Waste Management of Canada Corporation

Environmental Assessment for a New Landfill Footprint at the West Carleton Environmental Centre

NATURAL ENVIRONMENT EXISTING CONDITIONS REPORT

DRAFT FOR DISCUSSION AND COMMENT

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1. Introduction

This report provides an overview of the existing Natural Environment conditions associated with the proposed new landfill footprint at the West Carleton Environmental Centre (WCEC). The Minister approved Terms of Reference (ToR) included a preliminary description of the existing environmental conditions in the site vicinity study area with the commitment that the description would be expanded upon in the Environmental Assessment (EA). With this in mind, investigative studies of the following environmental components were carried out for the purposes of generating a more detailed description and understanding of the environment for use in the assessment and evaluation of alternative landfill footprint options during the EA:

- Atmospheric Environment;
- Geology and Hydrogeology;
- Surface Water;
- Biology – Terrestrial and Aquatic;
- Cultural Heritage Resources;
- Transportation;
- Land Use;
- Agriculture; and,
- Socio-economic.

The results of these individual studies will be documented in separate stand-alone reports during the EA. The final Existing Conditions Document will form a chapter of the EA Report with each of the stand-alone reports becoming supporting documents/appendices to the EA Report.

1.1 Natural Environment Study Team

The Natural Environment study team consisted of AECOM staff. The actual individuals and their specific roles are provided as follows:

- **Richard Booth**, Senior Aquatic Ecologist;
- **Bill McLeod**, Senior Environmental Technician; and,
- **James Kamstra**, Senior Terrestrial Ecologist.

Previous field work and data collection was completed by staff of Gartner Lee Limited (GLL). Subsequently, GLL was acquired and merged with AECOM.

2. Landfill Footprint Study Areas

In accordance with the approved ToR, the On-Site and Site-Vicinity study areas for the proposed new landfill footprint at the WCEC are listed below.

On-Site ..... the lands owned or optioned by Waste Management (WM) and required for the new landfill. The Site is bounded by Highway 417, Carp Road and Richardson Side Road;

Site-Vicinity..... the lands in the vicinity of the site extending about 500 metres (m) in all directions; and,

Regional..... the lands within approximately 3-5 kilometres (km) of the Site for those disciplines that require a larger analysis area (i.e., socio-economic, odour, etc.).

The following report provides an assessment of site conditions contained On-Site, as identified in **Figure 1**. The study area for the purposes of vegetation and wildlife was primarily On-Site. The study area for potential fish habitat extended off-site to include the downstream extent of the South Huntley Creek to where it joins the Huntley Creek. The landscape connectivity analysis covered the On-Site area including the subject property and extended to include land several kilometres away.

3. Methodology

Information on existing natural environmental conditions of the WM Ottawa landfill site and vicinity was gathered from a combination of field investigations, research of existing documents and agency consultation. Site specific field investigations were conducted in 2005, 2006 and 2011 as discussed in this report.

3.1 Available Secondary Source Information Collection and Review

Available secondary sources of information were queried and all received information was reviewed by the Natural Environment Study Team to determine aquatic, vegetation community and wildlife conditions within the study area. The natural environment component has the sub-components aquatic ecosystems and terrestrial ecosystems. The following tasks and secondary information are considered to be relevant to the characterization of the natural

environment and information from these sources was collected and reviewed to characterize existing environmental conditions:

- Ongoing terrestrial and aquatic surveys;
- Published information from Ontario Ministry of Natural Resources, Fisheries and Oceans Canada and Conservation Authority, including potential Species at Risk (SAR); and Aerial photos and topographic and drainage mapping.
- Natural Heritage Information Centre Database (Ontario Ministry of Natural Resources);
- Ontario Ministry of Natural Resources Fisheries Database;
- Species at Risk (Fisheries and Oceans Canada) and Endangered Species (Ontario Ministry of Natural Resources) Databases;
- City of Ottawa Official Plan;
- Christmas Bird Count information;
- Characterize terrestrial environment baseline conditions in the area of the proposed expansion and vicinity including occurrence and distribution of wetlands, vegetation communities and wildlife (e.g., birds, mammals, reptiles, amphibians by means of breeding bird surveys, amphibian surveys, rare plant and insect assessment, snake/turtle surveys, mammal surveys, specific surveys for any identified SAR); natural areas such as significant wetlands, woodlands, valley lands and wildlife habitat, and habitat for endangered and threatened species; and,
- Characterize existing aquatic ecosystems, including drainage ditches and natural watercourses by fish community surveys, aquatic habitat assessment, benthic invertebrate sampling programs, water quality and flow information.

All field investigation dates are shown in **Table 1**.

Table 1. Field Investigations

Date of Field Visit	Field Investigation Details
October 26, 2004	• Vegetation and Animal Survey
October 27, 2004	• Vegetation and Animal Survey
June 2, 2005	• Partial Amphibian and Animal Survey
June 3, 2005	• Breeding Bird Survey, Vegetation and Animal Survey
June 27, 2005	• Amphibian and Animal Survey
May 26, 2006	• Aquatic Survey
July 26, 2006	• Aquatic Survey
September 28, 2006	• Aquatic Survey
October 24, 2006	• Aquatic Survey

Table 1. Field Investigations

Date of Field Visit	Field Investigation Details
June 13, 2007	• Vegetation and Animal Survey
May 3, 2011	• Vegetation and Amphibian Survey
May 4, 2011	• Vegetation Survey
June 1, 2011	• Vegetation Survey
June 2, 2011	• Amphibian Survey
June 3, 2011	• Vegetation and Breeding Bird Survey
June 16, 2011	• Breeding Bird Survey
August 2, 2011	• Aquatic Survey
August 3, 2011	• Aquatic Survey

3.2 Process Undertaken

Natural environment investigations are undertaken using a process that is based on conducting surveys during appropriate seasonal periods for the target feature. For example, breeding bird surveys are undertaken in spring between May and July when birds are actively breeding; whereas fisheries investigations are typically undertaken before or after fish have spawned when there is low potential for disturbing breeding periods. The following sections provide methods and timing for the natural environment investigations.

3.2.1 Aquatic Surveys

The existing WM Ottawa landfill lies within the watershed of the Carp River. The Carp River watershed flows through the northwest portion of the City of Ottawa in the former municipalities of West Carleton, Kanata and Goulbourn. It drains an area of approximately 306 km² and discharges to the Ottawa River at Fitzroy Harbour. For most of its length, the Carp River flows through poorly drained clay soils in a relict glaciofluvial channel of the Ottawa River. The Carp River has four major tributaries draining into it: Corkery Creek, Huntley Creek, Feedmill Creek and Poole Creek (Robinson, 2004).

