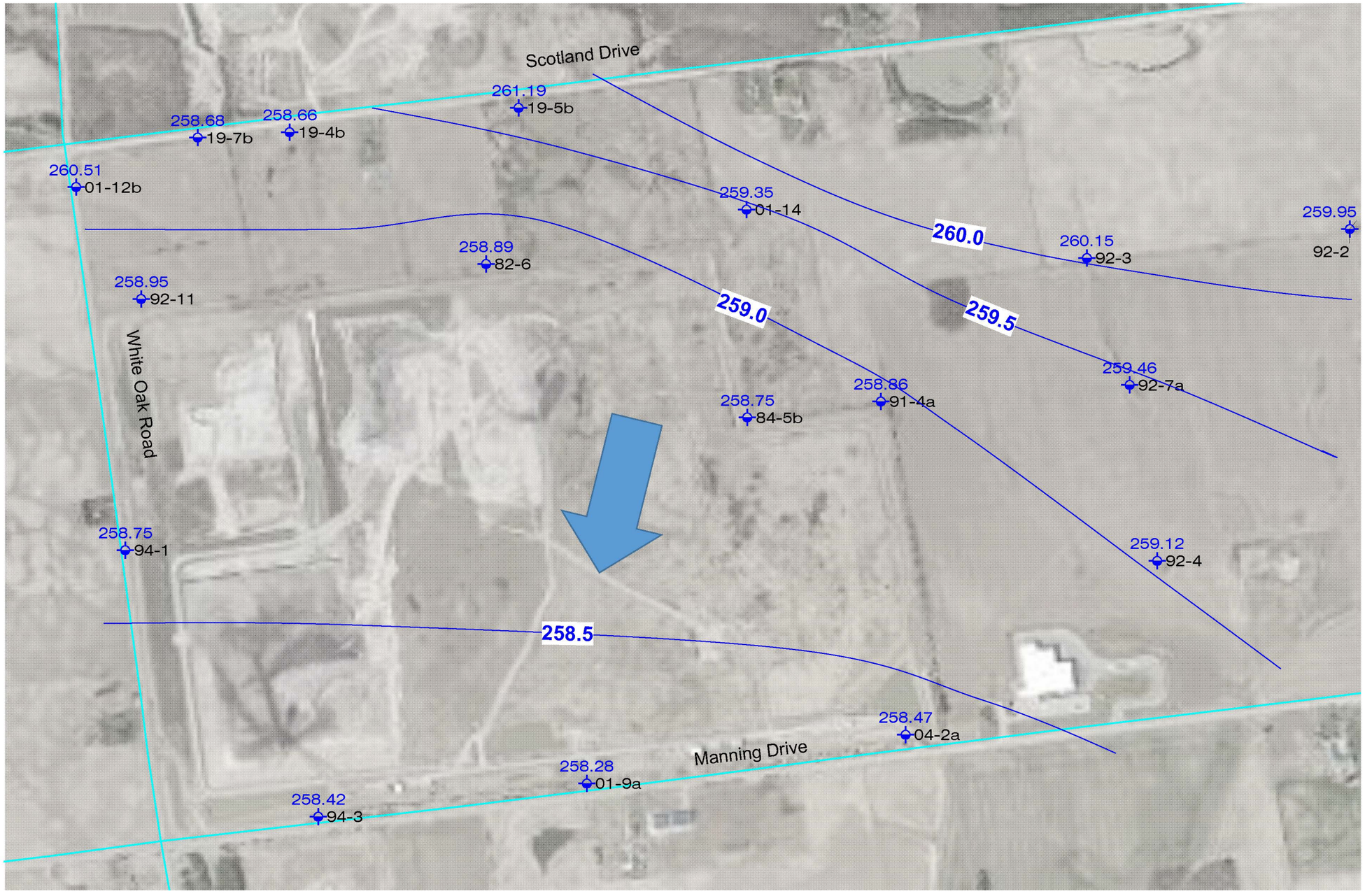


Existing Groundwater Conditions

CORPORATION OF THE CITY OF LONDON

INDIVIDUAL EA OF THE PROPOSED W12A LANDFILL EXPANSION

GROUNDWATER ELEVATION IN UPPER AQUIFER

Figure 5.3-5

LEGEND

259.46 Fall 2019 Upper Aquifer Groundwater Elevation (masl)

Groundwater Flow Direction

0 100 200 300 400 m

Scale 1 : 8 000

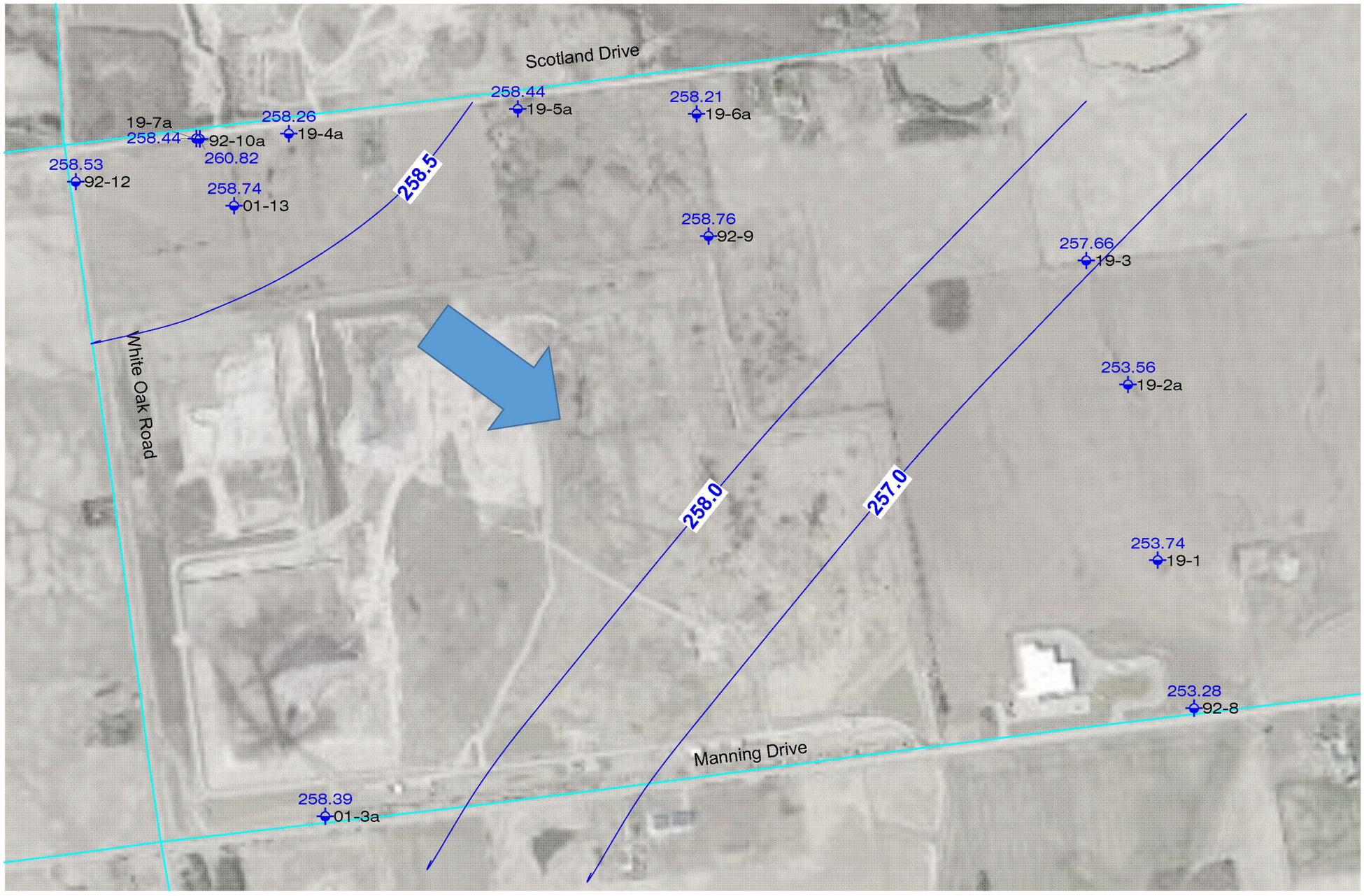
MAP CREATED BY : LOM
MAP CHECKED BY: RFK
MAP PROJECTION: NAD 1983 UTM Zone 18N
2017 AIR PHOTO

DILLON CONSULTING

PROJECT: 19-1230

STATUS: FINAL

DATE: SEPTEMBER 2020



Existing Groundwater Conditions

CORPORATION OF THE CITY OF LONDON

INDIVIDUAL EA OF THE PROPOSED W12A LANDFILL EXPANSION

GROUNDWATER ELEVATION IN WHITE OAK AQUIFER
Figure 5.3-6

LEGEND

257.66 Fall 2019 White Oak Aquifer Groundwater Elevation (masl)

Groundwater Flow Direction

0 100 200 300 400 m
Scale 1 : 8 000

MAP CREATED BY : LOM
MAP CHECKED BY: RFK
MAP PROJECTION: NAD 1983 UTM Zone 18N
2017 AIR PHOTO

DILLON CONSULTING

PROJECT: 19-1230
STATUS: FINAL
DATE: AUGUST 2020

5.4 Surface Water

This section of the EASR provides a summary of the existing surface water setting within which the W12A Landfill property and adjacent lands are located, as well as an overview of the existing SWMS at the W12A Landfill site. The work was carried out as described in the approved Amended ToR (Volume II) and the Surface Water Work Plan (provided in Volume III Appendix B.03). The report providing additional details on the existing surface water environment is contained in Volume IV Appendix D.04.

5.4.1 Surface Water Setting

The description of the surface water setting of the W12A Landfill site was based on a review of available background studies and a detailed site reconnaissance carried out in May 2020. These consisted of the following:

- Earth Tech Stormwater Management Master Plan (2002)
- Dillon Consulting Limited Surface Water Background Study (2005)
- Subwatershed Studies
- Dingman Creek Subwatershed Background Study (1992, updated in 2005 and 2006)
- Kettle and Dodd Creek Subwatershed Study (1995)
- Site reconnaissance in May 2020 to confirm overland flow routes, drainage boundaries, and the location and condition of drainage outlets from the W12A Landfill property and adjacent lands.

The W12A Landfill is situated on the boundary between two large subwatershed areas, Dingman Creek and Dodd Creek; the boundary is oriented northeast to southwest across the northern portion of the landfill site. Dingman Creek is a tributary of the Thames River (Lake St. Clair Basin) watershed and Dodd Creek is part of the Kettle Creek (Lake Erie Basin) watershed. The majority of the landfill property falls within the Dodd Creek watershed and a small northerly portion of the landfill falls within the Dingman Creek watershed. The subwatershed boundary and drainage features are shown on Figure 5.4-1.

