ENBRIDGE

January 2014

LINE 11 WESTOVER SEGMENT REPLACEMENT AND DECOMMISSIONING PROJECT:

ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT

Submitted by:

DILLON CONSULTING

FINAL

Environmental and Socio-Economic Assessment
Line 11 Westover Segment Replacement and Decommissioning Project

Prepared for:

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LIST OF ACRONYMS AND ABBREVIATIONS

AANDC	Aboriginal Affairs and Northern Development Canada
AAQC	Ambient Air Quality Criteria
ABH	Amphibian Breeding Habitat
AMO	Atlas of the Mammals of Ontario
ANSI	Area of Natural and Scientific Interest
BSS	Blue-spotted Salamander
CAC	Criteria Air Contaminants
CACC	Central Ambulance Communications Centre
CATCH	Citizens at City Hall
CC	Co-efficient of Conservatism
CEAA	Canadian Environmental Assessment Act
CEPA	Canadian Environmental Protection Act
cm	centimetre
CO	Carbon Monoxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CSA	Canadian Standards Association
D.R Poulton	D.R. Poulton & Associated Incorporated
DBH	Diameter at Breast Height
DFO	Fisheries and Oceans Canada
DFWA	Detailed Field Work Area
Dillon	Dillon Consulting Limited
EC	Environment Canada
ELC	Ecological Land Classification
EMS	Emergency Medical Services
Enbridge	Enbridge Pipelines Inc.
END	Endangered
EPA	Environmental Protection Act
EPP	Environmental Protection Plan
ESA	Environmental and Socio-Economic Assessment
GHG	Greenhouse Gas
HA	Herpetofaunal Atlas
HCA	Hamilton Conservation Authority
HDD	Horizontal Directional Drilling
IDF	Intensity-Duration-Frequency
km	kilometre
LSA	Local Study Area
m	metre
MAA	Ministry of Aboriginal Affairs
masl	metres above sea level
MBCA	Migratory Birds Convention Act
MBBH	Marsh Breeding Bird Habitat
mbgs	metres below ground surface
mg/L	milligrams per liter
mm	millimetre

MNO	Métis Nation of Ontario
MNR	Ministry of Natural Resources
MOE	Ministry of the Environment
NAAQO	National Ambient Air Quality Objective
NEB	National Energy Board
NHIC	Natural Heritage Information Centre
NO_2	Nitrogen Dioxide
NPA	Navigation Protection Act
NPS	Nominal Pipe Size
NWPA	Navigable Waters Protection Act
OBBA	Ontario Breeding Bird Atlas
OPR	Onshore Pipelines Regulation
PAH	Polycyclic Aromatic Hydrocarbons
PB	Perfoliate Bellwort
PCB	Polychlorinated Biphenyl
PF	Project Footprint
PM	Particular Matter
PPS	Provincial Policy Statement
PR	Puttyroot
PSW	Provincially Significant Wetland
PTTW	Permit to Take Water
RH	Reptile Hibernaculum
RoW	Right-of-Way
RSA	Regional Study Area
SAR	Species at Risk
SARA	Species at Risk Act
SC	Special Concern
SO_2	Sulphur Dioxide
SWG	Shiny Wedge Grass
TDS	Total Dissolved Solids
THR	Threatened
TNA	Turtle Nesting Area
TOA	Turtle Overwintering Area
VEC	Valued Ecosystem Component
VSC	Valued Socio-Economic Component
WNA	Waterfowl Nesting Area

EXECUTIVE SUMMARY

Enbridge Pipelines Inc. (Enbridge) retained Dillon Consulting Limited (Dillon) to undertake an Environmental and Socio-Economic Assessment (ESA) for the replacement of one segment of the Line 11 liquids pipeline located between Westover Station and approximately 500 m north of Concession Road 4 West as well as the decommissioning in place of the existing segment of the Line 11 pipeline located in the same area (referred to as "the Project"). The segment of Line 11 to be replaced is located in the rural area of the City of Hamilton, Ontario, Canada, and is approximately 3.2 km in length. The proposed new segment of Line 11 is proposed to be placed within, and directly adjacent to, the existing right-of-way (ROW). The combined existing RoW and newly acquired RoW paralleling it will be referred to as the "existing corridor" throughout this document to distinguish it from the reroute alternative option.

The location of the new pipeline in the existing corridor minimizes impacts to natural and socio-economic features and at the same time reduces the overall length of the route. The existing pipeline will be decommissioned in place following the tie-in of the new pipeline. No ground disturbance, and thus environmental or socio-economic effect, is anticipated as part of the decommissioning. The diameter of the existing Line 11 pipeline varies, but the segment to be replaced is nominal pipe size (NPS) 20 (508 mm) to be replaced with NPS 20.

The Project is regulated by the National Energy Board (NEB) and is subject to the *NEB Act* (including the NEB Filing Manual, 2013) and associated regulations including the *Onshore Pipeline Regulations (OPR)*. Enbridge will require a Board Order as per Section 58 of *NEB Act* to build and operate the Project. If approved by the NEB, the Project is planned to start construction in the 2nd or 3rd quarter of 2014, to meet an in-service date of the 4th quarter of 2014. The *Canadian Environmental Assessment Act* (*CEAA*) was not triggered for this Project.

The spatial scope of this ESA was determined based on preliminary alignment information for the existing corridor option and the reroute alternative. This information suggested that the existing corridor option would begin at Westover Terminal and end approximately 200 m north of Concession Road 4 West. Since then the decision has been made to reduce the length of the project and tie in to the existing pipeline approximately 500 m north of Concession Road 4 West. For the area at the south end of the Project, this ESA therefore contains more information than is strictly necessary, but for contextual reasons the additional information remains included.

The ESA involved undertaking an inventory of physical, natural and socio-economic features along the existing corridor and a reroute alternative. This information was used to produce maps identifying features that could be impacted by pipeline construction, operation and decommissioning activities and constraints that could impact the Project. Routes were reviewed based on a series of environmental and socio-economic criteria and information received as part of stakeholder consultation.

The Study included four main phases including the following:

- *Phase 1: Description of the Environmental and Socio-Economic Setting;*
- *Phase 2: Effects Assessment;*
- *Phase 3: Cumulative Effects Assessment; and,*
- *Phase 4: Inspection, Monitoring, and Follow-Up.*

A cumulative effects assessment was also completed as part of the ESA. The assessment concluded that the Project is unlikely to have cumulative effects based on the lack of past, current or future projects identified in the area.

Environmental inspection and monitoring plans will be developed for the Project. The primary objective of inspection and monitoring is to determine the effectiveness of mitigation measures, inspect the construction site and to determine compliance with pertinent environmental legislation, regulations industry standards, and project permit conditions, including any notification requirements or conditions set by the NEB.

An Environmental Protection Plan (EPP) will be developed following the ESA and will be used to communicate Enbridge's environmental protection procedures and mitigation measures to employees, contractors and regulators. The EPP will document all Project-specific environmental commitments made by Enbridge and the associated mitigation measures.

Mitigation measures provided in the EPP should be implemented in combination with Enbridge's *Environmental Guidelines for Construction, June 2012.* Dillon does not anticipate any long-term, adverse effects resulting from the Project in the context of the mitigation measures provided in this ESA. Enbridge commits to adopting and implementing the mitigation measures in this ESA.

