CITY OF TEMISKAMING SHORES
NEW WASTE MANAGEMENT CAPACITY

ENVIRONMENTAL ASSESSMENT

Submitted to:

City of Temiskaming Shores
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P.O. Box 2050
Temiskaming Shores, Ontario
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Submitted by:

Amec Foster Wheeler Environment & Infrastructure
a Division of Amec Foster Wheeler Americas Limited
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August 2016

Project No. TY910491

FOREWORD

As of January 1, 2015, we have changed our company name from AMEC Environment & Infrastructure, a Division of AMEC Americas Limited to Amec Foster Wheeler Environment & Infrastructure, a Division of Amec Foster Wheeler Americas Limited (Amec Foster Wheeler). This reflects the combination of our parent company, AMEC plc, and Foster Wheeler AG. This name change is administrative in nature and we assure you that we will continue to maintain the current resources, contracts or other existing services you have with Amec Foster Wheeler. We will continue to provide the same quality of services and the same dedicated team of consultants, project managers, engineers and scientists. Our focus remains on delivering projects safely and successfully for you. You can find more information on Amec Foster Wheeler at www.amecfw.com.

September 2, 2016

Project No. TY901491

Ms. Kathleen Hedley
Director
Environmental Approvals Branch
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, Floor 1
Toronto, Ontario M4V 1P5

Dear Ms. Hedley:

Re: City of Temiskaming Shores, New Waste Management Capacity Environmental Assessment

On behalf of the City of Temiskaming Shores, Amec Foster Wheeler Environment & Infrastructure is pleased to submit the Environmental Assessment Report for the New Waste Management Capacity Project.

Yours truly,

Amec Foster Wheeler Environment & Infrastructure
a Division of Amec Foster Wheeler Americas Limited

Tim McBride, B.Sc., P.Geo.
Project Manager/Senior Hydrogeologist

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EXECUTIVE SUMMARY

Introduction

The City of Temiskaming Shores is located in northeastern Ontario, near the Quebec border, at the head of Lake Temiskaming. The City was formed in January 2004 through the amalgamation of the towns of Haileybury and New Liskeard and Township of Dymond into a single tier municipality. The City has two existing landfill sites: the New Liskeard Landfill (formally the Town of New Liskeard Landfill) and the Haileybury Landfill (formally the Town of Haileybury Landfill).

The City's draft Solid Waste Management Master Plan (WMMP) was completed in August 2008. It recommended the promotion of waste diversion and the provision of new long-term waste disposal capacity. Based on waste generation projections contained within the annual monitoring report, the Haileybury Landfill is expected to reach its approved landfill capacity by mid-2018 (Amec Foster Wheeler, 2014a).

In response to the recommendations of the draft WMMP, the City retained Amec Foster Wheeler Environment & Infrastructure to prepare an individual Environmental Assessment (EA), as per Part II of the *Environmental Assessment Act*, for the New Waste Management Capacity Project (Project).

Through a series of evaluations, including Alternatives To and Alternative Methods, the City identified the expansion of the New Liskeard Landfill as the preferred option for the Project. The proposed area (the Site) is located on the west ½ of Lot 5, Concession 2 within the City of Temiskaming Shores, in the District of Timiskaming. The Site is located on the north side of Rockley Road, approximately 3 kilometres (km) west of the former Town of New Liskeard.

Terms of Reference

The Terms of Reference (ToR) was prepared pursuant to the *Code of Practice for Preparing and Reviewing Terms of Reference for Environmental Assessments in Ontario* for the Ministry of the Environment (now the Ministry of the Environment and Climate Change; MOECC). The ToR was approved by the Minister of the Environment on the 28 November 2012. The ToR provides the framework for undertaking and evaluating the EA.

Assessment Methodology

The EA study was carried out in accordance with the approved ToR. The study involved the evaluation of Alternatives To and subsequently Alternative Methods, characterization of the existing environment, prediction and assessment of potential effects, and identification of mitigation measures, and monitoring and contingency plans.

There were several phases that were undertaken, including:

- Phase 1 – Alternative To, assessing the different ways of managing waste;

- Phase 2 – Alternative Methods, assessing different locations of the selected Alternative To;
- Phase 3 – Assessment, characterizing the existing environment and prediction of effects for the Preferred Alternative Method; and
- Phase 4 – Preparing and submitting the EA study.

Consultation

Consultation occurred throughout the EA process in accordance with the approved ToR. A variety of consultation activities were used to engage with and seek input from the public, Aboriginal communities, agencies, and other interested parties. The objectives of the consultation activities were to provide information about the proposed Project, identify Project-related interests and concerns, seek input, provide opportunities for involvement, document the process and show how the input received influenced the EA.

The consultation methods used during the EA process included:

- Distribution of letter and email correspondence to the public, Aboriginal communities, agencies, and other interested parties;
- Publishing of notices in local newspapers;
- Posting of notices and related Project information on the City's website (http://www.temiskamingshores.ca/en/business/Waste-Management-Capacity-Project.asp);
- Conducting two community open houses;
- Establishing the Waste Management Advisory Committee;
- Meeting and communications between the City (and its consultant) and the MOECC;
- Meeting and correspondence with interested persons, including neighbours, community organizations and business owners, and Aboriginal communities; and
- Posting the draft EA Study Report to the City's website and providing it directly to the Government Review Team and Aboriginal communities.

A summary of the consultation program implemented as part of the EA is presented in Section 9 and the associated Appendix L.

Evaluating Alternatives To

The Alternatives To the undertaking refer to examining alternative means of managing the City's waste, which involved:

- Identification of Alternatives To;
- Identification of Criteria;
- Evaluation of Alternatives To; and
- Determination of the Preferred Alternative To.

An initial reasonable range of Alternatives To was established based on the Project team's review of existing practices and experience with waste management as well as input from the City. These Alternatives To were presented in the approved ToR, and included:

- Do nothing;
- Thermal technology (waste incineration);
- Energy from waste;
- Waste export;
- Waste import; and
- Landfilling.

The criteria (i.e., environmental components) used in the evaluation were established in the approved ToR. These criteria were considered during the evaluation and in consultation with stakeholders and Aboriginal communities. Each of the Alternatives To was examined with respect to each of the environmental components. The subsequent assessment was based on a qualitative evaluation, taking into account potential for impact management measures (mitigation), net environmental effects, and overall advantages and disadvantages.

A summary of the evaluation of Alternatives To is presented in Section 4 and the associated Appendix D.

Evaluating Alternative Methods

Following the identification of the Preferred Alternative To, in this case landfilling, an evaluation of the Alternative Methods was completed. For landfilling, this evaluation considered various locations where the City could establish a landfill facility within and outside the municipal boundaries.

To identify potentially suitable locations, site selection screening criteria (i.e., setbacks) were applied to the preliminary study area. The preliminary study area, as identified in the ToR, considered a large area surrounding the City in which alternatives could be assessed. These setbacks considered distance from the municipality, adequate road access, existing land use, and environmentally sensitive areas. Nine locations within and eight locations outside the municipal boundaries were identified. Each location was evaluated against the environmental components presented in the approved ToR.

From evaluation of the 17 potential candidate sites, a short list of 4 candidate sites was identified for further evaluation and discussion with the City's Waste Management Advisory Committee. As a result of the further evaluation and discussion with the Waste Management Advisory Committee, the Preferred Alternative Method of the expansion of the New Liskeard Landfill was identified.

A summary of the evaluation of Alternative Methods is presented in Section 5 and the associated Appendix E.

Description of the Proposed Undertaking

The City has selected the expansion of the New Liskeard Landfill to provide the needed additional waste management capacity for their 30-year planning period. The existing 6.12 hectare (ha) footprint of the New Liskeard Landfill would be expanded to the southwest over an area of 4.8 ha. The Preferred Alternative Method would provide the City with a maximum of 874,000 cubic metres (m^3) of capacity for waste and daily cover.

The major components for the proposed Project would include those common to the operation of municipal non-hazardous solid waste landfills, such as:

- Waste haul trucks travelling along site roads to the working face;
- Deposition of waste materials, compaction, bulldozing, and grading activities at the working face;
- Stockpiling of clean cover materials, with loading of daily cover material into haul trucks and transport to the working face; and
- Facility support activities, with vehicular traffic from small vehicles or trucks.

The proposed landfill expansion will be spread over five lined waste disposal cells. For the purpose of this EA, it is assumed that the construction of the proposed landfill expansion will begin from the south end at Cell 1. The Project will progress sequentially from Cell 1 through Cell 5 (i.e., south to north). The activities associated with the landfill expansion are expected to occur over a 45-year period and are divided into four phases for the assessment of potential effects:

- Phase 1 Construction (Year 1), includes the construction of Cell 1 base and associated perimeter access roads, swales, and drainage ditches (including the appropriate sediment and erosion protection measures);
- Phase 2 Operations (Years 2 to 20), includes landfilling at active cells (1 through 5) and concurrent development of cells (2 through 5) and subsequent closure of cells (1 through 4) as they reach the designed final contours;
- Phase 3 Closure (Years 20 to 21), includes closure of Cell 5 and placement of final capping and cover; and
- Phase 4 Post-Closure (Years 21 to 45), includes post-closure monitoring (including groundwater).

Pending the successful completion of the EA and the necessary approvals are obtained, it is anticipated that construction of the new cells would begin in 2019 (Year 1).

During the post-closure period, the only activities anticipated are annual water quality monitoring, Site performance monitoring and maintenance.

Description of the Environment

A number of supporting studies were completed to characterize the existing environment that could be potentially affected by the proposed undertaking. In accordance with the approved ToR, these supporting studies covered the following environmental components.

- Natural environment
  - Atmospheric environment (air quality; greenhouse gas emissions)
  - Aquatic environment (fish habitat; fish community/species; Species at Risk)
  - Geology and soils (surficial geology; soil contamination)
  - Groundwater (quality; quantity and flow)
  - Surface water (quality; quantity and flow)
  - Terrestrial environment (habitat, vegetation communities, plant life; protected areas; wetlands; birds; other wildlife; rare species/Species at Risk)
- Social environment
  - Aboriginal communities (traditional uses of land and resources; built heritage; archaeological sites; cemeteries, burial grounds)
  - Land use and resources (existing land uses; planned land uses and land use policies; land resources)
  - Municipal and community services (municipal infrastructure and services)
  - Noise (noise levels; sensitive receptor locations)
  - Public health and safety (water wells/drinking water supplies; effects related to litter, odours, and dust; road safety)
  - Recreation (Trails, parks and other designated recreation areas)
  - Transportation (road infrastructure, air traffic)
  - Visual aesthetics (visual landscape quality)
- Cultural environment
  - Archaeology (archaeological sites; cemeteries, burial grounds, other)
  - Heritage (built heritage; other cultural features)
- Economic environment
  - Local economy (labour market, local employment; local businesses)
  - Municipal finances (revenues and expenses)

Further detail on each of these environmental components is presented in Section 6 and associated appendices.

Study Areas

Characterization of the existing environment was undertaken within two areas for the EA:

- Site Study Area – the lands owned by the City that lie adjacent to the New Liskeard Landfill site, which is located on the west ½ of Lot 5, Concession 2 within the City of Temiskaming Shores, in the District of Timiskaming. It corresponds to the direct footprint of the on-Site Project components. It has a total Site area of 4.8 ha.

- Site-vicinity Study Area – this includes the existing 6.12 ha landfill footprint plus the additional 4.8 ha proposed expansion and the lands in the vicinity of the Site with a buffer of 500 metre (m).

An extended study area was used for specific environmental components as described below.

- For atmospheric environment a 10 km extended study area was used to address the potential impacts on surrounding receptors;
- For aquatic environment and surface water characterization a 1.5 km extended study area was used to capture a regional context as there are currently no permanent surface water features on-Site;
- For noise environment a 5 km extended study area was used to address the potential impacts on surrounding receptors;
- For groundwater a 1.5 km extended study area was used to capture municipal wells;
- For terrestrial environment an extended study area to north and west was used to capture additional characteristics;
- For cultural environment a 1.5 km extended study area was used to capture additional characteristics; and
- For social/economic environments the City's municipal boundaries were used to capture the census area.

Prediction of Potential Effects

For each of the environmental components, the EA predicted the effects of the proposed undertaking based on detailed studies. Any identified potential negative effects were carried forward for the development of mitigation measures as appropriate. A summary of each environmental component is presented below and further detail is presented in Sections 7 and 8.

Natural Environment

Atmospheric Environment

Potential environmental effects from the Project on air quality are considered adverse for particulate matter (fugitive dusts); however, these effects will be short-term, reversible, generally limited to the Site-vicinity Study Area and can be managed through mitigation measures. Environmental effects for all other parameters within the Ambient Air Quality Criterion are considered to be negligible.

Potential environmental effects from the Project on greenhouse gas emissions are considered to be adverse but negligible in the context of the overall greenhouse gas inventories for Ontario and Canada.

Since the predicted greenhouse gas emissions from the Project are minor in comparison to Ontario, Canadian and global emissions, the Project will have no appreciable effect on current estimates of future global climate change.

Aquatic Environment and Surface Water

Two tributaries were identified in the Project area. These tributaries were observed to be intermittent in status with significant obstructions to fish passage including debris, blockages, steep valley slopes and lack of refuge habitat. Neither tributary were considered to support fish habitat, and no rare species or fish Species at Risk nor were their habitats identified.

The implementation of the proposed Project includes the installation of perimeter drainage ditches and swales, sediment and erosion control measures and a surface water monitoring program. The nature and quality of the surface water features, including lack of fish habitat, will likely result in no impact through development of this Project and proposed mitigation and monitoring plans.

Potential effects from the Project on the aquatic environment and surface water are expected to be positive as a result of the improved surface water drainage and sediment erosion control measures.

Geology and Soils

The surficial geology of the Site has been modified as a result of previous aggregate extraction and landfilling at the Site. Further modification will occur as part of the proposed Project and will not return to baseline conditions post-closure. This adverse effect is long-term and not reversible due to the nature of landfilling.

Surficial materials removed during construction will offset some of the need to import non-native materials to the Site for construction. However, the volume of surficial materials is limited as the overburden depth in the area of the proposed expansion is approximately 2 m. As a result of the previous disturbances, the Project effects to surficial materials are considered not to be adverse.

The natural attenuation of landfill-derived leachate does present the risk of soil contamination in the immediate vicinity of the landfill footprint. As a result, the potential uses for this property will be limited in the post-closure period. The risk for soil contamination decreases rapidly with increased distance from the landfill as the leachate is diluted through natural processes and the migration and impacts are more apparent in the dissolved phase (i.e., the groundwater) and potential discharge areas (i.e., surface water receptors), which will be monitored.

Groundwater

The New Liskeard Landfill was historically operated as a natural attenuation landfill; groundwater/leachate impacts were managed through the historical purchase of approximately 32 ha of land to the east of the landfill property to act as a Contaminant Attenuation Zone (CAZ). The proposed Project design assumed that the Site will continue to be operated as a natural attenuation landfill following expansion. Natural attenuation is an appropriate means of continued groundwater management at the Site following expansion. There is the potential for impacts to groundwater quality; however, the inclusion of the ongoing groundwater monitoring program will provide a means to monitoring for potential adverse effects. Therefore, the potential

environmental effects to groundwater are considered adverse; however, these effects will be managed through a monitoring program and contingency plan.

It is not anticipated that any aspects of the Project will have an adverse effect on the groundwater quantity at the Site. There is the potential for the Project to effect the groundwater flow system as a result of groundwater mounding within the waste materials. This change could result in localized radial flow that alters the current groundwater flow system in the immediate vicinity of the landfill footprint. The potential for an adverse effect would be offset by the available CAZ and quantified through the ongoing monitoring program.

Terrestrial Environment

The terrestrial environment was assessed for a number of aspects. For the habitat, vegetation communities and plant life, there will be a limited area of vegetation and habitat loss resulting from the Project (direct loss from clearing), and the adverse effects are expected to be minimal. In terms of protected areas, there are no Areas of Scientific and Natural Interest, Provincially Significant Wetlands, Wildlife Concentration Areas or other Natural Areas within the Site-vicinity Study Area.

One wetland (1.2 ha) was identified within the Site-vicinity Study Area but outside the Site Study Area; the wetland was noted to be somewhat disturbed with large and extensive gaps within the forest canopy, faint trails, but moderate and widespread miscellaneous waste (from human activity). There will be no direct (vegetation clearing) impacts on the wetland and the Project footprint is sufficiently offset to eliminate potential indirect effects such as dust generation.

The potential adverse effects to breeding bird populations will be largely associated with direct habitat loss from forest and vegetation clearing, potentially coupled with changes to habitat suitability related to the production of edge effects (such as increased predation and brood parasitism); however, no Significant Wildlife Habitat for birds (except raptors, Broad-winged Hawk and Northern Harrier) was identified during baseline surveys. Additionally, the Natural Heritage Information Centre Natural Areas Database did not identify any areas within the Extended Study Area as having significant or unique natural heritage features pertaining to migratory bird species and no Important Bird Areas or nature reserves were identified. It is not expected that vegetation removal will affect raptor nests through the loss of habitat. There is some potential for increased road kills along roads, but this effect is considered to be limited because of the low traffic volumes and frequency expected, and reduced travelling speeds.

The potential adverse effects to wildlife populations in the Project footprint may include i) direct loss of habitat due to vegetation clearing, ii) long-term displacement due to habitat loss, iii) short-term displacement due to disturbance during construction and iv) potential habitat abandonment along the edges of cut forest. Loss of any potential wildlife habitat is not expected to have any long-term effects on local and regional populations. Direct mortality is not an expected effect from Project activities.

While secondary sources identified five Species at Risk as potentially occurring within the Extended Study Area, neither these wildlife species nor potentially suitable habitat was identified during baseline surveys. As such, it was determined that Species at Risk are not present and are not predicted to be impacted by the Project.

Social Environment

Aboriginal Communities

No information has been provided by the potentially affected Aboriginal communities with respect to traditional uses of land and resources, built heritage, archaeological sites, cemeteries and burial grounds. However, the area has had archaeological potential removed due to previous landfilling operations throughout the entirety of the Site.

Land Use

The proposed expansion will be located on lands designated by the City for waste management purposes. The proposed expansion would occur on the east side of the existing facility and be fully contained on City-owned lands. The potential effects from the Project on land use are expected to be neutral.

Municipal and Community

Municipal infrastructure and community services will not be affected by the proposed Project. The proposed Project would ensure that the City can continue to provide waste management services to its citizen; therefore, the Project effects are anticipated to be beneficial.

Noise

Noise effects have been assessed over a time period of one hour, using the energy equivalent sound level as required by the applicable guidelines (MOECC's draft Noise Guidelines for Landfill Sites). Noise levels were modelled and assessed for the daytime period (07:00 – 19:00) as the landfill operations are not expected to extend over the evening and night-time periods.

Daytime operational noise levels at the receptor locations (i.e., residences) were predicted to be below the MOECC noise criteria limit. However, the operations may be audible at receptors in close proximity of the Project. The post-closure stage of the Project is considered negligible as there are no major activities expected during this phase other than the post-closure monitoring.

Public Health and Safety

According to the regional groundwater study, the municipal well draws its water from an aquifer beyond the flow path of the proposed landfill expansion area. As such, the proposed expansion is not a threat to the municipal potable water supply. A series of private potable water supply wells along Highway 65 are currently monitored as part of the ongoing environmental monitoring

program for the existing New Liskeard Landfill site and it is anticipated that these efforts will continue.

There are no safety road features (i.e. turning lanes, signage, etc.) at the entrance of the New Liskeard Site as it is currently inactive. The Project would provide opportunities for modifications to the Site entrance to alleviate traffic safety concerns, such as entrance design and signage. Similarly, school bus transportation schedules and routes will be considered as part of a mitigation plan that addresses waste haulage schedules to minimize any potential conflicts.

The potential effects of the Project on public health and safety are considered to be negligible given the existing groundwater monitoring program and proposed strategies for design and operation.

Recreation

There are no trails, parks or other designated recreation areas within 1 km of the Site that would be affected by the proposed Project.

Transportation

The New Liskeard Site was previously used as a waste disposal site and it is assumed that the infrastructure (i.e., Rockley Road) is suitably constructed to support the proposed development, although some improvements to enhance public safety may be considered and thus there are no anticipated effects from the Project. Further evaluation during the design and development will indicate the improvements to be incorporated into the design that enhance public safety (i.e., signage for entry/exit lanes, location and design of access points).

As previously mentioned, there is the potential for associated traffic effects related to school bus routes along haul routes. As such, transportation schedules and routes will be considered as part of a mitigation plan that addresses waste haulage schedules to minimize any potential conflicts.

There are no active airports or heliports within the Extended Study Area that could be potentially affected by the Project.

Visual Aesthetics

In general, the proposed landfill expansion development will have minimal impact on the visual environment from distant (regional) viewpoints. Although the height of the proposed landfill expansion will be visible on the horizon, there are no natural or man-made landmarks within the view-sheds that will be obscured. The City will consider design and operations modifications to reduce the potential for effects to visual aesthetics (such as daily cover, fencing and vegetative screening).

Distant views from the south, north and west will not be impacted by the Project development due to the presence of existing vegetation and topographic features. However, distant views from the

east will be most affected by the Project development. From this area (i.e., Highway 11), which is an elevated position, existing vegetation growing east of the Site is less effective for screening, but will be capable of obscuring the bottom quarter of the landfill face. Therefore, the application of daily cover will be an important component of operations.

Close-up views from the south will not be impacted by the Project development due to the presence of the existing landfill feature. Generally, close-up views from the west, north and east will be unaffected by the Project development due to the presence of significant vegetation and topography along the eastern and western edges of the Site.

Cultural Environment

Archaeology

The Site does not exhibit any archaeological potential or archaeological resources, and therefore no adverse effects are predicted. This prediction is based on the fact that prior to its development as a landfill, the Site was used as a limestone quarry where deep land alterations took place over the majority of the Site. As a result, the Site has had archaeological potential removed due to previous landfilling operations, including grading, road construction, and stripping of vegetation and topsoil over 30 centimetres in depth. Existing land features, including the presence of excessive slopes (i.e. >20°) along the eastern extent of the previous landfill activities and a permanent wet and low-lying area in the north-east corner of the Site created by the removal of natural ground, also limit the archaeological potential.

Heritage

The Site does not contain significant built heritage or cultural heritage landscape resources. Prior to its development as a landfill, the existing landfill area was used as a limestone quarry. Any potential for heritage resources has been removed by deep and extensive land alterations, including excavations, grading, road construction, and the stripping of vegetation and topsoil. There are no adverse effects are predicted.

Economic Environment

Local Economy

The City acts as a regional centre and the expansion of the New Liskeard Landfill will provide continued service to its population and neighbouring populations (such as the Town of Cobalt) and provide opportunity for the City to establish relationships with other communities who may wish to utilize the landfill (such as Timiskaming First Nation). It is recognized that while not all of the goods and services required for the proposed Project will be available locally, there will be opportunities for local businesses to capitalize on the Project. The potential effects from the Project would be considered positive due to the opportunities for employment or supply to the various Project phases.

Municipal Finances

The proposed expansion of the New Liskeard Landfill is more cost-effective for the City to finance as opposed to the development of a completely new site. The City has earmarked capital expenditures to cover the expansion development, as well as closure activities and post-closure monitoring at the Haileybury Landfill. It is anticipated that the landfill revenues and tax levy will continue to fund the day-to-day operations of the proposed expansion. As well, investments made in the waste diversion programs will further the life expectancy of the current operations as well as future operations. The potential effects from the Project would be considered adverse given the investment the City will need to make for the development of the proposed expansion area plus the closure and monitoring at the Haileybury site. However, in contrast to developing a new site separate from the existing New Liskeard Landfill site, the adverse effect on municipal finances is negligible.

Written by: Mary Kathryn Kelly, B.Sc.
Senior Consultant – Human Environment

Signature:  Date: August 24, 2016

Reviewed by: Tim McBride, B.Sc., P.Geo.
Project Manager/Senior Hydrogeologist

Signature:  Date: August 24, 2016

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GLOSSARY AND ABBREVIATIONS

AAQC	Ambient Air Quality Criteria
AMEC	AMEC Environment & Infrastructure (pre-2015 work)
Amec Foster Wheeler	Amec Foster Wheeler Environment & Infrastructure
ANSI	Areas of Natural or Scientific Interest
ATV	all-terrain vehicle
BCR	Bird Conservation Region
CAZ	Contaminant Attenuation Zone
City	City of Temiskaming Shores
cm	centimetre
CO	Carbon Monoxide
CO^2eq	Carbon Dioxide equivalent
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CTWMB	Cochrane Temiskaming Waste Management Board
CWS	Canadian Wildlife Services
dBA	Decibel, A-Weighted
DBMP	Dust Best Management Plan
DOC	dissolved organic carbon
EA	Environmental Assessment
EAA	Ontario *Environmental Assessment Act*
ECA	Environmental Compliance Approval
ELC	Ecological Land Classification
EPA	*Environmental Protection Act*
FEC	Forest Ecosystem Classification
FWCA	*Fish and Wildlife Conservation Act*
GHG	greenhouse gas
GIS	Geographical Information System
GPS	Global Positioning System
GRT	Government Review Team
H_2S	Hydrogen Sulphide
ha	hectare
kg	kilogram
kg/m^3	kilogram per cubic metre
kiloTonne/yr	kilotonne (1 metric tonne) per year
km	kilometres
kV	kilovolt
LEL	lower explosive limit
L_{eq}	Energy Equivalent Sound Level
m	metre
m^3	cubic metres

MBCA	*Migratory Birds Convention Act*
mg/L	milligram per Litre
MMAH	Ministry of Municipal Affairs and Housing
MNR	Ministry of Natural Resources
MNRF	Ministry of Natural Resources and Forestry
MOE	Ministry of the Environment
MOECC	Ministry of the Environment and Climate Change
MRF	Materials Recovery Facility
MTCS	Ministry of Tourism, Culture, and Sport
NO_x	Nitrogen Oxides
NO_2	Nitrogen Dioxide
OASD	Ontario Archaeological Sites Database
O.Reg.	Ontario Regulation
OU/m^3	Odour unit per cubic metre
OWRA	*Ontario Water Resources Act*
PET	polyethylene terephthalate
$PM_{2.5}$	particulate matter less than 2.5 micrometres in diameter
PM_{10}	particulate matter less than 10 micrometres in diameter
PM_{TOT}	particulate matter total
PML	Project Mailing List
POI	point of impingement
POR	points of reception
Project	City of Temiskaming Shores New Waste Management Capacity Project
RO	reverse osmosis
SAR	Species at Risk
Site	expansion of New Liskeard Landfill
SO_2	Sulphur Dioxide
STP	Sewage Treatment Plant
SWH	Significant Wildlife Habitat
TAC	Technical Advisory Committee
ToR	Terms of Reference
TSP	Total Suspended Particulate
UEL	upper explosive limit
$\mu g/m^3$	microgram per cubic metre
VC	Vinyl Chloride
Vol %	percent volume in air
WMAC	Waste Management Advisory Committee
WMMP	Waste Management Master Plan

1.0 INTRODUCTION

1.1 Identification of the Proponent

The Corporation of the City of Temiskaming Shores (City) is the proponent for this undertaking. The contact for this undertaking is:

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Technical and Environmental Compliance Coordinator
City of Temiskaming Shores
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1.2 Background

The City was formed in January 2004 through the amalgamation of the towns of Haileybury and New Liskeard and Township of Dymond into a single tier municipality. The City has two existing landfill sites: the New Liskeard Landfill (formally the Town of New Liskeard Landfill) and the Haileybury Landfill (formally the Town of Haileybury Landfill). The locations of these landfills are identified on Figures 1.1, 1.2 and 1.3.

The New Liskeard Landfill, located approximately 3 kilometres (km) west of the former Town of New Liskeard off of Rockley Road, has been used for waste management since 1916 (Earth Tech Canada Inc.; Earth Tech, 2008). The Haileybury Landfill, located approximately 9 km southwest of the former Town of Haileybury off of Highway 11 along Dump Road, has been in operation since 1975 (Earth Tech, 2008).

Prior to amalgamation, the New Liskeard Landfill received waste only from the former Town of New Liskeard, while the Haileybury Landfill received waste from the former Town of Haileybury, the former Township of Dymond, the Town of Cobalt, and from residents of Firstbrooke and Lorrain Townships (Earth Tech, 2008). The New Liskeard Landfill reached its approved landfill capacity in June 2009 and is currently no longer accepting waste. The Haileybury Landfill, the City of Temiskaming Shores' only operating landfill site, continues to accept waste from the City of Temiskaming Shores and the Town of Cobalt.

The City historically administered a recycling program through the operation of a Materials Recovery Facility (MRF) with the Cochrane Temiskaming Waste Management Board (CTWMB) (Earth Tech, 2008). The recycling program included the collection of paper fibres, aluminum and steel cans, container glass, and No. 1 polyethylene terephthalate (PET) plastic that were deposited at drop-off depots located throughout the City (Earth Tech, 2008). The City has since

developed a Solid Waste Management Policy (By-law No. 2015-021) that includes curbside collection of recyclables, which began in September 2014. The CTWMB was disbanded 31 December 2014.

The City's draft Solid Waste Management Master Plan (WMMP) was completed in August 2008 (Appendix A). It recommends the promotion of waste diversion and the provision of new long-term waste disposal capacity. Based on waste generation projections contained within the annual monitoring report prepared for the site, the Haileybury Landfill is expected to reach its approved landfill capacity by mid-2018 (Amec Foster Wheeler, 2014a). As such, the City's draft WMMP identified the provision of additional landfill capacity to facilitate long-term waste disposal as the second key objective in establishing a sustainable solid waste management program for the City of Temiskaming Shores (Earth Tech, 2008).

In response to the recommendations of the draft WMMP, the City retained Amec Foster Wheeler Environment & Infrastructure (Amec Foster Wheeler) to undertake two Landfill Feasibility Study reports. The reports estimated the City's need for long-term landfill capacity at more than 100,000 cubic metres (m^3). The first report (Existing Sites Report; Amec Foster Wheeler, 2010a) reviewed options for expanding the existing New Liskeard Landfill and Haileybury Landfill sites. The second report (New Sites Report; Amec Foster Wheeler, 2010b) reviewed options for developing a new landfill site at two properties. One property is located outside the municipal boundary but within a 10 km study zone. The second property is the Harley Township Landfill site also located outside the municipal boundary and within a 10 km study zone (given the small size of the Harley site, the development in this location was also considered to represent the development of a new site).

The studies were developed under the guidance of the City's Technical Advisory Committee (TAC) and the final report (Feasibility Study; Amec Foster Wheeler, 2010c) was approved by Council on 14 December 2010. The Feasibility Study examined all alternatives on the basis of a comprehensive set of criteria addressing the natural environment, public health, socio-economic/cultural factors, technical issues and cost. The overall most preferred option for the provision of new waste management capacity was determined to be the expansion of the existing New Liskeard Landfill site.

The Ministry of the Environment and Climate Change (MOECC) identified the need to take a more holistic approach to evaluating the City's new waste management capacity. As a result, the City retained Amec Foster Wheeler to complete this Environmental Assessment (EA) for the New Waste Management Capacity Project (Project).

1.3 Provincial Environmental Assessment Process

An EA is a decision-making process used to promote good environmental planning. In Ontario, this process is defined and finds its authority in the *Environmental Assessment Act* (EAA). Proceeding with an undertaking under the EAA is a two-step process involving:

- Preparation of Terms of Reference; and
- Preparation of the Environmental Assessment.

Figure 1.4 provides a schematic flow chart of the EA process. Public consultation and involvement of Aboriginal communities is an integral part of both steps and extends over the duration of the entire EA planning process.

The City of Temiskaming Shores New Waste Management Capacity EA has involved the evaluation of alternative ways of managing waste (Alternatives To) and alternative locations (Alternative Methods). The alternatives consist of either the establishment of a new facility, the change to an existing landfill that would add more than 100,000 m^3 to the total waste disposal existing volume, or the export of waste outside of the municipality for handling by another waste management facility. As a result, Ontario Regulation (O.Reg.) 101/07 (Waste Management Projects Regulation) under the EAA, indicates that the Project will be subject to Part II of the EAA.

1.3.1 Terms of Reference

The Terms of Reference (ToR) provide the framework and requirements for preparation and review of the EA. The ToR was prepared by the City following the MOECC's *Code of Practice for Preparing and Reviewing Terms of Reference for Environmental Assessments in Ontario* (Ministry of the Environment; MOE, 2009). [Note that the MOE changed its name to the Ministry of the Environment and Climate Change and released a new Code of Practice in 2014]. The ToR dated May 2012 (Appendix B) was approved by the Minister of Environment on 28 November 2012 (Appendix C) and has been followed in the preparation of this EA.

1.3.2 Environmental Assessment Process

The second step in the planning process, the EA itself, has been prepared in accordance with the requirements set out in the approved ToR. In accordance with subsection 6.1(2) of the EAA, the EA for identifying additional waste management capacity to manage solid waste from the City of Temiskaming Shores consists of:

- A description of the purpose of the undertaking;
- A description of and a statement of the rationale for:
  - The undertaking;
  - The alternatives to the undertaking (Alternatives To); and
  - The alternative methods of carrying out the undertaking (Alternative Methods);
- A description of:
  - The environment that will be affected or that might reasonably be expected to be affected, directly or indirectly;
  - The effects that will be caused or that might reasonably be expected to be caused to the environment; and

- The actions necessary or that may reasonably be expected to be necessary to prevent, change, mitigate or remedy the effects upon or the effects that might reasonably be expected upon the environment, by the undertaking, the alternative methods of carrying out the undertaking and the alternatives to the undertaking;

- An evaluation of the advantages and disadvantages to the environment of the undertaking, the alternative methods of carrying out the undertaking and the alternatives to the undertaking;
- A description of any consultation about the undertaking by the proponent and the results of the consultation; and
- Any maps or documents as required under the EAA or based on the provisions of O.Reg. 334 under the EAA.

1.4 Required Approvals

The New Waste Management Capacity Project requires approval under the EAA, the *Environmental Protection Act* (EPA), and the *Ontario Water Resources Act* (OWRA). The City is seeking the EAA approval prior to proceeding with other approvals, such as those required by the EPA and OWRA. The application for approval under the EPA and OWRA are combined into an application for an Environmental Compliance Approval (ECA) for a Waste Disposal Landfill Site. Under OWRA, a Permit to Take Water may be required if a leachate collection system is required; however, the current size and design does not warrant a collection system.

If the City is successful in obtaining EAA approval, it will not be able to begin the undertaking until such time as other necessary approvals are obtained.

1.5 EA Organization

This EA has been prepared in accordance with the following key documents:

- The ToR (as approved by the Minister of the Environment on 28 November 2012);
- Guide to Environmental Assessment Requirements for Waste Management Projects (MOE, 2007);
- Code of Practice: Preparing and Reviewing Environmental Assessments in Ontario (MOECC, 2014a); and
- Code of Practice: Consultation in Ontario's Environmental Assessment Process (MOECC, 2014b).

The EA is organized as follows:

- Section 1 – provides an introduction to the proponent and background information regarding the EA. It describes the process used to carry out the EA, the EAA requirements, and provides an overview of the overall EA Report.

- Section 2 – provides an overview of the assessment methodology, identifies the environmental components to be evaluated, describes the study areas and temporal boundaries, and provides related details.
- Section 3 – identifies the purpose of and rationale for the undertaking.
- Section 4 – identifies and describes the Alternative To of carrying out the undertaking and summarizes the comparative evaluation processes leading to the selection of a Preferred Alternative To.
- Section 5 – identifies and describes the Alternative Methods of carrying out the undertaking and summarizes the comparative evaluation processes leading to the identification of a Preferred Alternative Method.
- Section 6 – provides a description of the Site and proposed undertaking as well as an overview of the existing environmental conditions of the Site.
- Section 7 – provides a detailed effects prediction and assessment on the potentially affected environment associated with it, and summarizes the potential environmental effects.
- Section 8 – provides a description of the mitigation, monitoring and contingency plans for the preferred undertaking.
- Section 9 – provides an overview of the consultation process and a summary of consultation elements and activities.
- Section 10 – provides an overall conclusion to the EA.
- Section 11 – provides a list of studies and references for the EA.

The EA includes the following Appendices:

- Appendix A: Draft Solid Waste Management Master Plan
- Appendix B: Terms of Reference
- Appendix C: Terms of Reference Approval
- Appendix D: Alternatives To Report
- Appendix E: Alternative Methods Report
- Appendix F: Air Quality Technical Support Document
- Appendix G: Hydrogeology Technical Support Document
- Appendix H: Terrestrial Environment Technical Support Document
- Appendix I: Noise Assessment Technical Support Document
- Appendix J: Stage 1 Archaeological Assessment
- Appendix K: Heritage Technical Support Document
- Appendix L: Record of Consultation

1.6 ToR and EA Documentation Concordance

Amec Foster Wheeler has prepared this EA on behalf of the City of Temiskaming Shores to meet the framework outlined in the ToR for conducting and evaluating the EA. The following tables

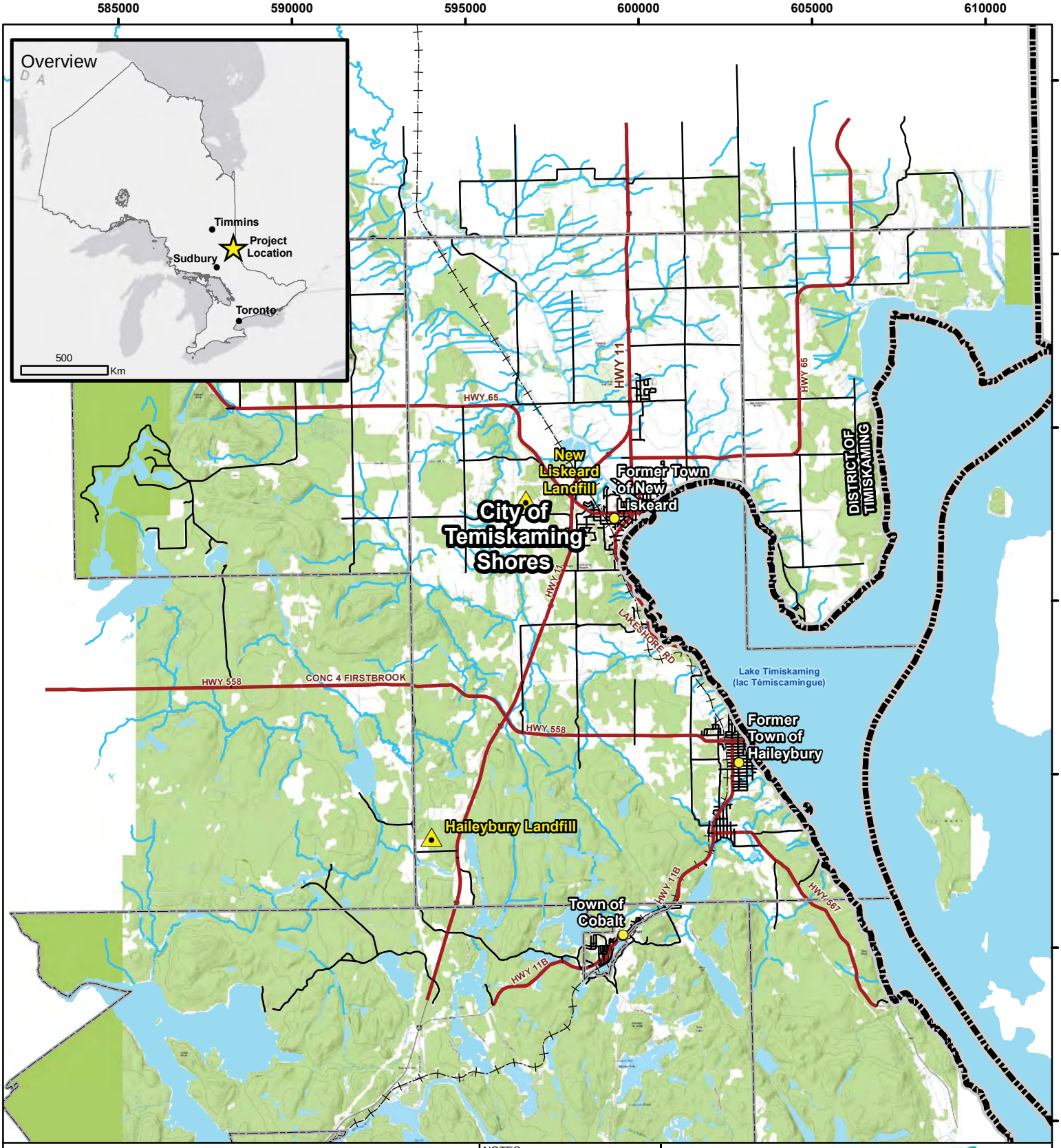
document the concordance between this document and the legislative requirements (Table 1.1) and the ToR (Table 1.2).

Table 1.1: Concordance of this EA with EAA Requirements

EAA Subsection	EAA Requirement	Section of the EA
6.1 (2)(a)	A description of the purpose of the undertaking.	3.0
6.1 (2)(b)(i)	A description of and a statement of the rationale for the undertaking.	3.1
6.1 (2)(b)(ii)	A description of and a statement of the rationale for the alternative methods of carrying out the undertaking.	5.0 and 6.0
6.1 (2)(b)(iii)	A description of and a statement of the rationale for the alternatives to the undertaking.	4.0
6.1 (2)(c)(i)	A description of the environment that will be affected or that might reasonably be expected to be affected, directly or indirectly, by the undertaking, the alternatives for the undertaking and the alternatives to the undertaking.	6.0
6.1 (2)(c)(ii)	A description of the effects that will be caused or that might reasonably be expected to be caused to the environment by the undertaking, the alternative methods of carrying out the undertaking and the alternatives to the undertaking.	7.0
6.1 (2)(c)(iii)	A description of the actions necessary or that may reasonably be expected to be necessary to prevent, change, mitigate or remedy the effects upon or the effects that might reasonably be expected upon the environment, by the undertaking, the alternative methods of carrying out the undertaking and the alternatives to the undertaking.	8.0
6.1 (2)(d)	An evaluation of the advantages and disadvantages to the environment of the undertaking, the alternative methods of carrying out the undertaking and the alternatives to the undertaking.	4.0, 5.0, 6.0 and 7.0
6.1 (2)(e)	A description of any consultation about the undertaking by the proponent and the results of the consultation.	9.0

Table 1.2: Concordance of this EA with ToR Requirements

ToR Requirement	Section of the EA
3.0 Rationale for and Description of the Undertaking	3.0 and 5.0
4.0 Description of the Environment	6.0
4.0 Description of Potential Effects	7.0
5.0 Alternatives to the Undertaking	4.0
6.0 Alternative Methods	5.0
7.0 Commitments and Monitoring	8.0
8.0 Consultation Plan	Appendix B



Path: P:\projects\2009 Projects\Environmental\TY910491 COTS - Landfill Feasibility Study\TY910491 - Expansion Design and EA\GIS\MXD\August\1.1_General Site.mxd, Author: Matthew.Thornton, modified by Matthew.Thornton, 15 August 2016

LEGEND

- Existing Landfill Locations
- Regional Communities
- District of Timiskaming Boundary
- City of Temiskaming Shores Boundary
- Highway / Major Roads
- Local Roads
- Railway
- Watercourse
- Waterbody
- Wooded Area

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.

Datum & Projection: NAD 1983 UTM Zone 17N

0 3 6 9 12 Kilometres

N W E S

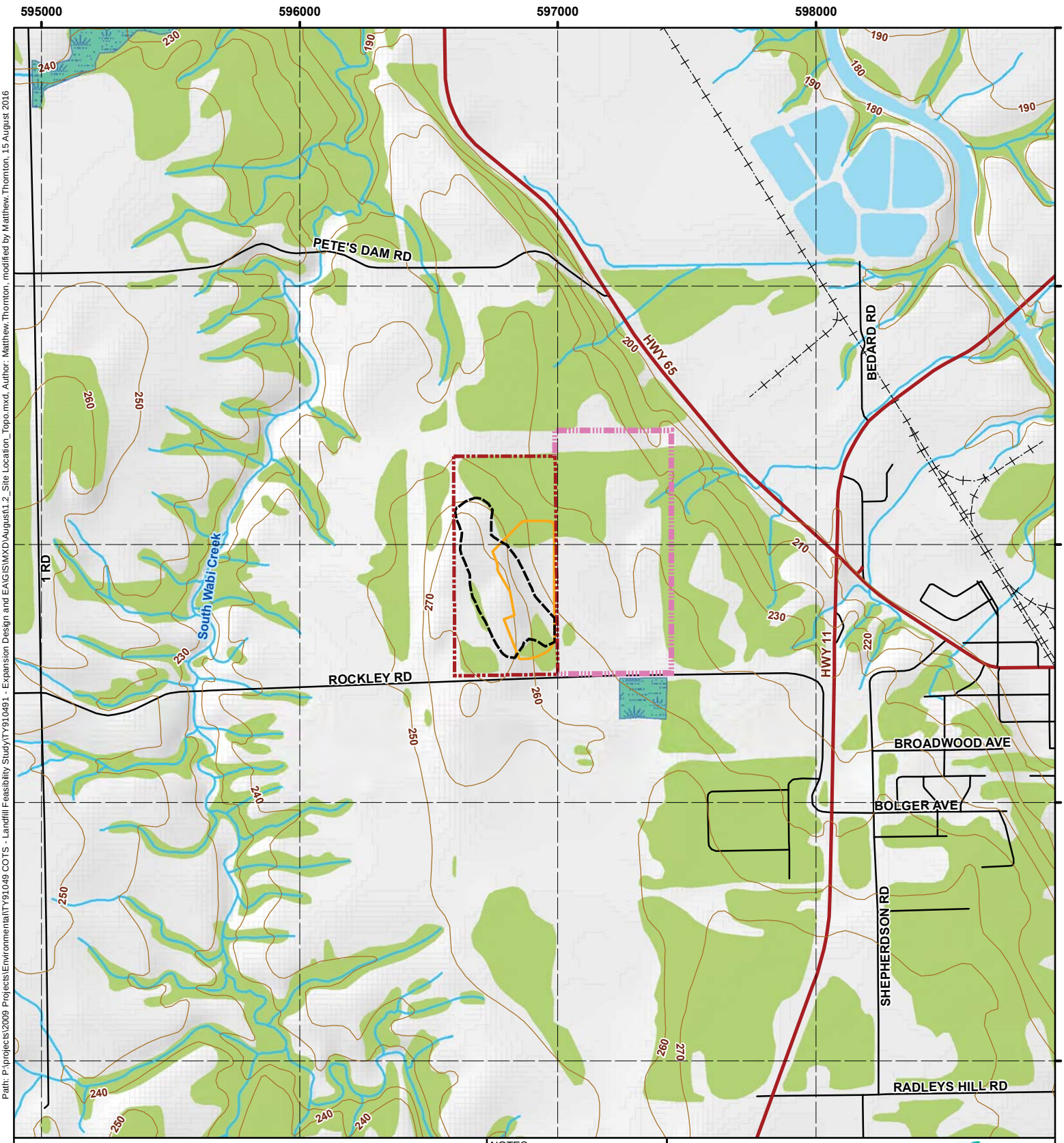
Temiskaming Shores

amec foster wheeler

ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

General Site Location

PROJECT N°:TY910491	**FIGURE: 1.1**
SCALE: 1:150,000	DATE: August 2016



Path: P:\projects\2009 Projects\Environmental\TY910491 COTS - Landfill Feasibility Study\TY910491 - Expansion Design and EA\GIS\MXD\August\1.2_Site Location_Topo.mxd, Author: Matthew.Thornton, modified by Matthew.Thornton, 15 August 2016

LEGEND

- Property Boundary
- Contaminant Attenuation Zone
- Site (Proposed Landfill Expansion Area)
- Approximate Domestic Solid Waste Boundary
- Contour (10m Interval)
- Highway / Major Roads
- Local Roads
- Railway
- Watercourse
- Waterbody
- Wetland
- Wooded Area

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.

0 0.5 1 1.5 2 Kilometres

Datum & Projection: NAD 1983 UTM Zone 17N

Temiskaming Shores

amec foster wheeler

ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Site Location Topography

PROJECT N^{o}:TY910491	**FIGURE: 1.2**
SCALE: 1:20,000	DATE: August 2016

Path: P:\projects\2009 Projects\Environmental\TY91049 COTS - Landfill Feasibility Study\TY910491 - Expansion Design and EA\GIS\MXD\August\1.3_SiteLocation_Aerial.mxd, Author: Matthew.Thornton, modified by Matthew.Thornton, 15 August 2016

LEGEND

- Property Boundary
- Contaminant Attenuation Zone
- Site (Proposed Landfill Expansion Area)
- Approximate Domestic Solid Waste Boundary
- Highway / Major Roads
- Railway
- Watercourse
- Wetland

0 0.5 1 1.5 2 Kilometres

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.

