

AECOM

Appendix D

Natural Heritage Impact Assessment



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**Sault Ste. Marie Solid Waste Management
Environmental Assessment
Natural Heritage Impact Assessment**

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1.0 Introduction

This document presents the findings of the natural heritage assessment provided as part of the Environmental Assessment (EA) of the proposed City of Sault Ste. Marie's landfill expansion project. The natural heritage assessment examines the potential impacts to the natural environment as a result of the proposed landfill expansion and discusses approaches to avoid or minimize these impacts.

Following on from this introductory section the report takes on the following format:

- Description of the study area;
- Outline of methodology and approach to natural heritage assessment;
- Summary of existing natural heritage conditions;
- Evaluation of potential impacts to natural heritage features; and
- Mitigation of potential impacts to natural heritage features.

2.0 Study Area

The study area includes areas within 100 m of the preferred option boundary. It is generally assumed that the natural features that most commonly occurred in this region of Ontario would not be impacted by proposed expansion works if they were located outside of this 100 m setback.

3.0 Methodology and Approach

3.1 Background Review

Prior to field studies, a background review of the following applicable secondary sources was conducted:

- Aerial photography;
- City of Sault Ste. Marie Official Plan (Consolidated in 2006) and associated schedules;
- Ministry of Natural Resources (MNR) Natural Heritage Information Centre (NHIC) database;
- Agency consultation (e.g. MNR and Sault Ste. Marie Conservation Authority (SSMRCA));
- Wildlife Atlases;
 - Ontario Breeding Bird Atlas (OBBA) (Cadman *et al.*, 2005);
 - Atlas of the Mammals of Ontario (Dobbyn, 1994);
 - Ontario Herpetofaunal Atlas (Oldham and Weller, 2000);
 - Atlas of Reptiles and Amphibians in Ontario (Ontario Nature, 2013); and
 - Ontario Odonata Atlas (NHIC).

The findings of this review of secondary sources are as follows:

- Official Plan mapping indicates that the landfill is located within several land use designations:
 - Official Plan Schedule A indicates that the landfill falls within a Rural Aggregate Extraction designation and a Significant Ground Water Recharge Protection Area.
 - Official Plan Schedule B indicates that the landfill falls within a Ground Water Recharge Area.
 - Official Plan Schedule C indicates that the landfill falls within Rural Area.
 - Zoning mapping indicates that the lands associated with Canon Creek adjacent to the north edge of landfill are designated as Environmental Management Zone.
- Sault Ste. Marie Region Conservation Authority mapping indicates that the landfill falls within Fill Interim Hazard Limit Lands.
- Through review of historic occurrence records for Species at Risk (SAR) and Species of Conservation Concern (SCC) for the study area, it was determined that there is the potential for 27 SAR/SCC to occur in the general area of the project. SAR are those species listed as *Endangered* or *Threatened* under Ontario's Species at Risk Act, 2007; SCC are species that are listed as *Special Concern* under Ontario's Species at Risk Act, 2007, or that have provincial conservation ranks of S1-S3. An explanation of these status levels is provided below:
 - *Endangered* – a species living in the wild in Ontario in imminent danger of becoming extirpated or extinct
 - *Threatened* - a species living in the wild in Ontario, is not endangered, but is likely to become endangered if steps are not taken to address factors threatening to lead to its extinction or extirpation.
 - *Special Concern* – a species living in the wild in Ontario, is not endangered or threatened, but may become threatened or endangered because of a combination of biological characteristics and identified threats.
 - S1 – Critically Imperiled; often with 5 or fewer occurrences in Ontario.
 - S2 – Imperiled; often with 20 or fewer occurrences in Ontario.
 - S3 – Vulnerable; often 80 or fewer occurrences in Ontario.

3.2 Field Studies

Field studies were conducted following the background review. Studies were conducted on the dates and conditions outlined in **Table 1**.

Table 1: Fieldwork Dates, Times and Weather Conditions

Date	Survey Type	Site Investigators	Time of Survey	Weather Conditions (2011 Fieldwork)
Spring 1990 to September 27, 2011	Water Quality, Benthic Invertebrate Sampling	Richard Baxter, Ben Gottfried	8:00-18:00	Temperature: 15 Cloud Cover: 100% Wind (Beaufort Scale): 3 Precipitation: rain
September 28, 2011	ELC, Wildlife Habitat, Aquatic Habitat Assessment	Richard Baxter, Ben Gottfried	9:00-16:30	Temperature: 20 °C Cloud Cover: 20-40% Wind (Beaufort Scale): 1 Precipitation: none

Vegetation Assessment

Vegetation surveys were carried out in the fall of 2011, concurrently with Ecological Land Classification fieldwork. They consisted of area searches to determine the richness and abundance of floral species present within the study area. Species nomenclature is based on the Ontario Plant List (Newmaster *et al.*, 1998).

Ecological Land Classification (ELC)

During field investigations, vegetation was characterized using the Ecological Land Classification System (ELC) for Southern Ontario (Lee *et al.*, 1998). This classification system was used because vegetation communities found in the Study Area were found to closely conform to vegetation communities commonly occurring in southern and central Ontario. Where present, vegetation community boundaries were determined through the review of aerial photography, and then further refined through on-site soil and vegetation studies. Soil studies involved the examination of a 120 cm soil profile dug using a hand auger. This allows for the description of soil texture and site moisture characteristics which influence plant distributions and the resulting vegetation assemblage. Other physical traits such as topography and slope aspect were also noted within each community. Soil investigations were completed in order to gain a better understanding of ecological conditions on site. Vegetation studies involved identifying the dominant species in each vegetation cover type based on visual estimates of species abundances and biomass, or in the case of accessible forest stands, by quantitative sampling using a factor 2 wedge prism. Field data collection was undertaken in order to classify and map these ecological communities to the vegetation level.

Wildlife Observations

During all field studies, incidental wildlife observations were noted. In addition, a search for wildlife evidence such as dens, tracks and scat (animal droppings and other signs) throughout the study area occurred.

Aquatic Assessment

For the purposes of the SSM Landfill Expansion EA, an aquatic assessment was not required as the proposed landfill expansion areas will not directly affect local aquatic systems.

A long-term biological monitoring program for Canon Creek and the Root River watercourses located adjacent to the landfill site, was initiated in 1990, modified in 1992, and continued through to 2010. Its purpose was to monitor water quality using a biological indicator – benthic macroinvertebrates and abiotic water quality parameters using a multi-metre probe and laboratory analysis. Baseline conditions of the benthic communities at sites upstream, adjacent to, and downstream of the landfill along Canon Creek and the Root River were monitored at control and test sites for 20 years. Water quality parameters measured include temperature, pH, dissolved oxygen, conductivity, alkalinity, total dissolved solids, total organic carbon and chemical oxygen demand. The monitoring determined that two decades of landfill operation did not have a measurable biological effect on local surface water quality. As such, the program's purpose was fulfilled and discontinued starting in 2011.

4.0 Existing Conditions

Vegetation Inventory

A total of 76 plant species were documented during terrestrial field studies completed on September 28, 2011. A list of plant species observed is included in **Table A-1** in **Appendix A**. Of the 76 species observed, two (2) were identified down to Genus level due to the timing of vegetation field surveys and the absence of key identification plant features (e.g., flowering parts). Of the remaining 74 species, 59% are listed as native species and 41% are listed as introduced species. All of the native plant species observed are considered to have *Apparently Secure* (S4) or *Secure* (S5) populations in the Province of Ontario. Species with a S4 ranking are common and *Apparently Secure* in Ontario; usually with more than 100 occurrences in the province. Species with a S5 ranking are defined as very common with a demonstrably *Secure* population in Ontario.