1. INTRODUCTION

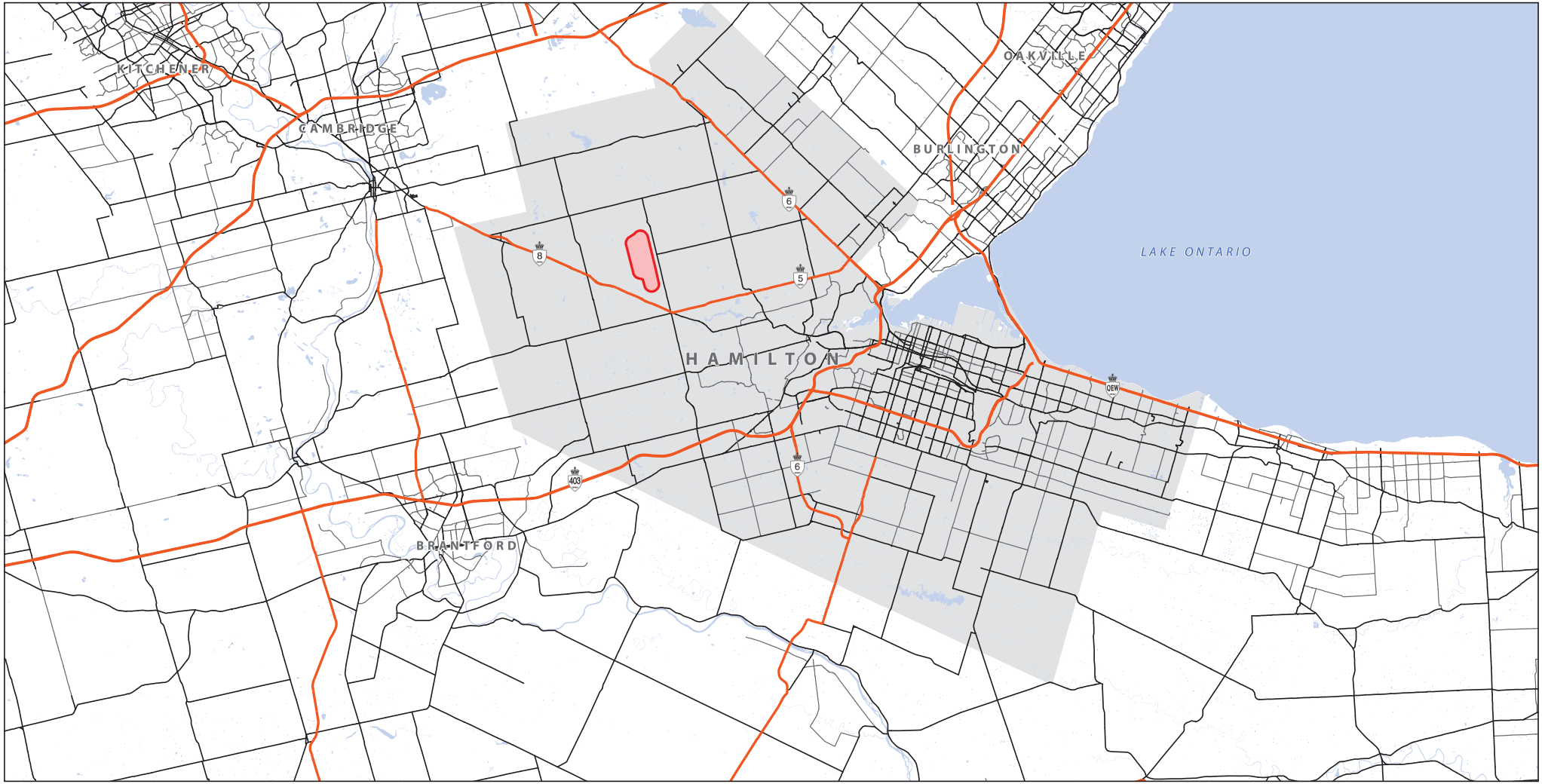
Enbridge Pipelines Inc. (Enbridge) retained Dillon Consulting Limited (Dillon) to undertake an Environmental and Socio-Economic Assessment (ESA) for the replacement of one segment of the Line 11 liquids pipeline located between Westover Station and approximately 500 m north of Concession Road 4 West as well as the decommissioning in place of the existing segment of the Line 11 pipeline located in the same area (referred to as "the Project"). The segment of Line 11 to be replaced is located in the rural area of the City of Hamilton, Ontario, Canada, and is approximately 3.2 km in length. The proposed new segment of Line 11 is proposed to be placed within, and directly adjacent to, the existing right-of-way (ROW). The combined existing RoW and newly acquired RoW paralleling it will be referred to as the "existing corridor" throughout this document to distinguish it from the reroute alternative option **(Figure 1: Project Location)**.

Westover Station (Dillon, 2013).

The location of the new pipeline in the existing corridor minimizes impacts to natural and socio-economic features and at the same time reduces the overall length of the route. The existing pipeline will be decommissioned in place following the tie-in of the new pipeline. No ground disturbance, and thus environmental or socio-economic effect, is anticipated as part of the decommissioning. The diameter of the existing Line 11 pipeline varies, but the segment to be replaced is nominal pipe size (NPS) 20 (508 mm) to be replaced with NPS 20. The ESA includes both the decommissioning of the existing pipeline and the proposed pipeline.

Enbridge expects to apply to the National Energy Board (NEB) for permission to build and operate the Project. If approved by the NEB, the Project is planned to start construction in the 2nd or 3rd quarter of 2014, to meet an in-service date of the 4th quarter, 2014. The Project is regulated by the NEB and is subject to the *NEB Act* and associated regulations including the *Onshore Pipeline Regulations (OPR)*.

Enbridge expects to apply to the NEB for the decommissioning of the existing pipeline simultaneously with their application to construct the proposed pipeline. The new pipeline will require an application under Section 58 of the *NEB Act*, while the decommissioning of the existing pipeline will require an application under Section 45.1 of the *OPR*.



ENBRIDGE PIPELINES
LINE 11 WESTOVER SEGMENT
REPLACEMENT AND
DECOMMISSIONING PROJECT

ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT

PROJECT LOCATION
FIGURE 1

Highway
Arterial Road
Collector Road
Study Area
Waterbody

ENBRIDGE

DILLON CONSULTING

MAP CREATED BY: GM
MAP CHECKED BY: CC
MAP PROJECTION: NAD 1983 UTM Zone 17N

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNR, Geowarehouse,
City of Hamilton, LOID,
Google Earth Pro

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N W E S

FILE LOCATION: I:\GIS\137662 - Enbridge Line 10 and 11 Replacement\Mapping

PROJECT: 137662 STATUS: DRAFT DATE: 11/15/2013

1.1. Project Need and Justification

Line 11 is an approximately 76 km long pipeline constructed in 1971 which travels from the Enbridge Westover Station to the Nanticoke Terminal.

The Project includes the replacement of approximately 3.2 km of the 76 km long pipeline and is being undertaken as part of Enbridge's ongoing pipeline integrity management and maintenance program. The Project is needed to address pipeline integrity features identified during in-line pipeline inspections. While a conventional integrity dig program would be capable of maintaining the safe operation of the existing pipeline, it would be less disruptive and more efficient to replace a segment of the line.