Datum & Projection: NAD 1983 UTM Zone 17N

N W E S

Temiskaming Shores

amec foster wheeler

ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Site Location Aerial Photograph

PROJECT N^{o}:TY910491	**FIGURE: 1.3**
SCALE: 1:20,000	DATE: August 2016

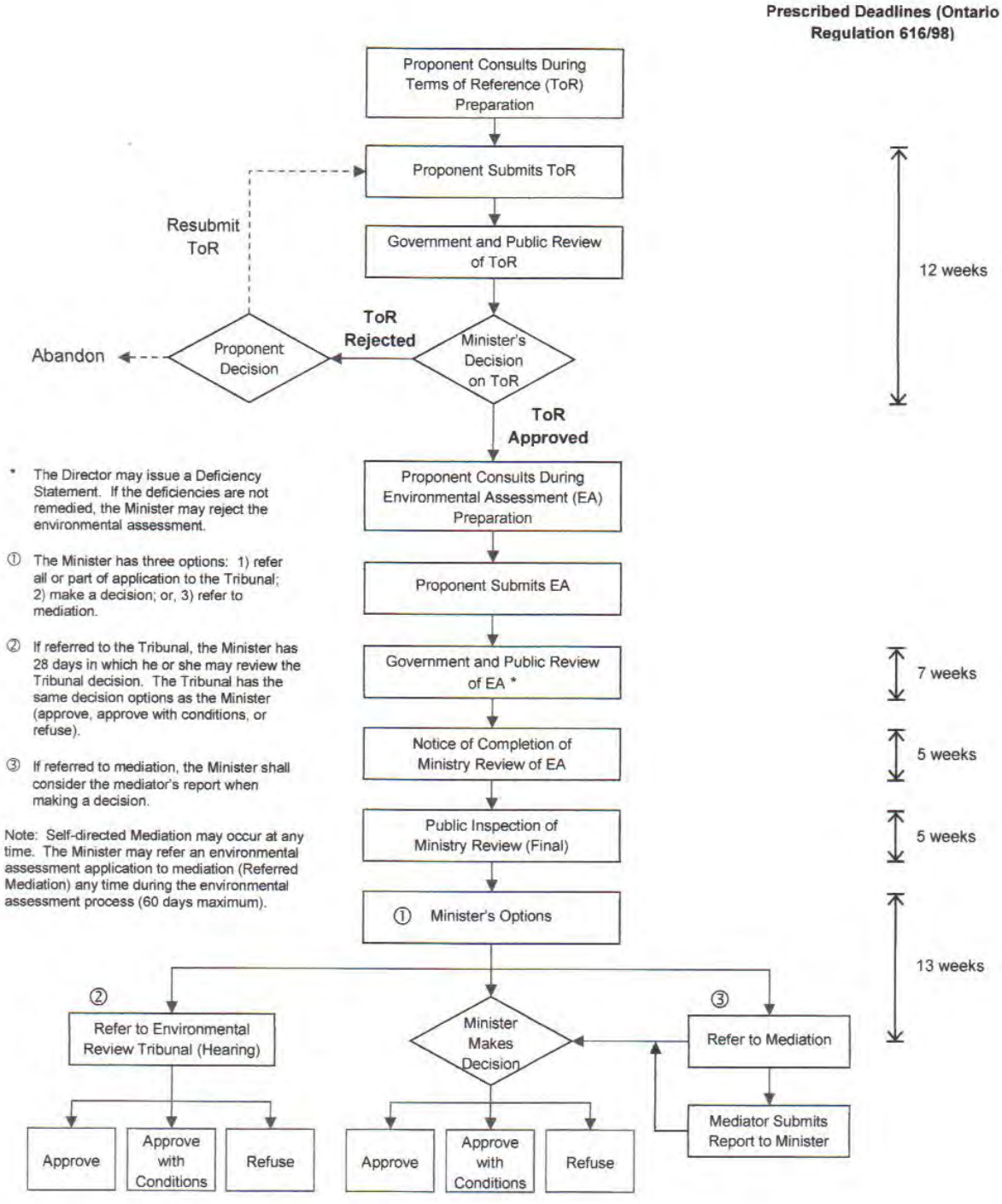


Figure 1.4: Environmental Assessment Process (Source: MOECC, 2014)

2.0 ASSESSMENT METHODOLOGY

The EA includes an evaluation of the Alternatives To, an evaluation of Alternative Methods for the Preferred Alternative To, followed by the characterization of the existing environment for the Preferred Alternative Method, prediction and assessment of potential effects to the natural, social, cultural and economic environments, and identification of mitigation measures, monitoring and contingency programs.

In accordance with the approved ToR, the EA was undertaken in several phases:

- Phase 1 – Alternatives To, assessing the different ways of managing waste;
- Phase 2 – Alternative Methods, assessing different locations of the selected Alternative To;
- Phase 3 – Assessment, characterizing the existing environment and prediction of effects for the Preferred Alternative Method; and
- Phase 4 – Preparing and submitting the EA.

Consultation with the public, Aboriginal communities, agencies, and other interested parties was ongoing throughout the EA process.

2.1 Environmental Components

As specified in the approved ToR, the following environmental components were evaluated in the EA.

- Natural environment
    - Atmospheric environment (air quality; greenhouse gas emissions)
    - Aquatic environment (fish habitat; fish community/species; Species at Risk)
    - Geology and soils (surficial geology; soil contamination)
    - Groundwater (quality; quantity and flow)
    - Surface water (quality; quantity and flow)
    - Terrestrial environment (habitat, vegetation communities, plant life; protected areas; wetlands; birds; other wildlife; rare species/Species at Risk)
- Social environment
    - Aboriginal communities (traditional uses of land and resources; built heritage; archaeological sites; cemeteries, burial grounds)
    - Land use and resources (existing land uses; planned land uses and land use policies; land resources)
    - Municipal and community services (municipal infrastructure and services)
    - Noise (noise levels; sensitive receptor locations)
    - Public health and safety (water wells/drinking water supplies; effects related to litter, odours, and dust; road safety)
    - Recreation (Trails, parks and other designated recreation areas)
    - Transportation (road infrastructure, air traffic)

- Visual aesthetics (visual landscape quality)
- Cultural environment
  - Archaeology (archaeological sites; cemeteries, burial grounds, other)
  - Heritage (built heritage; other cultural features)
- Economic environment
  - Local economy (labour market, local employment; local businesses)
  - Municipal finances (revenues and expenses)

2.2 Describing Alternatives

The ToR specified the types of Alternative To that are to be assessed in the EA; however, the ToR did not identify or describe the Alternative Methods (actual alternatives or number of alternatives to be assessed). The identification of the Alternative Methods was done subsequent to the selection of the Preferred Alternative To (in this case landfilling). To identify the landfill location alternatives (Alternative Methods) for consideration in the EA, a number of Site-specific factors were considered (Section 5).

2.3 Comparing Alternatives

The team completed an evaluation of the Alternatives To by identifying the Alternatives To (as identified in the approved ToR), developing criteria (environmental components as identified in the approved ToR) and assessing each Alternative To against the selected criteria and feedback received during the consultation process (Sections 4 and 9).

Similarly, the team completed an evaluation of the Alternative Methods by identifying potential locations for new waste management facilities or expansion of existing waste management facilities. The environmental components were used to conduct a comparative analysis of the Alternative Methods. Each alternative was ranked and then assessed by the magnitude of the differences among the alternatives. This detail was compiled into a single table. Subsequently, the identification of a short list of Preferred Alternative Methods were identified and evaluated (Section 5).

The results of these evaluations were presented and discussed with the Waste Management Advisory Committee (WMAC) to ensure that the process was vetted with stakeholders in a collaborative manner (Section 9).

2.4 Identifying Preferred Alternative

The evaluation and consideration of stakeholder input resulted in the selection of a Preferred Alternative Method from the short list of Alternative Methods (Section 5). The Preferred Alternative Method selected is expansion of the New Liskeard Landfill.

2.5 Describing the Existing Environment

For the Preferred Alternative Method, a description of the environment was developed covering the environmental components and study areas (Section 6).

2.6 Prediction of Environmental Effects

Subsequent to development of the existing environment description, the environmental effects were predicted for the Preferred Alternative Method (Section 7).

2.7 Refining Mitigation Measures for Environmental Effects

To reduce or avoid environmental impacts, mitigation measures were identified for the Preferred Alternative Method. This includes a cover system, leachate management strategy (i.e., monitored natural attenuation), stormwater management system and monitoring programs. The conceptual design was reassessed after completion of the prediction of environmental effects to confirm the proposed design would meet regulatory requirements and address stakeholder concerns (as appropriate). Where the proposed design did not meet these requirements, additional mitigation measures were identified. The proposed mitigation, monitoring and contingency plans are presented in Section 8.

3.0 PURPOSE OF THE PROPOSED UNDERTAKING

The City's 30-year planning period began in 2009 and anticipated the end of landfilling activities at the Haileybury Landfill in 2015. However, with the City's waste diversion efforts this date has been extended to 2019.

Based on the estimated remaining capacity of the Haileybury Landfill (approximately 175,455 m^3, inclusive of daily and final cover, at the end of 2013) and the estimated average annual waste generation rate (approximately 11,311 m^3/year), the City has identified a need for additional waste management capacity of 685,000 m^3 (Amec Foster Wheeler, 2014a). This represents a conservative estimate for the 30-year planning period.

The purpose of the proposed undertaking; therefore, is to provide the City additional waste management capacity for non-hazardous solid waste. As part of the EA process, the City evaluated Alternatives To (Section 4) and subsequently Alternative Methods (Section 5) for waste management.

3.1 Description and Rationale for the Proposed Undertaking

The City is responsible for providing waste management services to its residents that is protective of human safety and health and the environment. The proposed undertaking will address the identified waste management needs for the City for the 30-year planning period. The first step was to evaluate Alternatives To for waste management, which included do nothing, thermal technology (incineration), energy from waste, waste export, waste import, and landfilling. Further detail on the Alternatives To is presented in Section 4. Following the assessment of Alternatives To and the selection of a Preferred Alternative To, in this case landfilling, the City completed an evaluation of the Alternative Methods. For this EA, the Alternative Methods evaluation included the review of 17 potential landfilling sites. Further detail on the Alternative Methods are presented in Section 5.

3.1.1 Population Projections

The City has a population of 10,400 as reported in the latest census (Section 6.3.1, Community Profile). For Project planning purposes, population was linearly extrapolated based on the 1991, 1996, 2001 and 2006 census data for the City of Temiskaming Shores and the Town of Cobalt (Amec Foster Wheeler, 2010c). Based on this extrapolation, the City and the Town of Cobalt will have a projected combined population of 16,423 by the end of the 30-year planning period. The recent census data (2011) indicates that the population decreased slightly between 2006 and 2011, and therefore, the population projection can be a conservative estimate of population growth over the 30-year planning period.

3.1.2 Waste Generation

A 30-year projection of the quantities of waste generation by the communities (Haileybury, Dymond, Cobalt and New Liskeard) was completed as part of the Feasibility Study (Amec Foster Wheeler, 2010c). These projections were based on:

- Linear extrapolations of population growth calculated from 1991, 1996, 2001 and 2006 census data, as provided by Statistics Canada for the City of Temiskaming Shores and the Town of Cobalt;
- Uncompacted (i.e., pre-landfilled) waste quantity estimates for 2008 provided by the City of Temiskaming Shores;
- Tonnage based a typical density value of 150 kilograms per cubic metre (kg/m^3) for uncompacted residential solid waste (McBean et. al., 1995);
- Volume based on the conservative assumption that landfilled and compacted residential solid waste has an in-place density of 300 kg/m^3; and
- Uncompacted waste generation estimates of 2.6 m^3 per capita for the communities of Haileybury, Cobalt and Dymond (combined) and 3.9 m^3 per capita for the former Town of New Liskeard.

The projections for the generation of uncompacted residential solid waste for the City of Temiskaming Shores represents the total of the projected waste generation estimates from the City of Temiskaming Shores (i.e., the former communities of Dymond, Haileybury and New Liskeard) and the Town of Cobalt. McBean, *et al*. (1995) indicates that the density of uncompacted residential solid waste generally ranges from 90 kg/m^3 to 180 kg/m^3, with a typical value of 150 kg/m^3. It was assumed that the uncompacted residential waste generated by the City will have a density of 150 kg/m^3 (Amec Foster Wheeler, 2010c). As such, the calculation of the tonnage of projected waste generated per year is arrived at by multiplying the volume of uncompacted solid waste by a density of 150 kg/m^3 and dividing the result by a factor of 1 tonne to 1,000 kilogram (kg).

Amec Foster Wheeler observed that waste disposed at the Haileybury Landfill was subjected to compaction using a HL760 front end loader. Although the actual densities of the compacted waste material at the New Liskeard and Haileybury Landfills are not known, McBean, *et al.* (1995) indicates that the density of residential solid waste after landfill compaction generally ranges from 445 kg/m^3 to 505 kg/m^3. As a result, the in-place density of residential solid waste after landfilling and compaction is conservatively estimated at 300 kg/m^3 representing an increase from the uncompacted residential waste density by a factor of two. Thus, the volume of compacted residential waste is calculated by multiplying the tonnage of projected waste generated by a factor of 1,000 kg to 1 tonne and dividing the result by an in-place density of 300 kg/m^3.

The results indicate that the City of Temiskaming Shores (including the Town of Cobalt) is projected to cumulatively generate approximately 699,073 m^3 of compacted solid waste during the 30-year planning period. It should be noted that typical landfill operations in Ontario require

that daily cover soil be applied on solid municipal waste at a ratio of 4:1 (waste to daily cover soil), representing approximately 20% of typical landfill capacity. Given a projected long-term solid waste disposal volume of approximately 699,073 m^3, the total landfill capacity of waste and daily cover soil was calculated as follows:

TC = 699,073 m^3 x RTOTAL/RWASTE
= 699,073 m^3 x [(4+1)/4]
= 699,073 m^3 x 5/4
= 873,841 m^3

Where: TC = Total Capacity of projected solid waste generated
RTOTAL = Total Ratio of solid waste and daily cover soil
RWASTE = Ratio of solid waste

The overall projected waste and daily cover soil needs for the 30-year planning period represent a landfill volume of approximately 874,000 m^3 (rounded value), including waste and daily cover soil quantities. This volume is based on waste generation rates from published data and community-specific population rates.

3.1.3 Waste Diversion

The City administers the management of recyclable waste through its Solid Waste Management Policy (By-law No. 2015-021). It was conservatively assumed that there will a minimal amount of waste diverted over the planning period but as the City continues to improve and increase its waste diversion capacity there will be a resulting increase in the life of the current landfill.

The City's current diversion program includes a bi-weekly recycling (blue box) curbside collection, a depot at the existing landfill for the Ontario Tire Stewardship program as well as for Waste Electrical and Electronic Equipment. The existing landfill also provides bins for cardboard and single-stream recycling. The City also hosts an annual Orange Drop event for the collection of Household Hazardous Material.

In 2015, the City developed requirements for contractors to supply a waste diversion plan for construction and demolition material. This is monitored through the City's building/demolition application process. The City also budgets sufficient funds yearly to provide continued promotion and education associated with the curbside recycling, Waste Electrical and Electronic Equipment, and Household Hazardous Waste programs.

It is currently anticipated that these efforts will be incorporated into the new waste management facility.

4.0 ALTERNATIVES TO THE UNDERTAKING

The Alternatives To the undertaking refer to examining alternative means of managing the City's waste. At the on-set of the EA process, the City's current and projected waste generation rates and associated waste diversion were examined in order to update the quantitative future waste management requirements. This review involved estimation of landfill volume using annual topographic survey results to calculate the actual in-place waste volumes. The review and updated calculations identified:

- Current waste generation rates (2012): 13,630 m^3/year;
- Future waste generation rates (average over 30 years): 15,760 m^3/year;
- Required waste management capacity over 30-year planning period: 472,800 m^3; and
- Daily cover requirements of 117,000 m^3.

As a result, the updated projected waste and daily cover soil needs for the 30-year planning period represent a landfill volume of approximately 590,000 m^3 (rounded value), including waste and daily cover soil quantities. The discrepancy between the calculated volume estimates based on population versus the annual waste deposition measured via the topographic surveys is attributed to the conservative density values used in the population-based method. If the uncompacted density of the waste was increased by a factor of three (as opposed to two), the overall projected waste and daily cover soil needs for the 30-year planning period represent a landfill volume of approximately 582,000 m^3 (rounded value).

This waste projection estimate assumes that the City continues and improves on its waste diversion efforts, and achieves on average a 30% diversion rate for the 30-year planning period.

The summary report for the evaluation of Alternatives To is presented in Appendix D.

For the purpose of this document, the more conservative waste volume of 874,000 m^3 identified in Section 3.1.2 Waste Generation, will be considered to ensure that the City will have the required waste capacity in the future.

4.1 Methodology

The determination of the Preferred Alternative To involved the following steps:

- Identification of Alternatives To;
- Identification of Criteria;
- Evaluation of Alternatives To; and
- Determination of the Preferred Alternative.

An initial reasonable range of Alternatives To was established based on the Project team's review of existing practices and experience with waste management as well as input from the City. These Alternatives To were presented in the approved ToR.

The criteria (i.e., environmental components) used in the evaluation were established in the approved ToR. These criteria were considered during the evaluation and in discussions with stakeholders and Aboriginal communities. Each Alternative To was examined with respect to the identified criteria. The subsequent assessment was based on a qualitative evaluation taking into account potential for impact management measures (mitigation), net environmental effects, and overall advantages and disadvantages.

Feedback received during consultation on the ToR, and as part of the Alternative To process (including the February 2013 Open House), was considered during the process. Further detail about the associated consultation activities is presented in Section 9.

4.2 Identification of Alternatives To

Practical but different ways of addressing the City's identified waste management needs were reviewed. Considering input from stakeholders and Aboriginal communities, the City identified the following list of alternative technologies for waste treatment as well as more traditional disposal alternatives.

- Do nothing;
- Thermal technology (waste incineration);
- Energy from waste approach;
- Waste export;
- Waste import; and
- Landfilling.

The general characteristics of the Alternatives To and the rationale for their selection are presented in the following subsections.

4.3 Description of Alternatives

4.3.1 Alternative 1 – Do Nothing

The Do Nothing scenario is considered the status quo, where waste from the City is continued to be landfilled at the Haileybury Landfill site. This scenario was proposed to be considered for the purpose of providing a comparison to any other Alternative To.

4.3.2 Alternative 2 – Thermal Technology

This Alternative To involves the development and operation of a waste incinerator, where waste would be incinerated at a high temperature in a controlled facility using fossil fuel (e.g., natural gas). Any such facility would be equipped with air emission controls. The operation would be closely monitored with respect to its compliance with applicable air quality standards. Typically this alternative involves a small landfilling component as residues from the incineration process are typically disposed of at a landfill. This Alternative To was included as it offers a potential approach to future waste management that minimizes the need for additional landfill capacity.

4.3.3 Alternative 3 – Energy from Waste

There are numerous approaches to the management of waste and, at the same time, obtain energy from the waste management process. This is typically associated with waste streams high in organic content. It was included as an Alternative To as it potentially offered an economically attractive approach for managing the waste in combination with the utilization of its value as an energy source.

4.3.4 Alternative 4 – Waste Export

This Alternative To involves the export of waste into another jurisdiction outside of the City's municipal boundaries. In this scenario, the waste would be disposed of or otherwise processed at a facility, licensed to manage the various types of waste generated by the City. The City would ensure long-term acceptance of its waste in a contractual agreement with the facility's owner. This Alternative To was included as it has the potential to address the need for additional waste management capacity without the City becoming owner/operator of an existing or new management facility.

4.3.5 Alternative 5 – Waste Import

This Alternative To involves the import of waste by the City and its management together with the City's own residual waste. For a small community to develop and operate certain waste management facilities is often not economically feasible. This is typically due to low waste generation rates and small overall waste volumes. When evaluating alternatives to managing its own needs for waste management, the City therefore could have considered waste imports in order to take advantage of additional revenue streams from processing fees (e.g., tipping fees) and economy of scale considerations. The additional funds that such a program could provide may cover the cost for the development and operation of a new management facility for the City's own residual waste, at least to a degree, that such a facility would be economically viable.

4.3.6 Alternative 6 – Landfilling

This Alternative To involves the orderly disposal of waste in an engineered landfill facility, designed and operated to handle the various types of waste generated by the City in accordance

with O.Reg. 232/98. This could involve the development of a new landfill site or the expansion of an existing site. Typical landfill design features include measures to collect and manage landfill gas and leachate. Operational features would involve daily cover, groundwater monitoring, and the implementation of a capping and closure scenario when the approved capacity is reached. This Alternative To was included as it would represent a continuation of the City's current waste management practices (i.e., including comprehensive waste diversion).

4.4 Screening Assessment of Alternatives To

The primary evaluation of the Alternatives To involved a qualitative comparison of the advantages and disadvantages with respect to each of a set of evaluation criteria. The comparison focused on the principal differences between the Alternatives To and associated potentials for effects, impact management (mitigation) and net effects. The results of the examination were documented in a summary matrix, which addressed each evaluation criterion for each of the Alternatives To (Appendix D).

4.4.1 Do Nothing

Based on feedback received during the consultation process, it has been determined that the Do Nothing alternative is not an acceptable option. Simply doing nothing is not advantageous to the City, as it does not address the City's need for additional waste management capacity. Once the permitted capacity of the Haileybury Landfill is reached, landfilling at that location would have to be terminated. Continued landfilling would represent an operational noncompliant with the landfill permit.

4.4.2 Thermal Treatment and Energy from Waste

Thermal treatment (incineration) and energy from waste are alternatives that significantly reduce the waste stream. These types of systems are widely used in Europe and Asia, where there is a large volume of waste with limited space for landfilling. Also, given the complexity of these systems, they are most often third-party operations with the necessary expertise and experience. A key concern related to adverse environmental effects of incinerators relates to air emissions (in particular during start up and upset conditions). With proper emission controls and continuous monitoring these facilities can be operated in compliance with regulatory requirements. However, public acceptance is generally very poor.

Typically, incineration systems require a large amount of waste to keep the incinerator functioning properly and to generate marketable energy. The City is not a large urban centre and has a relatively small waste stream, which makes this alternative on its own not feasible. To make it feasible the City would have to import waste, which has been identified through consultation as not acceptable. An incineration system can only effectively reduce the waste stream by approximately 75%, as the remainder of the materials is collected as residuals (i.e., ash, kiln dust) that must be then disposed of in a landfill. As such, the alternative of thermal treatment/waste

from energy is not a suitable option for the City, as it does not effectively address the City's needs for waste management.

4.4.3 Waste Import

The importing of waste into the municipal boundaries would not provide the City with new waste management capacity, although it could lead to additional revenue streams. This scenario would increase the waste volumes that would need to be managed by the City through techniques such as landfilling, thermal treatment, and/or energy from waste. Therefore, the environmental effects of waste import would depend on the selected management technique.

Irrespective of the technology selected, the increased waste volumes would provide for an increased potential of adverse environmental effects. This would be a result of the increased facility size as well as the additional trucking necessary to import the waste. The advantage of waste import solely rests on the fact that the increased waste volumes to be processed by the City could reduce the cost per tonne of waste and provide a revenue source through the processing fees that the City would impose on the imports. Based on feedback received, the general view has been that, irrespective of the potential for economic benefits, the community did not want to be considered a regional hub for waste management.

4.4.4 Waste Export

The export of waste has the advantage that it eliminates the need for a local waste management facility, with waste being collected at transfer stations and being trucked to an acceptable location administered by another jurisdiction (outside the City's municipal boundaries). Adverse environmental effects potentially experienced within the municipality would be limited to those associated with the transfer station and trucking.

However, the hauling to and tipping fees at the receiving facility are likely to result in higher costs for the City. In addition, the City would need to bear costs associated with the construction and operation of a transfer station(s) within the City. As the City is in a relatively remote location, there is no large municipal centre nearby that could receive the City's waste, while keeping the potential fees low. This option has been explored as part of previous studies conducted by the City. In one case, a neighbouring community would have accepted the City's waste, yet the tipping fees were extremely high. As well, the City would have had to take on the liability of the landfill. In addition, residents that wish to dispose of large items that may be excluded from regular pick-up would have to travel long distances to dispose of such materials.

4.4.5 Landfilling

In general, the City has significant experience with landfilling. The community has generally reacted favourably to landfilling as a future approach to managing the City's waste. Adverse environmental effects of landfilling are associated with potentials for groundwater contamination,

dust and odours. Experience with numerous engineered landfill sites in Ontario (including the City's two sites) demonstrate that properly engineered and closely monitored sites can operate in full compliance with all applicable regulatory requirements. Landfills have the flexibility to adjust to changing waste types and quantities, while being less costly to build and operate than incinerators for comparable waste volumes. With the potential of additional diversion at the source, the overall waste stream that is disposed of at the landfill can be significantly reduced. Furthermore, landfilling is a proven technology within the region and is a generally accepted practice. Additional landfill capacity has also been explicit component of City's draft WMMP objectives.

4.5 Preferred Alternative To

The Preferred Alternative To, landfilling, is considered the alternative that is most preferred overall taking into consideration all of the established criteria as well as input obtained from consultation with stakeholders and Aboriginal communities. Table 4.1 below summarizes the evaluation of Alternatives To.

Table 4.1: Summary of Evaluation of Alternatives To

Considerations	Do Nothing	Thermal Treatment	Energy from Waste	Waste Export	Waste Import	Landfilling
Environmental	N/A	2	2	3	1	2
Socio/Cultural	N/A	2	2	3	1	2
Economic	N/A	1	1	1	3	3
Technical	N/A	2	2	3	3	3
Policy	N/A	1	1	2	2	3
Overall	**N/A**	**8**	**8**	**12**	**10**	**13**

Notes: N/A = not applicable; 3 = most preferred/suitable; 2 = preferred/suitable; 1 = least preferred/suitable

5.0 ALTERNATIVE METHODS OF CARRYING OUT THE UNDERTAKING

5.1 Methodology

After selection of the Preferred Alternative To, the next step in the assessment of alternatives was to evaluate Alternative Methods of carrying out the Preferred Alternative To. A summary report on the assessment of Alternative Methods is presented in Appendix E. For landfilling, the Alternative Methods assessment evaluated potential landfill locations within and outside the municipal boundary of City of Temiskaming Shores. The Provincial Policy Statement (Ministry of Municipal Affairs and Housing; MMAH, 2014) and the MOECC Guideline D-4 (Land Use On or Near Landfills and Dumps, 1994) provide guidelines and policies that must be met for new and expanding landfill sites. The EPA O.Reg. 347 (General-Waste Management) and O.Reg. 232/98 (Landfill Sites) identify specific setbacks from sensitive land uses and outline additional general buffer requirements.

With the setbacks applied to the preliminary study area, potentially suitable locations were identified. Potential candidate sites inside and outside the municipal boundary are illustrated on Figures 5.1 and 5.2, respectively. With the criteria of a location within 10 km of the municipal boundary and of having reasonable road access applied, 9 locations within and 8 locations outside the municipal boundary were identified. Each location was evaluated against the environmental components identified in the approved ToR.

The ranking of each environmental component was based on the level of concern and/or the potential for adverse impact presented by each conceptual landfill alternative. The determination of the level of concern and potential for adverse impact was based on how each Alternative Method affects the criteria's indicator. For example, evaluating a candidate site for the social environment component of public health and safety will include determining the distance of the proposed landfill development to the nearest residence. For the purpose of this assessment, the closer the distance between the proposed development and the nearest residence, the greater the level of concern and/or potential adverse impact to the environment.

The rating of the level of concern and/or potential for adverse environmental effects was determined in consultation with the WMAC. For those criteria where a concern or potential for environmental effect was identified, one of the following ratings was assigned.

- High – Where the candidate site may affect the environmental component so as to seriously disturb the integrity, distribution, operation or abundance of the environmental component, and is expected to raise serious concern with stakeholders and/or government reviewers.
- Medium – Where the candidate site may affect the environmental component so as to bring about a disturbance but does not threaten the integrity, distribution, operation or abundance of the environmental component as determined by stakeholders and/or

government reviewers. Short-term effects associated with construction and operation of facilities also constitute a potential for moderate effects/concerns.

- Low – Where the candidate site may affect the environmental component in such a way that only a portion of the environmental component is disturbed for a short period of time.
- None – The candidate site causes little or no effect to the environmental component and causes no concern among stakeholders and/or government reviewers.

To assist with the identification of the overall most feasible (preferred) alternative the following ranking system was applied:

Table 5.1: Feasibility Assessment Ranking System

Level of Concern / Potential Impact Rating	Ranking Value
None	0
Low	1
Low to medium	2
Medium	3
Medium to high	4
High	5

The scores are introduced to summarize the quantitative and qualitative evaluation using the environmental components in a numeric score. To arrive at an overall score for each of the candidate sites, the individual scores for each environmental component were tallied in order to assess the overall feasibility.

Further detail on the assessment of Alternative Methods in presented in Appendix E.

5.2 Identification of Alternative Methods

Site constraint / opportunity mapping is an exercise that is typically applied to the screening of potential new landfill sites. The exercise involves incorporating a series of setbacks from sensitive areas or land uses, which are determined by provincial regulation or local by-laws, onto a map of the candidate site generated by Geographical Information System (GIS) software. The graphical representation of these setbacks on the candidate site provides a preliminary guideline to determine if the candidate site will be constrained by the regulatory setbacks and/or if the location of the candidate site will present any potential opportunities for the municipality with respect to proximity to nearby highways, roads and sources of waste generation. Table 5.2 presents a summary of the landfill constraints/opportunity mapping criteria.

Table 5.2: Site Constraint / Opportunity Mapping Criteria

Site Constraint / Opportunity	Criteria
Distance to Existing Infrastructure	Landfill located within 1,000 m of an existing roadway
Distance from Water Supply Wells	Landfill located more than 500 m from an existing water well
Elevation above Flood Zone	Landfill located above an elevation of 182 m above sea level (based on local topography to remain above low-lying and potential wet areas)
Distance from Railway	Landfill located more than 50 m from a railway
Limit Preferential Contaminant Pathway	Landfill located more than 60 m from a fault zone
Distance from Surface Water	Landfill located more than 30 m from a surface water body
Distance from Existing Roadways	Landfill located more than 50 m from the existing roadway
Conflicting Land Use	Landfill located outside of agricultural lands, Areas of Natural or Scientific Interest (ANSI), Ministry of Natural Resources and Forestry (MNRF) designated wetlands, and Significant Ecological Areas

5.3 Screening Assessment of Alternatives Methods

5.3.1 Long List Assessment

The ranking of potential candidate sites is presented in Appendix E. The candidate site with the most favourable score has the lowest overall score as defined by Table 5.1.

Within the municipal boundaries, the candidate site with the most favourable score is I-1 (the existing New Liskeard Landfill) with a score of 41; the next closest ranked candidate sites are locations I-8 and I-9 with scores of 52 and 56, respectively. The candidate site I-8, located northwest of Highway 11B between Cobalt and North Cobalt, scores lower than most of the candidate sites based on the lower likelihood of concern or impact to its natural environment. Candidate site I-9, located in the southwest corner of the City limits, scores only marginally better than some of the other potential sites for its likelihood of concern or impact to the environmental components.

Outside the municipal boundaries, the candidate site with the most favourable score is O-3 with a score of 57. This candidate site is located north of Highway 558 past the Bartle Lake Access Road; the location is preferable based on its likelihood of concern or impact to natural and social environments.

Based on the evaluation, the preliminary study area has been refined to the short list of candidate sites: I-1, I-8, I-9, and O-3.

5.3.2 Short List Assessment

5.3.2.1 Location I-1 – New Liskeard Landfill

The design and operations of the historic New Liskeard Landfill consisted of the disposal of refuse on a north-south trending bedrock outcrop that was coincident with a topographic high. Waste deposits extended easterly in a mounded configuration. The design of this candidate site would be an expansion of the existing mounded deposition. The proposed expansion area will be located directly east of the existing approved waste footprint and the waste deposits will cover an additional 4.8 ha. The expansion area also includes an overlap of the eastern slope of the existing waste deposits. A plan view of the existing and proposed configuration is presented in Figure 1.3.

The Site is currently owned by the City, has a layout and infrastructure in place suitable for a landfill as well as an existing environmental monitoring network. Daily cover materials are expected to be obtainable from existing sources on-Site.

The primary advantage to this candidate site is that the location is permitted, zoned for waste management, and it has previously operated as a landfill site. The candidate site has the advantage of having the least amount of potential impact on the economic environment. This candidate site is largely disturbed as a result of past landfilling activity.

The two main disadvantages of this candidate site in comparison to the short list of candidate sites is the proximity to sensitive noise receptors and the visual aesthetics.

5.3.2.2 Location I-8 – Northwest of Highway 11B

Based on the Ontario Geological Survey maps indicating quaternary geology, this candidate site is assumed to be bedrock. It is within proximity to multiple abandoned mine / mine hazards and part of an active mining claim (L 4272008), which indicates the candidate site is expected to have limited overburden over bedrock. The landfill design would be a mounded deposition on a southeast facing slope towards Highway 11B. The acquisition of the land may present additional effort and cost based on mining considerations. Creating mild sloped access roads, providing infrastructure and proper site layout may require additional effort as a result of inferred bedrock topography. The candidate site will require new permitting, a full hydrogeological assessment and the implementation of environmental monitoring program. On-site availability of daily cover materials may be limited; importing material or using alternative cover materials may need to be considered.

The primary advantage to this candidate site is that the location is already in a historically stressed and impacted area from mining-related activities.

The disadvantage of this candidate site, in comparison to the other candidate sites, is the level of potential impact on resource extraction mining activities. The lack of overburden deposits on-site

also presents a number of limitations for site development as the design would have to follow the bedrock topography. The absence of overburden will also have implications on the attenuation potential of the site. The potential impact on the economic environment is expected to be greater than candidate site I-1 (New Liskeard Landfill) due to the capital costs required to develop this property for the intended use. The uncertainty of impact on the cultural environment is also a disadvantage to this candidate site as it is not known whether cultural environment information is available.

5.3.2.3 Location I-9 – Southwest Corner

Based on the Ontario Geological Survey maps indicating quaternary geology, this candidate site is assumed to have a thin veneer of glacial drift deposits over bedrock. As identified on Ontario Geological Survey maps, given the proximity to sand and gravel pits, these drift deposits are expected to be comprised of sand and gravel overburden. The landfill design would be a mounded deposition on a west-facing slope towards Moose Lake Road. The acquisition of the land may present additional effort and cost based on the potential aggregate resources on the site. Creating mild sloped access roads, providing infrastructure and proper site layout may require additional effort as a result of inferred bedrock topography. The site will require new permitting, a full hydrogeological assessment and the implementation of environmental monitoring. Daily cover materials are expected to be obtainable from existing sources on-site.

The primary advantage to this candidate site is that the location is already in a historically stressed and impacted area from its proximity to the Haileybury Landfill and aggregate resources.

The disadvantage of this candidate site, in comparison to the other candidate sites, is the level of potential impact on resource extraction, forestry and aggregate activities. In addition, given the type of geology mapped, there is a potential for rapid development and migration of a leachate plume that may result in the need for a large Contaminant Attenuation Zone (CAZ). The potential impact on the economic environment is also expected to be greater due to the effort required to develop this property for the intended use. The uncertainty of impact on the cultural environment is also a disadvantage to this candidate site as it is not known whether cultural environment information is available.

5.3.2.4 Location O-3 – North of Highway 558 past Bartle Lake Access Road

Based on the Ontario Geological Survey maps indicating quaternary geology, the candidate site is assumed to be on an ice contact delta, esker, delta, kame delta, delta moraine. As identified on Ontario Geological Survey maps, given the proximity to sand and gravel pits, the candidate site is expected to have sand and gravel overburden. A landfill design for this site could consist of either trench fill or mounded deposition to a mild southeast facing slope towards the intersection of Highway 558 and Bartle Lake Access Road. The acquisition of the land may present additional effort and cost based on the candidate site being located outside the municipal boundary and potential for aggregate pit resources. Creating mild sloped access roads, providing infrastructure

and a proper site layout should be relatively inexpensive. The candidate site will require new permitting, a full hydrogeological assessment and the implementation of environmental monitoring. Daily cover materials are expected to be obtainable from existing sources on-site.

The primary advantage to this candidate site is that the location is in a remote location and expected to be relatively flat with sufficient aggregate materials for daily cover and initial site construction.

The disadvantage of this candidate site, in comparison to the other candidate sites, is that it is outside the municipal boundary and the level of potential impact on aggregate resources. The potential impact on the economic environment is expected to be greater than the other candidate sites due to increased haulage distances and the required site development effort associated with this Greenfield property. The uncertainty of impact on the cultural environment is also a disadvantage to this site as it is not known whether cultural environment information is available.

5.3.3 Short List Evaluation

Four candidate sites were carried forward for a short list evaluation. These candidate sites and their associated scores (the ranking of potential sites presented in Appendix E) are:

- Location I-1 – New Liskeard Landfill, with a score of 41
- Location I-8 – Northwest of HWY 11B, with a score of 52
- Location I-9 – Southwest Corner, with a score of 56
- Location O-3 – North of HWY558 past Bartle Lake Access Road, with a score of 57

The ranking indicates a distinct advantage to candidate site I-1, the New Liskeard Landfill with a score of 41. The primary advantages to this location are that this candidate site is permitted and zoned for waste management, the established environmental monitoring network coupled with the social impression associated with the location. The area of the proposed expansion at this candidate site is designed to take advantage of the area of the site that has an increasing overburden thickness. Socially the location is recognized and associated by local residents, businesses and government authorities as a waste disposal facility since 1916 (Earth Tech, 2008). While a medium level of concern were identified for groundwater (quality, quantity and flow) and surficial geology, it is believed that these environmental components can be managed through design and mitigation. The two main disadvantages of this candidate site in comparison to the short list of candidate sites is the proximity to sensitive noise receptors and the visual aesthetics.

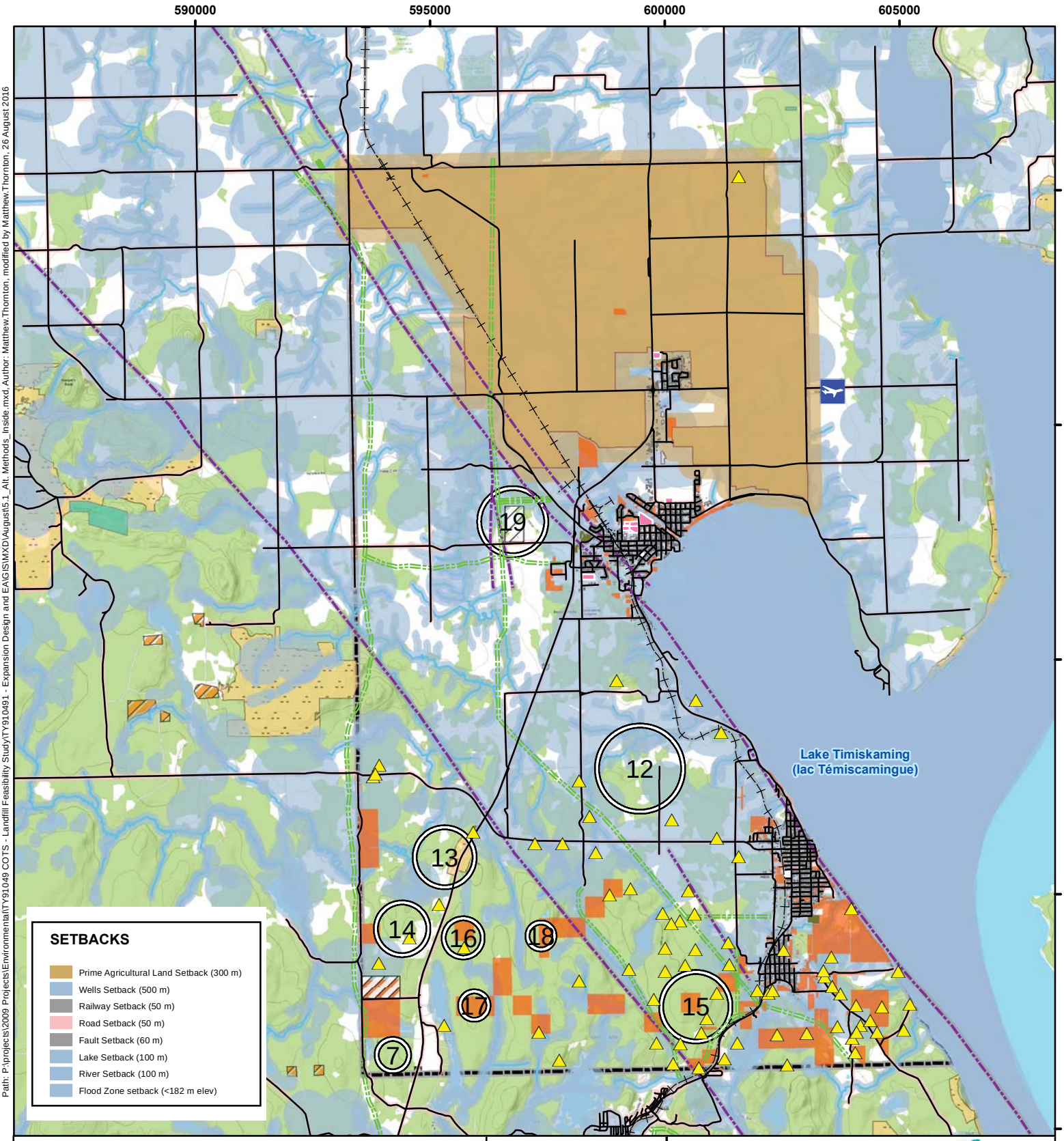
The primary advantage of candidate site I-8 is that the location is already in a historically stressed and impacted area from mining-related activities. The principal disadvantage of candidate site I-8 is the anticipated shallow overburden over bedrock, and the associated design and operational challenges that would require distinctively constructed solutions.

Similar to I-8, the primary advantage of candidate site I-9 is that the location is already in a historically stressed and impacted area from its proximity to the Haileybury landfill and aggregate resources.The principal disadvantage of candidate siteI-9 is the anticipated shallow overburden over bedrock, and the associated design and operational challenges that would require distinctively constructed solutions.

The primary advantage of candidate site O-3 is that the location is in a remote location and expected to be relatively flat with sufficient aggregate materials for daily cover and initial site construction. The major disadvantage of candidate site O-3 is that the location is outside the municipal boundaries and would require negotiations with other authorities to purchase and use the site as well as increasing haulage distances.

Another consideration in the selection of the candidate site was municipal finances. The closure of the two existing landfill sites and the development of a completely new site would not only add additional capital costs, it would also increase the City's long-term environmental, closure and post-closure care liabilities. The existing landfill sites would require closure and a minimum 25-year post-closure care period. An additional new site would also be subject to ongoing environmental monitoring during its operating period, as well as a minimum 25-year post-closure care period. In short, the development of a completely new site would require a complete environmental monitoring network (i.e., groundwater monitoring wells, surface water monitoring stations, etc.) and result in the City having three landfill sites (two closed and one active) to inspect and monitor for the described 25-year overlap.

Thus, based on the evaluation of the short list of candidate sites, the Preferred Alternative Method is I-1, the existing New Liskeard Landfill, located on the north side of Rockley Road.



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LEGEND

- Airport
- Mine Hazards
- Road Network
- Utility Line
- Faults
- Railway
- Candidate Sites for Waste Management
- Schools
- Landfill Property Boundary
- Vacant Land - City
- Cemetery
- Prime Agricultural Land
- Building Footprints
- Landfill Footprint
- MNRF Waste Disposal Site
- Wetland
- Significant Ecological Area
- Areas of Natural and Scientific Interest
- Aggregate Site
- Waterbody
- Watercourse
- Municipal Boundary (City of Temiskaming Shores)
- Wooded Area

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.

Datum & Projection: NAD 1983 UTM Zone 17N

0 2.5 5 7.5 10 Kilometres

N W E S

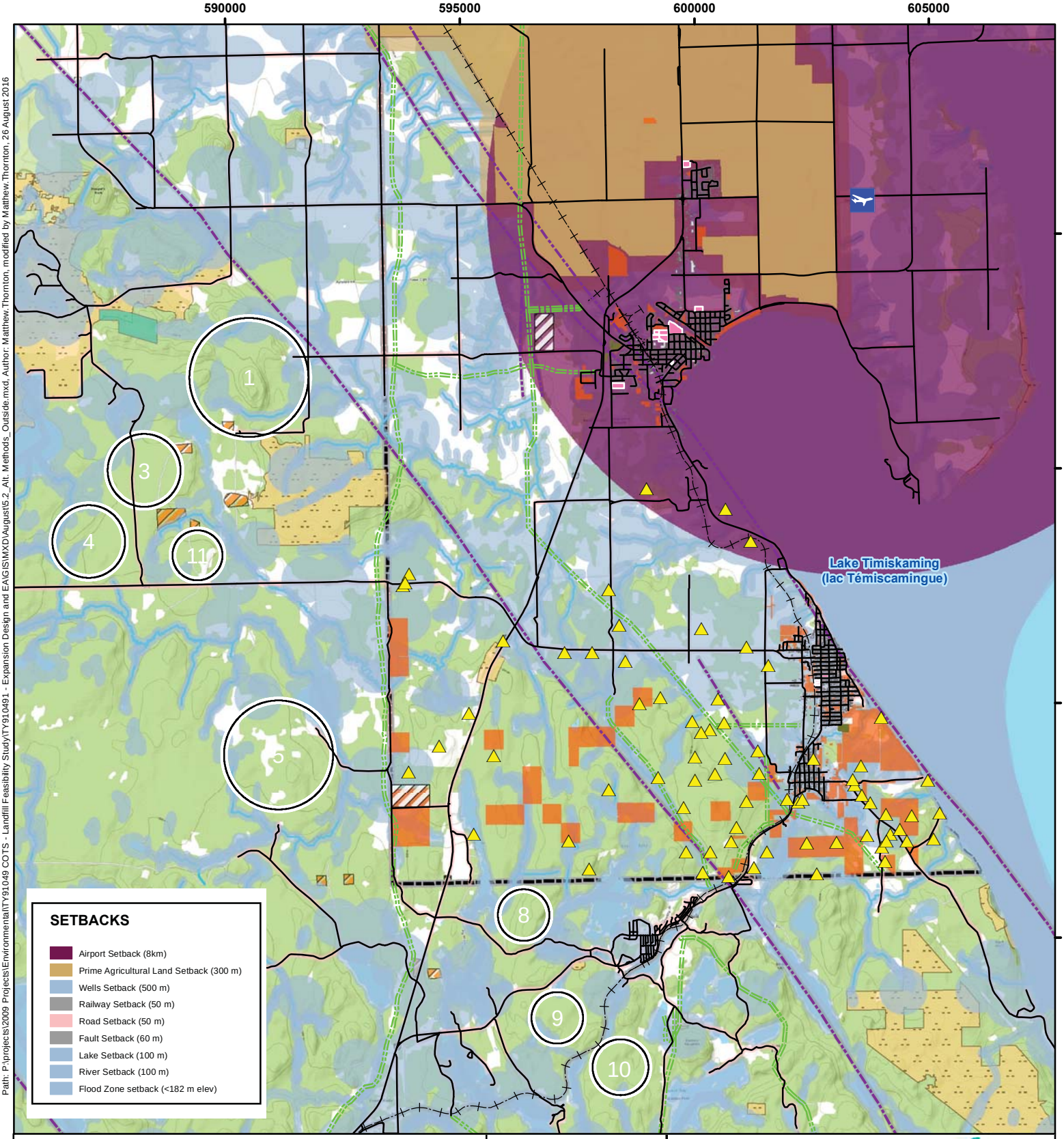
Temiskaming Shores

amec foster wheeler

ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMNG SHORES, ONTARIO

Alternative Methods Inside Municipal Boundaries

PROJECT N°:TY910491	**FIGURE: 5.1**
SCALE: 1:110,000	DATE: August 2016



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LEGEND

- Airport
- Mine Hazards
- Road Network
- Utility Line
- Faults
- Railway
- Candidate Sites for Waste Management
- Schools
- Landfill Property Boundary
- Vacant Land - City
- Cemetery
- Prime Agricultural Land
- Building Footprints
- Landfill Footprint
- MNRF Waste Disposal Site
- Wetland
- Significant Ecological Area
- Areas of Natural and Scientific Interest
- Aggregate Site
- Waterbody
- Watercourse
- Municipal Boundary (City of Temiskaming Shores)
- Wooded Area

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
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Datum & Projection: NAD 1983 UTM Zone 17N

0 2.5 5 7.5 10 Kilometres

N W E S

Temiskaming Shores

amec foster wheeler

ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMNG SHORES, ONTARIO

Alternative Methods Outside Municipal Boundaries

PROJECT N°:TY910491	**FIGURE: 5.2**
SCALE: 1:110,000	DATE: August 2016

6.0 DESCRIPTION OF THE ENVIRONMENT POTENTIALLY AFFECTED BY THE UNDERTAKING

6.1 Description of the Undertaking

As a result of the assessment of Alternatives Methods, the City has selected the expansion of the New Liskeard Landfill to provide the needed additional waste management capacity for the 30-year planning period. The existing 6.12 hectare (ha) footprint of the New Liskeard Landfill would be expanded to the northeast over an area of 4.8 ha. The Preferred Alternative Method design would provide the City with 874,000 m^3 of capacity for waste and daily cover. The final contours, cross-sections and bottom waste contours for this area are presented in Figures 6.1 through 6.5.

The major components for the proposed Project would include those common to the operation of a municipal non-hazardous solid waste landfills, such as:

- Waste haul trucks travelling along site roads to the working face;
- Deposition of waste materials, compaction, bulldozing, and grading activities at the working face;
- Stockpiling of clean cover materials, with loading of daily cover material into haul trucks and transport to the working face; and
- Facility support activities, with vehicular traffic from small vehicles or trucks.

6.1.1 Site Description

The City of Temiskaming Shores is located in northeastern Ontario, near the Quebec border, at the head of Lake Timiskaming (Wabi Bay). The proposed area for the new waste management capacity (the Site) is located on the west ½ of Lot 5, Concession 2 within the City of Temiskaming Shores, in the District of Timiskaming. The Site is located on the north side of Rockley Road, approximately 3 km west of the former Town of New Liskeard.