Many streams within the Site-vicinity Study Area have been altered to improve drainage characteristics by straightening and deepening the channels. Deep, confined channels tend to exhibit substantially higher peak flow velocities (due to small top-width and deep flow depth) compared to unconfined channels with equivalent flow rate. Natural stream morphology and associated instream habitat have been significantly impacted in the altered streams. Very few (less than 10%) of the watercourses have vegetated streambanks, typically consisting of woody species and, as a result, banks are unstable, erosion and scour is prevalent, water temperatures are high and soil transported from adjacent lands readily enters the watercourses.

Legend:
- Hydraulic Structure Location
- Watercourse
- Ditch Drain
- Subwatershed Divide
- Subcatchment Divide

Location 1
Location 2
Location 3
Location 4
Location 5
Location 6
Location 7
Location 8
Location 9
Location 10
Location 11
Location 12
Location 13
Location 14
Pond A
Pond B
Pond C
SWM Pond 1
SWM Pond 2/3
SWM Pond 4
SWM Pond 5
Material Recovery Facility SWM Pond 1
Material Recovery Facility SWM Pond 2
Shore Drain
DINGMAN CREEK SUBWATERSHED
DODD/KETTLE CREEK SUBWATERSHED
SCOTLAND DRIVE
MANNING DRIVE
WHITE OAK ROAD
WELLINGTON ROAD SOUTH

c:\projectwise\working directory\active\10dja\d0043386\176665 - Existing Conditions Figures.dwg

CONSULTANT OR DIVISION: DILLON CONSULTING

ENGINEER'S STAMP

CORPORATION OF THE CITY OF LONDON
London CANADA

SCALE 1:5000
SCALE - 1 : 5000
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TITLE: INDIVIDUAL EA OF THE PROPOSED W12A LANDFILL EXPANSION

EXISTING SURFACE WATER FEATURES

PROJECT No. 17-6665
SHEET No. FIG 5.4-1
PLAN FILE No.

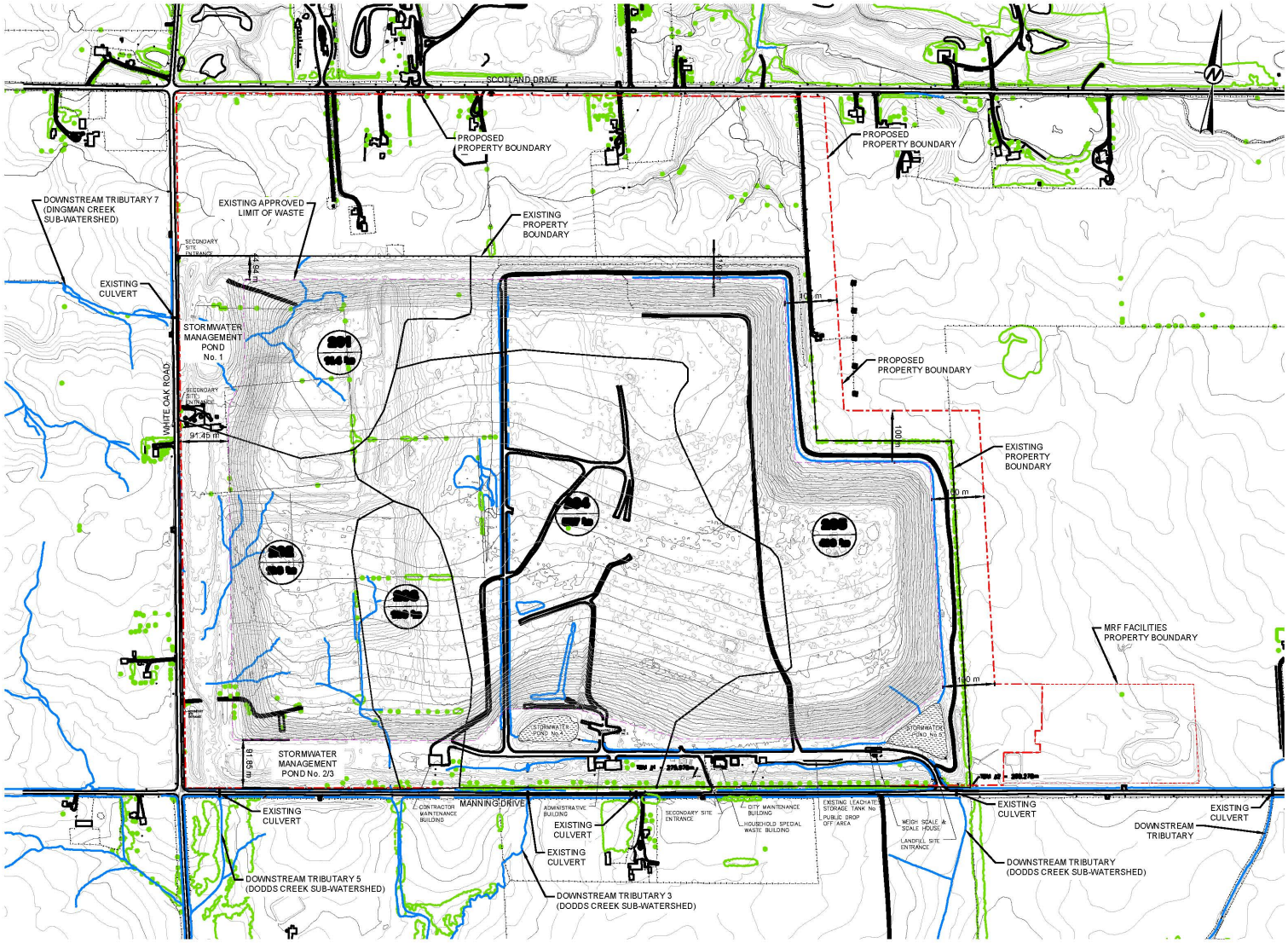
There is a total of 14 hydraulic structures that receive drainage from the W12A Landfill property and adjacent lands and convey this runoff to off-site watercourses. These hydraulic structures consist of pipe culverts, tile drains and one open frame box culvert; their location is shown on Figure 5.4-1. Stormwater management on the W12A Landfill is provided by four SWM ponds - Pond 1, Pond 2/3, Pond 4 and Pond 5. These ponds outlet from the landfill via hydraulic structures crossing beneath the adjacent roadways to off-site watercourses. As shown on Figure 5.4-1, Pond 1 discharges into the Dingman Creek subwatershed via structure Location 13 westward beneath White Oak Road; Ponds 2/3, 4 and 5 discharge southward into the Dodd Creek subwatershed beneath Manning Drive via structure Locations 12, 10 and 9, respectively. All of these off-site receiving watercourses are documented as being seasonally dry, intermittent watercourses with a majority of flow generated as a result of direct runoff during precipitation events.

5.4.2 Stormwater Management System

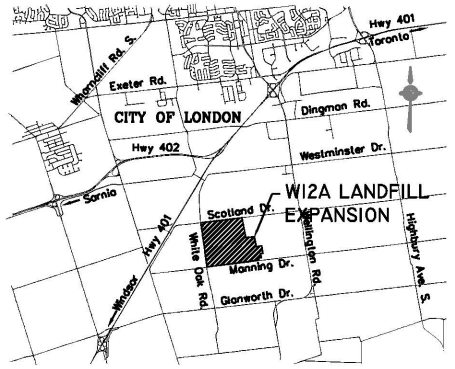
The existing drainage network in the vicinity of the landfill is divided into four general areas with a system of berms, slopes and perimeter drainage ditches directing runoff generated within the W12A Landfill Operations Area (the landfill footprint and the area immediately adjacent where operations will take place) to four separate SWM ponds. As shown on Figure 5.4-2, SWM ponds 2/3, 4 and 5 are located along the south side of the site and currently service approximately 129.3 ha of drainage area and discharge to the Dodd Creek subwatershed. SWM pond 1 is located at the northwest corner of the landfill area and services approximately 14.4 ha of drainage area that falls within the Dingman Creek subwatershed area. The following sections provide an overview of the current SWM ponds at the site. The site SWM facilities operate under ECA 1828-9CKRMK issued by the MECP December 11, 2013.

SWM Pond 1 is located at the northwest corner of the landfill area and is an extended detention wet pond that receives stormwater runoff from a total drainage area of 14.4 ha under existing conditions. The existing pond was designed to provide enhanced 80% long-term suspended solids removal as defined by the MECP Stormwater Management Planning and Design Manual (MECP, 2003) and has a permanent pool storage capacity of 2,470 m^3 and an active storage capacity of 5,800 m^3. The pond includes a forebay, a permanent pool with elevation 273.2 masl, a 150 mm diameter Hickenbottom outlet structure discharging via a 150 mm diameter gate valve into an existing 900 mm diameter Corrugated Steel Pipe (CSP) culvert into Tributary 7 and a 3.2 m wide rip-rap overflow at invert elevation 275.0 masl discharging into Tributary 7.

SWM Pond 2/3 is located in the southwest corner of the existing landfill property and is an extended detention wet pond that receives stormwater runoff from a total drainage area of 30.6 ha under existing conditions. The pond was designed to provide Normal 70% long-term suspended solids removal as defined by the MECP Stormwater Management Planning and Design Manual (MECP, 2003) and has a permanent pool storage capacity of 2,660 m^3 and an active storage capacity of 11,100 m^3. The pond includes a forebay, a permanent pool with elevation 271.2 masl, a 300 mm diameter Hickenbottom outlet structure discharging via a 300 mm diameter gate valve into an existing outlet ditch that drains into Tributary 5, one ditch



KEY MAP



LEGEND

- DRAINAGE BOUNDARY
- DRAINAGE AREA I.D. No.
- AREA (ha)
- SITE BOUNDARY

REFERENCE(S)

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

REDUCE PRINT

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1:4,000 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
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SEAL

LICENCED PROFESSIONAL ENGINEER
M.H.H. KNOWLES
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CLIENT
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1931 ROBERTSON ROAD
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CANADA
[+1] (613) 529 9600
www.golder.com

PROJECT
ENVIRONMENTAL ASSESSMENT OF THE PROPOSED W12A LANDFILL EXPANSION

TITLE
EXISTING DRAINAGE AREAS

PROJECT NO.	CONTROL	REV.	of	DRAWING
1648176	0016	0		5.4-2

Path: \\golder.gds\corp\ottawa\Active\Spatial_MC\Cyd\London\Site_W12A\88_PROJ\1648176\01_PRO\D0016_ESA\R-REPORT\ | File Name: 1648176-0016-CW-0002.dwg | Last Edited By: mfrogat Date: 2021-09-14 Time: 1:43:46 PM | Printed By: mfrogat Date: 2021-09-14 Time: 4:16:39 PM
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inlet structure and 750 mm diameter concrete pipe outlet that drains via an outlet ditch into Tributary 5 and one 5.0 m wide overflow spillway at invert elevation 274.0 masl.