1.2. Environmental and Socio-Economic Impact Assessment

The purpose of this ESA is to identify any potential environmental and socio-economic effects that the Project could potentially have and to provide mitigation measures designed to minimize such effects. The results are documented in this ESA report. The ESA includes the following:

- *regulatory requirements;*
- *concordance table;*
- *a description of the Project;*
- *overview of stakeholder consultation undertaken by Enbridge;*
- *Project routing and selection rationale;*
- *methodology followed for the assessment (including scoping, spatial and temporal boundaries and identification of valued components, i.e., valued ecosystem components or VECs, and valued socio-economic components, or VSCs);*
- *environmental and socio-economic setting (baseline information);*
- *effects assessment (with determination of residual effects and significance) and proposed mitigation measures;*
- *effects of the environment on the project;*
- *accidents and malfunctions;*
- *cumulative effects assessment; and,*
- *inspection and monitoring.*

The ESA was completed using the following process:

- *identify the environmental and socio-economic baseline setting including spatial and temporal boundaries;*
- *predict potential beneficial and adverse effects of the Project on the socio-economic and biophysical environment;*
- *recommend mitigation measures;*
- *assess the presence or absence of potential residual effects; and,*
- *predict the significance of residual Project effects and residual cumulative effects.*

The ESA included the review of both the existing corridor and a potential reroute alternative.

1.3. Regulatory Framework

This ESA was prepared to meet the requirements of the NEB. Additional requirements established by other key government agencies were also considered as part of the ESA. More information on these requirements is provided in a complete list of anticipated notifications, permits and approvals provided in **Section 1.5** of this ESA.

1.3.1. National Energy Board

As a federally regulated pipeline, Enbridge is required by the *NEB Act* to apply for approval for the Project. NEB requirements state that Enbridge must fulfill the following:

- *completion of an ESA which examines environmental and socio-economic effects of the Project and establishes mitigation measures; and,*
- *complete construction, maintenance and operation of the Project in accordance with the OPR and associated Enbridge standards and manuals filed and approved by the NEB.*

Enbridge will require a Board Order as per Section 58 of *NEB Act* to build and operate the proposed pipeline. Enbridge will also file a decommissioning application pursuant to Section 45.1 of the *OPR*.

Canadian Environmental Assessment Act (2012)

The Project is not listed under the *Canadian Environmental Assessment Act (CEAA) 2012*'s Regulations Designating Physical Activities as a "Designated Project" and as such *CEAA* does not apply. Although this Project is not a "Designated Project" with respect to the *CEAA*, the following should be noted:

> *"For projects not identified by the CEAA 2012, the NEB will continue to conduct a federal environmental assessment as part of its public interest mandate under the NEB Act. The NEB has significant experience in considering potential environmental effects when making regulatory decisions. Environmental aspects have been addressed in Board decisions under the NEB Act since the early 1970's. In addition, the NEB has been conducting environmental assessments under the former CEAA Act since it came into force in 1995. The NEB will continue to conduct an independent, fair and publicly accessible environmental assessment and regulatory review process for projects under its jurisdiction and will continue to recommend terms and conditions in the public interest.*
> *Also, as a result of the Jobs, Growth and Long-term Prosperity Act, changes have been made to the NEB Act and the Canada Oil and Gas Operations Act. The amendments are now in force and require the NEB to take into account the effects of pipeline and power*

line crossings of navigable waters on navigation and navigation safety, before making its recommendations or decisions on applications under section 52 and 58 of the NEB Act and section 5 of the Canada Oil and Gas Operations Act (NEB, 2013a)."

1.4. Scope of Assessment

This section provides information relating to the Project scope, ESA scope and level of detail, and spatial and temporal boundaries.

1.4.1. Project Scope

Project scoping ensures that the assessment focused on relevant issues and concerns, and assisted in determining the appropriate level of detail to include in the assessment. The ESA was prepared to provide an assessment of the following project activities:

- *construction of a new 3.2 km , NPS 20 (508mm) liquids pipeline within the existing corridor, including approximately 25 m of temporary working space on one side of the RoW, access roads, pipe laydown and other storage areas;*
- *up to approximately 6 m new permanent easement in some areas;*
- *operation, maintenance, and decommissioning of the pipeline; and,*
- *decommissioning in place of the existing pipeline.*

Figure 1.1: Pipeline Segment To Be Replaced includes an overview of the segment of pipeline proposed to be replaced.

ENBRIDGE PIPELINES
LINE 11 WESTOVER SEGMENT REPLACEMENT AND DECOMMISSIONING PROJECT

ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT

PIPELINE SEGMENT TO BE REPLACED
FIGURE 1.1

Project Components
- Segment of Line 11 to be Replaced
- Existing Line 11
- Local Study Area

Base Map
- Hydro Transmission Line
- Highway
- Arterial Road
- Collector Road
- Local Street
- Parcel

DILLON CONSULTING

MAP CREATED BY: GM
MAP CHECKED BY: CC
MAP PROJECTION: NAD 1983 UTM Zone 17N

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNR, Geowarehouse, City of Hamilton, LOID, Google Earth Pro

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0 250 500 1,000 m

ENBRIDGE

FILE LOCATION: I:\GIS\137662 - Enbridge Line 10 and 11 Replacement\Mapping

PROJECT: 137662 STATUS: FINAL DATE: 11/15/2013

1.4.2. ESA Scope

The main elements considered as part of the ESA included the following:

- *the potential environmental and socio-economic effects of the Project;*
- *the significance of the effects (residual);*
- *effects of the environment on the Project;*
- *potential accidents and malfunctions;*
- *monitoring requirements;*
- *comments from stakeholders; and,*
- *mitigation measures to minimize potential effects.*

The ESA takes into account the requirements provided in the NEB Filing Manual (2013) and comments received as part of the consultation program. Although this Project does not require a screening under the *CEAA*, similar scoping principles were used. The biophysical and socio-economic factors assessed as part of the ESA included those provided in Tables A-1 to A-3 of the NEB Filing Manual (2013) identified within the spatial and temporal boundaries established for the Project. Table A-1 was used to identify potentially affected valued components, and Tables A-2 and A-3 were used to further refine potential effects and mitigation measures.

Project activities considered as part of the Project include the following:

- *site preparation by clearing of vegetation and stripping of topsoil;*
- *construction of the pipeline including trenching (as well as trenchless construction), pipe setup and stringing, welding, lowering-in of the pipeline, testing and backfilling*[1]*;*
- *reclamation including replacement of topsoil and seeding, if applicable, and final clean-up;*
- *decommissioning of the existing pipeline; and,*
- *operation of the pipeline.*

Valued components reviewed as part of the ESA include:

Biophysical

- *Physical and meteorological environment;*
- *Soil and soil productivity;*
- *Vegetation;*
- *Water quality and quantity;*
- *Fish and fish habitat (including any fish compensation required);*
- *Wetlands;*
- *Wildlife and wildlife habitat;*
- *Species at Risk (SAR) or Species of Special Status and related habitat;*
- *Air emissions;*
- *Greenhouse gas (GHG) emissions; and,*
- *Acoustic environment.*

[1] Trenchless construction refers to the use of either horizontal direction drill (HDD) or bore throughout this report.

Socio-Economic

- *Human occupancy and resource use;*
- *Heritage resources;*
- *Navigation and navigation safety;*
- *Traditional land and resource use;*
- *Social and cultural well-being;*
- *Human health and aesthetics;*
- *Infrastructure and services; and,*
- *Employment and economy.*

1.4.3. Level of Detail

The nature of the Project together with the environmental and socio-economic setting, establish the extent of interactions between the Project and the environment. Those interactions formed the basis on which effects were predicted, and for understanding the appropriate level of detail needed about the setting, interactions, and predicted effects.

The level of detail in the ESA was based on the nature and scale of the Project, the predicted effects of the Project, and the level of public interest in the Project.

The determination of the level of detail for specific valued components during all phases of the Project was based on Table A-1 through A-3 of the NEB Filing Manual (2013) and included both qualitative and quantitative information including mapping and preliminary baseline data.

