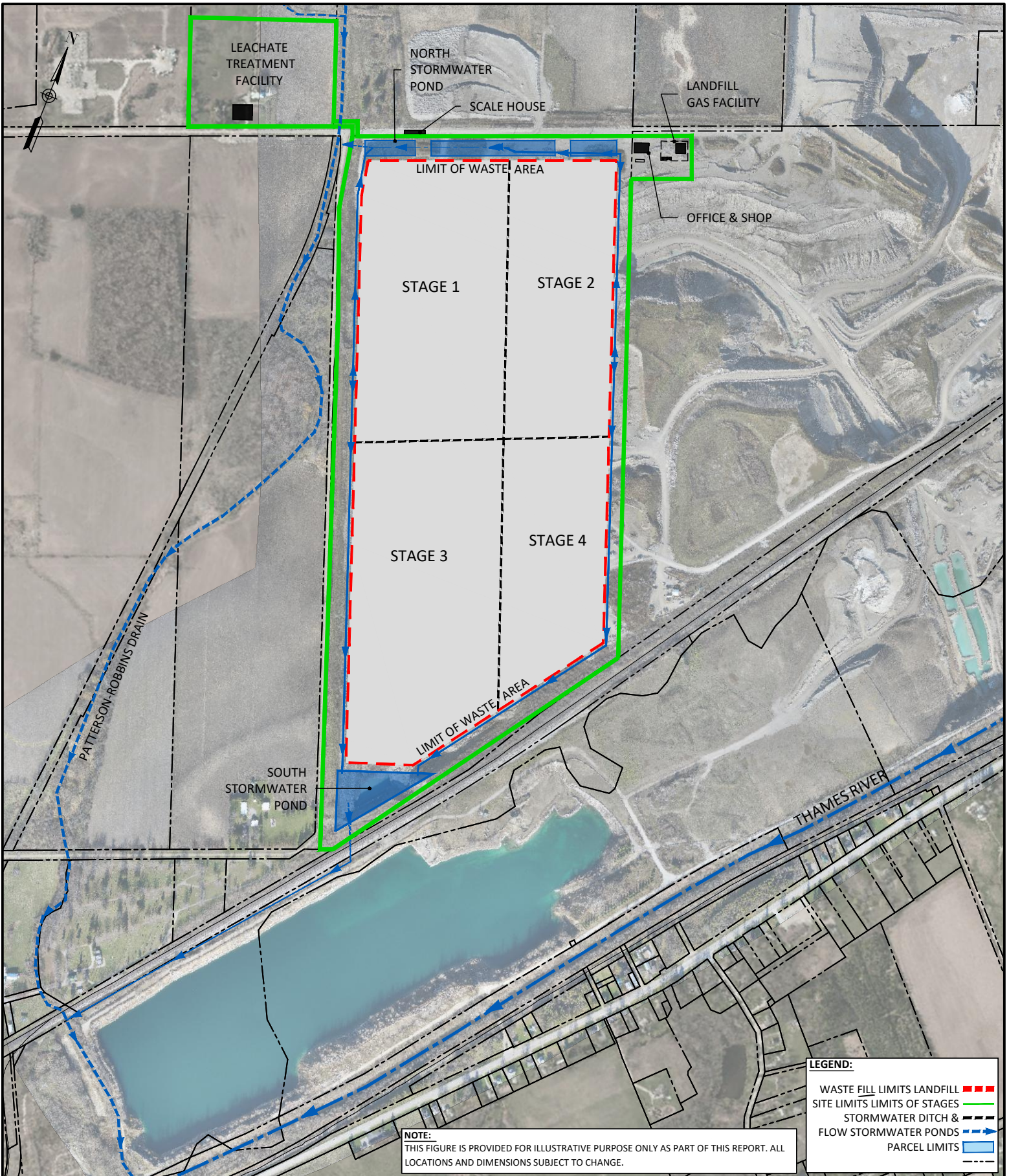
The landfill is to be located on a portion of Carmeuse's landholdings at its Beachville Quarry Operations in the Township of Zorra, Oxford County. Approximately 17.4 million m³ of solid, non-hazardous waste and daily/intermediate cover will be deposited within a footprint of about 59 ha. The balance of the 81.6 ha site will be comprised of buffer areas for monitoring, maintenance, environmental controls and other necessary infrastructure. **(Figure 1)**.

Landfill construction will proceed progressively in a series of cells, generally from north-to-south **(Figure 1)**. The former quarry floor will be backfilled to within about 30 to 40 metres below ground surface with engineered fill, and then a *Generic Design Option II – Double Liner* system (as specified by the Ministry of Environment, Conservation & Parks in the *Landfill Standards* under *O. Reg. 232/98*; see **Figure 2**) will be constructed across the bottom and up the sides of the landfill to contain and collect leachate **(Figure 3)**. Up to 850,000 tonnes *per year* of solid, non-hazardous waste, and up to 250,000 tonnes *per year* of daily/intermediate cover soils¹ will then be placed and compacted above the liner in a series of small working areas approximately 0.2 ha in size at any given time, in order to minimize the exposed waste. Waste will be covered with soil on a daily basis, and a final cover with vegetation will be applied as the landfill reaches its final height, which peaks at about 15 m above ground **(Figure 4)**. A landfill gas collection system will also be installed as the landfill/cell development progresses.

Most of the supporting infrastructure for the landfill will be located in the buffer area along the northern site perimeter, including the leachate and gas treatment plants. Leachate collected from the liner system will be treated on-site and the clean effluent from the treatment plant will be discharged into the Patterson-Robbins Drain next to the treatment plant. Clean precipitation and groundwater that has not come into contact with waste will be segregated and treated in a stormwater management pond before being discharged from the site **(Figure 1)**. Landfill gas will be collected in a network of extraction wells and pipes. Initially the landfill gas will be flared (combusted), but when the quantities permit the gas will be beneficially utilized as a renewable fuel.

The site will be open for waste deliveries from 7:00 a.m. to 5:00 p.m. on weekdays and from 7:00 a.m. to 1:00 p.m. on Saturdays, but closed on Sundays and statutory holidays. On-site construction activities may start up to one hour before opening and continue up to two hours after closure. The primary designated haul route (i.e., for all waste trucks except deliveries from the local area, if any) is from Highway 401 north along County Road #6, then west into the quarry property; trucks will then follow a newly constructed haul route across the quarry site to a landfill site entrance at the northwestern corner of the site **(Figure 5)**. Vehicle traffic, including waste trucks as well as construction vehicles and staff, is expected to average approximately 210 trips *per day*. Nuisance controls will include speed enforcement, regular haul road cleaning (on- and off-site), litter fencing and pick-up, and bird/pest management, with a public complaints reporting and response system.

¹ The daily/intermediate cover soil could consist of acceptable and suitable waste soils, and would be reported as waste, so the total reported waste receipts could be up to 1,100,000 tonnes *per year*.

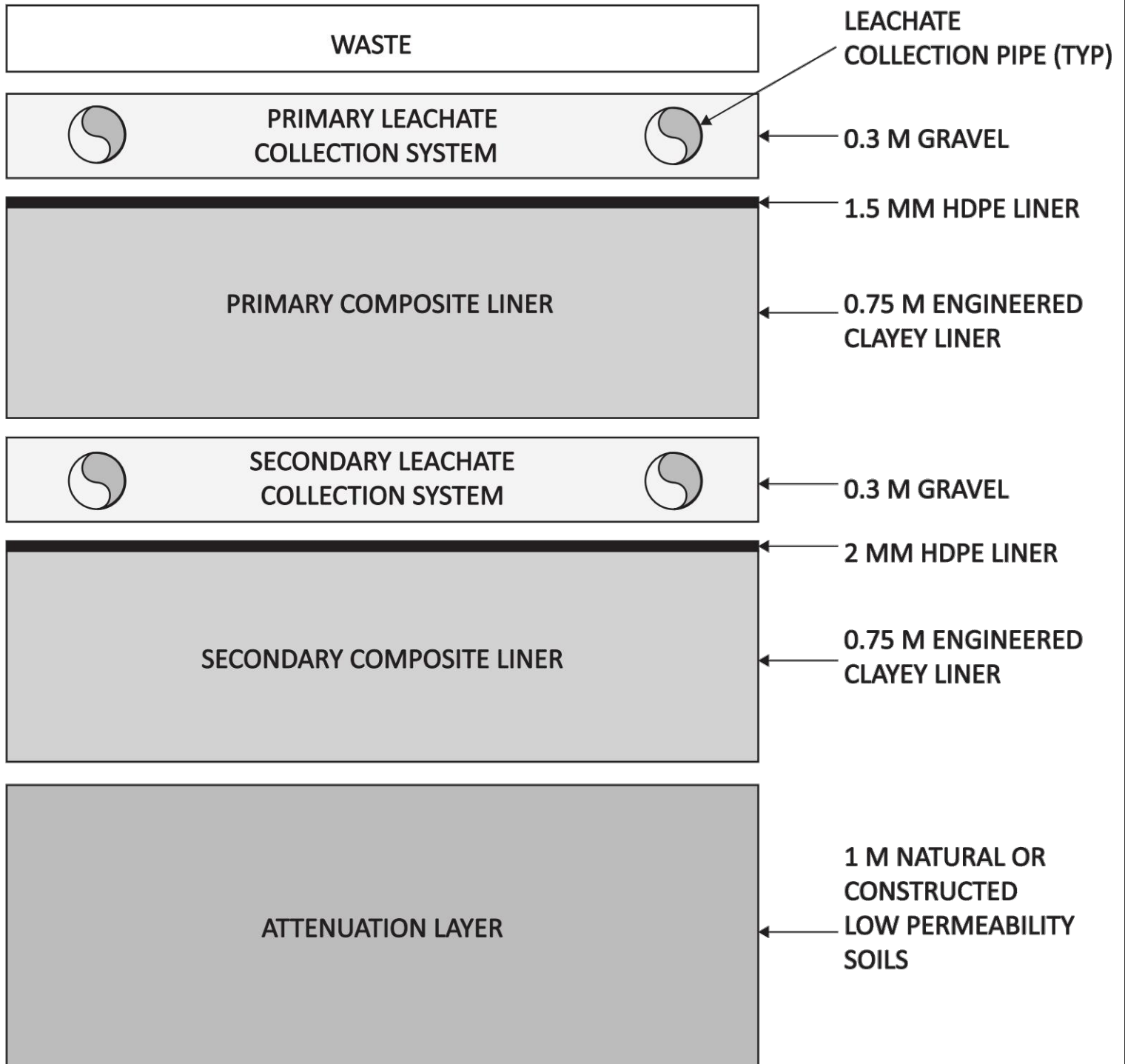


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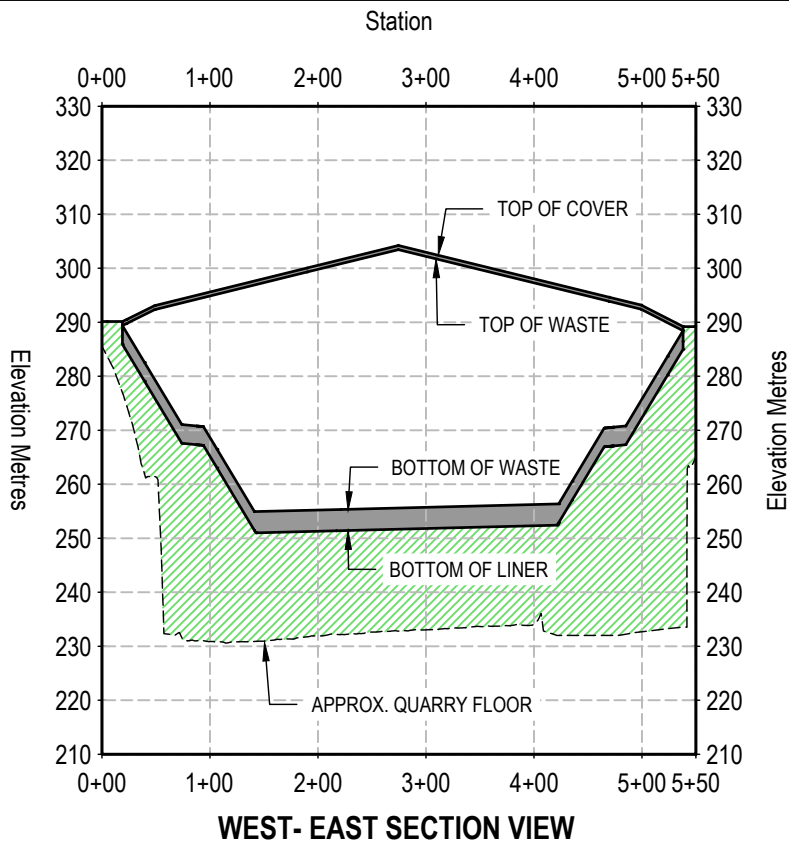
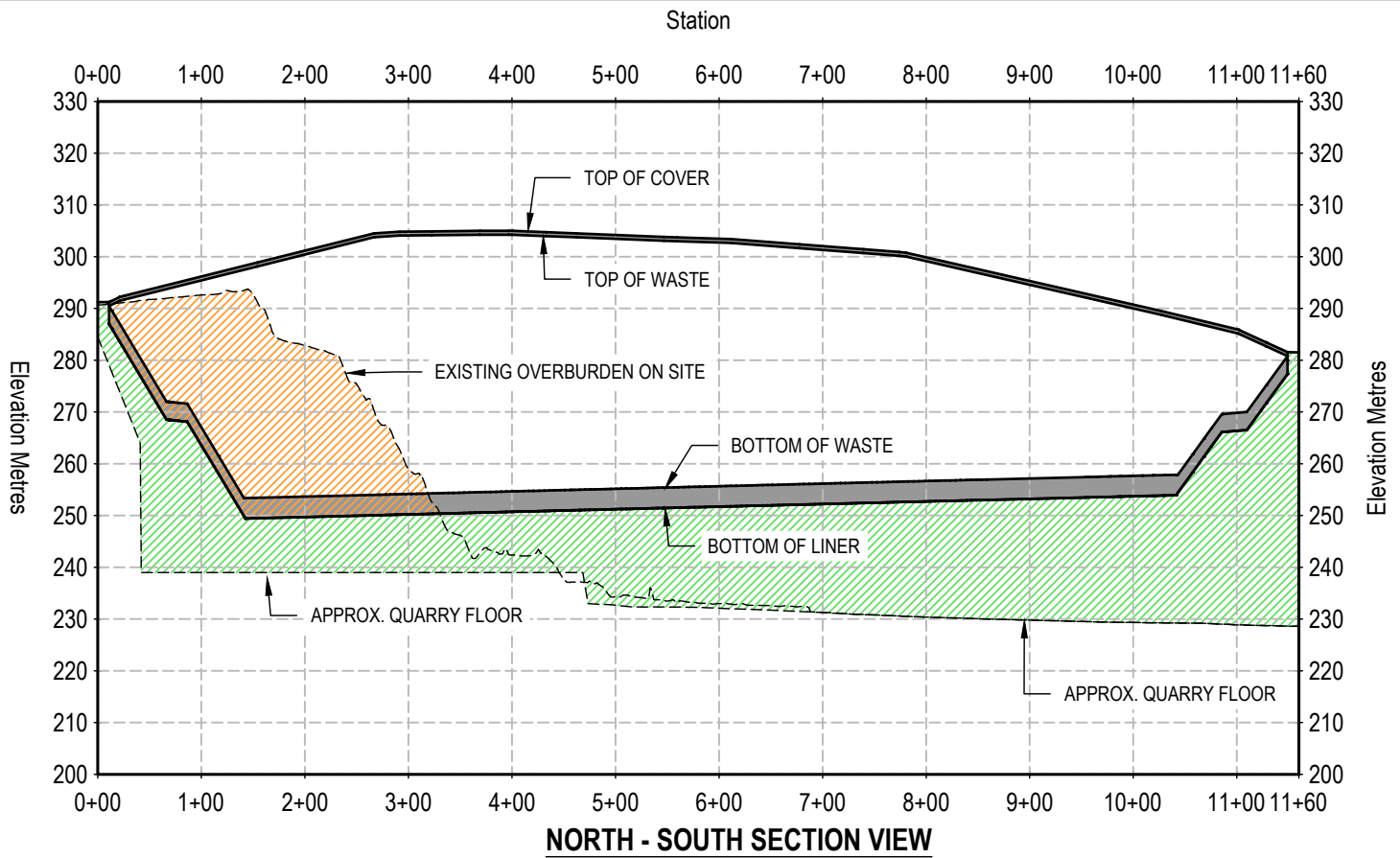
WASTE FILL LIMITS LANDFILL	---
SITE LIMITS LIMITS OF STAGES	—
STORMWATER DITCH & FLOW STORMWATER PONDS	- - -
PARCEL LIMITS	—

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Owner



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SOUTHWESTERN LANDFILL

Project No.