SWM Pond 4 is located on the south side of the existing landfill property and is an extended detention wet pond that receives stormwater runoff from a total drainage area of 57.7 ha. The existing pond was designed to provide Normal 70% long-term suspended solids removal as defined by the MECP Stormwater Management Planning and Design Manual (MECP, 2003) and has a permanent pool storage capacity of 5,200 m^3 and an active storage capacity of 20,200 m^3. The pond includes a forebay, a permanent pool with elevation 269.7 masl, a 125 mm diameter Hickenbottom outlet structure discharging via a 150 mm diameter gate valve into a 450 mm diameter pipe into an outlet structure with a ditch inlet catchbasin top followed by a 1,050 mm diameter pipe into Tributary 3.

SWM Pond 5 is located on the southeast corner of the existing landfill property and is an extended detention wet pond that receives stormwater runoff from a total drainage area of 41.0 ha under existing conditions. The pond was designed to provide Normal 70% long-term suspended solids removal as defined by the MECP Stormwater Management Planning and Design Manual (MECP, 2003) and has a permanent pool storage capacity of 3,690 m^3 and an active storage capacity of 11,800 m^3. The pond includes a forebay, a permanent pool with elevation 268.5 masl, an outlet structure with a 150 mm diameter orifice and an overflow weir at elevation 269.4 masl and a 600 mm x 600 mm slide gate valve.

The SWMS is designed to separate leachate impacted or potentially leachate impacted runoff from entering the stormwater management ditches and ponds. The design of the ongoing surface water monitoring program for the SWM ponds is to detect the presence of leachate impacts in the pond discharge and, if detected, to implement a trigger mechanism for implementation of a contingency plan to discontinue the discharge from the affected pond(s) until such time that the cause of leachate gaining access to the pond(s) has been determined and mitigated. The annual monitoring programs, including 2019 (City of London, March 2020), have demonstrated that the surface water quality discharged from the ponds is acceptable and not having an adverse effect on the downstream receiving watercourses.

5.5 Biology

This section of the EASR provides a summary of the existing biology (natural heritage) setting within which the W12A Landfill property and surrounding lands are located. The work was carried out as described in the approved Amended ToR (Volume II) and following the Biology Work Plan (provided in Volume III Appendix B.04). The report providing additional details on the existing biology environment is contained in Volume IV Appendix D.05.

The determination of biological conditions was carried out using the following steps: review of background information; review of relevant legislation, policies and guidelines that may apply to the W12A Landfill expansion; agency consultation and information requests, and; field investigations.

The following sections provide a description of the existing physical and natural heritage features within the Site Study Area and the Site-vicinity Study Area (which includes a 500 m area surrounding the landfill property to capture natural heritage features on adjacent lands which may be affected by the proposed expansion). In the sections below, these are combined into one, referred to as the Study Area for the biological assessment.

The Study Area is located within the Ministry of Natural Resources and Forestry (MNRF) Aylmer District and in both the Upper Thames River Conservation Authority (UTRCA) and Kettle Creek Conservation Authority (KCCA) watersheds.

Land Use within the Study Area is comprised predominately of the existing landfill as well as agricultural lands to the east, west and south, with an aggregate facility and natural heritage features present north of the subject lands.

A review of Map 1 of the London Plan (2016) identifies land use within the Study Area as Waste Management Resource Recovery Area, Farmland, Green Space and Environmental Review. Map 5 of the London Plan (2016) further identifies the following Natural Heritage Features within the Study Area:

- Unevaluated Vegetated Patches;
- Unevaluated Wetlands;
- Wetlands (i.e. Locally Significant Wetlands);
- Potential Environmentally Significant Area; and
- Significant Woodlands.

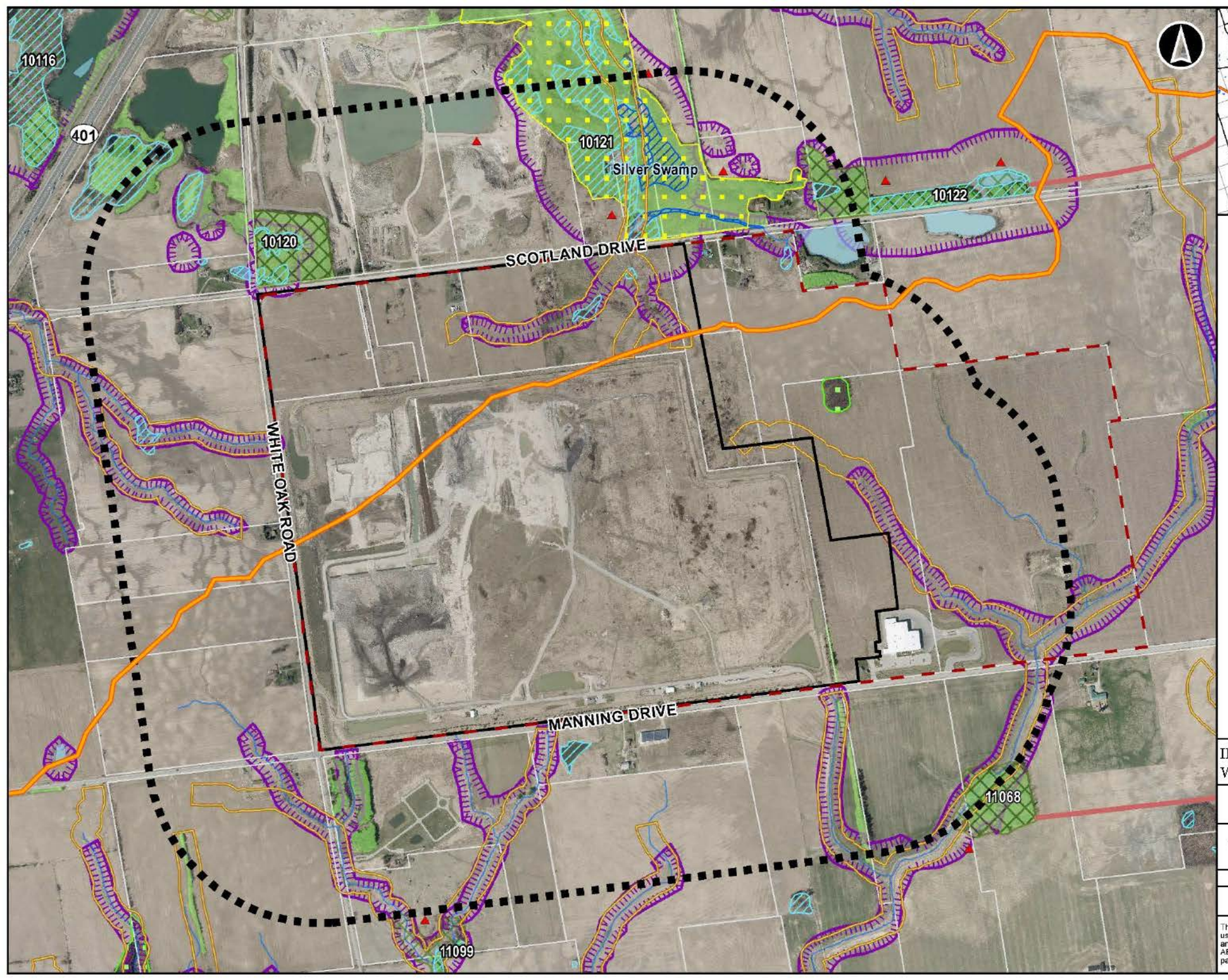
Figure 5.5-1 illustrates the Study Area in addition to land uses including natural heritage features identified in the London Plan (2016) and MNRF's Land Information Ontario (LIO) mapping.

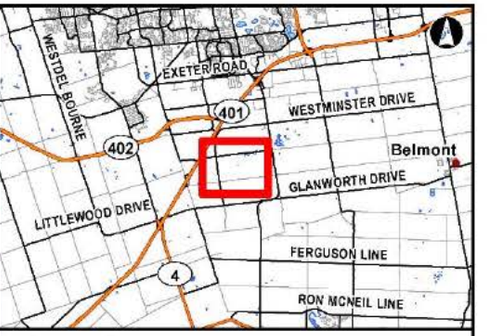
5.5.1 Physical Features and Functions

The northern portion of the W12A Landfill Study Area is located within the Dingman Creek subwatershed and the southern portion within the Dodd Creek subwatershed. The northern portion of the Study Area slopes gently towards the northwest where the Silver Swamp Locally Significant Wetland (LSW) is located adjacent to the subject lands (see Figure 5.5-2). The southern portion of the Study Area slopes gently to the south. The highest elevation occurs within the subject lands on the landfill itself and slopes to the north and south to low points where tributaries of Dingman Creek and Dodd Creek drain to the northwest and south, respectively. The northwest flow passes through the Silver Swamp LSW and continues to Dingman Creek. Cultivated agricultural lands occupy the majority of the Study Area, with the active W12A landfill, natural features, cemetery, MRF, aggregate pits and rural residences occupying the remainder.

According to Middlesex County soils data (Hagerty and Kingston 1992), the following soil associations are noted for the site and surrounding area:

- The Muriel Association – Drainage is moderately well to imperfect. Textures range between silt loam, loam and silty clay loam. Parent material is clayey glacial till;
- The Burford Association – Drainage is rapid to imperfect. Textures range from loam to fine sandy loam. Parent material is glaciofluvial outwash; and
- Most slopes are mapped as simple and less than 5% with some complex slopes greater than 5%. These conditions were also observed during site investigations. In general, soils for this region are predominantly grey-brown podzols (Chapman and Putnam 1984).





Legend

- Watercourse
- Waterbody
- Wooded Area (MNRF, 2018)
- Conservation Authority Regulation Limit
- Parcel Fabric
- Site Study Area
- Site-vicinity Study
- Waste Management Resource Recovery Area Boundary

Natural Heritage Features (2017)

- 11088 Vegetation Patch ID
- Potential Naturalization
- Subwatershed Boundary
- Upland Corridor
- Unevaluated Valleyland
- Locally Significant Wetlands
- Unevaluated Wetland
- Significant Woodland
- Unevaluated Vegetation Patch
- Potential ESA

0 100 200 300 400
Metres

INDIVIDUAL EA OF THE PROPOSED W12A LANDFILL EXPANSION

Study Area and Surrounding Land Use

March 2021	1:10,500 * when printed 11"x17"	Source: LIO, City of London Datum: NAD 1983 UTM ZONE 17N

P# 60556244

AECOM

Figure 5.5-1

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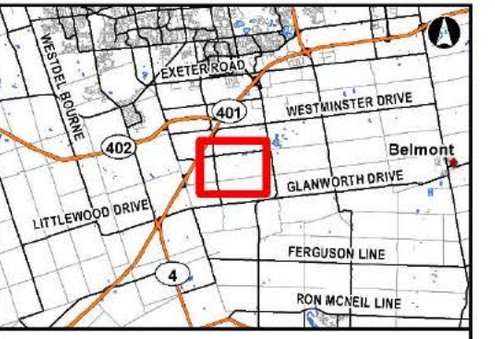

Legend

- Site Study Area
- Site-vicinity Study Area
- Drainage Direction
- Subwatershed Boundary
- Watercourse
- Waterbody
- Ponds and Stormwater Mangement Facilities
- Waste Management Resource Recovery Area Boundary
- Locally Significant Wetlands

0 100 200 300 400 500
Metres

INDIVIDUAL EA OF THE PROPOSED W12A LANDFILL EXPANSION

Terrain and Drainage within the Study

March 2021	1:10,500 * when printed 11"x17"	Source: LIO, City of London Datum: NAD 1983 UTM ZONE 17N
P#: 60556244		Figure 5.5-2

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5.5.2 Natural Heritage Features

5.5.2.1 Field Investigations Summary

Field investigations for the Study Area were intended to provide a comprehensive inventory of ecological features, and local flora and fauna. Field investigations completed by AECOM included: aquatic habitat assessments, vegetation community (Ecological Land Classification) delineation, snake cover board surveys, floral species inventories, anuran call surveys, breeding bird surveys, bat habitat assessments, lepidoptera/odonata surveys, a vernal pools assessment as well as a Significant Wildlife Habitat (SWH) assessment.