The spatial scope of this ESA was determined based on preliminary alignment information for the existing corridor option and the reroute alternative. This information suggested that the existing corridor option would begin at Westover Terminal and end approximately 200 m north of Concession Road 4 West. Since then the decision has been made to reduce the length of the project and tie in to the existing pipeline approximately 500 m north of Concession Road 4 West. For the area at the south end of the Project, this ESA therefore contains more information than is strictly necessary, but for contextual reasons the additional information remains included.

1.4.4. Spatial and Temporal Boundaries

Spatial and temporal boundaries were developed for the Project and were used in the ESA to describe the environmental and socio-economic setting and:

- *took into account valued components;*
- *included the area over which effects on the valued components may occur;*
- *included the duration that valued components may be affected;*
- *considered the effects of the Project on the valued components and the extent to which those effects are measurable;*
- *included all phases of the Project; and,*
- *were not constrained by jurisdictional boundaries.*

Spatial Boundary

The spatial boundary is the area likely to be affected by the Project. Criteria used when selecting appropriate spatial boundaries included ensuring that it was of sufficient size to encompass the boundaries of the Project and related project activities as well as capture any potential direct and indirect Project effects. To address this, three main spatial boundaries were developed including the Project Footprint (PF), Local Study Area (LSA) and the Regional Study Area (RSA).

Project Footprint (PF) – includes lands that will be directly affected by construction of the Project. The PF was selected because it includes all areas to be directly impacted by Project components as well as temporary working space. As such, a detailed field work area (DFWA) focused on approximately 50 m on either side of the existing corridor and reroute alternative. The DFWA was established to account for permanent and temporary working space easements, as well as the potential need for minor deviations should they be required. The DFWA and PF refer to the same area and are used interchangeably in the report.

Local Study Area (LSA) – includes the PF, plus additional lands up to and including 500 m on either side of the proposed pipeline routes being evaluated. The LSA was selected to assist with collecting less detailed but still site specific baseline data (between 50 m and 500 m from the pipeline) for the prediction of environmental and socio-economic effects of the Project. The LSA was used for the effects analysis for many valued components where impacts could be wider reaching than the PF.

Regional Study Area (RSA) – includes lands located beyond the PF and LSA and generally up to 2 km from the Project. The RSA was selected to assist with determining more general baseline data collection requirements and for the prediction of direct and indirect environmental and socio-economic effects of the Project. The RSA was the spatial scale for the collection of secondary source baseline data and effects analysis for some valued components where impacts could be wider reaching than the PF or LSA.

Valued components were assessed based on the spatial and temporal boundaries provided in this section unless otherwise mentioned in the remainder of this ESA. The spatial boundary used for heritage resources (i.e., Stage 1 archaeological assessment) was a 1 km radius from the Project as per the *Standards and Guidelines for Consultant Archaeologists* formulated by the Ministry of Tourism, Culture and Sport, 2011.

The determination of appropriate spatial boundaries was also based on several additional factors including pre-established start and end points for the pipeline as well as having a sufficient geographical area that would allow for the identification of potential route deviations.

Temporal Boundary

The temporal boundary is the timeframe (duration and timing) being reviewed as part of the ESA in relation to valued components. The temporal boundaries established for the ESA include all phases of the Project. Construction is expected to commence in the 2nd or 3rd quarter of 2014 and last approximately three (3) months. Project commissioning is expected in the 4th quarter, 2014. The Project is expected to operate for approximately 50 years or more once constructed. **Figure 1.2: Spatial Boundaries** provides an overview of the spatial boundaries identified for the Project.

ENBRIDGE PIPELINES
LINE 11 WESTOVER SEGMENT
REPLACEMENT AND
DECOMMISSIONING PROJECT

ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT

SPATIAL BOUNDARIES
FIGURE 1.2

Project Components
- Potential Line 11 Replacement Alternative (Option 1)
- Potential Line 11 Reroute Alternative (Option 2)
- Existing Line 11
- Project Footprint
- Local Study Area
- Regional Study Area

Base Map
- Hydro Transmission Line
- Highway
- Arterial Road
- Collector Road
- Local Street
- Parcel

DILLON CONSULTING

MAP CREATED BY: GM
MAP CHECKED BY: CC
MAP PROJECTION: NAD 1983 UTM Zone 17N

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNR, Geowarehouse, City of Hamilton, LOID, Google Earth Pro

ENBRIDGE

1:35,000
0 250 500 1,000 m

N W E S

FILE LOCATION: I:\GIS\137662 - Enbridge Line 10 and 11 Replacement\Mapping

PROJECT: 137662 STATUS: FINAL DATE: 11/15/2013

1.5. Environmental Notifications, Permits and Approvals

Notifications, permits and approvals may be required for the Project and will be acquired prior to construction (**Table 1**).

Table 1:
Environmental Notifications, Permits and Approvals

Agency	Notifications, Permits, Approvals and Potential Triggers
Federal[2]	
Fisheries & Oceans Canada	▪ Watercourse crossings – Notification of proposed works to be completed under Operational Statements 10 days prior to conducting the work
Provincial	
Ministry of Environment	▪ Permit to Take Water, if greater than 50,000 L / day is moved for construction dewatering or hydrostatic testing purposes (if water is taken from a natural source).
Local/Municipal	
Hamilton Conservation Authority	▪ Permit to cross watercourses and work within regulated areas (*Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation)* ▪ Letter of Advice related to avoidance of impacts to fish and fish habitat
Ministry of Tourism, Culture & Sport	▪ Archaeological clearance
City of Hamilton	▪ Permit to Injure or Remove Trees (woodlands/woodlots), as applicable ▪ Noise By-Law exemptions (if work is to be completed outside of permitted hours specified in Noise By-Law)

1.6. Concordance with the NEB Filing Manual (2013)

Table 1.1 provides information on where requirements provided in the NEB Filing Manual (2013) are located in the ESA.

[2] While no navigable waterways were identified as part of the ESA, and due to recently revised legislation on this matter, a final determination on the presence of navigable waterways is subject to review by the NEB.

Table 1.1

Guide A – A.2 Environment and Socio-Economic Assessment Concordance Table

Filing #	Filing Requirement	In Application? References	Not in Application? Explanation
A.2.5 Description of the Environmental and Socio-Economic Setting			
1.	Identify and describe the current biophysical and socio-economic setting of each element (i.e., baseline information) in the area where the project is to be carried out.	Section 5 of the ESA	n/a
2.	Describe which biophysical or socio-economic elements in the study area are of ecological, economic or human importance and require more detailed analysis taking into account the results of consultation (see Table A-1 for examples). Where circumstances require more detailed information in an ESA, see: i. Table A-2 – Filing Requirements for Biophysical Elements; or ii. Table A-3 – Filing Requirements for Socio-Economic Elements.	Section 3, 5 and 7 of the ESA	n/a
3.	Provide supporting evidence (e.g., references to scientific literature, field studies, local and traditional knowledge, previous environmental assessment and monitoring reports) for: • information and data collected; • analysis completed; • conclusions reached; and • the extent of professional judgment or experience relied upon in meeting these information requirements, and the rationale for that extent of reliance.	Sections 3, 5 and 7 of the ESA	n/a
4.	Describe and substantiate the methods used for any surveys, such as those pertaining to wildlife, fisheries, plants, species at risk or species of special status, soils, heritage resources or traditional land use, and for establishing the baseline setting for the atmospheric and acoustic environment.	Sections 3, 5 and 7 of the ESA	n/a
5.	Applicants must consult with other expert federal, provincial or territorial departments and other relevant authorities on requirements for baseline information and methods.	Sections 3, 4, 5 and 7 of the ESA	n/a
A.2.6 Effects Assessment			
Identification and Analysis of Effects			
1.	Describe the methods used to predict the effects of the project on the biophysical and socio-economic elements, and the effects of the environment on the project.	Sections 3, 7 and 9 of the ESA	n/a