The Co-efficient of Conservatism (CC) provides additional information on the nature of the site. Co-efficient of Conservatism values range from 0 to 10 and represent an estimated probability that a plant is likely to occur in a landscape that is relatively unaltered or is in a pre-settlement condition. For example, a CC of 0 is given to plants such as Manitoba Maple (*Acer negundo*), that have demonstrated little fidelity to any remnant natural community, i.e. may be found almost anywhere. Similarly, a CC of 10 is applied to plants like Shrubby Cinquefoil (*Potentilla fruticosa*) that are almost always restricted to a pre-settlement remnant and a high quality natural area. Introduced plants were not part of the pre-settlement flora, so no CC value is applied to these.

Two of the plant species observed in the Dry-Fresh White Pine - Hardwood Mixed Forest Ecosite have a CC of 7 or greater, including Jack Pine (*Pinus banksiana*) and American Mountain-ash (*Sorbus americana*). The mean CC for native plants found in the study area was 3.3 out of a possible 10. This mean CC value and the high number of non-native species indicate that the natural vegetation communities adjacent to the current landfill have undergone previous disturbance. The Forb Meadow Ecosite and Dry-Fresh Poplar Deciduous Forest immediately adjacent to the current landfill area were observed to have an especially high number of non-native invasive species.




In addition, each plant species in Ontario is assigned a Co-efficient of Wetness (CW) which indicates the soil moisture regimes these plant species typically prefer. Co-efficient of Wetness numbers range from +5 to -5. Plants with CW numbers of -5 are considered wetland obligate species, with the majority of occurrences being in wetland habitats. Plants with CW numbers of -4 to -2 are considered facultative wetland species that usually occur in wetlands but may occasionally be found outside of wetland habitats. Plants with CW numbers of -1 to +1 are considered species with an equal likelihood of being found in wetland or upland habitats. Plants with CW numbers of +2 to +4 are considered facultative upland species that usually occur in upland habitat but may occasionally be found in wetland habitats. Plants with CW numbers of +5 are considered upland obligate species, with the majority of occurrences being in dry upland habitats. Of the species found in the Study Area the great majority are upland species with occasional occurrences (i.e. 14 of 76 species) of facultative wetland species and only one




occurrence of a wetland obligate species, Black Bulrush (*Scirpus atrovirens*), on a small depression along a trail. This is reflected in the lack of wetland habitats found in the Study Area.

Ecological Land Classification

A total of seven natural and/or naturalized ecological communities and one cultural (human influenced) land use were observed within the study area. All vegetation communities surveyed are considered common in Ontario and no rare vegetation community types were observed. The location, type and boundaries of these vegetation communities are delineated on **Figure 1**. **Table 2** outlines the communities documented during ELC surveys.

Table 2: ELC Communities Documented within in the Sault Ste. Marie Landfill Expansion Study Area

ELC Code	Classification	Soils	Vegetation	Comments	Photos
NATURAL COMMUNITIES					
FODM3-1	Dry-Fresh Poplar Deciduous Forest Type	Soils not sampled	This small patch of young poplar deciduous forest is dominated by Trembling Aspen (<i>Populus tremuloides</i>) with Pin Cherry (<i>Prunus pensylvanica</i>) in the understory.	This early-successional forest community occurs adjacent to the northeast corner of the current landfill boundary surrounded by disturbed lands (see Figure 1). A small section of this forest community is in the landfill expansion area.	
FODM5-1	Dry-Fresh Sugar Maple Deciduous Forest Type	Coarse sand; Moisture = 0	The canopy of this deciduous forest community is entirely dominated by sugar maple, with occasional balsam poplar and rare occurrences of Hop Hornbeam (<i>Ostrya virginiana</i>) in the understory. The shrub layer is absent and the ground layer is also dominated by Sugar Maple seedlings. Other herbaceous species occurring in the ground layer include Evergreen Wood Fern (<i>Dryopteris intermedia</i>), Jack-in-the-pulpit (<i>Arisaema triphyllum</i> ssp. <i>triphyllum</i>), White Baneberry (<i>Actaea pachypoda</i>) and Indian-pipe (<i>Monotropa uniflora</i>).	This community is located to the northwest and north of the current landfill boundary. A small portion of this community is located within the proposed expansion lands (see Figure 1).	
FODM5-3	Dry-Fresh Sugar Maple - Oak Deciduous Forest	Medium Sand; Moisture = 0	This deciduous forest community includes abundant Sugar Maple (<i>Acer saccharum</i> ssp. <i>saccharum</i>) in the canopy with other tree species including Red Oak (<i>Quercus rubra</i>), White Birch (<i>Betula papyrifera</i>), Trembling Aspen, with rare occurrences of coniferous species such as White Spruce (<i>Picea glauca</i>), White Pine (<i>Pinus strobus</i>) and Balsam Fir (<i>Abies balsamea</i>). Few shrubs were present in the understory with only Red-berried Elderberry (<i>Sambucus racemosa</i> ssp. <i>pubens</i>) being observed. Herbaceous species present include occasional occurrences of False Solomon's Seal (<i>Maianthemum racemosum</i> ssp. <i>racemosum</i>), Jack-in-the-pulpit, Canada Mayflower (<i>Maianthemum canadense</i>), Starflower (<i>Trientalis borealis</i> ssp. <i>borealis</i>), a sedge species (<i>Carex</i> sp.) and rare	This forest community is located adjacent to the western end of the current landfill boundary within lands selected for expansion. Moderate amounts of light rubbish are present within this community (see Figure 1).	

ELC Code	Classification	Soils	Vegetation	Comments	Photos
			occurrences of Indian tobacco (<i>Lobelia inflata</i>) and Black Bulrush (<i>Scirpus atrovirens</i>).		
FOMM2	Dry-Fresh White Pine - Hardwood Mixed Forest Ecosite	Medium Sand; Moisture = 0	This mixed forest community contains abundant Jack Pine, with occasional White Pine, Balsam Fir and Trembling Aspen. Other tree species occurring include Sugar Maple, Balsam Poplar (<i>Populus balsamifera</i> ssp. <i>balsamifera</i>) and White Spruce. Shrub species present in the understory include Choke Cherry (<i>Prunus virginiana</i> ssp. <i>virginiana</i>), Tartarian Honeysuckle (<i>Lonicera tatarica</i>) and American Mountain-ash (<i>Sorbus americana</i>). Herbaceous species include Bracken Fern (<i>Pteridium aquilinum</i> var. <i>latiusculum</i>), Wild Strawberry (<i>Fragaria virginiana</i> ssp. <i>virginiana</i>) Large-leaved Aster (<i>Aster macrophyllus</i>) and Common Speedwell (<i>Veronica officinalis</i>).	This forest community is located to the southwest of the current landfill operation with a small portion in the landfill expansion area. Large amounts of light rubbish are present (see Figure 1).	
MEFM1	Forb Meadow	Soils not sampled	Species occurring include Viper's Bugloss (<i>Echium vulgare</i>), Ribgrass (<i>Plantago lanceolata</i>), Bittersweet Nightshade (<i>Solanum dulcamara</i>), Wild Carrot (<i>Daucus carota</i>), Common Ragweed (<i>Ambrosia artemisiifolia</i>), Tall Goldenrod (<i>Solidago altissima</i> var. <i>altissima</i>), Lamb's Quarters (<i>Chenopodium album</i> var. <i>album</i>), and Panicked Aster (<i>Aster lanceolatus</i> ssp. <i>lanceolatus</i>).	The forb meadow occurs within proposed expansion lands at the northeast section of the landfill and is covered in a variety of weedy and invasive forb species. This meadow community experiences regular disturbance (see Figure 1).	
MEGM3	Dry-Fresh Graminoid Meadow	Soil not sampled	This graminoid meadow community is dominated by grass species with rare forb species occurrences. This polygon was classified to ecosite level due to site access restrictions.	This community is located to the southwest of the current landfill boundary and outside of proposed expansion lands (see Figure 1).	