Benthic Invertebrate Surveys were completed by StraightUp Environmental in April 2018.

Prior to commencing field investigations, properties requiring Permission to Enter (PTE) were identified using aerial photography and property parcel mapping. AECOM prepared notification letters to individual landowners, which described the nature of the studies (i.e., ecological field investigations), the anticipated timing of each investigation and request to enter their property. A total of 31 PTE letters were issued by the City for properties within the Study Area.

Twenty-five signed PTE letters granting property access were received from landowners. Where site access was not granted, field investigations were completed roadside or within an adjacent property with granted access. Figure 5.5-3 displays the PTE status for the Study Area.

The location of the anuran call, aquatic habitat assessment, benthic invertebrate surveys, snake coverboard and breeding bird field investigation surveys completed within the Study Area can also be found on Figure 5.5-3.

The remaining surveys were not confined to a specific location and are therefore not displayed on this figure. Table 5.5-1 summarizes all field investigations completed for the Study Area.

Legend

- Watercourse
- Wooded Area (MNRF, 2018)
- Parcel Fabric
- Site Study Area
- Site-vicinity Study
- Waste Management Resource Recovery Area Boundary

Natural Heritage Features (2017)

- Locally Significant Wetlands
- Unevaluated Wetland
- Significant Woodland
- Unevaluated Vegetation Patch

Field Survey Location

- Snake Coverboard Location
- Anuran Call Survey Location
- Aquatic Survey Location
- Benthic Survey Location
- Breeding Bird Survey Location

Permission To Enter (PTE)

- Aquired
- PTE Not Gained
- No Access Needed

INDIVIDUAL EA OF THE PROPOSED W12A LANDFILL EXPANSION

Field Investigation Locations

March 2021	1:10,500 * when printed 11"x17"	Source: LIO, City of London Datum: NAD 1983 UTM ZONE 17N

P#: 60556244

AECOM

Figure 5.5-3

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Table 5.5-1: Field Investigations Summary

Field Investigation/Survey	Date
Anuran Call Surveys	April 23rd 2018, May 9th 2018, May 31st 2018, July 3rd 2018
Aquatic Habitat Assessments	June 14th 2018
Benthic Invertebrate Surveys	June 5th, 2018
Vernal Pool Surveys	April 24th 2018
Bat Habitat Assessment	April 23rd 2018, April 24th 2018, May 7th 2018, May 31st 2018
Snake Cover Board and Area Searches	April 24th, 2018, May 31st 2018, July 20th 2018, July 27th 2018, August 9th 2018
Breeding Bird Surveys	June 7th 2018, June 18th 2018, June 28th 2018
Lepidoptera and Odonata Surveys	July 20th 2018, July 27th 2018, August 9th 2018
Ecological Land Classification	April 23rd 2018, May 7th 2018, May 31st 2018, June 7th 2018, July 20th 2018, July 27th 2018, August 9th 2018, October 23rd 2018
Floral Inventory	April 23rd 2018, May 7th 2018, May 31st 2018, June 7th 2018, July 20th 2018, July 27th 2018, August 9th 2018, October 23rd 2018
Significant Wildlife Habitat Survey	April 23rd 2018, May 7th 2018, May 31st 2018, June 7th 2018, July 20th 2018, July 27th 2018, August 9th 2018, October 23rd 2018

Methods for the investigations noted above are described in Section 5.5.2.2 and Section 5.5.2.3.

5.5.2.2 Aquatic Ecosystems

The following section documents the existing aquatic conditions within the Study Area. Aquatic ecosystems are those associated with bodies of water such as, but not limited to, pools, ponds, lakes, rivers, streams and wetlands. Aquatic ecosystems provide habitat for a variety of wildlife species, some of which are rare or sensitive. Aquatic systems and the species which are known in the area were identified through background review of secondary sources and the completion of site investigations.

Background

A review of the background information identified the following six Municipal Drains within the Study Area (OMAFRA, 2019): Shore Drain, Sterling Drain, W12A Municipal Drain (all within the Dodd Creek subwatershed), Gouge Drain, Bannister-Johnson Drain, and C.B. Smith Drain (all within the Dingman Creek subwatershed). These watercourses have been altered (e.g., channelized) to facilitate drainage for surrounding land use.

The northern portion of the Study Area is located in the Dingman Creek subwatershed and within the jurisdiction of the UTRCA. The Dingman Creek subwatershed is situated in the agricultural heartland of southwestern Ontario in close proximity to Lakes Huron, St. Clair and Erie. The subwatershed drains 176 km^2 of land, and ultimately flows into the Thames River.

According to the Dingman Creek Watershed Report Card (2017), the watershed is comprised of 56% agricultural, 24% urban, 18% natural cover, 1% aggregates and 1% water. There are 46 fish species and 13 freshwater mussels recorded within the watershed, with specific gamefish including Smallmouth Bass, Largemouth Bass, Black Crappie, Northern Pike, and Brown Trout. The Report Card identifies one fish species at risk (SAR), Silver Shiner, under the *Endangered Species Act* (ESA) and one SAR mussel species, Rainbow, under the *Species at Risk Act* (SARA) recorded within the watershed. A review of Fisheries and Oceans Canada (DFO) SAR Habitat Mapping indicates that no aquatic SAR have been identified within the Study Area. The MNRF and the UTRCA did not have any fish, benthic or mussel data pertaining to the Study Area beyond those data reported in the Watershed Report Card. The Natural Environment Assessment Report completed by BioLogic Incorporated (2013) for Aaroc Aggregates Limited indicates that the Bannister-Johnson Drain provides warm water habitat for small-bodied fish species.

The southern portion of the Study Area is located within the Dodd Creek subwatershed, which is part of Kettle Creek watershed under the jurisdiction of the KCCA. According to the Kettle Creek Watershed Report Card (2013), the Dodd Creek subwatershed is the largest tributary of the main branch of Kettle Creek. It is located within an area of extensive agricultural land use with few natural areas and little wetland cover, disturbed riparian zones and altered stream reaches. These characteristics result in warm water temperatures, rapid water level fluctuation, and poor surface water quality. Thirty species of fish are found in the Dodd Creek subwatershed.

Fish community data collected on August 17, 2018 from Shore Creek Drain at Manning Drive provided by the KCCA indicated the following small-bodied fish species were present: Johnny Darter, Creek Chub, Brook Stickleback, and Bluntnose Minnow. Sampling at another site within Shore Creek Drain at Glanworth Drive south of the Study Area on August 30th, 2018 found the above species as well as White Sucker and Blacknose Dace. Other sampling sites, including benthic and water quality sites, were located well outside of the Study Area.
A review of DFO SAR Habitat Mapping indicates that no aquatic SAR have been identified within the Study Area.

Field Investigation Methods

Aquatic Habitat Assessment

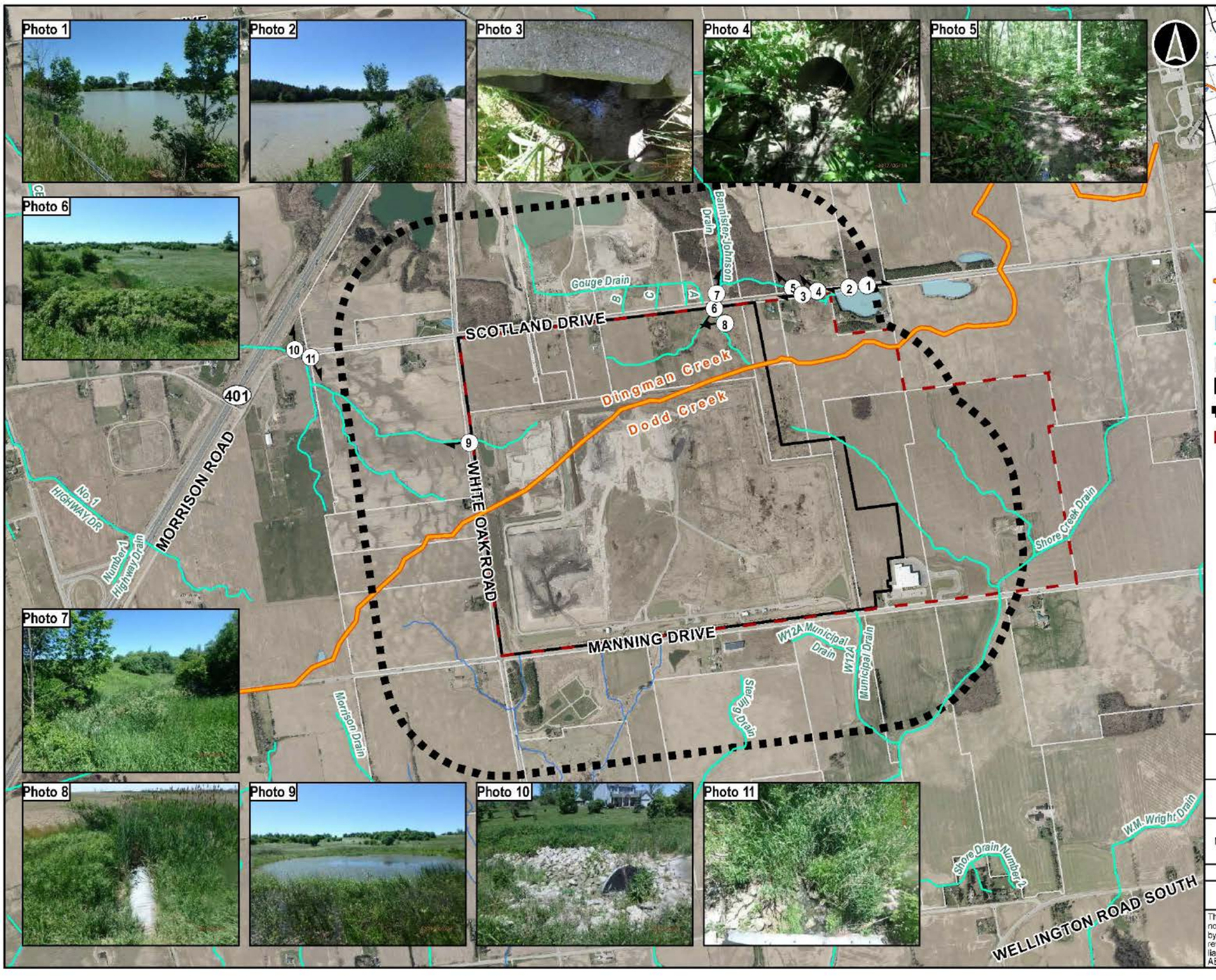
Potential aquatic natural heritage features were identified within the Study Area from aerial photography and agency mapping. Detailed aquatic habitat assessments were undertaken on July 14, 2018 to confirm aquatic natural heritage features and document aquatic existing conditions. The location of aquatic surveys is shown on Figure 5.5-3 and a photographic log of aquatic features is provided on Figure 5.5-4.