Filing #	Filing Requirement	In Application? References	Not in Application? Explanation
2.	Predict the effects associated with the proposed project, including those that could be caused by construction, operations, decommissioning or abandonment, as well as accidents and malfunctions. Also include effects the environment could have on the project. For those biophysical and socio-economic elements or their valued components that require further analysis (see Table A-1), provide the detailed information outlined in Tables A-2 and A-3.	Sections 5, 7, 9 and 10 of the ESA	n/a
Mitigation Measures for Effects			
1.	Describe the standard and project specific mitigation measures and their adequacy for addressing the project effects, or clearly reference specific sections of company manuals that provide mitigation measures. Ensure that referenced manuals are current and filed with the NEB.	Section 7 of the ESA	n/a
2.	Ensure that commitments about mitigative measures will be communicated to field staff for implementation through an Environmental Protection Plan (EP Plan).	Section 3 and 13 of the ESA	n/a
3.	Describe plans and measures to address potential effects of accidents and malfunctions during construction and operation of the project.	Sections 7 and 10 of the ESA	n/a
Evaluation of Significance			
1.	After taking into account any appropriate mitigation measures, identify any remaining residual effects from the project.	Section 7, 9, 10 and 12 of the ESA	n/a
2.	Describe the methods and criteria used to determine the significance of adverse effects, including defining the point at which any particular effect on a valued component is considered "significant".	Sections 3, 7, 9, 10 and 12 of the ESA	n/a
3.	Evaluate the significance of residual adverse environmental and socio-economic effects against the defined criteria.	Sections 7, 9, 10 and 12 of the ESA	n/a
4.	Evaluate the likelihood of significant residual adverse environmental and socio-economic effects occurring and substantiate the conclusions made.	Section 7, 9, 10, 12 and 11 of the ESA	n/a
A.2.7 Cumulative Effects Assessment			
Scoping and Analysis of Cumulative Effects			
1.	Identify the valued components for which residual effects are predicted, and describe and justify the methods used to predict any residual effects.	Section 3 and 12 of the ESA	n/a
2.	For each valued component where residual effects have been identified, describe and justify the spatial and temporal boundaries used to assess the potential cumulative effects.	Section 12 of the ESA	n/a

Filing #	Filing Requirement	In Application? References	Not in Application? Explanation
3.	Identify other physical works or activities that have been or will be carried out within the identified spatial and temporal boundaries for the cumulative effects assessment.	Section 12 of the ESA	n/a
4.	Identify whether the effects of those physical works or activities that have been or will be carried out would be likely to produce effects on the valued components within the identified spatial and temporal boundaries.	Section 12 of the ESA	n/a
5.	Where other physical works or activities may affect the valued components for which residual effects from the applicant's proposed project are predicted, continue the cumulative effects assessment, as follows: ▪ Consider the various components, phases and activities associated with the applicant's project that could interact with other physical work or activities. ▪ Provide a description of the extent of the cumulative effects on valued components. ▪ Where professional knowledge or experience is cited, explain the extent to which professional knowledge or experience was relied upon and justify how the resulting conclusions or decisions were reached.	Section 12 of the ESA	n/a
Mitigation Measures for Cumulative Effects			
1.	Describe the general and specific mitigation measures, beyond project-specific mitigation already considered, that are technically and economically feasible to address any cumulative effects.	Section 12 of the ESA	n/a
Applicant's Evaluation of Significance of Cumulative Effects			
1.	After taking into account any appropriate mitigation measures for cumulative effects, identify any remaining residual cumulative effects.	Section 12 of the ESA	n/a
2.	Describe the methods and criteria used to determine the significance of remaining adverse cumulative effects, including defining the point at which each identified cumulative effect on a valued component is considered "significant".	Sections 3 and 12 of the ESA	n/a
3.	Evaluate the significance of adverse residual cumulative effects against the defined criteria.	Section 12 of the ESA	n/a
4.	Evaluate the likelihood of significant, residual adverse cumulative environmental and socio-economic effects occurring and substantiate the conclusions made.	Section 12 of the ESA	n/a

Filing #	Filing Requirement	In Application? References	Not in Application? Explanation
A.2.8 Inspection, Monitoring and Follow-Up			
1.	Describe inspection plans to ensure compliance with biophysical and socio-economic commitments, consistent with sections 48, 53, and 54 of the OPR.	Sections 7 and 13 of the ESA	n/a
2.	Describe the surveillance and monitoring program for the protection of the pipeline, the public and the environment, as required by Section 39 of the OPR.		n/a
3.	Consider any particular elements in the Application that are of greater concern and evaluate the need for a more in-depth monitoring program for those elements.		n/a
4.	For CEAA designated projects, identify which elements and monitoring procedures would constitute follow-up under the CEAA 2012.		
Table A-1 Circumstances and Interactions Requiring Detailed Biophysical and Socio-Economic Information			
	Physical & meteorological environment	n/a	No effects anticipated.
	Soil and soil productivity	Sections 5 and 7 of the ESA	n/a
	Vegetation	Sections 5 and 7 of the ESA	n/a
	Water quality and quantity	Sections 5 and 7 of the ESA	n/a
	Fish and fish habitat, including any fish habitat compensation required	Sections 5 and 7 of the ESA	n/a
	Wetlands	Sections 5 and 7 of the ESA	n/a
	Wildlife and wildlife habitat	Sections 5 and 7 of the ESA	n/a
	Species at Risk or Species of Special Status and related habitat	Sections 5 and 7 of the ESA	n/a
	Air emissions	Sections 5 and 7 of the ESA	n/a
	Greenhouse gas emissions	Sections 5 and 7 of the ESA	n/a
	Acoustic environment	Sections 5 and 7 of the ESA	n/a
	Human occupancy and resource use	Sections 5 and 7 of the ESA	n/a
	Heritage resources	Sections 5 and 7 of the ESA	n/a
	Navigation and navigation safety	n/a	No effects anticipated.
	Traditional land and resource use	n/a	No effects anticipated.

Filing #	Filing Requirement	In Application? References	Not in Application? Explanation
	Social and cultural well-being	n/a	No effects anticipated.
	Human health and aesthetics	Sections 5 and 7 of the ESA	n/a
	Infrastructure and services	Sections 5 and 7 of the ESA	n/a
	Employment and economy	Sections 5 and 7 of the ESA	n/a

2.DESCRIPTION OF THE PROJECT

This section provides a description of the Project including project components, schedule, and an overview of construction, operation, decommissioning and abandonment activities.

2.1. Project Components

This section provides an overview of the Project including the proposed pipeline, decommissioning of the existing pipeline and temporary working space requirements.

2.1.1. Proposed Pipeline

The proposed pipeline will be installed in the existing corridor and will connect the Westover Station to the existing pipeline approximately 500 m north of Concession Road 4 West.

Minimum depth of ground cover over the pipeline will be 0.9 m. However, the pipeline may be installed deeper in areas where it crosses underneath existing infrastructure (i.e., roads, sewers, rail lines, pipelines) or sensitive environmental and socio-economic features. Additional details are provided in **Table 2**.