ELC Code	Classification	Soils	Vegetation	Comments	Photos
TAGM1	Coniferous plantation	Soils not sampled	This coniferous plantation is composed entirely of Red Pine (<i>Pinus resinosa</i>).	This community occurs adjacent to the south west corner of the current landfill boundary adjacent to proposed expansion lands (see Figure 1).	
CULTURAL COMMUNITIES					
CVI_2:	Disposal and Recycle	n/a	This community is comprised of the landfill area	This community encompasses the majority of the study area.	

Incidental Wildlife Observations

Incidental wildlife species observed in the study area are listed in **Table 3** below. With the exception of Bald Eagle, which is listed as *Special Concern* under Ontario's *Endangered Species Act* (ESA), 2007, all of the species listed below are considered common and secure in Ontario. The Bald Eagle occurrence is discussed further below.

Table 3: Incidental Wildlife Species Documented

Scientific Name	Common Name	SARA ¹	ESA ²	SRank ³
<i>Corvus brachyrhynchos</i>	American Crow	---	---	S5B
<i>Haliaeetus leucocephalus</i>	Bald Eagle	---	SC	S4B, SZN
<i>Poecile atricapillus</i>	Black-capped Chickadee	---	---	S5
<i>Corvus corax</i>	Common Raven	---	---	S5
<i>Zenaidura macroura</i>	Mourning Dove	---	---	S5
<i>Larus delawarensis</i>	Ring-billed Gull	---	---	S5B, S4N
<i>Melospiza melodia</i>	Song Sparrow	---	---	S5B
<i>Cathartes aura</i>	Turkey Vulture	---	---	S5B
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow	---	---	S4B
<i>Tamiasciurus hudsonicus</i>	Red Squirrel	---	---	S5
<i>Ursus americanus</i>	Black Bear	---	---	S5
<i>Pseudacris crucifer</i>	Spring Peeper	---	---	S5
<i>Nymphalis antiopa</i>	Mourning Cloak	---	---	S5

1. Federal Species at Risk Act (Source: SARA Public Registry, 2007)
2. Provincial Endangered Species Act (Source: OMNRF website, 2007)
3. Subnational (Provincial) Rank (Source: OMNRF National Heritage Information Centre website, 2007)

Aquatic Assessment

The aquatic habitat and species assemblage in the Root River and Canon Creek vary considerably upstream, adjacent to and downstream of the landfill site. Natural fluctuations were documented extensively in the Environmental Assessment Report submitted in 1984, which included information on: substrate particle size, occurrence of benthic (bottom-dwelling) organisms, stream width and depth, fish habitat quality and stream bank characteristics. These biophysical characteristics were measured again in 1993 to monitor the long term morphological changes related to stream dynamics, erosion and flow rates, and relate these changes to the benthic invertebrate community indices of water quality. Further, biophysical sampling was replicated twice a year between 1993 and 2010 to collect empirical data for the Root River and Canon Creek that is used to estimate the potential long-term water quality effects of the landfill on these aquatic systems. Due to the absence of any measurable deleterious water quality monitoring results in the Root River and Canon Creek, the monitoring program in these aquatic systems adjacent to the landfill was deemed to be no longer required by the MOECC.

Ministry of Natural Resources and Forestry (MNRF) historical fish collection data, as well as incidental observations made during sampling events, indicate that the Root River and lower sections of Canon Creek can support a diverse fish community, including salmonid species. During the sampling events,

salmonid migration and individual fry were observed by Dillon staff. The Root River was identified as sensitive cold-water fish habitat (e.g., brook trout, rainbow trout), while Canon Creek is warm-water fish habitat (e.g., blacknose dace, brook stickleback and creek chub), with the occasional coldwater species present.

Species at Risk and Species of Conservation Concern

During the background review, it was determined through a search of available historical occurrence records within 3 km of the landfill from the MNRF and various wildlife atlases, that 27 SAR and SCC have the potential to occur in the general geographic vicinity of the study area. A habitat screening for these species is provided in **Table A2 in Appendix A**. This summary table includes the habitat requirements for SAR and provincially rare species (e.g., SCC). A determination on the potential habitat in the study area and a description of the rationale used to make this determination is also provided.

One SCC, Bald Eagle, was observed in the Study Area during fieldwork. **Table A2 in Appendix A** provides rationale for why this species will be unaffected by the proposed landfill expansion project (e.g., lack of established stick nest observed).

Candidate Significant Wildlife Habitat

The MNRF has developed a set of criteria by which Significant Wildlife Habitat (SWH) can be identified in Ontario. Candidate significant wildlife habitat is identified according to the Significant Wildlife Habitat Technical Guide (SWHTG) and associated Ecoregion 5E Significant Wildlife Habitat Criteria Schedules. Based on site characteristics observed during field work, four Candidate Significant Wildlife Habitats were identified in the Study Area. As no targeted surveys were completed, the significance of wildlife habitat could not be confirmed; however, Table 4 provides a preliminary assessment and criteria used to confirm the significance of candidate habitats. Most habitats were assessed to have a low potential of occurrence in the study area. Woodland raptor nesting habitat had a moderate potential due to the presence of woodlands and viable nesting trees; although, no raptor nests were observed in the immediate vicinity of the study area. Further, existing site noise disturbance may preclude nesting in proximity to the landfill. As such, it is unlikely that this potential habitat is present.

Table 4: Candidate Significant Wildlife Habitats Present in the Study Area¹

Wildlife Habitat	Wildlife Species	Attributes of Habitat	Relevant Attributes for <u>Candidate</u> SWH Criteria to be Considered (from SWHTG)	Relevant Attributes for <u>Confirmation</u> of SWH Criteria to be Considered (from SWHTG)	Preliminary Determination on the Potential for Significant Wildlife Habitat in the Study Area
Seasonal Concentration Areas of Animals					
Snake Hibernacula Rationale: Generally sites are the only known sites in an area. Sites with highest number of individuals are most significant.	Eastern Garter Snake Northern Water Snake Red-bellied Snake Brown Snake Smooth Green Snake Ring-necked Snake	Any forested Ecosite in Central Ontario other than very wet ones. Talus, Rock Barren, Crevice and Cave, and Alvar sites may be directly related to these habitats. The existence of rock piles or slopes, stone fences and crumbling foundations.	Rock crevices and other natural cavities that extend below frost line. Wetlands can be important overwintering sites.	Studies Confirm: Presence of snake hibernacula used by 5 individual of one species or individuals of 2 or more snake species. Congregations of 5 individual of one species or individuals of 2 or more snake species near potential hibernacula sites on warm sunny days in spring and fall. Presence of Special Concern Species.	Candidate habitat (low potential) , no snakes observed during fieldwork. Small area of exposed bedrock was observed in the Dry-Fresh Sugar Maple Deciduous Forest Type.