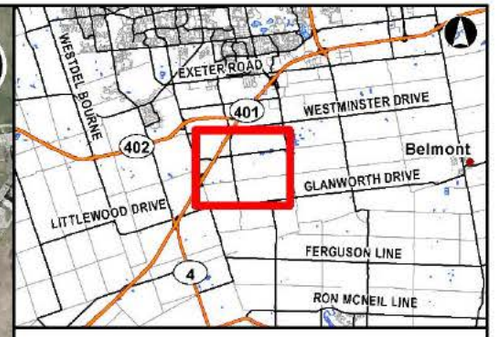
Results and Discussion

Aquatic Habitat Assessment

Bannister-Johnson Drain

The Bannister-Johnson Drain crossing at 3713 Scotland Drive was assessed upstream (south) of the roadway crossing. The watercourse consisted of an intermittent channel with sloping valley topography surrounding the watercourse. The surrounding land-use upstream was meadow and an agricultural drainage pond adjacent to the watercourse with agricultural land-use beyond. Evidence of overland flow (bent grasses) providing inputs from additional drainage features was present. Channel dimensions were assessed to have a mean wetted width of 0.30 m and mean wetted depth of 0.05 m. The pond dimensions were approximately 21 m wide by 21 m long. Channel banks were well vegetated and stable. Substrate was composed predominantly of muck, with lesser amounts of detritus. Dense (90%) in-stream cover was provided by aquatic vegetation, both emergent and submergent. The channel morphology consisted of pools of standing water. Low flow barriers to fish passage were present in the form of intermittently dry sections of watercourse. The watercourse may provide marginal fish habitat and potential warm water refuge habitat within the agricultural drainage pond during high flow conditions, but connectivity downstream to fish bearing watercourses could not be assessed due to PTE restrictions. However, based on watercourse characteristics and aerial photo interpretation, the Bannister-Johnson Drain and the adjacent pond have the potential to support fish and fish habitat that are regulated under the Fisheries Act. No important or exceptional fish habitat was observed.





Legend

- Photo Location and Direction
- Subwatershed Boundary
- Watercourse
- Waterbody
- Municipal Drain
- Parcel Fabric
- Site Study Area
- Site-vicinity Study Area
- Waste Management Resource Recovery Area Boundary

0 200 400 600 800
Metres

INDIVIDUAL EA OF THE PROPOSED W12A LANDFILL EXPANSION

Aquatic Existing Conditions

March 2021	1:15,000 * when printed 11"x17"	Source: LIO, City of London Datum: NAD 1983 UTM ZONE 17N
P#: 60556244		

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Figure 5.5-4

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Unnamed Pond (3405 Scotland Drive)

The waterbody was a permanent offline pond with rolling hill topography surrounding the waterbody. The surrounding land-use was residential southeast of the pond and a plantation tree-row along the southern bank and forest beyond. The pond dimensions were approximately 90 m wide and 170 m long. Water depth at the northern bank was approximately 0.4 m, but high turbidity prevented an estimation of water depth deeper in the pond. Inputs into the pond from roadside and residential drainage were present, as was a dry overflow drain crossing under Scotland Drive at the northeast portion of the pond. Waterbody banks were stable and sparsely vegetated with low (0-30%) cover provided predominantly (90%) by willow trees and small patches (10%) by herbaceous common reed (Phragmites australis). High turbidity prevented assessment of substrate composition. The pond has the capacity to support fish species, but none were observed, and the pond was offline. Since the pond is offline, it does not have the potential to support fish and fish habitat that is regulated under the Fisheries Act.

Unnamed Drain (3502 Scotland Drive)

The watercourse upstream (south) of Scotland Drive was channelized for 10 m leading from a buried plastic culvert and dry at the time of assessment, while downstream (north) the channel was intermittent and increasingly defined with more standing water further downstream away from the Study Area. The topography was rolling hills with surrounding land use of forest with residential and agricultural land beyond. The watercourse received roadside drainage inputs from ditches along Scotland Drive. The bankfull depth where the watercourse became more defined downstream was approximately 0.3 m. The banks at this location were stable and had high (90-100%) canopy cover provided by trees and grasses. Substrate was composed entirely of muck within the channel. Low flow barriers to fish passage were present in the form of intermittently dry sections of watercourse. The watercourse may provide marginal fish habitat during high flow conditions, but connectivity downstream to fish bearing watercourses could not be assessed due to limited PTE. However, based on watercourse characteristics, the unnamed drain has the potential to support fish and fish habitat that is regulated under the Fisheries Act. No important or exceptional fish habitat was observed.

C.B. Smith Drain

The C.B. Smith Drain crossing under White Oaks Road from the W12A Landfill site downstream onto 4067 Scotland Drive was assessed from the road right-of-way. The watercourse was intermittent and dry at the time of assessment where it crosses White Oak Road, but flow was present further downstream where the watercourse crosses Scotland Drive outside the 500 m area of investigation. Existing conditions within the watercourse on the property at 4067 Scotland Drive could not be assessed due to limited PTE. The topography was sloping toward the watercourse and surrounding land use was agricultural downstream at 4067 Scotland Drive and landfill upstream at the W12A Landfill site. Channel dimensions at the Scotland Drive crossing were a wetted width of 0.5 m and wetted depth of 0.1 m. In-stream cover was provided by algae and aquatic vegetation. Substrate was composed of 60% muck, 30% silt, and 10% cobble. The channel morphology was 90%

standing pool and 10% run. The watercourse may provide marginal fish habitat at the Scotland Drive crossing, but no fish were observed and this watercourse crossing was outside the Site-vicinity Study Area; however, incidental observations of fish within the C.B. Smith Drain at the White Oak Road crossing were recorded during benthic sampling when a precipitation event provided flow in the channel. Since C.B. Smith Drain is connected to other fish bearing watercourses downstream and supports fish and fish habitat, it is regulated under the Fisheries Act. No important or exceptional fish habitat was observed.

Benthic Invertebrates

Water chemistry parameters measured during benthic invertebrate sampling documented high conductivity, total dissolved solids, and salinity in at least one sampling reach within each site (Table 5.5-2). The Provincial Water Quality Objectives (PWQO) do not provide specific guidance for these parameters. Additionally, the water quality measurements were taken during a precipitation event, which may have contributed to an increase in these parameters due to increased flow from surrounding roadways and agricultural runoff.

All sites sampled had a BioMAP Water Quality Index (WQI) rating less than 14, which indicated the water quality was impaired under the protocol (Table 5.5-3). Similarly, the Hilsenhoff Biotic Index rating was above 7.26 for all sites indicating very poor water quality and severe organic pollution was likely. The predominantly agricultural surrounding land use may have contributed to these indices scores and acted as a source of organic pollution. Complete benthic invertebrate sampling results are provided in the StraightUp Environmental Consulting W12A Landfill Benthic Water Quality Report in Appendix E of Appendix D.04 in Volume IV.

5.5.2.3 Terrestrial Ecosystems

The following sections document the existing terrestrial conditions within the Study Area. Terrestrial ecosystems are those associated with land including, but not limited to, forests, meadows, thickets and wetlands. Ecosystems and species identified within the Study Area during the background review and sites investigations are described below.

Vegetation Communities

Background

A review of the background information identified the following natural heritage features within the Study Area:

- Potential Environmentally Significant Area on the north side of Scotland Drive (Vegetation Patch #10121);
- Unevaluated vegetation patches north of Scotland Drive (vegetation patches #10120 and #10122);
- Unevaluated vegetation patches south of Manning Drive (vegetation patch #11068);
- Unevaluated wetlands north of Scotland Drive;
- Locally Significant Wetland north of Scotland Drive (Silver Swamp); and,
- Significant Woodlands (vegetation patches #10120, #10122, and #11068) and an Unevaluated Vegetation Patch at the north end of the property at 3438 Manning Drive.

Table 5.5-2: Water Chemistry Parameter Results

Reach	Temperature (°C)	Conductivity (µS/cm)	Total Dissolved Solids (mg/l)	Salinity (Practical Salinity Units)	Dissolved Oxygen (mg/l)	pH	Turbidity	Algae
W12A-1A	15.85	649	0.422	0.32	5.82	7.44	Turbid	Sparse
W12A-1B	14.67	2013	1.311	1.04	7.21	7.48	Turbid	Sparse
W12A-2A	19.14	5791	3.81	3.23	5.94	6.80	Turbid	Sparse
W12A-2B	16.47	1701	1.106	0.87	5.89	7.27	Turbid	Sparse
W12A-3A	15.33	2156	1.403	1.11	3.78	6.97	Turbid	Sparse
W12A-3B	15.59	469	0.304	0.23	8.73	7.51	Turbid	Sparse
W12A-4A	14.56	651	0.423	0.32	6.39	7.06	Turbid	Sparse
W12A-4B	13.57	2048	1.329	1.05	7.12	7.30	Turbid	Sparse

Table 5.5-3: Benthic Water Quality Indices Results

Standard	Reach							
	W12A-1A	W12A-1B	W12A-2A	W12A-2B	W12A-3A	W12A-3B	W12A-4A	W12A-4B
Average BioMap WQI	1.36	2.46	1.29	1.11	1.722	3.449	2.69	3.09
Hilsenhoff Biotic Index	9.34	8.81	9.65	9.95	8.5	7.281	8.85	8.66

Field Investigation and Analysis Methods

The following section outlines the methods used to assess the vegetation communities within the Study Area.

Vegetation Community Classification and Delineation – Each vegetation community within the Study Area was assessed and classified into Ecological Land Classification (ELC) units as per the MNRF guidelines (Lee et al, 1998). This system provides a standard for comparing similar communities across Ontario and classifies vegetation communities through the completion of a multilayer (canopy, sub-canopy, ground cover) vegetation inventory. A summary of disturbance factors, community conditions, plant species list and representative photographs were also recorded for each vegetation patch. The plant list was established through the completion of a three season floral species inventory completed in the spring, summer and fall of 2018. Where wetland communities were encountered, the wetland boundary delineation was refined using the 50/50 rule (i.e., 50% of plants were comprised of wetland plant species and 50% were comprised of upland plant species) as per the MNRF Wetland Evaluation Guidelines for Southern Ontario (OMNRF 3rd Edition, 2013).