6.1.1.1 Site History

The Site is home to the historic New Liskeard landfill, which operated from approximately 1916 to June 2009. Although there are no as-built documents, it is inferred that the original landfill was constructed on a bedrock outcrop that trends north-south and began as an end-dumping type of operation. As it developed, the height of the fill area was increased in order to utilize the full capacity and included management features such as a perimeter road, security fence with a lockable gate, some drainage ditching and several waste segregation areas.

The New Liskeard Landfill was purchased by the former Town of New Liskeard in 1916 and the land was used for waste deposition soon thereafter (Sutcliffe Rody Quesnel Inc; SRQ, 2004). In 1976, the landfill's original Certificate of Approval expired, prompting new investigations at the

landfill to facilitate the application for a new Provisional Certificate of Approval (SRQ, 2004). There is limited information available on the operation of the landfill between the years 1976 and 1978. SRQ (2004) reports that in 1978, the then MOE warned the Town of New Liskeard as to the potential issuance of a formal order regarding the operation of the New Liskeard Landfill, although, in a letter dated 10 November 1978, the MOE agreed to withhold the order if specific conditions of landfill operations were met. These conditions included an "in-depth" study to determine the extent of leachate migration within and outside the landfill boundary; the prohibition of all on-site burning activities; maintaining a minimum 23 m "working face"; that any property affected by landfill leachate were to be purchased by the Town; and that the Town was to investigate the use of bentonite cut-off walls to control leachate migration.

In 1979, the former Town of New Liskeard commissioned a phased hydrogeological investigation of the landfill site, which was completed in 1980 (SRQ, 2004). The results of the investigation indicated that leachate was detected approximately 300 to 400 m northeast from the toe of the landfill; however, the report indicated that the leachate was not impacting any downgradient groundwater users (SRQ, 2004). The resulting report recommended that the Town of New Liskeard purchase property within 500 m of the north and east landfill boundary, an area designated as the CAZ.

Between 1979 and 1980, the former Town of New Liskeard commissioned the preparation of landfill operation documentation, which was submitted to the MOE to secure the issuance of Provisional Certificate of Approval No. A571501, dated 11 December 1980. It should be noted that although a topographic survey was completed in 1980 in support of the Certificate of Approval application, the information available at that time provides no indication of the limits of the 2.02 ha area approved for landfill operations (SRQ, 2004). In 1999, the MOE conducted an inspection of the New Liskeard landfill. The MOE inspection report indicated that the landfill was operating beyond the approved limits, estimating that landfilled waste was deposited in an area of approximately 4 ha rather than the approved 2.02 ha. The MOE report also indicated that groundwater monitoring had not been conducted since 1983 and that the recommended CAZ had not been purchased by the Town of New Liskeard. The MOE recommended that an Emergency Certificate of Approval and Environmental Assessment were required.

In order to comply with the MOE's recommendations, the former Town of New Liskeard commissioned a new hydrogeological investigation, as well as topographic surveys to delineate the extent of the approved 2.02 ha landfill area, to delineate the limit of the waste deposited outside of the approved area and to determine the amount of waste deposited at the landfill. The estimate of the Total Site Capacity quantity for the New Liskeard Landfill are not available, although SRQ reports that in 2004 the Total Remaining Site Capacity of the New Liskeard Landfill Site was approximately 49,580 m^3, including waste and waste cover soil (SRQ, 2004).

Subsequently, the former Town of New Liskeard purchased the land adjacent to the east landfill property boundary for use as a CAZ. A revised Certificate of Approval No. A571505 was issued on 9 May 2000 (SRQ, 2004) outlining the disposal of domestic, commercial and non-hazardous

solid industrial waste at the New Liskeard Landfill within an approved 2.02-ha landfill area. Certificate of Approval No. A571505 was amended on 27 April 2005 after amalgamation. This amendment changed the name of the landfill owner from “The Corporation of the Municipality of New Liskeard” to “The Corporation of the City of Temiskaming Shores”, as well as revised the landfill’s service area to the municipal boundary of the City of Temiskaming Shores, which includes the communities of New Liskeard, Haileybury and Dymond Township, as well as the Town of Cobalt. Certificate of Approval No. A571505 was again amended on 17 April 2007 to include the November 2005 application for Provisional Certificate of Approval and a figure showing the CAZ in the Schedule “A” list of landfill operating documents.

Prior to amalgamation in 2004, the historic New Liskeard landfill received waste only from the Town of New Liskeard. At amalgamation all waste from the various communities comprising the newly formed City of Temiskaming Shores (as well as the additional communities that it provide waste management for, including Cobalt, Firstbrook and Lorrain) were diverted to the New Liskeard landfill. In June 2009, the landfill reached its approved capacity and landfill activities ceased.

6.1.2 Study Areas

Characterization of the existing environment was undertaken within two areas for the EA:

- Site Study Area – the lands owned by the City that lie adjacent to the New Liskeard Landfill site, which is located on the west ½ of Lot 5, Concession 2 within the City of Temiskaming Shores, in the District of Timiskaming. It corresponds to the direct footprint of the on-site Project components. It has a total Site area of 4.8 ha.
- Site-vicinity Study Area – this includes the existing 6.12 ha landfill footprint plus the additional 4.8 ha proposed expansion and the lands in the vicinity of the Site with a buffer of 500 metre (m).

An extended study area was used for specific environmental components as described below.

- For atmospheric environment a 10 km extended study area was used to address the potential impacts on surrounding receptors;
- For aquatic environment and surface water characterization a 1.5 km extended study area was used to capture a regional context as there are currently no permanent surface water features on-Site;
- For noise environment a 5 km extended study area was used to address the potential impacts on surrounding receptors;
- For groundwater a 1.5 km extended study area was used to capture municipal wells;
- For terrestrial environment an extended study area to north and west was used to capture additional characteristics;
- For cultural environment a 1.5 km extended study area was used to capture additional characteristics; and

- For social/economic environments the City's municipal boundaries were used to capture the census area.

Figures 6.6 and 6.7 depict these study areas.

6.1.3 Temporal Boundaries

The proposed landfill expansion will be spread over five lined waste disposal cells. For the purpose of this EA, it is assumed that the construction of the proposed landfill expansion will begin from the south end at Cell 1. The Project will progress sequentially from Cell 1 through Cell 5 (i.e., south to north). The activities associated with the landfill expansion are expected to occur over a 45-year period and divided into four phases for the assessment of potential effects:

- Phase 1 Construction (Year 1), includes the construction of Cell 1 base and associated perimeter access roads, swales, and drainage ditches (including the appropriate sediment and erosion protection measures);
- Phase 2 Operations (Years 2 to 20), includes landfilling at active cells (1 through 5) and concurrent development of cells (2 through 5) and subsequent closure of cells (1 through 4) as they reach the designed final contours;
- Phase 3 Closure (Years 20 to 21), includes closure of Cell 5 and placement of final capping and cover; and
- Phase 4 Post-Closure (Years 21 to 45), includes post-closure monitoring (including groundwater).

Pending the successful completion of the EA and the necessary approvals are obtained, it is anticipated that construction of the new cells would begin in 2019 (Year 1).

During the post-closure period, the only activities anticipated are annual water quality monitoring, Site performance monitoring and maintenance.

6.2 Natural Environment

6.2.1 Atmospheric Environment

Background air quality in the Extended Study Area is expected to be good, given the absence of nearby large urban centres. However, air quality will be influenced by long range transport of air emissions from the south and also by natural sources, such as volatile organic emissions from vegetation and forest fires.

There may be some influence from nearby sources of air emissions, which include small and mid-sized industrial facilities to the southeast, public highways and roads, and small residential developments; this influence is expected to be less than what would be found in and around large

urban centres or near major industrial facilities. Miller Minerals operates a quarry and lime plant approximately 6 km to the southeast, and other mining and quarrying operations are present within 10 km to the west and southwest. There would be particulate emissions associated with the mining and quarrying activities, and although these facilities are located beyond the Extended Study Area, a portion of these emissions may be carried longer distances and contribute to the baseline concentrations in the vicinity of the Project. This would be particularly true of the smaller particle size fraction $PM_{2.5}$ (particulate matter less than 2.5 micrometres in diameter) and to a lesser extent the PM_{10} (particulate matter less than 10 micrometres in diameter). The use of baseline concentrations from a number of surrounding monitoring sites is anticipated to take into account contributions from industries of this nature that are common in Ontario.

Air quality in Sudbury may be more influenced by urban populations than the Site, therefore the use of data for these stations may be conservative when used as baseline for the Extended Study Area.

The background concentrations considered for the assessment are summarized in Table 6.1.

Table 6.1: Extended Study Area Atmospheric Baseline Concentrations

Compound	CAS Number	Averaging Time	Air Quality Criterion ($\mu g/m^3$)	Baseline Concentration ($\mu g/m^3$)	Reference for Baseline Concentration
Total Suspended Particulate (TSP)	n/a	24 hour	120	40.8	TSP = $PM_{2.5}$ Baseline * 4
		Annual	60	22.0	TSP = $PM_{2.5}$ Baseline * 4
PM_{10}	n/a	24 hour	50	20.4	PM_{10} = $PM_{2.5}$ Baseline * 2
$PM_{2.5}$	n/a	24 hour	28	10.2	Average of 5 years of hourly and 90th percentile $PM_{2.5}$ data at Sudbury and Rouyn-Noranda.
		Annual	8.8	5.5	
Nitrogen Oxides (NOx, as Nitrogen Dioxide, NO_2)	10102-44-0	1 hour	400	33.2	Average of 5 years of 90th percentile data at Sudbury and North Bay.
		24 hour	200	28.8	
Sulphur Dioxide (SO_2)	7446-09-5	1 hour	690	9.3	Average of 5 years of hourly and 90th percentile SO_2 data at Sudbury and Rouyn-Noranda.
		24 hour	275	14.9	

Compound	CAS Number	Averaging Time	Air Quality Criterion (µg/m³)	Baseline Concentration (µg/m³)	Reference for Baseline Concentration
		Annual	55	5.4	
Carbon Monoxide (CO)	630-08-0	1 hour	36,200	None available and not expected to be significant.	
		8 hour	15,700		
Vinyl Chloride (VC)	75-01-4	24 hour	1	None available and not expected to be significant.	
		Annual	0.2		
Hydrogen Sulphide (H_2S)	7783-06-5	24 hour	7	None available and not expected to be significant.	
		10 minute	13		
Acrylonitrile	107-13-1	24-hour	0.6	None available and not expected to be significant.	
		Annual	0.12		
Benzene	71-43-2	24-hour	2.3	None available and not expected to be significant.	
		Annual	0.45		

Source: Environment Canada, 2008 Notes: microgram per cubic metre (µg/m³)

Further detail is presented in the Air Quality Technical Support Document (Appendix F).

6.2.2 Aquatic Environment

A recent characterization of watercourses located within the Site Study Area was completed in support of a Renewable Energy Approval application for Canadian Solar's New Liskeard 1, 3, and 4 sites (Dillon Consulting Limited, 2011). The Site is located immediately west of Canada Solar's New Liskeard 1 site. Based on the findings of the report, the headwaters of two tributaries of Wabi Creek (Tributary 1 and Tributary 2) are located within the boundary of the Site Study Area. Amec Foster Wheeler confirmed these findings in two Site visits (28 July 2014 and 23 September 2014). Figure 6.8 presents the surface water features.

6.2.2.1 Tributary 1

Tributary 1 originates as an ephemeral overland drainage channel from the adjacent tablelands to the west. Approximately 34 m to the east of the CAZ, this tributary transitions to a defined intermittent channel and continues to flow to the northeast before converging with Tributary 2 upstream of Highway 65 and eventually draining into Wabi Creek via a grassed drainage ditch. The substrate in the channel was noted to be a mixture of silt, cobbles, boulders and detritus, and was composed of a short run habitat type. The water course had a wetted width of approximately less than 0.5 m, a bankfull of 1.0 m and a wetted depth of 0.05 m. Within 30 m of the water course the lands are comprised of fresh-moist poplar mixed forest and open pasture.

6.2.2.2 Tributary 2

Tributary 2 originates as an ephemeral overland drainage channel from the surrounding open fields to the west. Approximately 64 m to the east of the CAZ, this tributary transitions to a defined intermittent channel and continues to flow to the northeast and into Wabi Creek. The substrate in the channel was noted to be a mixture of silt and detritus, and was composed of predominately run and flat habitat types. The water course had a wetted width of approximately less than 0.5 m, a bankfull of 1.0 m and a wetted depth of 0.05 m. Within 30 m of the water course the lands are comprised of fresh-moist poplar mixed forest.

6.2.2.3 Tributary Status

Tributary 1 and Tributary 2 converge approximately 300 m from the CAZ boundary. This combined watercourse continues for approximately 1.3 km in a northeasterly direction before draining into Wabi Creek.

These tributaries were observed to be intermittent in status with significant obstructions to fish passage including debris, blockages, steep valley slopes and lack of refuge habitat; neither watercourse was considered to support fish habitat. No rare species or fish Species at Risk (SAR), or habitats of rare species or fish SAR were identified.

6.2.3 Geology and Soils

Borehole logs, prepared to support the ongoing groundwater monitoring program (Morison Beatty, 1980; Jagger Hims Limited 2008; Amec Foster Wheeler, 2014b), detailing soil and groundwater conditions surrounding the Site were reviewed. The borehole logs indicate subsurface conditions at the Site consist of silt over shallow limestone bedrock in the vicinity of the proposed expansion area. It is anticipated that the limestone unit is similar in hydraulic properties to the silt unit, and that the two units generally behave as one. Overburden increases in thickness with distance from the historic fill area towards the northeast, and is comprised mostly of silt, which varies in sand and clay content depending on location. Bedrock in the vicinity of the northeast CAZ boundary, and further to the northeast, is reported to be characterized as assumed mafic igneous, as opposed to the limestone type that is found in the vicinity of the current and proposed fill areas.

The deeper bedrock unit to the northeast of the Site was encountered at depths of up to approximately 23 m below ground surface. A deep silt bedrock contact unit was instrumented in the multi-level wells in this area as part of the ongoing environmental monitoring of the closed landfill. The locations of the boreholes are presented in Figure 6.9. The surficial geology is presented in Figure 6.10.

It was determined through previous intrusive investigations that the Site is situated on a topographic high comprised of an exposed limestone bedrock ridge. Little to no overburden is present in the immediate vicinity of the existing landfill with an increasing thickness in the area of the proposed landfill expansion. Overburden increases in thickness towards the northeast, with a significant increase in thickness at the east boundary of the CAZ, as compared to the landfill. Overburden is comprised primarily of silt, which varies in sand and clay content depending on location. A number of documented weathered bedrock and joint sets are present in the vicinity of the Site and within the downgradient area.

6.2.4 Groundwater

The New Liskeard Landfill site is approximately 2,150 m from the closest municipal water supply wells and these wells do not appear to be in the flow path of groundwater originating at the landfill. According to the Municipal Groundwater Study for the Central Temiskaming Area (WESA/Knight Piesold, 2003), the geology in the vicinity of the New Liskeard municipal drinking water wells consist of thick glaciofluvial clay (over 30 m) overlying a very transmissive gravel deposit. The gravel is approximately 12 m thick according to the Well Record of the municipal wells and overlies the limestone bedrock. The municipal wells are completed within the gravel materials. There is no record of an aquifer test being completed at these wells; however, based on the daily pumping records it appears the transmissivity of the aquifer is very high. The location of the municipal groundwater wells is presented in Figure 6.11.

The direction of groundwater flow in the vicinity of New Liskeard is from the ridge lying to the west, and at a gentler slope from the north (up the Wabi River valley) towards Lake Timiskaming. To the west and southwest of New Liskeard is a ridge corresponding to the outcrop of the Precambrian bedrock. Generally, the thickness of the confining clay layer diminishes towards the ridge. The thickness of the gravel unit is also variable. Therefore, recharge occurs along the ridge where the gravel and bedrock are close to the ground surface. There is also a component of groundwater flow originating from the north along the path of the Wabi River valley. This groundwater recharges from gravel and bedrock outcrops farther to the northwest. The groundwater from the sand and gravel aquifer discharges towards Lake Timiskaming.

The horizontal hydraulic gradient is quite strong in the immediate vicinity of the nearby escarpment. The hydraulic gradient immediately upgradient of the well field is approximately 0.04. Farther upgradient, the hydraulic gradient is less pronounced and is approximately 0.009.

Based on Amec Foster Wheeler's recent intrusive investigations (Amec Foster Wheeler, 2014b) the Site is situated on a topographically elevated, exposed (i.e., little to no overburden) limestone, bedrock ridge. A number of documented weathered bedrock and joint sets are present in the vicinity of the Site and within the downgradient area. Geological investigations in this area indicate a presence of some overburden immediately east of the existing New Liskeard Landfill limits, with depths ranging from 0 to 2 m below ground surface. Overburden thickness increases towards the northeast (i.e., in the area of the proposed expansion), with a significant increase in thickness at the east boundary of the CAZ, as compared to the immediate vicinity of the existing fill area. As discussed below in Section 6.3.3 Land Use, the CAZ has been developed as a solar facility. The development of a solar facility in this area has resulted in the removal of the vegetation and organic soils. The result this development has the potential, in the short-term, to reduce infiltration in the CAZ and increase erosion and sediment transport, if not properly mitigated. The Renewable Energy Approval application for Canadian Solar's New Liskeard 1, 3, and 4 sites (Dillon Consulting Limited, 2011) estimates that the runoff in the area will increase by 3% due to the operations.

Figure 6.12 presents a conceptual hydrogeological model of the hydrostratigraphy based on the survey data as well as the observations and conditions documented on the borehole logs compiled through previous intrusive investigations and well instrumentation programs. As depicted in this conceptual model the hydrogeological setting can be summarizes as follows. The Site is situated on a topographically elevated, exposed (i.e., little to no overburden) limestone, bedrock ridge. A number of documented fault zones are present in the vicinity of the Site and within the downgradient area. Geological investigations in this area indicate a thin veneer overburden within the Site boundary and extending east into the CAZ with depths typically ranging from 2 to 5 m. As this area is on a topographic high near an inferred groundwater divide there are strong downward gradients within nested wells indicating a recharging aquifer. The absence of a significant low permeability confining layer overlying the limestone bedrock in this area means that there is a high susceptibility for contaminant migration to the bedrock aquifer and the faults. It is anticipated that the limestone bedrock has similar hydraulic properties to the overburden deposits and that the two stratigraphic units generally form one aquifer.

Overburden thickness increase at the east boundary of the CAZ to range from 12 to 23 m. The increased overburden deposits form a very stiff and dense to very dense silty clay deposit which divides the overlying and underlying silty sand deposits. This area of the drainage basin is followed by a steep downward topographic change. Upward vertical groundwater gradients observed in the instrumented monitoring well nests indicate a discharging groundwater condition. The silty clay deposit is inferred to have a lower permeability than the overlying silty sand deposit and forms a hydraulic barrier to produce a shallow overburden aquifer within the silty sand deposit. Bedrock near the CAZ boundary, and further to the northeast is characterized as assumed mafic igneous (JHL, 2008). It is anticipated the igneous mafic bedrock has a lower permeability forming a barrier to contaminant migration and produces a confined deep overburden aquifer. As a result of the low permeability igneous mafic bedrock the confined deep overburden aquifer is producing upward vertical hydraulic gradients as observed in the nested wells in this area.

Borehole logs, detailing soil and groundwater conditions for the monitoring well network are provided in the Hydrogeological Technical Support Document (Appendix G).

6.2.4.1 Groundwater Quality

A number of groundwater monitoring wells are already in place in the immediate vicinity of the Site and downgradient throughout the CAZ. Additional groundwater monitoring wells were installed as part of this EA. A total of 37 groundwater wells (Figure 6.13) are currently used for monitoring purposes as follows.

- 23 groundwater monitoring wells are used for sample collection three times annually, including OW1R-I, OW1R-III, OW10-I, OW10-II, OW11-I, OW11-II, OW12-I, OW12-II, OW13-I, OW16-I, OW16-II, OW16-III, OW17-I, OW17-II, OW17-III, OW23-I, OW23-II, OW24-I, OW24-II, OW24-III, OW25-I, OW25-II and OW25-III.
    - 5 additional groundwater monitoring wells were installed in September 2014, including OW26-14, OW27-14, OW28-14, OW30-I and OW30-II.
- 9 groundwater monitoring wells are used for water level measurements, including OW1R-II, OW13-II, OW14-I, OW14-II, OW18-I, OW20-I, OW20-II, OW-21 and OW22-I.

Samples were collected from all applicable groundwater monitoring wells during all three 2014 monitoring events, with the exception of OW24-I and OW24-II, which were damaged prior to the spring and summer monitoring events. Both wells were re-installed prior to the fall 2014 monitoring event, at which time samples were obtained. Sampling events occurred on 2 June 2014 (Spring), 29 July 2014 (Summer) and 29 September 2014 (Fall).

To date, the Site groundwater quality data indicates a landfill-derived impact to groundwater quality in the groundwater wells in closest proximity to the existing waste fill area, and a decrease in impact with distance from the landfill, indicating effective natural attenuation at the Site. Exceedances of the Guideline B-7 maximum allowable concentrations have been quantified at the downgradient CAZ boundary in well nests OW-30, OW-25, OW-24 and OW-16 for sodium and dissolved organic carbon (DOC) in the 2015 data. It is noted that the sole exceedance quantified in the shallow aquifer - for DOC in downgradient well OW-24-III - is only marginally elevated above the calculated maximum concentration (3.7 milligrams per Litre [mg/L] versus 3.65 mg/L). Exceedances quantified in deep wells OW-25-II, OW-16-I, OW-30-I and OW-30-II are not necessarily landfill-derived and could potentially represent unimpacted groundwater quality at depth that is dissimilar in water type to that of the moderate depth background well, as a result of increased residence time within the aquifer. When compared, the water quality at the Site indicates varying groundwater types, dependent on groundwater well nest location and installation depth. The water quality is stable over time, with consistent concentrations of most parameters throughout the monitoring record and low ranges of fluctuation at most monitoring wells. A detailed interpretation of the current water quality across the Extended Study Area (i.e., at the source area, as well as the downgradient property boundaries) is presented in the Hydrogeological Technical Support Document (Appendix G).

The current horizontal extent of the landfill-derived impacts, as evidenced by 2015 chloride concentrations (a generally accepted tracer parameter), is presented on Figures 6.14a through 6.14c, and indicates that the plume is well contained within the CAZ. These contours were created using the maximum reported chloride concentration at each multi-level well nest and are considered to be representative of "worst-case".

In order to provide an understanding of the plume behaviour with respect to the depth as well as distance from the source, a cross-sectional drawing that trends along the inferred groundwater flow direction (i.e., likely the centre of the plume) is presented on Figures 6.15a through 6.15c. The surficial topography, groundwater elevation and bedrock topography are shown in this vertical representation, as well as the 2015 chloride concentrations.

6.2.4.2 Groundwater Flow

The static groundwater levels indicate groundwater flow is across the Site towards the northeast in both the shallow and deep groundwater flow systems. Groundwater elevations in the vicinity of the Site mirror the topography of the area, decreasing to the northeast within the existing landfill area, then flattening out across the CAZ, and subsequently decreasing steeply from the northeast corner of the CAZ to Highway 65. Strong downward hydraulic gradients have been reported on the bedrock ridge and below the landfill, indicating that the landfill is located in a groundwater recharge area. This is to be expected since the Site is located just east of a presumed groundwater divide at the top of the bedrock ridge. The vertical hydraulic gradients level out to nearly horizontal downgradient of the landfill. At the eastern boundary of the CAZ, upward vertical hydraulic gradients have been observed in some well nests.

6.2.5 Surface Water

As discussed in Sections 6.2.2, no waterbodies were observed within the Site Study Area. The nearest waterbodies to the Project were found to be two small tributaries, Tributary 1 and Tributary 2. Both tributaries are located within the Extended Study Area and Canadian Solar project. Dillon Consulting characterized the tributaries in the 2011 Water Assessment Report, which was completed by qualified fisheries biologists: Daniel Knee, B.Sc.H. (Biology), Resource Management Technician Diploma and Richard Baxter, B.Sc. (Resource Management – Fish and Wildlife), Fish and Wildlife Technologists Diploma (Dillon Consulting Limited, 2011). Amec Foster Wheeler confirmed these findings in two Site visits (28 July 2014 and 23 September 2014). Tributary 1 and 2 were both found to originate from ephemeral overland drainage and are intermittent.

6.2.6 Terrestrial Environment

Amec Foster Wheeler completed a biophysical inventory for the Site to characterize and evaluate the existing biophysical environment. The biophysical inventory comprised a review of existing secondary data sources directly relevant to the Extended Study Area, as well as a number of specific field surveys for the Site-vicinity Study Area that were completed on the 13, 14, 25 and

26 June 2014. Methodology and results are described in detail in the Terrestrial Environment Technical Support Document (Appendix H) and summarized below.

6.2.6.1 Vegetation Communities

Vegetation surveys were conducted on 13 and 14 June 2014. All vegetation communities were delineated through interpretation of aerial photography and/or using a Global Positioning System (GPS) device with 5 m accuracy. Ecosystems were classified based on the composition of the dominant species. The Forest Ecosystem Classification of Northeastern Ontario (FEC; Taylor *et al.*, 2000) was used to describe forest communities and the Ecological Land Classification (ELC) system (Lee *et al.*, 1998) was used to describe other community types including disturbed habitats. These classifications were later converted to Provincial Ecosites in order to ascertain potential Significant Wildlife Habitat.

Five distinct plant communities (upland and wetland) and seven distinct polygon types are present within the Site-vicinity Study Area (Figure 6.16). The majority of the area (61.9%) is covered by upland forest communities whose canopies are most commonly dominated by trembling aspen (*Populus tremuloides*), white birch (*Betula papyrifera*), balsam fir (*Abies balsamea*), and black spruce (*Picea mariana*). An additional 23.7% of cover is comprised of cultural meadows and thickets. One wetland community (organic coniferous swamp) is present within the Site-vicinity Study Area and covers an area of 1.2 ha (2.7% of the total area).

6.2.6.2 Wildlife

Birds

Data from the Atlas of Breeding Birds in Ontario (Cadman *et al.*, 2007) describes 24 species as possible, probable or confirmed breeders in the vicinity of the Site-vicinity Study Area; however, due to the northern position of the Site-vicinity Study Area relative to urban and rural areas in southern Ontario, the avian diversity of the region is under-reported. A total of 32 bird species were recorded within the Site-vicinity Study Area during standardized point counts surveys, of which 18 species had not previously been identified in the Extended Study Area.

The six most common birds, recorded an average of at least once at each station, include the American Goldfinch (*Spinus tristis*), White-throated Sparrow (*Zonotrichia albicollis*), Song Sparrow (*Melospiza melodia*), Cedar Waxwing (*Bombycilla cedrorum*), Red-eyed Vireo (*Vireo olivaceus*) and Black-capped Chickadee (*Poecile atricapillus*). Of the 32 bird species (277 total birds) recorded, the American Goldfinch, White-throated Sparrow, Song Sparrow, Cedar Waxwing, Red-eyed Vireo and Black-capped Chickadee represented 53% of all observations.

Bird species richness ranged from 10 to 16 species at point count stations and averaged 12.4 bird species per station. In general, species diversity was higher in the northern areas of the Site-vicinity Study Area, near the edges of forest communities, ranging from 14 to 16 species per point count station (Stations 3, 4, 10-12). Species diversity was relatively low in the central portion of

the Site-vicinity Study Area within the Cultural Meadow Ecosite with a total of 10 species (Stations 6 and 7). Bird species density followed a similar trend as species richness, with the greatest bird densities occurring in the northern areas of the Site-vicinity Study Area. Overall, the average species density at each point count station was 23.08 birds. No additional bird species were recorded during crepuscular bird surveys.

Of the 43 total species identified through the review of background information and field surveys, 36 total bird species are expected to be breeding or potentially breeding within the Site-vicinity Study Area. Thirty-nine (39) of the 43 (91%) bird species are seasonal migrants, occurring in northern Ontario only during the summer breeding season.

Two SAR birds were identified through the review of background information. Consultation with the MNRF revealed the presence of a historically recorded occurrence of a Black Tern (*Chlidonias niger*) within 2 km of the Site, while the Atlas of Breeding Birds of Ontario listed a "possible" occurrence of Barn Swallow (*Hirundo rustica*).

Mammals

The review of the Atlas of the Mammals of Ontario indicated that 41 mammalian species may occur in the general area of the Extended Study Area (Dobbyn, 1994). Visual sightings, evidence (e.g., scat, tracks and vocalizations) did not reveal any mammal species occurring within the Extended Study Area.

The majority of the species listed in the Atlas of the Mammals of Ontario as potentially occurring within the Site-vicinity Study Area are both small and difficult to detect using standard, non-invasive methods and/or are elusive, large mammals; nonetheless, many of these species may occur within the Site-vicinity Study Area.

The Atlas of the Mammals of Ontario indicated that two SAR mammal species, including northern myotis (*Myotis septentrionalis*) and little brown myotis (*Myotis lucifugus);* both provincially *Endangered*) may occur within the Extended Study Area.

Amphibians and Reptiles

Ten amphibian species were identified in the review of the Ontario Reptile and Amphibian Atlas (Ontario Nature, 2013) as occurring within the Extended Study Area. These species include: American toad (*Anaxyrus americanus*), gray treefrog (*Hyla versicolor*), Spring peeper (*Pseudacris crucifer*), green frog (*Lithobates clamitans*), wood frog (*Lithobates sylvatica*), northern leopard frog (*Lithobates pipiens*) and mink frog (*Lithobates septentrionalis*) as well as spotted salamander (*Ambystoma laterale*), blue-spotted salamander (*Ambystoma maculatum*) and Jefferson/blue-spotted salamander complex (*Ambystoma jeffersonianum/laterale*). Spring peeper was heard at two survey stations in the Site-vicinity Study Area (C3 and C6) and at low densities (one and four individuals, respectively), while the American toad was heard at station C6 (two individuals).

Four reptile species were identified in the review of the Ontario Reptile and Amphibian Atlas (Ontario Nature, 2013) as occurring within the vicinity of the Extended Study Area. This included the eastern gartersnake (*Thamnophis sirtalis*), red-bellied snake (*Storeria occipitomaculata*), midland painted turtle (*Chrysemys picta marginata*) and snapping turtle (*Chelydra serpentina*). No reptile species were identified during field surveys in the Site-vicinity Study Area. Snapping turtle, a provincially *Special Concern* SAR, is further discussed below.

6.2.7 Species at Risk and Provincially Rare Species

Based on a review of secondary source information and consultation with the MNRF, five SAR were identified as occurring or potentially occurring within the vicinity of the Extended Study Area, including two bird species, one reptile species and two mammal species. None of these SAR were recorded during field surveys. Detailed habitat descriptions and potential for occurrence of SAR within the Extended Study Area are provided in the subsections below.

6.2.7.1 Bird Species at Risk

Based on a review of the Atlas of Breeding Birds in Ontario and correspondence with MNRF North Bay District, two avian SAR were identified as potentially occurring within the Extended Study Area including Barn Swallow and Black Tern.

Barn Swallow

Before European settlement in Ontario, Barn Swallows nested mostly in caves, holes, crevices and ledges in cliff faces (Committee on the Status of Endangered Wildlife in Canada; COSEWIC, 2011). Although Barn Swallows continue to nest in traditional natural habitats, they are now most closely associated with human structures in rural areas. Such nesting sites include a variety of artificial structures that provide either a horizontal nesting surface (e.g., a ledge) or a vertical face, often with some sort of overhang that provides shelter (COSWEIC, 2011). Nests are most commonly located in and around open barns, garages, sheds, boat houses, bridges and road culverts, and are situated on such surfaces as beams and posts, light fixtures, and ledges over windows and doors (COSEWIC, 2011). Because Barn Swallow nests are constructed of mud pellets, Barn Swallows require nest sites that have a source of nearby mud, which makes bridges and large culverts ideal sites for nesting (COSEWIC, 2011). Barn Swallows typically select foraging sites close to open habitats such as farmlands of various descriptions, wetlands, road rights-of-way and large forest clearings (COSEWIC, 2011).

During breeding bird surveys, no Barn Swallows were identified in the Site-vicinity Study Area and no suitable nesting habitat is available within the Site-vicinity Study Area.

Black Tern

The Black Tern is a small tern that nests semi-colonially in fresh-water marshes amidst emergent vegetation in biologically rich fresh-water wetlands, including prairie sloughs, margins of lakes,

and occasionally river or island edges (Heath *et al*., 2009). Habitat suitability appears to be determined more by landscape structure at a larger scale (wetland complex) than local vegetation conditions within wetlands (Heath *et al*., 2009). Black Terns selectively choose wetlands located in high-density wetland landscapes within areas where less than 50% of upland habitat is tilled. Black Terns are less likely to occur in wetlands surrounded by woody vegetation. Black Terns generally prefer marshes or marsh complexes of more than 20 ha in size for breeding; the smallest reported breeding habitat is 5.3 ha (Heath *et al*., 2009).

During breeding bird surveys and vegetation surveys, no individual Black Terns or evidence of nesting colonies were observed within the Site-vicinity Study Area. Based on the habitat preferences of Black Terns (large mash wetlands or wetland complexes), no suitable nesting habitat is present within the Site-vicinity Study Area.

6.2.7.2 Mammal Species at Risk

Bats

The Atlas of the Mammals of Ontario indicated that two mammal SAR, including northern myotis and little brown myotis may occur within the Extended Study Area. Both species have recently been listed both provincially and nationally as *Endangered*. Since it first appeared in upstate New York in 2006, the fungal disease known as White Nose Syndrome has decimated millions of bats throughout eastern North America and is rapidly spreading westward (Frick *et al*., 2010). The natural histories of the two species most impacted by White Nose Syndrome are very similar in that both rely on old growth forest stands where they form maternity colonies in tree cavities. Both also rely on caves and abandoned mines as hibernacula and staging points for reproductive activities (Norquay *et al.*, 2013).

Three critical bat habitat types are recognized by the MNRF: 1) bat hibernacula, 2) bat maternity roost sites and 3) bat migration stopover sites (Ministry of Natural Resources; MNR, 2011). [Note that the MNR changed its name to the MNRF in 2014]. Little is known regarding bat migratory stopover habitat in Ontario and there are currently no provincial criteria for identifying critical bat migratory stopover habitat (MNR, 2011). During the spring and early summer, most Ontario bat species rely on forest habitat that supports a healthy density of large-diameter cavity trees. Females form maternity colonies of tens to hundreds of individuals in cavities that provide a warm, humid microclimate that optimizes gestation and growth of offspring (Kunz and Anthony, 1982). Maternity colonies are generally located in mature (dominant trees greater than 80 years old) deciduous or mixed forest stands with a density of at least 10 trees per hectare of cavity trees with a diameter at breast height of 25 centimetre (cm) or greater. In August and September, bats congregate at the entrance of caves or mine shafts that are used as hibernacula during the winter (Norquay *et al*., 2013). During winter, suitable hibernacula maintain temperatures slightly above freezing, a consistent air flow and high humidity levels (Raesly and Gates, 1987).

Targeted surveys for bat species, such as acoustic monitoring, were not conducted during baseline field surveys. However, no critical habitat for bats was identified during vegetation

surveys. Deciduous and mixed forests that were identified were too young to provide habitat and large-diameter snags for maternity colonies, and no caves or deep rock fissures were found. As such, the Site-vicinity Study Area is not likely to provide critical habitat for either the northern myotis or the little brown myotis.

6.2.7.3 Reptile Species at Risk

Snapping Turtle

The preferred habitats for the snapping turtles are characterized by slow-moving water with a soft mud bottom and dense aquatic vegetation. Established populations are most often located in ponds, sloughs, shallow bays or river edges and slow streams, or areas combining several of these wetland habitats (COSEWIC, 2008). Although individual turtles will persist in heavily urbanized waterbodies (e.g. golf course ponds, irrigation canals), it is unlikely that populations persist in such habitats (COSEWIC, 2008). No open waterbodies are present within or near to the Site-vicinity Study Area, and as such, no habitat for snapping turtles is present.

6.3 Social Environment

The existing social (including economic and cultural) environment within the City of Temiskaming Shores is characterized in this section. The Extended Study Area used for this was the City's municipal boundaries. A literature review of the following background resources was conducted to inform this characterization.

- *Planning Act*;
- *Environmental Protection Act*;
- Growth Plan for Northern Ontario, 2011;
- Provincial Policy Statement, 2014;
- Official Plan for the City of Temiskaming Shores (Tunnock Consulting Limited, 2014);
- Aerial photography, mapping and field reconnaissance; and
- Published information on the recreational and tourist resources and other community institutions.

Consultation with City staff also provided insights for this characterization.

6.3.1 Community Profile

Located in northeastern Ontario near the Quebec border, the City of Temiskaming Shores is situated at the head of Lake Timiskaming (at Wabi Bay), which stretches 100 km south, eventually becoming the Ottawa River. The City was formed in 2004 from the amalgamation of the municipalities of Dymond, Haileybury and New Liskeard.

Neighbouring communities include Englehart, Earlton, Cobalt, Coleman, Latchford, Elk Lake, Hudson, Harley, Casey, Armstrong, Kerns, Harris, Hilliard, Thornloe and Brethour. The nearest

northern Ontario urban centres outside of the City of Temiskaming Shores are the Town of Kirkland Lake (with a population of approximately 8,133), situated 90 km to the north; City of Timmins (with a population of approximately 43,165), situated 200 km to the northwest; City of North Bay (with a population of approximately 53,651), situated 160 km to the south; and City of Greater Sudbury (with a population of approximately 160,274), situated 225 km to the southwest (Statistics Canada, 2012a, 2012b, 2012c, 2012d).

The City's population of 10,400 represents 0.08% of the population of Ontario (Table 6.2). The City has exhibited a lower growth rate than the Province since 2006. The median age is higher than that of the Province, which is indicative of an older population. The higher median age may be due to migration of youth out of the City due to employment and education opportunities elsewhere. The 2011 population density (58.5 persons per square kilometre) is substantially higher than that of the Province (14.1 persons per square kilometre).

Table 6.2: Populations Statistics

	Temiskaming Shores (City)	Temiskaming Shores (Census agglomeration)[1]	Province of Ontario
2011	10,400	13,566	12,851,821
2006	10,442	13,654	12,160,282
2006-2011 Change (%)	-0.04	-0.06	5.7
Population density 2011 (persons per square kilometre)	58.5	23.3	14.1
Median age 2011 (years)	45	45.3	40.4

Notes:
1 - Census agglomeration for Temiskaming Shores includes the City of Temiskaming Shores as well as the Town of Cobalt and the Townships of Casey, Coleman, Harley and Harris.
Source: Statistics Canada, 2012e, 2012f, 2013a

The Ministry of Finance develops population projections for each of the census divisions. The City of Temiskaming Shores is within the Timiskaming census division. It is projected that during the Project's phases, the population of Timiskaming will have little change between 2016 and 2041 (Table 6.3). The negative rate of growth is significantly less than the projected rate of growth for the Province.

While the number of seniors (aged 65 and older) is projected to double across the Province, the number of seniors will grow most slowly in areas such as Timiskaming (Ministry of Finance, 2014).

Table 6.3: Projected Population, 2016-2041

	Timiskaming Census Division	Province of Ontario
2016	33,100	13,948,800
2021	32,600	14,702,600
2026	32,300	15,503,300
2031	31,900	16,296,000
2036	31,500	17,054,100
2041	31,200	17,779,600

Source: Ontario Ministry of Finance, 2014

6.3.1.1 Labour Force and Income

The labour force and income indicators for the City of Temiskaming Shores are presented in Table 6.4. In 2011, the unemployment rate in the City and larger area was over three percent greater than that of the Province. Median income in the City and larger area was approximately 15% lower than that of the Province.

Table 6.4: Labour Force and Income, 2011

	Temiskaming Shores (City)	Temiskaming Shores (Census agglomeration)[1]	Province of Ontario
Total population 15 years and over	8,425	11,095	10,473,665
Labour force	4,770	6,455	6,864,985
Unemployment rate (%)	11.9	11.6	8.3
Individual median income ($)	25,823	25,664	30,526

Source: Statistics Canada, 2013a, 2013b, 2013c

The distribution of labour force by industry in the study area is presented in Table 6.5. The top five industries of employment for the City of Temiskaming Shores (and for the census agglomeration) include retail trade, health care and social assistance, educational services, construction and manufacturing. The top five industries of employment in the Province are retail trade, manufacturing, health care and social assistance, professional, scientific and technical services, and educational services. The waste management and remediation sector employees 60 people, 0.7% of the labour force of the City.

Table 6.5: Labour Force by Industry, 2011

Industry	Percent of total experienced labour force 15 years and older (%)		
	Temiskaming Shores (City)	Temiskaming Shores (Census agglomeration)[1]	Province of Ontario
Agriculture, forestry, fishing and hunting	0.7	1.6	1.0
Mining, quarrying, and oil and gas extraction	2.6	2.4	0.3
Utilities	0.5	0.6	0.5
Construction	4.9	5.4	4.0
Manufacturing	4.2	4.5	6.7
Wholesale trade	0.9	0.9	2.9
Retail trade	12.0	11.8	7.2
Transportation and warehousing	2.1	2.6	2.9
Information and cultural industries	0.9	0.8	1.7
Finance and insurance	1.1	1.0	3.5
Real estate and rental and leasing	0.4	0.4	1.3
Professional, scientific and technical services	1.4	1.2	4.9
Management of companies and enterprises	0.0	0.0	0.1
Administrative and support, waste management and remediation services	0.7	0.8	3.0
Educational services	5.6	4.9	4.8
Health care and social assistance	8.0	8.2	6.6
Arts, entertainment and recreation	0.6	0.5	1.4
Accommodation and food services	2.9	3.1	4.0
Other services (except public administration)	3.0	3.4	2.8
Public administration	2.8	2.4	4.4

Source: Statistics Canada, 2013a, 2013b, 2013c

The City's economic base includes a diverse range of industries including retail, manufacturing, construction, retail and service. The City of Temiskaming Shores is well serviced by an economic development office and chamber of commerce, which provide resources and support to local businesses.

The Haileybury Landfill currently employs one full-time operator for a total of 2,080 person hours per year.

6.3.2 Aboriginal Communities

The approved ToR identified eight Aboriginal communities that the City was to engage with regarding this Project. These communities include:

- Beaverhouse First Nation;
- Matachewan First Nation;
- Mattagami First Nation;
- Temagami First Nation;
- Timiskaming First Nation;
- Wahgoshig First Nation;
- Métis Nation Ontario; and
- Temiskaming Métis Council.

Consultation activities with Aboriginal communities are detailed in Section 9. To date, the City has not received any specific information from these Aboriginal communities regarding the Alternatives To, Alternative Methods or the Preferred Alternative.

Section 6.4.1 identifies that there is a significant amount of pre- and post-contact history in the area. Pre-contact, Aboriginals from the Algonquin First Nations inhabited the area and their traditional hunting territory included Dymond Township; however, by the time the first European settlers arrived in 1891 records indicate that they may have abandoned the area (City of Temiskaming Shores, 2014). Section 6.4.1 also identifies that the Site does not exhibit archaeological potential due to specific Site conditions (slopes in excess of 20°) and prior land development as a limestone quarry and landfill. No Aboriginal built heritage, archaeological sites, cemeteries or burial grounds were identified through the investigations or by members of the Aboriginal communities.

6.3.3 Land Use

Temiskaming Shores consists of an urban-centred municipality that is surrounded by a large rural area where the majority of development and settlement has occurred within the communities of Haileybury, New Liskeard and Dymond, and neighbouring communities (such as Cobalt). Land use within the rural section of the district consists primarily of resource use focused on farming and mining while residential, commercial, institutional and industrial development is primarily focused within the urban centres.

The Site is currently designated in the City's Official Plan as 'Waste Management Facility'; that includes both the currently closed New Liskeard Landfill site and a 500 m influence area (Tunnock Consulting Limited, 2014). Land use surrounding the Site is designated as agriculture to the west and north; renewable energy generation to the east (Canadian Solar's New Liskeard 1, 3, 4 solar project); and rural area south and southeast. The privately owned lands immediately to the south

are currently occupied by the solar facility. The City has identified that there are no pending applications or zoning restrictions.

Land uses permitted within agricultural areas include: farming, agriculture-related industrial, commercial, or research activity; residential uses directly related to agriculture; natural features that enhance the area for agriculture and ecosystem health; and sustainable agricultural practices. Land uses permitted within rural areas include: natural and renewable resources, primarily agriculture, mining, mineral aggregates; protection of natural heritage features; and infrastructure and public services facilities appropriate to a rural setting (waste management facilities, communication facilities, energy facilities, cemeteries).

In addition to the land use designations above, Hydro One Networks Inc.'s 230 kilovolt (kV) transmission line rights-of-way bound the Site on the west and north sides. There are no mining leases or patents and there are no aggregate operations or proposed operations within the Site-vicinity Study Area. The existing land uses and neighbouring land uses are presented on Figures 6.17 and 6.18.

6.3.4 Municipal and Community Services

Municipal facilities and infrastructure, including recreation, within the municipal boundaries are presented on Figure 6.19. There are:

- 3 fire stations, including:
  - Dymond Fire Station, located approximately 4.5 km northeast of the Site;
  - New Liskeard Fire Station, located approximately 3.1 km east of the Site; and
  - Haileybury Fire Station, located approximately 10.5 km southeast of the Site;
- 8 schools, including:
  - Timiskaming District Secondary School, located approximately 2.5 km east of the Site;
  - Haileybury Public School, located approximately 9.2 km southeast of the Site;
  - New Liskeard Public School, located approximately 2.8 km east of the Site;
  - École Secondaire Sainte-Marie, located approximately 4.2 km east of the Site;
  - École élémentaire publique des Navigateurs, located approximately 4 km east of the Site;
  - École élémentaire Catholique St-Michel, located approximately 6.6 km north of the Site;
  - École Catholique Paradis Des Petits, located approximately 3.7 km east of the Site;
  - École élémentaire Catholique Ste-Croix, located approximately 10 km southeast of the Site; and
- A number of municipal and residential wells (Section 6.2.4).

The Temiskaming Hospital is located 2.2 km southeast of the Site. The Temiskaming Hospital is a fully accredited, community hospital committed to providing primary care as well as a full range of acute care services. The hospital provides rural health care and support service delivery across the Temiskaming communities.

Other community-related facilities include:

- Don Shepherdson Memorial Arena (New Liskeard) Arena, located approximately 3.1 km east of the Site;
- Haileybury Arena, located approximately 9.2 km southeast of the Site;
- Dymond Outdoor Rink, located approximately 5.1 km northeast of the Site;
- New Liskeard Golf Club, located approximately 4.2 km northeast of the Site; and
- Haileybury Golf Club, located approximately 8.0 km southeast of the Site.

6.3.5 Recreation

There is a large network of snowmobile and all-terrain vehicle (ATV) trails within the municipal boundaries. The trail system is important to the local economy as it generates revenues to support local restaurants, gas stations, hotels, retailers, and other establishments. Recreation resources are presented on Figure 6.20. The nearest recreation sites are as follows:

- Municipal parks and trails, including:
  - Pete's Dam Park, located approximately 1.8 km north of the Site;
  - Devil's Rock Trail, located approximately 14.6 km southeast of the Site;
  - South Temiskaming Active Travel Organization Trail, located approximately 3.2 km east of the Site;
- Provincial Parks, including:
  - Kap-Kig-Iwan Provincial Park, located approximately 34.8 km northwest of the Site;
  - WJB Greenwood Provincial Park, located approximately 24.7 km southwest of the Site; and
  - Lady Evelyn - Smoothwater Provincial Park, located approximately 54.2 km west of the Site.

6.3.6 Transportation

The major transportation corridor for the area is Highway 11, which connects the communities to North Bay to the south and Cochrane to the north. Highway 65 is the main corridor that connects the City of Temiskaming Shores to Elk Lake to the west and the Province of Quebec to the east.

There is one airport, the Earlton-Timiskaming Regional Airport (YXR), which located approximately 24 km northwest of the Site. This airport is an active, certified airport that services

the region; however, there are no scheduled passenger service available. The airport provides charter services on an on-call basis and is a hub for Air Ambulance Service.

The main access to the Site is west of Highway 11 via Rockley Road, which is paved up to approximately 725 m of the Site entrance where it becomes a gravel road.

6.3.7 Visual Aesthetics

The landscapes and views in the vicinity of the Site are telling of the area's rural character. Flat clay belt farmland comprises most of the surrounding area with some rolling hills that grade towards Lake Timiskaming. Lands immediately to the north of the Site are generally wooded and undeveloped, with farming occurring further to the north. To the east of the Site, is City-owned land currently occupied by a solar facility, beyond which are privately owned lands developed with single family dwellings, farmland and pasture. Lands immediately south of the Site are privately owned lands and currently occupied by a solar facility. Lands immediately to the west of the Site are undeveloped and in a wooded and/or natural state; while further to the west, the lands are privately owned with single family residences, farmland, pasture and natural areas.

6.4 Cultural Environment

6.4.1 Archaeology

6.4.1.1 Regional Historic Overview

There is a significant amount of pre- and post-contact history in the area. The Ottawa River, which flows into and out of Lake Timiskaming, has provided a travel route and access point to the area. Pre-contact, Aboriginal Peoples from the Algonquin First Nations inhabited the area and their traditional hunting territory included Dymond Township; however, by the time the first European settlers arrived in 1891, records indicate that they may have abandoned the area (City of Temiskaming Shores, 2014). In 1695, French explores established Fort Temiscamingue. Further to the north, in 1794, the Hudson's Bay Company established Abitibi House on Lake Abitibi (Telfer, A.H., 2004).