¹ 1. OMNRF Significant Wildlife Habitat Eco-regional Criteria Schedule for Ecoregion 5E

Wildlife Habitat	Wildlife Species	Attributes of Habitat	Relevant Attributes for <u>Candidate</u> SWH Criteria to be Considered (from SWHTG)	Relevant Attributes for <u>Confirmation</u> of SWH Criteria to be Considered (from SWHTG)	Preliminary Determination on the Potential for Significant Wildlife Habitat in the Study Area
Specialized Habitats for Wildlife					
Bald Eagle and Osprey Nesting Foraging and Perching Habitat Rationale: Nest sites are fairly uncommon in Eco-region 5E and area used annually by these species. Many suitable nesting locations may be lost due to increasing shoreline development pressures and scarcity of habitat.	Bald Eagle Osprey	Forest communities directly adjacent to riparian areas – rivers, lakes, ponds and wetlands.	Nests are associated with lakes, ponds, rivers or wetlands along forested shorelines, islands, or on structures over water. Osprey nests are usually at the top of a tree, Bald Eagle nests are usually in a super canopy tree.	Studies confirm: The presence of one or more active Bald Eagle or Osprey nest in area. Annual use of nest site.	Candidate habitat (low potential) , a single Bald Eagle individual observed in study area during field work but no nests observed in area. Root River is adjacent to the landfill and may provide seasonal foraging habitat. Existing site noise disturbance may preclude nesting in proximity to the landfill.
Woodland Raptor Nesting Habitat Rationale: Nest sites for these species are rarely identified; these habitats are often used annually by these species.	Red-tailed Hawk Great Horned Owl Broad-winged Hawk Sharp-shinned Hawk Merlin Barred Owl Red-shouldered Hawk Cooper's Hawk Northern Goshawk	May be found in all Forested and Swamp ELC Ecosites.	Stick nests found in a variety of intermediate aged to mature conifer, mixed or mature forests in tops or crotches of trees. Species like Merlin or Cooper's Hawk may nest at forest edge or on peninsulas or small off-shore islands.	Presence of one or more active nests from a species in indicator list.	Candidate habitat (moderate potential) , no woodland raptors observed in study area during field work and no nests observed. Areas of woodland habitat surrounding the landfill are large and generally contiguous to the north and could provide potential habitat. Existing site noise disturbance may preclude nesting in proximity to the landfill.

Wildlife Habitat	Wildlife Species	Attributes of Habitat	Relevant Attributes for <u>Candidate</u> SWH Criteria to be Considered (from SWHTG)	Relevant Attributes for <u>Confirmation</u> of SWH Criteria to be Considered (from SWHTG)	Preliminary Determination on the Potential for Significant Wildlife Habitat in the Study Area
			Includes nest sites within tree cavities for Barred Owl, and occasionally Great Horned Owl and Merlin.		
Animal Movement Corridors					
<p>Cervid Movement Corridors</p> <p>Rationale: Corridors important for all species to be able to access seasonally important life-cycle habitats or to access new habitat for dispersing individuals by minimizing their vulnerability travelling.</p>	White-tailed Deer Moose	All forested Ecosites.	<p>Movement Corridor connecting confirmed Deer Wintering Area, Moose Aquatic Feeding Area and Mineral Lick Significant Wildlife Habitats.</p> <p>Corridors typically follow riparian areas, woodlots, areas of physical geography.</p>	<p>Corridors leading to Deer Wintering areas should be unbroken by roads or residential areas.</p> <p>Corridors leading to Moose Aquatic Feeding Areas should remain intact.</p> <p>Corridors should be a minimum of 200 m wide, or 15 m wide in riparian zones.</p>	Candidate habitat (low potential), no identified Deer Wintering Area, Moose Aquatic Feeding Area and Mineral Lick Significant Wildlife Habitats are present in proximity to the study area.

5.0 Impact Assessment

5.1 Direct Impacts

The preferred expansion is shown on **Figure 1**. Potential direct impacts to the natural environment due to the proposed landfill expansion are detailed below.

Direct impacts are those that are immediately evident as a result of the landfill expansion. Typically, the adverse effects of direct impacts are most evident during the site preparation and construction phase of a development. The potential direct impacts of the proposed development are:

- Woodland and meadow vegetation removal and loss of wildlife habitat;
- Incidental wildlife mortality; and,
- Erosion and sedimentation effects.

Woodland and Meadow Vegetation Removal and Loss of Wildlife Habitat

The expansion of the Sault Ste. Marie Landfill will require the removal of trees and ground vegetation. Tree removal may result in the following impacts on a site level:

- Loss of woodland and meadow vegetation. **Table 5** below details vegetation removal areas required for the preferred landfill expansion option;
- Loss of woodland and meadow habitat potentially used by wildlife common to this area,
- Narrowing of the ecological linkage west of the landfill; and,
- Physical injury, root damage, and compaction of trees not intended for removal that may result from construction activity.

Table 5: Vegetation Removal Areas for the Preferred Landfill Expansion Option

ELC Community	Area removed (ha)
1 - FODM5-3 (Dry-Fresh Sugar Maple- Oak Deciduous Forest)	6.21
2 – FODM3-1 (Dry-Fresh Poplar Deciduous forest)	0.41
3 – MEFM1 (Forb Meadow)	1.28
4 - FODM5-1 (Dry-Fresh Sugar Maple Deciduous Forest)	4.77
Total Vegetation Removal Area	12.67

It is expected that the proposed expansion will lead to a minimal residual effect on local wildlife habitat. General tree protection and management recommendations to minimize the physical disturbance associated with vegetation removal are detailed in below.

Incidental Wildlife Mortality

When a construction project is located within or in proximity to potential wildlife habitat, there is the potential for incidental wildlife mortality (i.e., incidental take), primarily attributed to vehicle wildlife collisions. General wildlife impact mitigation measures have been recommended for the study area to avoid incidental take of wildlife during construction.

Erosion and Sedimentation Effects

As there are vegetation buffers between the landfill expansion area and the Root River and Canon Creek adjacent to the site, erosion and sedimentation effects will be limited to localized edge disturbance and/or loss of adjacent vegetation due to the deposition of dust and/or overland mobilization of soil. There are no direct aquatic effects anticipated as a result of erosion and sedimentation.

5.2 Indirect Impacts

Indirect impacts are those that do not always manifest in the core development area, but in the areas adjacent to the development. Indirect impacts can begin in the construction phase; however, they can continue post-construction. Potential indirect impacts of the proposed landfill expansion include:

- Operational disturbance to wildlife and ecological linkages;
- Operational aquatic effects; and
- Colonization of exotic invasive species.

Operational Disturbance to Wildlife and Ecological linkages

Man-made disturbance to local wildlife communities on the lands adjacent to the proposed landfill expansion due to indirect impacts could result if left unmitigated. Operational noise, light, vibration and human presence are indirect impacts that can adversely influence movement, population size and breeding success of local wildlife. These effects will be minor given that local wildlife is likely habituated to the existing operational activity on the site. The disturbance is expected to be most pronounced during the site preparation (vegetation removal) phase of the expansion.

Based on the extent and location of the vegetation removal, forest fragmentation on a landscape level scale is not anticipated as alternative movement corridors exist in the general area of the landfill; however, localized ecological connectivity west of the site may be affected by removal of vegetation cover, subsequent narrowing of the ecological linkage and the disturbances mentioned above associated with operations.

The management recommendations outlined below include design recommendations and measures implemented during the operational phase to mitigate these impacts.

Operational Aquatic Effects

There is the potential for effects to aquatic systems in Canon Creek and the Root River if operational best management practices are not implemented in the landfill expansion area. Potential impacts to aquatic habitat features are generally associated with release of leachate from the landfill that could result in water quality effects. Landfill leachate could contain microorganisms and high concentrations of nutrients and other deleterious substances (e.g., organic carbon, nitrogen, chloride, iron, manganese,

phenols, pesticides, solvents, heavy metals, etc.) that could degrade groundwater and aquatic systems in surface water.

In order to mitigate potential water quality impacts to groundwater and downstream surface water features, an operational stormwater management (SWM) plan and leachate collection system are recommended. An overview of the SWM plan and leachate collection system is discussed below.