Where property access was not granted, communities were identified and delineated through a combination of roadside and aerial imagery interpretation or through the review of previously completed reports. Species lists for these communities are truncated due to limited visibility and in some instances were limited to genus.

Variables captured in the field were used to determine numerous indices which provide insight into the vegetation community quality and sensitivity. The variables included species richness (i.e., the number of species within a community), Co-efficient of Conservatism, Floristic Quality Index, Weediness Index and Wetness Index.

Vegetation community sensitivity was based on the Floristic Quality Assessments System for Southern Ontario (Oldham et al., 1995) which included the calculation of the Mean Coefficient of Conservatism, the Floristic Quality Index and the Weediness Index for all wetland communities and quadrats located within the Study Area. These three parameters are intended to be used together in order to assign an ecological community sensitivity ranking based on plant species composition. The ranking is not intended to provide a measure of the overall value of a community, but rather reflects the sensitivity of the community to disturbance based on the grouping of plants present within the community.

Natural Heritage Features Mapping – A mapping exercise was completed to identify and delineate natural heritage features within the Study Area. This exercise included a compilation of digital vegetation layers obtained through the background information review as well as ELC community identification and delineation through the completion of field investigations and aerial photo interpretation as described above. Mapping of natural heritage features within the Study Area was completed following the guidelines outlined in the Middlesex Natural Heritage System Study (MNHSS; 2014). To maintain a consistent approach with that undertaken during field investigations, ELC community terminologies were used in place of the MNHSS defined Vegetation Communities. Following the MNHSS (2014), Vegetation Groups were established by grouping vegetation communities of similar structure

within 20 m of each other. This assessment resulted in the identification of five Vegetation Groups within the Study Area consisting of woodlands, wetlands, thickets, meadows, connected vegetation features and water features. Vegetation patches were then delineated by combining one or more abutting (< 20 m apart) vegetation groups. Using criteria outlined in Table 9 of the MNHSS (2014), an assessment was completed to identify significant natural features. Table 5.5-4 below summarizes the criteria used to assess the natural heritage features identified within the W12A Landfill Study Area.

Table 5.5-4: Summary of Criteria for Significant Natural Heritage Features as outlined in Table 9 of the Middlesex Natural Heritage Systems Study (2014)

Applied to Vegetation	Criterion #	Feature Type	Description	Meets Criteria for Provincial Significance
Groups	1	Significant Valleylands	Any Vegetation Group within or touching a Significant Valleyland	Yes
Groups	2	Areas of Natural and Scientific Interest (ANSI)	Any vegetation Group located within or touching a provincial or regional Life Science ANSI	Yes
Groups	3	Open Watercourse	Any Vegetation Group located within 30 m of an Open Watercourse	Yes
Groups	4	Wetlands	All evaluated wetlands and all unevaluated Wetland Vegetation Groups > 0.5 ha	No; unless identified by MNRF
Groups	5	Woodland Size	Any Woodland Vegetation Group ≥ 4ha	Yes
Groups	6	Woodland Proximity	Any Woodland Vegetation Group within 100 m of a ≥ 4 ha Woodland Vegetation Group	Yes
Groups	7	Thicket Size	Any Thicket Vegetation Group ≥ 2 ha	No
Groups	8	Meadow Size	Any Meadow Vegetation Group 10 ≥ ha	No
Groups	9	Meadow Proximity	Any Meadow Vegetation Group within 100 m of a ≥ 4ha Woodland or ≥ 2 ha Thicket Vegetation Group	No

Applied to Vegetation	Criterion #	Feature Type	Description	Meets Criteria for Provincial Significance
Patches	10	Patches with Vegetation Group that meet a Group Criteria	Any Vegetation Patch that contains a Vegetation Group that meets a group of Criteria (i.e., Meets Criteria 1-9 above)	No
Patches	11	Diversity	Any Vegetation Patch that contains a diversity of Vegetation Communities, Groups or Ecosystems	No
Patches	12	Proximity	Any Vegetation Patch within 100 m of a significant Vegetation Patch (i.e., meets Criteria 10 or 11 above)	No
Patches	13	Significant Wildlife Habitat	Any Vegetation Group that contains Significant Wildlife Habitat	Yes
Patches	14	Groundwater Dependent Wetland	Any Vegetation Group that contains Groundwater Dependent Wetland	Yes
Patches	15	Bluff or Depositional Area	All Watercourse Bluff or Depositional Areas	No

Results and Discussion

Vegetation communities identified within the Study Area included meadows, forests, woodlands, thickets and wetlands. The majority of the Study Area includes agricultural lands and cultural meadow communities associated with the active W12A Landfill. Two more contiguous natural heritage features are present north of Scotland Drive and contain a mosaic of vegetation communities. Five Vegetation Patches were identified within the Study Area. Table 5.5-5 below provides a summary of the Vegetation Community Series identified within each Vegetation Patch, as well as a brief description of the natural heritage features identified within the Study Area. Vegetation communities and patches are delineated on Figure 5.5-5.

Table 5.5-5: Vegetation Communities Summary for W12A Landfill Study Area

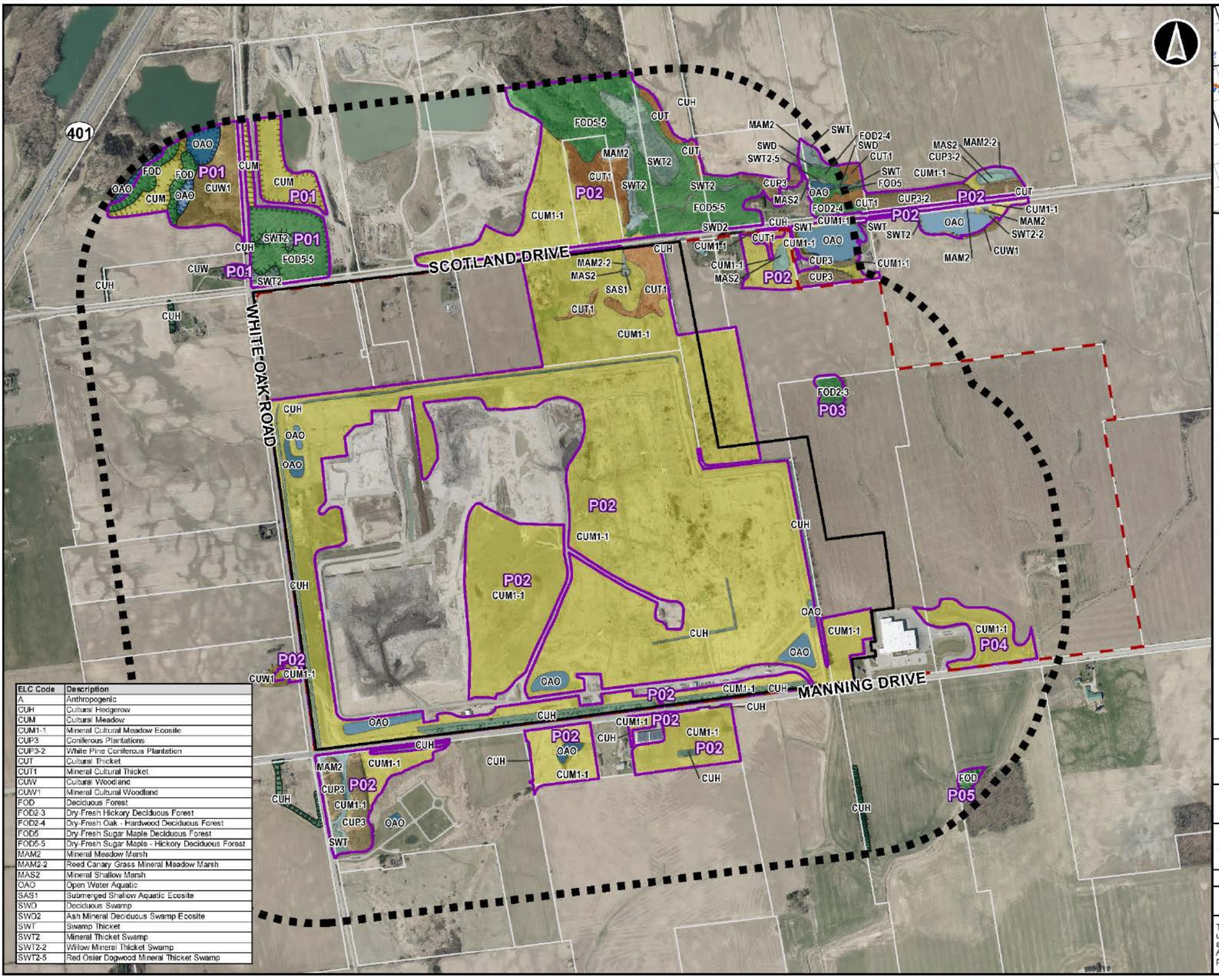
Vegetation Patch ID	Total Area	ELC Community Series Present	ELC Delineation Method	Patch Description	Natural Heritage Features Present
P01	16.00 ha	FOD OAO CUW CUW-1 CUM SWT2 FOD5-5	Aerial photo interpretation and roadside assessment	Patch P01 is located northwest of the subject lands and includes a mosaic of natural and cultural communities identified through field investigations.	Natural heritage features identified through review of MNHSS criteria (2014) and the London Plan (2016) include the following: • Significant Woodlands • Unevaluated Wetland The Significant Woodlands have the potential to provide suitable conditions for SWH and/or SAR habitat such as Bat Maternity Roosting Habitat and/or SAR bat habitat.
P02	166.1 ha	A CUH CUM1-1 CUP3 CUP3-2 CUT CUT1 FOD2-4 FOD5 FOD5-5 MAM2 MAM2-2 MAS OAO SAS SWD SWD2 SWT	Field investigations completed for W12A Landfill Expansion Environmental Assessment: Biology Assessment	Patch P02 is located south-southwest of the subject lands, within the subject lands, and north-northeast of the subject lands. The communities south and within the subject lands are primarily cultural communities, while the communities to the north of the subject lands are a mosaic of natural and cultural communities.	Natural heritage features identified through review of MNHSS criteria (2014) and the London Plan (2016) include the following: • Significant Woodlands • Locally Significant Wetlands (Silver Swamp) • Unevaluated Wetland • Valleyland • Potential Environmentally Significant Areas Additionally, SAR habitat has been confirmed within the vegetation patch for the following species: • Bobolink • Eastern Meadowlark

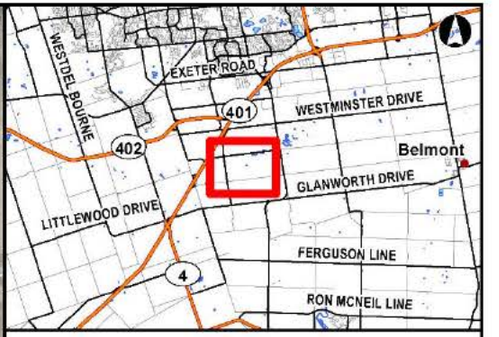
Vegetation Patch ID	Total Area	ELC Community Series Present	ELC Delineation Method	Patch Description	Natural Heritage Features Present
		SWT2 SWT2-2 SWT2-5			Vegetation groups within this patch have been confirmed as SWH for the following: • Eastern Wood-pewee • Monarch • Terrestrial Crayfish • Amphibian Breeding (Woodland) Vegetation groups within this patch have also been identified as Candidate SWH for the following: • Bat Maternity Colonies (Little Brown Myotis/Northern Myotis) • Turtle Overwintering Treed communities within this patch also have the potential to provide suitable bat SAR habitat.