The first Eurpoean settlers arrived in the area in 1891. By 1893, a Crown Lands Agent had been dispatched to the area to oversee the formal land settlement. Taking advantage of the Little Claybelt region's rich soil, a prosperous agriculture centre was established. Attracted by good, inexpensive farmland settlers arrived by steamboat prior to the introduction of the railway (1904) or road access. In 1901 and 1903, the Dymond Township and the Town of New Liskeard were incorporated, respectively.

Until the 1970's, Dymond Township was primarily an agricultural community. As the commercial area grew along the Highway 11 corridor, the area became a regional centre for administration, commercial and industrial services.

The region was commonly referred to as the Tri-Towns until 2004 when the City of Temiskaming Shores was formed by the amalgamation of Dymond, Haileybury and New Liskeard.

6.4.1.2 Study Areas History

According to the Ontario Archaeological Sites Database (OASD), there are no archaeological sites registered within one kilometre of the Site (Ministry of Tourism, Culture and Sport; MTCS, 17 July 2014 correspondence). The background study indicated that the Site Study Area does not exhibit archaeological potential due to the following factors:

- Prior to its development as a landfill, the Site was used as a limestone quarry where deep land alterations took place over the majority of the Site Study Area;
- The Site has had archaeological potential removed due to previous landfilling operations, including grading, road construction, and stripping of vegetation and topsoil over 30 cm in depth;
- Excessive slopes (i.e. greater than 20°) along the eastern extent of the previous landfill activities; and
- The presence of a permanent wet and low-lying area in the north-east corner of the Site Study Area created by the removal of natural ground.

Based on the Site visits and desktop analysis, the Project area does not require additional archaeological assessment. A Stage 1 Archaeological Assessment is presented in Appendix J.

6.4.2 Heritage

Background research indicates that the Site does not contain significant built heritage or cultural heritage landscape resources. Prior to its development as a landfill, the existing landfill area was used as a limestone quarry. Any potential for heritage resources there was removed by deep and extensive land alterations, including excavations, grading, road construction, and the stripping of vegetation and topsoil to a depth of at least 30 cm. Photographic evidence compiled during the spring, summer and fall of 2013 and the spring of 2014, along with desktop research and analysis, indicate a completely disturbed existing Site with no built heritage or cultural heritage landscape resources that would meet the evaluation criteria provided by MTCS in O.Reg. 9/06 (Criteria for determining cultural heritage value or interest). Similarly, the proposed expansion area does not contain built heritage or cultural heritage landscape resources that would meet the evaluation criteria provided by MTCS in O.Reg. 9/06. Additional detail is presented in Appendix K.

6.5 Economic Environment

6.5.1 Local Economy

The City of Temiskaming Shores serves as the service and commercial centre for a large agricultural, forestry and mining region, and is also the gateway to the largest travel region in

Ontario. The City acts as the regional centre, providing education, health and public administration services, to residents living in the region. While mining and forestry are still important to the local economy, other industry sectors have emerged as major employers, including:

- Sales and service;
- Trade transport and equipment operators;
- Business services;
- Health and social services; and
- Business, finance and administration.

6.5.2 Municipal Finances

The current rate structure for the landfill directs a portion of the tipping fees collected to the reserve fund with the balance used to offset operating costs. The current landfill revenues generally consist of sale of material (such as scrap metal). The tax levy is used to cover the balance of operating costs.

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LEGEND

- Property Boundary
- Contaminant Attenuation Zone
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)
- Local Roads

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.

Datum & Projection: NAD 1983 UTM Zone 17N

0 0.1 0.2 0.3 0.4 Kilometres

N W E S

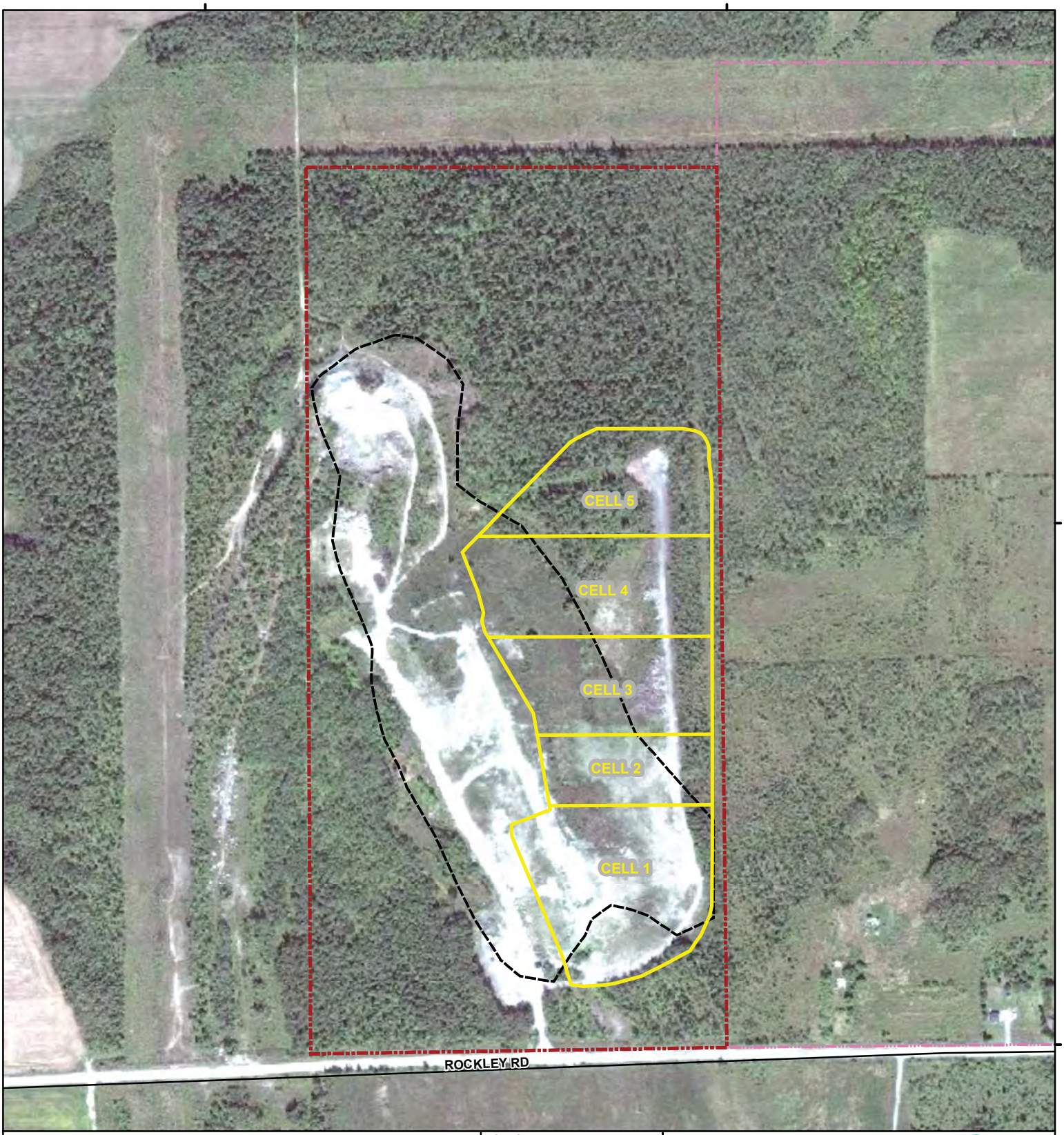
Temiskaming Shores

amec foster wheeler

ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMNG SHORES, ONTARIO

Proposed Site Plan

PROJECT N^{o}:TY910491	**FIGURE: 6.1**
SCALE: 1:5,000	DATE: August 2016



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LEGEND

- Property Boundary
- Contaminant Attenuation Zone
- Proposed Landfill Cells
- Approximate Domestic Solid Waste Boundary
- Local Roads

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.

Temiskaming Shores

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ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMNG SHORES, ONTARIO

Proposed Phasing Plan

Datum & Projection: NAD 1983 UTM Zone 17N

0 0.1 0.2 0.3 0.4 Kilometres

N W E S

PROJECT N°:TY910491 | **FIGURE: 6.2**

SCALE: 1:5,000 | DATE: August 2016

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LEGEND

- Property Boundary
- Contaminant Attenuation Zone
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)
- 275 Proposed Landfill Contours
- Local Roads

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.

Datum & Projection: NAD 1983 UTM Zone 17N

0 125 250 375 500 Meters

N W E S

Temiskaming Shores

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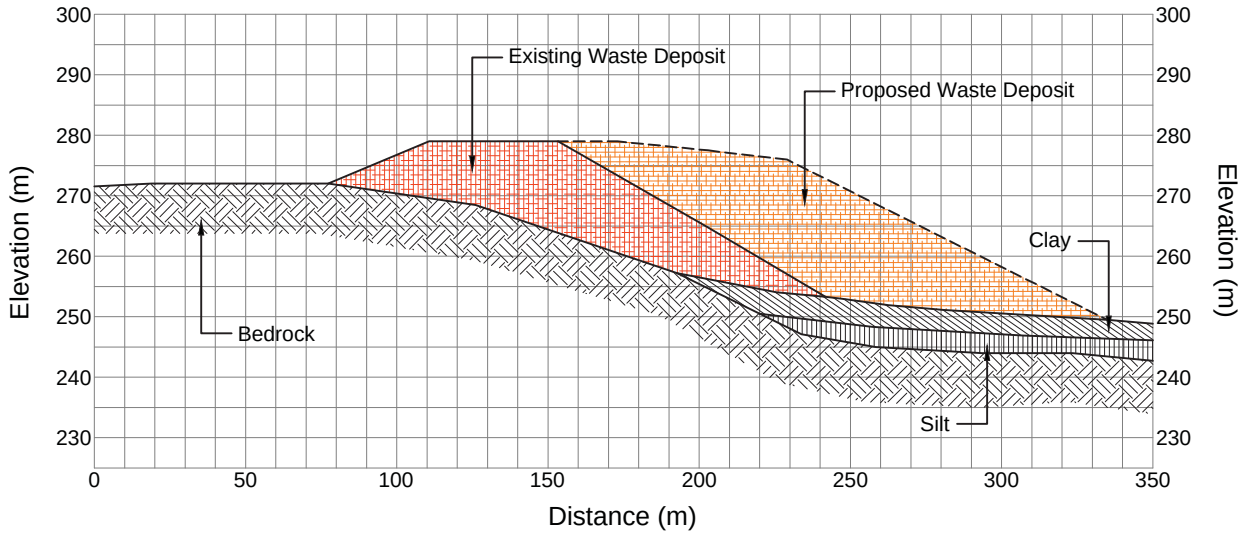
ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMNG SHORES, ONTARIO

Proposed Cross Section Site Plan

PROJECT N°:TY910491	**FIGURE: 6.3**
SCALE: 1:5,000	DATE: August 2016



Proposed Site Plan Cross Section

LEGEND

- Bedrock
- Silt
- Clay
- Existing Waste Deposit
- Proposed Waste Deposit

NOTES:
- Existing Waste and Bedrock profiles interpolated from survey date and investigative drilling.

Temiskaming Shores

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ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Proposed Site Plan Cross Section

PROJECT NO: TY910491	FIGURE: 6.4
SCALE: AS SHOWN	DATE: August 2016

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LEGEND

- Property Boundary
- Contaminant Attenuation Zone
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)
- 275 Proposed Waste Bottom Contours (5 m interval)
- Local Roads

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.

Datum & Projection: NAD 1983 UTM Zone 17N

0 125 250 375 500 Meters

N W E S

Temiskaming Shores

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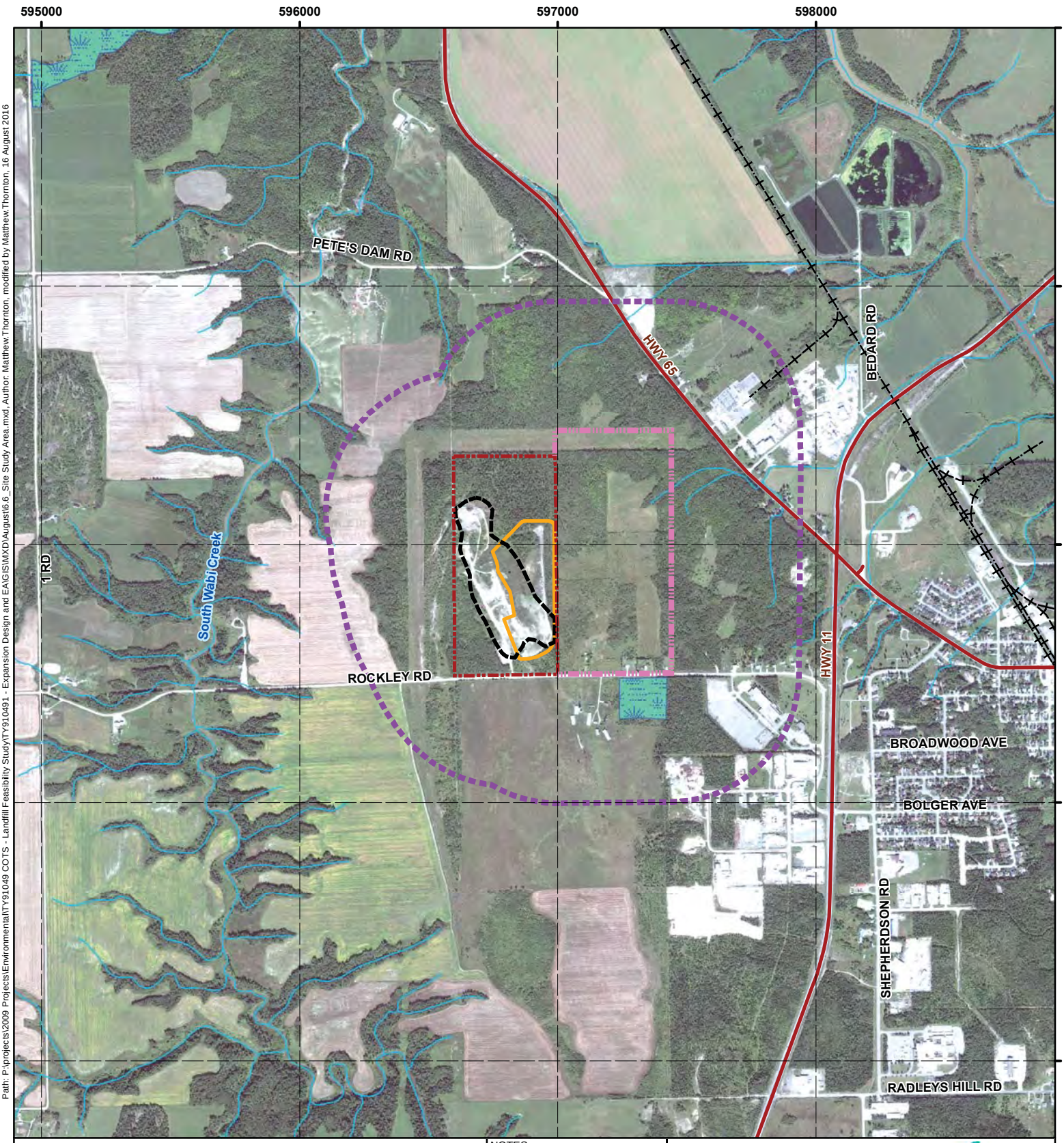
ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMNG SHORES, ONTARIO

Proposed Site Plan
Waste Bottom Contours

PROJECT N^{o}:TY910491	**FIGURE: 6.5**
SCALE: 1:5,000	DATE: August 2016



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LEGEND

- Property Boundary
- Contaminant Attenuation Zone
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area; Site Study Area)
- Site-vicinity Study Area (500 m Buffer)
- Highway / Major Roads
- Railway
- Watercourse
- Wetland

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.

Temiskaming Shores

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ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Site Study Area and Site-vicinity Study Area

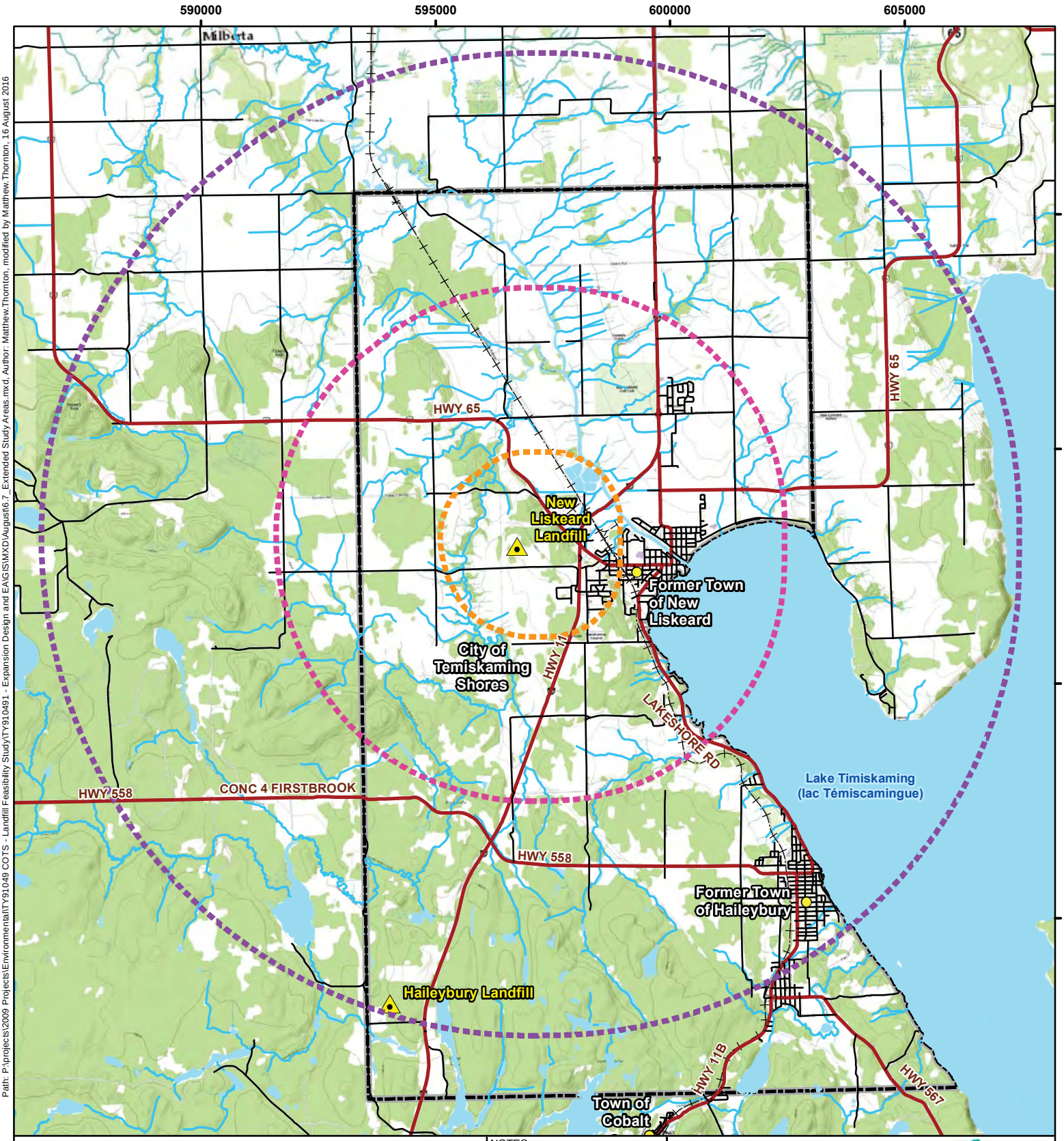
Datum & Projection: NAD 1983 UTM Zone 17N

0 0.5 1 1.5 2 Kilometres

N W E S

PROJECT N°:TY910491 | **FIGURE: 6.6**

SCALE: 1:20,000 | DATE: August 2016



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LEGEND

- Existing Landfill Locations
- Groundwater Study Area (1.5 km Buffer)
- Noise Study Area (5 km Buffer)
- Atmospheric Study Area (10 km Buffer)
- Municipal Boundary (City of Temiskaming Shores)
- Highway / Major Roads
- Local Roads
- Railway
- Watercourse
- Waterbody
- Wooded Area

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.

Datum & Projection: NAD 1983 UTM Zone 17N

0 2.5 5 7.5 10 Kilometres

N W E S

Temiskaming Shores

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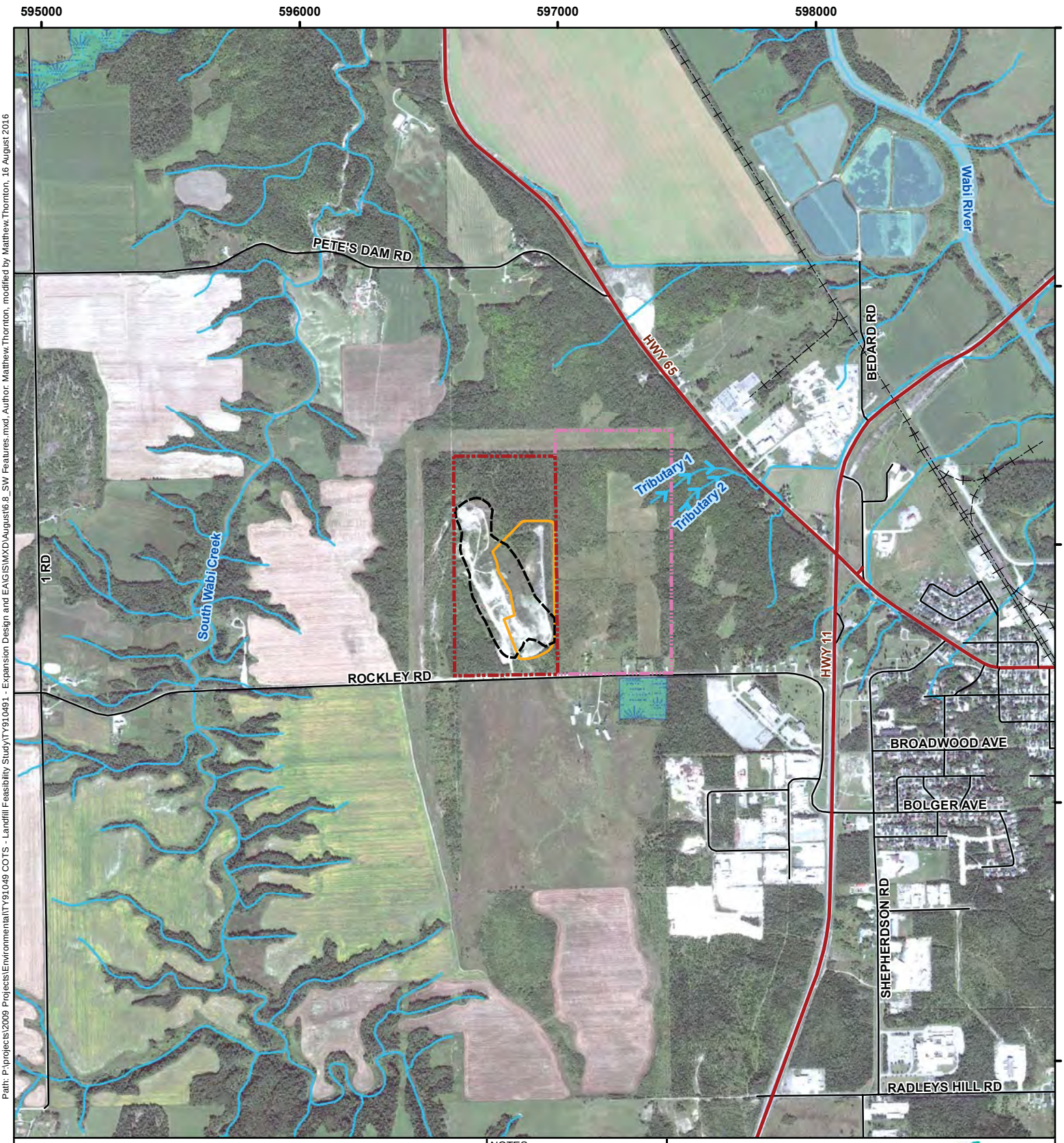
ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMNG SHORES, ONTARIO

Extended Study Areas

PROJECT N°:TY910491 | **FIGURE: 6.7**

SCALE: 1:110,000 | DATE: August 2016



Path: P:\projects\2009 Projects\Environmental\TY910491 COTS - Landfill Feasibility Study\TY910491 - Expansion Design and EA\GIS\MXD\August\6.8_SW Features.mxd, Author: Matthew.Thornton, modified by Matthew.Thornton, 16 August 2016

LEGEND

- Property Boundary
- Contaminant Attenuation Zone
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)
- Highway / Major Roads
- Local Roads
- Railway
- Permanent Watercourse
- Waterbody
- Wetland
- Tributary Flow Direction

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.

Temiskaming Shores

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ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Surface Water Features

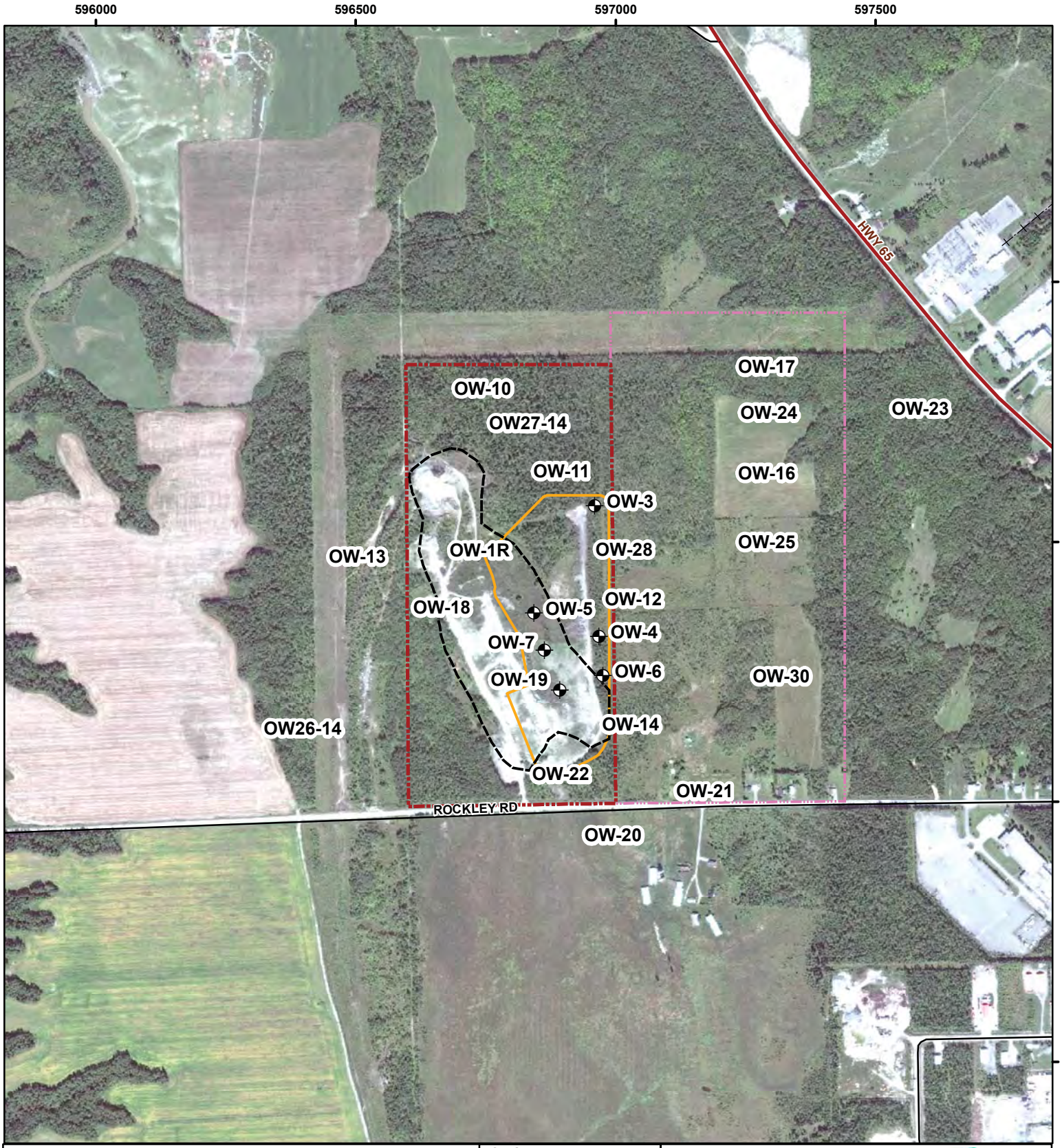
Datum & Projection: NAD 1983 UTM Zone 17N

0 0.5 1 1.5 2 Kilometres

N W E S

PROJECT N°:TY910491 | **FIGURE: 6.8**

SCALE: 1:20,000 | DATE: August 2016



Path: P:\projects\2009 Projects\Environmental\TY910491 COTS - Landfill Feasibility Study\TY910491 - Expansion Design and EA\GIS\MXD\August\6.9_Borehole Locations.mxd, Author: Matthew.Thornton, modified by Matthew.Thornton, 16 August 2016

LEGEND

- Property Boundary
- Contaminant Attenuation Zone
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)
- Highway / Major Roads
- Local Roads
- Railway

0 0.25 0.5 0.75 1 Kilometres

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.

Datum & Projection: NAD 1983 UTM Zone 17N

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ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Borehole Locations

PROJECT N^{o}:TY910491	**FIGURE: 6.9**
SCALE: 1:10,000	DATE: August 2016

Path: P:\projects\2009 Projects\Environmental\TY91049 COTS - Landfill Feasibility Study\TY910491 - Expansion Design and EA\GIS\MXD\August\6.10_Surface Geology.mxd, Author: Matthew.Thornton, modified by Matthew.Thornton, 16 August 2016

LEGEND

- Property Boundary
- Contaminant Attenuation Zone
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)
- Highway / Major Roads
- Local Roads
- Railway
- Watercourse

0 0.5 1 1.5 2 Kilometres

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.

Datum & Projection: NAD 1983 UTM Zone 17N

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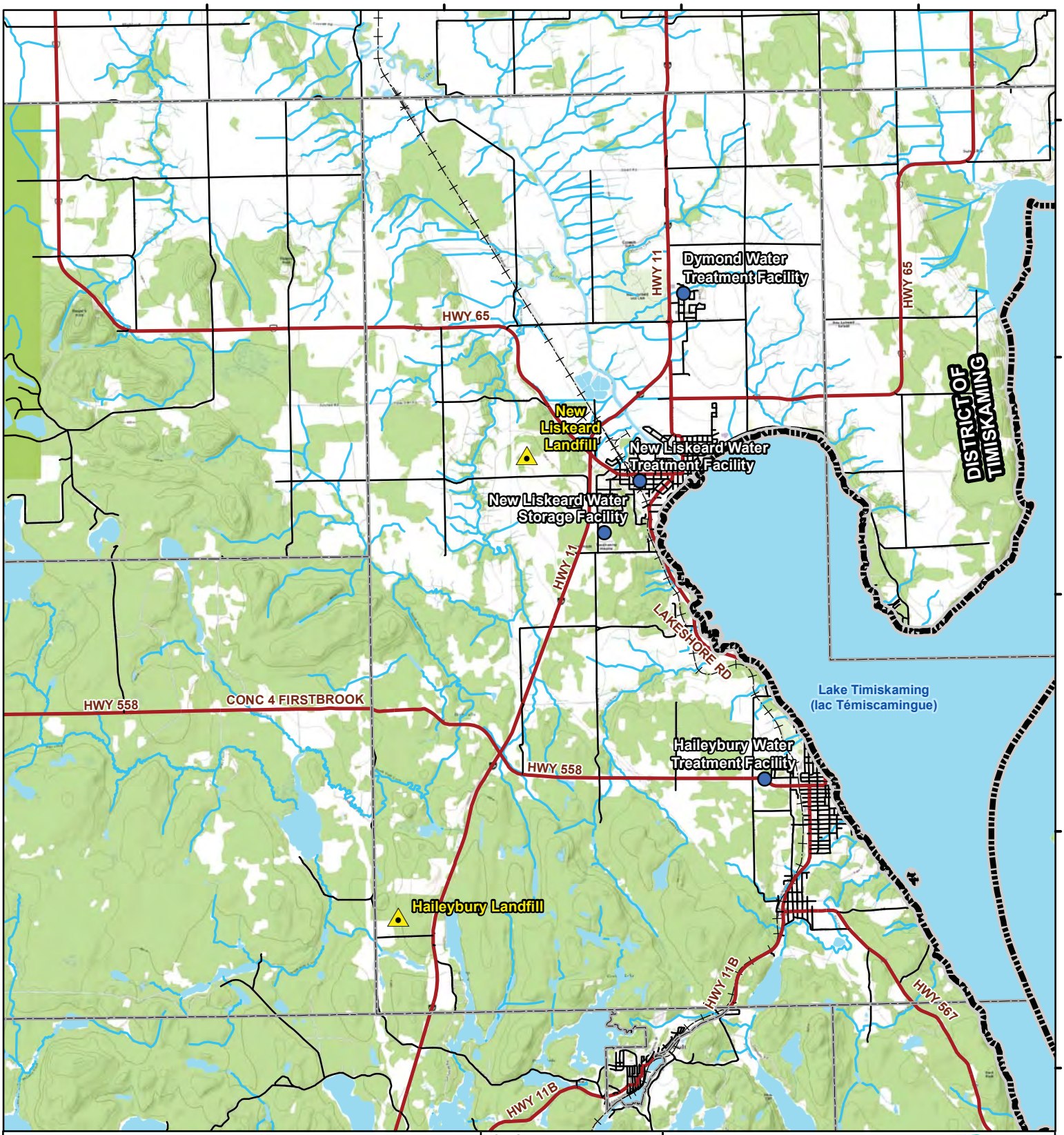
ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Surficial Geology

PROJECT N°:TY910491	**FIGURE: 6.10**
SCALE: 1:20,000	DATE: August 2016



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LEGEND

- Existing Landfill Locations
- Municipal Water Facilities
- District of Timiskaming Boundary
- City of Temiskaming Shores Boundary
- Highway / Major Roads
- Local Roads
- Railway
- Watercourse
- Waterbody
- Wooded Area

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.

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ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

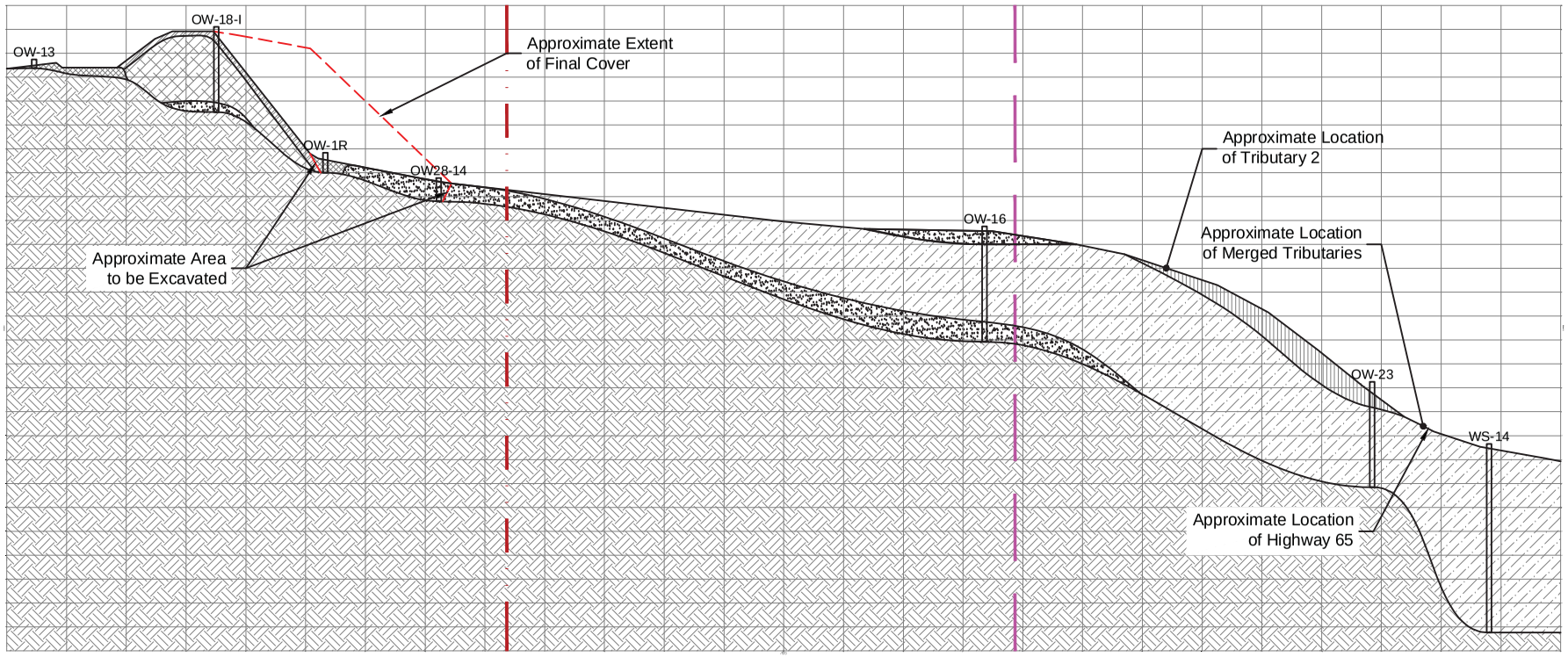
Municipal Groundwater Well Locations

Datum & Projection: NAD 1983 UTM Zone 17N

0 2 4 6 8 Kilometres

PROJECT N°:TY910491 | **FIGURE: 6.11**

SCALE: 1:110,000 | DATE: August 2016



LEGEND

- Property Boundary
- Contaminant Attenuation Zone
- Approximate Extent of Final Cover
- Approximate Area to be Excavated

- Fill
- Clay
- Refuse
- Silty Sand
- Till
- Clayey Silt
- Bedrock

NOTES:
- Existing Waste and Bedrock profiles interpolated from survey date and investigative drilling.
- Vertical exaggeration factor of four (4) shown.

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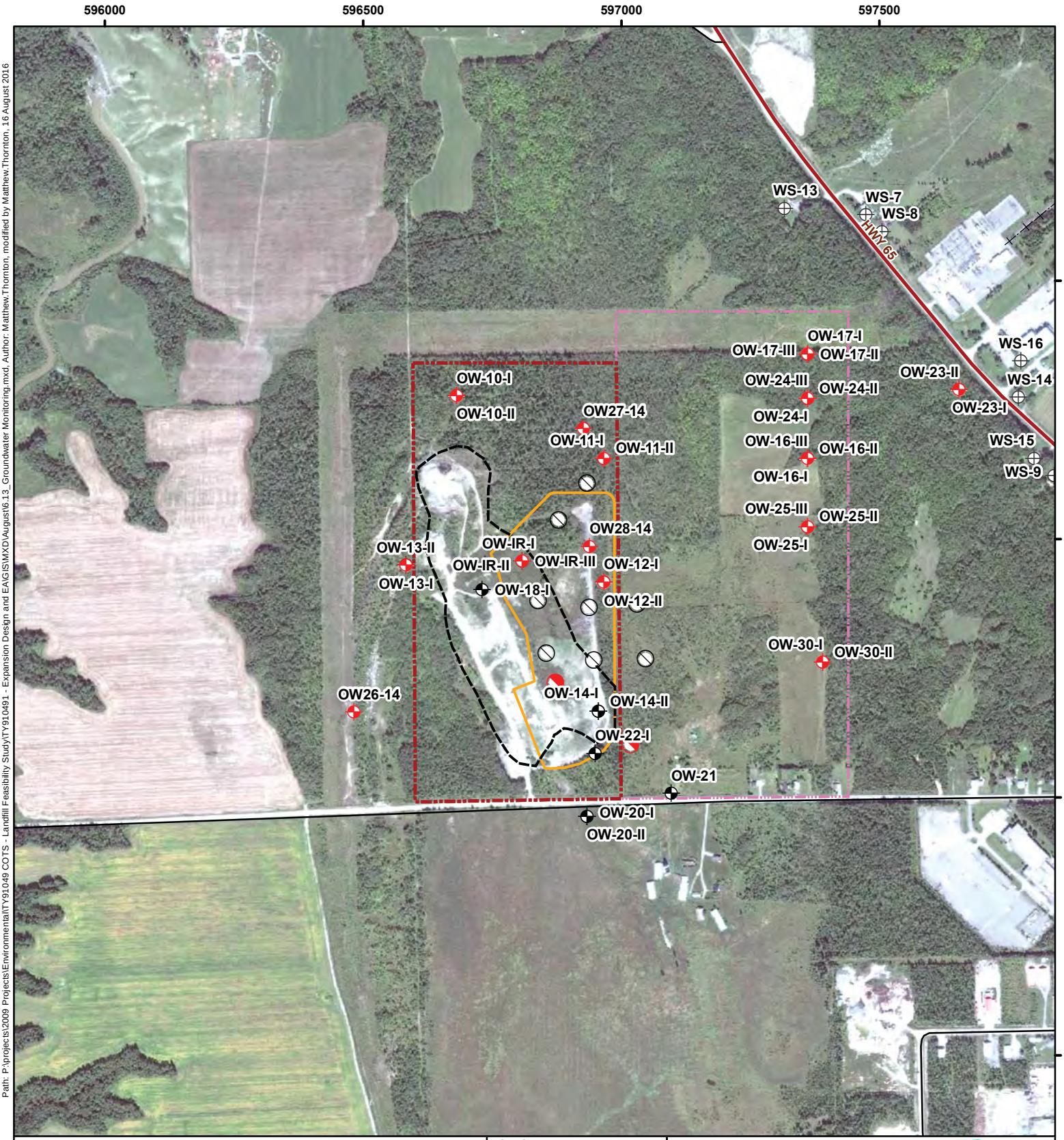
ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Hydrogeological Cross Section

PROJECT NO: TY910491	FIGURE: 6.12
SCALE: AS SHOWN	DATE: August 2016



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LEGEND

- Property Boundary
- Contaminant Attenuation Zone
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)
- Highway / Major Roads
- Local Roads
- Railway
- Monitoring Well (Groundwater Monitoring)
- Monitoring Well (Destroyed)
- Monitoring Well (Decommissioned)
- Monitoring Well (Groundwater Level)
- Residential Wells

0 0.25 0.5 0.75 1 Kilometres

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.

Datum & Projection: NAD 1983 UTM Zone 17N

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ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Groundwater Well Locations

PROJECT N^{o}:TY910491	**FIGURE: 6.13**
SCALE: 1:10,000	DATE: August 2016

Path: P:\projects\2009 Projects\Environmental\TY91049 COTS - Landfill Feasibility Study\TY910491 - Expansion Design and EA\GIS\MXD\August\6.14 A_Chloride Concentration.mxd, Author: Matthew.Thornton, modified by Matthew.Thornton, 26 August 2016

LEGEND

- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)
- Highway / Major Roads
- Local Roads
- Railway
- Monitoring Well (Groundwater Monitoring)
- Monitoring Well (Groundwater Level)
- 50 Chloride Concentration
- Limit of Waste

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.

Datum & Projection: NAD 1983 UTM Zone 17N

0 0.25 0.5 0.75 1 Kilometres

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NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Chloride Concentration Contour Plan Spring 2015

PROJECT N°:TY910491	**FIGURE: 6.14 A**
SCALE: 1:10,000	DATE: August 2016

Path: P:\projects\2009 Projects\Environmental\TY910491 COTS - Landfill Feasibility Study\TY910491 - Expansion Design and EA\GIS\MXD\August\6.14 B_Chloride Concentration.mxd, Author: Matthew.Thornton, modified by Matthew.Thornton, 26 August 2016

LEGEND

- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)
- Highway / Major Roads
- Local Roads
- Railway
- Monitoring Well (Groundwater Monitoring)
- Monitoring Well (Groundwater Level)
- 50 Chloride Concentration
- Limit of Waste

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.

Datum & Projection: NAD 1983 UTM Zone 17N

0 0.25 0.5 0.75 1 Kilometres

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ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Chloride Concentration Contour Plan July 2015

PROJECT N°:TY910491	**FIGURE: 6.14 B**
SCALE: 1:10,000	DATE: August 2016

Path: P:\projects\2009 Projects\Environmental\TY91049 COTS - Landfill Feasibility Study\TY910491 - Expansion Design and EA\GIS\MXD\August\6.14 C_Chloride Concentration.mxd, Author: Matthew.Thornton, modified by Matthew.Thornton, 26 August 2016

LEGEND

- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)
- Highway / Major Roads
- Local Roads
- Railway
- Monitoring Well (Groundwater Monitoring)
- Monitoring Well (Groundwater Level)
- 50 Chloride Concentration
- Limit of Waste

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.

Datum & Projection: NAD 1983 UTM Zone 17N

0 0.25 0.5 0.75 1 Kilometres

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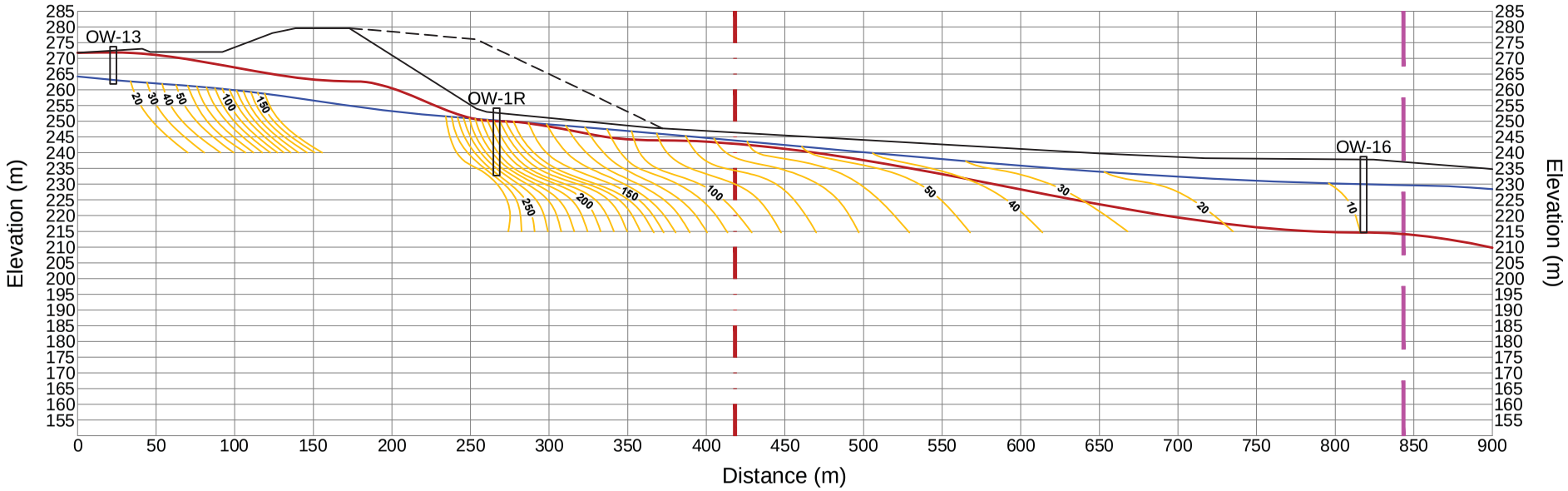
ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Chloride Concentration Contour Plan September 2015

PROJECT N^{o}:TY910491	**FIGURE: 6.14 C**
SCALE: 1:10,000	DATE: August 2016



Section A - A

LEGEND

- Property Boundary
- Contaminant Attenuation Zone
- Existing Ground Profile
- Inferred Bedrock Profile
- Inferred Groundwater Profile
- Approximate Extent of Final Cover
- Inferred Chloride Contour (mg/L)

NOTES:
- Existing Waste and Bedrock profiles interpolated from survey date and investigative drilling.

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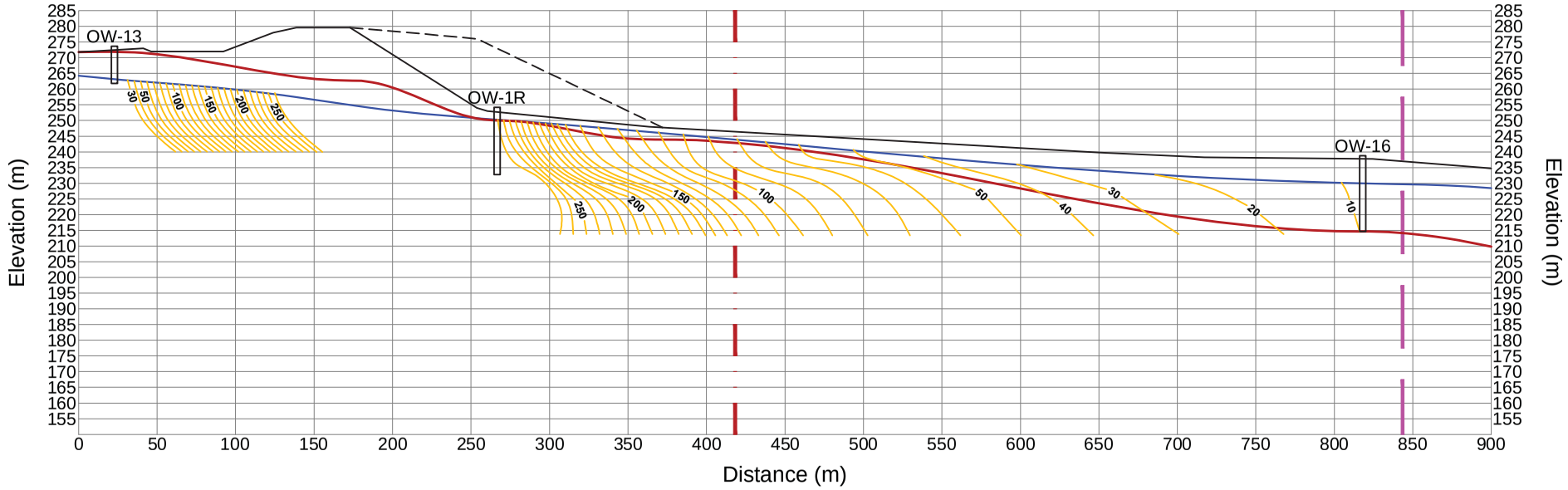
ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Chloride Cross Sectional Profile
May 2015

PROJECT NO: TY910491	FIGURE: 6.15 A
SCALE: AS SHOWN	DATE: August 2016



Section A - A

LEGEND

- Property Boundary
- Contaminant Attenuation Zone
- Existing Ground Profile
- Inferred Bedrock Profile
- Inferred Groundwater Profile
- Approximate Extent of Final Cover
- Inferred Chloride Contour (mg/L)

NOTES:
- Existing Waste and Bedrock profiles interpolated from survey date and investigative drilling.