Surveys in 2005 and 2006 determined that an ephemeral pool and agricultural drainage ditch lying on the west side of the Carp facility currently provide seasonal and wet-weather surface water flow into an unnamed tributary of Huntley Creek, hereafter referred to as South Huntley Creek. The entire Huntley Creek sub-watershed is 4,900 ha including the area drained by South Huntley Creek. South Huntley Creek has not been assigned a thermal designation (i.e., warmwater (+25°C); coolwater (18 to 25°C); or coldwater (10 to 18°C) from the Ontario Ministry of Natural Resources (OMNR), but the Carp River Watershed/Subwatershed Study (Robinson, 2004) designates the South Huntley Creek as containing a degraded warmwater fish community. South Huntley Creek eventually flows into Huntley Creek, which has been

designated by the Carp River Watershed/Subwatershed study as a coldwater stream (Robinson, 2004). Temperature and stream flow data were collected to confirm the thermal designation and presence of fish community.

A desktop analysis was completed for the project limits using aerial photography and topographic maps. Existing fisheries and aquatic information was obtained from the OMNR Kemptville District Office. A field assessment of identified surface aquatic features within the study area was conducted on May 26, July 26, September 28 and October 24, 2006.

To confirm and supplement this earlier work, AECOM completed an on-site review of watercourses to confirm their existence and overall condition. This work was undertaken between May 3rd and 4th, 2011 and is the first of three stages of work to be completed. During this time, an aquatic biologist visited each watercourse within the project footprint study area and examined characteristics such as:

- Presence or absence;
- Overall channel condition;
- Riparian (shoreline) features;
- Water depth, flow and visual quality (i.e., clear, muddy);
- Adjacent impacts or factors affecting the watercourse, such as agriculture, forestry development, etc.; and,
- Potential for fish or fish habitat.

Following these confirmatory investigations, the identified watercourses were sampled for fish habitat and fish community characteristics to confirm and supplement previous findings. These surveys were conducted on August 2nd and 3rd 2011. Fish habitat evaluations follow the Rapid Ontario Stream Assessment Protocol. This protocol provides for a standardized classification of the habitat features within the watercourse and an assessment of its significance. Fish community sampling involves trap netting and or electrofishing, depending on site conditions (water depth and temperature) at the time of the survey. Regardless of method, biologists collect and record fish captured within reaches of the watercourses identified within the project footprint. All fish are live released following identification, morphology measurements (length, weight), and a photograph has been taken. Photographs are taken for each species collected, not each fish; unless the specimen displays abnormalities or signs of existing disease. Water quality parameters including temperature, dissolved oxygen, pH and conductivity are taken at each sampled reach of the watercourse being evaluated.

The third and final step in the aquatic survey work is to undertake a sensitivity analysis for each watercourse based on background information, field collections and observations and thermal information about the watercourse. Sensitivity rankings will be used to determine the potential risk of future project elements to harm fish or fish habitat.

3.2.2 Vegetation, Amphibians and Bird Surveys

Vegetation communities both on-site and in the site vicinity were interpreted from aerial orthophotographic images from 2005 and 2010 to delineate preliminary vegetation polygons prior to field surveys. Stereo aerial photographs using images taken in May 2001 (scale 1:16,000) was examined to better define vegetation types. Field investigations were conducted on Oct 26th and 27th, 2004, June 3rd, 2005, June 13th, 2007, May 3rd and 4th, 2011, and June 1st, 3rd, and 16th, 2011 by an AECOM ecologist. All encountered vascular plant species were documented.

Vegetation communities were described in terms of vegetation structure, stand characteristics and soil description, which provided guidance for detailed ecological classification. The classification of these communities followed Ecological Land Classification (ELC), as per Lee *et al*. (1998). The ELC system adopts a structured approach that incorporates both biological elements (such as dominant plant species and relative cover characteristics) and physical conditions within a hierarchical framework. In this regard, vegetation communities were classified to the finest level of definition: Vegetation Type.

Breeding Birds – Field Investigations

Breeding bird surveys were conducted on June 3rd, 2005, June 3rd, 2011, and June 16th, 2011 in the early morning period (approximately between 05:30 and 10:30). **Table 1** provides a summary of the field investigation dates for the wildlife component of the study. The site was walked such that it was possible to detect most singing territorial birds. Breeding birds were counted, using the "assumed pair" as the counting unit (i.e., one of: a singing male, a pair seen, or single adult birds in suitable nesting habitat).

Amphibians – Field Investigations

Field surveys for calling frogs were conducted during evenings (between 9:00 and 11:30 p.m.) on June 2nd and June 27th, 2005 and May 3rd and June 2nd, 2011. On the second survey date, amphibians were surveyed at all locations on site that had potential to hold breeding amphibians based on examination of aerial photographs. At each location the numbers of each calling species were recorded using a scale from Code 0 – Code 3, adapted from the Canadian Wildlife Service Marsh Monitoring Program. This survey method provides an indication of amphibian abundance during the breeding season using the following scale:

Code 0:....none heard;

Code 1:....calls heard without overlapping of calls, possible to count number of individuals calling;

Code 2:....call overlapping, but it is still possible to pick out individuals or count them; and,

Code 3:....a chorus where it is impossible to pick out individuals or count them.

Other Wildlife

Incidental observations of non-breeding birds, mammals and reptiles contribute to the overall picture of wildlife use of the area and these were recorded if seen or heard while conducting amphibian, gull or vegetation surveys.

Landscape Connectivity

Pathways of landscape connectivity and core areas were taken from The Big Picture 2002 (Ontario Natural Heritage Information Centre 2003) and interpreted based upon local knowledge of the area.

4. Existing Natural Environment Conditions

4.1 Aquatic Survey Results

The dominant watercourse within the project limits is South Huntley Creek (**Figure 2**). South Huntley Creek is a permanent warmwater system that has been significantly impacted historically by surrounding agricultural land use; and linear developments such as roadways which have bisected its length into smaller reaches, separated generally by culverts.

The most unaltered and natural portion of South Huntley Creek occurs in the west study envelope (Tributary A, Tributary B, Tributary C) which is bounded by William Mooney Road to the east, Highway 417 to the west and Richardson Side Road to the north. A smaller series of creek reaches occur in the north envelope (Tributary D), bounded by William Mooney Road to the west, Richardson Side Road to the north and Carp Road to the east. Small drainages to the creek were historically located within the current landfill property limits, however these historical reaches have been realigned or buried within culverts and no longer occur as open creek channel (Tributary E).

Western Project Envelope

Within this area, AECOM identified three different tributaries of South Huntley Creek (**Figure 2**).

Tributary A originates south of Highway 417 and flows northwesterly through the Goulbourn Wetland within the Western Project envelope. This tributary possesses a relatively natural channel form typically 1.0 to 1.5 m wide with 10 to 15 mm of flowing water on average over much of its length (**Plates 1 to 4**). There is evidence of meandering and scour that are indicative of natural channel function and ongoing geomorphic adjustments. It is generally situated within woodlands although portions pass through areas of open and active agricultural

use. Specifically, cattle grazing and pasture lands. During the May survey, flows were generally 0.5 to 1.0 m per second; but it should be noted that the conditions at the time of assessment were abnormally wet and flows are likely not indicative of those during a typical year. No fish were observed during the May survey.

Plate 1. Natural channel within Tributary A showing pool/glide habitats within wooded area

Plate 2. Instream cover and structure of Tributary A

Plate 3. Tributary A passing from wooded area into pasture lands. Note meandering and riffle in background

Plate 4. Flooded area of Tributary A due to abnormal precipitation during spring.