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Drawing

SECTION VIEWS

Approved

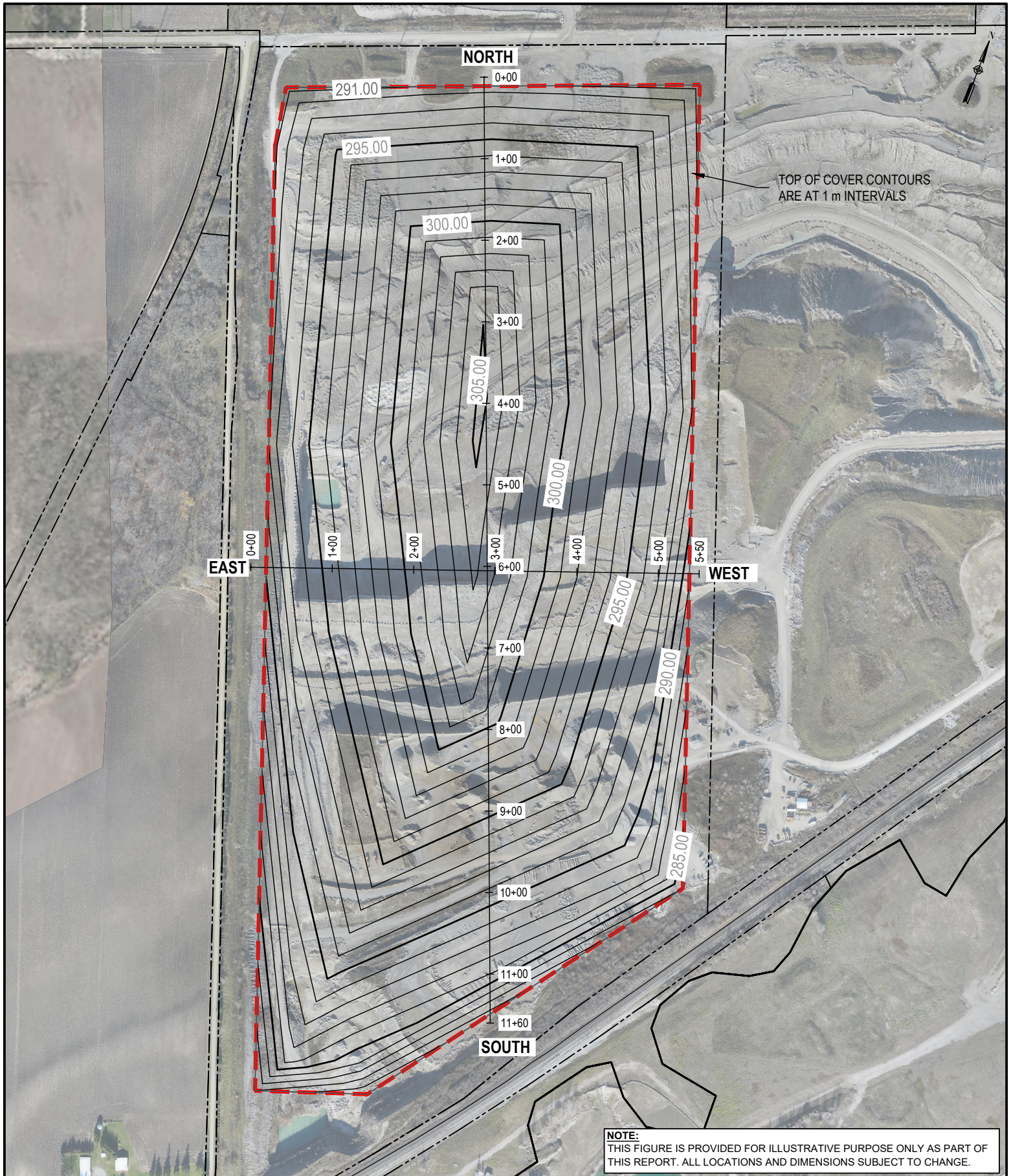
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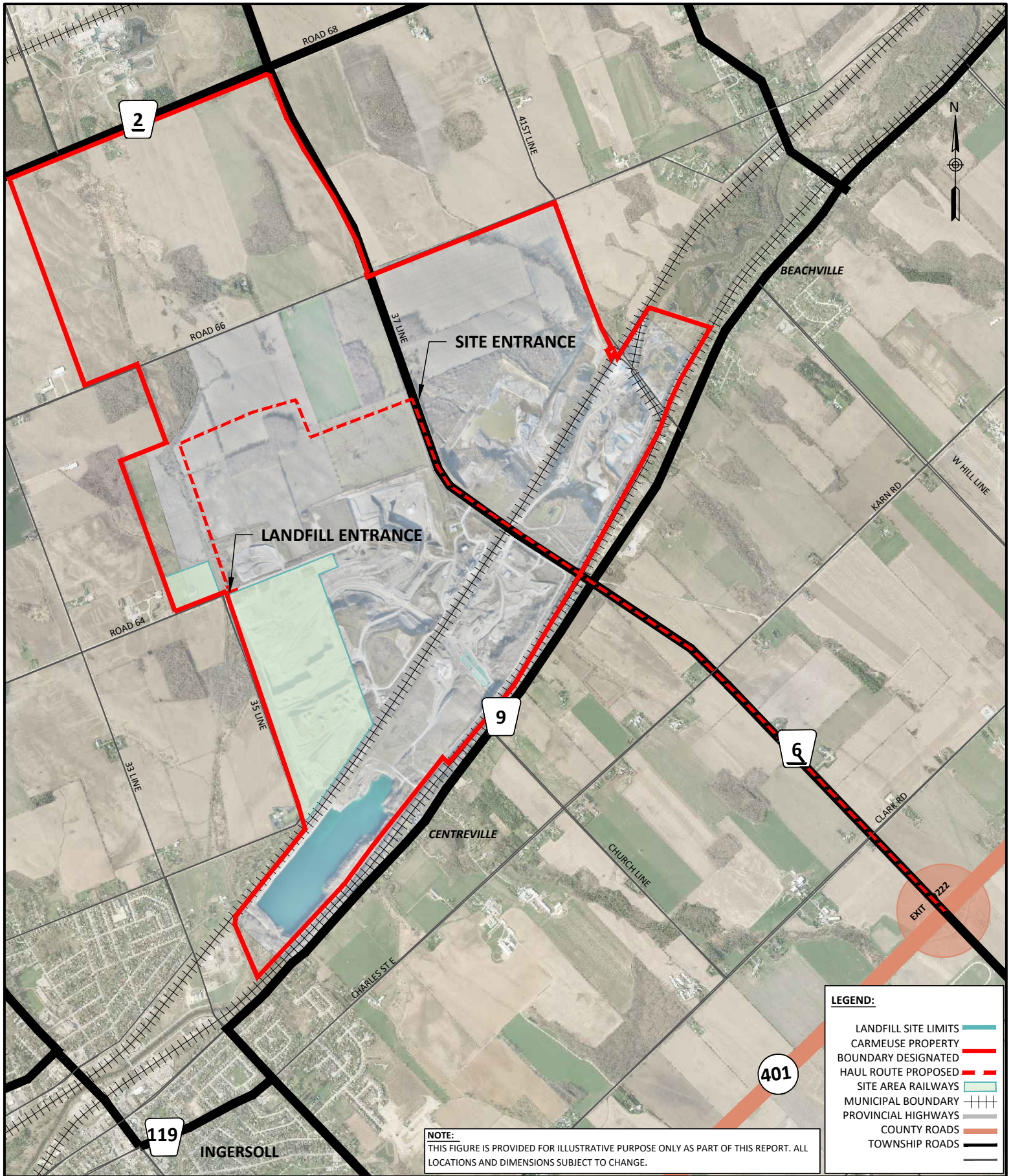
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Owner



walker
environmental

Project

SOUTHWESTERN LANDFILL

Drawing

SITE LOCATION & HAUL ROUTE

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There will be monitoring programs for equipment operations, leachate, groundwater, surface water, air emissions, gas, noise, and particulates (dust).

The landfill is anticipated to receive waste for approximately 20 years commencing in about 2023. After closure, maintenance and operation of the relevant environmental controls and monitoring will carry on during the post-closure period, until there is no further risk of environmental contamination. The end-use is assumed to be passive green space and agriculture, but the design is flexible to accommodate other potential end-uses.

4. Environmental Assessment Criteria & Indicators

The **environmental assessment criteria**, as approved in the ToR, are tabulated in Appendix B, Table B-1. In the table, check marks indicate which technical studies are assigned primary (“lead”) responsibility for assessing each of the criteria. Following are the EA criteria which are assigned to this study:

EA Criteria	Definition/Rationale
Displacement of agricultural land.	The establishment of a waste disposal facility has the potential to displace existing or potential agricultural resources, including the loss of prime agricultural land.
Disruption of farm operations.	The establishment and operation of the waste disposal facility may affect agricultural crop or livestock production and related agriculture activities

Furthermore, the criteria for this EA were designed to be cross-disciplinary to permit an assessment of cumulative effects. **Table B-2** in **Appendix B**, from the ToR, illustrates some (though not necessarily all) of the key interconnectivities between the studies. As a result, this study provides input/data to additional environmental criteria that will be addressed through studies conducted by other experts including (but not limited to):

- Effects due to exposure to air emissions;
- Effects due to fine particulate exposure;
- Flood hazard;
- Impact on the availability of groundwater supply to wells;
- Loss/displacement of surface water resources;
- Disease transmission *via* insects or vermin;
- Potential for traffic collisions;
- Nuisance associated with vermin;
- Changes to community character/cohesion;
- Compatibility with municipal land use designations and official plans;
- Displacement/disruption of businesses or farms;
- Property value impacts; and
- Effects on stream base flow quantity/quality.

Indicators identify how the potential environmental effects will be measured for each criterion. Following are the indicators that were applied to each of the primary EA criteria addressed in this assessment:

EA Criteria	Proposed Indicators/Measures
Displacement of agricultural land.	<ul style="list-style-type: none"> • Loss of existing or quarry rehabilitated Prime Agricultural Land defined as Canada Land Inventory Classes 1 – 3, in the Provincial Policy Statement.
Disruption of farm operations.	<ul style="list-style-type: none"> • Area of cropland potentially affected by emissions, fine particulates (dust), flooding or drainage disruption; • Number of farm operations with potential for loss of water quality or quantity affecting livestock or crop production; • Number of farm operations with livestock or crop production potentially affected by air emissions, disease transmission, noise or litter or other effects associated with the proposed landfill; • Number of inter-property farm operational linkages along the proposed haul routes; • Number of farm laneway and field access points occurring along the haul routes; and • Number of farm operations with potential business impacts

The above indicators and measures provide a basis for the identification of possible mitigation measures to reduce agricultural impacts. Generally, impacts are measured in terms of the number of farms/agricultural facilities and/or area of cropland affected.

5. Study Durations

Two main **study durations** (or time frames) for this proposed landfill have been identified in the ToR:

Operational Period

The time during which the waste disposal facility is constructed, filled with waste, and capped. These activities are combined since they occur progressively (i.e., overlap) on a cell-by-cell basis, and they have a similar range of potential effects (e.g., there is heavy equipment active on the site).

Post-Closure Period

The time after the site is closed to waste receipt. Activities are normally limited to operation of control systems, routine property maintenance and monitoring, and thus have a more limited range of potential effects.

The approved EA Criteria in **Table B-1, Appendix B** indicate the relevant study duration(s) associated with each of the criteria used in this assessment

In addition, **common reference periods** or milestone dates were also defined for the operational period of the landfill:

<i>Start of Construction</i>	Est. 2021	Just prior to the start of landfill construction and operation, representing the existing baseline conditions.
<i>Mid-Point</i>	Est. 2033	Approximately midway through the landfill construction and operation.
<i>Closure</i>	Est. 2043	At the completion of the landfill construction and operation, representing the full operating size of the proposed landfill.

6. Study Areas

For the purposes of this EA, three general **study areas** were established in the ToR:

<i>On-Site and in the Site Vicinity:</i>	<i>On-site</i> includes the proposed waste disposal facility plus the associated buffer zones. <i>Site vicinity</i> is the area immediately adjacent to the waste disposal facility property that is directly affected by the on-site activities. Its size is variable depending on the particular criteria being addressed.
<i>Along the Haul Routes:</i>	The primary route along which the waste disposal facility truck traffic would move between a major provincial highway and the proposed waste disposal facility site entrance, plus the properties directly adjacent to these roads.
<i>Wider Area:</i>	The broader community, generally beyond the immediate site vicinity. Depending on the particular criteria this may include neighbourhoods, local municipalities, the Oxford County, or the Province of Ontario.

The tables of approved EA Criteria in Appendix B indicate the relevant study duration(s) associated with each of the criteria in this assessment.

Although these three general study areas were common across all of the studies, their actual physical boundaries were not necessarily identical for every study or criterion; a flexible approach was used and the study area boundaries were adjusted as the work progressed to ensure that they adequately encompassed the potential significant effects of the proposed landfill.

For this assessment, the final study areas are as follows:

<i>On-Site and in the Site Vicinity</i>	The on-site and in the site vicinity area includes the area proposed for the waste facility plus its associated buffer zones and an area including all agricultural lands and facilities situated immediately adjacent to the proposed landfill, extending to include all farm properties north to County Road 2 (68 Rd), west to 31 st Line, east to 43 rd Line – Zorra Line extension south to Highway 401 and west to Ingersoll.
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<i>Along the Haul Routes</i>	The haul route area for this assessment will include all farm properties located on both sides of the proposed route, encompassing all production areas lying adjacent to and/or accessing directly onto the route. Access includes both farm facility laneways and field access points.
<i>Wider Area</i>	This area encompasses the larger agricultural area containing the site and includes agricultural census data describing the broader agricultural context in Zorra and South-West Oxford Townships as well as Oxford County.

7. Methodologies

The environmental criteria, indicators, measures and data collection and impact analysis components of this agricultural assessment were developed during the process of preparation and approval of the Environmental Assessment Terms of Reference and the Agriculture Assessment Work Plan.

The identification of potential agriculture issues and the approaches to addressing agricultural concerns relating to the proposed landfill evolved from consultation conducted during the Terms of Reference and Work Plan review and approval process. That consultation included specific agricultural comments and responses from the Community Liaison Committee, the Town of Ingersoll, the Joint Municipal Peer Review Coordinating Committee, The National Farmers Union (Ontario and Perth/Oxford), the Ontario Farm Land Trust and a peer review conducted by DBH Soil Services Inc.

The description of agriculture baseline conditions within the Study Area relied on a combination of published information regarding the level and type of agricultural production found within the Study Area; registry information on farm operational characteristics; and field observations of farm facilities and agriculture and nonagricultural land-use. Field observations were supplemented by selective interviews with specialized farm operations and information derived from a local resident survey conducted as part of the social assessment.

The published data, fieldwork, interviews and survey led to the development of an agricultural baseline description for the Study Area which provided an understanding of the agricultural context for the proposed landfill, in terms of the type and intensity of agricultural production within the Site Vicinity.

An appreciation of future agricultural conditions spanning the life of the proposed waste facility was developed on the basis of Land Use and Climate Change Forecasts (see Sections 9.1.1 and 9.1.2), and observed farming trends evident within the Agricultural Census data acquired from Statistics Canada.

The analysis of potential agricultural impacts associated with the proposed landfill was conducted on the basis of the findings of the groundwater, surface water, air quality, noise and vibration, traffic, ecology, social and economic studies prepared by other specialists within the Environmental Assessment study team. These findings were interpreted based on the understanding of the agricultural character of the area surrounding the proposed landfill, as derived from the agricultural baseline work, in order to

determine the potential for agricultural impacts. This led to the consideration of possible mitigation measures and the assessment of the level of any potential residual net effects on agriculture.

8. Data Collection

8.1 Background Data

As part of the establishment of agricultural baseline conditions, the background data collection phase of this agriculture assessment provided an agricultural context for the landfill proposal. Several sources of existing and available background information were consulted, as listed in Section 12 of this report.

In order to understand the agricultural characteristics of the area containing and surrounding the site of the proposed landfill, a wide variety of 2016 agricultural statistics were reviewed. These data were as compiled by Statistics Canada's Census of Agriculture (2016 and 2011) and the Ontario Ministry of Agriculture, Food and Rural Affairs, provided information for the townships containing the proposed landfill site and its haul route, namely Zorra and Southwest Oxford, in the context of County and Provincial data. The specific Statistics Canada source table references are included within the various tables contained in the description of existing conditions found in Section 9.2.1 of this report.

The characteristics of the land base supporting agriculture within the Study Area, in terms of physiography, soil materials, topography, soil drainage characteristics, agricultural land drainage and soil capability for agriculture, were derived from available physiographic (Chapman and Putnam, 1984), County soil survey mapping (Wicklund and Richards, 1961) and Canada Land Inventory mapping available from the Ontario Ministry of Agriculture, Food and Rural Affairs Agriculture Information Atlas and Geographical Information Portal, and Environment Canada Land Inventory Mapping (1972).