Vegetation Patch ID	Total Area	ELC Community Series Present	ELC Delineation Method	Patch Description	Natural Heritage Features Present
P03	0.694 ha	FOD2-3	Field investigations completed for W12A Landfill Expansion Environmental Assessment: Biology Assessment	Patch P03 is located in the eastern portion of the subject lands and consists entirely of a single natural deciduous forest community.	Vegetation groups within this patch have been confirmed as Significant Wildlife Habitat for the following: • Other Rare Vegetation Communities Vegetation groups within this patch have been identified as Candidate SWH for the following: • Bat Maternity Colonies (Little Brown Myotis/Northern Myotis) This community may also provide suitable bat SAR habitat.
P04	3.263 ha	CUM1-1	Field investigations completed for W12 Landfill Expansion Environmental Assessment: Biology Assessment	Patch P04 is located immediately southeast of the subject lands and consists entirely of a single cultural meadow community.	Natural heritage features identified through review of MNHSS criteria (2014) and the London Plan (2016) include the following: • Valleyland.
P05	0.365 ha	FOD	Field investigations completed for W12A Landfill Expansion Environmental Assessment: Biology Assessment	Patch P05 is located southeast of subject lands and south of P04. This patch consists entirely of a single natural deciduous forest community.	Natural heritage features identified through review of MNHSS criteria (2014) and the London Plan (2016) include the following: • Significant Woodlands • Valleyland The Significant Woodlands have the potential to provide suitable conditions for SWH and/or SAR habitat such as Bat Maternity Roosting Habitat and/or SAR bat habitat.

Notes:

A – Anthropogenic
CUH – Cultural Hedgerow
CUM – Cultural Meadow
CUM1-1 – Mineral Cultural Meadow Ecosite
CUP3 – Coniferous Plantation
CUP3-2 – White Pine Coniferous Plantation
CUT – Cultural Thicket
CUT1 – Mineral Cultural Thicket Ecosite
CUW – Cultural Woodland
CUW1 – Mineral Cultural Woodland Ecosite
OAO – Open Aquatic
FOD – Deciduous Forest
FOD2-3 – Dry-Fresh Hickory Deciduous Forest
FOD2-4 – Dry-Fresh Oak – Hardwood Deciduous Forest
FOD5 – Dry-Fresh Sugar Maple Deciduous Forest
FOD5-5 – Dry-Fresh Sugar Maple – Hickory Deciduous Forest
MAM2 – Mineral Meadow Marsh Ecosite
MAM2-2 – Reed Canary Grass Mineral Meadow Marsh
MAS2 – Mineral Shallow Marsh
OAO – Open Water Aquatic
SAS1 – Submerged Shallow Aquatic Ecosite
SWD – Deciduous Swamp
SWD2 – Ash Mineral Marsh Deciduous Swamp Ecosite
SWT – Thicket Swamp
SWT2 – Mineral Thicket Swamp
SWT2-2 – Willow Mineral Thicket Swamp Type
SWT2-5 – Red Osier Dogwood Mineral Thicket Swamp





Legend

- Parcel Fabric
- Site Study Area
- Site-vicinity Study Area
- Waste Management Resource Recovery Area Boundary
- Vegetation Patch

Vegetation Community	
CUH	FOD
CUM	MAM
CUP	MAS
CUT	OAO
CUW	SAS
	SWD
	SWT

Aerial Photo Interpretation / Roadside Assessment

0 100 200 300 400 500
Metres

ELC Code	Description
A	Anthropogenic
CUH	Cultural Hedgerow
CUM	Cultural Meadow
CUM1-1	Mineral Cultural Meadow Ecosite
CUP3	Coniferous Plantations
CUP3-2	White Pine Coniferous Plantation
CUT	Cultural Thicket
CUT1	Mineral Cultural Thicket
CUW	Cultural Woodland
CUW1	Mineral Cultural Woodland
FOD	Deciduous Forest
FOD2-3	Dry-Fresh Hickory Deciduous Forest
FOD2-4	Dry-Fresh Oak - Hardwood Deciduous Forest
FOD5	Dry-Fresh Sugar Maple Deciduous Forest
FOD5-5	Dry-Fresh Sugar Maple - Hickory Deciduous Forest
MAM2	Mineral Meadow Marsh
MAM2-2	Reed Canary Grass Mineral Meadow Marsh
MAS2	Mineral Shallow Marsh
OAO	Open Water Aquatic
SAS1	Submerged Shallow Aquatic Ecosite
SWD	Deciduous Swamp
SWD2	Ash Mineral Deciduous Swamp Ecosite
SWT	Swamp Thicket
SWT2	Mineral Thicket Swamp
SWT2-2	Willow Mineral Thicket Swamp
SWT2-5	Red Osier Dogwood Mineral Thicket Swamp

INDIVIDUAL EA OF THE PROPOSED W12A LANDFILL EXPANSION

ELC Vegetation Communities and Vegetation Patches

August 2021	1:300,000 * when printed 11"x17"	Source: LIO, City of London Datum: NAD 1983 UTM ZONE 17N

P#: 60556244

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Figure 5.5-5

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Bat Habitat Assessment

Background

During the background review, correspondence with the MNRF identified the potential for four species of SAR bats to occur within the Study Area: Eastern Small-footed, Little Brown Myotis, Tri-coloured Bat and Northern Myotis. These species are listed as Endangered provincially and are therefore afforded protection under the ESA. As the Study Area contains treed forest and swamp communities, a bat habitat assessment was completed to determine the presence of maternity roosting habitat for SAR and for SWH (Bat Maternity Roosting Habitat).

Field Investigation Methods

Trees within the Study Area were assessed for candidate bat habitat according to the MNRF guidelines outlined in the Survey Protocol for SAR Bats within Treed Habitats (OMNRF, 2017). Surveys included area searches within suitable ecosites <10 ha in size (properties at 3298 Scotland Drive, 3405 Scotland Drive, 6100 White Oak Road) and plot surveys in those ecosites >10 ha (properties at 3502 Scotland Drive and 3483 and 3583 Westminster Drive). The surveys were conducted during the leaf-off period to assess trees with a diameter at breast height (DBH) >10 cm for cavities, cracks, loose bark, or knot holes in addition to leaf clusters that provide maternity roosting habitat for SAR bats. Dates of the bat habitat assessments are provided in Table 5.5-1. The location of the surveys is presented on Figure 5.5-3.

Results and Discussion

Eighty-nine trees were observed that showed suitable characteristics for Little Brown Myotis/ Northern Myotis bats. Twenty-seven trees were identified within the FOD2-3 at 3438 Manning Drive, 12 within the FOD5-5 at 3502 Scotland Drive, 28 within the FOD5-5 at 3483 Westminster Drive, eight within the FOD5-5 at 3583 Westminster Drive, three within the CUP3 at 3298 Scotland Drive, and 11 within the CUP3 at 6100 White Oak Road. No suitable leaf clusters were observed.

According to the Survey Protocol for SAR Bats within Treed Habitats (OMNRF, 2017), there is no minimum threshold for snags/ha to be considered suitable maternity roost habitat, although ELC ecosites with 10 or more snags/ha may be considered high quality habitat. Based upon the results of the bat habitat assessment, candidate habitat for SAR bats and corresponding SWH may be present within the Study Area. Further acoustic monitoring would be required to confirm the presence of SAR bats and/or SWH for Bat Maternity Roosting Habitat in the identified candidate habitat within the Study Area. If SAR bats are recorded during acoustic monitoring and impacts to these features were anticipated, this data can be used to calculate snag densities to determine the quality of bat habitat present, which would then be used in consultation with MECP to determine requirements under the ESA.

Since the identified bat cavity trees are outside of the Subject Lands, impacts resulting in loss of bat cavity trees from landfill expansion within the subject lands are not anticipated.

Breeding Birds

Background

A review of background information identified 91 species of birds with various levels of breeding evidence within the 10 by 10 km^2 (17MH84) that encompasses the Study Area (BSC et al., 2016). Of these species, four were listed as provincially Threatened and four were listed as Special Concern under the Species at Risk in Ontario List (O. Reg. 230/08) (see Table 5.5-6). Breeding bird surveys were completed to determine the presence of SAR and Species of Conservation Concern (SOCC) birds within the Study Area.

Table 5.5-6: Ontario Breeding Bird Atlas (OBBA) Significant Species Records Within or in the Vicinity of the Study Area

Common Name	S-Rank	*Endangered Species Act* Status	Breeding Evidence
Red-headed Woodpecker	S4B	SC	Confirmed
Bank Swallow	S4B	THR	Confirmed
Barn Swallow	S4B	THR	Confirmed
Bobolink	S4B	THR	Confirmed
Eastern Meadowlark	S4B	THR	Confirmed
Eastern Wood-pewee	S4B	SC	Probable
Golden-winged Warbler	S4B	SC	Possible
Wood Thrush	S4B	SC	Confirmed

Notes:
END – Endangered
THR – Threatened
SC – Special Concern
S4B – Apparently Secure Breeding Population

Field Investigation Methods

Due to the size and diversity of habitats within southern Ontario, several bird monitoring protocols have been developed that focus on targeting groups of birds including the Forest Bird Monitoring Program developed by the Environment Canada - Canadian Wildlife Service (EC-CWS 2009) and the Marsh Monitoring Program (Bird Studies Canada et al. 2009). Similarly, the OBBA Guide for Participants (2001) provides additional methods for conducting breeding bird surveys throughout Ontario. These protocols outline the methods to be conducted in order to obtain representative and unbiased data. The methods listed below outline proper site selection, timing including time of day and time of year to conduct the surveys and suitable weather conditions (EC-CWS 2009, OBBA, 2001).

Under the Canadian Wildlife Service Forest Bird Monitoring Program, survey stations should typically occur within an individual community that is characterized by uniform community

structure. Within these communities, stations should be located at least 250 m apart and 100 m from the edge (EC-CWS, 2009). Survey stations were situated in natural areas that occur within the Study Area boundary. These natural areas were comprised predominantly of cultural meadow communities. Each station was located at least 200 m apart to maintain a degree of separation and reduce the chances of double counting individual birds. Six stations were established within natural features located in the subject lands. Locations of breeding bird survey stations are shown on Figure 5.5-3.