Detailed habitat mapping was conducted during the site visit in early August 2011. No water was present and therefore no OSAP rapid assessment was completed. Bottom substrates were largely clay and sand/gravel within the reach. The channel also contained instream structure such as gravel areas, boulders and woody debris; features important to fish for feeding, rearing and cover. Woody debris was present throughout the forested area. Portions of the watercourse had been undermined by cattle crossing, resulting in bankside erosion and sediment loading within these areas. The local farmer confirmed that this watercourse is dry for the majority of the summer months.

Tributary A is likely to provide seasonal fish habitat and its hydraulic connection to the wetlands and Tributary C is important for surface water conveyance in support of downstream seasonal fish habitat.

Tributary B originates in the Goulbourn Wetland and flows southeasterly through the western project envelope. This tributary has been highly altered by historical and current agricultural activities, including recent evidence of cattle access and crossing. There was no discernable channel for about half of its length due to flooding and significant channel degradation (**Plates 5 and 6**). Flows were not measureable due to the absence of a defined channel and flooded condition. Detailed habitat mapping was attempted during a site visit in early August 2011, but no water was present. There was no defined channel, although the general substrate was primarily sand/silt, with some rocks and cobbles in sections.

Plate 5. Flooded lands within impacted channel of Tributary B showing inability to contain flow

Plate 6. Intact channel portion of Tributary B showing ability to maintain flows.

Based on AECOM's investigations, it appears that Tributary B lacks habitat suitable for supporting a permanent fish community. It is also considered that ongoing disturbance will further impair creek function and deter fish from re-colonizing the reach, even though its hydraulic connection to wetlands is important for surface water conveyance.

Tributary C of South Huntley Creek is an agricultural drain that runs parallel to William Mooney Road. It flows northwest and is intercepted by Tributaries A and B approximately 400 m south of Richardson Side Road. This tributary has been highly altered by historical agricultural land use and is subject to current impacts resulting from adjacent crop farming. It is a linear channel lacking dominant riparian vegetation (trees and shrubs) and dominated by shoreline grasses and some sedges (**Plates 7 to 10**). Trees occur randomly along the channel but provide very little shading to the watercourse. There are no pool or riffle habitats present in this tributary. During May site visits, the channel south of the property laneway had no discernable flow during AECOM's investigations and was generally dry, despite an abnormally wet period preceding the site visit. The channel north of the property laneway contained flow, largely originating from tributaries A and B which intersect the channel 80 m north of the laneway. Again, flows as observed are considered to be atypical of normal conditions due to the abnormal precipitation during the month of April. Fish (unidentified cyprinids) were observed in a deep scoured pool in Tributary C near the confluence with Tributary A.

Plate 7. Tributary C displaying agricultural channel, south of property laneway upstream from the confluence with Tributary A and B.

Plate 8. Tributary C displaying agricultural channel, northwest of property laneway, downstream of the confluence with Tributary A and B.

Plate 9. Tributary C proximity to current agricultural land use.

Plate 10. Emergent vegetation in Tributary C.

During the August site visit, Tributary C was dry. Based on these preliminary investigations, it appears that the tributary functions as an agricultural drain and provides some seasonal fish habitat. Ongoing agriculture, including crop planting up to top of bank will further impair the tributary and its water quality. The adjacent farm field has been cultivated to within approximately 2 m of the watercourse banks, and access to cattle has resulted in bankside instability and erosion. This observation is consistent with the fisheries resources work completed in 2006 and documented in Section 4.1.3 of this report.

Northern Project Envelope

The northern project envelope contains privately owned properties that were not accessible for survey. Roadside surveys of Tributary D confirmed the existing condition to be typical of an ephemeral or intermittent watercourse, as the channel contained little or no discernable flow. Bifurcation of the creek and distribution through culverts beneath Richardson Side Road have likely caused the creek to acquire its current condition. It is unlikely Tributary D can support a resident fish population, and its likely function is the provision of indirect fish habitat for warmwater baitfish species in downstream reaches.

Although a detailed assessment of Tributary D could not be undertaken such a survey is not warranted as the proposed project footprint is unlikely to include Tributary D since WM does not own or option the property containing it.

4.1.1 South Huntley Creek Fisheries Resources

To confirm the watercourse conditions and presence of fisheries resources, temperature, stream flow and electrofishing work was undertaken in 2006. This information is provided in the following sections of this report.

4.1.1.1 Temperature

Three continuous Onset Tidbit temperature loggers were installed in South Huntley Creek. Two loggers were installed along William Mooney Road (Site 1 and 2, see **Figure 3**) and the third logger was installed at Richardson Side Road (Site 4; **Figure 3**). Loggers were installed on April 13, 2006 and removed on September 28, 2006. The results of the temperature loggers are shown in **Figures 4** to **8**.

Site 1, located adjacent to the landfill on William Mooney Road, was dry for the majority of the summer. During the May sampling event, there was a shallow pool of water on the northeast side of William Mooney Road. Mapping of surficial geology indicates the presence of a clay lens in this area. The pool is fed by surface water from a wooded swale running east under the fence of the existing landfill facility. It contained water during the spring and fall, and for brief periods following several very large summer storm events. The stream temperature graph reflects the same water and air temperatures for the end of July through September, 2006. Prior to and during most of the July sampling event, the logger at Site 1 exhibited lower water temperature compared to the air temperature. Although this appears to indicate that there was water present in the pool, the July, 2006 site visit revealed that the logger was submerged in the bottom sediment (mud). The temperature of the sediment was lower than the air temperature. The logger was removed from the sediment and placed on the surface of the sediment on July 25, 2006. The average summer (July and August) water temperature was 20.1°C. This system is ephemeral and is considered warmwater when flowing.

Site 2 is located further downstream, near the intersection with Richardson Side Road. Water temperatures at this site also reflected the air temperature indicating that this is a warmwater system with little to no groundwater influence. The average summer (July and August, 2006) water temperature was 19.7°C, which is similar to the average summer air temperature of 20.9°C. The slightly cooler water temperatures are most likely the result of inputs from wetlands southwest of the monitoring station.

Site 4 is located approximately 3.5 km downstream from Site 1, on the north side of Richardson Side Road. Summer water temperatures at this site were, on average, 3°C cooler than air temperatures. The average summer (July and August 2006) water temperature was 17.9°C. The water temperatures at this site indicate that the thermal regime for this portion of the stream

is coolwater. Coolwater systems are defined as having average daily maximum water temperatures of approximately 18°C (Stoneman and Jones, 1996).

4.1.2 Stream Flow

Stream flow was measured using a Marsh McBernie flow meter on several occasions. Flow was recorded only at Sites 1, 5 and 6 during the July site visit due to technical difficulties. The flow measurements were used in conjunction with stream depths to produce discharge information. Discharge information along with staff gauge readings are presented in **Table 2**.