Agricultural land use field mapping within the Study Area was augmented by use of the most recent available aerial photography and satellite imagery (Google Maps and Google Earth, 2018 and the County of Oxford Geographic Land Information and Mapping Resource system (GLIMR, 2017)). Field Identification of local fresh farm product markets and sales outlets was assisted by a review of online information.

Farmland and facility ownership was examined using the land registry data contained within the Terenet Geowarehouse Property Assessment Land Registry Data Base (2018). This web-based property information database and mapping provided input into the identification of potential farm property linkages and helped characterize the scale and operational nature of farm operations situated within the vicinity of the proposed landfill site.

Agricultural planning designations and zoning were derived from the Oxford County Official Plan, the County of Oxford Geographic Land Information and Mapping Resource (2017) and Township zoning maps for Zorra and Southwest Oxford Townships. Provincial Policy Statement Draft Policies and Local Official Plan designations and associated policies for the study areas, were also considered, as they may relate to agriculture.

The potential agricultural after-use for the rehabilitated quarry site with and without the landfill was determined through a review of the quarry site Rehabilitation Schematic (2016) and the top-of-cover

contour plan and cross sections for the landfill, (Walker Environmental Group Facility Characteristics Assumptions Report).

Forecasting changes in the future agricultural baseline conditions over the 20 year period of active waste disposal incorporated Land Use Planning Forecasts prepared by MHBC Planning (January, 2020), climate change assumptions for Ontario (McDermid, J., Fera and A. Hogg, 2015) and an assessment of farming trends evident within the Agricultural Census data acquired from Statistics Canada.

8.2 Field Data

The existing background information and data collection described in section 8.1 above was refined in the field to provide a more detailed characterization of agricultural operations and activities in the area surrounding the proposed landfill.

Within the Site Vicinity, field reconnaissance mapping of existing agricultural facilities and operations was conducted to observe the type of field crop production and to establish the location and type of farm facilities and structures associated with livestock and cropping operations. Within the Study Area, the location of fresh farm markets and farm product sales outlets and agribusiness service and supply outlets were also noted. These field observations were augmented by aerial photo interpretation of facility features from 2018 and 2017 aerial imagery available from Oxford County and Google as referred to above. As part of the field data collection, the number of farm laneways and field access points intersecting the primary designated haul route were also recorded. The field reconnaissance surveys were conducted on December 5-7, 2017, September 4-5, 2018 and on November 1-2, 2018.

Based on these reconnaissance investigations, farm facilities were generally categorized in terms of their most probable and most predominant type of production. These categories distinguished predominately cattle (dairy and beef facilities) from those focused primarily on poultry/swine production. In some locations, due to poor visibility, it was difficult to distinguish swine from poultry facilities. In those cases, satellite imagery was utilized to look for manure or livestock handling features that would suggest production type. Those facilities with apparent use for housing horses were also identified and mapped.

Farm facilities more apparently dedicated to machinery and crop storage in association with cash crop production were also mapped. Many older and apparently retired or inactive barns were observed. Often, these exhibited retired livestock components. Although these often smaller facilities were categorized as now being cash crop oriented, they may include limited, ongoing use for the housing of some horses or mixed livestock and could still be functional for machinery or other forms of storage in support of agricultural production.

The owners of two specialized farm operations located within the Study Area, namely, the Killean Acres equestrian facility and the Leaping Deer Adventure Farm and Market were interviewed on September 4 and September 5, 2018 respectively, in order to gain insight into their unique agricultural operations and concerns with respect to the proposed landfill.

Agricultural input to and data collection from a local resident survey conducted, as part of the social assessment, was also utilized to help characterize the nature of agricultural activity within the study area.

The farm facilities inventoried within the On-site and In the Site Vicinity Study Area are illustrated in **Figure 6**. This mapping provides a general representation of the fabric of agricultural activity within the site vicinity.

9. Environment Potentially Affected by the Undertaking

Section 6.1(2)(c)(i) of the Act requires a “*description of the environment that will be affected or might reasonably be expected to be affected, directly or indirectly*”. Section 8.2 of the ToR describes the methodology by which the environment potentially affected by the proposed landfill is to be developed, notably including both the existing environment as well as the environment that would be expected to exist in the future without the proposed undertaking (i.e., the environmental baseline conditions, or the “*do nothing*” alternative).

9.1 Baseline Assumptions

9.1.1 Land Use Forecast

A common set of assumptions were provided by MHBC Planning (January, 2020) on behalf of Walker regarding the forecasted land uses in the area, so that this study could reflect any reasonably foreseeable changes in the uses of the land on and around the proposed landfill site (including the expected ongoing operation of the quarries and lime plants in the vicinity of the site). These assumptions are detailed in Walker’s *Environmental Assessment Report*, while a brief summary of the aspects relevant to this study follows.

Agriculture will maintain its position as an extensive user of land and an industry of significant importance to the local economy. The policies of the County Official Plan and its composite Area Municipalities will continue to protect the prime agricultural land base for long term agriculture use.

Employment sectors within Oxford County that are anticipated to demonstrate growth over the next 30-year planning period include agribusiness involving supply and services focused on supporting the prominent agricultural sector in the area. The County’s primary sectors (i.e. agricultural and resource-based employment), however, are forecast to experience minimal growth. For agriculture, this is partially a result of the trends toward farm enlargement and increasing mechanization within the agricultural industry.

9.1.2 Climate Change Forecast

Another set of common assumptions that were established for the purpose of this EA is the potential for climate change, so that these could be considered in the individual studies of the potential effects of the proposed landfill. These assumptions are detailed in Walker’s *Environmental Assessment Report* and basically adopt the guidance in the Ontario Ministry of Natural Resources and Forestry’s *Climate change projections for Ontario: An updated synthesis for policymakers and planners*.

The following table summarizes the mean climate change (temperature and precipitation) assumptions to be considered during this study, where relevant.)

	Temperature (°C)			Precipitation (mm)		
	Annual	Summer	Winter	Annual	Summer	Winter
2011-2040	+2.3	+2.0	+2.2	+52.0	-2.7	+28.3
2041-2070	+3.9	+3.2	+4.5	+87.0	-2.5	+34.9
2071-2100+	+4.8	+4.1	+5.5	+89.0	-4.4	+46.8

Source: McDermid, J., S. Fera and A. Hogg. 2015. *Climate change projections for Ontario: An updated synthesis for policymakers and planners*. Ontario Ministry of Natural Resources and Forestry, Science and Research Branch, Peterborough, Ontario. Climate Change Research Report CCRR-44.

The proposed 20-year operating period for the landfill facility will involve approximate increases in temperature of 2 degrees C, and potentially wetter winters and drier summers. The research suggests that the southern part of the province may show little change in total precipitation during this period, however, the likelihood of more extreme weather events will be greater (OMAFRA and OCCIAR).

For crops, a potentially longer and warmer growing season may lead to opportunities for increased crop varieties and increased productivity, however a larger risk of drought possibly requiring more irrigation and potential damage from more frequent extreme weather events may have offsetting negative impacts on production. For livestock, heat stress could impact production. For both crops and livestock climate change will result in an increased reliance on the availability of a clean and abundant water supply.

Climate change is also projected to increase disease pressures on livestock from insects migrating northwards from the United States and from vector borne infectious diseases in animals resulting from more extreme weather events and flooding. For crops, warmer winters could result in the increased spreading of pests and fungal diseases such as soybean rust (OMAFRA and OCCIAR).

9.2 Environmental Baseline Conditions

9.2.1 Existing Conditions

This section of the Agriculture Assessment report contains a baseline description of agricultural resources and land-use features found within the Study Areas identified for the Agricultural Assessment Work Plan. This information provides a basis for the assessment of potential agricultural impacts associated with the landfill proposal, including possible agricultural resource and operational impacts as described in Section 10.0 of this report.

The baseline agricultural resource data was gathered from available background information and field data collection undertaken as described in Section 8.0 of this report.

9.2.1.1 Agricultural Context

In order to understand the agricultural characteristics of the wider area containing and surrounding the site of the proposed landfill, a wide variety of 2016 agricultural statistics were reviewed.

These data, as compiled by Statistics Canada's Census of Agriculture (2016), provided information for the townships containing the proposed landfill site and its haul route, namely Zorra and Southwest Oxford, in the context of County and Provincial data. In surface area, Southwest Oxford is slightly smaller in size than Zorra Township. Zorra represents approximately one quarter of the size of Oxford County as a whole. In combination, these two townships make up close to one half of the County area.

The review of the Census of Agriculture data allowed for a characterization of the type of farming being conducted in the vicinity of the site, along the haul route and in the wider area. This included information on the number, area, size, tenure and operational characteristics of farms and identification of the type and level of crop and livestock production in the area containing and surrounding the proposal.

In addition to agricultural statistics, agricultural resource and land-use planning designations and zoning were explored for the site and its vicinity, as well as within the wider area defined within the approved agricultural work plan.

Farms

The statistics on farm type, based on the North American Industry Classification System (NAICS, 2012), are set out in Table 1, below:

Table 1: Farms Classified by Farm Type - 2016

Production Type	Number of Farms		Combined % of Oxford Co.
	Zorra	SW Oxford	
Total Number of Farms	496	375	46%
Oilseed and Grain	192	128	45%
Vegetables and Melons	11	12	48%
Crop Combination*	5	8	54%
Nursery / Tree	8	6	58%
Maple syrup	7	2	90%
Hay	11	9	37%
Tobacco	0	7	37%
Cattle	126	104	50%
Swine	40	23	51%
Poultry and Eggs	38	24	46%
Horses	26	18	51%
Sheep / Goat	11	7	45%
Animal Combination and Misc.	14	12	40%

* Fruit, Tree Nut and Fruit/Vegetable combination

NAICS Classification - North American Industry Classification System

Source: Stats Canada Table 32-10-0403-01
The NAICS system classifies farms according to their predominant type of production.

Crop Production

Table 1 of this report provides information on the type of crop production occurring within these farms.

Common field crop production (oilseeds, grains and perennial forages) is predominant in both Zorra and Southwest Oxford and the number of farms that are predominantly engaged in this production is increasing in both townships, as in Oxford as a whole. These crops include primarily such crops as corn, soybeans, wheat and other grains and forage crops. Zorra and Southwest Oxford have a total of 320 farms classified in this type of production, representing 45% of such farms found in Oxford County.

In 2016 there were 11 vegetable farms in Zorra and another 12 in Southwest Oxford. These make up roughly one-half of the number of the farms of this type reported in the County.

There were 5 fruit, tree nut and fruit/vegetable combination farms situated in Zorra and 8 in Southwest Oxford in 2016 representing 54% of County farms classified in this category.

Zorra and Southwest Oxford have 8 and 6 greenhouse, nursery/tree farms respectively. In total this represents 58% of the frequency of occurrence of such farms in the County.

Hay production included 20 farms in Zorra and Southwest Oxford comprising 37% of the number of such farms found in the County.

Other crops represented in the 2016 Census farm classification include those specialized in maple syrup production. This included 7 in Zorra and another 2 in Southwest Oxford, making up 9 of 10 such farms identified in the County. These 9 farms represent 28% of the total number of such farms classified as specialized in the maple syrup products category in all of Southern Ontario. In total, Zorra had 25 farms reporting some maple taps and Southwest Oxford had 14 (see **Table 2** of this report).

Southwest Oxford also has 7 farms classified as tobacco farms, representing 37% of such farms in Oxford County.

Beyond the classification of farm type, the Census of Agriculture also tallies the area of production of different crop types. Although by far, common field crops predominate, there is representation of the broader diversity of crop production in the County and in the Townships immediately surrounding the proposed landfill (**Table 2**). In 2016, 5 of the 18 farms reporting potato production in Oxford County were located in Zorra and Southwest Oxford.

Table 2: Specialty Crop Statistics - 2016

Crop Type	Zorra		SW Oxford		Oxford Co.	
	Farms	Ha	Farms	Ha	Farms	Ha
Potatoes	3	X	2	X	18	317
Apples	1	X	5	14	13	21
Strawberries	5	9	3	X	20	40
Raspberries	5	2	3	1	15	7

Table 2: Specialty Crop Statistics - 2016

Crop Type	Zorra		SW Oxford		Oxford Co.	
	Farms	Ha	Farms	Ha	Farms	Ha
Blueberries	2	X	1	X	9	22
Vegetables *	25	694	27	912	114	2806
Combined **	10	X	9	X	47	101
Nursery, Sod	8	X	5	X	23	X
Greenhouse***	1		1		29	
Maple Taps	25		14		62	

* Excluding greenhouse production

** Fruit, berry and nut combination

*** Including Mushroom production

X Data suppressed in order to meet Statistics Canada confidentiality requirements.

Source: Statistics Canada Tables:

32-10-0423-01

32-10-0416-01

32-10-0420-01

32-10-0417-01

32-10-0419-01

32-10-0418-01

Within Oxford County the total reported area of combined fruit, berry and nut production declined 44% from 180 ha in 2011 to 101 ha in 2016, with a total of 19 farms supporting some level of production in Zorra and Southwest Oxford in 2016. A total of 9 ha of strawberry production were reported in Zorra. Zorra and Southwest Oxford had 2 ha and 1 ha respectively of raspberry production and a limited amount of blueberry cropping. Apples were reported on 21 ha in Oxford County with 14 ha of this production occurring within Southwest Oxford

Vegetables, excluding greenhouse production, were grown on 2806 ha countywide in 2016 with 57% (1606 ha) of this cropping occurring within Zorra and Southwest Oxford.

Nursery and sod production are also represented in Zorra and Southwest Oxford with 8 and 5 farms respectively involved in such production in 2016.

In 2016, 13 farms in Zorra and another 30 in Southwest Oxford indicated the use of irrigation equipment in crop production (Statistics Canada Table 32-10-0437-01).

Livestock Production

The strong agricultural presence characterizing the Study Area is further reflected in the concentration of livestock facilities located within the vicinity of the proposed landfill and in the wider area containing the site.

In terms of the number of cattle farms reported in the 2016 Census, the combined Zorra and Southwest Oxford total of 230 farms, with a combined population of 48,329 cattle and calves (Statistics Canada Table 32-10-0424-01) represents a full one half of all the cattle farms found in Oxford County (**Table 1**).

Dairy is quite concentrated in the Study Area, with a total of 164 dairies found in Zorra and Southwest Oxford. This represents almost one quarter of all dairy operations found in Southern Ontario. Many of these dairies are advanced, large-scale operations involving the latest technologies to enhance the efficiencies of production. In 2016, Zorra reported 11 and Southwest Oxford another 13 dairy operations using robotic milking technology. Cattle operations within these two municipalities also included a total of 66 beef cattle operations in 2016.

In-field grazing or feeding was a common practice reported in 2016 by agricultural operations in both Zorra and Southwest Oxford with 27 and 22 farms reporting such feeding practices, respectively.

Slightly over one half, (51%) of all of Oxford's swine farms are found within Zorra and Southwest Oxford. These two municipalities reported a total pig population of 261,934 animals in 2016, (Statistics Canada Table 32 –10 – 0426– 01). These pigs were housed on a combined total of 63 swine facilities in these townships.

Zorra and Southwest Oxford contain close to one half (46%) of the poultry and egg farms found in Oxford County, with a combined total of 62 facilities and a population of over 1.6 million birds, (Statistics Canada Table 32 –10 – 0428– 01). Turkey farms include 20 facilities in Zorra and Southwest Oxford.

Zorra and Southwest Oxford reported an annual production of some 5 million dozen eggs in the year prior to the 2016 census. This represents 67% of Oxford County's total production, (Statistics Canada Table 32 –10 – 0430– 01).

Slightly more than one half (51%) of the farms classified as horse farms in Oxford are found in Zorra and Southwest Oxford (**Table 1**), with a combined 2016 population of 822 horses (Statistics Canada Table 32 –10 – 0427– 01). A total of 44 such farms were situated in these municipalities.

Zorra and Southwest Oxford reported a total population of 3,171 sheep and lambs and 8,709 goats in 2016 (Statistics Canada Table 32 –10 – 0425 and 0427– 01). Together, these municipalities contain a total of 18 sheep/goat farms, 1 fur/rabbit facility and 3 farms specializing in apiculture. Southwest Oxford reported 158 bee colonies on census day in 2016 (Statistics Canada Table 32 –10 – 0403 and 0432– 01).

Farm Operational Characteristics

Table 3 compiles agriculture census data that serves to further characterize the nature of the agricultural environment found within the site vicinity and wider area containing the proposed Southwestern Landfill Proposal.

The two municipalities surrounding the Subject Lands, namely Zorra and Southwest Oxford, include roughly one half of the number of total farms (46% - **Table 1**) and farm operators (47% - **Table 3**) found within the County.