Table 2:
Pipeline Design and Alignment Summary

Pipeline Diameter	NPS 20
Total Length	3.2 km
Commodity Type	LVP Hydrocarbons
Start Point	Westover Station
End Point	Approximately 500 m north of Concession Road 4 West
Permanent Easement Required (approximate)	6 m
Temporary Working Space Required (approximate)	Up to 25 m
Expected Depth of Cover (min.)	0.9 m

2.1.2. Decommissioning of Existing Pipeline

The Project also includes the decommissioning of the existing pipeline. The pipeline to be decommissioned is approximately 3.2 km in length and parallels the proposed pipeline. Decommissioning in place and the associated lack of any ground disturbance will minimize adverse

environmental and socio-economic effects and includes on-going RoW surveillance and maintenance activities as well as continued cathodic protection after decommissioning.

2.1.3. Temporary Space Requirements

The Project will require temporary working space during the construction period. Temporary working space required is up to 25 m in width on one side of the pipeline (the side of the pipeline to be determined following detailed design). Temporary working space will be reclaimed following construction. It will not be required during the operations phase of the Project.

Additional space may be required for temporary facilities during the construction period for equipment staging areas, soil stockpile sites, temporary bridges to facilitate watercourse crossings, drill or bore entry and exit areas, and temporary access roads. The location of the temporary facilities will be determined by Enbridge and the contractor(s).

2.2. Schedule

Enbridge will apply to the NEB for permission to build and operate the Project. If approved by the NEB, the Project is planned to start construction in the 2nd or 3rd quarter of 2014, to meet an in-service date of the 4th quarter, 2014. Detailed design is currently underway for the Project. Construction of the Project (including decommissioning activities) will take approximately 3 months.

Duration for key construction activities is anticipated to be as follows:

Table 2.1:
Construction Activities and Approximate Duration

Construction Activity	Approximate Duration
Right-Of-Way Preparation	3 weeks
Pipe Delivery and Pipe Preparation	2 weeks
Joining Pipe Sections	2 weeks
Trenchless Construction	1 month
Backfilling	3 weeks
Hydrostatic Testing	1 week
Tie-in and decommissioning of Existing Pipeline	2 weeks
Clean-up	2 weeks
Operation/Maintenance	50 years (approximately)

It should be noted that the approximate duration of construction activities in the above table may occur concurrently and is an estimate only. Specific timing will be developed with Enbridge and their contractor(s) closer to the construction date.

Routine maintenance will begin following the construction and commissioning of the Project. Maintenance will include regular monitoring by Enbridge by aerial and ground patrols, RoW maintenance including vegetation management, in-line inspections, and integrity digs. Maintenance will be ongoing and will occur over the life of the Project for both the proposed and decommissioned pipelines.

2.3. Construction

The following provides an overview of the construction activities for the new pipeline and the decommissioning of the existing pipeline.

2.3.1. Proposed Pipeline

It is estimated that the construction period will require approximately 50 workers during the peak period. Construction will generally involve a number of distinct steps including:

- *RoW and temporary workspace preparation;*
- *pipe delivery;*
- *joining pipe sections;*
- *trenching, drilling and boring;*
- *lowering the pipe and pulling pipe through;*
- *hydrostatic testing;*
- *tie-in and backfilling; and,*
- *clean-up.*

Construction of the pipeline will be completed in accordance with Enbridge's *Environmental Guidelines for Construction, June 2012.*

Appendix A provides an overview of the typical pipeline construction sequence.

2.3.2. Decommissioning In Place of the Existing Pipeline

The pipeline segment to be replaced will be decommissioned in place. Decommissioning activities do not require any ground disturbance. Enbridge will retain ownership of the RoW and continue to monitor and maintain it following the decommissioning. All existing pipeline crossing signs will be left in place.

Decommissioning activities will include the following:

- *remove the oil from the pipeline segment by purging it with nitrogen between two valves;*
- *disconnect the pipeline segment being replaced from any operating facilities;*
- *cap the open ends of the decommissioned pipeline; and,*
- *monitor the decommissioned segment of pipe and the RoW and maintain cathodic protection to minimize corrosion.*

2.4. Operation and Maintenance

The Project, once constructed, will operate on a continuous basis and will be maintained by Enbridge on a regular basis. Routine maintenance will begin following the construction and commissioning of the Project. Maintenance will include regular monitoring by Enbridge by aerial and ground patrols, in-line inspections, and integrity digs (as required).

Patrols will focus on identifying pipeline damage and vandalism, erosion or other potential problems. In-line inspections are completed through the use of specialized equipment which is pushed through the pipeline to identify potential damage such as cracks, corrosion or dents. Integrity digs will be completed by Enbridge in areas where potential issues have been identified by patrols or in-line inspections. Integrity digs are completed in a manner that minimizes potential effects to the environment and socio-economic disturbances to the area and includes reclamation activities.

2.5. Decommissioning and Abandonment of Proposed Pipeline

The level of detail provided in this section is constrained by uncertainties inherent with forecasting a phase of the Project that may be several decades in the future. Generally, decommissioning is defined as the permanent end of pipeline operation but without discontinuing service, whereas abandonment is defined as the permanent end of use, or operation, of a pipeline, and its removal from service. Enbridge will determine whether to decommission or abandon the Project along with specific methods to facilitate this process when a decision is made to remove it from service. At such time, a detailed ESA will be completed to determine potential effects and mitigation measures.

Generally, activities that would be completed to facilitate the abandonment or decommissioning of the Project would include pipeline purging and cleaning, pipeline cutting and capping and ground reclamation (in areas with ground disturbance). Leaving the pipeline in place generally has the least impact to the environment and causes the least disturbance to the socio-economic environment. Above-ground components (if any) will be removed. An assessment will also be completed to determine the potential for ground contamination along the RoW prior to pipeline abandonment. Reclamation objectives will be developed in accordance with applicable agency requirements at the time.

The abandonment (or decommissioning) of the Project would follow all applicable municipal, provincial and federal regulations and standards in place at the time. Potential adverse environmental and socio-economic effects associated with abandonment or decommissioning activities, as well as mitigation measures, would likely be similar to those during construction of the Project. However, abandonment or decommissioning activities will cause far fewer adverse effects than the construction of the pipeline provided the pipeline is decommissioned or abandoned in place.

3.ESA STUDY PROCESS

Dillon undertook the following steps as part of the ESA study process:

- *Phase 1: Description of the Environmental and Socio-Economic Setting;*
- *Phase 2: Effects Assessment;*
- *Phase 3: Cumulative Effects Assessment; and,*
- *Phase 4: Inspection, Monitoring and Follow-Up.*