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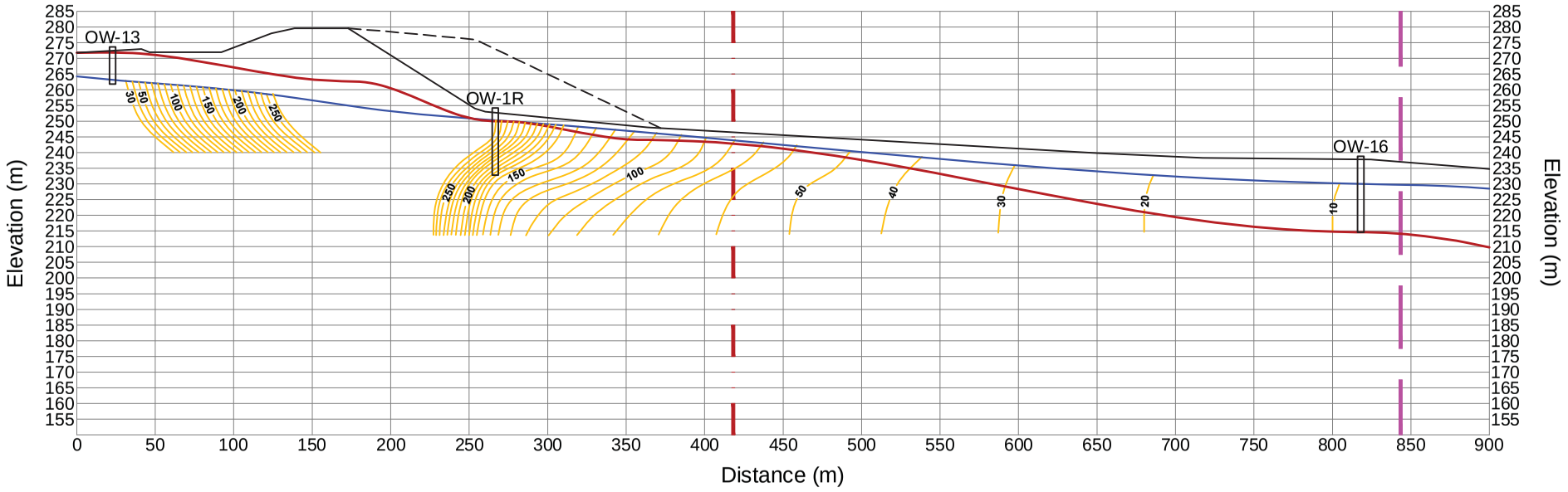
ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Chloride Cross Sectional Profile
July 2015

PROJECT NO: TY910491 | FIGURE: 6.15 B

SCALE: AS SHOWN | DATE: August 2016



Section A - A

LEGEND

- Property Boundary
- Contaminant Attenuation Zone
- Existing Ground Profile
- Inferred Bedrock Profile
- Inferred Groundwater Profile
- Approximate Extent of Final Cover
- Inferred Chloride Contour (mg/L)

NOTES:
- Existing Waste and Bedrock profiles interpolated from survey date and investigative drilling.

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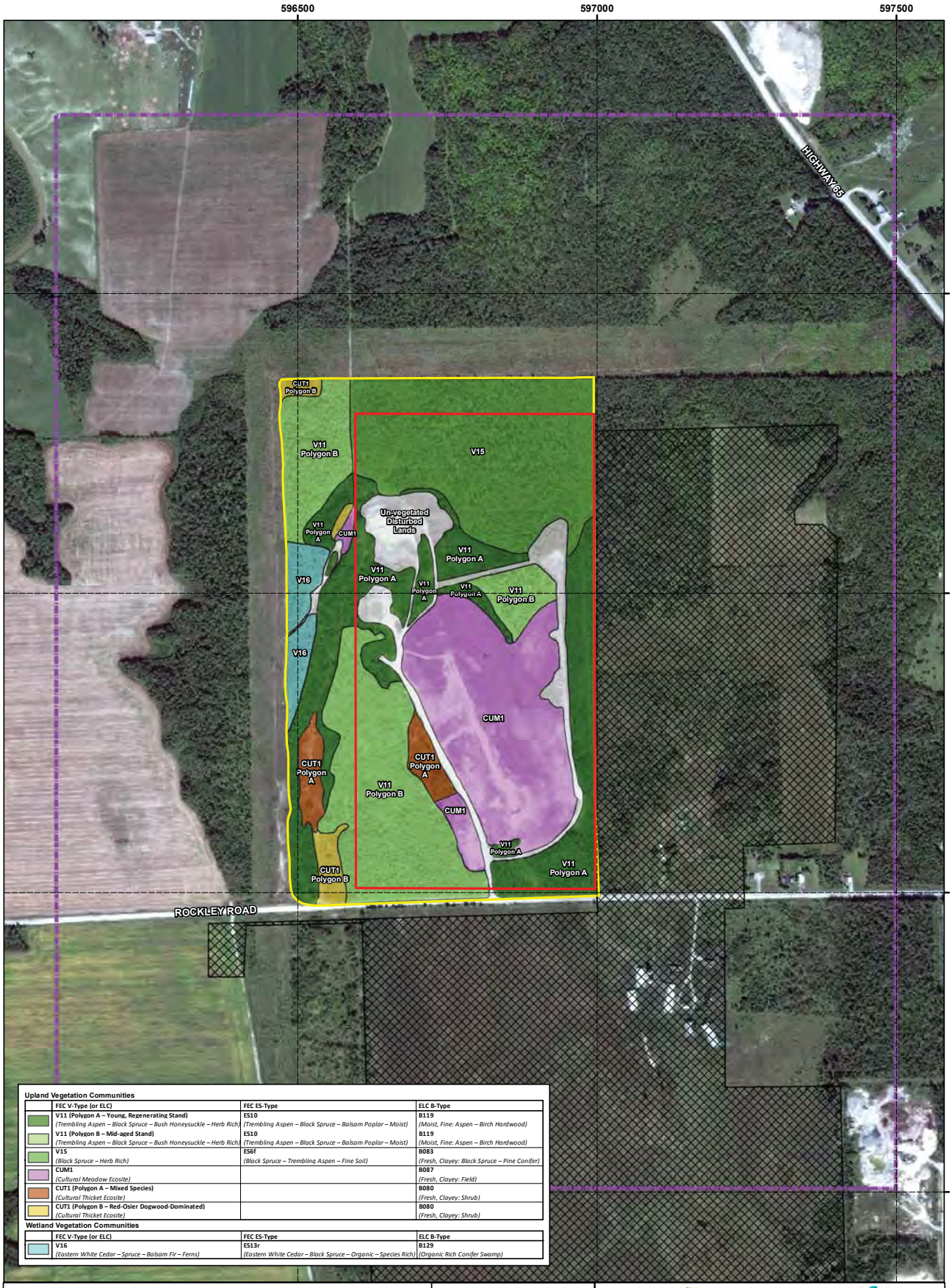
ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Chloride Cross Sectional Profile
September 2015

PROJECT NO: TY910491	FIGURE: 6.15 C
SCALE: AS SHOWN	DATE: August 2016



Upland Vegetation Communities

	FEC V-Type (or ELC)	FEC ES-Type	ELC B-Type
	V11 (Polygon A – Young, Regenerating Stand) *(Trembling Aspen – Black Spruce – Bush Honeysuckle – Herb Rich)*	**ES10** *(Trembling Aspen – Black Spruce – Balsam Poplar – Moist)*	**B119** *(Moist, Fine: Aspen – Birch Hardwood)*
	V11 (Polygon B – Mid-aged Stand) *(Trembling Aspen – Black Spruce – Bush Honeysuckle – Herb Rich)*	**ES10** *(Trembling Aspen – Black Spruce – Balsam Poplar – Moist)*	**B119** *(Moist, Fine: Aspen – Birch Hardwood)*
	V15 *(Black Spruce – Herb Rich)*	**ES6f** *(Black Spruce – Trembling Aspen – Fine Soil)*	**B083** *(Fresh, Clayey: Black Spruce – Pine Conifer)*
	CUM1 *(Cultural Meadow Ecosite)*		**B087** *(Fresh, Clayey: Field)*
	CUT1 (Polygon A – Mixed Species) *(Cultural Thicket Ecosite)*		**B080** *(Fresh, Clayey: Shrub)*
	CUT1 (Polygon B – Red-Osier Dogwood-Dominated) *(Cultural Thicket Ecosite)*		**B080** *(Fresh, Clayey: Shrub)*

Wetland Vegetation Communities

	FEC V-Type (or ELC)	FEC ES-Type	ELC B-Type
	V16 *(Eastern White Cedar – Spruce – Balsam Fir – Ferns)*	**ES13r** *(Eastern White Cedar – Black Spruce – Organic – Species Rich)*	**B129** *(Organic Rich Conifer Swamp)*

LEGEND

- Surveyed Terrestrial Study Area
- Site Study Area
- Extended Terrestrial Study Area
- Approximate Boundary of Proposed Solar Facility
- Un-vegetated Disturbed Lands

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.

Datum & Projection: NAD 1983 UTM Zone 17N

0 200 400 600 800 Meters

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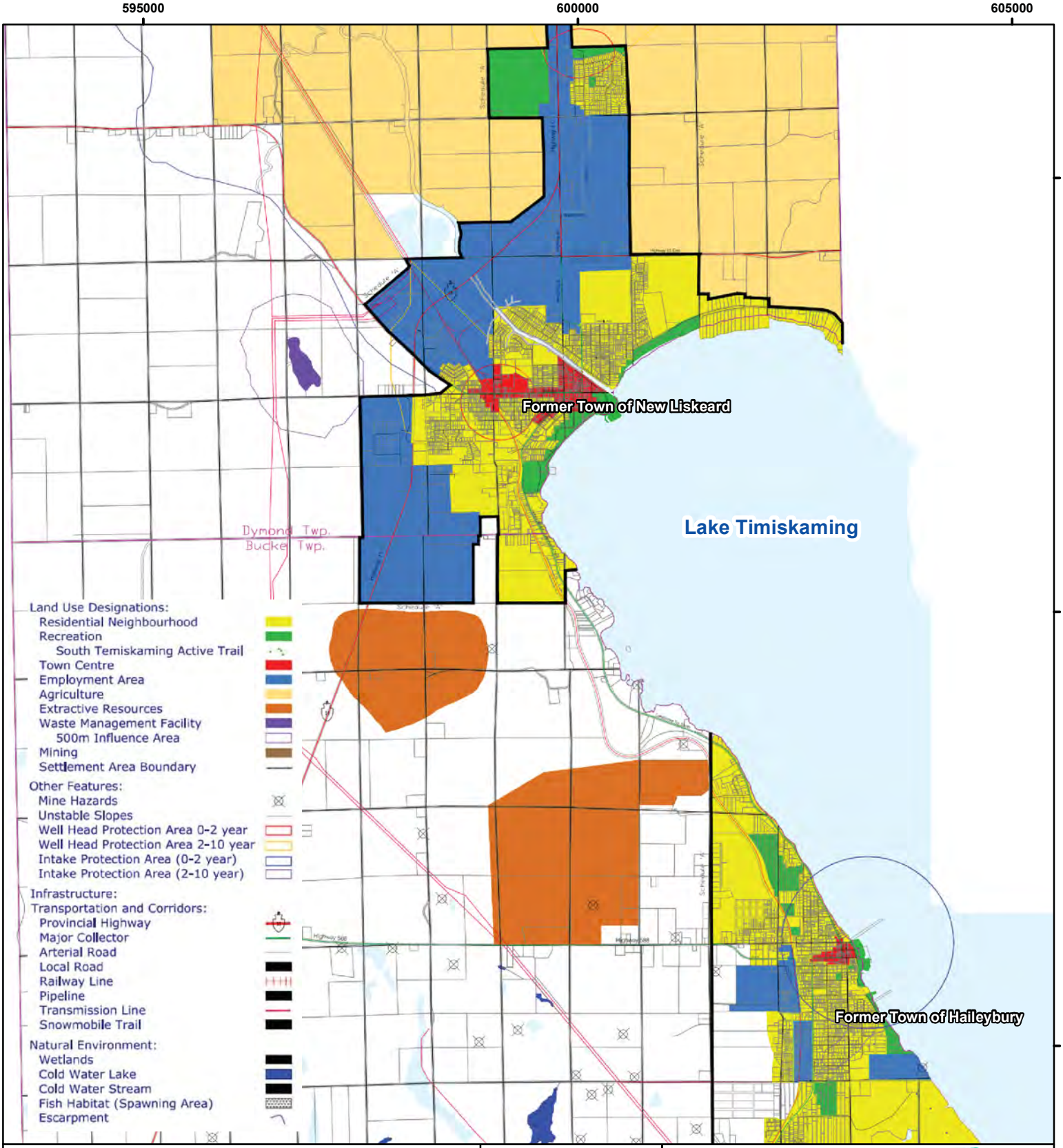
ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES ONTARIO

Forest Ecosystem Classification and Ecological Land Classification

PROJECT N°:TY910491 | **FIGURE: 6.16**

SCALE: 1:6,000 | DATE: August 2016



Path: P:\projects\2009 Projects\Environmental\TY910491 COTS - Landfill Feasibility Study\TY910491 - Expansion Design and EA\GIS\MXD\August\6.17_Existing Land Use.mxd, Author: Matthew.Thornton, modified by Matthew.Thornton, 26 August 2016

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Land use designations extracted from the City of Temiskaming Shores Official Plan.

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ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Existing Land Use

Datum & Projection:
NAD 1983 UTM Zone 17N

N
W E
S

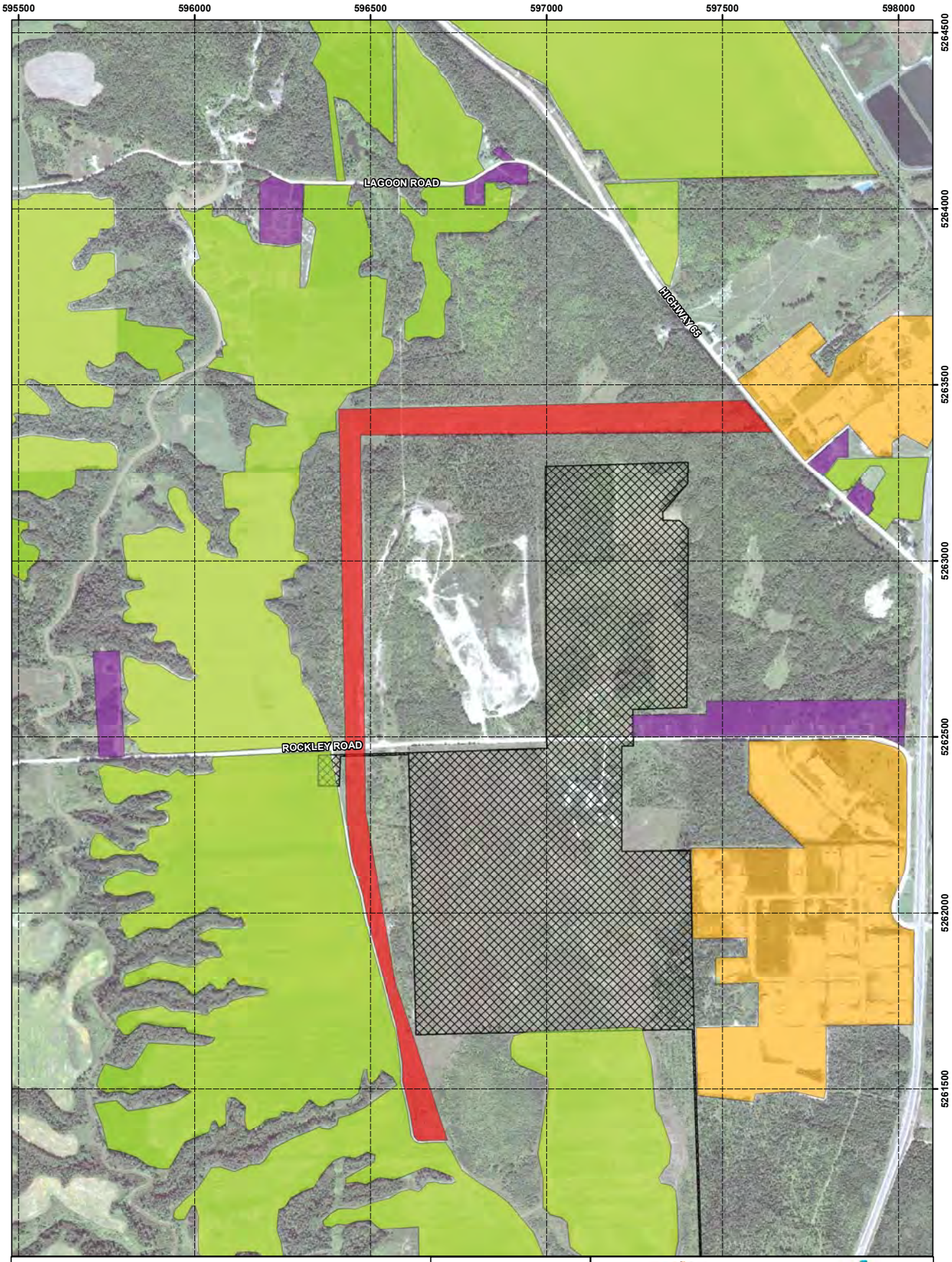
0 1 2 3 4 5 Kilometres

PROJECT N^{o}:TY910491

FIGURE: 6.17

SCALE: 1:60,000

DATE: August 2016



LEGEND

- Approximate Boundary of Proposed Solar Facility
- Approximate Utility Easement
- Agricultural Land Use
- Residential Properties
- Commercial / Industrial

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.

Datum & Projection:
NAD 1983 UTM Zone 17N

0 300 600 900 1,200 Meters

N W E S

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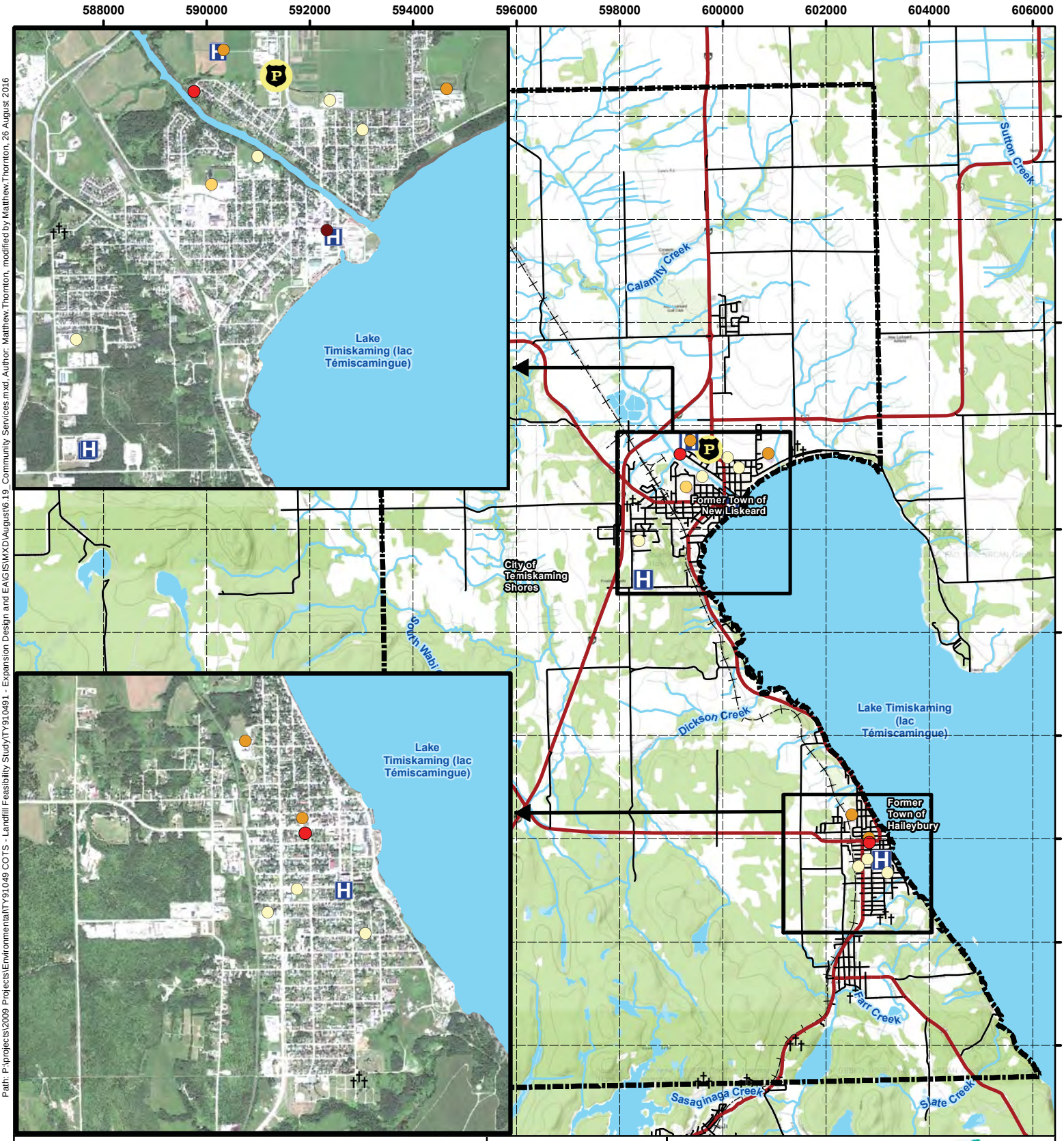
ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES ONTARIO

Neighbouring Land Use

PROJECT N^{O}:TY910491 | **FIGURE: 6.18**

SCALE: 1:10,000 | DATE: August 2016



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LEGEND

- City of Temiskaming Shores Boundary
- Highway / Major Roads
- Local Roads
- Railway
- Watercourse
- Waterbody

Municipal and Community Services

- Fire Station
- OPP Station
- Health Care Facility
- Elementary School
- Post-Secondary School
- High School
- School Board
- Cemetery

NOTES:
* Forest Ecosystem Classification extracted from Forest Resource Inventory, using the MNR classsification codes, under Land Information of Ontario open data licence terms.
- Topographic Data extracted from LIO, MNRF

Datum & Projection: NAD 1983 UTM Zone 17N

0 2 4 6 8 Kilometres

N W E S

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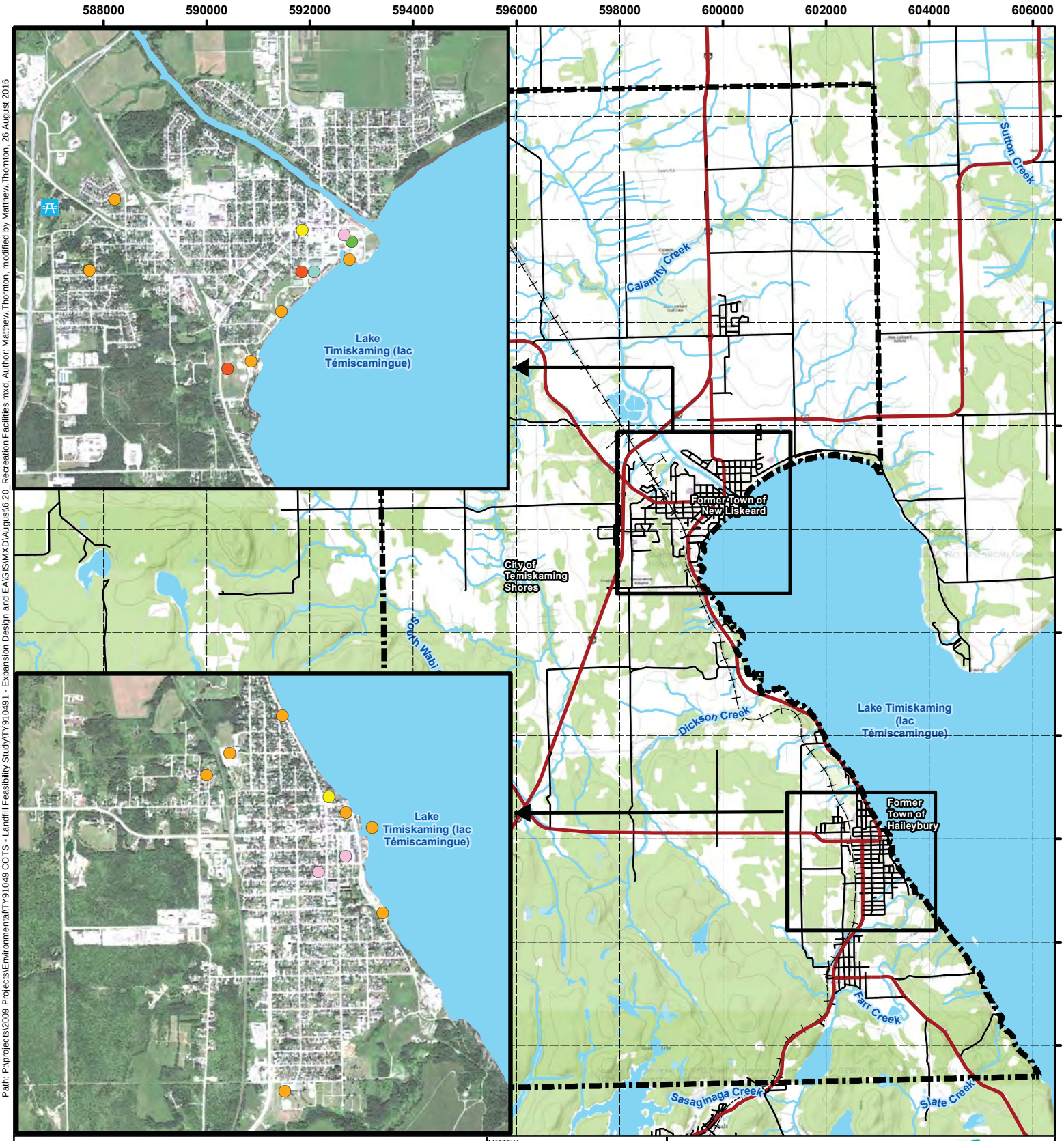
ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Municipal and Community Services

PROJECT N°:TY910491	**FIGURE: 6.19**
SCALE: 1:100,000	DATE: August 2016



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LEGEND

- City of Temiskaming Shores Boundary
- Highway / Major Roads
- Local Roads
- Railway
- Watercourse
- Waterbody

Recreation Facilities

- Amusment Park
- Arena
- Exhibition Grounds
- Golf Course
- Outdoor Ice Rinks
- Parks
- Picnic Area
- Pool
- Public Library
- Skateboard Park

NOTES:
- Community services and recreation points are vector representations derived from visual interpretation/ coordinates of Temiskaming Shores website.
- Recreations points extracted from CanVec, MNRF
- Topographic Data extracted from LIO, MNRF

Datum & Projection: NAD 1983 UTM Zone 17N

0 2 4 6 8 Kilometres

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ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Recreation Facilities and Locations

PROJECT N^{o}:TY910491	**FIGURE: 6.20**
SCALE: 1:100,000	DATE: August 2016

7.0 ENVIRONMENTAL EFFECTS PREDICITON AND ASSESSMENT

7.1 Natural Environment

7.1.1 Atmospheric Environment

7.1.1.1 Air Quality

The Project's Construction Phase (Year 1) will include Site preparation and construction of landfill infrastructure (specifically Cell 1). However, construction activities will be part of the Project's Operation Phase (Years 2 to 20) due to simultaneous and sequential activities (i.e., filling of an active cell, construction of the next cell and closure of the previous cell). The environmental effects assessment considered the sources of air emissions that are associated with the active construction and operation activities of the Project. As well, to be conservative, the maximum operating scenario was developed based on the maximum material and truck movements.

Similar equipment will be used during the construction and operation activities, and particulate matter (dust) is the key substance with the potential for the most notable off-Site effect. Vehicle travel on the approximately 725 m unpaved section of Rockley Road can also be a contributor to particulate emissions. The Project's emissions will be managed through a fugitive dust best management plan (DBMP).

A technical support document has been prepared for the assessment of the atmospheric environment, including air quality and greenhouse gas (GHG) emissions, and is presented in Appendix F.

For the Project, the following emission sources were identified and included in the dispersion modelling assessment:

- Landfill working face;
- Landfill cover;
- Existing (closed) landfill;
- Site roadway; and
- Cover stockpile.

The air quality assessment encompassed the sources of air emissions that are associated with the operation of the landfill. A maximum emission scenario was developed and the dispersion model was used to predict the worst-case off-Site effects (in $\mu g/m^3$) of TSP, $PM_{10,}$ $PM_{2.5}$, NO_2, SO_2, CO, VC, H_2S, benzene, acrylonitrile and odour, for each of the relevant averaging times (e.g., 24 hour, 1 hour, and 10 minute). The dispersion modelling was used to predict the maximum off-Site effects for a given pollutant, which is termed the maximum point of impingement (POI); the POI for each key substance was compared to the respective Ambient Air Quality Criterion

(AAQC). The AAQCs are not standards but are air quality objectives, or desirable air quality objectives, and are used to consider all sources as well as background air quality.

In addition to modelling to determine maximum off-Site effects (POI concentrations), a number of nearby sensitive receptors were identified to assess potential effects at locations where human activity is expected. Each of the receptors identified is a residence. Figure 7.1 presents the location of these receptors.

The results of the dispersion modelling are presented in Tables 7.1 to 7.3 as the maximum off-property modelled concentrations. Table 7.1 presents the aggregate Site-wide emission rates for all contaminants from all sources (mobile and stationary), with comparison to the Ontario AAQC.

Table 7.1 provides a summary of results of the full AAQC assessment. The results reflect the maximum predicted concentrations considering all Site emission sources (stationary and mobile) and also present the maximum cumulative concentration for each parameter in terms of the sum of the modelled and the baseline concentrations. The specific air quality results at the maximum of the sensitive receptors in the Extended Study Area are shown in Table 7.2.

There were no exceedances of NO_2, CO, SO_2, VC or H_2S predicted off-property, as all ground level air concentrations were determined to be lower than the respective AAQC for all averaging times.

The modelling output for the AAQC scenarios are depicted in Figures 7.2 to 7.8, with the predicted ambient concentration isopleths (lines of equal concentration) for total particulate matter (PM_{tot}), PM_{10}, $PM_{2.5}$ (maximum 24-hour and annual), NO_2 (24- and 1-hour) and H_2S (24-hour) shown.

The shapes of the isopleths indicate the location of effects, which vary with direction and distance, as a result of source locations, emission rates, meteorological conditions and receptor elevation (the model assesses the effect of topography on dispersion).

Fugitive dusts are one of the key substances that may be emitted from the Site and have a high potential for causing off-Site effects unless effective mitigation is implemented at the various sources. As summarized in Table 7.2, PM_{10} and $PM_{2.5}$ show potential exceedances of the AAQC at the property boundary but not at any sensitive receptors. The potential AAQC exceedances are limited to an area along the eastern property boundary and the modelled concentrations decrease to below the AAQCs within 100 m of the property boundary, which is within the 500 metre buffer zone established for the Project. The modelled concentrations are at a level that is also typical of many landfill sites in Ontario.

The potential for NO_2 exceedances also exists should too many large engines operate simultaneously in close proximity. For the purposes of the assessment, it was assumed that up to three large pieces of equipment may be in operation in an 80 m by 80 m area centred at the active face.

Table 7.1: Emission Summary Table with Comparison to Ontario AAQCs

Compounds	CAS Number	Facility Emission Rate (g/s)	Model Used	Averaging Period (hr - unless noted otherwise)	Ontario AAQC (µg/m^3)	Limiting Effect	Modelled POI Concentration (µg/m^3)	% of AAQC	Baseline Concentration (µg/m^3)	Cumulative Concentration (Modelled + Baseline) (µg/m^3)	% of Criteria
Total Particulate (TSP)	NA	0.28	AERMOD	24	120	visibility	113.2	94.4%	40.8	154.0	128.4%
			AERMOD	annual	60		13.8	22.9%	22.0	35.8	59.6%
PM_{10}	NA	0.10	AERMOD	24	50	health	58.9	117.8%	20.4	79.3	158.6%
$PM_{2.5}$	NA	0.06	AERMOD	24	27	health	46.8	173.3%	10.2	57.0	211.1%
			AERMOD	annual	8.8		5.6	64.0%	5.5	11.1	126.5%
Nitrogen Dioxide (NO_2)	10102-44-0	0.75	AERMOD	1	400	health	317.1	79.3%	33.2	350.3	87.6%
		0.19	AERMOD	24	200		35.5	17.8%	28.8	64.3	32.2%
Carbon Monoxide (CO)	630-08-0	0.80	AERMOD	1	36200	health	376.0	1.0%	NA	376.0	1.0%
			AERMOD	8	15700		83.0	0.5%	NA	83.0	0.5%
Sulfur Dioxide (SO_2)	7446-09-5	0.059	AERMOD	24	275	health and vegetation	3.5	1.3%	14.9	18.4	6.7%
		0.0147	AERMOD	1	690		31.3	4.5%	9.3	40.6	5.9%
			AERMOD	annual	55		0.44	0.8%	5.4	5.8	10.6%
Vinyl Chloride	75-01-4	8.75E-04	AERMOD	24	1	health	0.21	20.7%	NA	0.21	20.7%
			AERMOD	annual	0.2		0.037	18.7%	NA	0.037	18.7%
Hydrogen sulphide (H_2S)	7783-06-4	2.35E-03	AERMOD	24	7	health	0.557	8.0%	NA	0.56	8.0%
		2.35E-03	AERMOD	10-min	13	odour	2.02	15.5%	NA	2.02	15.5%
Acrylonitrile	107-13-1	6.40E-04	AERMOD	24	0.6	health	0.15	25.3%	NA	0.15	25.3%
			AERMOD	annual	0.12		0.027	22.9%	NA	0.03	22.9%
Benzene	71-43-2	2.84E-04	AERMOD	24	2.3	health	0.07	2.9%	NA	0.07	2.9%
			AERMOD	annual	0.45		0.01	2.7%	NA	0.01	2.7%

Notes:
The modelled concentrations account for meteorological anomalies, as per MOE Guidance, except for hydrogen sulphide, vinyl chloride, and annual averages where the maximum concentrations were reported.

For $PM_{2.5}$, the 2015 CAAQS is 28 µg/m^3, and the 2020 CAAQS will be 27 µg/m^3. CAAQS will also come into effect for the annual averaging period.
The annual averages were those averaged over 5-years; since the POIs were notably lower than the AAQCs, the maximum for each individual year was not determined.
The PM_{10} AAQC is an interim value.

Table 7.2: Emission Summary Table with Maximum Concentration at Sensitive Receptor

Compounds	CAS Number	Facility Emission Rate (g/s)	Model Used	Averaging Period (hr - unless noted otherwise)	Ontario AAQC ($\mu g/m^3$)	Maximum Concentration at POR ($\mu g/m^3$)	Receptor ID	Baseline Concentration ($\mu g/m^3$)	Cumulative Concentration (Modelled + Baseline) ($\mu g/m^3$)	% of Criteria
Total Particulate (TSP)	NA	0.28	AERMOD	24	120	8.7	POR-01	40.8	49.5	41.3%
			AERMOD	annual	60	0.5	POR-01	22.0	22.5	37.5%
PM_{10}	NA	0.10	AERMOD	24	50	4.8	POR-01	20.4	25.2	50.5%
$PM_{2.5}$	NA	0.06	AERMOD	24	27	3.9	POR-01	10.2	14.1	52.2%
			AERMOD	annual	8.8	0.22	POR-01	5.5	5.7	65.0%
Nitrogen Dioxide (NO_2)	10102-44-0	0.75	AERMOD	1	400	135	POR-02	33	168.5	42.1%
		0.19	AERMOD	24	200	5.9	POR-02	28.8	34.7	17.3%
Carbon Monoxide (CO)	630-08-0	0.80	AERMOD	1	36200	153	POR-02	NA	153.4	0.4%
			AERMOD	8	15700	21	POR-02	NA	21.3	0.1%
Sulfur Dioxide (SO_2)	7446-09-5	0.059	AERMOD	24	275	0.6	POR-02	14.9	15.5	5.6%
		0.0147	AERMOD	1	690	13.3	POR-02	9.3	22.6	3.3%
			AERMOD	annual	55	1.48E-02	POR-01	5.4	5.4	9.8%
Vinyl Chloride	75-01-4	8.75E-04	AERMOD	24	1	0.070	POR-02	NA	0.07	7.0%
			AERMOD	annual	0.2	3.91E-03	POR-02	NA	0.004	2.0%
Hydrogen sulphide (H_2S)	7783-06-5	2.35E-03	AERMOD	24	7	0.19	POR-02	NA	0.19	2.7%
		2.35E-03	AERMOD	10-min	13	1.11	POR-02	NA	1.11	8.5%
Acrylonitrile	107-13-1	6.40E-04	AERMOD	24	0.6	0.05	POR-02	NA	0.05	8.5%
			AERMOD	annual	0.12	2.861E-03	POR-02	NA	0.003	2.4%
Benzene	71-43-2	2.84E-04	AERMOD	24	2.3	0.02	POR-02	NA	0.02	1.0%
			AERMOD	annual	0.45	0.0013	POR-02	NA	0.0013	0.3%

Notes:

The modelled concentrations account for meteorological anomalies, as per MOE Guidance, except for hydrogen sulphide and vinyl chloride where the maximum concentrations were reported.

For $PM_{2.5}$, the 2015 CAAQS is 28 $\mu g/m^3$, and the 2020 CAAQS will be 27 $\mu g/m^3$. CAAQS will also come into effect for the annual averaging period.

The annual averages were those averaged over 5-years; since the POIs were notably lower than the AAQCs, the maximum for each individual year was not determined.

The PM10 AAQC is an interim value.

These predicted levels should be considered in the context of the conservative nature of the assessment and the frequency at which exceedances are modelled. The assessment is conservative in terms of the emission rate estimates reflecting the maximum emission scenario, and in terms of the modelling, which predicts effects from the worst-case meteorological conditions over five years of meteorological data. There were no exceedances of NO_2, CO, SO_2, VC or H_2S predicted off-property, as all ground level air concentrations were determined to be lower than the respective AAQC for all averaging times.

An analysis of the frequency of AAQC exceedances was performed to determine how many days out of the five-year modelling period that the predicted 24-hour average concentrations were greater than the respective AAQC. For $PM_{2.5}$, it was determined that at the most impacted receptor, the AAQC was exceeded 33 days or 1.8% of the time. For PM_{10} the AAQC, at the most impacted receptor, was exceeded 6 days or 0.3% of the time. The most impacted receptor is located along the property boundary. The frequency analysis at the most impacted receptor is presented in Table 7.3.

Table 7.3: PM_{10} and $PM_{2.5}$ Frequency Analysis at the Most Impacted Receptor

Parameter	Maximum Off-Site Concentration (µg/m^3)	Number of Days of Exceedance	Frequency of Exceedance
PM_{10}	58.9	6 days in 5 years	0.3%
$PM_{2.5}$	46.8	33 days in 5 years	1.8%

Potential environmental effects from the Project on air quality are considered adverse for particulate matter (fugitive dusts); however, these effects will be short-term, reversible, generally limited to the Site-vicinity Study Area and can be managed through mitigation measures. Environmental effects for all other parameters within the AAQC are considered to be negligible.

7.1.1.2 Nuisance Effects (Odour and Litter)

There is the potential for odorous effects from landfilling operations to result in a nuisance to humans that live, or may be present, in the vicinity of the landfill. Landfill gas odours are caused primarily by the presence of hydrogen sulphide and mercaptans that are often found at trace quantities in landfill gas. These compounds may be detected by sense of smell at very low concentrations (i.e., 0.005 and 0.001 parts per million for hydrogen sulphide and mercaptans, respectively).

Odorous emissions from the working face and the landfill cover were quantified and modelled in order to assess the potential for such effects to occur as a result of the Project.

The maximum predicted odour concentration at the property boundary during the Operations Phase suggest that odour may be at detectable levels; however, there are no human receptors at this location. The maximum concentrations (as per MOECC guidance) at all sensitive receptors are shown in Table 7.4. These values may be compared to an odour concentration of one odour unit per cubic metre (OU/m^3), which is the level at which 50% of the population would perceive

an odour. Although 1 OU/m^3 is not a standard, it is sometimes a useful metric in discussions of predicted odour effects. The results indicate that the maximum results at receptors POR01 and POR02 are only marginally above the 1 OU/m^3 level and less than levels which are often used for assessment of other municipal infrastructure. For POR01 there are only 37 hours that exceed 1 OU/m^3 out of a 5-year MET set or 0.08%. For POR02 there are only 57 hours that exceed 1 OU/m^3 out of a 5-year MET set or 0.13%. Therefore, the exceedances are not significant. Mitigation to control particulate emissions from the active face will also help to control and mitigate odours. Mitigation has not been factored into the odour modelling therefore these results are considered conservative.

Table 7.4: Potential Odour Effects

Receptor ID	Maximum 10-minute Odour Effect (OU/m^3)
POR01	1.1
POR02	1.4
POR03	0.3
POR04	0.4
POR05	0.4

Litter will be managed through best practices discussed in Section 8 and is considered to be a negligible effect.

The Project will have a net positive effect as long as mitigation measures are implemented.

7.1.1.3 Landfill Gas and Subsurface Migration

The generated landfill gas has two methods of emanating from a landfill Site: emission of the landfill gas to the atmosphere either under controlled release conditions (designed venting and/or collection structures) or uncontrolled conditions (venting through the landfill cover); and/or the migration of the landfill gas within the surrounding subsurface until a venting location is encountered.

Gas migration in the subsurface soil is governed by the same principles as groundwater flow. The migration of landfill gas is dependent on the soil conditions at the landfill Site, the landfill gas generation rate, the landfill site design and weather conditions throughout the year. A perched water table or frost layer will impact the distance of landfill gas migration and affect the location(s) of landfill gas venting from the soil to atmosphere since the boundary layer will create a reduced exfiltration area for the gas.

The risk of a landfill gas explosion is generally associated with subsurface migration of landfill gas into enclosed, subsurface structures located on or near the site. If landfill gas is allowed to accumulate in these areas, explosive concentrations of methane could develop. Accumulation of landfill gas within an enclosure could also create an environment that is toxic and oxygen deficient, and therefore, hazardous.

O.Reg. 232/98 (Landfill Sites) provides threshold criteria for landfill gas concentrations at new or expanding landfill sites. The criteria outlined in O.Reg. 232/98 provide a basis for assessing the potential impacts due to methane gas migration. The concentration limits specified in the regulation are:

- Less than 2.5 by volume in air (vol %) in the subsurface at the property boundary;
- Less than 1.0 vol % in any on-site building and in the area immediately outside the foundation if the building or structure is accessible to any person or contains electrical equipment or a potential source of ignition; and
- Less than 0.05 vol % in any off-site building and in the area immediately outside the foundation if the building or structure is accessible to any person or contains electrical equipment or a potential source of ignition.

O.Reg. 232/98 and 347(General – Waste Management) require landfill gas collection and flaring (burning) or use, for new, expanding and operating landfills larger than 1.5 million m^3. The revised O.Reg. 347 amended the requirements for control of the atmospheric emissions of landfill gas in Section 15 of O.Reg. 232/98 (in place since 1998) primarily by changing the landfill size trigger to 1.5 million m^3 and applying the requirements to operating sites, in addition to new or expanding landfills. The regulations also require the submission of a report, if appropriate, showing that a landfill does not generate gas of significant concern and that landfill gas facilities may not be needed.

The concentration level at which methane has the potential to explode is called the Explosive Limit. Methane is explosive when mixed with air at concentrations between 5 vol % and 15 vol %. At concentrations below 5 vol % and above 15 vol %, methane is not explosive. Therefore, the Lower Explosive Limit (LEL) of methane is 5 vol % and the Upper Explosive Limit (UEL) is 15 vol %. Methane is lighter than air and is likely to dissipate unless trapped inside enclosed spaces.

In Guideline D-4 (Land Use On or Near Landfills and Dumps), the MOECC provides Procedure D-4-1 (Guideline for Assessing Methane Hazards from Landfill Sites, dated November 1987), which states:

> *2.1 Methane cannot cause an explosion unless it accumulates to a concentration above its lower explosive limit (LEL) in an enclosed space where it can be ignited.*

In accordance with Procedure D-4-1, methane cannot cause an explosion unless it enters an enclosed space and accumulates to a concentration above its LEL, and has a high enough entry rate and high enough accumulation time, such that the methane concentration will be still above the LEL after dilution by ventilation of the enclosed space.

Procedure D-4-1 considers that methane concentrations in air (or in an enclosed space) greater than 20% LEL (equivalent to 1 vol % methane) may be associated with still higher concentrations,

exceeding the LEL. Therefore, methane concentrations greater than 20% LEL warn of conditions that could potentially be hazardous in enclosed structures and gas control systems should be designed to maintain methane concentrations below this level.

Landfill gas monitoring of potential subsurface migration and the development of a contingency plan to address migration are discussed in Section 8.0.

7.1.1.4 Greenhouse Gases and Climate Change Impacts

The estimated GHG emissions for the Project are presented in Table 7.5 for Year 21 (2039), the year determined to release the maximum GHG emissions in carbon dioxide equivalent (CO_2eq). The graph presented as Figure 7.9 shows the landfill and fleet GHG emissions, in kiloTonne per year (kiloTonne/yr), with the peak in Year 21 (2039).

Table 7.5: Project GHG Emissions

Year	GHG Emissions CO_2-eq (kiloTonne/yr)		
	Tailpipe	Landfill	Total GHG Emissions
2020	3.15	3.08	6.22
2025	3.15	6.32	9.47
2030	3.15	9.04	12.19
2035	3.15	11.35	14.50
2039	3.15	12.96	16.11

This maximum of 16.1 kilotonnes CO_2eq in forecast GHG emissions associated with the Project for the maximum year (Year 45) represents less than 0.01% of the 2012 GHG emissions inventory for Ontario (167 million tonnes CO_2eq) and 0.002% of the 699 million tonnes CO_2eq in the overall Canadian GHG Inventory for 2012.

Table 7.6: Year 45 GHG Emissions Contribution by Source Group

	GHG Emissions (kiloTonne)	Percentage Contribution (%)
Fleet	3.15	19.6
Landfill	12.96	80.4
Total	**16.11**	**100**

Since the predicted GHG emissions from the Project are minor in comparison to Canadian and global emissions, the Project will have no appreciable effect on current estimates of future global climate change.

Potential environmental effects from the Project on GHG emissions are considered to be adverse but negligible in the context of the overall GHG inventories for Ontario and Canada.

Since the predicted greenhouse gas emissions from the Project are minor in comparison to Ontario, Canadian and global emissions, the Project will have no appreciable effect on current estimates of future global climate change.

While the project scale is such that adaptation to climate change over the project lifetime is not a specific requirement, there are a number of meteorological influences, which if modified significantly with changing climate, could potentially impact the project environment. These include wind speed and precipitation and the effects would be more related to an increase in the frequency of occurrence of extreme events. Table 7.7 indicates the climatic parameter, type of effect and the mitigation measures which could be implemented. It is anticipated that the proponent would continue to monitor changes in climate conditions over the project lifetime and adapt dust or leachate management plans as required.

Table 7.7: Effects of Climate Change on the Project

Climate Parameter	Project Impact	Mitigation Measure
Precipitation	Increased precipitation causing increased leachate	Continued monitoring of precipitation amount, cover status and leachate volume
Wind Speed	Increased potential for fugitive dust or litter	Cover and road maintenance

7.1.2 Aquatic Environment and Surface Water

The Project will not remove or disturb the natural aquatic habitat and/or species. The indicators used to assess these potential effects, include:

- Predicted changes in surface water quality;
- Changes to surface water quantity and flow; and
- Predicted Project impacts on aquatic habitat.

As identified in Sections 6.2.2 and 6.2.5, there are two tributaries in the Project area that were observed to be intermittent in status with significant obstructions to fish passage including debris, blockages, steep valley slopes and lack of refuge habitat. Neither watercourse was considered to support fish habitat. No rare species or fish SAR, or habitats of rare species or fish SAR were identified.

7.1.2.1 Surface Water Quality

There is the potential for adverse effects to surface water quality and therefore a pre-Construction Phase baseline water quality monitoring program will be implemented in accordance with the Landfill Standard (MOE, 2012) and these requirements will be captured in the ECA application. In general, this monitoring program will likely include semi-annually (spring freshet and summer low flow conditions) for Schedule 5, Column 3 and 4 parameters. During the Construction and

Operation Phases, drainage ditches and swales at the perimeter of the Site will be protected from potentially impacted runoff through the use of temporary berms and silt fences. Perimeter ditches will divert runoff through grass lined swales. At no point would runoff from the expansion area be directly discharged to surface waterbodies beyond the property boundaries. Suspended sediment will be removed through the use of the sediment and erosion control measures. These features will also assist in preventing significant outflows that could impact the quality of downstream water features.