As illustrated in **Table 3**, these municipalities generally reflect the broader Oxford County farm operational characteristics.

Table 3: Farm Operational Characteristics -2016

Operation	Zorra Twp	SW Oxford Twp	Oxford Co
Farm Operators	770	565	2830
Farms < 162 ha (400 ac)	87%	84%	86%
Farms > 162 ha (400 ac)	13%	16%	14%
Farms < 53 ha (130 ac)	53%	51%	54%
Area Owned	74%	74%	72%
Sole Operator	37%	34%	35%
Partnership	25%	24%	26%
Corporation	38%	42%	39%
Two or > Operators	70%	67%	68%
Operator Age > 55	52%	43%	49%
Operator Living On-Farm	92%	88%	90%
Farm Capital > \$2m	58%	52%	53%
Total Gross Farm Receipts	\$248M	\$191M	\$911M
Employees	818	639	3391
No off-Farm Work	60%	60%	60%
Farms Reporting Farm Gate Sales	6%	9%	8%
Farms Reporting Use of Farm Markets	2%	2%	2%
Farms with Certified Organic Products	7	5	29%

Source: Statistics Canada Tables:

32-10-0440-01	32-10-0414-01
32-10-0404-01	32-10-0435-01
32-10-0433-01	32-10-0436-01
32-10-0441-01	32-10-0439-01
32-10-0442-01	32-10-0447-01
32-10-0443-01	32-10-0445-01
32-10-0407-01	

Approximately one half of these farms are less than 53 ha (130 ac) in size. The majority of these farms (84 to 87%) are less than 162 ha (400 ac) in size. Province-wide farm consolidation and enlargement trends are in evidence in both municipalities. In 2016 Zorra reported 11 farms and Southwest Oxford 18 farms exceeding 453 ha (1120 ac) in size. Zorra had 3, and Southwest Oxford 5 operations with areas of greater than 906 ha (2240 ac), (Statistics Canada Table 32-10-0404-01).

Within the wider area surrounding the Subject Lands, the farms involve largely owned (74%) rather than leased or rented land holdings. Approximately 40% of the farms are corporate in nature, while 34 to 37% are sole proprietorships. Another quarter of the farms (24-25%) are organized as partnerships.

Most of the farms in Zorra and Southwest Oxford reported 2 or more operators per farm, reflecting the increasing size and related managerial complexity of today's expanding agricultural industry.

By far the majority of farm operators live on the farm (roughly 90%). Approximately one half of the farms in the area have farm operators who are 55 years of age and over.

Farming today in Ontario is big business, including major capital investment. Oxford County and Zorra and Southwest Oxford are no exceptions, with greater than one half of all operations reporting total farm capital well over \$2 million. Land and buildings represent 91% of that value, (Statistics Canada Table 32-10-0437-01). This investment generated close to \$1 billion in gross receipts (\$911 million) in Oxford County in 2016 with Zorra and Southwest Oxford contributing \$248 million and \$191 million in farm receipts, respectively.

Agriculture in Oxford and in the two municipalities surrounding the Subject Lands is a major employer with on-farm paid agricultural work in the year prior to the 2016 Census employing 3,391 employees countywide, including 818 in Zorra and 639 in Southwest Oxford. To supplement income, in the same year, 40% of farm operators secured some level of nonfarm work.

Fresh food sales in the Study Area, in the form of farm gate sales, stands, kiosks or you-pick sales included 6 to 9% of the Zorra and Southwest Oxford farms, respectively, in 2016. Countywide, this occurred on 8% of the farms with 2% of all farms reporting in the Census indicating the use of local farm markets for product sales.

As illustrated by the Agriculture Census review, the Study Area containing the proposed landfill operation is characterized by an extensive and widely diversified level of agriculture production. This includes an increasing occurrence of certified organic products reflecting this expanding market niche. Twelve farms report such production in Zorra and Southwest Oxford Townships. This is up from 7 reported in 2011 (Statistics Canada Table 32-10-0414-01).

Oxford County's Provincial Agricultural Context

As described above, the municipalities immediately surrounding the Subject Lands, namely Zorra and Southwest Oxford Townships, are quite representative of Oxford County as a whole. Together, these two townships, comprise roughly one half of Oxford County's total area (44%). For most of the agricultural production described above, these municipalities also reflect approximately 50% of County production.

Utilizing Agriculture Census data gathered by Statistics Canada, Oxford County's agricultural productivity can also be compared to that of the Southern Ontario agriculture region, which contains Oxford, and to the broader Province as a whole. These data support the fact that Oxford County and its component municipalities exhibit a very strong level of agricultural activity and productivity.

Table 4 summarizes Oxford County's substantial contribution to Ontario's agricultural production.

In 2016, Oxford County's number of census farms, farm operators and total farmland area represented 11 - 12% of the Southern Ontario region and 4% of the Province. The relatively high concentration of agricultural activity in the County however, is reflected by the fact that the County's total farm capital value and farm capital receipts are proportionately higher at 14– 16% of Southern Ontario and 6 – 7% of the Province.

The census data reveals an especially high concentration of cattle and particularly dairy production in the County. Oxford's total population of cattle comprises 32% that Southern Ontario and 6% of Ontario. Milk production within the County is especially concentrated, totaling 46% of that of Southern Ontario

and a full 12% of all that occurs within Ontario. In 2016, Oxford County was the largest milk producing county/region in all of Ontario, exceeding Perth, Wellington, Huron and Middlesex counties.

A prominent level of swine production also characterizes Oxford. This includes 32% of the pig population of Southern Ontario and 14% of the entire Province. This is only exceeded by Perth and Huron Counties.

Poultry, and in particular turkey production, is common throughout Oxford. The County has 19% of Southern Ontario's and 7% of the Ontario's poultry farms. In 2016, Oxford's 15 turkey farms represented 26% of those occurring within Southern Ontario and 12% of those occurring within the Province.

In terms of common field crop production, Oxford has a proportionately high level of production of grain corn. In 2016, Oxford produced 15% of Southern Ontario's total tonnage and 7% of the Province as a whole. Hay production is also common, in support of Oxford's high cattle population.

In terms of specialty crops, in 2016, Oxford's 267 acres of cabbage production represented 13% of Southern Ontario's and 7% of provincial production. There is also a considerable level of maple syrup production in the County, including 31% of Southern Ontario's and 3% of Ontario's maple syrup farms.

**Table 4: Oxford County Contribution
to Provincial Production - 2016**

Farm/ Production Type	S. Ontario*	Ontario
Census Farms	11%	4%
Farm Operators	12%	4%
Farm Land Area	11%	4%
Farm Capital Value	16%	6%
Farms with Capital Value > \$1M	14%	5%
Total Farm Cash Receipts	14%	7%
Cattle Farms	30%	5%
Cattle	32%	6%
Milk Producers	42%	8%
Milk Production	46%	12%
Swine Farms	27%	10%
Pigs	32%	14%
Poultry / Egg Farms	19%	7%
Sheep / Goat Farms	17%	4%
Sheep	12%	2%
Horse Farms	10%	3%
Oilseed and Grain Farms	8%	4%
Grain Corn	15%	7%
Soybeans	10%	5%
Hay	26%	4%
Fruit/Vegetable/Greenhouse/Nursery Farms	4%	2%
Strawberries	8%	3%

**Table 4: Oxford County Contribution
to Provincial Production - 2016**

Farm/ Production Type	S. Ontario*	Ontario
Cabbage	13%	7%
Green and Waxed Beans	6%	5%
Sweet Corn	7%	5%
Potatoes	7%	3%
Maple Syrup Farms	31%	3%

Southern Ontario Agriculture Region includes:
Essex, Kent, Lambton, Middlesex, Elgin,
Oxford, Brant, Norfolk, Haldimand, Hamilton, and Niagara
Farm Type per North America Industry Classification System (NAICS)
Source: Statistics Canada, 2016 Census of Agriculture

Agricultural Planning Designations and Zoning

The strong agricultural presence and productive agricultural resource base characterizing the Study Area are reflected in the Oxford County Official Plan policies and designations and in the Zorra and Southwest Oxford Township Zoning By-Laws (Numbers 35-99 and 25-98 respectively).

At the Official Plan level, beyond the designated settlement areas of Ingersoll and Beachville, most of the Study Area is designated as 'Agriculture Reserve'. The primary exception occurs within the northern portion of the Study Area, north of the Thames River. In this area, straddling 37th line between 41st line and 35th line, a large portion of the Study Area is designated as 'Quarry Area' in recognition of the limestone mineral aggregate resources and licensed quarries found in that area.

Further to the protection of the significant agricultural resources and associated agricultural industry within the Study Area, both the Zorra Township and Southwest Oxford Township zoning bylaws predominantly assign agricultural zoning (A2 and A1) to the rural areas comprising the Study Area. The only exception is in the limestone resource area situated north of the Thames River in Zorra Township. Here, the primary zoning is 'Quarry Industrial'.

9.2.1.2 Agricultural Resource Characteristics

Physiography

The agricultural lands located in the Study Area defined for this assessment are part of the headwaters of the Thames River and are situated in the upper reaches of that watershed. The Thames River dissects the Study Area flowing Northeast to Southwest through Beachville to Ingersoll.

The Study Area occupies a physiographic region known as the Oxford Till Plain (Chapman and Putnam, 1984). This region includes most of the North half of Oxford County. Within the Study Area, this till plain is largely level but in the southern portion, below the Thames River, there is a slightly rolling and gently

sloping topography that is evidence of glacial drumlin features that, in this area, have a northwest longitudinal alignment.

Soil Materials

The till materials from which this part of Oxford's productive agricultural soils developed are largely comprised of calcareous loam soils dominated by limestone and dolostone materials that are reflective of the underlying bedrock.

The area north of the Thames River is dominated by loam till soil material of the Guelph Soil Catena. South of the river, soils of the Honeywood-Guelph Soil Complex are predominant. These soils are made up of mixed silty alluvial deposits and loam till.

Along the Thames River valley, recent alluvial bottomland deposits are aligned with gravelly and sandy glacial meltwater spillway and kame deposits. These deposits result in a narrow, linear band of Fox sandy loam soils, (Soil Survey of Oxford County, 1961).

Soil Drainage

The moderately rolling topography characterizing the Study Area results in a predominance of naturally well-drained soils with good internal and surface drainage ideally suited to crop production. These well-drained soils include both the Guelph and the Honeywood-Guelph Complex Soil Series that largely characterize the Study Area.

Smaller areas of more level terrain result in the occurrence of imperfectly drained Guelph loam and Embro silt loam soils within the Study Area. These soils, as well as the better-drained Guelph and Honeywood-Guelph soils, are often enhanced by agricultural tile drainage systems and constructed drains that further support their high productivity for agricultural crops.

Soil Capability for Agriculture

The soil conditions described above provide a highly productive land base for agriculture within the Study Area. With the exception of the floodplain lands situated along the Thames River valley and isolated pockets of poorly drained soils, the land base of the Study Area is classified as Prime Agricultural Land within the Canada Land Inventory (CLI) system of soil classification for agriculture. Class 1 soils with no significant limitations to the production of common field crops prevail. These soils, combined with Class 3 soils with moderate topographic limitations, dominate the Study Area.

Site Agricultural Rehabilitation

With the exception of the small area to be used for the leachate treatment plant, the proposed landfill site is not part of the local agricultural land base. The proposed waste disposal area itself is located within a quarry that forms part of an amalgamated quarry licensed area providing for the mining of limestone resources that underlie the area.

The portion of the licensed quarry that is proposed for landfill use is part of the existing active quarry operation. In the quarry rehabilitation plan this portion of the quarry is intended to be partially backfilled with overburden resulting in a relatively level surface of approximately 43.1ha (107 acres). This area would have some potential for agriculture rehabilitation, however the site plan does not specifically assign this form of after-use.

Within the quarry site plan, this central area is bordered along its northern and southern limits by overburden side slopes, which are steeply sloping and of little value for agricultural after-use. This steeper sloping area comprises about 17.4 ha (43 acres).

The site plan also specifies that the extreme southern portion of the site is to remain as a lake of approximately 13.6 ha (34 acres) in size.

Within the quarry rehabilitation plan (MacNaughton Hermsen Britton Clarkson Planning Limited, October, 2016), the area proposed for landfilling would have roughly 58% of its area in a relatively level form that would have some undetermined agricultural rehabilitation potential.

9.2.1.3 Agricultural Land Use

Farm Facilities and Operations

The Agricultural Assessment Work Plan for the Southwestern Landfill proposal identifies an On-site and In the Site Vicinity Study Area, as illustrated in **Figure 6**. Beyond the proposed landfill site, this Study Area includes the area north of the site to County Road 2 (68th Road) west to 31st Line, east to 43rd Line – Zorra Line extension south to Highway 401 and west to Ingersoll.

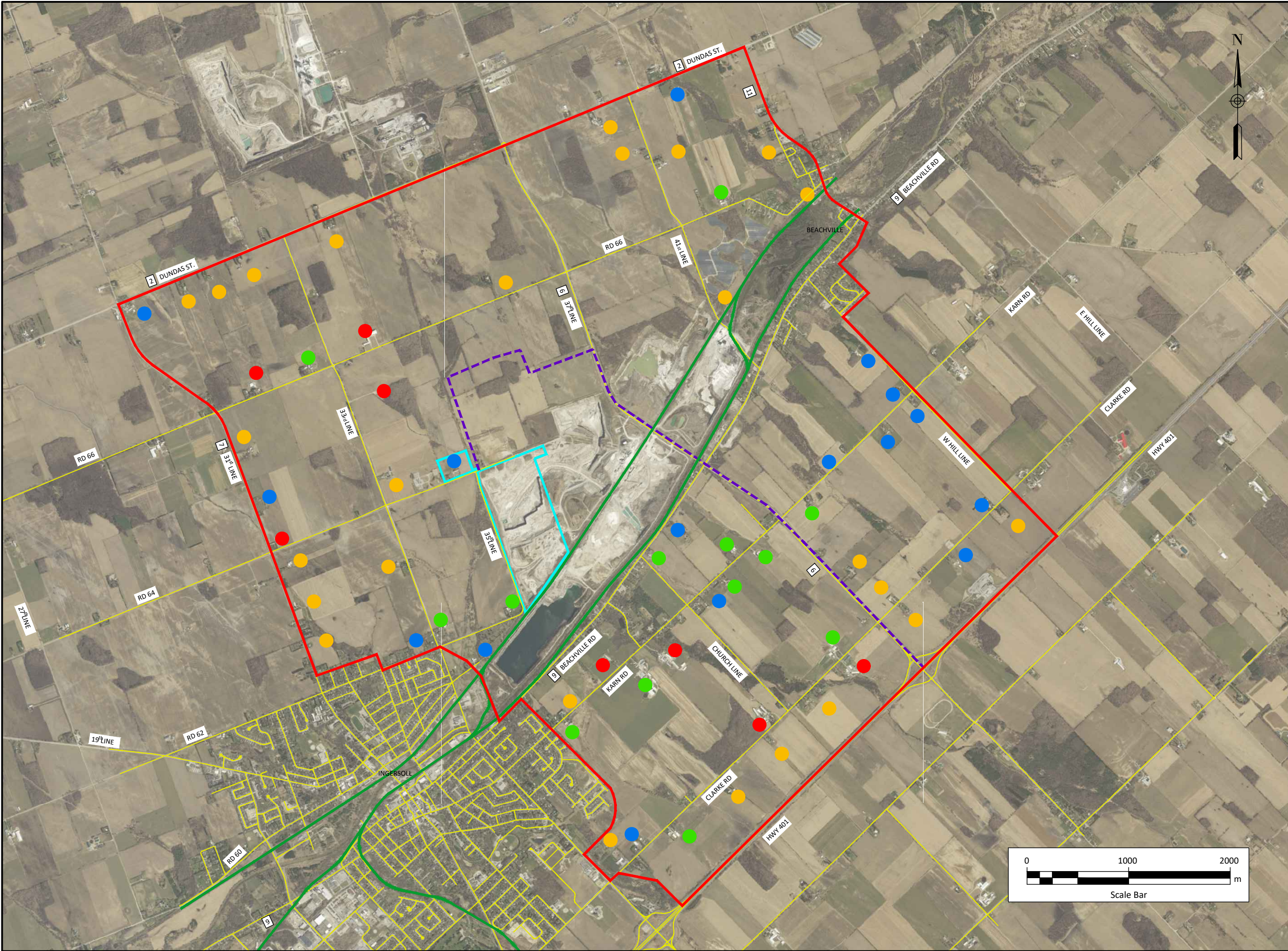
Within this area, field reconnaissance mapping of existing agricultural facilities and operations was conducted to observe the type of field crop production and to establish the location of farm facilities and structures associated with livestock and cropping operations. These field observations were conducted on December 5-7, 2017, September 4-5, 2018 and on November 1-2, 2018. Field observations were augmented by aerial photo interpretation of facility features from 2017 GLIMR (Geographic Land Information and Mapping Resources) aerial imagery available from Oxford County.