Table 2. Discharge and Staff Gauge Readings

Date	Precipitation[1] (mm)	Staff Gauge Reading (m)				Discharge (L/s)					
		CARP1 S. Huntley	*CARP2 S. Huntley*	*CARP4 S. Huntley*	*CARP5 S. Huntley*	*CARP1 S. Huntley*	*CARP2 S. Huntley*	*CARP3 S. Huntley*	*CARP4 S. Huntley*	*CARP5 S. Huntley*	*CARP6 S. Huntley*
11-Apr-06	0.0	0.12	0.29	0.44	0.36	0	56	114	109	159	870
18-May-06	28.2	0.28	0.39	-	-	-	-	-	-	-	-
26-Jul-06	32.0	0.00	0.08	0.44	0.01	dry	-	-	-	3.2	164.0
19-Sep-06	4.6	0.00	-	-	-	dry	-	-	-	-	-
28-Sep-06	4.0	0.00	0.10	0.42	0.05	dry	0.7	1.4	12.0	13.7	-
24-Oct-06	13.0	0.15	0.31	-	-	-	-	-	-	-	-

Note: 1. Precipitation for 48 hours prior to sampling.

4.1.3 Fisheries Resources

4.1.3.1 Fish Habitat

Fish habitat was assessed at five sites along South Huntley Creek (Sites 1-5) as well as at one site on Huntley Creek (Site 6). The conditions at locations along South Huntley Creek at three separate times during 2006 are shown in photographs in **Appendix A**. Fish habitat was evaluated three times (May, July and September, 2006) in order to evaluate seasonal availability. Staff gauges were installed at four sites (Sites 1- 2 and Sites 4-5) and flow measurements were made at least twice in 2006.

The fish habitat characteristics and quality of the sites were classified into four categories (no fish habitat, poor, moderate, good) according to the habitat conditions described **Table 3**.

Table 3. Fish Habitat Classification

Assessment	Stream Attributes
No Fish Habitat	▪ Swale ▪ Not defined to poorly defined channel ▪ Dry at time of site visit
Poor	▪ Poorly defined stream channel (i.e., wetland area) ▪ Some vegetation in channel ▪ Possibly permanent flow ▪ Soft substrates
Moderate	▪ Well defined channel ▪ Permanent flow ▪ Poor riffle / pool morphology ▪ Some instream cover ▪ Sand / fine gravel substrates
Good	▪ Well defined channel ▪ Permanent flow ▪ Well defined riffle / pool morphology ▪ Abundant instream cover (i.e., large woody debris, undercut banks) ▪ Gravel / cobble substrates

4.1.3.2 Fish Community

Historical fisheries information for South Huntley Creek was extremely limited. South Huntley Creek was sampled once near Carp Road in July 2001. Six species of fish were captured: central mudminnow (*Umbra limi*), blacknose dace (*Rhinichthys atratulus*), creek chub (*Semotilus atromaculatus*), redbelly/finescale dace (*Phoxinus* sp.) and brook stickleback (*Culaea inconstans*). All six species are common, tolerant species typical of urban systems.

Huntley Creek at William Mooney Road was sampled in July 2001. This site is upstream of where South Huntley Creek enters Huntley Creek. Twelve species of fish were captured. In addition to the six species found in South Huntley Creek, white sucker (*Catostomus commersonii*), common shiner (*Luxilus cornutus*), blacknose shiner (*Notropis heterolepis*), bluntnose minnow (*Pimephales notatus*) and fathhead minnow (*Pimephales promelas*) and mottled sculpin (*Cottus bairdii*) were captured. Fish collections have also been competed at Huntmar Road, downstream of the South Huntley Creek confluence. The data are not presented here as Bradley Falls (off Bradley Side Road) prevents a barrier to upstream fish migration.

AECOM staff conducted an electrofishing and habitat survey at three sites (Sites 1, 3 and 4) on South Huntley Creek (**Figure 3**) in May 2006.

4.1.3.3 Site 1 – South Huntley Creek

This site is located adjacent to the landfill (**Figure 3**). On the northeast side of William Mooney Road, there is a pool of water, which steadily decreased during the summer. The water temperature in the pool was 21.2º C on April 12, 2006. This temperature was significantly higher than the other sites on the same date. These warm temperatures, along with the variable size of the pool, indicate that this is a surface water pool. Water exits the pool through a ~0.5 m diameter corrugated steel pipe (CSP) culvert and flows in a straightened agricultural ditch that is filled with terrestrial grasses. The May, July and October site visits were conducted after rain events, during which a small amount of water was flowing in the ditch. During the August site visit, the ditch was dry indicating that the ditch is ephemeral. Approximately 150 m downstream, water flows in from another tributary from the southwest substantially increasing stream flow.

The pool of standing water on the northeast side of the road was electrofished during the May site visit. No fish were caught at Site 1

This site does not provide direct fish habitat due to its ephemeral nature. This site may contribute to downstream fish habitat during periods of high flow (i.e., spring freshet).

4.1.3.4 Site 2 – South Huntley Creek

Site 2 is located on William Mooney Road, near Richardson Side Road (**Figure 3**). This section of the stream is permanent and ranged from 0.75 to 1.25 m wide and 0.04 to 0.3 m deep during the site visits. On the north side of the road, the stream flows through agricultural and livestock (cow) fields before flowing under William Mooney Road through a concrete box culvert. For approximately 100 m downstream of the road, the stream is unaltered before becoming straightened along the edge of a farm field. Water then flows in a ditch along Richardson Side Road for approximately 250 m. Water draining from various fields collects in this ditch, increasing stream flow. A beaver dam exists just upstream from Cardevco Road preventing upstream movement of fish. Recent beaver activity was noted during the April site visit.

Electrofishing was not conducted at Site 2 as WM does not have access to this property. This site is considered poor fish habitat due to the upstream farm, low summer water levels and beaver dam preventing upstream fish migration.

4.1.3.5 Site 3 – South Huntley Creek

This site is located at Carp Road (**Figure 3**). This section of the stream is permanent and ranged from 0.12 to 0.27 m deep and 1.2 to 1.9 m wide during the site visits. On the west side of Carp Road, the stream is channelized for approximately 50 m by concrete (~1 m high) walls. Large patches of vegetation grow in channel causing braiding. East of Carp Road, the stream bottom is hardened with sediment (gravel, sand) on top. The hardened bottom is an impervious surface that limits the burrowing depth of fish and benthic invertebrate habitat. Two small watercress plants were found near the culvert indicating the potential for groundwater seepage in the area. Riparian vegetation consists only of mown grass on either side of Carp Road. After passing Carp Road, South Huntley Creek enters the M-Con Products Inc. quarry property.

The stream on the east side of Carp Road was electrofished from the quarry fence to the culvert. Two creek chub (*Semotilus atromaculatus*) were caught at this site. Creek chub are common, tolerant fish that prefer coolwater (Eakins, 2006).

This site is considered moderate fish habitat because of its permanent flow, well defined channel, low to moderate in-stream cover and lack of riparian vegetation.