Colonization of Exotic Invasive Species

Physical site disturbance may increase the likelihood that exotic and/or invasive flora species will be introduced to the surrounding vegetation communities. Invasive flora can establish in disturbed sites more efficiently than native flora, and can then encroach into adjacent undisturbed areas. A number of non-native and potentially invasive species were observed during site investigations, mainly associated with the regularly disturbed areas in the landfill. The potential impact of invasive species can be largely mitigated through the implementation of an edge management plan.

The general management recommendations outlined below provide measures to prevent the colonization of non-native invasive species.

6.0 Mitigation Measures

Mitigation involves the avoidance or minimization of potential landfill expansion related impacts through the application of appropriate design criteria and implementation of best management practices during site preparation, construction and operational phases of the project. The feasibility of mitigation options has been evaluated based on the sensitivity of natural features and the magnitude and extent of potential effects within and adjacent to the study area. Site-specific operational management areas have been identified for natural features that could experience residual impacts during operations. In situations where residual impacts are unavoidable, ecological enhancement is recommended.

The potential direct impacts identified in the impact assessment include: woodland and meadow vegetation removal and loss of wildlife habitat, incidental wildlife mortality and erosion and sedimentation effects. Identified potential indirect impacts include: operational disturbance to wildlife and ecological linkages, operational aquatic effects and colonization of exotic invasive species.

A variety of mitigation techniques can be used to minimize or avoid the above-mentioned impacts. Specifically, five key areas are identified for management, mitigation, and monitoring, including:

- Woodland Edge Management;
- Wildlife Impact Mitigation during Construction;
- Erosion and Sediment Control;
- Stormwater Management and the Leachate Collection System; and
- Environmental Monitoring.

Each measure is described below. Detailed mitigation measures will be finalized in consultation with the Sault Ste. Marie Region Conservation Authority (SSMRCA) and the City as part of the detailed design of the landfill expansion project.

6.1 Woodland Edge Management

The following woodland edge management practices are recommended to mitigate the potential woodland and meadow vegetation removal and loss of habitat effects, colonization of exotic invasive species and operational disturbance to wildlife and ecological linkages described above.

- Waste piles and any inorganic debris within the proposed vegetation removal area should be removed and disposed of in an appropriate location.
- A qualified professional (e.g. arborist or forester) should selectively fell trees recommended for removal away from the existing forest and the remaining trees along the new woodland edge should be in a non-hazardous condition.
- Where feasible, select felled logs and other organic debris should be placed carefully in the existing forest.

- Small trees, shrubs, and ground vegetation situated immediately adjacent to the clearing area should be preserved to minimize edge dessication and windthrow.
- Tree protection fencing should be installed along the boundary of the critical root zone of trees to be retained. Tree protection fencing should have a filter fabric secured and entrenched, and will protection against migration of silt/sediment from the construction site into the forest edge. The fencing should also control the encroachment of equipment and material stockpile.
- Ongoing monitoring and maintenance of tree protection measures should occur throughout construction of the development.
- The use of heavy machinery within the root zones of trees located in the forest adjacent to the expanded landfill boundary should be avoided to prevent soil compaction and physical damage to roots. Where heavy machinery must be used within the woodland edge, a thick layer (10 centimetres in depth) of wood chips over a heavyweight non-woven geotextile or a reasonable alternative should be placed along the edge to mitigate impacts to roots. Mulch should be free of weeds, seeds and inorganic or toxic materials.
- If structural fill is required to build up areas, periods of high runoff volumes should be avoided to prevent deposition of sediment in tree root zones, where possible (e.g. spring and fall).
- If excavation or the lowering of grade is required near the forest edge adjacent to the landfill expansion, an arborist should expose the root system(s) systematically to determine where root pruning is recommended.
- To improve aeration and drainage, aeration of compacted soils near the forest edge adjacent to the landfill expansion using standard core aerators should be considered where appropriate.
- Trees located along any new woodland edges adjacent to the expanded landfill boundary that may conflict with construction activity (e.g. encroaching limbs or roots) should be pruned by a qualified forester or arborist.
- During construction, the woodland edge should be inspected periodically for indicators of tree dieback.
- If there is visual evidence that suggests tree dieback within the woodland edge, a condition assessment should be completed by a qualified arborist.
- In areas that become heavily invaded by invasive exotic species, selective removal of large specimens should take place, generally removal of invasive vegetation can occur during dormancy or during the growing season, but should be done before these species flower.
- Within 12 months of the each stage of landfill expansion, a qualified arborist should assess the new woodland edge. Trees which are dead, in poor health, or hazardous should be removed or pruned, as determined by the arborist.

6.2 Wildlife Impact Mitigation During Construction

General strategies to mitigate disturbance impacts to wildlife and use of wildlife ecological linkages during site preparation and construction are as follows:

- Vegetation removal should not take place during the established core breeding bird season for Bird Conservation Region (BCR) Zone 12, (i.e. May 9th to August 8th) as per the Environment Canada – Canadian Wildlife Service guidance under the federal *Migratory Bird Convention Act*, 1994. If removals must occur during this time period, a qualified biologist should inspect trees and other vegetated areas for nesting birds. If an active nest is found, tree removal cannot take place until nest activity has subsided (i.e. young have fledged) as determined by the qualified biologist.
- Where appropriate, retain non-hazardous wildlife habitat trees adjacent to development limits that contain nest, den, or roost cavities.
- Avoid construction lay-down and staging within the boundary of a natural feature scheduled for preservation.
- Where possible, maximize the distance of construction equipment used from the woodland edge to avoid disturbing wildlife.
- Limit the use of lighting where possible. Avoid light effects entering the vicinity of the woodland (eliminate light trespass) where possible.
- Advise contractor and construction staff through drawing specifications and awareness training to visually monitor wildlife species and report encounters.

6.3 Erosion and Sediment Control

As discussed in **above**, site alteration and earthworks may increase the availability of sediment due to erosion and transport by surface drainage. In order to mitigate the adverse impacts caused by the release of sediment-laden runoff, general measures for erosion and sediment control are recommended for construction works. Control measures must be selected that are appropriate for the erosion potential of the site and it is important that they be implemented and modified on a staged basis to reflect the site activities. Furthermore, erosion and sedimentation control structure effectiveness decreases with sediment loading and therefore, inspection and maintenance is required.

Control measures should be detailed in an Erosion and Sediment Control (ESC) Plan that is prepared as part of the detailed design. The following is a description of general sediment controls that could be implemented at the study area:

- Silt fencing or a reasonable alternative should be installed at strategic locations upstream of receiving bodies during the construction of each cell or during mining operations the silt fences are to be properly installed and constructed with 150 x 150 mm heavy duty wire farm fence fabric to properly support the geotextile.
- Rock Check Dams and/or Filter Socks can be constructed in swales and ditches to reduce velocities and trap sediment.
- Water should be pumped to a filter bag that discharges over a vegetated buffer strip and through a combination rock check dam and/or filter sock design at least 30 metres from a drainage feature.

- A backhoe or similar machinery should be used to remove any accumulated sediments at ESC structures.
- Surface stabilization should be applied to all stockpiles, temporary sediment basins and cut-off swales should be stabilized as quickly as possible to prevent erosion. If the works are undertaken outside of the growing season, an erosion control blanket should be installed over the surface.
- Erosion control blankets may be required for sloped restoration areas regardless of timing. The erosion control blankets are a biodegradable system that promotes ideal growing conditions while protecting seed and topsoil from wind and water erosion, as well as wildlife that would feed on the planted seeds.
- ESC measures should be monitored regularly and/or after every 10 mm or greater rainfall event as they could require periodic cleaning, maintenance and/or re-construction. If damaged control measures are found, they should be repaired and/or replaced promptly.