Based on these reconnaissance investigations, farm facilities were generally categorized in terms of their most probable and most predominant type of production. These categories distinguished predominately cattle (dairy and beef facilities) from those focused primarily on poultry/swine production. In some locations, due to poor visibility, it was difficult to distinguish swine from poultry facilities. In those cases, satellite imagery was utilized to look for manure or livestock handling features that would suggest production type. Those facilities with apparent use for housing horses were identified and mapped.

Farm facilities more apparently dedicated to machinery and crop storage in association with cash crop production were also mapped. Many older and apparently retired or inactive barns were observed. Often, these exhibited retired livestock components. Where livestock facility components were still present, these structures were categorized according to the most probable form of prior production. Where small or older facilities were categorized as now being cash crop oriented, they may include limited, ongoing use for the housing of some horses or mixed livestock and could still be functional for machinery or other forms of storage in support of agricultural production.

The farm facilities inventoried within the On-site and In the Site Vicinity Study Area are illustrated in **Figure 6**. This mapping provides a general representation of the fabric of agricultural activity within the site vicinity.

The farm facilities identified on **Figure 6** are included in the description of Common Receptors utilized by other study components within the broader Environmental Assessment (see **Appendix C**). These Common Receptor locations have unique identification numbers that serve as a common reference for



Legend

- Cattle and Sheep
- Swine and Poultry
- Horses
- Cash Crop / Storage / Mixed Use
- Study Area
- - - Haul Route
- Proposed Site Area
- CN Rail Lines
- Roads

Notes

Satellite images (GeoTIFF) obtained from Oxford County GLIMR interactive mapping site using 2015 aerial imagery layer.

No.	Date D/M/Y	Revision	By	App.
A	JAN 2020	Issued for Use	JT	JH

Prepared By

Prepared For

WALKER ENVIRONMENTAL GROUP

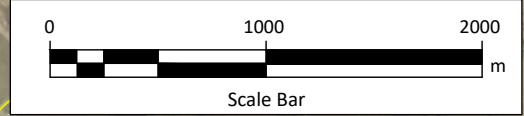
Project

SOUTHWESTERN LANDFILL

Drawing

FARM FACILITIES

Project No.		C4012	
Drawn	JThompson	Date	JAN 2020
Approved	JHagarty	Scale	1:35,000
Drawing No.	FIG-6	Revision No.	A



use by all study participants in the description of baseline conditions and in the cumulative effects assessment.

Farmland and facility ownership was examined using the land registry data contained within geowarehouse.ca's web-based property information database and mapping. This provided input to the identification of potential farm property linkages and helped characterize the scale and operational nature of farm operations situated within the vicinity of the proposed landfill site.

The owners of two specialized farm operations located within the Study Area, namely, the Killean Acres equestrian facility and the Leaping Deer Adventure Farm and Market were interviewed on September 4 and September 5, 2018 respectively, in order to gain insight into their unique agricultural operations and concerns with respect to the proposed landfill.

Geographically, the number of agriculture facilities situated in close proximity to the proposed landfill site is limited by the largely cash crop orientation of much of the Quarry Area designated lands located to the north and northeast. Likewise, to the south, the concentration of farm facilities neighboring the site is lessened by the nonagricultural orientation of land-use associated with the Thames River Valley and the developed area of Ingersoll and along Beachville Road. To the immediate east of the site, an existing quarry and the adjacent solar energy facilities also separate the site from active agricultural use.

The closest agriculture facilities to the site occur immediately west and northwest in Zorra Township and to the south and southeast in Southwest Oxford Township, beyond the Thames River Valley, especially along Karn Road.

A total of 63 separate facilities were identified within the Study Area. Another 37 agricultural properties without buildings or structures were also inventoried. Only one retired facility and one small barn, with horses were found to be less than 500 m from the waste disposal area. Generally, most of the adjacent farm fields remain in crop production on a rented or leased basis. Another 5 facilities are located within 500 to 1000 m away. Most of these are situated to the west of the proposed landfill site. The remaining 56 facilities identified from the field reconnaissance survey are located over 1 km away from the site.

Cattle and Sheep

As discussed in section 2.3, the Agricultural Census (2016) recorded 230 farms engaged in either beef or dairy production within Zorra and Southwest Oxford Townships. Thirteen cattle facilities were recorded within the Study Area, 4 of which did not appear to be currently involved in active production or had minimal evidence of such production.

Milk production is quite concentrated within Zorra and Southwest Oxford and in the County as a whole. It is the most prominent form of production associated with cattle in the Study Area. A total of 8 dairy farms were identified within the Study Area (Common Receptors (CR) # ZOR 13; SWO 10-12, 14-19, 21, 22; ING 9-10- See **Appendix C**). Several of these dairy operations are quite large and have substantial investment in modernized, large-scale production. Most of these major facilities are located to the southeast of the proposed landfill site, along Karn Road and Clarke Road.

One mixed beef and cheese production facility including cattle and sheep was also found (CR# ZOR 2). All of these active cattle operations were situated greater than 1 km from the proposed landfill site. Only 3 facilities were identified within the 1 km distance (CR# ZOR 11,10; SWO 3). These facilities do not appear to be actively engaged in milk or beef production. Retired facilities and other mixed production facilities may, however house a few cattle, sheep or horses.

Swine and Poultry

The Agricultural Census Data (2016) illustrates the prominence of swine and poultry production within Oxford County. A total of eight such facilities are located within the Study Area. All but one of these facilities appears to be actively in production.

Two of the 7 active facilities were involved in swine production. Both of these are situated to the northwest of the site (CR# ZOR 2- See **Appendix C**). The remaining 5 facilities are involved in poultry and egg production (CR# ZOR 1; SWO 10-12, 14-17, 19, 22). Sprucro Farms on Clarke Road (CR# SWO 22) specializes in turkey production. Two of the identified poultry facilities lie south of the site on Karn Road (CR# SWO 10-12).

All identified swine and poultry facilities are located beyond a 1.0 km distance from the site of the proposed landfill.

Horses

Horses are quite commonly found within the Study Area, particularly in the eastern portion, in the vicinity of West Hill Line and Karn and Clarke Roads. One large equestrian facility, Killean Acres, is situated southwest of the proposed landfill site (CR # ZOR 12- See **Appendix C**).

Sixteen structures housing horses were identified within the Study Area. Eleven of these were quite small, accommodating only a few horses. One is located within 500 m of the proposed waste disposal area (CR# ZOR 2). All of the remaining equestrian facilities are situated greater than 1 km from the proposed landfill site.

Cash Crops

Due to the prominence of soils of high capability for agricultural crop production within the Study Area, common field crops, including corn, soy beans, wheat and other grains are consistently grown in rotation over all of the available cropland. Many of the farms not involved in livestock production have facilities including crop and/or machinery storage structures in support of that production. Retired livestock barns can also be utilized for crop or machinery storage.

A total of 19 facilities, on lots exceeding a few hectares in size, were identified as associated with cash crop production. Many were comprised of properties containing machinery sheds; grain storage facilities; or inactive livestock barns that may still play a role in operational support for crop production. These facilities are scattered throughout the Study Area (CR# ZOR 1-3, 6, 9, 13; ING 9-10; SWO 19, 21-22- See **Appendix C**).

Specialty Agricultural Operations

Two specialized agricultural operations are located within the Study Area. The Killean Acres Standard Bred Horses facility on Cemetery Lane, is located immediately east of the Ingersoll Rural Cemetery, approximately 830 m southwest of the site of the proposed landfill (CR# ZOR 12- See **Appendix C**). The Leaping Deer Adventure Farm is situated on Clarke Road, about 2.8 km to the southeast of the site (CR# SWO 19).

Interviews were conducted on September 4-5, 2018 with both property owners in order to better understand the nature of these unique operations.

The Killean Acres operation comprises 8 ½ ha (21 acres) and was a nationally recognized standardbred horse breeding and foaling operation with a strong 60-year history of siring award-winning race contenders, some of which have achieved Canadian Horse Racing Hall of Fame status. The breeding program, which ended in 2012, included prominent stallions and associated brood mares, which, together with offspring, were housed on the property. The operation also had a state-of-the-art lab in support of the breeding program. Killean Acres, through its six-decade history, has been a favorite agri-touring location for Ingersoll residents.

The Killean standardbred breeding operations have now ceased and the property is for sale, but the facility continues to house a few brood mares and offspring for clients, and some donkeys.

The Leaping Deer Adventure Farm is a major agritourism attraction located on a 61 ha (150 acre) property situated off of County Road 6 and Highway 401 at Clarke Road. The adventure farm, on its website and on Facebook, has recently announced that it is closing because there is no family member to carry on operations. The owners intend to continue with agricultural operations on the farm.

Over almost a decade and a half, Leaping Deer featured activities for all ages including an extensive corn maze, farm animals, wagon rides, nature trails, special events, a store, a café serving local agricultural fare, a bakery and a renowned John Deere museum collection.

The Leaping Deer attraction grew since 2006 to become a prominent tourist destination for local, regional and international tours including school tours focused on agriculture. The farm includes facilities designed for large fundraising and group/club events as well as a variety of workshops and festivals. It was open from Easter until Christmas and employed up to 14 to 15 people during peak periods, serving 15,000 to 20,000 tourists annually. The operation stood as an excellent example of agritourism in Ontario.

Fresh Farm Markets and Product Sales

The demand for fresh, locally produced food has grown to support the local economy throughout Oxford County. This has resulted in an increasing number of roadside stands and pick-your-own operations and expanding farm markets and associated agritourism activities.

Within the Study Area, the Leaping Deer Adventure Farm and market was a prime example of this expansion and of the increasing interest in locally grown fresh farm produce. The Leaping Deer market is located on Clarke Road, 2.8 km to the southeast of the proposed landfill site (CR # SWO 19- See **Appendix C**).

Turner's Farm Market on Oxford Road 68 (Highway 2) is located approximately 3.5 km to the northwest of the site, just outside of the Study Area, in Zorra Township. Further north and northeast, nearer to Embro and Woodstock are 3 other fresh fruit, vegetable and meat markets, namely Fleming Farms, Red Barn Berries and Veggies and Miedema's Meat Market, (in Embro).

To the east of the Study Area, Victory Veg is located on Karn Road. Further away, nearer to Sweaburg, is the Jakeman's Maple Farm on Trillium Line, and Stonecroft Farms local fresh meats on Rivers Road.

Within the adjacent and nearby settlement areas of Ingersoll and Woodstock, there are also many local agricultural produce offerings. In Ingersoll, Local Dairy Products is located on Victoria Street. FoodDelicious Inc. on Chisholm Drive distributes frozen fruits and vegetables. Ingersoll also supports the seasonal, Saturday morning Kiwanis Farmers Market.

Among other stories, the Ingersoll Cheese and Agricultural Museum tells the history of early cheese production in the area. Quality Sheep Milk, Oxford Honey and Supplies and the Village Cheese Mill are located near Salford just south of Ingersoll.

In Woodstock there is the Woodstock Fairgrounds year-round farmer's market as well as a seasonal downtown farmer's market. The community also hosts a long list of the local food outlets including Blue Cow Delivery, Your Farm Market, Van Dyk's Greenhouses and Tom's Organics, Gunn's Hill Artisan Cheese Ltd., Kerry (Canada) Inc., Springbank Cheese Company Ltd. the Agropur Co-operative and the Birch Farm (R.R.# 7) pick-your-own operation.

Other, regional pick-your-own operations include the Berrylicious Fruit Farm near Burgessville and, further south, Brus' Orchards and Winery near Tillsonburg.

The Van Beek's Nursery is located just north west of the Study Area boundary on Oxford Road 68.

Agribusiness

There is a strong network of agricultural service and supply organizations supporting agriculture within the Study Area and the Wider Area containing the Subject Lands. These include a wide range and variety of outlets including farm equipment sales and service, feed, fertilizer and seed suppliers, commercial grain storage and drying operations, veterinary services, licensed deadstock services, meat plants and abattoirs, dairy plants and farm and tile drainage and soil erosion control contractors.

Although there is a limited presence of commercial farm supply/service outlets within the Study Area, there are many nearby, to the north, along or near to Road 68 and Oxford Road 17. These include, for example, Stratford Farm Equipment, Minler Agricultural Commodities, Embro Farm Systems, and Performance Dairy Center Inc..

Oxford Feed Supply is located in Ingersoll, immediately to the west of the Study Area and Oxford Bovine Veterinary Services is situated near Foldens, to the south of Highway 401 on Sweaburg Road.

Woodstock, to the East and Tillsonburg further south are also centers with a strong agribusiness presence. The site for the Canadian Outdoor Farm Show is located in Woodstock.

The Haul Route

The primary designated haul route for the proposed landfill will be Highway 401 Exit 222, proceeding north along County Road 6 to the proposed site's main entrance and then westward at a point situated approximately $\frac{3}{4}$ of a kilometer to the south of Road 66. The site's actual entrance will be located in the northwestern corner of the site.

The County Road 6 portion of the haul route is approximately 4.5 km in length. Valley lands and quarry lands characterize most of the haul route north of Karn Road. The only agricultural field access point situated outside of the segment of the haul route between its intersection with Karn Road and Highway 401 is located roughly 300 m north of Karn Road. Sixty percent of the proposed haul route has no intersection with current agricultural field or farm laneway access points.

Within the 1.8 km section of the haul route that touches on agricultural access points, there are 2 farm laneway intersects on the east side; 2 field access points on the west side; and 3 field access points

located on the east side of County Road 6. There are no agricultural access intersects north of Beachville Road or south of Clarke Road.

Ontario agriculture has experienced a strong trend toward farm consolidation and enlargement in order to achieve economies-of-scale. The Study Area is no different. There are many farms that conduct their field operations between and among more than one property location. This involves the transport of large farm machinery on local roadways, including County Road 6.

Within the Study Area there are 16 farms operating on two or more property locations. Land Registry data suggests that as many as 12 of these farms have land holdings located 3 to 4 km outside of the northeastern and southern Study Area boundaries. The registry data from both within and adjacent to the Study Area indicates that as many as 7 farms may have land holdings involving potential machinery movement across or along the haul route.

Beyond recognizable farm property linkages, today's agricultural operations involve increasingly complex, dynamic and diversified components that could use or cross the proposed County Road 6 haul route. These might include widespread custom cropping operations or land lease/rental arrangements; cooperative inter-farm working arrangements; access to and from farm services and suppliers; and/or transport of farm produce to market or to crop storage facilities. In addition, future farm expansion plans could involve possible property acquisition or evolving operational arrangements on either side of the proposed haul route that might make use of or cross the route.

9.2.2 Future Baseline Conditions

In the future, the highly productive agricultural land base characterizing the Study Area will continue to produce an abundance of agricultural products. Oxford County's agricultural contribution to the total Southern Ontario and broader provincial production is expected to continue at levels similar to those described in section 9.2.1.1 of this report. Farm enlargement and mechanization trends within the industry will affect agriculture province-wide, including Oxford, as fewer but larger farms seek increased efficiencies and economies-of-scale through farm consolidation.

Agricultural census reporting for Oxford County (Statistics Canada) indicate that there has been a 21% decline in the number of census farms in the County over the 25 year period from 1991-2016, despite an increase of 6% in farm land area over the same period. Crop statistics for Oxford in the 10-year period from 2006 to 2016 indicate an increasing level of production of soybeans (86%) and grain corn (25%), reflecting the ongoing importance of cash crop production in the County.

Other environmental trends supporting the consumption of more local farm produce will most likely result in changes to farm product distribution and marketing with an emphasis on local markets.

The increased mechanization of a more industrialized style of agricultural production will mean an ongoing and increased reliance on local road networks for the movement of large farm machinery between and among farm land operational components. Increased demand for efficiency may also see greater use of drones for crop monitoring and aerial application of fertilizers, cover crop seeding and pesticides with both fixed-wing and, increasingly, helicopter platforms.

As described in section 9.1.2, climate change will also bring about future changes in agriculture with higher temperatures resulting in an increased reliance on the availability of a clean and abundant water supply and an increased monitoring of pests and fungal diseases.

More specifically, within the Study Area itself, a large area designated Quarry Area and zoned Quarry Industrial Area occurs to the north and northeast of the site of the proposed landfill. This recognizes the underlying limestone mineral resources in that area. Much of this area is currently still in agricultural production, however, over time, quarrying will result in an interruption to farm activity, with the possibility of agricultural rehabilitation returning these lands to production within areas where final rehabilitation surfaces are above the water table.

10. Evaluation of the Proposed Landfill

Section 6.1 (2)(c) and (d) of the Act, and the Terms of Reference, require an evaluation of:

- The effects that will be caused on the environment;
- The actions necessary to prevent, change, mitigate or remedy the effects on the environment;
- An evaluation of the advantages and disadvantages (net effects) to the environment.