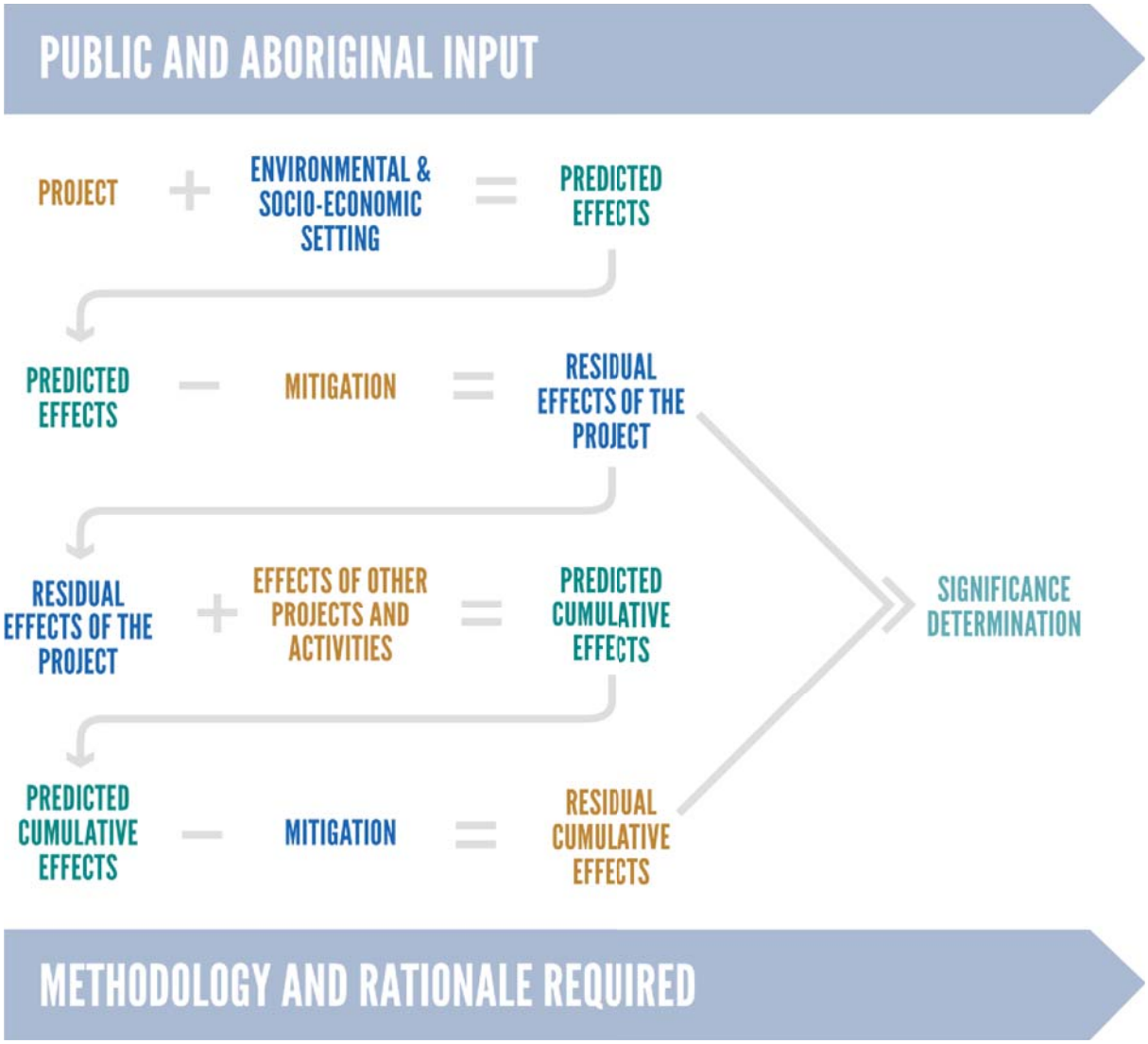
Dillon's ESA was designed to achieve the following objectives:

- *select appropriate spatial and temporal boundaries for the Project;*
- *identify the existing conditions of the area as well as assess potential Project effects;*
- *integrate comments provided to the Project team through stakeholder consultation (completed by Enbridge);*
- *choose a Preferred Route; and,*
- *recommend mitigation measures to be implemented during pipeline planning and construction.*

The ESA process was guided primarily by a variety of published literature, regulatory guidelines field work and supplemented with professional experience, as necessary. The ESA also includes information related to future Project abandonment, as well as the decommissioning of the existing pipeline. The ESA was completed between March and October 2013.

Figure 3: The ESA Process provides an overview of the ESA process.

Figure 3:
The ESA Process



Source: NEB Filing Manual, 2013

3.1. Phase 1: Description of the Environmental and Socio-Economic Setting

Dillon described the environmental and socio-economic setting in the area of the Project by developing an environmental inventory, undertaking a review of all records published through secondary sources and agencies, and completing features and constraints mapping. Dillon mapped features based on both primary and secondary data sources including existing literature, site reconnaissance activities, and contact with local, and provincial and federal agencies.

The purpose of collecting data to compile features mapping was to assist the Project team and stakeholders in understanding the existing conditions of the area and how the environment may be affected by the Project. The features maps serve as the baseline for route evaluation and determination and for assessing the potential impacts (including cumulative and residual effects) resulting from all phases of the Project.

The environmental and socio-economic setting established for the Project was used to predict the effects of the Project. The baseline information provided a backdrop against which the Project's effects were assessed, including the cumulative effects of the Project.

Data Sources

Primary and secondary source data was collected and used to develop the environmental and socio-economic baseline conditions for the Project. Primary sources include data retrieved during site reconnaissance and field studies, and secondary sources include data obtained through the review of electronic databases, published reports, existing literature, journals, information letters, and information received from Project stakeholders. Proper record-keeping practices were exercised to maintain data and results for future use. Methods used to retrieve information included internet research, local libraries, and correspondence with agencies and other stakeholder. A list of key secondary sources is included in **Table 3** below.

Table 3:
Key Records and Resources Reviewed

Source	Records Reviewed
Manuals/Guidelines	Natural Heritage Reference Manual, Second Edition, 2010
	Significant Wildlife Habitat Technical Guide, Appendices and Eco-region 7E Criteria Schedules
	Hamilton Harbour and Watershed Fisheries Management Plan
Land Information Ontario	Interactive Online Mapping Tool Warehouse Data
Natural Heritage Information Centre (NHIC)	Biodiversity Explorer ▪ Rare species ▪ Rare plant communities ▪ Natural areas ▪ Invasive species ▪ Wildlife Concentration Areas Ontario Herpetofaunal Summary Atlas Ontario Odonata Atlas
Ministry of Natural Resources (MNR) Guelph District	Consultation with staff at the MNR took place to identify Species at Risk and Species of Special Status with the potential to occur in the LSA and RSA. A list of species to consider and species-specific field survey protocols were provided. Provincially Significant Wetland (PSW) evaluations and fisheries records for watercourses in the LSA and RSA obtained.
MNR Species at Risk Website	Accessed to determine status of species as a Species of Special Status or a Species at Risk. Species at Risk Government Response Statements and Recovery Strategies accessed.

Source	Records Reviewed
Species at Risk Public Registry	Accessed to determine status of species as a Species of Special Status or a Species at Risk.
Committee on the Status of Endangered Wildlife in Canada (COSEWIC)	Used to identify specific information (i.e., Species Reports) on Species at Risk and Species of Special Status with the potential to occur in the LSA and RSA.
Environment Canada Documentation	Climate normals, IDF curves, hourly wind speed and direction records.
Ministry of Environment (MOE) Ambient Air Quality Monitoring Data	Hourly monitoring data at Hamilton west, downtown, and mountain stations
Canadian Climate Normals 1981-2010 Webpage	Canadian Climate Normals 1981 – 2010
Intensity-Duration-Frequency Curves Webpage	IDF Curves 2012
Archived National Ambient Air Quality Objectives Webpage	Archived National Ambient Air Quality Objectives
Canadian Council of Ministers of the Environment Webpage	Canadian Council of Ministers of the Environment, 2000, Canada-Wide Standards for Particulate Matter (PM) and Ozone, June, 2000.
Hamilton Conservation Authority	Assessment Report, Hamilton Region Source Protection Area (2010). Westover Creek Watershed- Stewardship Action Plan (2011). West Spencer Creek Watershed- Stewardship Action Plan (2011). Middle Spencer Creek Watershed- Stewardship Action Plan (2011). Hamilton Natural Areas Inventory.
City of Hamilton	Urban and Rural Official Plan and mapping schedules. Zoning By-Law and Index Maps (November 2006). City of Hamilton Online Mapping 2013. Map No. 4- Environmentally Significant Areas (January 2005). City of Hamilton Airport Employment Growth District Water and Wastewater Master Plan, 2008.
Ontario Breeding Birds Atlas (OBBA)	Square 17NH79
Mammals of the Western Hemisphere v3.0	Digital data files of species' range distributions
Distribution of Fish and Mussel Species at Risk Mapping for HCA	Fisheries and Oceans Canada (2013) mapping of occurrences of federally listed Endangered, Threatened and Special Concern fish and mussel species
Canadian Association of Petroleum Producers, Canadian Energy Pipeline Association, Canadian Gas Association	Pipeline Associated Watercourse Crossings Manual, 3rd Edition (2005).
Chapman, L.J., and Putnam, D.F., (1984) The Physiography of Southern Ontario.	Physiographic Regions: ▪ 6 – Flamborough Plain ▪ 22 – Norfolk Sand Plain
Barnett, P.J., Cowan, W.R. and Henry, A.P. (1991), Quaternary Geology of Ontario, Southern Sheet; Ontario Geological Survey	Map 2556, Scale 1:1,000,000