6.4 Stormwater Management and the Leachate Collection System

A leachate collection system was installed south of the landfill during the summer of 1992 and has been operating without interruption since November 1992. Prior to 1998, the collected leachate was re-circulated (i.e., pumped up to the northern end where it was discharged back into the landfill). In 1998, the leachate collection system was connected by forcemain to the sanitary sewer system of Sault Ste. Marie. In addition, in 2006, the Canon Creek was realigned by moving the most southern section of the creek to the east and away from the landfill. The leachate collection system was then extended towards the northeast in line with the former section of Canon Creek.

The leachate collection system is expected to be expanded to encompass the landfill expansion area and mitigate potential impacts to water quality due to input of pollutants originating from the landfill. In general, the upgrades to the leachate collection system will reduce the risk of release of deleterious substances into local surface water or groundwater resources.

6.5 Environmental Monitoring

Construction

Environmental monitoring during each landfill expansion phase will consist of monitoring the ESC measures, tree protection fencing, and the edges of protected natural features. Periodic environmental monitoring is recommended to be carried out through the duration of construction activities to ensure that the erosion and sediment control (ESC) measures described above operate effectively and to monitor the potential impacts to natural features. The duration of construction is defined as the period of time from the beginning of site preparation (e.g., vegetation clearing grubbing) and earthworks until the site is stabilized. Site stabilization is defined the point in time when expansion works have been completed, the associated infrastructure installed and exposed soil has been stabilized.

Protected vegetation areas will require periodic monitoring to ensure that they are not impacted by the adjacent development landfill expansion. Should impacts be observed, necessary steps will be taken to ensure that the impacted vegetation is either restored or replaced.

Operations

Environmental monitoring will be initiated to track potential effects on local groundwater and surface water systems and their associated aquatic habitat. Environmental monitoring activities during operations will also include monitoring of invasive species encroachment, invasive species control (if necessary) and woodland edges.

7.0 Summary

This report presents the findings of the natural heritage assessment in support of the Environmental Assessment (EA) for the proposed City of Sault Ste. Marie's landfill expansion project. These findings include a background information review, summary of existing conditions, natural feature evaluation, impacts assessment and identification of mitigation strategies recommended for implementation to avoid or minimize effects to the natural environment. Based on the foregoing, and in the context of the natural heritage system encompassed by the Study Area, the Sault Ste. Marie landfill expansion project is not anticipated to have a residual adverse effect on the natural environment.

Appendix A

Plant Species List and Potential Species at Risk and Species of Conservation Concern

Table A-1: Vascular Plant Species Documented Within Study Area

Scientific Name	Common Name	SARA ¹	ESA 2007 ²	Srank ³	Coefficient Conservation	Coefficient Wetness
<i>Abies balsamea</i>	Balsam Fir	---	---	S5	5	-3
<i>Acer negundo</i>	Manitoba Maple	---	---	S5	0	-2
<i>Acer rubrum</i>	Red Maple	---	---	S5	4	0
<i>Acer saccharum</i> ssp. <i>saccharum</i>	Sugar Maple	---	---	S5	4	3
<i>Achillea millefolium</i> ssp. <i>millefolium</i>	Common Yarrow	---	---	SE	0	3
<i>Actaea pachypoda</i>	White Baneberry	---	---	S5	6	5
<i>Amaranthus</i> sp	Pigweed Species	---	---	---	---	---
<i>Ambrosia artemisiifolia</i>	Common Ragweed	---	---	S5	0	3
<i>Aralia nudicaulis</i>	Wild Sarsaparilla	---	---	S5	4	3
<i>Arctium minus</i> ssp. <i>minus</i>	Common Burdock	---	---	SE5	0	5
<i>Artemisia vulgaris</i>	Common Mugwort	---	---	SE5	0	5
<i>Asclepias syriaca</i>	Common Milkweed	---	---	S5	0	5
<i>Aster ciliolatus</i>	Ciliolate Aster	---	---	S5	6	4
<i>Aster lanceolatus</i> ssp. <i>lanceolatus</i>	Panicked Aster	---	---	S5	3	-3
<i>Aster macrophyllus</i>	Large-leaved Aster	---	---	S5	5	5
<i>Barbarea vulgaris</i>	Common Wintercress	---	---	SE5	0	0
<i>Betula papyrifera</i>	White Birch	---	---	S5	2	2
<i>Bromus inermis</i> ssp. <i>inermis</i>	Smooth Brome	---	---	SE5	0	5
<i>Carex</i> sp	Sedge Species	---	---	---	---	---
<i>Centaurea maculosa</i>	Spotted Knapweed	---	---	SE5	0	5
<i>Chenopodium album</i> var. <i>album</i>	Lamb's Quarters	---	---	SE5	0	1
<i>Cichorium intybus</i>	Chicory	---	---	SE5	0	5
<i>Coronilla varia</i>	Trailing Crown-vetch	---	---	SE5	0	5
<i>Daucus carota</i>	Wild Carrot	---	---	SE5	0	5
<i>Dryopteris intermedia</i>	Evergreen Wood Fern	---	---	S5	5	0
<i>Echinochloa crusgalli</i>	Barnyard Grass	---	---	SE5	0	-3
<i>Echinocystis lobata</i>	Wild Cucumber	---	---	S5	3	-2
<i>Echium vulgare</i>	Viper's Bugloss	---	---	SE5	0	5
<i>Elymus repens</i>	Quack Grass	---	---	SE5	0	3
<i>Erigeron annuus</i>	Daisy Fleabane	---	---	S5	0	1

Scientific Name	Common Name	SARA ¹	ESA 2007 ²	Srank ³	Coefficient Conservation	Coefficient Wetness
<i>Fragaria virginiana</i> ssp. <i>virginiana</i>	Common Strawberry	---	---	S5	2	1
<i>Helianthus annuus</i> ssp. <i>annuus</i>	Common Sunflower	---	---	SE4	0	1
<i>Hieracium caespitosum</i> ssp. <i>caespitosum</i>	Field Hawkweed	---	---	SE5	0	5
<i>Lobelia inflata</i>	Indian Tobacco	---	---	S5	3	4
<i>Lonicera tatarica</i>	Tartarian Honeysuckle	---	---	SE5	0	3
<i>Maianthemum canadense</i>	Canada Mayflower	---	---	S5	5	0
<i>Maianthemum racemosum</i> ssp. <i>racemosum</i>	False Solomon's Seal	---	---	S5	4	3
<i>Melilotus alba</i>	White Sweet-clover	---	---	SE5	0	3
<i>Mentha spicata</i>	Spearmint	---	---	SE4	0	-4
<i>Monotropa uniflora</i>	Indian-pipe	---	---	S5	6	3
<i>Oenothera biennis</i>	Common Evening-primrose	---	---	S5	0	3
<i>Ostrya virginiana</i>	Hop Hornbeam	---	---	S5	4	4
<i>Parthenocissus inserta</i>	Thicket Creeper	---	---	S5	3	3
<i>Phleum pratense</i>	Timothy	---	---	SE5	0	3
<i>Phragmites australis</i>	Common Reed	---	---	S5	0	-4
<i>Picea glauca</i>	White Spruce	---	---	S5	6	3
<i>Pinus banksiana</i>	Jack Pine	---	---	S5	9	3
<i>Pinus strobus</i>	Eastern White Pine	---	---	S5	4	3
<i>Plantago lanceolata</i>	Ribgrass	---	---	SE5	0	0
<i>Plantago major</i>	Common Plantain	---	---	SE5	0	-1
<i>Poa pratensis</i> ssp. <i>pratensis</i>	Kentucky Blue Grass	---	---	S5	0	1
<i>Polygonum persicaria</i>	Lady's Thumb	---	---	SE5	0	-3
<i>Populus balsamifera</i> ssp. <i>balsamifera</i>	Balsam Poplar	---	---	S5	4	-3
<i>Populus grandidentata</i>	Large-tooth Aspen	---	---	S5	5	3
<i>Populus tremuloides</i>	Trembling Aspen	---	---	S5	2	0
<i>Prunus pensylvanica</i>	Pin Cherry	---	---	S5	3	4
<i>Prunus virginiana</i> ssp. <i>virginiana</i>	Choke Cherry	---	---	S5	2	1
<i>Pteridium aquilinum</i> var. <i>latiusculum</i>	Eastern Bracken Fern	---	---	S5	2	3
<i>Quercus rubra</i>	Red Oak	---	---	S5	6	3