This section presents the assessment of these matters as it relates to agriculture, and for each of the EA criteria related to this study.

For agriculture, there were two Environmental Assessment Criteria established as part of the approved EA Terms of Reference. As described in Section 4 of this report, these criteria include the following:

- Displacement of Agriculture Land; and
- Disruption of Farm Operations

As set out in the Agriculture Assessment work plan the net effects assessment relies on the characterization of the nature of the onsite, adjacent and surrounding agricultural resources and production. That characterization, as contained in Section 9.2 of this report, provides information on the type and intensity of agricultural production and investment within the Study Areas. This provides input to the assessment of the potential net effects associated with the above Environmental Assessment Criteria dealing with agriculture.

This net effects analysis also relies on the findings of many of the other technical studies conducted as part of the broader Environmental Assessment, as set out in Section 4.

10.1 Displacement of Agricultural Land

Table B-1 (EA Criteria Table) from the Environmental Assessment Terms of Reference (see Appendix B) lists Displacement of Agricultural Land as Criteria #37 of the assessment. The definition/rationale identified for this criteria in Table B-1 is as follows:

The establishment of a waste disposal facility has the potential to displace existing or potential agricultural resources, including the loss of prime agricultural land.

10.1.1 Potential Effects

The proposed landfill itself (i.e., the waste disposal area) would occupy the site of an existing limestone quarry. The area to be landfilled is not presently agricultural land. It is designated 'Quarry Area' within the Oxford County Official Plan and zoned 'Quarry Industrial' within the zoning bylaws of Zorra Township. As such, the proposed undertaking does not displace or otherwise result in any significant reduction in the area of the existing agricultural land base comprising the Study Area.

Although the primary footprint of the proposed waste disposal area does not utilize existing agricultural land, the proposed haul route extending westward from County Road 6 to the site's main entrance and the area proposed for ancillary infrastructure, located immediately adjacent to the northwest corner of the site, will retire some existing cropland.

The haul route extending from County Road 6 to the site will involve the construction of a new roadway of approximately 2.65 km in length. With an access road width of 25 m, this would result in the utilization of 6.6 ha of land currently in crop production. This part of the haul route, however, is contained within an area designated, zoned and presently licensed for quarry use. This will result in the eventual retirement of current crop production, as these licenses take effect, however, future quarry rehabilitation may reestablish a crop production capability for those portions of the route remaining above water table after extraction.

After landfill closure, the haul route would be rehabilitated. Long-term service access for post-closure activities associated with ongoing leachate treatment and gas management would occur from Road 64.

The proposed leachate treatment facility for the landfill is located on lands north of Road 64 that are presently designated and zoned for agricultural use. These lands are situated immediately adjacent to the northwest corner of the site entrance on lands currently in agricultural production. These lands stretch between nonagricultural designated and zoned quarry lands to the east and nonagricultural designated lands utilized for an existing Hydro Service Area to the west.

The landfill leachate treatment facility will be accommodated in an area approximately 300 m by 210 m in size representing an area 6.3 ha. This land would be permanently removed from agricultural production as the infrastructure continues to function in ongoing leachate treatment.

As described above, the waste disposal area footprint itself is not part of the local agricultural land base. It is currently within a licensed quarry Lime and Stone. The site forms part of a larger amalgamated quarry licensed area providing for the mining of limestone resources that underlie the area.

The rehabilitation plan for this portion of the quarry involves backfilling with overburden resulting in a relatively level surface of approximately 43.1 ha (107 acres). This area would have some potential for agriculture rehabilitation, however the site plan does not specifically assign this form of after-use.

Within the quarry rehabilitation plan, this central area is bordered along its northern and southern limits by overburden side slopes, which are steeply sloping and of little value for agricultural after use. These steeper sloping areas comprise about 17.4 ha (43 acres).

The quarry rehabilitation plan also specifies that the extreme southern portion of the site is to remain as a lake of approximately 13.6 ha (34 acres) in size.

Within the quarry rehabilitation plan (October, 2016), the area proposed for landfilling would have roughly 58% of its area in a relatively level form that would have some undetermined agricultural rehabilitation potential.

The Landfill Facility Characteristics Assumptions Report describes the potential end uses for the period following closure of the landfill as including passive green space and agricultural uses.

The landfill facility design (See **Figure 4** of this report) illustrates the proposed top-of-cover contour plan for the landfill. The surface is proposed to have consistent slopes in the order of 5% over an approximate area of approximately 54.2 ha (133.9 acres). These relatively level areas offer potential for post closure agricultural after-use. This potential agricultural surface represents 91.4% of the waste-filled area of 59.3 ha (146.5 acres) and 73.3% of the total landfill site area of 73.9 ha (182.6 acres) which includes buffer areas and storm water management areas.

The configuration of the top-of-cover for the completed landfill provides a larger potential surface suitable for post-closure agricultural use (11.1 ha or 27.4 acres more) than that available from the quarry rehabilitation plan. This would offset any loss of agricultural land (6.3ha or 15.6 ac) associated with the siting of the landfill leachate treatment facility.

10.1.2 Potential for Cumulative Effects

The biggest potential reduction in the area of the existing agricultural land in the site vicinity will result from quarrying activities associated with existing and future aggregate licensing of the broad limestone mineral resource area designated as 'Quarry Area' within the Oxford Official Plan. Agricultural rehabilitation of quarried areas can only occur where final rehabilitation surfaces are above the water table.

The proposed landfill is expected to have a minimal impact on the area of agricultural land. There is a greater potential for loss of agricultural land in this area associated with future below water table extraction and with the topographic limitations involved in quarry side slopes that would limit agricultural rehabilitation potential.

10.1.3 Additional Mitigation Recommendations

Agricultural rehabilitation of the completed landfill could be enhanced through the diversion of organic (composted or digested) wastes and other bio-solids as soil forming or soil enhancement materials to be used in the rehabilitation of the final cover. Agriculture rehabilitation may also be more economically feasible if post closure land taxes were reduced through reclassification of the site from industrial to Agriculture.

10.1.4 Net Effects

The landfill will result in no overall loss or displacement of agricultural land.

10.2 Disruption of Farm Operations

Table B-1 (EA Criteria Table) from the Environmental Assessment Terms of Reference (see **Appendix B**) lists Disruption of Farm Operations as Criteria #38 of the assessment. The definition/rationale identified for this criteria in Table B-1 is as follows:

The establishment and operation of the waste disposal facility may affect agricultural crop or livestock production and related agriculture activities.

10.2.1 Potential Effects

Previously, Criteria #37 (Section 10.1 above), addressed potential landfill impacts on the extent of agricultural lands found within the Study Area. This Section of the assessment focuses on Criteria # 38 Disruption of Farm Operations and the potential for impacts on the agricultural activities and production that occurs on that land base.

To address potential impacts on agricultural operations, this part of the assessment looked into the possibility of direct impacts on:

- Agricultural facilities, soils, tile drainage, farm woodlots and land value;
- Livestock production including cattle, swine and poultry;
- Crop production;
- Farm operations, including potential interference or hazards presented by the landfill and its associated haul route;
- Farm markets;
- Agriculture supply and service infrastructure; and
- The agricultural character of the study area.

In conjunction with the other technical disciplines involved in the landfill Environmental Assessment, these potential effects were evaluated with respect to:

- Water quality or quantity impacts including surface and groundwater sources;
- Air quality impacts including landfill emissions, dust and odour;
- Farm machinery transport hazards associated with haul route traffic
- Disease vectors including birds and vermin;
- Nuisance impacts associated with blowing litter and birds;
- Economic impacts associated with effects on markets, land value or infrastructure; and
- Changes in the agricultural character of the Study Area.

Each of these types of potential impact are discussed below.

For Criteria # 38 (Disruption of Farm Operations), the indicators utilized in the assessment of potential effects are described in Section 4 of this Report. These include 4 basic measures that include the following:

- Area (ha.) of cropland and farm woodlots potentially affected by the landfill;
- Number of farm operations with livestock or crop production potentially affected by the landfill;
- Number of farms with potential haul route interference with agricultural operations; and
- Number of farm operations with other forms of potential business impacts associated with the landfill.

Water

Concern over potential landfill-related water quality and quantity impacts affecting agricultural operations and production were primary issues identified for consideration in the Agricultural Assessment Work Plan that forms part of the overall approved Environmental Assessment Terms of Reference. These issues included:

- Surface and ground water quality impacts affecting livestock or food quality; and
- Loss or reduction in water availability for agricultural operations, including that required for livestock or crop production.

Also related to potential surface water impacts, agricultural concerns were also raised regarding:

- Impact on surface or tile drainage or drainage outlets;
- Flooding hazards affecting crop production or resulting in soil erosion impacts;

The local resident survey conducted as part of the Social Impact Assessment (SLR Consulting, January 2020), reflects these concerns regarding potential water quality and supply issues. The results of that survey consistently refer to water impacts as a primary worry of local residents, both from an agricultural and a nonagricultural perspective.

For groundwater and surface water the concern for farms located in the vicinity of the proposed landfill involves:

- The potential loss or reduction of groundwater supplying farm wells and related constraints affecting the watering of livestock and possibly the irrigation of crops;
- The potential contamination of groundwater or surface water resources potentially affecting livestock or crops or soils and related concerns for food quality or safety; and
- Potential impacts on farmland productivity due to disruption to tile drainage and outlets and increased flooding events and related erosion or alteration of stream base flows.

The Patterson-Robbins drain (Cemetery Creek) intersects the northwest corner of the proposed landfill site.

An uninterrupted and uncontaminated supply of groundwater to farm wells is critical to livestock production. As illustrated in **Figure 6**, livestock production is limited in the Quarry designated area lying immediately to the north and east of the proposed landfill site. The site is also separated from livestock facilities to the south and southwest by the valley lands of the Thames River and by the nonagricultural land uses found along Beachville Road and in the Town of Ingersoll.

A number of livestock facilities are located to the west and northwest of the site (CR# ZOR 1,2). All of these are situated at or greater than a kilometer from the site. To the west, within 1 kilometer of the site there are 2 small barns housing a few horses, 2 retired cattle facilities, plus the now retired Killlean equestrian facility (CR# ZOR # 10-11, 17).

To the south of the site, across the Thames River Valley and beyond the Beachville Road residential/commercial strip there is a significant concentration of dairy farms (Karn Road – CR# SWO 10-12, 14-19,21,22). Also, to the south, across the valley along Karn Road, there are some older retired cattle facilities, some small barns with horses and 2 poultry facilities. All of these livestock facilities are located at or beyond a one kilometer distance from the proposed landfill site.

Common field crop production characterizes the farmlands surrounding the proposed landfill site the field observations did not reveal large-scale irrigation infrastructure however, in 2016, 13 farms in Zorra and another 30 in Southwest Oxford indicated some form of use of irrigation equipment in crop production (Statistics Canada Table 32-10-0437-01). With climate change, there may be some potential for greater use of groundwater resources for crop irrigation in the longer-term.

Ground water concerns are addressed in the hydrological assessment report prepared by Golder Associates Ltd., (January, 2020). The findings of the Golder report indicate that the conversion of the quarry to a landfill use will not result in any additional groundwater drawdown (i.e., aside from that which is already induced by the quarry dewatering activities) and will therefore not have any effect on groundwater elevations or groundwater contribution to farm wells or stream base flow. Groundwater availability for livestock production or for existing or future irrigation would, therefore, not be compromised by the proposed landfill.

The Golder hydrogeological report also indicates that the generic double composite landfill design will include a liner and leachate collection systems that will comply with Ontario's Ministry of Environment regulations resulting in no predicted impacts on ground water quality beyond the site boundary. There are, therefore, no negative impacts on groundwater quality that might affect livestock or crop production and related food quality or safety.

The report also establishes that the design components of landfill will efficiently eliminate any gas migration that might affect neighboring farmlands and the soils that comprise them.

Surface water concerns are addressed in the Surface Water Assessment report also prepared by Golder Associates Ltd., (January, 2020). That report indicates that the leachate treatment plant and storm water management system incorporated into the landfill design will achieve the required water quality standards in receiving watercourses resulting in no surface water quality impacts that might affect agricultural production.

The surface water report also indicates that the storm water management ponds designed for the landfill facility will control peak flows in receiving watercourses, including the Patterson-Robbins drain immediately to the west, resulting in no significant flooding or erosion impacts that might affect surrounding farmland. At closure, the landfill is expected to result in an overall increase in base flow within receiving watercourses of approximately 5%.

Since the landfill itself will not occupy existing agricultural land, there is no predicted impact on agricultural tile drainage systems or outlets. The haul route extending westward from County Road 6 and the leachate treatment plant will be designed to maintain the integrity of any agricultural tile drainage systems that they may encounter.

The Golder reports state that landfill design performance will be monitored and that proven contingency measures can be implemented if unanticipated issues arise.

Air

In a similar fashion to water, air quality concerns associated with the proposed landfill are prominent in both the agricultural and non-agricultural sectors of the local community. The results of the local resident survey identified air quality concerns associated with both the existing quarry operation and the proposed landfill operations. In addressing these concerns the agricultural work plan looked into the 2 main considerations, as follows:

- Landfill related airborne emissions, including vehicular (both onsite and along the haul route) and gas emissions and particulate (dust) potentially affecting livestock or contaminating crops, feedstocks or soils and associated concerns regarding the quality and safety of food production; and
- Odour impacts affecting agri-tourism or fresh produce marketing opportunities.

Once again, much of the land area situated in proximity to the site of the proposed landfill is characterized by lower intensity agricultural production associated with a large adjacent area of existing licensed quarries and Quarry designated lands to the northeast and with the Thames River Valley lands and the development along Beachville Road to the south.

Crop production in proximity to the site and along the haul route is comprised predominately of common field crops with scattered, small-scale vegetable and maple syrup production. Existing agricultural field cropping activities and existing quarrying activities can contribute to present ambient particulate levels.

All active beef, sheep, dairy, swine and poultry operations are situated greater than 1 km away from the site. There is minimal livestock production in the immediate vicinity of the proposed landfill site or haul route of the type that might potentially be sensitive to noise and vibration impacts

The Killean equestrian facility (CR # ZOR 12) is located just southwest of the site (830 m away). Although the Killean standardbred breeding operations have now ceased and the property is for sale, the farm has a long history of local agri-tourism interest in its equestrian activities. Landfill emissions, particularly odour were noted as a concern by the owner.

The Leaping Deer Adventure Farm (CR# SWO 19) was a major agri-tourism attraction located off of County Road 6 and Highway 401 at Clarke Road. It is situated on Clarke Road, 2.8 km to the southeast of the proposed landfill site and immediately west of the County Road 6 haul route, at its junction with Clarke Road. Odour impacts on its agri-tourism operations and their fresh farm market sales were major concerns expressed by the proprietor. The Leaping Deer operation has recently announced that it is closing since there is no family member to carry it on.

Other fresh food markets within the agricultural study area, beyond those found within Ingersoll and Woodstock, are generally comprised of small and occasional farm gate sales.

As part of the Environmental Assessment for the landfill, air quality concerns were addressed by RWDI (January, 2020)

The dust dispersion modeling looked at particulate matter and dust fall for current conditions and for landfill stage 1 and 3 operations. The RWDI results indicate that there are some local, existing particulate matter air quality criteria exceedances near the site of the proposed landfill. These exceedances are primarily related to existing background sources and do not extend to receptor locations associated with active livestock facilities. The frequency of these exceedances is very low and the modeling indicates that the landfill contribution would be nominal with the increased frequency of exceedances generally in the order of 1% or less of the standard.

The RWDI gas modeling looked into potential landfill gas compounds relative to current conditions that includes the quarry operation and landfill operating Stages 1, 3, 4 and post-closure. The background concentrations for most compounds are low, relative to their criteria.

For annual chloroform, the background concentration exceeds the standard on its own; the landfill contribution to off-site impacts is very small (<10% of the standard). Therefore, the predicted exceedances are a result of the background concentration and the incremental contribution from the proposed landfill is low.

For other potential contaminants, there are some expected contributions from landfill operations, the leachate plant and from fugitive emissions. For these compounds, there are no currently applicable air quality criteria. In all cases, however, the models did not predict any overlap with existing agricultural livestock operations, however, there will be some overlap with existing and future crop production in the immediate area of the proposed landfill. Results of deposition modelling conducted as part of the human health risk assessment indicated that neither any potential fugitive emissions from the proposed landfill and ancillary facilities (i.e. leachate treatment plant), nor deposition of particles emitted from diesel trucks using the proposed haul routes would adversely impact agricultural crops within the Project Area.