4.1.3.6 Site 4 – South Huntley Creek

Site 4 is located on Richardson Side Road, near Oak Creek Road (**Figure 3**), downstream of M-Con Products Inc. Riparian vegetation and canopy cover at this site is fair (~40%). Recent beaver activity was seen along the stream banks. The average stream width was 3 m and the depth ranged from 0.2 to 0.5 m. Bottom sediment was mainly sand with some gravel and rock. Orange staining, possibly indicating groundwater, was noted on the left bank (when facing upstream) on the downstream (north) side of the culvert.

The stream on the southeast side of Richardson Side Road was electrofished. Seven species of fish were caught at this site: white sucker (*Catostomus commersonii*), blacknose dace (*Rhinichthys atratulus*), brook stickleback (*Culaea inconstans*), fathead minnow (*Pimephales promelas*), creek chub (*Semotilus atromaculatus*), central mudminnow (*Umbra limi*) and mottled sculpin (*Cottus bairdii*). This community is indicative of a cool to coldwater fish community and is similar to the community found in Huntley Creek (~500 m downstream).

This site is considered good fish habitat because of its cool temperature, gravel substrates, moderate in-stream cover and fair riparian vegetation.

4.1.3.7 Site 5 – South Huntley Creek

Site 5 is located at Newill Place road (**Figure 3**). A 2 m diameter CSP culvert has been installed under the road and rip-rap has been installed to stabilize the banks. This section of the stream is permanent and ranged from 0.03 to 0.42 m deep and 0.7 to 2.1 m wide during the site visits. At the time of sampling there were large stockpiles of dirt and machinery from the recent construction of residential housing. Riparian vegetation consists mainly of herbaceous plants and grasses and there is very little canopy cover in this area. The bottom sediment is composed mainly of sand and silt and the bottom sediment was covered in thick mats of filamentous algae on all site visits. Minnows were seen swimming in the pooled water near the road on all site visits. During the July site visit when water levels were low, the channel was almost disconnected near the road due to veneer flow where the new culvert has been installed (water spreads out and is not confined to a channel). Minnows were seen trapped in a pool of water near the culvert unable to travel upstream.

This site is considered moderate fish habitat because of its poor connectivity during summer months, poor in-stream cover and lack of riparian vegetation.

4.1.3.8 Site 6 – Huntley Creek

Site 6 is located on Huntley Creek at Oak Creek Road (**Figure 3**). This site is just downstream of where the South Huntley Creek tributary flows into Huntley Creek. The mean channel width was approximately 8 m with water depths ranging from 0.06 to 0.75 m. The bottom sediment consists mainly of sand with some rock. Undercut banks along with some in-stream aquatic vegetation provide fish habitat. Riparian vegetation consists mainly of herbaceous plants and grasses and there is very little canopy cover in this area. Minnows were seen during all site visits.

This site is considered good fish habitat because of its permanent flow, moderate to high in-stream cover, moderate riparian vegetation and riffle-pool sequence.

4.1.4 Fisheries Resources Summary

Site 1 (Tributary E) does not provide direct fish habitat due to its lack of water for the majority of the year. Site 2 (Tributary C) is considered poor seasonal fish habitat due to the upstream farm, low summer water levels and beaver dam downstream (near Cardevco Road) which prevents upstream fish movement. The channel along Richardson Side Road is used mainly for agricultural drainage. Although there is water present year-round, terrestrial plants have grown in many portions of the ditch making it unfavourable for fish habitat. Tolerant fish (i.e., creek chub, brook stickleback) are likely present in this channel as a result of upstream movement in

spring when water levels are high. This fish then become trapped in the drainage channel until higher flows return in the fall. The beaver dam near Cardevco Road also prevents upstream movement of fish. The channelized portion of the stream north of Carp Road, is also unfavourable for fish habitat. Because of the width of the channel, the stream becomes braided and water levels are often very low. Downstream of Carp Road, the entire stream is considered moderate to good fish habitat.

The fisheries resources observed are classified and summarized in **Figure 9**.

4.2 Terrestrial

4.2.1 Vegetation Communities

The existing landfill is typical in that the refuse material is buried and covered by soil that has been allowed to become colonized with grasses. In some areas the landfill remains as exposed fill, as grasses have not yet established. Mature deciduous woodlot and some deciduous swamp fringes are located on the south and west sides of the landfill mound. Man-made ponds and marsh are fed by surface water that flows from the surrounding operations, including the landfill.

Active agriculture covers about 45% of the lands outside of the existing landfill site area. Most of this is cropland but there are some areas used for livestock pasture. Some former cultivated land or pasture has been abandoned in the last decade or so and is regenerating to cultural meadow and thicket. North of the landfill and along Carp Road, a former farmstead has been recently removed and is now regenerating to meadow. Immediately to the west, a former gravel pit is also regenerating to a weedy growth. The lower portion of the pit is seasonally flooded meadow marsh. A deeper permanent pond and cattail marsh is present in the south side of the pit. A portion of deciduous swamp extends onto the site.

Southwest of William Mooney Road, a fairly extensive contiguous area of natural vegetation abuts Highway 417. It contains a mosaic of coniferous, mixed and deciduous forest, as well as deciduous and mixed swamp. There is also a beaver flooded marsh surrounded by thicket swamp. Overall terrain is level or very slightly undulating with a high water table. Consequently forest is mostly moist. Several slightly elevated pockets of well drained sandy soils exist that are maintained as cultural meadow by low intensity livestock grazing.

The Natural Heritage Information Centre (NHIC, a branch of the OMNR) provides a provincial status ranking for the Ecological Land Classification (ELC) vegetation communities of Ontario. None of the vegetation communities recorded on site is considered provincially rare (S1 through S3) by the NHIC.

The natural vegetation communities in the immediate vicinity of the existing landfill site show some similarity to those on site. That is, most of the surrounding vegetated communities are low-lying moist forests, swamps and swamp thickets. Two large wetland areas lie close to the site: the Provincially Significant Goulbourn Wetland lies approximately 400 m to the west, across active agricultural fields (**Figure 10**); and a second wetland lies approximately 200 m to the south, across the four lane, divided highway (Highway 417, the Queensway). Much of the immediately adjacent land uses are agricultural or industrial as seen on **Figure 10**.

Vegetation Classes

The vegetation pattern, shown on **Figure 10** and the broad vegetation classes are summarized in this section.

Eight forest communities were identified consisting of coniferous, mixed and deciduous types. Coniferous forest consists of fresh-moist White Cedar forest (FOC4-1) that is dominated by White Cedar (*Thuja occidentalis*) with occasional other species in the canopy such as Balsam Fir (*Abies balsamea*), Paper Birch (*Betula papyrifera*) and Trembling Aspen (*Populus tremuloides*). Both Glossy Buckthorn (*Rhamnus frangula*) and Common Buckthorn (*R. cathartica*) may be common in the shrub layer. The ground cover is sparse where the canopy is dense but contains abundant Lady Fern (*Athyrium felis-femina*), Poison Ivy (*Rhus radicans*) and Wild Sarsaparilla (*Aralia nudicaulis*) where more open.