The installation of these features to separate potentially impacted runoff is expected to mitigate any potential adverse effects to surface water quality. Surface water monitoring will be integrated into the site monitoring program (Section 8) to monitor for landfill-related impacts.

During the Closure and Post-Closure Phases, perimeter ditches at the toe of the waste footprint will capture and direct runoff from the landfill. Swales and/or ditches will direct runoff to the environment.

The proposed Project, including the proposed mitigation measures (Section 8) that separate Site water (i.e., clean surface water, sediment-impacted water and potentially contaminated stormwater), will result in no adverse effects on surface water quality. There is the potential for beneficial effects as a result of the implementation of drainage ditches and swales thus no adverse impacts are likely.

7.1.2.2 Surface Water Quantity and Flow

There are no permanent surface water features identified at the Site. It is not anticipated that the development of the perimeter ditches will result in alterations to the existing Site conditions, as it pertains to surface water quantity or flows. An attempt will be made to design the perimeter ditches so that discharge water is conveyed to areas that would have naturally received this overland flow. As a result, there will be no adverse effects on surface water quantity and flow. Similar to the surface water quality monitoring program described above, the surface water flow will be measured semi-annually, as specified in Schedule 5 of the Landfill Standards.

7.1.2.3 Fish Habitat

Runoff from the Site may result in periodic increases in flow in Tributary 1 and Tributary 2. It is estimated that the long-term increase in runoff as a result of the solar facility will be approximately 3% (Dillon Consulting Limited, 2011). Although Tributaries 1 and 2 do not appear to support fish, the lower sections of the stream that are formed by the joining of these water courses may. Therefore impacts on surface water quality and quantity are still important, but with quality and quantity controls described in Section 7.1.2, it is anticipated that there will be no adverse effects to fish habitat downstream of the Site.

7.1.3 Geology and Soils

The indicators for assessing the predicted effects on geology and soils are:

- Changes to surficial geology; and
- Changes due to soil contamination.

7.1.3.1 Surficial Geology

Section 6.2.3 provided a baseline overview of the surficial geology. The surficial geology of the Site has been modified as a result of previous aggregate extraction and landfilling. Further modification will occur with the Construction and Operation Phases of the Project and will not return to baseline conditions post-closure. This adverse effect is not reversible due to the nature of landfilling. Surficial materials removed during construction will offset some of the need to import non-native materials to the Site for construction. However, the volume of surficial materials available may be limited as the overburden depth in the area of the proposed expansion is approximately 2 m.

7.1.3.2 Soil Contamination

The area has been used for quarry development and landfilling for over 100 years. It is anticipated that soil contamination may be present in the proposed expansion area; however, through the implementation of the Project, further contamination (primarily due to residential waste) will be managed in accordance with best practices that meet and/or exceed regulatory requirements. Any contaminated soil resulting for the previous landfilling operations will be collected and disposed of in accordance with the applicable regulations of operating landfills.

The natural attenuation of landfill-derived leachate does present the risk of soil contamination in the immediate vicinity of the landfill footprint. As a result, the potential uses for this property will be limited in the post-closure period. The risk for soil contamination decreases rapidly with increased distance from the landfill as the leachate is diluted through natural processes and the migration and impacts are more apparent in the dissolved phase (i.e., the groundwater) and potential discharge areas (i.e., surface water receptors).

7.1.4 Groundwater

The indicators for assessing the predicted effects on groundwater are:

- Changes to groundwater quality; and
- Changes to groundwater quantity and flow.

7.1.4.1 Groundwater Quality

The historic New Liskeard Landfill was operated as a natural attenuation landfill; groundwater/leachate impacts were managed through the purchase of approximately 32 ha of land to the east of the landfill property to act as a CAZ. The proposed Project design, as presented on Figure 6.1, has assumed that the Site will continue to be operated as a natural attenuation landfill following expansion. Various assessments have been undertaken by Amec Foster Wheeler in order to confirm that the existing CAZ will be sufficient to manage additional impacts

introduced by the landfill expansion, as designed. Through an assessment of the existing CAZ, it was determined that natural attenuation is an appropriate means of continued groundwater management at the Site following expansion.

An attenuation factor was calculated based on historical concentrations of chloride observed at source, background and mid-Site locations. Chloride in groundwater is an industry accepted landfill tracer/indicator. For the purposes of the assessment, the maximum observed background concentration of chloride (20 mg/L), source strength of chloride (1,220 mg/L) and downgradient concentration of chloride (100 mg/L) were conservatively applied in order estimate the degree of natural attenuation occurring with respect to distance based on observed concentrations. These maximum concentrations of chloride were quantified in 2008 and have not reached these concentrations since in the monitored locations. The reduction in chloride concentration from the source well (OW-18) to the downgradient/mid-Site well nest (OW-12), located 175 m away, was used to calculate the attenuation factor of 6.4 mg/L per metre.

Based this attenuation factor, the required attenuation distance for chloride, and by extension the leachate plume, to be attenuated from the source area is 171 m (based a reduction of chloride concentration from 1,220 mg/L to the maximum allowable chloride concentration of 125 mg/L). The observed attenuation rate is presented spacially in Figures 6.14 and 6.15.

Using the infiltration rates for the landfill and CAZ, which is expected to decrease by 3% (Dillon Consulting Limited, 2011) with the presence of the solar facility, a water balance calculation indicated that a dilution rate of 6.2 would be applicable to the downgradient area. As such, the expected chloride concentration in the CAZ under the landfill expansion scenario could be expected to almost double from 101 mg/L to 197 mg/L (i.e., the maximum leachate chloride concentration of 1,220 mg/L divided by 6.2). Therefore, it is conservatively assumed that the attenuation distance of the leachate plume from the edge of the landfill will also double as a result of the additional waste. The required distance for attenuation of the leachate plume in the subsurface is projected to be 342 m (i.e., 2 x 171 m) and within the 400 m area of the existing CAZ.

Natural attenuation is an appropriate means of continued groundwater management at the Site following expansion. There is the potential for impacts to groundwater quality; however, the inclusion of the ongoing groundwater monitoring program will provide a means to monitoring for potential adverse effects.

7.1.4.2 Groundwater Quantity and Flow

Historical hydrogeological studies completed in the vicinity of the Site have not incorporated groundwater quantity assessments, therefore no current or previous information regarding groundwater quantity is available for the purposes this assessment. However, it is not anticipated that any aspects of the Project will have an adverse effect on the groundwater quantity at the Site.

There is the potential for the Project development to effect the groundwater flow system as a result of groundwater mounding within the waste materials. This change could result in localized radial flow that alters the current groundwater flow system in the immediate vicinity of the landfill footprint. The potential for an adverse effect would be offset by the available CAZ and quantified through the ongoing monitoring program.

The cumulative effects of the proposed Project, with that of the adjacent solar facility, located on the CAZ are not likely to be adverse as the changes in runoff/infiltration are not considered to be significant at 3%.

7.1.5 Terrestrial Environment

7.1.5.1 Habitat, Vegetation Communities, and Plant Life

Indicator wildlife species offer an indication of the biological condition in an ecosystem, which in this circumstance is a healthy ecosystem able to support numerous wildlife species. MNRF forest management guidelines use American marten as an indicator species, as its preferred habitat is interior, mature forests of the Boreal region and territories are determined by the amount of dense forest cover and availability of food (MNR, 2001). Marten tracks or potential denning sites were not observed during the field surveys of the Site-vicinity Study Area.

Forest birds such as Ovenbird, Hermit Thrush (*Catharus guttatus)*, Veery (*Catharus fuscescens*), Black-throated Blue Warbler (*Dendroica caerulescens)*, Blackburnian Warbler (*Dendroica fusca)*, Mourning Warbler (*Oporornis philadelphia)* and woodpecker species (e.g., Pileated Woodpecker, *Dryocopus pileatus;* Hairy Woodpecker, *Picoides villosus*; Yellow-bellied Sapsucker*, Sphyrapicus varius*) are also good indicators of mature and/or healthy forest ecosystems. Only the Downy Woodpecker (*Picoides pubescens*), Ovenbird, Veery, and Mourning Warbler were detected within the Site-vicinity Study Area. This suggests that the forest communities are healthy but perhaps still within a process of succession towards maturity.

Environmental effects to vegetation communities within the Project footprint are direct (clearing) and are localized. The majority of vegetation loss will occur in the already disturbed cultural meadow (5.0 ha; 57.9% of the total cultural meadow present in the Site-vicinity Study Area). The total area of forest habitat that would be displaced by the proposed Project development is approximately 2.2 ha of deciduous forest and 1.5 ha of mixed forest (13.3% of the total upland forest present in the Extended Study Area). The remaining direct Project impacts overlap with already un-vegetated/disturbed lands. All of the vegetation communities present within the Site-vicinity Study Area are common in the larger region. No wetland vegetation communities are directly impacted by the Project footprint. No locally significant plant communities have been identified within the proposed footprint and no provincially rare plant species or community types were located.

Indirect effects to adjacent vegetation communities include dust generation. Without mitigation, an increase in vehicle traffic in the Project footprint will result in increased dust generation and deposition on vegetation. Dust can affect photosynthesis, respiration and transpiration in plants

and allow the penetration of phytotoxic gaseous pollutants (Farmer, 1993). Overall, dust deposition on plants results in some visible injury symptoms and a general decrease in plant productivity. The structure of vegetation communities may also be affected. Those vegetation communities that are dominated by epiphytic lichen and *Sphagnum* moss species are typically the most sensitive of those studied (Farmer, 1993). As noted in Section 7.1.1, dust generation will be minimized through best practices.

Given the limited area of vegetation and habitat loss resulting from the Project, the adverse effects of the Project on habitat, vegetation communities and plant life are expected to be minimal.

7.1.5.2 Protected Areas

There are no Areas of Scientific and Natural Interest, Provincially Significant Wetlands, Wildlife Concentration Areas or other Natural Areas within the Site-vicinity Study Area (MNRF, 2015a; MNRF, 2015b).

7.1.5.3 Wetlands

Wetlands of all types provide important habitat that is often utilized by species that can survive nowhere else. In particular, aquatic/terrestrial ecotones provide a high diversity of habitats, which support a large number of species. There are many wildlife and plant species that exclusively use these specialized habitats including birds, reptiles, amphibians, insect larvae and orchid species.

Only one wetland was identified within the Site-vicinity Study Area, two small polygons of organic coniferous swamp totaling an area of 1.2 ha (2.7% of the total area). This wetland was noted to be somewhat disturbed with large and extensive gaps within the forest canopy, faint trails, but moderate and widespread miscellaneous waste (from human activity). This wetland lays outside of the Site Study Area.

There will be no direct (vegetation clearing) impacts on wetlands within the Site-vicinity Study Area and the Project footprint is sufficiently offset to eliminate potential indirect effects such as dust generation.

7.1.5.4 Birds

Migratory Birds

The overall amount of terrestrial habitat lost within the Project footprint due to new clearing of vegetation is 8.7 ha; of these, 3.7 ha will be deciduous/mixed forest and 5.0 ha will be cultural meadow. The loss of this terrestrial habitat is not expected to result in any direct mortalities of birds, nor in a decrease in reproductive effort of any bird species if clearing takes place outside of the breeding bird season (outside of 12 April – 30 August) and if proper mitigation measures are implemented (Section 8). Vegetation removal will result in direct habitat loss causing displacement of individuals when they return to breed in the spring; however, these habitat types are common and widespread within the greater region.

Adverse effects to breeding bird populations will be largely associated with direct habitat loss from forest and vegetation clearing, potentially coupled with changes to habitat suitability related to the production of edge effects (such as increased predation and brood parasitism); however, no Significant Wildlife Habitat (SWH) for birds (except raptors) was identified within the Site-vicinity Study Area. Additionally, the Natural Heritage Information Centre Natural Areas Database did not identify any areas within the Extended Study Area as having significant or unique natural heritage features pertaining to migratory bird species and no Important Bird Areas or nature reserves were identified.

Some species are not expected to be overly sensitive to human presence or temporary heavy equipment usage during construction. Other species may be affected by noise effects and other disturbance related to construction, operation, and closure activities. Sound can cause adverse effects on birds in a variety of ways including masking important communication signals, loss of the ability to hear important behavioural triggers such as the songs of territorial males, calls of females, begging calls of nestlings, approaching predators, or the presence of prey items. As a result, long-term noise disturbance can decrease breeding success or bird density in a chronically noisy habitat. Although tolerance of noise levels varies species by species, 50 dBA has recently been recommended as the minimum threshold for impacts to birds (per discussions with Environment Canada). Based on 50 dBA contour lines for each phase of the Project, periodic noise production will occur during construction and operation of the Project. Sound emissions will be greatest in areas of concentrated heavy equipment operation (during vegetation clearing, construction and operation). The production of noise during construction of the Project will take place primarily during the winter months when migratory bird species are not present. Operational effects of noise are predicted to extent up to 300 m from the Project footprint; however, much of the areas are either not expected to support significant bird populations (i.e., the solar facility to the east), overlap with land that were recently disturbed, or already experience intermittent disturbance from land use activities. Therefore, the Construction Phase is not expected to have an appreciable effect on species diversity, density or behaviour within the local area. In addition, production of noise during Operation Phase will be limited to occasional heavy truck activity (waste disposal).

There is some potential for increased road kills along roads, but this effect is considered to be limited due to the expected low traffic volumes / frequency, and reduced travelling speeds.

Raptors

Raptor species recorded within the Site-vicinity Study Area during field surveys included Broad-winged Hawk and Northern Harrier. Vegetation clearing for construction of the Project is anticipated to remove 3.7 ha of forested land capable of providing woodland raptors nesting habitat (for Broad-winged Hawk); however, the SWH Woodland Raptor Nesting Habitat is considered to have a low probability of occurrence. Stick nests of these species are typically found in a variety of intermediate-aged to mature conifer, deciduous or mixed forests within tops or crotches of trees. Though forest stands are present, mature trees suitable for raptor nesting are mainly absent. The Northern Harrier breeds in large, undisturbed tracts of wetlands (marshes) and grasslands with low, thick vegetation. Such habitat is absent from the Site-vicinity Study Area.

Though open meadows do occur, they are small and associated with recent anthropogenic disturbance. As such, it is not expected that vegetation removal will affect raptor nests through loss of habitat.

There is some potential for increased road kills along roads, but this effect is considered to be limited due to the expected low traffic volumes / frequency, and reduced travelling speeds.

7.1.5.5 Other Wildlife

7.1.6 Predicted Effects on Other Wildlife

Potential adverse effects to wildlife populations in the Project footprint may include i) direct loss of habitat due to vegetation clearing, ii) long-term displacement due to habitat loss, iii) short-term displacement due to disturbance during construction and iv) potential habitat abandonment along the edges of cut forest. Direct mortality is not an expected effect from Project activities (Section 8).

The majority of vegetation (and potential wildlife habitat) loss will occur in the already disturbed cultural meadow (5.0 ha; 57.9% of the total cultural meadow present in the Site-vicinity Study Area). The total area of forest habitat that would be displaced by the proposed Project development is approximately 2.2 ha of upland forest and 1.5 ha of mixed forest (13.3% of the total upland forest present in the Site-vicinity Study Area). All of the vegetation communities present within the Site-vicinity Study Area are common in the larger region. No wetland vegetation communities are directly impacted by the Project footprint. Loss of any potential wildlife habitat is not expected to have any long-term effects on local and regional populations.

7.1.6.1 Species at Risk and Rare Wildlife

Based on a review of secondary sources, five SAR were identified as potentially occurring within the Extended Study Area (Barn Swallow, Black Tern, little brown myotis, northern myotis, and snapping turtle); however, based on baseline surveys, neither these wildlife species nor potentially suitable habitat was identified to be within or near to the Site-vicinity Study Area. As such, it was determined that SAR are not present and are not predicted to be impacted by the Project.

7.2 Social Environment

7.2.1 Aboriginal Communities

As identified in Section 6.3.2, no information has been provided by Aboriginal communities potentially affected by the Project with respect to traditional uses of land and resources, built heritage, archaeological sites, cemeteries and burial grounds. However, as noted in Section 6.3.2, the area has had archaeological potential removed due to previous landfilling operations throughout the entirety of the Site.

7.2.2 Land Use

The proposed expansion will be located on lands designated for waste management facility in the City's Official Plan (Tunnock, 2014). The proposed expansion would occur on the east side of the existing facility and be fully contained on City-owned lands. There is the potential for future land uses that may be developed around the Site may not be compatible with an operational landfill; however, the City's Official Plan identifies the designated uses to avoid this potential conflict.

The operation of the Site has the potential to generate dust from trucking and daily cover operations that may result in dust deposition on private residential properties and on the adjacent solar arrays. However, with the proposed mitigation measures (Section 8.0) there are no expected adverse effects.

7.2.3 Municipal and Community Services

Municipal infrastructure and community services, as identified in Section 6.3.4, will not be affected by the proposed Project. The proposed Project would ensure that the City can continue to provide waste management services to its citizen.

There is the potential for associated traffic effects related to school bus routes along haul routes. As such, transportation schedules and routes will be considered as part of a mitigation plan that addresses waste haulage schedules to minimize any potential conflicts.

7.2.4 Noise

An assessment of potential noise effects of the proposed Project was completed in accordance with the applicable MOECC noise assessment criteria. A technical support document for the noise assessment is presented in Appendix I.

Points of Reception

Five representative points of reception (POR) surrounding the Project have been identified within the Site-vicinity Study Area. It is expected that, due to the effects of distance attenuation, the sound levels at locations farther away from the Site than the selected receptors will be lower. The PORs locations are shown in Figure 7.10. The receptor height considered for all PORs is at 4.5 m above grade as this represents the worst-impacted location for all of the receptors (i.e., the highest window level for a two-story house).

Noise Sources

Noise would be generated from a variety of activities occurring at the Site and will move from cell to cell as the Project progresses. These activities include construction of the Cell 1 base and associated perimeter access roads/drainage ditches (Phase 1); deposition and compaction of waste materials, bulldozing and grading activities at the working face of the active cell along with excavating, loading and transporting of clean cover materials to the working face of the active cell from future cells, and closure of filled cells (Phase 2); and closure of Cell 5 and final capping

(Phase 3). Due to the overlap of construction, operation and closures stages, five operation scenarios are assessed for Phase 2 (i.e., Phase 2a through 2e). Potential effects from the Post-Closure Phase of the Project (Phase 4) is considered as insignificant, from a noise perspective, as there are no major activities during this phase, other than the post-closure monitoring.

For the purpose of the noise impact assessment, it was assumed that the construction of the proposed landfill expansion will begin from the south end of the Site (Cell 1). The Project is expected to progress sequentially from Cell 1 through Cell 5 (i.e., south to north). Noise sources considered for each phase are listed in Table 7.8 along with their corresponding sound power levels.

Table 7.8: Noise Source Summary

Noise Source Description	Source ID	Sound Power Level (dBA)	Sound Characteristics	Noise Control
Waste Compactor	C	108	Steady	None
Dozer	D	109	Steady	None
Loader	L	107	Steady	None
Excavator	E	106	Steady	None
Articulated Truck Route – Cover Material	TR1	113	Steady	None
Waste Haul Truck Route	TR2	113	Steady	None

Note: Sound power levels taken from Department of Environment, Food and Rural Affairs construction equipment database in Decibel, A-Weighted (dBA).

Noise source locations for various phases of the Project are shown in Figures 7.11 through 7.17. To model predictable worst-case, it was assumed that the noise sources for each phase operate continuous and simultaneous.

Noise Effects

Noise effects have been assessed over a time period of one hour, using the energy equivalent sound level (L_{eq}) as required by the applicable guidelines (MOECC's draft Noise Guidelines for Landfill Sites). Noise levels were modelled and assessed for the daytime period (07:00 – 19:00) as the landfill operations are not expected to extend over the evening and night-time periods.

The predicted daytime Project noise levels for various phases of the Project are presented in Table 7.8 and the noise contours are presented in Figures 7.18 through 7.24.

Table 7.7: Daytime Project Noise Levels at Sensitive Receptors

Receptor ID	Predicted Sound Level (dBA)						
	Phase 1	Phase 2a	Phase 2b	Phase 2c	Phase 2d	Phase 2e	Phase 3
POR01	46	50	48	47	44	42	42
POR02	48	50	49	47	44	42	39
POR03	31	36	35	36	36	34	33
POR04	31	35	36	37	38	37	35
POR05	28	35	37	38	39	38	36

Daytime operational noise levels at the receptor locations were predicted to be below the MOECC noise criteria limit of 55 dBA. However, the operations may be audible at receptors in close proximity of the Project (e.g., POR01 and POR02).

7.2.5 Public Health and Safety

Based on the Municipal Wellhead Protection Areas identified in the City's Official Plan (Tunnock, 2014) the municipal well appears to draw its water from an aquifer beyond the flow path of the proposed landfill expansion area. As such, the proposed expansion is not a threat to the municipal potable water supply. A series of private potable water supply wells along Highway 65 are currently monitored as part of the ongoing environmental monitoring program to the existing New Liskeard Landfill site, it is anticipated that these efforts will continue.

There are no safety road features (i.e. turning lanes, signage, etc.) at the entrance of the New Liskeard Site as it is currently inactive. The Project would provide opportunities for modifications to the Site entrance to alleviate traffic safety concerns, such as entrance design and signage. Similarly, school bus transportation schedules and routes will be considered as part of a mitigation plan that addresses waste haulage schedules to minimize any potential conflicts. Rockley Road is currently used by a single school bus between 7:30 and 8:15 in the morning and 4:00 and 4:30 in the afternoon.

7.2.6 Recreation

As presented in Section 6.3.5, there are no trails, parks or other designated recreation areas within 1 km of the Site that would be affected by the proposed Project.

7.2.7 Transportation

Based on the information provided by the City, the average weekly truck counts to the existing Haileybury Landfill site are approximately 18 trucks per week of commercial waste and 9 trucks every 2 weeks of residential waste. The New Liskeard Site was previously used as a waste disposal site and it is assumed that the infrastructure (i.e., Rockley Road) is suitably constructed to support the proposed development, although some improvements to enhance public safety

may be considered and thus there are no anticipated effects from the Project. Further evaluation during the design and development will indicate the improvements to be incorporated into the design that enhance public safety (i.e., signage for entry/exit lanes, location and deign of points of access).

There are no active airports or heliports within the Extended Study Area that could be potentially affected by the Project.

7.2.8 Visual Aesthetics

Changes in visual aesthetics to neighbouring properties (Section 6.3.7) due to the Project are not anticipated due to vegetative breaks, as well as topography.

The assessment of the proposed Project indicates that the proposed landfill expansion at completion will not interfere, obscure or compete with any nearby man-made or natural landmarks, nor will it significantly alter the existing vistas present within the Site-vicinity Study Area.

There is the potential for Project effects on how it is seen from surrounding viewpoints by the public. As a result of stakeholder feedback regarding the visual aesthetics of the proposed Project, a review of the visual aesthetics was completed. In general, the proposed landfill expansion development will have minimal impact on the visual environment from distant (regional) viewpoints. Although the height of the proposed landfill expansion will be visible on the horizon, there are no natural or man-made landmarks within the view-sheds that will be obscured. The City will consider design and operations modifications to reduce the potential for effects to visual aesthetics (such as daily cover, fencing).

Within the Site-vicinity and Extended Study Areas, views of the proposed layout vary from fully obscured to fully visible.

Distant Views (Regional)

- Distant views from the south, north and west will not be impacted by the Project development due to the presence of existing vegetation and topographic features.
- Distant views from the east will be most affected by the Project development. From this area (i.e., Highway 11), which is an elevated position, existing vegetation growing east of the Site is less effective for screening but will be capable of obscuring the bottom quarter of the landfill face. Therefore, as part of operations, it will be important for diligent application of daily cover.

Close-Up Views (Site-Vicinity)

- Close-up views from the south will not be impacted by the Project development due to the presence of the existing landfill feature.

- Generally, close-up views from the west, north and east will be unaffected by the Project development due to the presence of significant vegetation and topography along the eastern and western edges of the Site.

7.3 Social Environment

7.3.1 Archaeology

As identified in Section 6.4.1, the Site Study Area does not exhibit any archaeological potential and archaeological resources are not expected to be encountered, and therefore, no adverse effects are predicted.

7.3.2 Heritage

Background research indicates that the Site does not contain significant built heritage or cultural heritage landscape resources. Prior to its development as a landfill, the existing landfill area was used as a limestone quarry. Any potential for heritage resources has been removed by deep and extensive land alterations, including excavations, grading, road construction, and the stripping of vegetation and topsoil. There are no adverse effects are predicted.

7.4 Economic Environment

7.4.1 Local Economy

The City acts as a regional centre and the expansion of the New Liskeard Landfill will provide continued service to its population and provide opportunity for the City to continue or establish relationships with other communities who may wish to utilize the landfill. It is recognized that while not all of the goods and services required for the proposed Project will be available locally, there will be opportunities for local businesses to capitalize on the Project. Within the Extended Study Area there are numerous businesses that may be able to capitalize on opportunities to supply goods and services to the Project, with a number of businesses in the building supplies and services and industrial and manufacturing sectors. The potential effects from the Project would be considered positive due to the opportunities for employment or supply to the various Project phases.

7.4.2 Municipal Finances

The proposed expansion of the New Liskeard Landfill is more cost-effective for the City to finance as opposed to the development of a completely new site. The City has earmarked capital expenditures to cover the expansion development as well as closure activities and post-closure monitoring at the Haileybury Landfill. It is anticipated that the landfill revenues and tax levy will continue to fund the day-to-day operations of the proposed expansion. As well, investments made in the waste diversion programs will further the life expectancy of the current and future operations. The potential effects from the Project would be considered adverse given the investment the City will need to make for the development of the proposed expansion area plus

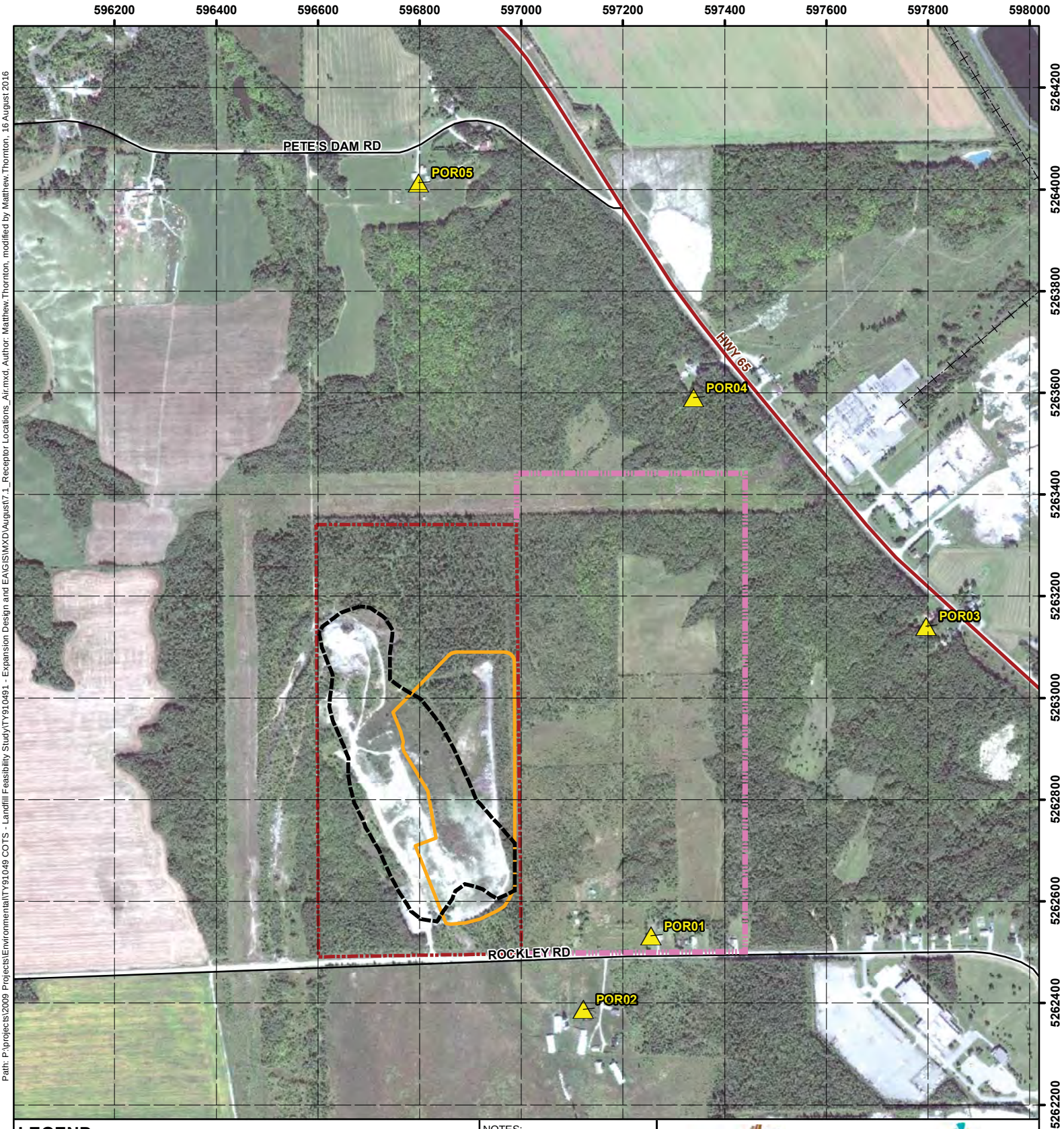
the closure and monitoring at the Haileybury site. However, in contrast to developing a new site separate from the existing New Liskeard Landfill site, the adverse effect on municipal finances is negligible.

7.5 Summary of Project-Environment Potential Effects

Based on the assessment of potential effects on the various environmental components during the proposed Project's lifecycle, the following environmental components are anticipated to incur some degree of adverse effect that warrant mitigation.

- Atmospheric environment, from particulate matter (dust) for air quality and from litter;
- Groundwater, from the potential to impact quality;
- Surface water, from the potential to impact quality;
- Terrestrial environment, from the potential effects to vegetation, birds and other wildlife; land use;
- Public health and safety (including transportation), from the potential traffic-related effects; and
- Visual aesthetics, from distant (regional) views due to the proposed Project location being situated on a topographic high.

Proposed mitigation measures, monitoring and contingency plans for each of these potential effects are detailed in the following section (Section 8).



Path: P:\projects\2009 Projects\Environmental\TY910491 COTS - Landfill Feasibility Study\TY910491 - Expansion Design and EA\GIS\MXD\August\7.1_Receptor Locations_Air.mxd, Author: Matthew.Thornton, modified by Matthew.Thornton, 16 August 2016

LEGEND

- Receptor (labelled with ID)
- Property Boundary
- Contaminant Attenuation Zone
- Highway / Major Roads
- Local Roads
- Approximate Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Figure to be reviewed with the Air Quality Technical Support Document.

Datum & Projection: NAD 1983 UTM Zone 17N

0 0.2 0.4 0.6 0.8 1 Kilometers

N W E S

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amec foster wheeler

ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Receptor Locations (Air Quality)

PROJECT N^{o}:TY910491	**FIGURE: 7.1**
SCALE: 1:10,000	DATE: August 2016

Path: P:\projects\2009 Projects\Environmental\TY910491 COTS - Landfill Feasibility Study\TY910491 - Expansion Design and EA\GIS\MXD\August\7.2_PM TSP Isopleth_24.mxd, Author: Matthew.Thornton, modified by Matthew.Thornton, 16 August 2016

LEGEND

- Property Boundary
- Contaminant Attenuation Zone
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)
- Highway / Major Roads
- Local Roads
- Railway

Modelled Concentration

- < 10 µg/m^3
- 10 - 40 µg/ m^3
- 40 - 80 µg/m^3
- > 80 µg/m^3

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Figure to be reviewed with the Air Quality Technical Support Document.

0 0.25 0.5 0.75 1 Kilometres

Datum & Projection: NAD 1983 UTM Zone 17N

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ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Total Suspended Particulate Matter Isopleth (24-hour Averaging Time)

PROJECT N^o:TY910491	**FIGURE: 7.2**
SCALE: 1:10,000	DATE: August 2016

Path: P:\projects\2009 Projects\Environmental\TY910491 COTS - Landfill Feasibility Study\TY910491 - Expansion Design and EA\GIS\MXD\August\7.3_PM 10 Isopleth_24.mxd, Author: Matthew.Thornton, 16 August 2016

LEGEND

- Property Boundary
- Contaminant Attenuation Zone
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)
- Highway / Major Roads
- Local Roads
- Railway

Modelled Concentrations

- 5 - 10 µg/ m^3
- 10 - 20 µg/ m^3
- 20 - 30 µg/m^3
- 30 - 50 µg/m^3
- > 50 µg/m^3

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Figure to be reviewed with the Air Quality Technical Support Document.

Datum & Projection: NAD 1983 UTM Zone 17N

0 0.25 0.5 0.75 1 Kilometres

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ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Particulate Matter PM_{10} Isopleth (24-hour Averaging Time)

PROJECT N^{o}:TY910491	**FIGURE: 7.3**
SCALE: 1:10,000	DATE: August 2016

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LEGEND

- Property Boundary
- Contaminant Attenuation Zone
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)
- Highway / Major Roads
- Local Roads
- Railway

Model Concentration

- 5 - 17 µg/ m^3
- 17 - 28 µg/m^3
- > 28 µg/m^3

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Figure to be reviewed with the Air Quality Technical Support Document.

Datum & Projection: NAD 1983 UTM Zone 17N

0 0.25 0.5 0.75 1 Kilometres

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NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Particulate Matter $PM_{2.5}$ Isopleth (24-hour Averaging Time)

PROJECT N^{o}:TY910491	**FIGURE: 7.4**
SCALE: 1:10,000	DATE: August 2016

Path: P:\projects\2009 Projects\Environmental\TY910491 COTS - Landfill Feasibility Study\TY910491 - Expansion Design and EA\GIS\MXD\August\7.5_PM 2.5 Isopleth_Annual.mxd, Author: Matthew.Thornton, modified by Matthew.Thornton, 17 August 2016

LEGEND

- Property Boundary
- Contaminant Attenuation Zone
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)
- Highway / Major Roads
- Local Roads
- Railway

Modelled Concentrations

- 1 - 2 µg/ m^3
- 2 - 3.3 µg/ m^3
- 3.3 - 5.6 µg/ m^3

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Figure to be reviewed with the Air Quality Technical Support Document.

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NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Particulate Matter $PM_{2.5}$ Isopleth (Annual Average)

Datum & Projection: NAD 1983 UTM Zone 17N

N W E S

0 0.25 0.5 0.75 1 Kilometres

PROJECT N°:TY910491 | **FIGURE: 7.5**

SCALE: 1:10,000 | DATE: August 2016

Path: P:\projects\2009 Projects\Environmental\TY910491 COTS - Landfill Feasibility Study\TY910491 - Expansion Design and EA\GIS\MXD\August\7.6_Landfill Gas_24.mxd, Author: Matthew.Thornton, modified by Matthew.Thornton, 17 August 2016

LEGEND

- Property Boundary
- Contaminant Attenuation Zone
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)
- Highway / Major Roads
- Local Roads
- Railway

Modelled Concentrations

- 0.05 - 0.1 µg/ m^3
- 0.1 - 0.2 µg/m^3

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Figure to be reviewed with the Air Quality Technical Support Document.

Datum & Projection: NAD 1983 UTM Zone 17N

0 0.25 0.5 0.75 1 Kilometres

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ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Landfill Gas (Hydrogen Sulphide) Isopleth (24-hour Averaging Time)

PROJECT N^{o}:TY910491	**FIGURE: 7.6**
SCALE: 1:12,500	DATE: August 2016

Path: P:\projects\2009 Projects\Environmental\TY910491 COTS - Landfill Feasibility Study\TY910491 - Expansion Design and EA\GIS\MXD\August\7.7_NO2 Isopleth_24.mxd, Author: Matthew.Thornton, modified by Matthew.Thornton, 17 August 2016

LEGEND

- Property Boundary
- Contaminant Attenuation Zone
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)
- Highway / Major Roads
- Local Roads
- Railway

Modelled Concentration

- 1 - 5 µg/ m^3
- 5 - 10 µg/m^3
- 10 - 20 µg/m^3
- 20 - 40.8 µg/m^3

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Figure to be reviewed with the Air Quality Technical Support Document.

Datum & Projection: NAD 1983 UTM Zone 17N

0 0.25 0.5 0.75 1 Kilometres

N W E S

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ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Nitrogen Dioxide (NO_2) Isopleth (24-hour Averaging Time)

PROJECT N^o:TY910491	**FIGURE: 7.7**
SCALE: 1:10,000	DATE: August 2016

Path: P:\projects\2009 Projects\Environmental\TY910491 COTS - Landfill Feasibility Study\TY910491 - Expansion Design and EA\GIS\MXD\August\7.8_NO2 Isopleth_1.mxd, Author: Matthew.Thornton, modified by Matthew.Thornton, 17 August 2016

LEGEND

- Property Boundary
- Contaminant Attenuation Zone
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)
- Highway / Major Roads
- Local Roads
- Railway

Modelled Concentration

- 1 - 50 µg/ m^3
- 50 - 100 µg/ m^3
- 100 - 200 µg/ m^3
- 200 - 366.8 µg/ m^3
- > 366.8 µg/m^3

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Figure to be reviewed with the Air Quality Technical Support Document.

Datum & Projection: NAD 1983 UTM Zone 17N

0 0.25 0.5 0.75 1 Kilometres

Temiskaming Shores

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ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Nitrogen Dioxide (NO_2) Isopleth (1-hour Averaging Time)

PROJECT N^o:TY910491	**FIGURE: 7.8**
SCALE: 1:10,000	DATE: August 2016

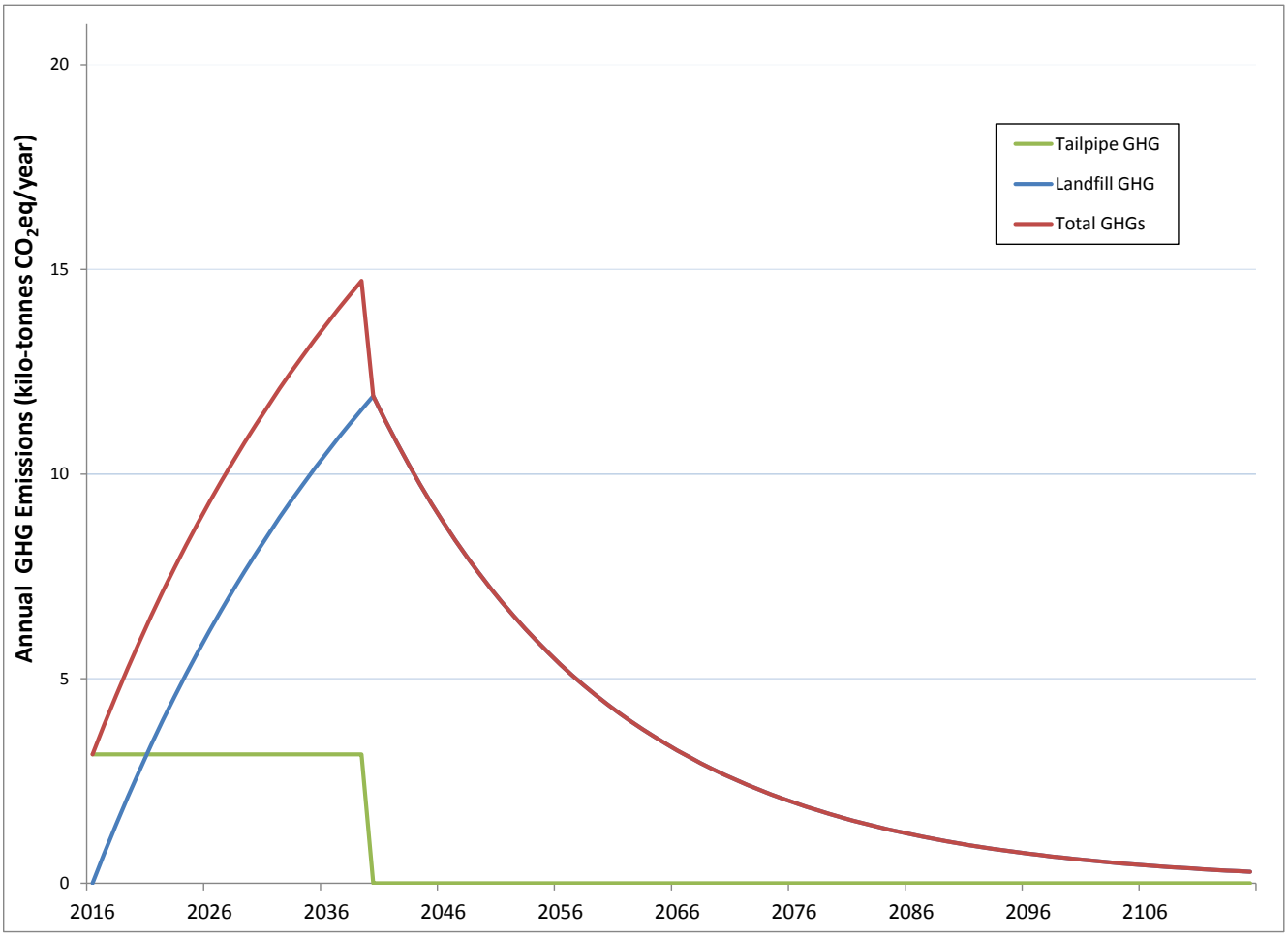
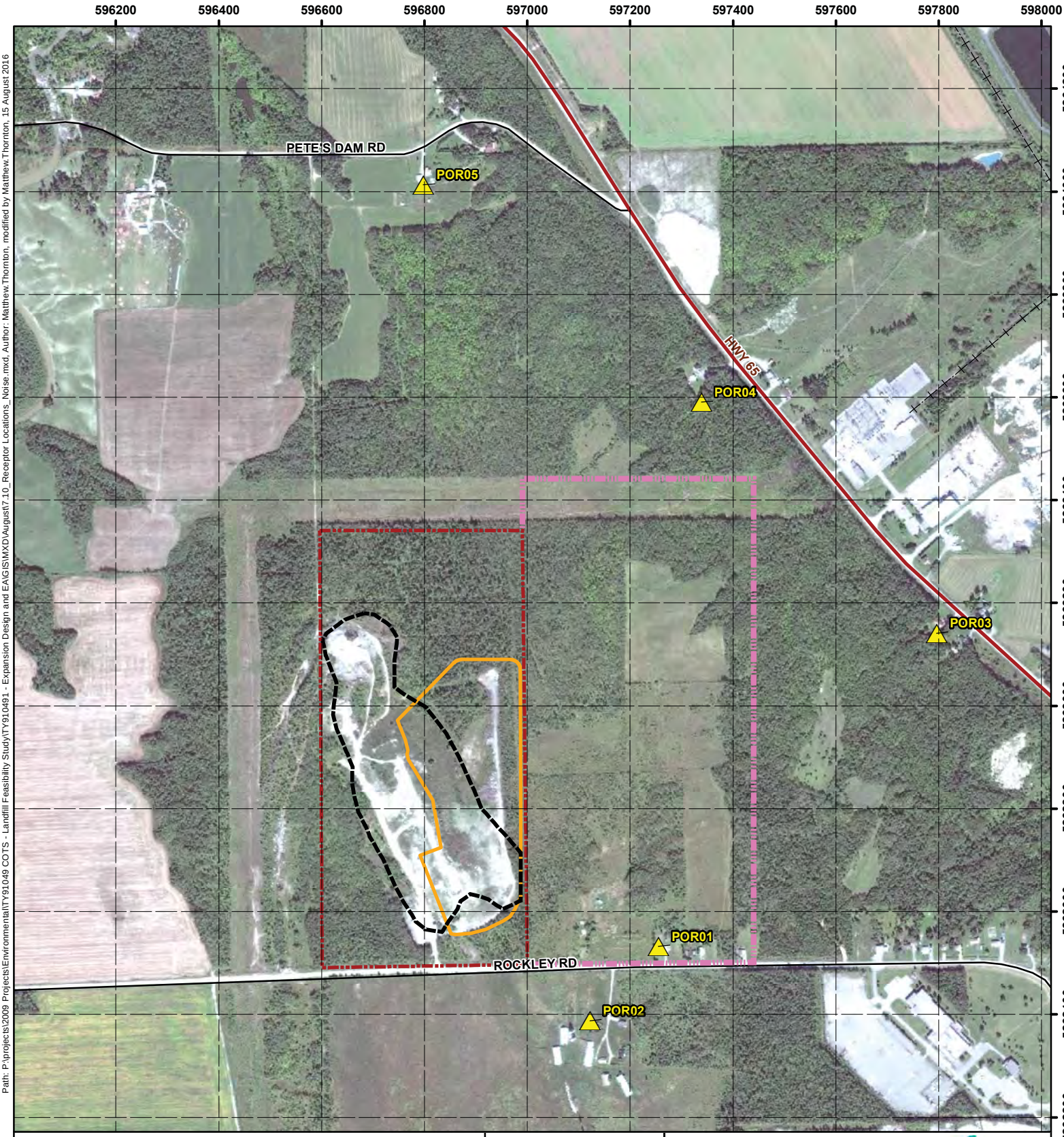


Figure 7.9: Annual GHG Emissions



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LEGEND

- Receptor (labelled with ID)
- Property Boundary
- Contaminant Attenuation Zone
- Highway / Major Roads
- Local Roads
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Figure to be reviewed with the Noise Technical Support Document.

Datum & Projection: NAD 1983 UTM Zone 17N

0 0.2 0.4 0.6 0.8 1 Kilometers

N W E S

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ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Receptor Locations (Noise)

PROJECT N°:TY910491	**FIGURE: 7.10**
SCALE: 1:10,000	DATE: August 2016

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LEGEND

- Receptor (labelled with ID)
- Point Source
- Line Source
- Property Boundary
- Contaminant Attenuation Zone
- Highway / Major Roads
- Local Roads
- Approximate Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)

POINT SOURCES:
E: Excavator
L: Loader

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Figure to be reviewed with the Noise Technical Support Document.

Datum & Projection: NAD 1983 UTM Zone 17N

0 100 200 300 400 500 Meters

N W E S

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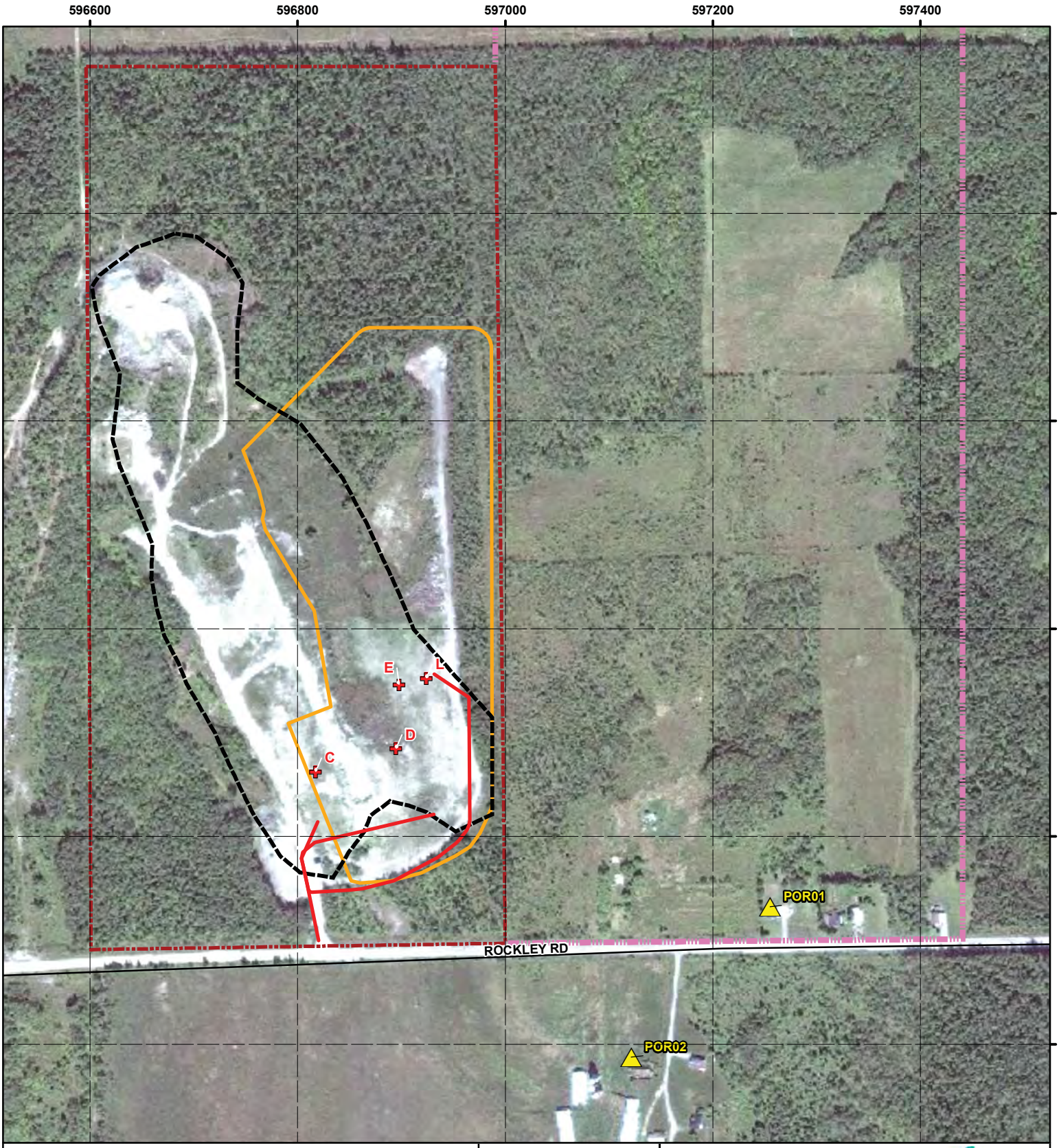
ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Significant Noise Source Location (Phase 1)

PROJECT N^{o}:TY910491	**FIGURE: 7.11**
SCALE: 1:5,000	DATE: August 2016



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LEGEND

- Receptor (labelled with ID)
- Point Source
- Line Source
- Property Boundary
- Contaminant Attenuation Zone
- Highway / Major Roads
- Local Roads
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)

POINT SOURCES:
C: Waste Compactor
D: Dozer
E: Excavator
L: Loader

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Figure to be reviewed with the Noise Technical Support Document.