RWDI's assessment of potential haul route air quality impacts looked at current conditions as well as landfill Stages 1 and 3 operations. The baseline concentrations for most contaminants are below their criteria. Any predicted exceedances are a result of the background concentration and the incremental contribution from the proposed landfill is low. Haul route effects will be localized and are not expected to affect existing livestock operations or crop production occurring along the haul route.

RWDI's odour assessment focused on odours associated with the active landfill face, interim and final cover, soil storage and leachate treatment during operational Stages 1, 3, 4 and post-closure. Their dispersion modeling indicated that all residential receptors will be below the one odour unit threshold 99.5 % of the time, with the exception of one receptor location associated with a retired farm operation located immediately adjacent to the landfill boundary on 35th line which could slightly exceed this odour detection frequency.

The Facility Characteristics Report for the proposed landfill specifies odour control measures that include, but are not limited to, the adaptive application of a small working face, daily cover, and ongoing refinements to the operation of the gas collection and leachate treatment systems.

At Walker's South Landfill in Niagara Falls, odour complaints are closely monitored and declined from 13 in 2017 to 10 in 2018. During operating days / hours WEG staff immediately go to the area of the

complaint to investigate and report to operations. During evening hours, WEG has full time coverage who will respond to complaint areas, investigate and report to operations. Walker employs an adaptive odour control program that emphasizes operational practices to minimize odour potential while utilizing engineered solutions (i.e. use of biofilter materials and odour suppressants) to mitigate odours.

The RWDI assessment concludes that, with the proper mitigation technologies in place, the landfill is expected to meet applicable guidelines for odour at all agricultural receptor locations including those associated with the Killean equestrian and Leaping Deer Adventure Farm locations (CR# ZOR 12 and SWO 19). Agri-tourism impacts associated with odour at these two locations are, therefore, not anticipated.

Traffic

Agricultural concerns regarding the potential impact of increased truck traffic, associated with waste and cover material haulage on the haul route, were also incorporated into the agricultural assessment work plan. These concerns included:

- Potential traffic hazards to the movement of farm machinery across or along the proposed haul routes and potential disruption of customer, supplier or employee access to farms.

As described in the report, the proposed landfill and its haul route are situated within a prominent agricultural area that has a high level of farming activity that typically includes the movement of farm produce and supplies, as well as large, slow farm machinery on local roadways.

Today's large mechanized agricultural operations often involve inter-property linkages that include movement between and among separate parcels. Beyond safety considerations for slow-moving farm vehicles and machinery, there is concern for the timeliness and efficiency of inter-property connections that might cross or move along the proposed haul route.

The haul route extends from the 401 (Exit 222) northward along County Road 6 and then westward into the quarry licensed property at a point approximately $\frac{3}{4}$ of a kilometer to the south of Road 66. The degree of concern is related to both the number of farm laneway and field access points directly intersecting the haul route and the extent of potential inter-property farm operational linkages that might involve machinery movements along or across the route.

There is also no potential agricultural machinery interference or hazard for the portion of the proposed haul route to be constructed west from County Road 6 to the site's main entrance. The baseline data indicates that, due to the extent to which the haul route traverses the Thames River valley lands and existing quarry or Quarry designated and held lands, only 40% of the County Road 6 portion of the proposed haul route has any intersection with farm field or farm laneway access. Only 1.8 km of this portion of the route touches on farm access points. This includes 2 farm laneways and 5 field access points. This section extends from part way between Beachville Road and Karn Road to Clarke Road (CR# SWO 18,19).

With the concentration of large agricultural facilities located on Karn Road and Clarke Road, it is expected that the intersection of these roadways with the haul route may result in relatively higher volumes of agricultural traffic. Agri-tourism access to and from the Leaping Deer Adventure Farm on Clark Drive, originating from the 401, passed through the Clarke Road intersection. The Karn Road and Clarke Road connections are referenced in the traffic studies as Common Receptor points SWO 18 and SWO 19 respectively, (see **Appendix C**).

As for inter-property farm linkages, Land Registry data indicates that as many as 7 farms may have land holdings involving potential machinery movement across or along the haul route. Beyond the identified potential property linkages, it is recognized that today's large, complex, and dynamic farm operations include widespread and evolving custom cropping operations or land lease/rental arrangements; cooperative inter-farm working arrangements; ongoing access to and from farm services and suppliers; and transport of farm produce to market or to crop storage facilities.

Although there are some restrictions and dimensional requirements associated with farm machinery movement on public roadways, they are allowed to use public thoroughfares to get to and from operational farm parcels and farm supply and service outlets and to get farm produce to market. As described above, the area containing the haul route is an intensive agricultural area characterized by large, integrated and often dispersed operations that depend on the local road network.

Farm machinery use of public roads is subject to the Highway Traffic Act and its associated regulations. The Ontario Ministry of Transportation has published a Farm Guide (for) Farm Equipment on the Highway. Its guidelines include the following:

- Avoiding peak traffic hours and/or bad weather that might involve hazardous situations relating to road conditions or visibility;
- Displaying a SMV (Slow Moving Vehicle) sign at all times;
- For visibility, using appropriate head and tail lighting, signaling, flashing amber or rotating lights and/or escort vehicles as required;
- Using safety chains for towing;
- Maximizing the use of the travelled portion of the highway rather than shoulders, where the weight bearing capabilities may be uncertain;
- Keeping to the right of the centerline to accommodate oncoming traffic; and
- While mirrors are not specifically required, farm vehicle operators must be capable of seeing a vehicle approaching from the rear in order to make a safe turn.

Other than some periodic field operations such as crop spraying, peak machinery inter-property movements on local roads would generally occur during field cultivation and seeding in April / May or harvest/ploughing in late August through November except for winter wheat which is generally harvested in July. Night time farm machinery movement is not common but is not always avoidable. After dusk, the potential for farm machinery conflict with landfill related traffic is generally not of concern since the landfill hours of operation cease at 5 PM weekdays and at 1 PM on Saturday.

The landfill traffic assessment was conducted by HDR (January, 2020). The HDR studies addressed the EA Criteria pertaining to the potential for traffic collisions with the indicators/measures being the number of collisions of various types, including agricultural vehicles per km and at all intersections with the haul route.

The traffic counts included in the HDR studies did not observe many farm vehicles using the proposed haul roads. One of these accounts occurred during the fall harvest season, but the other two counts were undertaken in early spring and early summer, outside of the probable peak time for agricultural activity. There is no quantitative measure of the frequency of farm machinery travel on County Road 6. The HDR report states (Section 9.3):

There are occasional farm vehicles travelling on CR 6 in the Study Area. During the field visits conducted by HDR during June 2017, large farm vehicles were observed moving slowly and were travelling on the shoulders and lanes of CR 6. However, queuing was rarely observed behind slow moving farm vehicles. The ATR (Automatic Traffic Recorder) counts and the TMC (Turning Movement Counts) counts received from MTO and the County of Oxford did not specifically include farm vehicles as a classification or category and therefore the number of farm vehicles cannot be differentiated from the overall heavy vehicle (truck) category in the traffic counts.

The patterns of agricultural use and fabric of farmland ownership would suggest that the most agriculturally travelled portion of the route would be between the 401 and Karn Road, with the busiest intersections for farm machinery movements being at Karn Road and Clarke Road (CR# SWO 18,19).

The HDR analyses included a review of collision rates on the County Road 6 portion of the haul route. As expected, collision data for County Road 6, (2014 – 2017) indicated relatively high collision rates during the winter months. The HDR collision data for County Road 6 also indicated that a full two thirds of all recorded accidents occurred in the evening or night time, outside of the hours of operation of the proposed landfill. Over half (51%) of collisions were classified as single motor vehicle accidents which would exclude any events involving farm machinery in collision with other motor vehicles. The majority (57%) of collisions occurred between Beachville Road and County Rd. 2 where the volume of non-agriculture related traffic is expected to be less. In general the collision data points to road, visibility and weather conditions that are less likely to be related to times of peak use by farm vehicles.

The HDR Report indicates a total of 194 truck trips plus 16 passenger vehicles trips (one-way) generated by the landfill during a typical weekday, including short and long haul waste and soil transport. The report's existing and future truck traffic projections, with and without the proposed landfill, indicate that the percentage of truck traffic increase relative to the total traffic on County Road 6 will be only 5% during peak periods. With the proposed landfill, traffic movements at all intersections will continue to operate with residual capacity. Since this represents a relatively small increase in truck traffic, the report concludes that the proposed landfill will have an insignificant impact on traffic safety.

From an agricultural perspective, use of County Road 6 for farm machinery movement is already cautionary since it is recognized to be a busy access road to and from the 401 with relatively heavy existing and projected truck traffic related, in part, to existing and ongoing quarrying operations situated north of Beachville Road. The proposed landfill is expected to have a relatively minor effect in terms of increasing the potential for traffic collisions. Continued use of County Road 6 for farm machinery movement may not be entirely avoidable, however, since it is an already a busy thoroughfare, alternative routes, where available, would be recognized as a safer option for farm machinery movement.

With the additional 5% traffic volume attributable to the landfill, use of County Road 6 for the transport of the slow-moving farm machinery will continue to require extra care and caution.

Walker has demonstrated their commitment to traffic safety at their established South Landfill in Niagara Falls. At that location, Walker monitors landfill-associated traffic speeds to reinforce compliance with posted speed limits.

Litter

During the process of developing the work plan for this Agriculture Assessment, concerns were raised regarding the possibility of blowing litter originating from landfill that might end up on agricultural lands surrounding the site. These concerns included the potential for damage to farm machinery as well as hazards for livestock.

Blowing litter impacts were addressed by RWDI (January, 2020). The RWDI assessment indicates that the potential for blowing litter impacts on surrounding farmlands will be lessened through most of the life of the landfill while landfilling occurs below the surrounding grade. Wind speed and directional data indicate that high winds that could potentially cause litter to blow toward farm properties lying 500m to 1 km to the west of the site will occur infrequently.

Unlike small and/or older landfills spread throughout the province, the proposed Southwestern landfill will be a modernized facility with:

- Compaction and application of daily cover on the working area;
- Permanent and temporary/mobile litter fencing erected at key locations around the perimeter and working areas to catch blowing litter; and
- Litter collection, managed by litter control technicians, will be regularly carried out on-site and in the vicinity of the site to remove any fugitive blowing litter.

Mobile litter control fencing will be comprised of highly mobile fences that can easily be moved throughout any given day around active areas or the tipping face to accommodate alternating wind directions to significantly reduce the amount of litter that reaches perimeter fencing.

At Walker's South Landfill in Niagara Falls, the site has been closed during extreme high wind events to mitigate the potential for blowing litter. At that facility, Walker has been complemented by both the public and the Ministry of the Environment for their quick response to litter that has left the Landfill area.

As described above, there is a limited level of livestock production in close proximity to the landfill site. The Walker nuisance complaint reporting protocol will provide a means for monitoring any litter-based farm machinery or crop production impacts.

To assist in recognizing and reporting any litter problems, Walker has proposed a formal hot line that residents can call, which will be operational 24 hours a day.

Birds/Vermin

Another concern for agriculture is the potential for disease transmission to farm produce or livestock associated with vermin or birds. Although there is limited livestock production occurring next to the proposed landfill site, there are poultry facilities to the northwest (CR#'s ZOR 1,2) and to the south, across the Thames River Valley (CR#'s SOW 11, 12, 22). These facilities range from approximately 1.0 to 2.3 km distance from the landfill.

For crop production, ever-larger cash crop operations will be trending toward greater use of technologies that improve efficiency. These could include aerial crop monitoring and application of

fertilizers, seed and pesticides. Bird hazards to fixed-wing, helicopter or drone platforms in the vicinity of the major landfill are a concern.

The potential for bird and vermin disease vectors in the area surrounding the proposed landfill was addressed by Beacon Environmental's Aquatic and Terrestrial Ecology Impacts Assessment (January 2020). The risk of disease transmission to surrounding poultry operations from wild birds or any vermin that might frequent the proposed landfill is considered to be quite low. The landfill operating procedures will include comprehensive, integrated bird management operating protocols, monitoring programs and preventative programs for vermin.

All active poultry facilities are situated over 1 km from the landfill site. Commercial poultry operations are typically enclosed indoor facilities that generally operate under strict biosecurity protocols that include strong disease vector control programs for insect, mammalian, avian and human vectors. Measures typically include window and vent screening and feed and water cover in enclosed environments designed to prevent contamination. This eliminates the pathways that might create disease risk.

Birds that might be attracted in numbers to landfills, such as gulls, do not frequent such facilities for most of the crop growing season and are not especially attracted to most grain-based poultry feed that might be present at a poultry facility. Generally, gulls are scavengers and omnivores capable of eating most other types of food.

Beacon Environmental also addressed the potential bird hazard risk to aviation, including crop spraying operations (January, 2020). Their report looked at crop spraying activity at the Woodstock airport and a number of farm based grass airstrips located within 20 km of the proposed landfill. Their findings indicate that, although the Woodstock airport has been used occasionally for local crop spraying, it is not recognized as an annual operation due to limited water resources. The private grass strips were not known to support local fixed wing crop spraying operations.

The actual frequency of aerial crop applications within the local area is unknown, however, in general, it is becoming more common, as expanding farms strive for improved efficiency in field operations. Use of helicopters for such operations is also increasing within the province, providing an enhanced capability that is not dependent on airstrips or runways.

Aerial spraying activity most frequently involves post-emergent applications of fertilizers, fungicides, herbicides, insecticides and cover crop seeding that typically occurs in late spring or summer periods that coincide with bird nesting times. At those times, the number of birds occurring at the landfill would be the lowest. Also, at those times, common crops such as corn and soybeans have growth densities that discourage feeding by gulls.

The Beacon study undertook a risk assessment for airport and crop spraying operations within the vicinity of the landfill. Their study determined that the overall, post-mitigation risk level for crop spraying operations was very low with no appreciable increase in the risk of bird strikes occurring as a result of the proposed landfill operations.

The Beacon study includes a comprehensive Integrated Bird Management Plan for the proposed landfill involving site operations and associated staffing commitments designed to minimize the attractiveness of the site to birds. This plan includes monitoring and the possible deployment of active bird control measures such as noise makers, scarecrows, repellants, distress calls and an onsite falconry.

As set out in the Walker Facility Characteristics Report:

- Birds of prey, noisemakers and other industry standard bird control methodologies will be used daily during operating hours to discourage birds from gathering and scavenging at the landfill; and
- Pest control measures will be employed if vermin are found at the site.

At Walker's Niagara Falls facility, there are 2 full time wildlife management employees on duty during operating hours. At that facility, the bird control program is effective in deterring birds from loafing or scavenging at the site.

At the Niagara Falls facility, Walker has a preventative program for vermin including rats, groundhogs and skunks although there has not been a significant issue with this wildlife at the landfill. The only vermin control issues experienced at the Niagara facility was with mice that were getting into the electrical control boxes and groundhogs that were tunneling under small pump station buildings.

The measures which are proven to be effective at the South Landfill in Niagara Falls would be adopted at the proposed Southwestern Landfill. As above, with respect to litter, any complaints regarding birds and vermin would be monitored 24 – 7 through a public hotline.

Noise

The landfill agricultural assessment also considered potential noise and/or vibration impacts on livestock production that might originate from the site or the haul route. Although most livestock habituates quickly to routine or repetitive background noise, some forms of specialty production, such as mink or free-range poultry can be affected. Within the study area, in the immediate vicinity of the proposed landfill site and the haul route, there is no livestock production of the type that might be potentially sensitive to noise or vibration impacts.

The RWDI noise/vibration studies (January, 2020), indicate that predicted noise levels from stationary sources associated with landfill operations will comply with prescribed limits. Increased noise associated with the haul route, beyond that currently associated with current County Road 6 traffic levels was determined to be insignificant. For pest control measures (bird bangers), noise limit exceedances were not predicted for any receptor locations representative of active poultry operations within the study area.

Economics

The assessment of farm business impacts included in a number of considerations, as follows:

- Impacts on agricultural land value;
- Farm operational impacts associated with predicted water, air, traffic, noise, litter, and birds;
- Market impacts on fresh or direct product sales and agri-tourism; and
- Interference with farm expansion or loss or impairment of local agricultural infrastructure and agri-business support services and suppliers.

Economic impacts associated with the proposed landfill were analyzed by Keir Corporation (January, 2020).

The economic analyses looked into the potential impacts of the landfill on agricultural land values in the area. These studies determined that current, median prices (2018) were in excess of \$20,000 per acre with a range from a low of \$16,000 to a high in excess of \$28,000. Between 2010 and 2017 agricultural land values in the County rose dramatically, more than doubling. Between 2017 and 2018 there was a slight tailing off with a decline of approximately 1.4%.

The Keir study indicated that there will be no predictable impact on farmland values associated with the landfill.

Farm operational impacts with respect to groundwater, surface water, air, traffic, litter, birds and vermin, noise and vibration are outlined above. The technical studies addressing these potential impacts did not identify any specific potential for farm operational disruption or interference or land resource impacts that might contribute to economic or farm business losses.