The most common mixed forest type is fresh-moist Cedar – Birch forest (FOM7-2). White Cedar and Paper Birch are typically co-dominants but other trees may be well represented including Balsam Fir, Trembling Aspen, Green Ash (*Fraxinus pennsylvanica*) and Red Maple (*Acer rubrum*). Sometimes there is a dense understorey of White Cedar and Balsam Fir, while at other locations, mostly deciduous saplings. Poison Ivy, Wild Sarsaparilla, Bracken Fern (*Pteridium aquilinum*) and sedges (*Carex* spp.) are common ground flora.

Younger deciduous forest is fresh-moist Poplar Deciduous Forest (FOD8-1) dominated by Trembling Aspen but also may contain some Balsam Poplar (*Populus balsamifera*), Green Ash and Paper Birch. Ground layer is a mix of species that may include Wild Lily-of-the-valley (*Maianthemum canadense*), violets (*Viola* spp.) and sedges. Paper Birch forest (FOD3-1) is found in two units. Paper Birch dominated with a component of Balsam Poplar and American Elm (*Ulmus americana*). Only one unit of more mature dry-fresh Sugar Maple – Birch – Poplar deciduous forest (FOD5-10) is present and it is in the landfill. It contains a rich ground layer that contains Trout Lily (*Erythronium americanum*), White Trillium (*Trillium grandiflorum*) and woodland sedges.

Cultural communities are those where human land uses have significantly influenced the vegetation. A small unit of cultural plantation consisting of White Pine (*Pinus strobus*) and

White Cedar, which was planted, occurs in the north. Cultural meadow (CUM1) consists of areas that were previously cultivated, grazed or mowed and are now dominated by non-native grasses such as Smooth Brome (*Bromus inermis*) and Kentucky Bluegrass (*Poa pratensis*). A variety of forbs such as Tall Goldenrod (*Solidago altissima*), asters (*Aster* spp.) and Common Milkweed (*Asclepias syriaca*) are also abundant. The dry cultural meadow (CUM1a) is on poor well drained soils of an abandoned pit. Dominants include Canada Bluegrass (*Poa compressa*), White Sweet Clover (*Melilotus alba*) and Chickory (*Cichorium intybus*). The ground is 30% bare.

Cultural thickets (CUT1) are at a later stage of succession and have developed from cultural meadow. Here shrub cover comprises at least 25% and may be as high as 100%. Willows, in particular Slender Willow (*Salix petiolaris*) dominate while Glossy Buckthorn and Red-osier Dogwood (*Cornus stolonifera*) are also frequent. Although the shrub layer suggests wetland, the ground cover does not which is dominated by species such as Kentucky Bluegrass, Birdfoot Trefoil (*Lotus corniculatus*) and Red Clover (*Trifolium pratense*).

4.2.1.1 Swamp

Relatively mature Cedar – Ash mixed mineral swamp (SWM1-1) occurs near Highway 417. White Cedar is co-dominant with Green and Black Ash (*Fraxinus nigra*). Balsam Fir, American Elm and other species are also present. Glossy Buckthorn and ash saplings are common in the shrub layer. The ground layer is dominated by Fowl Manna Grass (*Glyceria striata*) and Sensitive Fern (*Onoclea sensibilis*). The organic layer is about 20 cm deep.

Green Ash dominates several units of swamp (SWD2-2). Some Black Ash, American Elm and Swamp Maple (*Acer X freemannii*) often occur. Glossy Buckthorn is present and often forms an abundant shrub layer. These units have been designated Green Ash – Glossy Buckthorn mineral deciduous swamp (SWD2-2a). A large unit of Swamp Maple mineral deciduous swamp (SWD3-3) occurs south of the farmstead off William Mooney Road, and a smaller unit in the existing landfill site. The tall canopy is almost entirely Swamp Maple, but the subcanopy contains American Elm, Green Ash and Black Ash. The ground layer contains Sensitive Fern, Dwarf Raspberry (*Rubus pubescens*) and Fowl Manna Grass. A single small unit of Poplar deciduous mineral swamp occurs along Richardson Side Road.

A fairly large unit of Willow mineral thicket swamp (SWT2-2) surrounds the beaver marsh in the west end of the study area. Several species are present including Slender, Bebb's (*Salix bebbii*) and Pussy Willows (*S. discolor*). Other willow thicket swamp occurs in the landfill site. Glossy Buckthorn is present and appears to be colonizing more areas. Several units of thicket swamp are dominated by this aggressive non-native shrub and are Glossy Buckthorn mineral thicket swamp (SWT2-2a). This non-native plant is considered a principal invasive species by

White, Haber and Keddy (1993). An invasive species is one that has 'moved into a habitat and reproduced so aggressively that it has displaced some of the original components of the vegetative community'. Glossy Buckthorn is known to be spreading aggressively in the Ottawa area and it is thought to be displacing native species. Given that it is now the dominant shrub in most of the forested areas of the landfill site area, it has probably displaced many of the native shrub species that one would normally expect to find.

4.2.1.2 Marsh

Several units of cattail shallow mineral marsh (MAS2-1) are dominated by Hybrid Cattail (*Typha X glauca*). The largest marsh is the beaver influenced wetland at the west end of the study area. That marsh contains an organic layer of about 20 cm over fine sand. Other cattail marshes occur on the landfill site and in the former pit at the north. Two small units of Reed Canary Grass mineral meadow marsh (MAM1-1) occur along intermittent channels. Mixed mineral meadow marsh (MAM1-10) occurs in abandoned pasture near Richardson Side Road and in the abandoned pit in the north. A diverse variety of species are intermixed including Hybrid Cattail, Soft Bulrush (*Scirpus validus*), Marsh Fern (*Thelypteris palustris*), Field Horsetail (*Equisetum arvense*) and sedges.

Several permanent ponds contain submerged aquatic vegetation. One pond in the north contains a dense growth of stoneworts (*Chara* sp.). Other ponds on the landfill site may also have their bottoms dominated by Stoneworts.

4.2.2 Flora

A total of 194 vascular plant species were recorded during field investigations of which 38 (approximately 20%) are non-native species. A list of plant species recorded is included in **Appendix B**.

The only plant species at risk encountered was the Endangered Butternut (*Juglans cinerea*). Three individual trees occur within the landfill site, near the north edge of the dry-fresh birch deciduous forest in the southeast corner. Four other individual trees occur in the forest block southwest of William Mooney Road (see **Figure 10**). In November 2003, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designated Butternut an Endangered species. Although the Butternut is relatively common south of the Canadian Shield, COSEWIC has designated it "endangered" because of a disease, the Butternut Canker, which has rapidly spread through North America. This disease causes a high degree of mortality in Butternut trees. The Butternut is listed provincially as "S3?" (provincially rare to uncommon, status uncertain) by the NHIC. No individuals showed symptoms of the lethal Butternut canker. The plant species list was compared against the flora of Ottawa Region (Brunton 2005) of possible

locally or regionally significant species. No locally rare species were encountered but 22 are considered to be locally uncommon by Brunton (2005).

4.2.3 Wildlife

Wildlife surveys focused on breeding bird surveys and nocturnal amphibian surveys, as discussed in the following sections. Some key wildlife observations are shown on **Figure 11**.