Datum & Projection: NAD 1983 UTM Zone 17N

0 100 200 300 400 500 Meters

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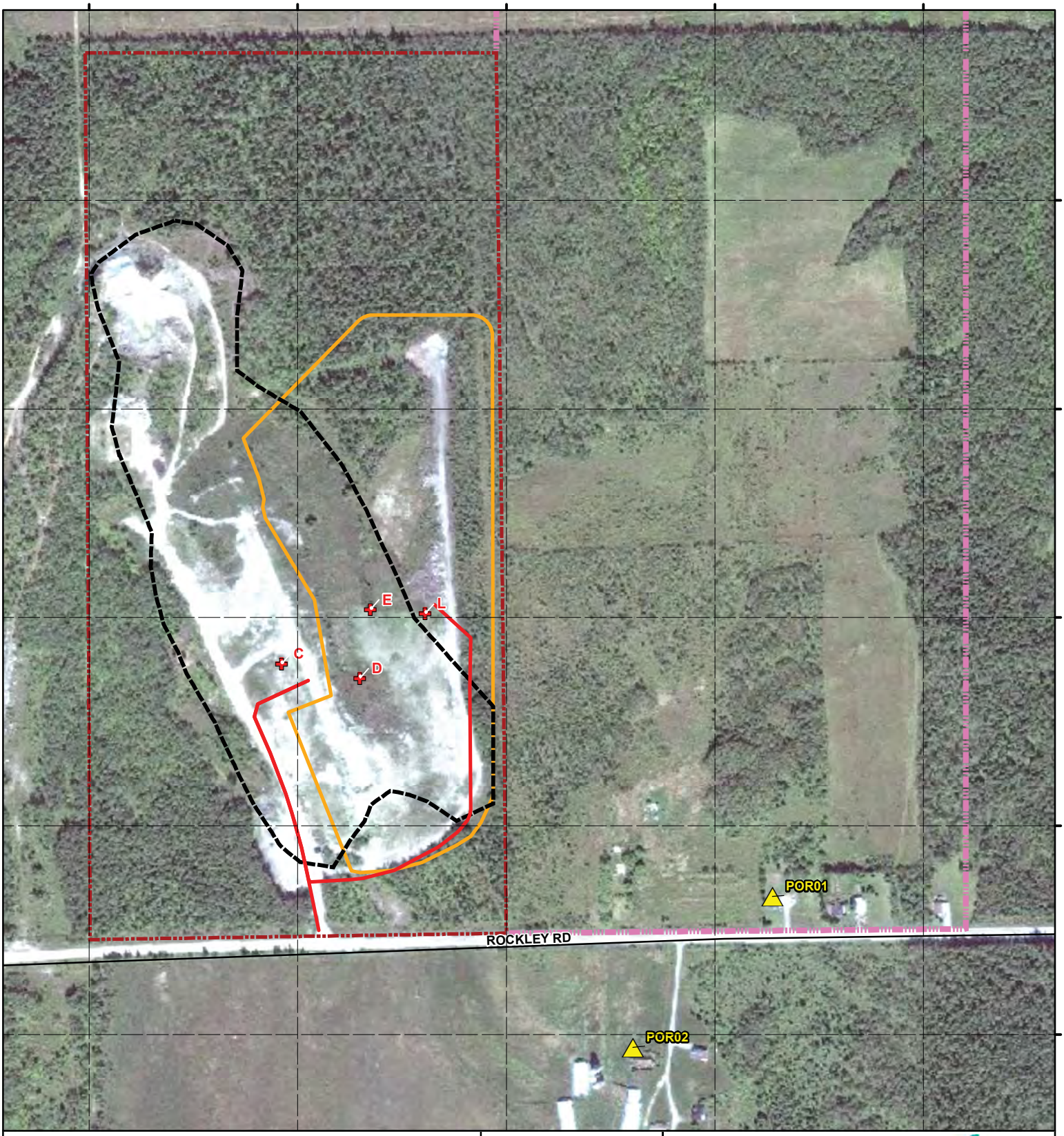
ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Significant Noise Source Location (Phase 2a)

PROJECT N^{o}:TY910491	**FIGURE: 7.12**
SCALE: 1:5,000	DATE: August 2016



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LEGEND

- Receptor (labelled with ID)
- Point Source
- Line Source
- Property Boundary
- Contaminant Attenuation Zone
- Highway / Major Roads
- Local Roads
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)

POINT SOURCES:
C: Waste Compactor
D: Dozer
E: Excavator
L: Loader

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Figure to be reviewed with the Noise Technical Support Document.

Datum & Projection: NAD 1983 UTM Zone 17N

0 100 200 300 400 500 Meters

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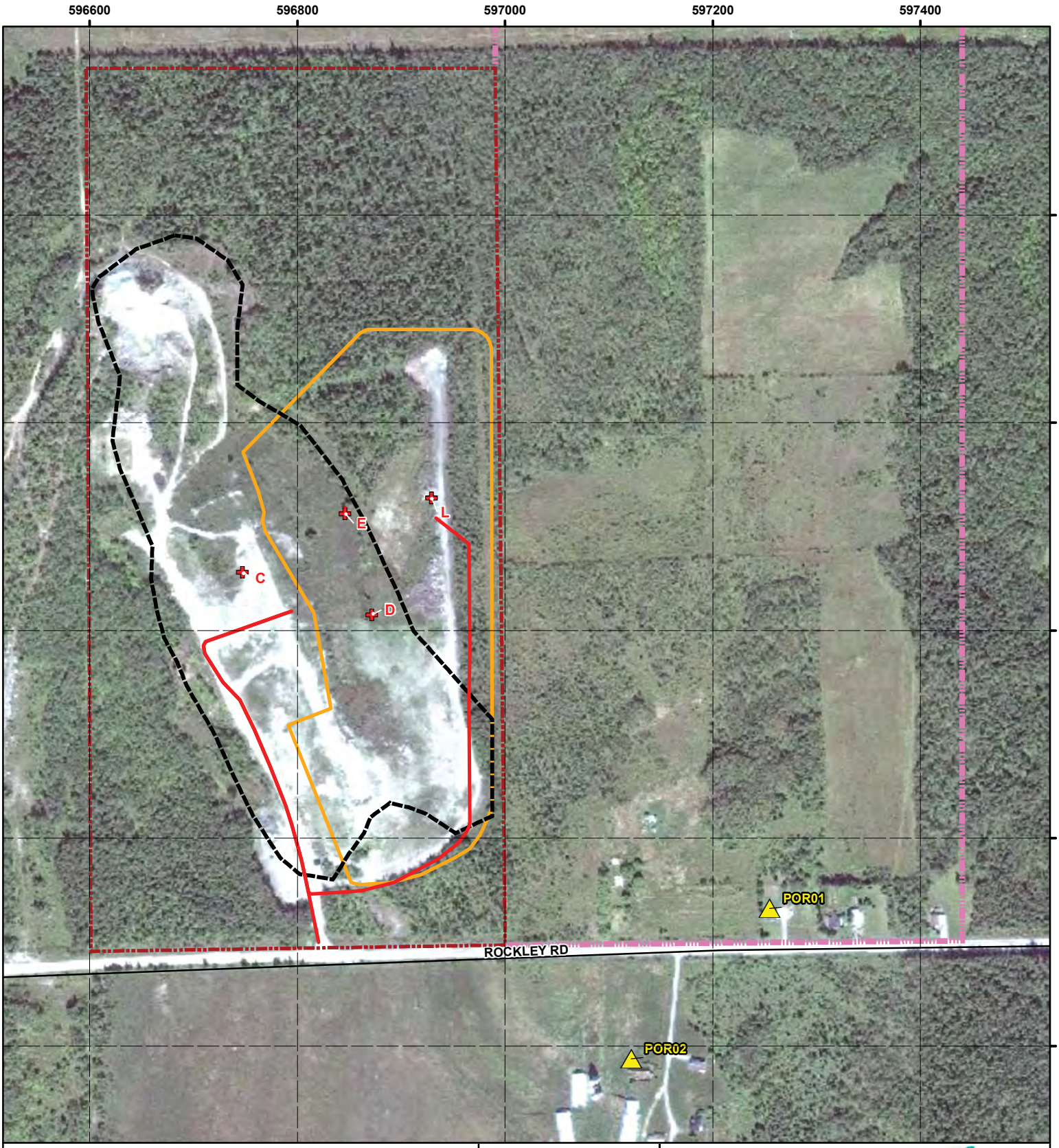
ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Significant Noise Source Location (Phase 2b)

PROJECT N°:TY910491	**FIGURE: 7.13**
SCALE: 1:5,000	DATE: August 2016



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LEGEND

- Receptor (labelled with ID)
- Point Source
- Line Source
- Property Boundary
- Contaminant Attenuation Zone
- Highway / Major Roads
- Local Roads
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)

POINT SOURCES:
C: Waste Compactor
D: Dozer
E: Excavator
L: Loader

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Figure to be reviewed with the Noise Technical Support Document.

Datum & Projection: NAD 1983 UTM Zone 17N

0 100 200 300 400 500 Meters

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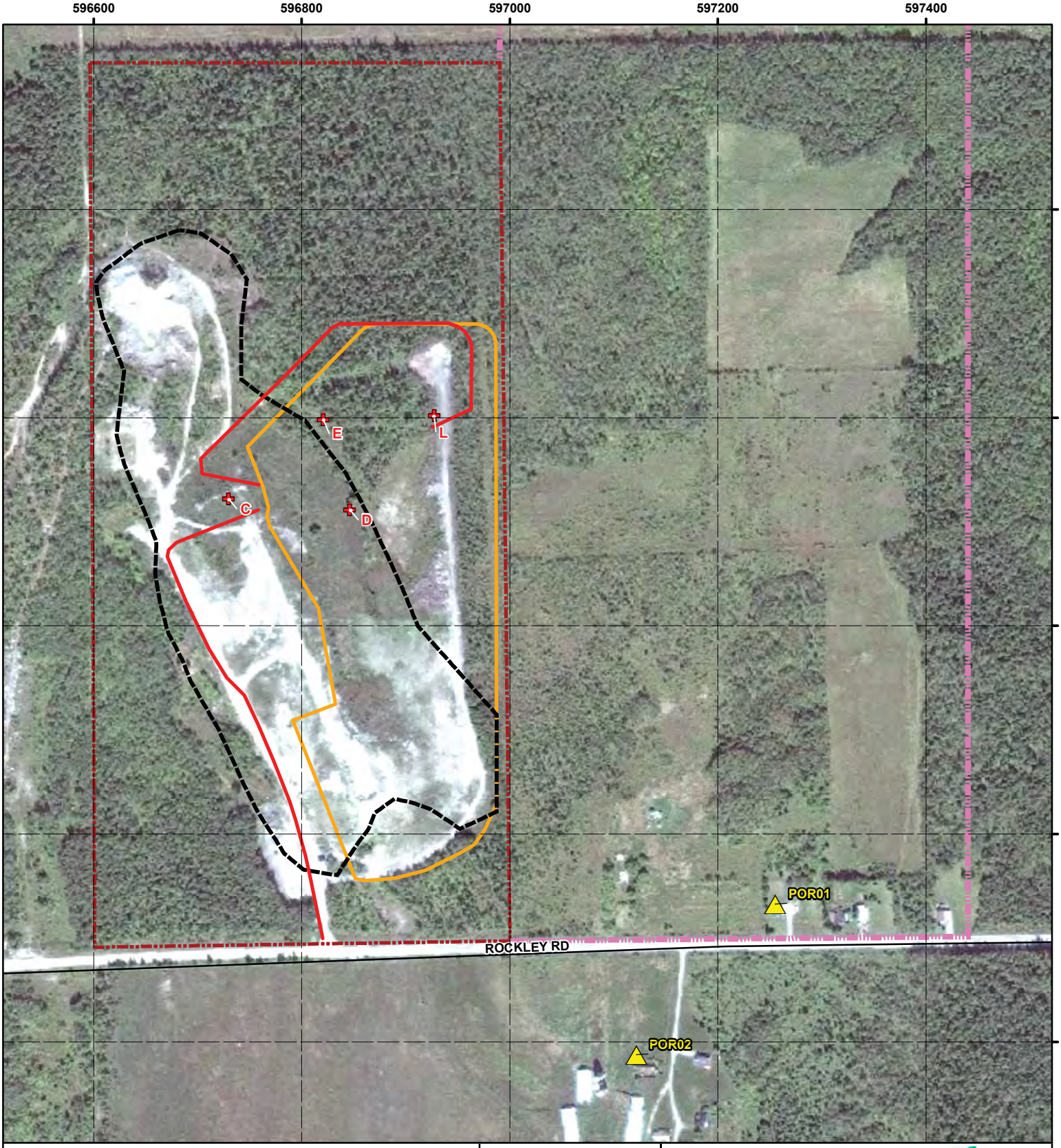
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Significant Noise Source Location (Phase 2c)

PROJECT N°:TY910491	**FIGURE: 7.14**
SCALE: 1:5,000	DATE: August 2016



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LEGEND

- Receptor (labelled with ID)
- Point Source
- Line Source
- Property Boundary
- Contaminant Attenuation Zone
- Highway / Major Roads
- Local Roads
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)

POINT SOURCES:
C: Waste Compactor
D: Dozer
E: Excavator
L: Loader

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Figure to be reviewed with the Noise Technical Support Document.

Datum & Projection: NAD 1983 UTM Zone 17N

0 100 200 300 400 500 Meters

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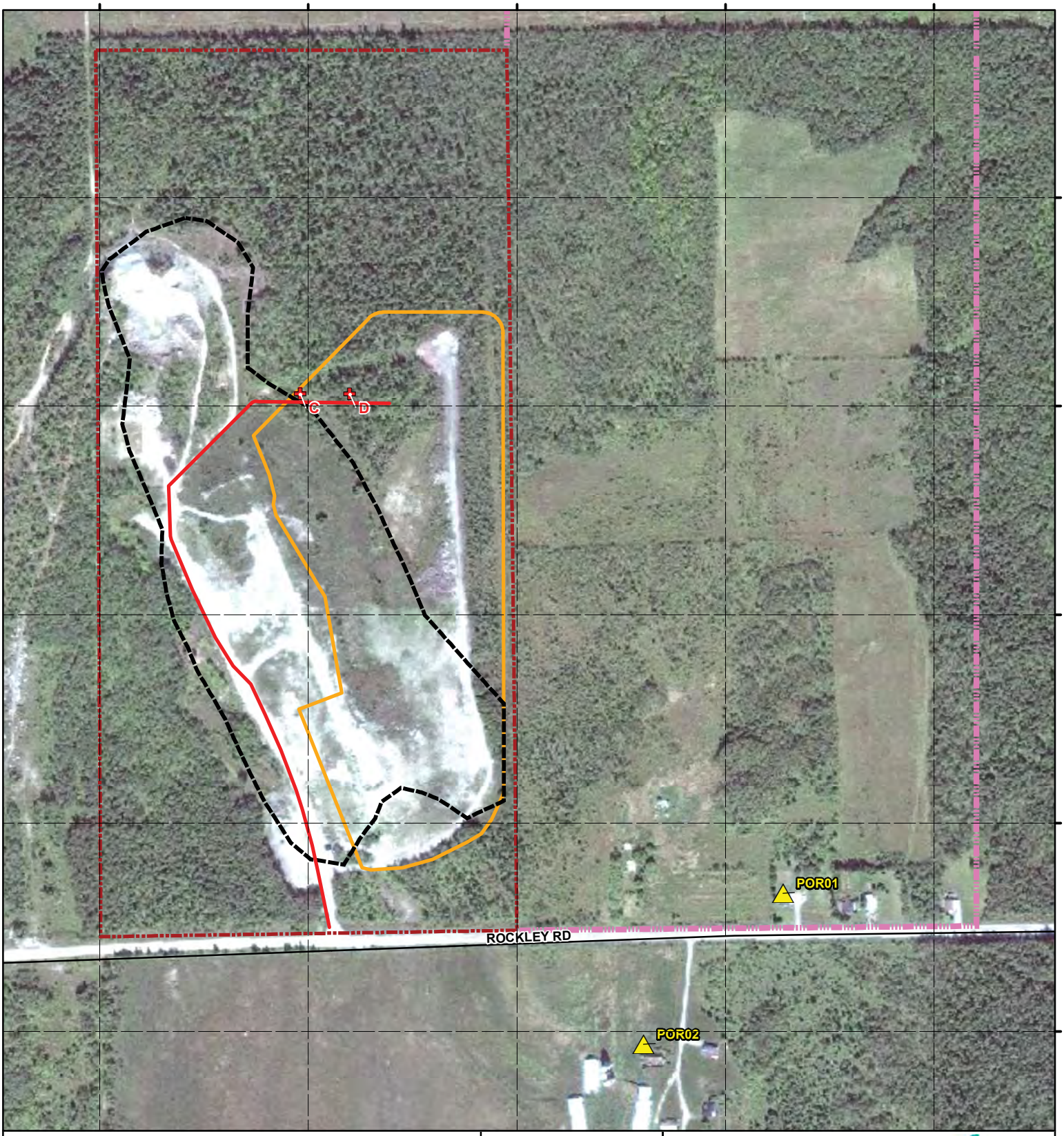
ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Significant Noise Source Location (Phase 2d)

PROJECT N°:TY910491	**FIGURE: 7.15**
SCALE: 1:5,000	DATE: August 2016



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LEGEND

- Receptor (labelled with ID)
- Point Source
- Line Source
- Property Boundary
- Contaminant Attenuation Zone
- Highway / Major Roads
- Local Roads
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)

POINT SOURCES:
C: Waste Compactor
D: Dozer

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Figure to be reviewed with the Noise Technical Support Document.

Datum & Projection: NAD 1983 UTM Zone 17N

0 100 200 300 400 500 Meters

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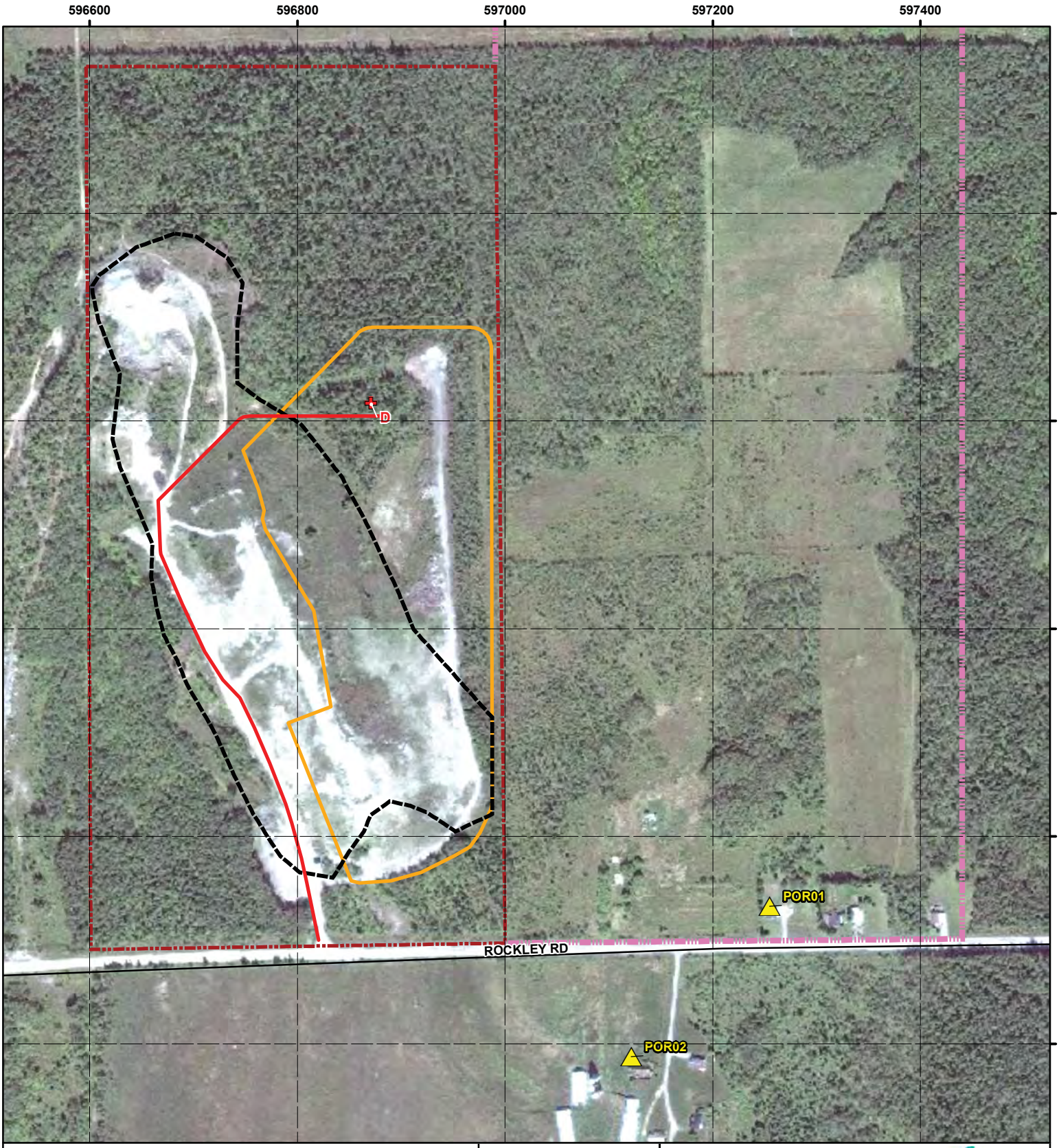
ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Significant Noise Source Location (Phase 2e)

PROJECT N°:TY910491	**FIGURE: 7.16**
SCALE: 1:5,000	DATE: August 2016



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LEGEND

- Receptor (labelled with ID)
- Point Source
- Line Source
- Property Boundary
- Contaminant Attenuation Zone
- Highway / Major Roads
- Local Roads
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)

POINT SOURCES:
D: Dozer

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Figure to be reviewed with the Noise Technical Support Document.

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NEW WASTE MANAGEMENT CAPACITY
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Significant Noise Source Location (Phase 3)

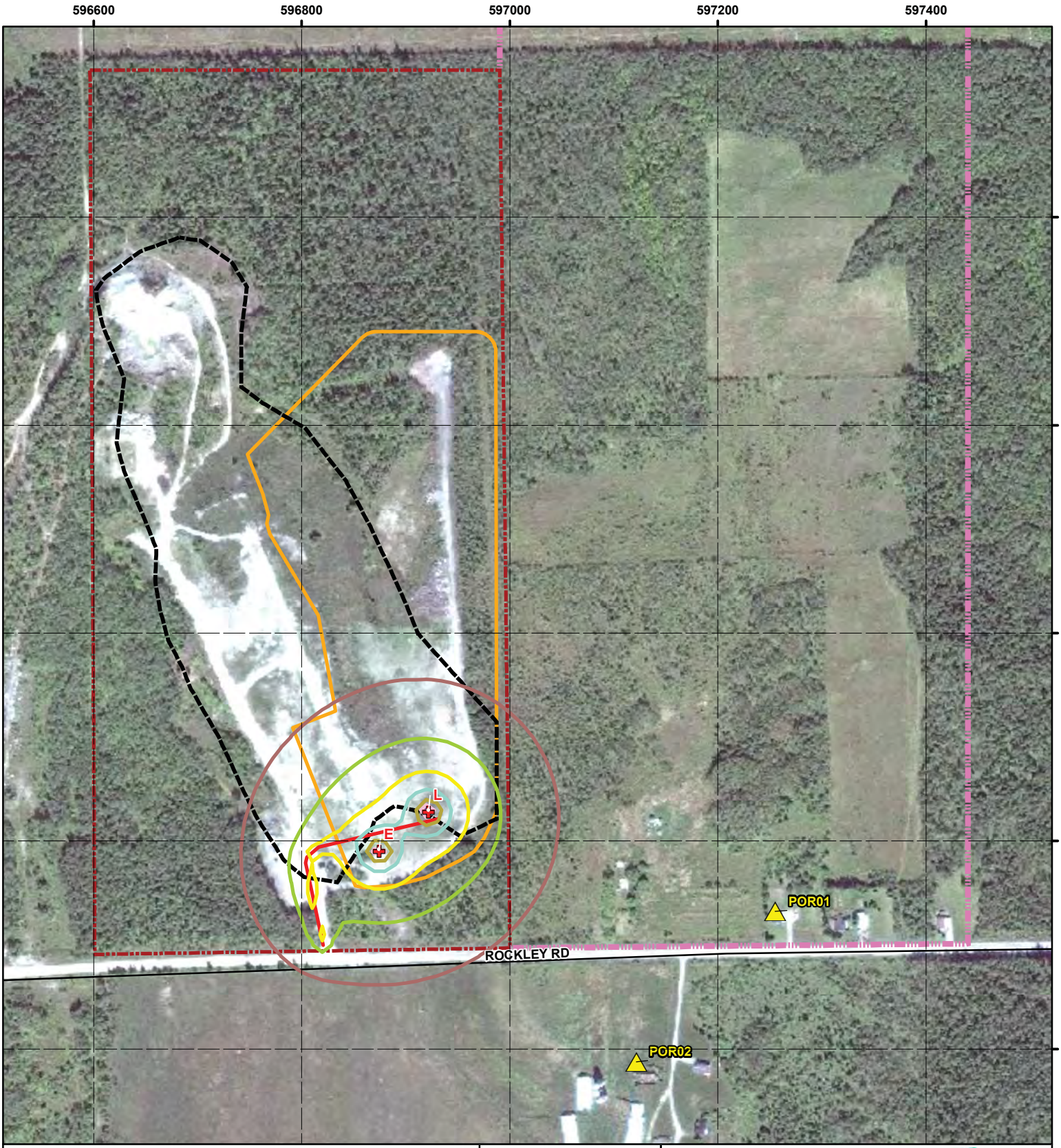
Datum & Projection: NAD 1983 UTM Zone 17N

0 100 200 300 400 500 Meters

N W E S

PROJECT N°:TY910491 | **FIGURE: 7.17**

SCALE: 1:5,000 | DATE: August 2016



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LEGEND

- Receptor (labelled with ID)
- Point Source
- Line Source
- Property Boundary
- Contaminant Attenuation Zone
- Highway / Major Roads
- Local Roads
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)

Daytime Operations dBA Contours

- >=55
- >=60
- >=65
- >=70
- >=75
- >=80
- >=85

POINT SOURCES:
E: Excavator
L: Loader

0 100 200 300 400 500 Meters

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Figure to be reviewed with the Noise Technical Support Document.

Datum & Projection: NAD 1983 UTM Zone 17N

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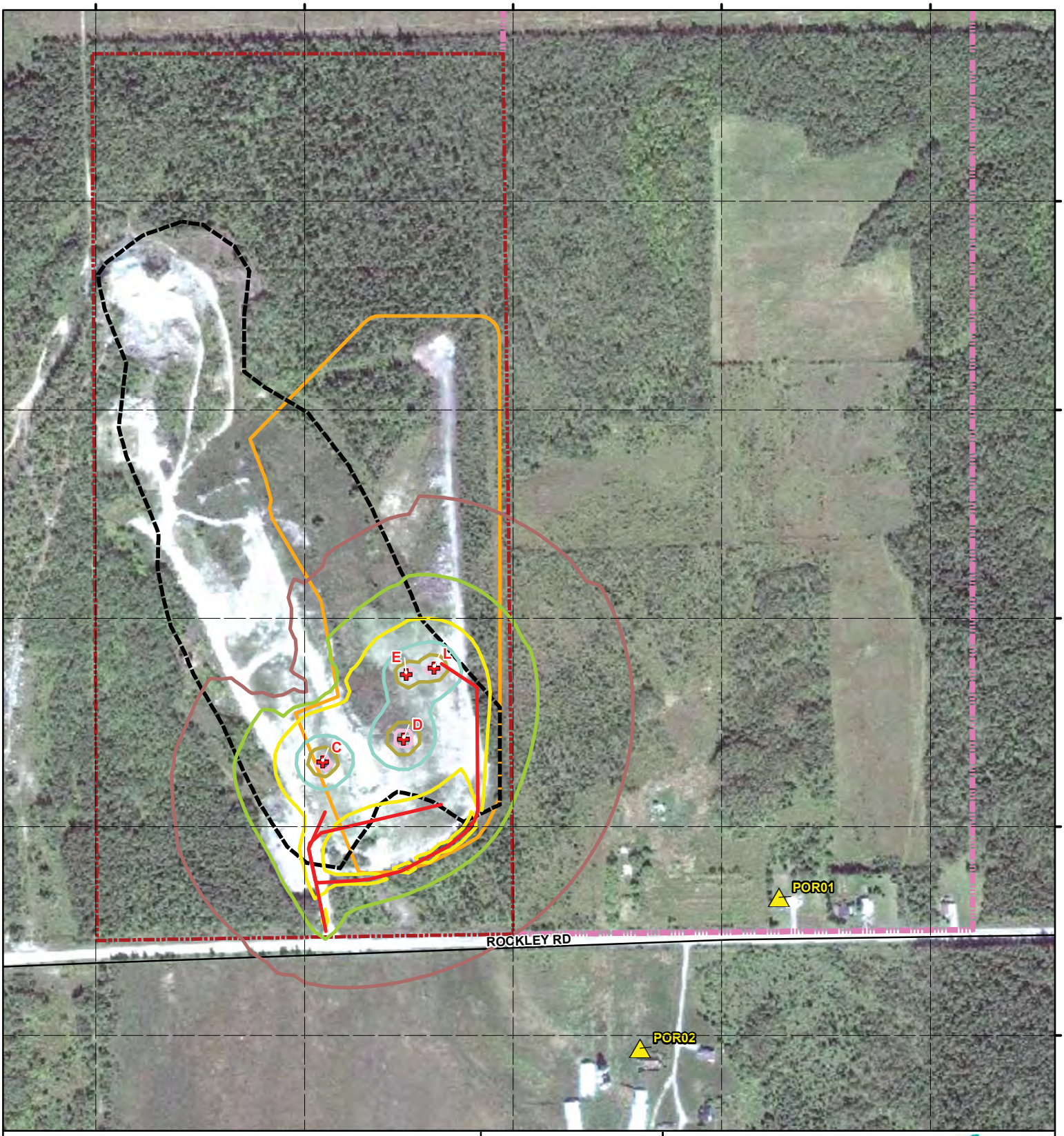
ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Daytime Noise Contours (Phase 1)

PROJECT N^{o}:TY910491	**FIGURE: 7.18**
SCALE: 1:5,000	DATE: August 2016



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LEGEND

- Receptor (labelled with ID)
- Point Source
- Line Source
- Property Boundary
- Contaminant Attenuation Zone
- Highway / Major Roads
- Local Roads
- Approximate Domestic Solid Boundary
- Site (Proposed Landfill Expansion Area)

Daytime Operations dBA Contours

- >=55
- >=60
- >=65
- >=70
- >=75
- >=80
- >=85

POINT SOURCES:
C: Waste Compactor
D: Dozer
E: Excavator
L: Loader

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Figure to be reviewed with the Noise Technical Support Document.

0 100 200 300 400 500 Meters

Datum & Projection: NAD 1983 UTM Zone 17N

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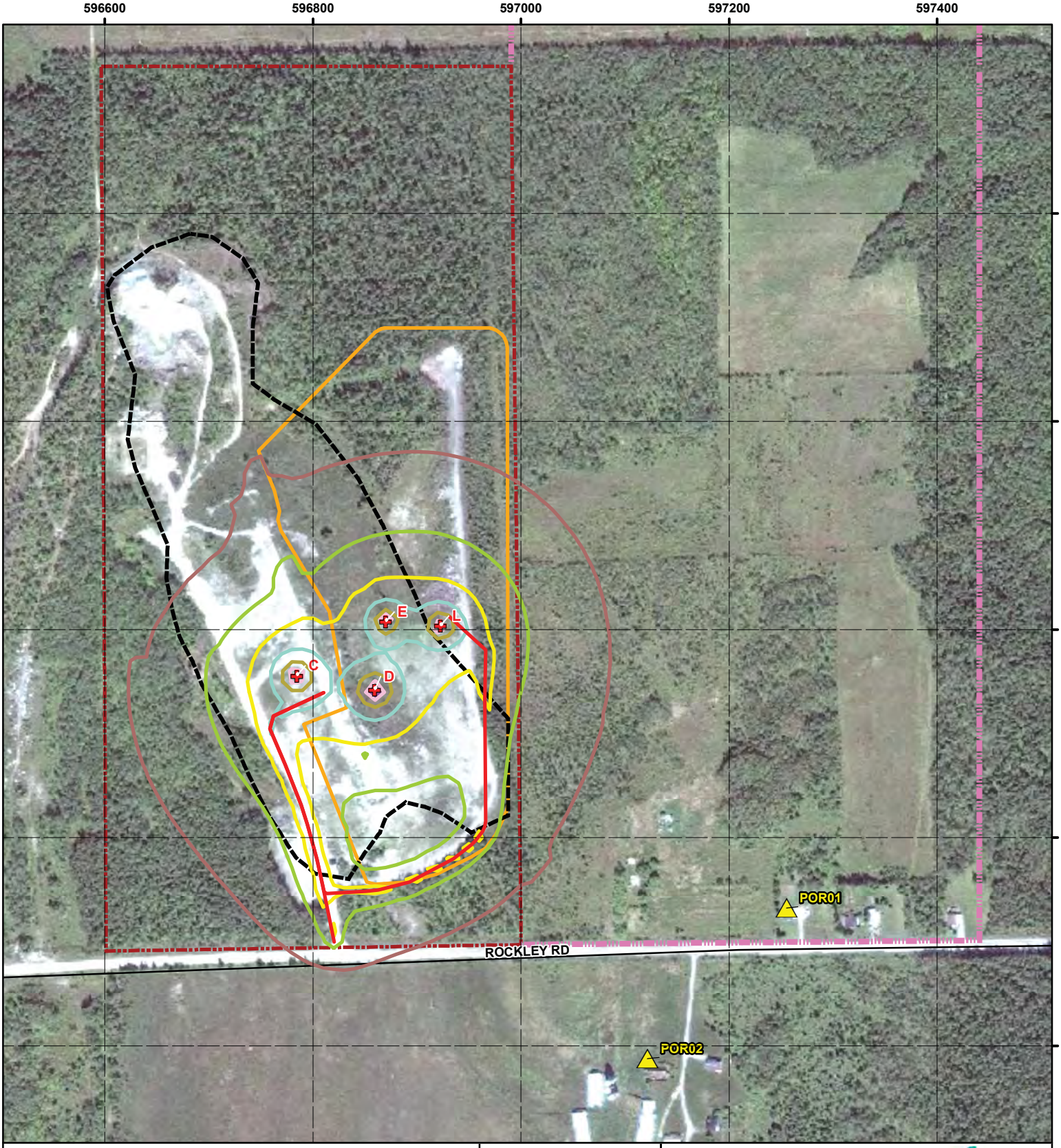
ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Daytime Noise Contours (Phase 2a)

PROJECT N^{o}:TY910491	**FIGURE: 7.19**
SCALE: 1:5,000	DATE: August 2016



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LEGEND

- Receptor (labelled with ID)
- Point Source
- Line Source
- Property Boundary
- Contaminant Attenuation Zone
- Highway / Major Roads
- Local Roads
- Approximate Domestic Solid WasteBoundary
- Site (Proposed Landfill Expansion Area)

Daytime Operations dBA Contours

- >=55
- >=60
- >=65
- >=70
- >=75
- >=80
- >=85

POINT SOURCES:
C: Waste Compactor
D: Dozer
E: Excavator
L: Loader

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Figure to be reviewed with the Noise Technical Support Document.

0 100 200 300 400 500 Meters

Datum & Projection: NAD 1983 UTM Zone 17N

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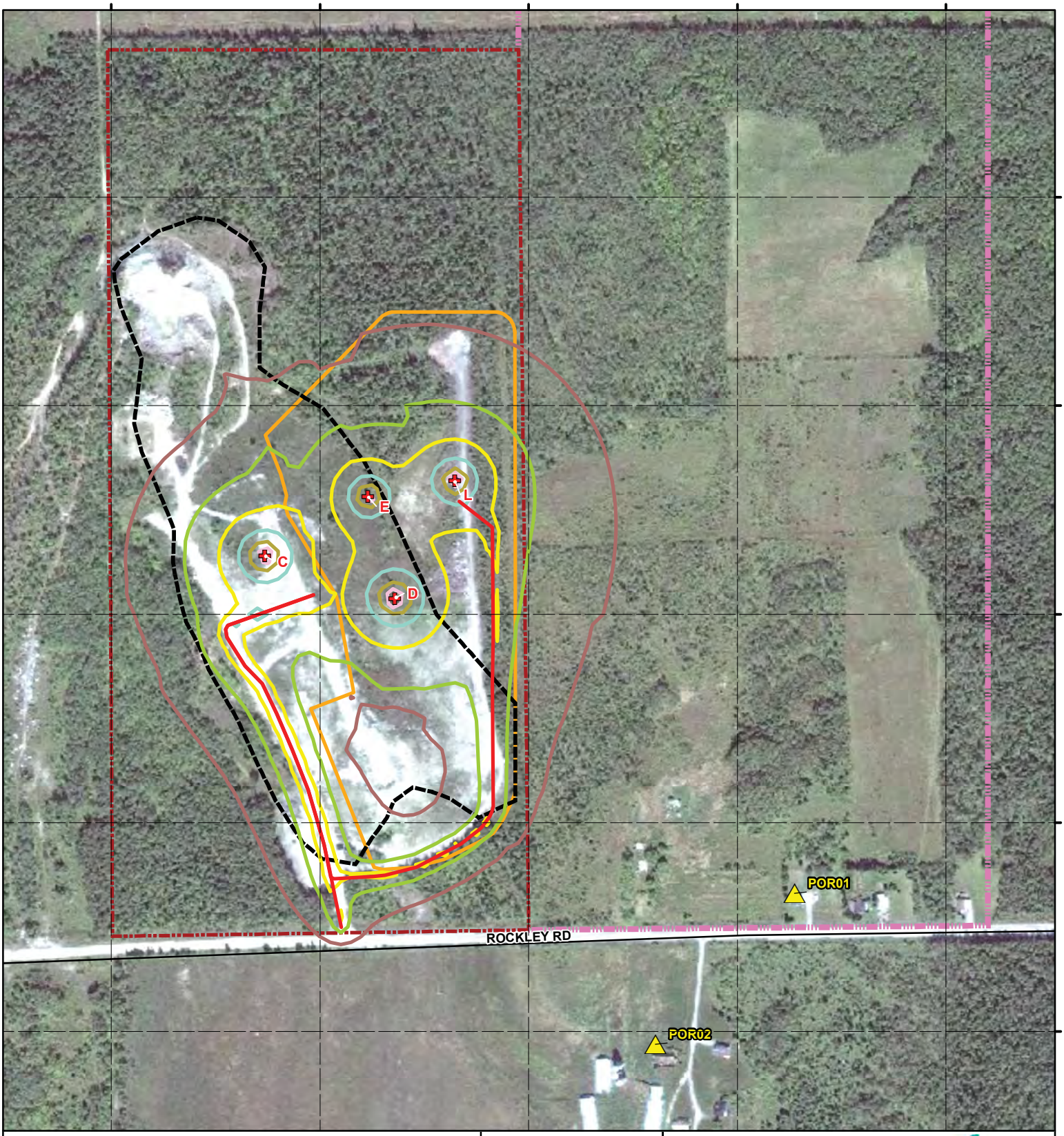
ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Daytime Noise Contours (Phase 2b)

PROJECT N^{o}:TY910491	**FIGURE: 7.20**
SCALE: 1:5,000	DATE: August 2016



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LEGEND

- Receptor (labelled with ID)
- Point Source
- Line Source
- Property Boundary
- Contaminant Attenuation Zone
- Highway / Major Roads
- Local Roads
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)

Daytime Operations dBA Contours

- >=55
- >=60
- >=65
- >=70
- >=75
- >=80
- >=85

POINT SOURCES:
C: Waste Compactor
D: Dozer
E: Excavator
L: Loader

0 100 200 300 400 500 Meters

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Figure to be reviewed with the Noise Technical Support Document.

Datum & Projection: NAD 1983 UTM Zone 17N

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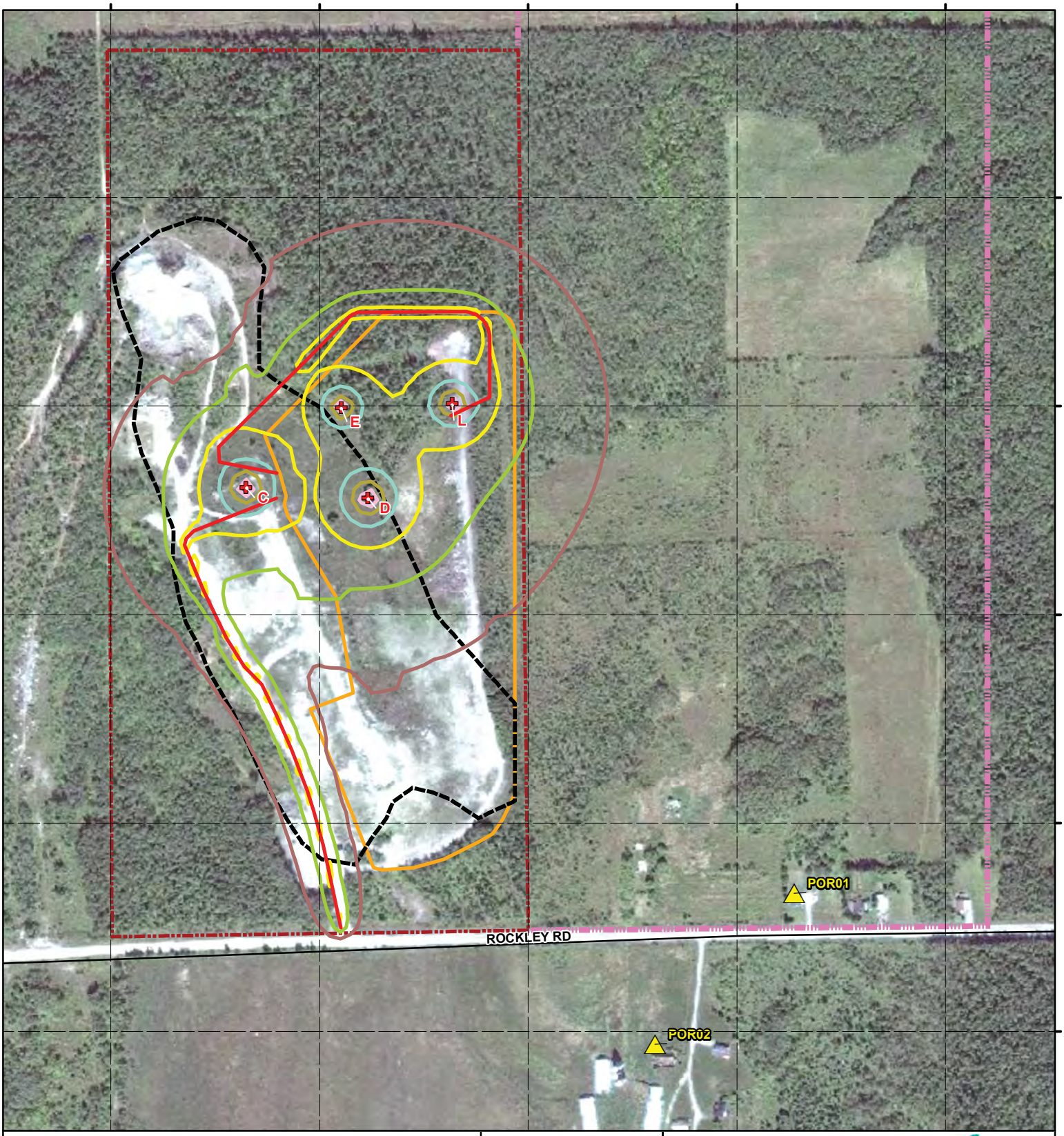
ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Daytime Noise Contours (Phase 2c)

PROJECT N^{o}:TY910491	**FIGURE: 7.21**
SCALE: 1:5,000	DATE: August 2016



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LEGEND

- Receptor (labelled with ID)
- Point Source
- Line Source
- Property Boundary
- Contaminant Attenuation Zone
- Highway / Major Roads
- Local Roads
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)

Daytime Operations dBA Contours

- >=55
- >=60
- >=65
- >=70
- >=75
- >=80
- >=85

POINT SOURCES:
C: Waste Compactor
D: Dozer
E: Excavator
L: Loader

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Figure to be reviewed with the Noise Technical Support Document.

0 100 200 300 400 500 Meters

Datum & Projection: NAD 1983 UTM Zone 17N

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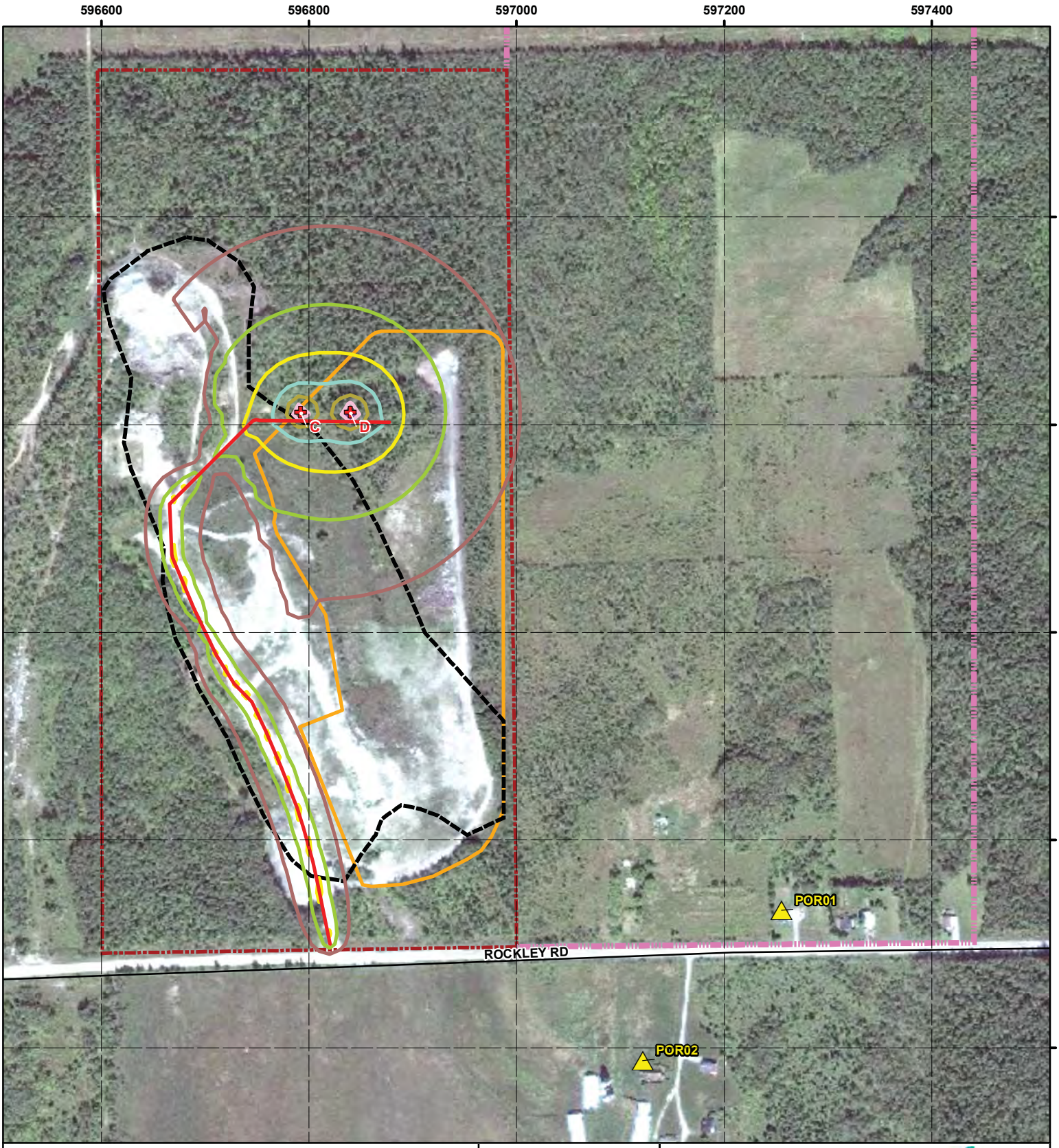
ENVIRONMENTAL ASSESSMENT
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Daytime Noise Contours (Phase 2d)

PROJECT N°:TY910491	**FIGURE: 7.22**
SCALE: 1:5,000	DATE: August 2016



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LEGEND

- Receptor (labelled with ID)
- Point Source
- Line Source
- Property Boundary
- Contaminant Attenuation Zone
- Highway / Major Roads
- Local Roads
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)

Daytime Operations dBA Contours

- >=55
- >=60
- >=65
- >=70
- >=75
- >=80
- >=85

POINT SOURCES:
C: Waste Compactor
D: Dozer

0 100 200 300 400 500 Meters

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Figure to be reviewed with the Noise Technical Support Document.