Scientific Name	Common Name	SARA ¹	ESA 2007 ²	Srank ³	Coefficient Conservation	Coefficient Wetness
<i>Rhus typhina</i>	Staghorn Sumac	---	---	S5	1	5
<i>Rubus flagellaris</i>	Northern Dewberry	---	---	S4	4	4
<i>Rubus idaeus ssp. melanolasius</i>	Wild Red Raspberry	---	---	S5	0	-2
<i>Rubus occidentalis</i>	Black Raspberry	---	---	S5	2	5
<i>Rumex crispus</i>	Curly Dock	---	---	SE5	0	-1
<i>Sambucus racemosa ssp. pubens</i>	Red-berried Elderberry	---	---	S5	5	2
<i>Scirpus atrovirens</i>	Black Bulrush	---	---	S5	3	-5
<i>Solanum dulcamara</i>	Bittersweet Nightshade	---	---	SE5	0	0
<i>Solidago altissima var. altissima</i>	Tall Goldenrod	---	---	S5	1	3
<i>Sonchus arvensis ssp. arvensis</i>	Field Sow-thistle	---	---	SE5	0	1
<i>Sorbus americana</i>	American Mountain-ash	---	---	S5	8	-1
<i>Tanacetum vulgare</i>	Tansy	---	---	SE5	0	5
<i>Trientalis borealis ssp. borealis</i>	Starflower	---	---	S5	6	-1
<i>Trifolium arvense</i>	Rabbit-foot Clover	---	---	SE4	0	5
<i>Trifolium pratense</i>	Red Clover	---	---	SE5	0	2
<i>Verbascum thapsus</i>	Common Mullein	---	---	SE5	0	5
<i>Veronica officinalis</i>	Common Speedwell	---	---	SE5	0	5

1. SARA status according to Federal SARA Registry

2. ESA status according to Provincial SARO list

3. Srank - S5 = secure; S4= apparently secure; S3 = vulnerable; S2 = imperiled; S1 = Critically Imperiled; SNA(SE) = conservation status ranking not applicable (exotic), ? -status uncertain

Table A2: Occurrence Records and Habitat Screening for Species at Risk and Species of Conservation Concern

Species		Federal SARA Status	Ontario ESA Status	S-Rank ¹	Background information Source ²	Habitat Requirements ³	Potential Habitat in the Study Area	Rationale & Potential Species/Habitat Effects
Scientific Name	Common Name							
BIRDS								
<i>Hirundo rustica</i>	Barn Swallow	---	Threatened	S4B	OBBA Atlas Square # 16GS06	Farmlands or rural areas; cliffs, caves, rock niches; buildings or other man-made structures for nesting; open country near body of water.	Yes	Barn Swallow could potentially find foraging habitat over open meadows present and potential nest sites at landfill buildings. Local foraging and nesting habitat will persist post landfill expansion.
<i>Haliaeetus leucocephalus</i> *	Bald Eagle	---	Special Concern	S4B, S2N	CBC - ONSS, MNRF	Require large continuous areas of deciduous or mixed forest around large lakes, rivers; require area of 255 ha for nesting.	Yes	Large continuous areas of deciduous/ mixed forest surround the study area; however, larger bodies of water are generally several kilometres from the landfill. A single individual was observed perched at the edge of the Sugar Maple - Oak Deciduous Forest community. No nests were observed. Species and habitat effects are not expected.
<i>Dolichonyx oryzivorus</i>	Bobolink	---	Threatened	S4B	OBBA Atlas Square # 16GS06	Large, open expansive grasslands with dense ground cover; hayfields, meadows or fallow fields; prefers larger tracts of grassland (e.g., >30-50 ha).	No	No large open grassy meadows are present in the study area. Species was not observed during site surveys.
<i>Wilsonia canadensis</i> *	Canada Warbler	Threatened	Special Concern	S4B	OBBA Atlas Square # 16GS06	Dense, mixed coniferous, deciduous forests with closed canopy; usually requires at least 30 ha.	Yes	Mixed forest adjacent to the proposed expansion lands could provide marginal habitat as Canada Warbler generally prefers large contiguous wet forests with dense shrub layers, which was not present. Species was not observed during site surveys.
<i>Chaetura pelagica</i>	Chimney Swift	Threatened	Threatened	S4B, S2N	OBBA Atlas Square # 16GS06	Urban areas near buildings; nests in hollow trees; crevices of rock cliffs; chimneys; feeds over open water.	No	The landfill is not directly adjacent to suitable urban/ residential areas and does not contain open water areas that may provide foraging habitat.

Species		Federal SARA Status	Ontario ESA Status	S-Rank ¹	Background information Source ²	Habitat Requirements ³	Potential Habitat in the Study Area	Rationale & Potential Species/Habitat Effects
Scientific Name	Common Name							
<i>Sturnella magna</i>	Eastern Meadowlark	---	Threatened	S4B	OBBA Atlas Square # 16GS06	Open grassy meadows, farmland, pastures, hayfields, grasslands with elevated singing perches, cultivated and weedy areas with trees, old orchards with adjacent grassy areas; habitats >10 ha in size.	No	Large open habitats are not present in the study area. Meadows in study area lack a high graminoid species composition and subject to regular disturbance.
<i>Contopus virens</i>	Eastern Wood-pewee	--- (This species is not listed on a SARA Schedule 1 but has been assessed as Special Concern by COSEWIC)	--- (This species is not listed on the ESA SARO List but has been assessed as Special Concern by COSSARO)	S4B	OBBA Atlas Square # 16GS06	Open, deciduous, mixed or coniferous forest; predominated by oak with little understory; forest clearings, edges; farm woodlots, parks.	Yes	Potentially suitable breeding habitat in the woodlands within and adjacent to proposed expansion lands. Mitigation of woodland removal activity required.
<i>Contopus cooperi</i> *	Olive-sided Flycatcher	Threatened	Special Concern	S4B	OBBA Atlas Square # 16GS06	Semi-open coniferous forest, prefers spruce; near ponds, lakes or rivers; treed wetlands for nesting; burns with dead trees for perching.	No	In general, forests present in the study area are not dominated by coniferous trees and potentially suitable wetland habitat does not occur within or adjacent to proposed expansion lands.
<i>Falco peregrinus</i> *	Peregrine Falcon	Special Concern	Special Concern	S2S3B, ZN		Rock cliffs, crags, situated near water; tall buildings.	No	No rock cliffs or tall buildings are present in or adjacent to the study area.
<i>Aythya americana</i> *	Redhead	---	---	S2B, S4N	CBC - ONSS	Shallow cattail/bulrush marshes, lakes, ponds, fens; usually nests close to shallow water but can be up to 266 m from water's edge.	No	No suitable wetland habitat is present in the study area.
<i>Podiceps grisegena</i> *	Red-necked Grebe	---	---	S3B, S4N	CBC - ONSS	Permanent freshwater lakes with a fringe of aquatic emergent vegetation, Marshes, impoundments or sewage lagoons with >4 ha of open water; protected marshy areas or bays in larger lakes.	No	No suitable wetland habitat is present in the study area.
<i>Euphagus carolinus</i>	Rusty Blackbird	Special Concern	---	S4B	OBBA Atlas Square # 16GS06	Openings in coniferous woodlands bordering bodies of water; tree bordered open wetlands or wooded swamps; streams bordered with willows or alders, wooded islands on lakes.	No	In general, forests present in the study area are not dominated by coniferous trees and potentially suitable wetland habitat does not occur within or adjacent to proposed expansion lands.