Due to the presence of Bobolink and Eastern Meadowlark, as determined during the first visit conducted on June 7th, 2018, three point-count surveys were completed at each station during the breeding bird period between May 24 and July 10 in order to confirm breeding evidence for these species (OBBA 2001, OMNRF 2012). The separate surveys are recommended as they typically provide data that more accurately reflects the number of species and birds utilizing the habitat at each station (EC-CWS 2009). Surveys were completed between 5:00 am and 10:00 am under appropriate weather conditions (i.e., no precipitation, calm to light wind) (EC-CWS 2009). Each point-count consisted of a ten minute survey during which time, species, breeding evidence and individual bird movement within a 100 m radius was recorded. Species heard outside of the 100 m radius or that were observed outside of their breeding habitat within the 100 m radius (i.e., flyovers) were recorded separately.

Results and Discussion

Forty-three bird species were identified within the subject lands during field investigations. Of these species, four were recorded as ‘confirmed’, 11 as ‘probable’ and 18 as ‘possible’ breeders within the subject lands. Ten species were observed but were not exhibiting breeding evidence. Additionally, five provincially listed species under the ESA were observed within the subject lands, including four Threatened species - Bank Swallow, Barn Swallow, Bobolink, and Eastern Meadowlark, and one Special Concern species - Eastern Wood-pewee.

Bank Swallows were observed foraging over cultural meadow at BS-01 and BS-02 during breeding bird surveys completed in 2018. This species builds their nests within burrows dug into natural (e.g., banks of rivers or lakes) and human-made vertical surfaces (i.e., active sand and gravel pits where banks remain stable) made of silt and sand deposits (OMNRF 2018). Bank swallows are considered colonially nesters which can range in size from several to a few thousand pairs (OMNRF 2018). This species is designated as Threatened provincially. Although no nesting habitat for Bank Swallow was observed during field investigations, it is anticipated that the species is utilizing potential habitat provided by the aggregate facility located north of Scotland Drive. Access to this property was not granted at the time of investigations and, therefore, habitat for the species could not be confirmed.

Similar to Bank Swallow, Barn Swallows were observed foraging over agricultural fields and cultural meadow at BS-01, BS-03, BS-05 and BS-06 during breeding bird surveys completed in 2018. Barn Swallow habitat consists almost exclusively of human-made structures including barns, bridges and culverts which provide ledges on which they can build their cup-shaped nests out of mud (MECP 2019). Barn Swallows are aerial-insectivores which are

frequently observed foraging over open areas including pastures, meadows, wetlands, agricultural fields and parks. No nesting was observed during site investigations; however, it is anticipated that the species is nesting in structures present within the Study Area. Barn Swallow is listed as Threatened in Ontario –protection for this species, along with its habitat is afforded protection under the ESA.

Bobolink was observed within cultural meadow communities in the Study Area during breeding bird surveys (BS-02, BS-03, BS-04, BS-05). This species breeds in a variety of natural and anthropogenic grasslands such as meadows, pastures and hayfields where small trees, shrubs and fence posts are used as elevated song perches (OMNRF 2018). This species was confirmed breeding within the Study Area. Bobolink is designated as Threatened provincially and is afforded protection under the ESA.

Eastern Meadowlark was also observed within cultural meadow communities (BS-01, BS-02, BS-03, BS-04 and BS-06) throughout the Study Area during breeding bird surveys. Similar to Bobolink, Eastern Meadowlark primarily breeds in tall grasslands including pastures and hayfields, but they can also be observed in alfalfa fields, weedy borders or croplands, roadsides, orchards, airports, overgrown fields and other open areas (OMNRF 2018). This species is designated as Threatened under the Species at Risk in Ontario List (O. Reg 230/08); this species and its habitat is therefore afforded protection under the ESA.

Eastern Wood-pewee was observed within the Dry-Fresh Sugar Maple – Hickory Deciduous Forest (FOD5-5) located at the northeast portion of the Study Area. This species commonly nests in the mid-canopy of forest clearings and edges of deciduous and mixed forests, commonly with little understory vegetation (OMNRF 2018). A singing male was observed during field investigations completed during the breeding bird season. Eastern Wood-pewee is designated as Special Concern provincially. Although this species is not afforded protection under the ESA, the species is considered a SOCC – habitat for this species is considered SWH as defined by the SWH Ecoregion 7E Criterion Schedule (OMNRF 2015).

In addition to Bobolink and Eastern Meadowlark, two area-sensitive bird species were also observed during the breeding bird surveys or incidentally: Sharp-shinned Hawk and Savannah Sparrow. These species require larger areas of suitable habitat for successful breeding and, in turn, sustain populations. As such, these species can provide an indicator of habitat quality and availability within the Study Area.

All other bird species observed are fairly common to abundant and widespread in southern Ontario. The majority of native bird species and their active nests are protected under the federal *Migratory Birds Convention Act*, 1994 (MBCA). Some bird species which are not under federal jurisdiction, such as raptors, are protected under Ontario's Fish and Wildlife Conservation Act, 1997. Nests of these species can only be removed if a permit is obtained from the Ministry of Natural Resources.

Amphibians

Background

A review of the background information identified no significant amphibian species within the Study Area (Ontario Nature, 2017). The potential presence of other species such as gray treefrog, spring peeper, western chorus frog, and wood frog indicate the potential for Significant Wildlife Habitat. Therefore, surveys were conducted to determine the presence and populations of anuran species within the Study Area and determine the presence of SWH including Amphibian Breeding Habitat.

Field Investigation Methods

Anuran call surveys were conducted at 11 wetland communities within the Study Area. The location of each anuran call survey can be found on Figure 5.5-3. These surveys were conducted following the Ontario Marsh Monitoring Program (Bird Studies Canada 2008).

In order to detect both early and late anuran breeders, three (3) site visits were conducted during the breeding season (April to July). In accordance with the protocol, surveys did not begin until at least one-half hour after sunset and were completed before midnight. In addition, surveys were only conducted during suitable weather conditions which included winds less than 19 km/hr (0-4 on the Beaufort wind scale) and minimum night-time air temperatures of at least 5 °C for the first survey, 10 °C for the second survey and 17 °C for the third survey. It should be noted that surveys can be conducted at lower temperatures if there is strong calling activity observed. Species observed and call frequency were recorded by biologists during each three-minute point count.

Results and Discussion

Based on the results of anuran call surveys, species observed within the Study Area during field investigations include spring peeper, wood frog, American toad, northern leopard frog, gray tree frog and green frog.

No amphibian SAR were recorded during field investigations conducted by AECOM staff in 2018. However, calling activity documented at AMP-02 met criteria for Amphibian Breeding (Woodland) Significant Wildlife Habitat. Therefore, the Mineral Thicket Swamp (SWT2) which is part of the Silver Swamp Locally Significant wetland, is considered Significant Wildlife Habitat.

Reptiles

Background

A review of the background information identified two reptile species within the 10 by 10 km^2 (17MH84) that overlaps the Study Area (Ontario Nature, 2017). These species included two provincially listed Special Concern species: Eastern Ribbonsnake and Snapping Turtle. Under COSEWIC and ESA, these species have a status of Special Concern and an S-rank of vulnerable.

Field Investigation Methods

During initial site investigations, staff recorded potential snake habitat/hibernacula within the Study Area. Dimensions of any rock or debris piles observed were recorded as well as a description of surrounding habitat conditions, slope and likelihood of the observed piles extending below frost line. The type of material and approximate size of the hibernacula was also recorded. These observations were used to inform the placement of cover boards for Artificial Cover Surveys within the Study Area.

Snake surveys included both Visual Encounter Surveys (VES) and Artificial Cover (e.g., cover board) surveys following the Survey Protocol for Ontario's Species at Risk Snakes (OMNRF 2016). Five VESs and four cover board surveys were conducted under ideal weather conditions including, calm, clear or partly cloudy days and with a temperature range of 10 to 25^{o}C (on very warm days, surveys were conducted in the morning). Where large stones or other cover objects were observed, they were slowly and carefully overturned and checked for the presence of snakes. Cover boards were also overturned and gently replaced to check for the presence of snakes. Any snake species observed was visually identified; the estimated length and any other visible distinguishing characteristics were recorded. Locations of snake cover boards are shown on Figure 5.5-3.

Results and Discussion

Three potential hibernacula sites were observed during field investigations. No significant snake species were observed during area searches or cover board surveys. One species, Eastern Gartersnake was observed during VESs. This species is common and widespread throughout Ontario.

Lepidoptera and Odonata

Background

A review of the background information identified 13 butterfly species as potentially present within the square (17MH84) that encompasses the Study Area. All species identified during the background review as potentially occurring within the Study Area are common and widespread species within Ontario. No SAR butterflies, dragonflies or damselflies were identified during background review.

Field Investigation Methods

All observations of butterflies, damselflies and dragonflies were recorded during the completion of other field surveys.

Results and Discussion

Eight odonatan species and six lepidopteran species were observed within the Study Area during field investigations. Monarch was observed within cultural meadow communities throughout the Study Area. This species is listed as Special Concern provincially and is therefore considered a Species of Conservation Concern. Habitat for this species is considered Significant Wildlife Habitat. All other species observed during field investigations are considered common and widespread within Ontario.

5.5.3 Species at Risk Assessment

5.5.3.1 Background

The status of species within Ontario is determined by the Committee on the Status of Species at Risk in Ontario (COSSARO) and Schedule 1 of the SARA (as recommended by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC)). The four categories of species classification within SARA and the ESA include (terms in brackets apply solely to the province):

- Extirpated: no longer lives within a certain region (of Ontario), although still lives somewhere in the world
- Endangered: lives in the wild (in Ontario) but is facing imminent extinction or extirpation
- Threatened: lives in the wild (in Ontario), is not endangered, but is likely to become endangered if steps are not taken to address factors threatening it, and
- Special concern: lives in the wild (in Ontario), is not endangered or threatened, but may become threatened or endangered due to a combination of biological characteristics and identified threats." (OMNRF 2014d, SARA 2002).

For the purpose of this assessment, SAR are defined as species that are listed as either Threatened or Endangered provincially or federally (in the case of aquatic organisms). These species, as well as their habitat, are afforded protection under the ESA (2007) and SARA. Species listed as Special Concern are not subject to the prohibitions under the ESA or SARA, but have been included in the SAR screening to avoid future implications should the status of these species change under the ESA (2007) or SARA, and to recognize that in some cases (i.e., aquatic species at risk) they are protected under other legislation. Furthermore, species listed as Special Concern are considered SOCC in the Natural Heritage Reference Manual (NHRM). As such, habitat for these species is considered SWH.

A preliminary SAR screening exercise was completed to determine the number of SAR within potentially suitable habitat within the W12A Landfill Study Area.