Datum & Projection: NAD 1983 UTM Zone 17N

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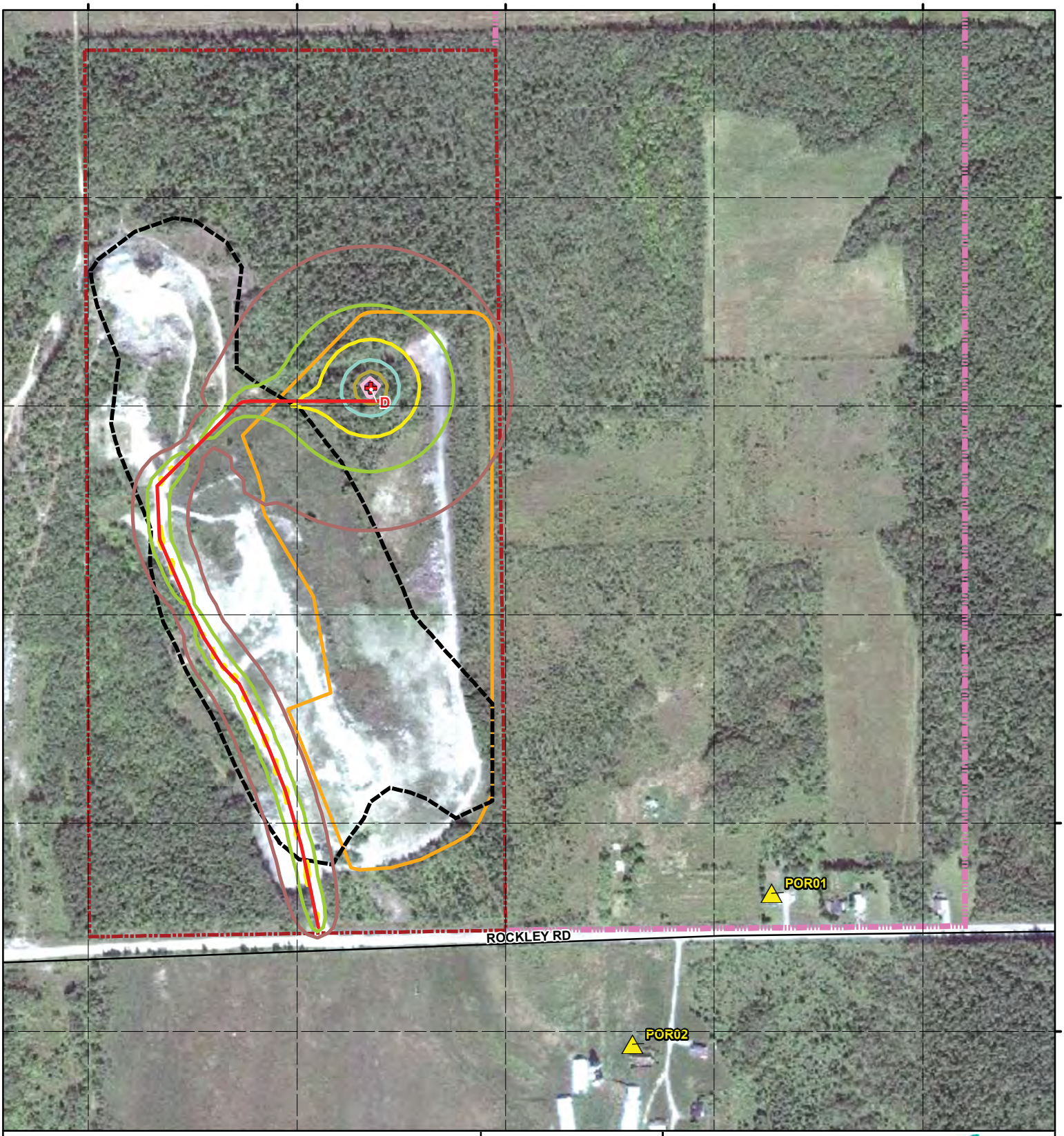
NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Daytime Noise Contours (Phase 2e)

PROJECT N^{o}:TY910491	**FIGURE: 7.23**
SCALE: 1:5,000	DATE: August 2016



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LEGEND

- Receptor (labelled with ID)
- Point Source
- Line Source
- Property Boundary
- Contaminant Attenuation Zone
- Highway / Major Roads
- Local Roads
- Approximate Domestic Solid Waste Boundary
- Site (Proposed Landfill Expansion Area)

Daytime Operations dBA Contours

- >=55
- >=60
- >=65
- >=70
- >=75
- >=80
- >=85

POINT SOURCES:
D: Dozer

NOTES:
- Background image extracted from ESRI World Topo Map.
- All base data on this map was extracted form Land Information
- Geonames extracted from Geobase.
- Figure to be reviewed with the Noise Technical Support Document.

Datum & Projection: NAD 1983 UTM Zone 17N

0 100 200 300 400 500 Meters

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NEW WASTE MANAGEMENT CAPACITY
TEMISKAMING SHORES, ONTARIO

Daytime Noise Contours (Phase 3)

PROJECT N°:TY910491	**FIGURE: 7.24**
SCALE: 1:5,000	DATE: August 2016

8.0 MITIGATION, MONITORING AND CONTINGENCY PLANS

8.1 Mitigation

8.1.1 Atmospheric Environment

The principal air quality parameters of concern emitted from the Project will be dust and landfill gases associated with the following sources:

- Road dust associated with haul trucks transporting waste to the cells;
- Fugitive dusts generated in the area of the working face; and
- Landfill gases generated by decomposition of the deposited wastes.

A DBMP will be prepared for the landfill operations to identify all potential sources of fugitive dusts, outline mitigative measures that will be employed to control dust generation, and detail the inspection and recordkeeping required to demonstrate that fugitive dusts are being effectively managed. The DBMP will be consistent with industry best management practices and MOECC requirements, to ensure that these management practices and active mitigation are effective. This will include:

- Control of dust emissions from roads through the application of water should visible dust or silt be identified;
- Control of dust from exposed soils through the application of water spray to mitigate dusts;
- Re-vegetation of all exposed soil areas at closure, and where practical, implement progressive reclamation;
- Maintenance of site roadways to ensure good condition through regular inspections and timely repairs that minimize the silt loading on the roads;
- Enforcement of speed limits to reduce road dust from trucks travelling to the working face; and
- Maintenance of the unpaved stretch of Rockley Road and manage fugitive dust through the use of chemical dust suppressants, as needed, and/or consideration of paving.

The proposed dust control measures are based on current international best management practices, are predictably effective and are not prone to failure. The DBMP includes opportunities for adaptive management, in which the intensity of the control measures may need to be increased if site inspections and monitoring indicate that current measures are insufficient to prevent off-site dust effects.

Air emissions associated with diesel-fuelled vehicles and equipment will be controlled through use of:

- Low sulphur diesel, as required by Environment Canada’s Sulphur in Diesel Fuel Regulation;

- Equipment meeting applicable Transport Canada off-road vehicle emission requirements, as these regulations and associated emission limits are phased-in; and
- Effective equipment maintenance via a preventative maintenance program.

Litter effects will be minimized through best management practices that would require all loads to be secured to prevent litter along roadways to landfill and would require litter fences installed if blowing litter is identified as an issue once the landfill begins receiving wastes.

Given that the Project GHG direct emissions are primarily due to the diesel-fuelled engines and landfill gases, mitigation measures would be most effectively related to these two activities. Measures to mitigate the Project's energy use and associated GHG emissions from such activities may include:

- Regular maintenance of landfill equipment and vehicles to maximize operational efficiency;
- Investigation of the use of lower emission equipment and fuels;
- Minimizing the distances vehicles travel on-site to the extent possible through planning; and
- Maintaining an annual inventory of GHG emissions to identify reporting requirements (if any) and potential opportunities to reduce emissions.

A summary of mitigation measures is provided in Table 8.1.

8.1.2 Groundwater

The relationship between the Site operations and the groundwater quality and quantity is very dynamic. For this reason several design and operations procedures must be considered in order to minimize the anticipated impacts to the groundwater regime. The landfill standards must be adhered to; however, there is operational latitude provided to Site operators to allow for the implementation of best management practices that may further enhance Site performance. Therefore, it is proposed that this Site will be operated following phased optimal cell design, which will limit the open filling area, in order to reduce infiltration and the resultant leachate generation. In addition, the Site design includes a progressive closure strategy, complete with a low permeability cover installed after each phase of waste deposition, as detailed in Section 6.1.3. The adequacy of the natural attenuation area (CAZ) will also be evaluated annually and any further development in this area would be assessed for the potential cumulative effects on the Site performance.

To determine the requirement for mitigation for the potential adverse effects to groundwater quality, the groundwater monitoring and sampling program will be continued. This program will be enhanced through the development of a formal, Site-specific trigger-level monitoring program and contingency plan. Table 8.1 includes a summary of the mitigation measures and the groundwater monitoring program is further discussed in Section 8.2.

It is predicted that with the implementation of these mitigation measures and the proposed monitoring program/contingency plan that the residual effects would be neutral.

8.1.3 Surface Water

To mitigate for the potential adverse effects to surface water quality, an Erosion and Sediment Control Plan would be developed for the Site covering both the construction and operational phases. The Sediment and Erosion Control Plan would follow best management practices and could include the installation, inspection and maintenance of silt fences, straw bales and sediment traps.

In order to measure the effectiveness of these controls, a surface water quality and quantity monitoring program will be implemented. This will include pre-Construction Phase baseline surface water monitoring program to determine the current conditions as well as an ongoing program from Construction through Post-Closure Phases. This will include monitoring of Tributaries 1 and 2, site surface water runoff and a control point. There are no suitable upstream sampling locations; therefore, sampling of the proposed stormwater management pond is envisioned. A Stormwater Management Plan will be developed as part of the design stage. Table 8.1 includes a summary of the mitigation measures and the surface water monitoring program is further discussed in Section 8.2.

It is predicted that with the implementation of these mitigation measures and the proposed monitoring program that the residual effects would be neutral and potentially beneficial in improving the surface water quality.

8.1.4 Terrestrial Environment

8.1.4.1 Habitat, Vegetation Communities, and Plant Life

Planning efforts for the Project have focused, where practical, on using lands that have been previously disturbed by past anthropogenic disturbance such as logging and clearing. This is advantageous to environmental protection as it reduces the location of vegetation clearing to already disturbed site and limits the creation of new negative edge effects. The clearing of sensitive wetland habitats was avoided.

The following mitigation measures are applicable to all phases of the Project. The principal mitigation measures that are proposed to limit short- and long-term adverse effects to local vegetation communities include:

- Minimize the Project footprint and vegetation removal to the extent practicable;
- Use existing permanent road / trail infrastructure to avoid creation of new access roads;
- Minimize dust generation along service roads through the implementation of the DBMP;

- Schedule construction activities to occur in winter, where feasible, to avoid sensitive wildlife breeding seasons, such as the migratory bird nesting season, and to minimize the potential for ground disturbance and soil erosion;
- Install silt fencing around the perimeter of the construction footprint for erosion and sediment control (silt fencing should also be sufficient to exclude wildlife from entering the construction area);
- Re-vegetate exposed soils as soon as possible;
- Excluding vehicle refuelling and maintenance activities from at least 30 m of a natural vegetated area;
- Directing water pumped during dewatering activities away from natural features and discharging the water to a settling pond or disposed off-Site; and
- Use of industry best management practices for Project design and construction management.

8.1.4.2 Birds

Vegetation clearing activities should be avoided during the breeding bird season, as there is currently no permit for incidental take of migratory bird nests/eggs and/or individuals. For Bird Conservation Region (BCR) 12, Environment Canada outlines that the breeding season extends from 12 April and 30 August. As such, vegetation clearing activities should be undertaken between from 1 September and 11 April to avoid disrupting bird species during their nesting season, as is required under the *Migratory Birds Convention Action* (MBCA) and the *Fish and Wildlife Conservation Act, 1997* (FWCA). Consultation with the MNRF and Environment Canada should be undertaken prior to clearing activities to confirm season restrictions.

If vegetation clearing activities must be undertaken between 12 April and 30 August, Environment Canada must be contacted prior to any activities to determine if confirmatory nest searching is permissible. Should vegetation clearing activities be permitted by Canadian Wildlife Services (CWS) during the breeding season, a combination of point count surveys and nest searching activities (for select species such as woodpeckers, colonial-breeding species or those species nesting of man-made structures) may be required to document the presence of breeding birds and to avoid disturbance and/or destruction of breeding birds and/or their nests. Should migratory birds and/or nesting sites be confirmed within these areas through point count surveys and active nest searching, appropriate avoidance buffer areas around active breeding areas and/or nesting sites would be required until the young have left the nest on their own accord. Appropriate buffers will vary depending on the species and should be implemented based on consultation with Environment Canada and the MNRF.

The following mitigation measures are applicable to all phases of the Project. Mitigation measures that will be used to reduce potential adverse effects to birds include the following:

- Minimize the Project footprint to the extent practicable;
- Undertake vegetation clearing in winter to avoid the migratory bird nesting season, where practical (outside of 12 April – 30 August);

- Minimize the level of potentially disturbing activities near any active nest sites that may be discovered during construction, until the nest is vacated;
- Enforce speed limits along proposed access roads to reduce the potential adverse effects of increased vehicular traffic associated with the Project. Signs warning drivers of the possibility of wildlife encounters should be posted in areas of high wildlife activity;
- Avoid idling of vehicles; equipment and vehicles should be turned off when not in use unless required for construction activities and/or effective operation;
- Require properly working machinery and equipment with adequate noise suppression devices that meet current government requirements;
- Cover or otherwise contain loose materials that have potential to release airborne particulates during their transport, installation or removal;
- Include wildlife awareness information into regular safety and environmental inductions given to Project workers; making wildlife sighting logs or information boards available to notify workers of local observations, and making workers aware of seasonal changes in local wildlife behaviour or presence in proximity to the Project;
- Advising construction crews not to interfere or harass wildlife; and
- Maintaining stockpiled soils and excavation slopes at slopes greater than 45 degrees between 12 April and 30 August to prevent birds from nesting in these areas.

In the event that future raptor nesting is observed within or in proximity to the Project footprint, an acceptable buffer defined in the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (MNR, 2010) should be observed until breeding activities have ended and the nesting site has been abandoned. Workers should be made aware of locally nesting raptors to avoid unnecessary disturbance.

8.1.4.3 Other Wildlife

The following mitigation measures are applicable to all phases of the Project. Mitigation measures that will be used to reduce potential adverse effects to wildlife include the following:

- Minimize the Project footprint to the extent practicable to reduce overall habitat loss and to limit the potential adverse effects related to interference with wildlife movement;
- Undertake vegetation clearing in winter to avoid sensitive wildlife breeding seasons, where practical;
- Enforce speed limits along proposed access roads to reduce the potential adverse effects of increased vehicular traffic associated with the Project. Signs warning drivers of the possibility of wildlife encounters should be posted in areas of high wildlife activity;
- Avoid idling of vehicles; equipment and vehicles should be turned off when not in use unless required for construction activities and/or effective operation;
- Require properly working machinery and equipment with adequate noise suppression devices that meet current government requirements;
- Cover or otherwise contain loose materials that have potential to release airborne particulates during their transport, installation or removal;

- The use of noise barriers and use of properly working machinery and equipment with adequate noise suppression devices that meet current government requirements;
- Include wildlife awareness information into regular safety and environmental inductions given to Project workers; making wildlife sighting logs or information boards available to notify workers of local observations, and making workers aware of seasonal changes in local wildlife behaviour or presence in proximity to the Project;
- Advising construction crews not to interfere or harass wildlife; and
- Installation of wildlife exclusion fencing around perimeter of the construction site to limit attraction to wildlife.

Provided the aforementioned mitigation techniques are carried out for habitat, vegetation communities, plant life, birds, and other wildlife there is not expected to be a significant effect to the overall terrestrial environment. A summary of mitigation measures for the terrestrial environment is provided in Table 8.1

8.1.5 Land Use

To avoid potential conflicts with future land use, the City will consider the location and operation of the proposed landfill prior to approval of future land use or zoning amendments in the vicinity of the landfill. Implementation of this mitigation measure will avoid future land use conflicts. Table 8.1 summarizes the mitigation measures for land use.

8.1.6 Public Health and Safety (including Transportation)

To mitigate for the potential effects due to Project-related traffic, all phases of the Project will consider other users of the road (such as school buses and neighnouring residents) and avoid road usage during sensitive time periods. As well, as part of detailed Site design, consideration will be given to appropriate layout for entrance and exits as well as signage. The combination of these measures should proactively eliminate the potential traffic effects. Any reconfigurations to the road layout will be completed in accordance with City and provincial standards. Transportation conflicts will be minimal following the implementation of these mitigation measures. A summary of the mitigation measures for public health and safety/transportation is provided in Table 8.1.

8.1.7 Visual Aesthetics

Different approaches can be taken to lessen the impact of the proposed landfill expansion. These include measures that will obscure the feature from the surrounding areas or measures that will improve the aesthetic quality of the landfill feature itself. A third option is to develop an approach that combines the first two options so that the proposed landfill expansion is aesthetically pleasing in high visibility public areas and unobtrusive near more private residential and rural areas. Diminishment of visual aesthetics will not be significant with the proper implementations of these mitigation measures. A summary of mitigation measures for visual aesthetics is provided in Table 8.1.

Table 8.1: Summary of Mitigation Measures

Project Phase	Issue/ Concern/ Interaction	Mitigation Measure	Description/Commitment	Standard	Residual Effects (after mitigation measure applied)
Atmospheric Environment					
Construction, Operations	Airborne particulates from Fugitive Dust Emissions	Dust Best Management Plan	• The DBMP will ensure effective fugitive dust management to mitigate potential off-site effects of the particulate matter and trace metals present on the particulate. • The DBMP will detail the following measures: watering frequency, visual monitoring, inspection, record keeping, responsibility, training, complaint response and corrective actions. • If further mitigation is required at specific locations (e.g., working face), dedicated water sprays will be employed. • Travel surfaces will be maintained to minimize silt (fine material) and a site speed limit will be enforced. • Dust generation on the unpaved stretch of Rockley Road can be controlled through the use of chemical surfactants for suppression, or alternatively, paving the road.	Maintain TSP, PM_{10} and $PM_{2.5}$ concentrations below AAQC at off-site receptors	Neutral

Project Phase	Issue/ Concern/ Interaction	Mitigation Measure	Description/Commitment	Standard	Residual Effects (after mitigation measure applied)
Construction, Operations	Exhaust from generators, trucks and mobile equipment	Engine maintenance program	• A preventative maintenance program will be employed that encompasses all pollution control equipment and diesel-fired engines.	Maintain air quality below AAQC for NO_2, SO_2, CO, and particulate matter at off-site receptors	Neutral
Construction, Operations	Exhaust from trucks and off-road mobile equipment	Equipment compliant with Transport Canada vehicle emission requirements	• Emission reductions achieved through the use of current equipment that complies with Transport Canada's off-road engine emission criteria.	Transport Canada Off-Road Compression-Ignition Engine Emission Regulations (SOR/2005-32)	Neutral
Construction, Operations	SO_2 emissions from diesel fuel use	Use of low sulphur fuel (15 ppm sulphur)	• Low sulphur fuels will be used in off-road diesel engines; this will reduce the sulphur dioxide emissions from all sources and the resultant off-site air concentrations.	Environment Canada Sulphur in Diesel Fuel Regulation limiting fuel sulphur content to less than 15 ppm for off-road engines (SOR/2002-254)	Neutral
Construction, Operations	GHG emissions from diesel fuel use	Regular service and maintenance of vehicles	• Overall efficiency will be maximized through the regular maintenance and service of vehicles.	Transport Canada Off-Road Compression-Ignition Engine Emission Regulations (SOR/2005-32)	Neutral
Operations	Litter	Best practices for managing landfill	• Measures to prevent wind-blown litter will be detailed in documented procedures.	Prevent nuisance effect of litter	Neutral
Groundwater					
Construction, Operations	Landfill-derived impairment of	Specified Operational Procedures	• The design and operations plan for the Site will include optimal	MOECC Guideline B-7, Ontario Drinking Water Standards	Neutral

Project Phase	Issue/ Concern/ Interaction	Mitigation Measure	Description/Commitment	Standard	Residual Effects (after mitigation measure applied)
	groundwater quality		cell design to limit the open tipping face area. • The landfill design will be developed to allow for progressive closure utilizing a low permeability cover system.		
Construction, Operations	Landfill-derived impairment of groundwater quality	Monitoring and contingency plans	• Groundwater monitoring and sampling at the Site and CAZ. • Development of a formal, Site-specific contingency plan and trigger-level monitoring program. • Annual evaluation of adequacy of the CAZ.	MOECC Guideline B-7, Ontario Drinking Water Standards	Neutral
Surface Water					
Construction, Operations	Sediment transport	Sediment and Erosion Control	• Installation, inspection and maintenance of sediment and erosion control structures such as silt fences, straw bales and sediment traps.	Best Practices – such Ministry of Transportation's Ontario Provincial Standard Specifications and Best Management Practices for Erosion and Sediment Control During Construction.	Neutral and/or potentially beneficial
Construction, Operations, Closure, and Post-Closure	Potential effects to surface water quality	Surface water monitoring program	• Details provided in Section 8.2.	MOECC Landfill Regulations	Neutral and/or potentially beneficial
Terrestrial Environment					
Construction, Operations,	Potential for reduced habitat,	Minimize any disturbance to on-site	• Disturbance to vegetation and habitat will be minimized by: the	MBCA guidelines for tree clearing	Neutral

Project Phase	Issue/ Concern/ Interaction	Mitigation Measure	Description/Commitment	Standard	Residual Effects (after mitigation measure applied)
Closure, and Post-Closure	vegetation communities, and plant biomass	vegetation, including vegetation surrounding the construction staging area and vegetation removal within practical means	use of existing permanent road / trail infrastructure, the use of silt fencing for erosion and sediment control, clearing vegetation in winter, the re-vegetation of exposed soils as soon as possible, refuelling 30 m away from a natural vegetated area, and the direction of pumped water into a settling pond, avoiding natural features.		
Construction, Operations, Closure, and Post-Closure	Potential for birds to be disturbed during breeding season by Project activities	Workers awareness and minimize the Project footprint	• Methods used to reduce adverse potential effects to birds include: vegetation clearing in winter outside of breeding season (April 12 to August 30), maintain Stockpiled soils and excavation slopes at angles greater than 45 degrees, minimize disturbance near active nest sites, enforce road speed limits, avoid idling of vehicles, provision of properly working equipment with adequate noise suppression devices, and inclusion of wildlife awareness information (i.e. sighting logs) for workers, warn drivers of possible encounters.	MBCA and FWCA guidelines	Neutral
Construction, Operations,	Potential for other wildlife to be	Workers awareness and	• Methods used to reduce the project footprint include: minimizing habitat loss, limit	FWCA guidelines	Neutral

Project Phase	Issue/ Concern/ Interaction	Mitigation Measure	Description/Commitment	Standard	Residual Effects (after mitigation measure applied)
Closure, and Post-Closure	disturbed by Project activities	minimize the Project footprint	interferences with wildlife movement, enforce road speed limits, avoid idling of vehicles, provision of properly working equipment with adequate noise suppression devices, and inclusion of wildlife awareness information (i.e. sighting logs) for workers, warn drivers of possible encounters.		
Land Use					
Construction, Operations, Closure, and Post-Closure	Potential conflicts with future land use	Consideration of the location and operation of the proposed landfill prior to future land use approval	• Location and operation of the proposed landfill will be considered by the City prior to approving future land use or zoning amendments in the vicinity of the landfill.	Zoning By-Law	Neutral
Public Health and Safety (including Transportation)					
Construction, Operations	Potential transportation conflicts	Consideration will be given to Site operations and other users of the road	• Other users of the road (such as school buses) will be considered in order avoid road usage during sensitive time periods.	Operational Hours	Neutral
Construction, Operations	Potential transportation conflicts	Site design	• Site design will consider appropriate layout for entrance and exits as well as signage.	City or Provincial Standards	Neutral
Visual Aesthetics					
Construction, Operations,	Visual aesthetics diminished to	Either obscure Site features from the surrounding	• Various features could be utilized to obscure the Site features such as erecting fencing. Tree planting	Non-applicable	Neutral

Project Phase	Issue/ Concern/ Interaction	Mitigation Measure	Description/Commitment	Standard	Residual Effects (after mitigation measure applied)
Closure, and Post-Closure	surrounding area by landfill expansion	areas, directly improving the Site aesthetics, or a combination thereof	could help improve the visual aesthetics of the site.		

Notes: Evaluation of effects after mitigation measure are applied was assessed to be adverse, neutral and/or potentially beneficial.

8.2 Monitoring

8.2.1 Air Quality and Landfill Gas

The findings of the air quality assessment identified the potential for fugitive dusts and litter to result in off-site effects if these are not adequately controlled through site practices and active mitigation.

In line with monitoring at other landfills, it is recommended that visual monitoring, in the form of routine site inspections following a prescribed checklist, be developed as part of the dust and litter management plans. That this visual monitoring be carried out on a daily basis to ensure that fugitive dusts and litter are adequately controlled, and to allow for implementation of additional mitigation as warranted.

In addition to monitoring for potential effects associated with litter and fugitive dusts from the landfill, there will also be monitoring of subsurface landfill gases (specifically methane) within on-site structures and via gas monitoring probes installed around both the closed landfill and the new landfill. The main concern associated with subsurface landfill gas is migration away from the landfill footprint.

Based on the requirements of O.Reg. 232/98 (Landfill Sites), all structures on-site are equipped with full-time gas monitoring devices. In addition, it is also proposed that the generation of landfill gas be measured at the source and at each property boundary. This routine monitoring would have to be completed through dedicated gas monitoring probes concurrently with the water quality monitoring programs. The landfill gas probes should be monitored using a Landtec GEM 2000 (or equivalent) portable monitoring device capable of recording methane (% by volume methane), carbon dioxide (% by volume carbon dioxide), oxygen (% by volume oxygen) and balance gases.

Should subsurface gas migration away from the landfill footprint be confirmed, possible contingency measures would include the installation of vertical extraction wells or horizontal collectors to capture the gas and control the migration. The wells and/or collectors would be connected to the existing landfill gas extraction system and the migrating gas would be managed with the remainder of the landfill gases. The current status of contingency plans will be reviewed annually as part of the reporting process. It is anticipated that the Landfill Annual Monitoring Report will be submitted to the MOECC by March 31 annually, as per a condition of the existing Certificate of Approval. Proposed contingency actions will be implemented if necessary in consultation with the MOECC District Office. The status of the contingency plans will be reviewed annually as part of the reporting process, and proposed contingency actions will be implemented, if necessary, in consultation with the MOECC District Office.

8.2.2 Groundwater

The rationale for monitoring the groundwater elevations is to determine the direction of groundwater flow and the hydraulic gradients. Groundwater elevations have been monitored at the Site on an annual basis for over 20 years providing an extensive database of water table

elevations. Based on recent trend analysis completed by Amec Foster Wheeler (2014b) the overall groundwater flow direction and hydraulic gradients are consistent from year-to-year with seasonal variations very well documented. The objectives of groundwater elevation monitoring are to continue to observe the groundwater flow orientations and to determine if and how the proposed landfill expansion may affect the groundwater flow patterns and rates. Groundwater elevations will be recorded on a semi-annual basis to monitor the local aquifer system.

The rationale for measuring the groundwater chemistry at any landfill site is to determine whether there is any release of leachate to the subsurface environment, and to observe the movement of any leachate-impacted groundwater in relation to the site boundaries. Monitoring is particularly imperative as a result of the increased likelihood for contaminant migration to the bedrock aquifer and subsequently through the faults due to the lack of a significant low permeability confining layer overlying the bedrock beneath the existing waste deposits. This type of program is intended to monitor for leachate-impacted groundwater at the Site boundaries and to determine if the observed concentrations of the parameters are adversely impacting neighbouring properties. It is currently recommended that the groundwater monitoring program follow the existing program utilizing the existing monitoring well network and follow the same sampling frequency (semi-annual) and parameter list, in order to evaluate the performance of the Site with consideration of the MOECC's Reasonable Use Guidelines (Guideline B-7).

The performance of Site will be evaluated against the applicable MOECC objectives as well as a Site-specific trigger mechanism that will determine the need for remedial actions, etc.

Based on the Municipal Wellhead Protection Areas, identified in the Official Plan, the municipal well appears to draw its water from an aquifer beyond the flow path of the proposed landfill expansion. As such, the proposed expansion is not a threat to the municipal potable water supply. A series of private potable water supply wells along Highway 65 are currently monitored as part of the ongoing environmental monitoring program to the existing New Liskeard Site, it is anticipated that these efforts will continue.

8.2.3 Surface Water

According to the current MOECC Landfill Regulations the owner and operator of a landfilling site must ensure that a surface water monitoring program is conducted to evaluate both the surface water quality and quantity of surface water features on the site and of the surface water features that receive a direct discharge from the site. The existing New Liskeard Landfill site is situated on a topographic high and there were no permanent surface water features that required monitoring. It is unlikely that the proposed perimeter ditching of the proposed landfill expansion will result in the development of any permanent surface water features. However, as noted in the existing surface water conditions in Sections 6.2.2 and 6.2.5, there are two intermittent tributaries that have headwaters coincident with the eastern edge of the CAZ. As such, surface water monitoring will be completed within these two tributaries at both near- and far-field locations to confirm that impacted groundwater is not discharging to these potential receivers.

The tributaries will be monitored concurrently with the groundwater monitoring program (i.e., semi-annually at spring freshet and summer low flow) as follows.

- Once for any compounds known to be common to industrial or agricultural use in the Study Area watershed to assess whether any of these compounds should be included in the surface water monitoring program;
- Semi-annually for parameters listed in Schedule 5, column 3 of the Landfill Standards (MOE, 2012); and
- On at least six other occasions (at least 30 days apart) for the parameters listed in Schedule 5, column 4 of the Landfill Standards.

The performance of Site will be evaluated against the applicable MOECC objectives as well as a Site-specific trigger mechanism, developed as part of the surface water monitoring program that will determine the need for remedial actions. The Site specific trigger mechanism will be more stringent than the MOECC objectives, in order to allow for the City to implement mitigation or contingency measures prior to being out of compliance, if required.

8.3 Contingency Plans

8.3.1 Landfill Gas

The main concern associated with subsurface landfill gas is migration away from the landfill footprint. Gas monitoring probes will be installed around the closed landfill and the new landfill to allow for routine monitoring of landfill gas concentrations, and to determine if contingency measures are warranted.

If subsurface gas migration away from the landfill footprint is confirmed, possible contingency measures would include the installation of vertical extraction wells or horizontal collectors to capture the gas and control the migration. The wells and/or collectors would be connected to the existing landfill gas extraction system and the migrating gas would be managed with the remainder of the landfill gases.

The current status of contingency plans will be reviewed annually as part of the reporting process. Proposed contingency actions will be implemented if necessary in consultation with the MOECC District Office.

8.3.2 Groundwater

Contingency measures associated with potential observed groundwater impacts will be dependent on the extent, degree and location of the actual impacts. Localized impacts of a non-health related parameter would be managed differently than a large-scale health related exceedance. The following section consists of a preliminary identification and evaluation of alternatives for the management of leachate-impacted groundwater should monitoring require remedial action. These alternatives include consideration of a range of collection and treatment

options, modifications to the Operations and Development Plan or other alternatives that may be identified during the monitoring or evaluation process. This activity would include preparation of conceptual life cycle cost estimates for each alternative. Based on our current understanding of the Site, the following potential leachate management alternatives are identified as potentially feasible for the Site.

1. Maintain the existing operations and process (i.e., status quo – natural attenuation). This alternative involves establishment of a formal CAZ for the Site. City ownership of the property located immediately adjacent to the Site in the area of concern or the formalization of a groundwater easement, would allow the landfill to continue to operate within compliance. The suitability of this approach would be verified through completion of an assessment on the effects of current and predicted plume migration. The implementation challenge of this approach is the presence of privately-owned lands in the downgradient area, which may require lengthy negotiations.

2. Purge wells and wetlands treatment. Wetland treatment systems include both surface-flow (where the leachate travels through emergent vegetation) and sub-surface flow (where the leachate travels through a bed of gravel or other media planted with cattails or other emergent vegetation, and achieves treatment in the root zone) wetlands systems. In addition, wetland systems may incorporate deeper ponds to allow for submergent type vegetation to establish, and to assist in regulating flow through the wetland. Factors such as temperature and seasonal variations will affect treatment efficiency in a wetland system.

3. Purge wells and poplar plantation treatment. This technology, referred to as “phytoremediaton”, uses poplar trees in the form of a plantation, and in some cases with understory grasses, to filter sediments and pollutants from groundwater, surface water and irrigation water. They are designed to remove organic and inorganic pollutants in wastewater effluents, contaminated soils and non-point source pollution. The trees can be managed for biomass yield and harvested for sale as wood and fibre. Additional benefits include erosion prevention, greenhouse gas sequestration, and creation of a visual barrier, windbreak and wildlife habitat. Factors such as temperature and seasonal variations will affect treatment efficiency in the poplar plantation systems.

4. Purge wells and biofiltration system treatment. This system treatment would likely be comprised of a vessel(s) or lagoon(s) containing a filter material such as peat-moss. Wastewater is uniformly distributed over the entire surface area of the filter by means of a gravity system. The wastewater is cleansed by percolating through the peat-moss filter bed allowing nitrification, and is finally discharged either to a surface water receptor or by infiltration into the soil or by dilution in a steadily flowing stream (in conformity with applicable legislation). Such a system is simple to operate and maintain with low energy consumption. However, treatment performance may not be stable given variable leachate characteristics.

5. Purge wells and reverse osmosis (RO) treatment. RO treatment requires a relatively small footprint to implement and provides a high quality effluent typically suitable for discharge to surface waters or for use for irrigation on Site. However, a RO treatment system is associated with a relatively high operating cost due to power demands and membrane maintenance. Contaminants in the leachate may lead to fouling of the membrane. Additional on- or off-Site treatment of the concentrate yielded by the RO system may be required prior to discharge or disposal as a waste at an appropriately licensed waste treatment facility.

6. Purge wells and piping effluent to the City (STP). The existing STP is likely suitable for treatment of leachate-impacted groundwater, given that it provides secondary effluent treatment, however an assessment into the operating capacity would be required. This alternative would require a long forcemain with resultant higher capital and operating costs associated with pumping. Leachate can be difficult to treat and can readily upset STP performance, depending on the characteristics and volume directed for treatment. Furthermore, the leachate is odorous and may cause foaming problems in the sanitary sewer resulting in public complaints and interference with any intermediate pumping stations.

7. Lining of the landfill and piping of the effluent and treating with an alternative system. It is noted that lining of the landfill is only practical for portions that have not received yet waste for disposal. Lining of the landfill would likely consist of a low permeable barrier (i.e., clay or flexible membrane liner) and/or underdrain collection system (i.e., granular blanket/French drains with piping) placed on the landfill base. For the portions of the landfill that have already received waste, retrofitting with a perimeter toe-drain collector pipe in a granular trench would facilitate collection of the leachate. Collected leachate could be hauled, or more likely pumped via forcemain to the municipal sanitary sewer, for disposal at the City STP.

8. Cut-off walls to enclose the plume and a treatment alternative. An example of such a system potentially applicable for this Site, would be a passive funnel and gate system. A passive treatment system could consist of a sheet pile or slurry trench used to construct a cut-off wall (“funnel”) and direct the leachate-impacted groundwater from the landfill to a central location for passive treatment by a reactive media (“gate”). The leachate-impacted groundwater would pass through the reactive media for pre-treatment and subsequently discharged to the native overburden soils for further attenuation. The cut-off wall would be installed to intersect the area of concern and would be required to be extended to a depth sufficient to mitigate the underflow of the leachate-impacted groundwater. The reactive media could consist of such material as granular activated carbon, limestone or iron fillings. Selection of the appropriate material would be determined based on the results of the leachate characterization.

8.3.3 Surface Water

The main concerns associated with potential surface water impacts relate to the discharge of leachate from surface seeps or the discharge of shallow impacted groundwater into the two identified tributaries. Routine visual inspections will be completed to identify leachate seeps, and surface water quality monitoring will be completed to characterize the surface water chemistry compared to the MOECC objectives and Site-specific trigger mechanisms which will determine if and when contingency measures are warranted.

The planned contingency measure for this potential impact will be to repair any leachate seepage areas, re-direct surface water to the collection areas, and/or to investigate the feasibility of on-site treatment and polishing of surface water discharge.

8.4 Commitments

The City is committed to honouring its commitments with the neighbouring communities of Cobalt, Firstbrooke and Lorrain to continue to accept and manage their waste at the municipal landfill.

In order to minimize the environmental effects the City is also committed to following the MOECC Standards for Landfill Design and Operation. These standards include generic monitoring and sampling requirements, which the City will utilize to develop a Site specific program tailored to the potential issues identified within this document. In addition, the City and its operators will follow best management practices as they relate to landfill operations to minimize potential erosion and sediment transport, noise, dust, vermin, nuisance animals and windblown litter.

9.0 CONSULTATION

Consultation conducted in relation to the Project for the purposes of the EA were carried out in accordance with the approved ToR. This section presents a summary of the results of the consultation program. Documentation of the program, including copies of notices, presentation materials, comments and correspondence are presented in Appendix L.

9.1 Overview

The Ontario EAA requires that proponents prepare a Consultation Record. The Consultation Record has been prepared following the MOECC's *Code of Practice for Preparing and Reviewing Terms of Reference for Environmental Assessments in Ontario* (MOECC, 2014a) and the *Code of Practice for Consultation in Ontario's Environmental Assessment Process* (MOECC, 2014b).

During the ToR phase, the City of Temiskaming Shores maintained a Project Mailing List (PML). This PML included individuals and organizations that had self-identified an interest in the Project, governmental and non-governmental organizations as well as government-identified Aboriginal communities. As the EA process progressed, the City continually updated the PML to reflect additional interested individuals and/or groups. This PML was used to communicate with these groups throughout EA process.

9.1.1 Consultation Objectives

As stated in the ToR, the objectives of the consultation program for the EA process were as follows.

- Inform interested persons about the proposed Project;
- Identify Project-related interests and concerns;
- Gather feedback on the EA;
- Provide opportunities for public, stakeholder, Government Review Team (GRT), and Aboriginal community involvement;
- Document the consultation process, issues and concerns and how stakeholder views have been incorporated in Project decision-making through the EA; and
- Show how feedback from the public, GRT, and Aboriginal communities has been used to influence the EA.

9.2 Consultation Methods

To achieve the objectives noted above, a variety of consultation events and activities were used during the EA process. These events and activities were designed to enhance consultation with potentially interested persons.

Consultation methods used during the EA were as follows:

- Letter and email correspondence distributed to the public, government and Aboriginal communities;
- Notices published in local newspapers;
- Notices on the Project website (http://www.temiskamingshores.ca/en/business/Waste-Management-Capacity-Project.asp);
- Open Houses (2) in the community;
- Establishment of the Waste Management Advisory Committee;
- Meetings and communications between the City (and its consultant) and the MOECC;
- Meetings and correspondence with interested persons including business owners, community organizations and neighbours; and
- Draft EA Study Report posted on the website and provided directly to GRT and Aboriginal communities.

The results of the consultation activities are presented in Appendix L.

9.3 Aboriginal Communities

The following Aboriginal communities were contacted and kept information throughout the EA process.

- Beaverhouse First Nation;
- Matachewan First Nation;
- Mattagami First Nation;
- Temagami First Nation;
- Timiskaming First Nation;
- Wahgoshig First Nation;
- Métis Nation Ontario; and
- Temiskaming Métis Council.

A summary of the activities and comments by Aboriginal group is presented in Appendix L.

9.4 Government Review Team

The following federal and provincial governmental organizations as well as health units, school boards were kept informed throughout EA process.

Federal Government

- Aboriginal Affairs and Northern Development Canada;
- Canadian Environmental Assessment Agency;
- Environment Canada;
- Fisheries and Oceans Canada; and
- Transport Canada.

Provincial Government

- Ministry of Agriculture, Food and Rural Affairs;
- Ministry of Aboriginal Affairs;
- Ministry of Health and Longterm Care;
- Ministry of Education;
- Ministry of Energy;
- Ministry of the Environment and Climate Change;
- Ministry of Infrastructure;
- Ministry of Municipal Affairs and Housing;
- Ministry of Natural Resources and Forestry;
- Ministry of Tourism and Culture;
- Ministries of Citizenship and Immigration, Tourism and Culture, and Health Promotion; and
- Ministry of Transportation.

Municipal Governments

- Central Temiskaming Planning Board;
- City of Temiskaming Shores;
- Municipality of Charlton and Dack;
- Town of Cobalt;
- Town of Elk Lake - Township of James;
- Town of Englehart;
- Town of Kirkland Lake;
- Town of Latchford;
- Township of Armstrong;
- Township of Black River-Matheson;
- Township of Brethour;
- Township of Casey;
- Township of Chamberlain;
- Township of Coleman;
- Township of Evanturel;
- Township of Gauthier;
- Township of Harley;
- Township of Harris;
- Township of Hilliard;
- Township of Hudson;
- Township of Kerns;
- Township of Larder Lake;
- Township of Matachewan;
- Township of McGarry; and
- Village of Thornloe.

Other

- Hydro One Networks;
- Kirkland Lake Fires Services;
- Ontario Power Generation;
- Ontario Provincial Police;
- Temiskaming Shores Fire Department; and
- Timiskaming Health Unit.

A summary of the activities and comments by Government and Stakeholders is presented in Appendix L.

9.5 Summary of Events

The following presents an outline of the consultation-related events that occurred throughout the EA process.

9.5.1 Notice of Commencement of the EA

The Notice of Commencement of the EA (Appendix L) provides an overview of the proposed Project, the EA process, consultation opportunities and how to contact the City.

The City posted the Notice of Commencement on their website on 2 February 2013 and issued copies to the PML. The Notice was published in the Temiskaming Speaker (on 6 and 13 February 2013) and the Weekender (on 8, 15 and 22 February 2013).

9.5.2 Open House – Alternatives To

The City organized and conducted an Alternative To Open House on 21 February 2013 to share information about the Project, the related EA process, and to solicit input on the identification and evaluation of “Alternatives To”. Notification about the event was published as follows:

- Notifications of the event were issued in advance through Canada Post’s unaddressed admail to all residents, apartments, farms and businesses within the municipal boundaries of the City (approximately 5,632 notices were delivered). Notices were also mailed to individuals and Aboriginal groups on the PML the week of 11 February 2013;
- Radio advertisement of the event was done through the local radio channel CJTT-FM (104.5 FM) on three times for thirty seconds on 20 and 21 February 2013;
- Newspaper advertisements of the event were done through publications in the Temiskaming Speaker (on 13 and 20 February 2013) and the Weekender (on 15 and 22 February 2013); and
- Notices were also posted on the Project website.

The Open House consisted of a selection of 17 poster boards covering various aspects of the Project. Information was presented on the following areas.

- Project history;
- Need for new waste management capacity;
- Current and future waste management practices;
- Environmental Assessment process;
- Alternatives To; and
- Evaluation Criteria.

Attendees were provided with a summary matrix of the Alternatives To, including a preliminary discussion of each Alternative To by proposed evaluation criteria. Copies of the poster boards and summary matrix are presented in Appendix L.

Attendees were encouraged to sign a registration form at the door and indicate whether they would want to be placed on a PML. There were 31 attendees (21 signed the register); none of the attendees self-identified as Aboriginal.

Comment Forms were made available for each attendee. Project representatives encouraged attendees to fill out and return the comment forms following the session. Completed comment forms are presented in Appendix L. Comments and questions gathered from comment form submissions and records of conversations recorded by Open House staff.

9.5.3 City Council Presentation

Subsequent to the February 2013 Open House, an evaluation of the alternatives was conducted including input received during this session and separate discussions with residents. The results of the evaluation and the selection of the Preferred Alternative To, Landfilling, was identified in a City Council meeting on 2 April 2013. Individuals on the PML were issued a letter identifying this selection and were invited to attend the City Council meeting. The City identified in separate letters to the Aboriginal communities that once a site was selected further engagement with the communities would occur.

9.5.4 Waste Management Advisory Committee

To further involve the community, the City established a Waste Management Advisory Committee (WMAC) in the fall of 2013. Terms of reference for the WMAC were developed and individuals were identified based on interest and/or experience and asked to participate. The primary roles and responsibilities of the WMAC are to:

- Review and make recommendations to City Council on the selection, siting, development and implementation of a long-term waste management site; and
- Promote public interest and involvement in the implementation of new waste management programs and to evaluate and consider recommendations received from the public.

The WMAC membership includes the City Mayor, City Councilors (2) and Staff (5; City Manager, Municipal Clerk, Director of Public Works, Technical and Environmental Compliance Coordinator,

Director of Community Growth and Planning) as well as community residents (2). Temagami First Nation was invited to participate as they are the closest Aboriginal community; however, the community declined participation.

The WMAC have met several times. During their meetings, the WMAC conducted an evaluation of the Alternative Methods – in this case location. This evaluation examined 17 potential sites – 9 sites within the municipal boundary and 8 sites outside the municipal boundary. Information from this evaluation was presented at the 25 June 2014 Open House.

9.5.5 Open House – Preferred Method

The City organized and conducted a Preferred Method Open House on 25 June 2014 to share information about the Project, the related EA process, and to solicit input on the selection of the "Preferred Method" of the expansion of the New Liskeard Landfill. Notification about the event was published as follows:

- Notifications of the event were mailed in advance to individuals and Aboriginal groups on the PML the week of 9 June 2014;
- Newspaper advertisements of the event were done through publications in the Temiskaming Speaker (on 11 and 18 June 2014) and the Weekender (on 13 June 2014);
- Individual letters with notices were also sent to each of the Aboriginal communities the week of 9 June 2014; and
- Notices were also posted on the Project website.

The Open House consisted of a selection of 18 poster boards covering various aspects of the Project. Information was presented on the following areas.

- Project history;
- Need for new waste management capacity;
- Current and future waste management practices;
- Environmental Assessment process;
- Alternatives To;
- Alternative Methods;
- Preferred Alternative;
- Baseline studies to be conducted; and
- Effects assessment.

Copies of the poster boards and summary matrix are presented in Appendix L.

Attendees were encouraged to sign a registration form at the door and indicate whether they would want to be placed on a PML. There were 10 attendees (7 signed the register); 3 representatives from Timiskaming First Nation were in attendance.

Comment Forms were made available for each attendee and Project representatives encouraged attendees to fill out and return the comment forms following the session. No completed comment forms were submitted. Comments and questions were gathered from records of conversations recorded by Project representatives.

9.6 Summary of Comments

Throughout the EA process, the City invited comments from interested persons through a variety of means, including mail, email, newspaper notices, in-person, and through the Project website.

Following is a summary of the main issues raised during the preparation of the EA.

- Comment received regarding having a regional waste management solution due to the high number of waste management facilities in the region;
- Concern expressed about potential adverse effects on property values for neighbours the landfill;
- Concerns expressed about leachate from the existing landfill and that it is being contained;
- Concerns expressed about the visual aesthetics associated with the expansion of the New Liskeard Landfill;
- Concerns and questions about adverse effects on groundwater quality were often raised specifically related to the potential adverse effects on drinking water wells; and
- Concerns expressed about off-site drainage and potential adverse effects on surface water quality.

10.0 ENVIRONMENTAL ASSESSMENT CONCLUSION

This report presents the results of the EA for the City of Temiskaming Shores' New Waste Management Capacity Project. Through a series of evaluative steps, landfilling and the expansion of the New Liskeard Landfill were identified as the preferred solution. Through consultation with the communities and identified Aboriginal communities, as well as the establishment of the WMAC, the City vetted the preferred solution. A complete assessment of the existing conditions and potential environmental effects was completed on the environmental components outlined in the approved ToR.

In summary, the proposed expansion of the New Liskeard Landfill does pose some potential adverse effects; however, through proposed mitigation measures and monitoring programs these effects can be managed.

Yours truly,
Amec Foster Wheeler Environment & Infrastructure
a Division of Amec Foster Wheeler Americas Limited

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Signature:  Date: August 24, 2016

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Project Manager/Senior Hydrogeologist

Signature:  Date: August 24, 2016

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APPENDIX A

DRAFT SOLID WASTE MANAGEMENT MASTER PLAN

APPENDIX B

TERMS OF REFERENCE

APPENDIX C

TERMS OF REFERENCE APPROVAL

APPENDIX D

ALTERNATIVES TO REPORT

APPENDIX E

ALTERNATIVE METHODS REPORT

APPENDIX F

AIR QUALITY TECHNICAL SUPPORT DOCUMENT

APPENDIX G

HYDROGEOLOGY TECHNICAL SUPPORT DOCUMENT

APPENDIX H

TERRESTRIAL ENVIRONMENT TECHNICAL SUPPORT DOCUMENT

APPENDIX I

NOISE TECHNICAL SUPPORT DOCUMENT

APPENDIX J

STAGE 1 ARCHAEOLOGICAL ASSESSMENT

APPENDIX K

HERITAGE SUPPORT DOCUMENT

APPENDIX L

RECORD OF CONSULTATION