4.2.3.1 Birds

During the breeding bird surveys on June 3 and 16, 2011, a total of 34 species and 22 species, respectively, were recorded within the existing Landfill Operation property, and 50 species and 37 species within the west and north project envelopes. The previous survey work in 2006 recorded 48 species of birds on the existing landfill site which included some non-breeding species such as Turkey Vulture (*Cathartes aura*) and gulls. Bird records are provided in **Appendix C**.

The most commonly occurring breeding birds include Red-winged Blackbird (*Agelaius phoeniceus*), European Starling (*Sturnus vulgaris*); Song Sparrow (*Melospiza melodia*), American Robin (*Turdus migratorius*), Yellow Warbler (*Dendroica petechia*) and Common Yellowthroat (*Geothlyphis trichas*). These are species of relatively disturbed, early successional vegetation.

The forested areas both on the existing landfill site and the project envelopes support a number of area sensitive breeding birds as recognized by OMNR (2000). Eight species were recorded on the landfill, three to the north of the landfill, and ten in the forest to the west. The forest block in the west part of the study area supported fewer area sensitive species than expected, perhaps because of noise and edge effect of Highway 417, or the abundance of invasive Glossy Buckthorn in many communities that reduces habitat quality. Two area sensitive grassland species: Eastern Meadowlark (*Sturnella magna*) and Savannah Sparrow (*Passerculus sandwichensis*), were recorded in some of the fields within the On-site study area. The approximate locations of the area sensitive species are all shown on **Figure 11**. Eastern Meadowlark and Barn Swallow have been recently listed as Threatened Species federally by COSEWIC (2011) because of long term declining trends in their populations. These species have not yet been listed at the provincial level and therefore are not currently covered.

The old field habitat to the west of William Mooney Road appears to provide potentially suitable habitat to the provincially Threatened Bobolink (*Dolichonyx oryzivorus*). The breeding bird survey was conducted on two dates in early and mid June at an appropriate time of year when this species would have been present. During the breeding season the male Bobolink is not

easily overlooked with its distinct pattern, bubbling territorial song and habitat of singing from conspicuous perches. Surveys adequately covered the open field in broad transects roughly 250 m apart. The AECOM ecologist questioned the operator of the agricultural field to the west of the existing site as to whether he had seen Bobolinks on his land. The operator of the agricultural field noted that he had seen them in the area previously, but not in the past several years. The fields are in the early stage of succession but woody shrubs are establishing. Bobolinks typically prefer fields with little or no shrubs so it is possible that the regeneration is no longer favourable to this species.

It is also noteworthy that approximately 100 Bank Swallow (*Riparia riparianesting*) holes were observed on a steep exposed earthen bank within the existing landfill property. Bank Swallow is a colonial nesting species. The location is important since there are a large number of breeding individuals that will forage over a large distance away from the site.

The ponds in the landfill are used for staging by a small number of migratory waterfowl as observations of Ring-necked Duck (*Aythya collaris*) and Lesser Scaup (*Aythya affinis*) on May 3rd indicate. Ring-billed Gull (*Larus delawarensis*) and likely other gull species are frequent visitors to the landfill. Canada Goose (*Branta canadensis*) also may congregate in ponds on the landfill or surrounding fields. A flock of 70 were observed in a field north of the landfill on June 1st.

On June 13, 2007, the non-regulated wetlands to the north revealed the presence of a breeding pair of Canada Geese, and one breeding pair of Mallard Ducks.

4.2.4 Amphibians

Amphibian calling surveys were conducted on evenings of May 3 and June 2, 2011 at areas of apparent amphibian habitat within the operating landfill and the adjacent area. Five species were recorded between the two surveys. Surveys had been conducted previously by AECOM in 2006. A total of six species, four on the existing landfill site and five in the wetland area to the north were recorded at that time. The locations of amphibians observed during the various field visits are shown on **Figure 11**.

The existing landfill itself contains several permanent ponds, and intermittent ponds that are used by breeding amphibians. Only the Green Frog (*Rana clamitans*) and, to a lesser extent Northern Leopard Frog (*Rana pipiens*), remain in the permanent ponds through the summer. Other species breed in the ponds but spend most of the active season in the adjacent woodlands or old field habitat. Therefore the proximity to ponds and woodlands is important to maintain functional amphibian habitat.

To the north of the existing landfill site it is interesting to note that in 2006 and 2007 five species were reported in the swamp along the northern limit of WM owned/optioned property, while in 2011 more amphibians were reported in the pit ponds.

Surprisingly few amphibians were heard calling from the core natural area west of William Mooney Road, which includes the Goulbourn provincially significant wetland (PSW). A rather large chorus of Spring Peepers (*Pseudacris crucifer*) were calling from the beaver marsh to the north but none were recorded elsewhere. Green Frogs were observed there in the day and from another pond further north. Generally most of the swamp in the core area only holds shallow seasonal standing water that is not sufficiently deep nor with a sufficiently long hydroperiod to allow for amphibians to complete their aquatic stage. The spring of 2011 was exceptionally wet and therefore there was more standing water than usual. Still it did not appear sufficient to support many amphibians.

There were no nationally or provincially at-risk amphibian species or provincially rare (S1 through S3) species recorded.

4.2.5 Other Fauna

Seven mammal species were observed in 2006 during visits to the site, or by landfill staff throughout the year (**Table 4**). Additional species such as Striped Skunk *Mephitis mephitis*, Meadow Vole *Microtus pennsylvanicus* and other small nocturnal mammals are likely present on the site, but these species are difficult to observe. None of the species recorded are rare or At-Risk nationally or provincially.

Table 4. Mammals Recorded at Ottawa Landfill

Common Name	Scientific Name	Comments
Woodchuck	*Marmota monax*	• Observed in southwest and south-central woods; young seen
Muskrat	*Ondatra zibethicus*	• Observed in northernmost pond (SASa)
Meadow Jumping Mouse	*Zapus hudsonius*	• Observed in edge of northwest woods
Coyote	*Canis latrans*	• Occasionally seen by landfill staff
Red Fox	*Vulpes vulpes*	• Occasionally seen by landfill staff; probable den seen at edge of northwest woods
Northern Raccoon	*Procyon lotor*	• Observed in several locations; regularly seen by landfill staff
White-tailed Deer	*Odocoileus virginianus*	• Observed in several locations; minor winter concentration in northwest woods

During the December 2006 field visit, a small group of White-tailed Deer *Odocoileus virginianus* was observed in the northwest woods. The conifer trees in this section of the site likely provide good wintering habitat for a small number of deer due to the shelter provided by the trees. The remaining woods appear to be of lower quality for wintering wildlife because they contain few conifer trees (species that keep their needles) to provide shelter, and fewer mature trees to provide cavities for nesting or hibernation.

No reptiles were observed while on the property. However, professional experience suggests that some common snake species, such as Common Garter Snake *Thamnophis sirtalis*, probably occur on the property.

4.3 Natural Heritage Designations

Some of the natural heritage features within the study area are already designated for their environmental functions and therefore receive some level of protection through the Provincial Policy Statement (PPS) (MMAH 2005).