Species		Federal SARA Status	Ontario ESA Status	S-Rank ¹	Background information Source ²	Habitat Requirements ³	Potential Habitat in the Study Area	Rationale & Potential Species/Habitat Effects
Scientific Name	Common Name							
<i>Asio flammeus</i> *	Short-eared Owl	Special Concern	Special Concern	S2N, S4B	CBC - ONSS	Grasslands, open areas or meadows that are grassy or bushy; requires 75-100 ha of contiguous open habitat.	No	Open meadow habitats present in the study area are regularly disturbed and do not meet size requirements for this species.
<i>Hylocichla mustelina</i>	Wood Thrush	--- (This species is not listed on a SARA Schedule 1 but has been assessed as Threatened by COSEWIC)	--- (This species is not listed on the ESA SARA List but has been assessed as Special Concern by COSSARO)	S4B	OBBA Atlas Square # 16GS06	Undisturbed moist mature deciduous or mixed forests with sapling growth, must have some trees higher than 12 m.	Yes	This species could find potentially suitable breeding habitat in the woodlands within and adjacent to proposed expansion lands. Mitigation of woodland removal activity required.
MAMMALS								
<i>Myotis lucifugus</i>	Little Brown Myotis	---	Endangered	S4	Patterson et al 2007	Uses caves, quarries, tunnels, hollow trees or buildings for roosting, winters in humid caves, maternity sites in dark warm areas like attics and barns, feeds in wetlands and at forest edges.	Yes	Could potentially find summer roosting sites in the forested habitats present and could forage along forest edges. No suitable hibernation sites were observed. Mitigation of woodland removal activity required.
<i>Myotis septentrionalis</i>	Northern Myotis	---	Endangered	S3	Patterson et al 2007	Hibernates during winter in mines or caves; during summer males roost alone and females form maternity colonies of up to 60 individuals; roosts in houses and other manmade structures but prefers hollow trees or under loose bark; hunts within forest, below canopy.	Yes	Could potentially find summer roosting sites in the forested habitats present and could forage within forest habitats. No suitable hibernation sites were observed. Mitigation of woodland removal activity required.
<i>Myotis leibii</i> *	Eastern Small-footed Bat	---	--- (This species is not listed on the ESA but has been assessed as Endangered by COSSARO)	S2S3	Patterson et al 2007	Roosts in caves, mine shafts, crevices or buildings that are in or near woodlands; hibernates in cold dry caves or mines; maternity colonies in caves or buildings, hunts in forests.	No	No suitable roosting or hibernation sites were observed in the study area.
HERPTILES								
<i>Chelydra serpentina</i> *	Snapping Turtle	Special Concern	Special Concern	S4	NRC, MNRF	Permanent, semi-permanent fresh water; marshes; swamps or bogs; rivers and streams; prefers slow-moving water with a soft mud or sand substrate and abundant vegetation.	Yes	Marshes, swamps, bogs, rivers and slow moving streams are not present within the study area. Canon Creek adjacent to the landfill has a relatively high flow velocity but could potentially be used as a movement corridor. This species is unlikely to occur within

Species		Federal SARA Status	Ontario ESA Status	S-Rank ¹	Background information Source ²	Habitat Requirements ³	Potential Habitat in the Study Area	Rationale & Potential Species/Habitat Effects
Scientific Name	Common Name							
<i>Lampropeltis triangulum</i> *	Milksnake	Special Concern	Special Concern	S3	NHIC	Can occur in a wide variety of habitats including meadows, fields, forest habitats and swamps.	Yes	lands for proposed landfill expansion. Species was not observed during site investigation surveys. This species may occur within the natural habitats present in the study area. The graminoid meadow located to the south-west, and the hydro power line corridor located to the west are both moderate potential snake foraging habitats. No candidate hibernacula was observed.
<i>Emydoidea blandingii</i>	Blanding's Turtle	Threatened	Threatened	S3	NRC	Shallow water marshes, bogs, ponds or swamps.	No	No suitable wetland habitat is present within or directly adjacent to the study area. Species was not observed during site investigation surveys.
<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Endangered	S2	NRC	Slow moving streams with sandy bottoms and woody edges; ponds, marshes, swamps; woodlands in floodplains; lives within 150 m of stream shores.	Yes	May potentially occur in the vicinity of the watercourse features located adjacent to the existing landfill and proposed expansion area. Species was not observed during site investigation surveys.
ODONATA								
<i>Somatochlora elongate</i> *	Ski-tailed Emerald	---	---	S3	NHIC, Odonata Atlas	Occurs in forest streams and riffles and near lake and pond outlets.	Yes	May potentially occur in the vicinity of the watercourse features located adjacent to the existing landfill and proposed expansion. Species was not observed during site investigation surveys.
<i>Helocordulia uhleri</i> *	Uhler's Sundragon	---	---	S3	Odonata Atlas	Wide range from small rocky woodland streams to larger open rivers, usually requires good current.	Yes	May potentially occur in the vicinity of the watercourse features located adjacent to the existing landfill and proposed expansion. Species was not observed during site investigation surveys.
<i>Ophiogomphus carolus</i> *	Riffle Snaketail	---	---	S2S3	NHIC, Odonata Atlas	Occurs on clear swift rivers and streams with rocky or sandy bottoms.	Yes	May potentially occur in the vicinity of the watercourse features located adjacent to the existing landfill and proposed

Species		Federal SARA Status	Ontario ESA Status	S-Rank ¹	Background information Source ²	Habitat Requirements ³	Potential Habitat in the Study Area	Rationale & Potential Species/Habitat Effects
Scientific Name	Common Name							
								expansion. Species was not observed during site investigation surveys.
VASCULAR PLANTS & BRYOPHYTES								
<i>Polystichum braunii</i> *	Braun's Holly Fern	---	---	S3	NHIC	This species prefers rocky stream margins and moist rocky habitats in cool, well shaded deciduous forests.	Yes	Forests in the study area did not have moist, rocky, shaded and/or cool habitat. Potentially this species could be found along the rocky stream bank of Canon Creek. Species was not observed during site investigation surveys.
<i>Galium kamtschaticum</i> *	Boreal Bedstraw	---	---	S2	NHIC	Cool moist mossy habitats within coniferous forests.	No	No cool mossy conifer dominated forests are present. Species was not observed during site investigation surveys.
<i>Vaccinium ovalifolium</i> *	Oval-leaved Bilberry	---	---	S3	NHIC	Occurs in rocky mixed woods and along the shores of lakes.	Yes	Could potentially occur in mixed forest community present. Species was not observed during site investigation surveys.

* Denotes a Species of Conservation Concern

1. Subnational (Provincial) Rank (Source: OMNR National Heritage Information Centre website, 2007)
2. OMNR National Heritage Information Centre website, 2007
3. OMNR Significant Wildlife Habitat Technical Guide, Appendix G (2000)

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