Market impacts on fresh or direct market produce sales or agri-tourism activities is not predicted in light of the RWDI odour assessment and the fact that rural fresh food markets are located some distance from the site. This includes the Leaping Deer, Turner's Market and the Victory Veg Market and fresh food market sales outlets and farm markets occurring in Ingersoll and Woodstock.

Beyond individual direct farm operational or land impacts, the Keir economic assessment did not identify the potential for any broader loss or impairment of local farm business infrastructure and/or supply and support services or any long-term farm business impacts associated with possible uncertainty regarding farm expansion planning.

Agricultural Character

The proposed landfill would occupy an existing quarry site that is part of a broad limestone resource area that is designated for ongoing mineral resource extraction. This non-agricultural designated area is already partially licensed for aggregates and is largely held by nonfarm interests. The site has a minimal interface with active agricultural activity due to its location within a predominantly industrial landscape and also due to the separation afforded by the Thames River valley lands and the nonagricultural land use dominating Beachville Road and Ingersoll proper to the south and southwest.

The primary haul route is already a busy access route for quarry and other local and regional traffic to and from the 401. A significant portion of this route passes through natural and quarry designated industrial lands.

Given the above, there is a low level of intrusion into the agricultural landscape of this area which will result in minimal potential for change to the agricultural character of the area or to the cohesion and continuity of farmland and use.

10.2.2 Potential for Cumulative Effects

As an industrial form of land use, the proposed landfill's biggest overlap of potential effect on agricultural operations relates to existing and future quarrying activity. The landfill is located within a broad limestone resource area designated for quarry development. Due to its size, broad extent and long period of development, the area of existing and future aggregate mining associated with this resource designation will have regulated effects on local groundwater, air quality, and truck traffic and noise/vibration profiles. By comparison, the contribution of the proposed landfill to each of these

effects will be relatively small. These comparisons are dealt with in detail for the various stages of the landfill development within the individual technical studies being conducted for the EA.

10.2.3 Additional Mitigation Recommendations

Specific mitigation recommendations for groundwater, surface water, air, traffic and for nuisance impacts are provided within the individual technical reports comprising the EA. The Facility Characteristics Report also provides mitigation measures appropriate for the landfill operation. These measures, as described within those documents, all contribute to the objective of minimizing impacts on agricultural operations.

In addition to the mitigation provided in the design of the site or as recommended by other subject experts, related to litter control, bird and vermin management, and traffic controls, the following additional measures are also recommended in order to further protect agricultural operations in the vicinity:

- Repair or restoration of any agricultural tile drains, drainage outlets or surface drainage features interrupted or disrupted within farmlands abutting the extension of the haul route to be constructed westward from County Road 6, or at the site entrance or the site of the leachate treatment plant; and
- Walker should maintain a complaints reporting and response system that is accessible to local farmers

10.2.4 Net Effects

With the implementation of the mitigation measures set out within the various technical studies comprising the EA, within the Facility Characteristics Report and within the preceding section, landfill impacts on agricultural operations within the study area are predicted to be insignificant.

More specifically, when the various impact models incorporating the recommended mitigation measures are applied to the agriculture operational baseline, the net effects are as follows:

- No groundwater drawdown or related effect on groundwater elevations or groundwater contribution to farm wells or stream base flow;
- No negative impacts on groundwater quality that might affect livestock or crop production and related food quality or safety;
- No gas migration that might affect neighboring farmlands and the soils that comprises them;
- No significant surface water quality impacts that might affect agricultural production as required water quality standards in receiving watercourses will be maintained;
- No significant flooding or erosion impacts that might affect surrounding farmland as storm water management ponds will control peak flows in receiving watercourses;
- No predicted impact on agricultural tile drainage systems or outlets;
- No dust or gas impacts on livestock or crops as particulate and landfill gas compounds are predicted to be nominal;

- Leachate plant and some fugitive air emissions will overlap crop production. Results of deposition modelling conducted as part of the human health risk assessment indicated that neither any potential fugitive emissions from the proposed Landfill nor deposition of particles emitted from diesel trucks using the proposed haul routes would adversely impact agricultural crops within the Project Area.
- No expected haul route air quality effects on existing livestock operations or on crop production occurring along the haul route;
- No expected odour impacts on agri-tourism establishments as the landfill is expected to meet applicable guidelines for odour;
- With an additional 5% traffic volume attributable to the landfill, use of County Road 6 for the transport of the slow-moving farm machinery will continue to require extra care and caution for farm machinery transport;
- No predicted noise impacts for any receptor locations representative of active poultry operations within the study area;
- Landfill design and operational procedures will minimize litter impacts on agriculture.
- Landfill design and operational procedures will minimize bird and vermin impacts on agriculture.
- No predictable impact on farmland values associated with the landfill
- No farm operational disruption or land resource impacts that might contribute to economic or farm business losses;
- No market impacts on fresh or direct market produce sales;
- No loss or impairment of local farm business infrastructure and/or supply and support services; and
- No change to the agricultural character of the area or to the cohesion and continuity of farmland and use.

11. Monitoring, Contingency & Impact Management Recommendations

11.1 Monitoring & Contingency Plans

As referenced in Section 3 of this report, there will be monitoring programs for equipment operations, leachate, groundwater, surface water, air emissions, gas, noise, and particulates (dust). Details regarding these monitoring plans and related contingency responses are contained within the various technical reports.

In addition to the monitoring plans contained within the other technical assessments, traffic speed compliance monitoring for landfill related truck traffic will further assist in providing a safer environment for any potential farm machinery transport on the haul route.

The public complaints reporting and response system will also provide a monitoring function.

11.2 Impact Management

Impact management of potential landfill net effects on agriculture will rely on the public complaints reporting and response system and on the monitoring activities described above. Of particular significance to agriculture will be the ongoing litter, bird, vermin and traffic management systems embedded in the landfill's operating procedures.

12. References

Southwestern Landfill Proposal Environmental Assessment

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Walker Environmental Group Inc., 2016. *Approved Amended Terms of Reference, Southwestern Landfill Proposal Environmental Assessment*. May, 2016.

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Appendix A

Glossary of Terms

Canada Land Inventory (CLI)

The Canada Land Inventory for agriculture is an interpretative system for assessing the effects of climate and soil characteristics on the limitations of land for growing common field crops.

Common Field Crops

Common field crops in Ontario include corn, soybeans, small grains, and perennial forages.

Prime Agricultural Lands

Prime agricultural lands, as defined by Ontario Provincial Policy (2014) *specialty crop areas* and/or Canada Land Inventory Class 1, 2, and 3 lands.

Physiography

Physiography is the subfield of geography that studies physical patterns and processes of the earth.

Till Plain

Till or glacial till is unsorted glacial sediment. Till is derived from the erosion and entrainment of material by the moving ice of a glacier. Where it is deposited in level areas it is described as a till plain.

Drumlin

A drumlin is a low oval mound or small hill, typically one of a group, consisting of compacted boulder clay moulded by past glacial action.

Calcareous Soil

Calcareous soil is a soil that has high levels of both magnesium carbonate and calcium that reduce acidity in the soil.

Alluvial Deposits

Deposits of clay, silt, sand, and gravel left by flowing streams in a river valley or delta.

NAICS.

The North American Industry Classification System (NAICS) is the standard used by Federal statistical agencies, including Statistics Canada, in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the economy.

GLIMR

Geographic Land Inventory and Mapping Resource (GLIMR) is a web mapping tool utilized by Oxford County for organizing and displaying County geographical data.

Appendix B

Environmental Assessment Criteria and Studies (from the Approved Amended Terms of Reference)

Table B-1 – EA Criteria Table

Criteria	Definition/ Rationale	Studies Addressing the Criteria												Study Areas			Duration		
		Agriculture	Air Quality	Archaeology	Cultural Heritage	Ecology	Economic/ Financial	Groundwater/ Surface Water	Human Health	Land Use	Noise/Vibration	Social	Traffic	Visual/ Landscape	On-Site & Site Vicinity	Along the Haul Routes	Wider Area	Operational Period	Post-Closure Period
Public Health & Safety																			
1	Explosive hazard due to combustible gas accumulation in confined spaces.						<input checked="" type="checkbox"/>											<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2	Effects due to exposure to air emissions.		<input checked="" type="checkbox"/>															<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3	Effects due to fine particulate exposure.		<input checked="" type="checkbox"/>															<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4	Effects due to contact with contaminated groundwater or surface water.						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>										<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5	Flood hazard.						<input checked="" type="checkbox"/>											<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6	Disease transmission <i>via</i> insects or vermin.				<input checked="" type="checkbox"/>													<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Study that will be primarily responsible for addressing criterion.

Note: Many of the studies will provide key input to criteria that will be address through other impact assessment studies.

Criteria	Definition/ Rationale	Studies Addressing the Criteria											Study Areas			Duration			
		Agriculture	Air Quality	Archaeology	Cultural Heritage	Ecology	Economic/ Financial	Groundwater/ Surface Water	Human Health	Land Use	Noise/Vibration	Social	Traffic	Visual/ Landscape	On-Site & Site Vicinity	Along the Haul Routes	Wider Area	Operational Period	Post-Closure Period
Public Health & Safety (continued)																			
7	Potential for traffic collisions.											<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>	
8	Aviation impacts due to bird interference.				<input checked="" type="checkbox"/>									<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>	
Social and Cultural																			
9	Displacement of residents from houses.										<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
10	Disruption to use and enjoyment of residential properties.										<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
11	Disruption to use and enjoyment of public facilities and institutions.										<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	
12	Disruption to local traffic networks.											<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	
13	Visual impact of the waste disposal facility.												<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
14	Nuisance associated with vermin.										<input checked="" type="checkbox"/>							<input checked="" type="checkbox"/>	

Study that will be primarily responsible for addressing criterion.

Note: Many of the studies will provide key input to criteria that will be address through other impact assessment studies.

Criteria	Definition/ Rationale	Studies Addressing the Criteria											Study Areas			Duration			
		Agriculture	Air Quality	Archaeology	Cultural Heritage	Ecology	Economic/ Financial	Groundwater/ Surface Water	Human Health	Land Use	Noise/Vibration	Social	Traffic	Visual/ Landscapes	On-Site & Site Vicinity	Along the Haul Routes	Wider Area	Operational Period	Post-Closure Period
Social and Cultural (continued)																			
15	Displacement/disturbance of cultural/heritage resources.				<input checked="" type="checkbox"/>													<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
16	Effects on land resources, traditional activities or other interests of Aboriginal Communities.																<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
17	Displacement/destruction of archaeological resources.			<input checked="" type="checkbox"/>														<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
18	Level of public service provided by the waste disposal facility.																	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
19	Effects on other public services.																	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Social and Cultural (continued)																			
20	Changes to community character/cohesion.																	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Study that will be primarily responsible for addressing criterion.

Note: Many of the studies will provide key input to criteria that will be address through other impact assessment studies.

Criteria	Definition/ Rationale	Studies Addressing the Criteria											Study Areas			Duration			
		Agriculture	Air Quality	Archaeology	Cultural Heritage	Ecology	Economic/ Financial	Groundwater/ Surface Water	Human Health	Land Use	Noise/Vibration	Social	Traffic	Visual/ Landscape	On-Site & Site Vicinity	Along the Haul Routes	Wider Area	Operational Period	Post-Closure Period
21	Compatibility with municipal land use designations and official plans.								<input checked="" type="checkbox"/>										
Economics																			
22	Displacement/disruption of businesses or farms.								<input checked="" type="checkbox"/>										
23	Property value impacts.								<input checked="" type="checkbox"/>										
24	Direct employment in waste disposal facility construction and operation.								<input checked="" type="checkbox"/>										
25	Indirect employment in related industries and services.								<input checked="" type="checkbox"/>										
Economics (continued)																			
26	New business opportunities related directly to waste disposal facility construction and operation.								<input checked="" type="checkbox"/>										

Study that will be primarily responsible for addressing criterion.

Note: Many of the studies will provide key input to criteria that will be address through other impact assessment studies.

Criteria	Definition/ Rationale	Studies Addressing the Criteria											Study Areas			Duration			
		Agriculture	Air Quality	Archaeology	Cultural Heritage	Ecology	Economic/ Financial	Groundwater/ Surface Water	Human Health	Land Use	Noise/Vibration	Social	Traffic	Visual/ Landscape	On-Site & Site Vicinity	Along the Haul Routes	Wider Area	Operational Period	Post-Closure Period
27	New business opportunities in related industries and services.						<input checked="" type="checkbox"/>									<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
28	Public costs for indirect liabilities.						<input checked="" type="checkbox"/>										<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
29	Effects on the municipal tax base.						<input checked="" type="checkbox"/>										<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
30	Effect on the cost of service to customers.						<input checked="" type="checkbox"/>										<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
31	Effects on the provincial/ federal tax base.						<input checked="" type="checkbox"/>										<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Natural Environment & Resources																			
32	Loss/displacement of surface water resources.							<input checked="" type="checkbox"/>							<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	
33	Impact on the availability of groundwater supply to wells.							<input checked="" type="checkbox"/>							<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
34	Effects on stream base flow quantity/quality.							<input checked="" type="checkbox"/>							<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Natural Environment & Resources (Continued)																			
35	Loss/disturbance of terrestrial ecosystems.					<input checked="" type="checkbox"/>									<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	

Study that will be primarily responsible for addressing criterion.

Note: Many of the studies will provide key input to criteria that will be address through other impact assessment studies.

Criteria	Definition/ Rationale	Studies Addressing the Criteria											Study Areas			Duration			
		Agriculture	Air Quality	Archaeology	Cultural Heritage	Ecology	Economic/ Financial	Groundwater/ Surface Water	Human Health	Land Use	Noise/Vibration	Social	Traffic	Visual/ Landscape	On-Site & Site Vicinity	Along the Haul Routes	Wider Area	Operational Period	Post-Closure Period
36	Loss/disturbance of aquatic ecosystems.					<input checked="" type="checkbox"/>									<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	
37	Displacement of agricultural land.	<input checked="" type="checkbox"/>													<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
38	Disruption of farm operations.	<input checked="" type="checkbox"/>													<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
39	Sterilization of industrial mineral resources.									<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
40	Displacement of forestry resources.									<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
41	Loss/disruption of recreational resources.													<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Study that will be primarily responsible for addressing criterion.

Note: Many of the studies will provide key input to criteria that will be address through other impact assessment studies.

Table B-2 – EA Technical Studies Interconnectivity Matrix

Because effectively evaluating the EA criteria provided in Table B-1 may require input from experts in many disciplines, WEG adopted a methodology that facilitates a cross-functional approach among the experts. Each EA criterion has been assigned a ‘lead’ expert for reporting purposes (see Table B-1). The lead expert is responsible for coordinating efforts with any other expert they determine necessary to effectively report on that criterion as well as providing information to other experts who need input from them to report on any other criteria. Table B-2 provides possible relationships required between experts to effectively report on their respective EA criteria. The actual relationships will be developed during the EA process in consultation with interested parties.

		Reference Studies												
		Agriculture	Air Quality	Archaeology	Cultural Heritage	Ecology	Economic / Financial	Groundwater / Surface Water	Human Health	Land Use	Noise / Vibration	Social	Traffic	Visual / Landscape
Technical Studies	Agriculture		✓							✓	✓		✓	
	Air Quality												✓	
	Archaeology													
	Cultural Heritage								✓		✓		✓	
	Ecology		✓					✓			✓		✓	
	Economic / Financial	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
	Groundwater / Surface Water	✓										✓		
	Human Health		✓					✓			✓			
	Land Use													
	Noise / Vibration													
	Social	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
	Traffic	✓								✓		✓		
	Visual Landscape											✓		

Appendix C

Common Receptors

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LEGEND

- 500m from Proposed Landfill Area
- 1000m from Proposed Landfill Area
- Current Quarry Lime Plant Area
- Potential Landfill Footprint
- Haul Route (North portion to be refined)
- Municipal Boundary
- Intermittent Watercourse
- Permanent Watercourse
- Railway
- Waterbody
- Accomodation
- Aerodrome
- Business
- Cemetary
- Recreational Club
- Conservation Area
- Farm Buildings
- Fire Department
- House
- Civic Building/Sevices
- Library
- Multi-Residential
- Museum
- Place of Worship
- Post Office
- Recreation Area/Park
- School
- Utility
- Town of Ingersoll Receptor
- Township of East Zorra-Tavistock Receptor
- Township of South-West Oxford Receptor
- Township of Zorra Receptor



SCALE: 1:25,000
NAD 1983 UTM Zone 17N

NOTES
This map is for conceptual purposes only and should not be used for navigational purposes.
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WALKER ENVIRONMENTAL GROUP

SOUTHWESTERN LANDFILL ENVIRONMENTAL ASSESSMENT

RECEPTORS

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Project No. 209.40418.00000		--



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