Provincially Significant Wetland

The Ontario Wetland Evaluation System was developed by the OMNR (1993). It was implemented in response to an increasing concern for the need to conserve wetland habitats in Ontario. The wetland evaluation system aims to evaluate the value or importance of a wetland based on a scoring system that takes into consideration four principal components - biological, social, hydrological, and special features. Based on scoring, a wetland can fall into one of two classes, Provincially Significant or Locally Significant. The Province of Ontario, under the PPS protects wetlands that rank as Provincially Significant. The PPS states that "*Development and site alteration shall not be permitted in significant wetlands*".

Two units of the Provincially Significant Goulbourn Wetland have been mapped by OMNR in the core natural area in the west portion of the On-Site study area. The wetland is much more extensive to the southwest on the other side of Highway 417. In the study area the wetland consists of deciduous swamp, thicket swamp and marsh surrounding a beaver flooded area. The ELC vegetation surveys indicated that contiguous wetland vegetation (mainly mixed and deciduous swamp) extends further to the north and west. This additional contiguous area should be treated as part of the PSW since OMNR requires that wetland boundaries be refined with field investigations when there is a development application.

OMNR typically identifies part of the wetlands using aerial photography without ground truthing, therefore boundaries need to be refined. Typically a 30 m natural buffer is applied to a PSW

boundary and an Environmental Impact Study (EIS) is required where development is proposed within 120 m of a PSW to show that there will be no detrimental effects to the wetland function.

There are several non-regulated features in the northeast portion of the On-site study area which include an on-line wetland and its associated woodland edge and three off-line wetlands of non-natural origin located in the old aggregate pit to the north of the current Laurysen Kitchens property. These four wetlands lie at the centre of an amphibian breeding area (see **Section 4.2.4** for further detail).

The origin of this on-line wetland is not evident since there is no obvious surface water flow into the area. The wetland may simply result from a high water table in the area, or it may also rely on groundwater infiltration and discharge along the relict beach ridge directly to the east.

It should be noted that the Mississippi Valley Conservation Authority (MVCA) confirmed that this small pocket of wetlands are not included on any of their mapping schedules and are not regulated by the MVCA. Although not regulated, they may provide important functions in regard to recharge functions or habitat.[1]

Significant Woodland

The Ottawa Official Plan OPA 76 (2009) has identified Significant Woodlands in their jurisdiction based on meeting the following criteria: a contiguous woodland patches that contain mature woodlands greater than 80 years, forest interior greater than 100 m from an edge and are within 5 m of a water feature. Areas in the study area which are mapped in Annex 14 of the OP are shown on Figure 11. Note that the Significant Woodland includes the forest block associated with the Goulbourn Wetland, the southern portion of the woodlots in the landfill, and the small woodlot in the north that is contiguous with the adjacent property. According to the PPS the function of the significant woodland must be maintained.

The Carp River Watershed Plan (Robinson Consultants 2004), which includes the study area, also maps woodlands as part of Greenland strategy to protect watershed functions. Their designation is based on woodlands that are at least 50 years of age. The woodlands mapped are similar to the Significant Woodland of the OP but include the central woodlot in the landfill but not the woodlot in the north.

The Carp River Watershed Plan recognises the Goulbourn PSW and immediately adjacent forest land as a “Category 1” area and therefore recommend that it should receive a high level of protection.

1. *Letter from Matt Craig, Manager Planning and Regulatory Services, submitted to AECOM as part of the Terms of Reference Work Plan review, dated June 14, 2010.*

4.4 Landscape Connectivity

Landscape connectivity (which includes the concept of 'wildlife corridors') has become recognized as an important part of natural heritage planning. Although there is not unanimous scientific support for corridors, it is generally accepted that a wide range of benefits can be attributed to the maintenance or re-connection of the natural landscape. These benefits may include: increased local species richness and biodiversity, more immigration and movement opportunities for individuals between core natural areas, and greater likelihood of seed dispersal and exchange of other genetic material between populations.

In the fragmented landscape of southern Ontario, connectivity functions are subjectively described. A low connectivity landscape is one where there are relatively small quantities of natural habitat (forest, wetland, thicket, etc.) separated by larger amounts of agricultural lands, urban areas and or roads. A high or very good connectivity landscape is one where the landscape is mostly natural habitat, with minimum quantities of agriculture or development breaking up the landscape and where the roads are not major highways or commuter roads. Larger areas (typically >25 ha) of natural habitat are sometimes identified as core areas.

In 2003, the NHIC, of the OMNR, produced The Big Picture 2002. This project utilized remote sensing imagery, geographic information systems (GIS), and the principles of landscape ecology to produce a digital map of existing and potential cores and corridors in Southern Ontario. Due to the inherent limitations of the automated methodology, the Big Picture 2002 maps should not be used without human interpretation. Nonetheless, it provides a useful tool for objectively assessing the overall connectivity of the landscape and the relative contribution of specific natural communities to that connectivity.

Although The Big Picture 2002 shows the overall landscape connectivity of the region as quite good, the specific connectivity value of the study area appears relatively low (**Figure 12**). Highway 417 to the south, forms a significant obstacle and cause of mortality for wildlife that attempt to cross. The highway bisects the Goulbourn PSW where there is a natural interface for about 1.5 km. Traffic is nearly continuous but some wildlife are likely able to move across particularly at night when traffic is less. Certainly the largest contiguous block of core forest and wetland habitat lies on the southwest side of Highway 417. The adjacent industrial area northeast of Carp Road effectively isolates the site to the east. There is a potential wildlife corridor along the north branch of Huntley Creek just to the north of Richardson Side Road. Forest cover remains, but is fragmented by residential development and a series of roads, but habitat linkage is fairly good in that direction.

5. Conclusions

5.1 Aquatic Surveys

South Huntley Creek and its tributaries contained within the On-Site study area are highly degraded watercourses, affected by historical and ongoing agricultural land use and linear development (roadways). Although they are considered to be permanent watercourses, dry conditions were observed in some areas during the spring and summer, suggesting that at least some reaches of the creek are ephemeral or intermittent.

Of the assessed watercourses, the only tributaries with the potential to support fish communities are Tributary A, originating south of Highway 417 and flowing northwesterly through the Goulbourn Wetland (seasonal fish habitat), and Tributary C, an agricultural drain that runs parallel to William Mooney Road (some seasonal fish habitat). Fish communities were observed previously in the downstream reaches of South Huntley Creek.

5.2 Terrestrial Surveys

Beyond the operating landfill property, the study area consists of a mix of active agriculture, early successional vegetation on former cropland and forest. A portion of the provincially significant Goulbourn Wetland has been mapped by OMNR in the core natural area at the west. There is actually more wetland area than was mapped by OMNR so the actual area of the PSW is likely more extensive than shown on **Figure 10**. The wetland and surrounding forest has been identified as a Centre of Ecological Significance in the context of the Carp River watershed.

The study area provides habitat for a range of wildlife species that are adapted to forest, meadows, thickets and swamp. Landfill expansion should attempt to minimize loss of wetland and forest habitat and maintain habitat linkages as much as possible.

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