Source	Records Reviewed
Ontario Geological Survey (1991), Bedrock Geology of Ontario, Southern Sheet	Map 2554, Scale 1:1,000,000
Niagara Escarpment Commission	Niagara Escarpment Plan Area
Greenbelt Plan, 2005	Greenbelt Plan Area
Provincial Policy Statement, 2005 (including updates)	Guidance document
Growth Plan for the Greater Golden Horseshoe, Office Consolidation, January 2012	Guidance document

3.2. Phase 2: Effects Assessment

Dillon reviewed the planned Project construction activities and operation of the proposed pipeline to assist in predicting the potential effects on valued components identified.

Table 3.1:
Potential Interactions of the Project with Valued Components

Valued Component	Interaction (Y/N)	Description of Potential Interaction(s)	Description of Potential Effects
Physical and Meteorological Environment	N	• No effects anticipated.	
Soil and Soil Productivity	Y	• Grubbing, stripping and excavation. • Open trenching	• Loss of topsoil through wind erosion • Loss of topsoil through surface water erosion • Soil compaction and rutting
Vegetation	Y	• Vegetation clearing and grubbing. • Re-vegetation. • Operational use of the RoW.	• Changes to native vegetation composition • Creation of new woodland edge • Spread of Forest Pathogens (i.e., Emerald Ash Borer) • Invasive species and/or Weed introduction and spread
Water Quality and Quantity	Y	• Vegetation clearing and grubbing. • Temporary watercourse crossings. • Dewatering activities. • Watercourse crossings. • Hydrostatic testing.	• Short-term disruption or alterations to natural groundwater levels and flow patterns especially in relation to dewatering • Reduced shade, increased thermal loading of watercourses

Valued Component	Interaction (Y/N)	Description of Potential Interaction(s)	Description of Potential Effects
			and increased algae growth • Sedimentation caused by loss of rooting • Interference with drainage tiles and irrigation systems. • Alteration of surface water drainage systems.
Fish and Fish Habitat	Y	• Watercourse crossings (open trench and trenchless). • Temporary bridged watercourse crossings. • Hydrostatic testing.	• Riparian habitat alteration • In-stream habitat alteration • Fish injury or mortality • Blockage of fish movements • Interbasin transfer of aquatic organisms
Wetlands	Y	• Vegetation clearing and grubbing. • Topsoil stripping, grading, trenching. • Pipeline installation (open trench and trenchless). • Backfilling and topsoil replacement.	• Alteration of wetland habitat function • Alteration of wetland hydrologic function • Introduction and/or spread of wetland associated invasive species • Fragmentation of wetland habitat
Wildlife and Wildlife Habitat	Y	• Vegetation clearing and grubbing. • Open trenching.	• Loss and alteration of wildlife populations and/or habitat • Habitat fragmentation • Wildlife movement blockage • Loss and/or alteration of habitat • Changes to habitat availability • Increase in mortality risk
Species at Risk and Species of Special Status Provincially listed Species at Risk			
Air Emissions	Y	• Construction activities including the use of heavy machinery as well as an increase in local traffic.	• Increase of localized fugitive dust emissions. • Increase in criteria air contaminants (CAC) emissions
Greenhouse Gas Emissions	Y	• Construction activities including the use of heavy machinery as well as an increase in local traffic.	• Temporary and transitory increase in GHGs
Acoustic	Y	• Construction activities including the use	• Temporary and

Valued Component	Interaction (Y/N)	Description of Potential Interaction(s)	Description of Potential Effects
Environment		of heavy machinery as well as an increase in local traffic. • Hydrostatic testing.	transitory increase in noise emissions.
Human Occupancy and Resource Use	Y	• Construction activities.	• Sensory effects to nearby residents. • Work adjacent to residences, farmsteads and other structures. • Temporary and transitory disruption to farming activities.
Heritage Resources	Y	• Construction activities including open trenching.	• Damage to, or the loss of, previously unidentified significant archaeological or other heritage sites.
Navigation and Navigation Safety	N	• No navigable waters were identified thus no effects are anticipated.	
Traditional Land and Resource Use	N	• No traditional land and resource uses were identified and thus no effects are anticipated.	
Social and Cultural Well-Being	N	• Project construction and operation is not anticipated to impact the local community and thus no effects are anticipated.	
Human Health and Aesthetics	Y	• Construction activities.	• Unsafe conditions if construction areas are not secured appropriately. • Impact to human health in the event of a spill or other unforeseen incident. • Interaction with contaminated sites. • Temporary and transitory visual nuisance to nearby residences during construction.
Infrastructure and Services	Y	• Increased use of existing infrastructure and local services.	• Increased traffic at road crossings. • Increased demand for parking. • Potential to disrupt existing utility infrastructure

Valued Component	Interaction (Y/N)	Description of Potential Interaction(s)	Description of Potential Effects
Employment and Economy	Y	• Economic benefits as a result of the use of local services and labour (where possible).	• Generate employment opportunities and economic "spin-offs".
Accidents and Malfunctions	Y	• Equipment failure and accidental spill of hazardous materials during construction, operation, or decommissioning. • Pipeline failure during operation resulting in an accidental release of liquids.	• Leaks from equipment and machinery or other spills causing contamination of soils and/or water • Pipeline failure resulting in adverse effects to valued components
Effects of the Environment on the Project	Y	• Various environmental conditions including climate change, extreme weather incidents and seismic activity.	• Delay in construction • Damage to facilities

Once potential Project effects were identified and understood, mitigation measures were identified that reflected:

- *Enbridge's Environmental Guidelines for Construction (2012);*
- *professional judgment and past experience of the Dillon team;*
- *industry best practices as well as the relevant permitting authority requirements; and,*
- *feedback received as part of the consultation program.*

The objective of Dillon's effects assessment was to:

- *predict and analyze the nature and extent of Project effects;*
- *identify mitigation measures to protect valued components; and,*
- *determine the significance of any effects remaining following mitigation (i.e., residual effects), including the significance of combined effects (where applicable).*

Several criteria were used to assess the significance of residual effects. Significant environmental effects are those identified as being adverse, and having sufficient magnitude, duration, frequency, geographical extent and irreversibility that may adversely affect a valued component to an unacceptable degree. The following table provides an overview of criteria used to determine the significance of potential residual effects.

Table 3.2:

Residual Effects Assessment – Definition of Criteria

Significance Criteria	Range of Criteria	Definition
Spatial Boundary (Geographic Extent)	PF LSA RSA	***Project Footprint* or PF** – The Project effect occurs only within the footprint of the Project. ***Local Study Area or LSA*** – The Project effect occurs within the LSA. ***Regional Study Area or RSA*** – The Project effect occurs within the RSA (i.e., within approximately 2 km).

Significance Criteria	Range of Criteria	Definition
Direction of Change (the type of effect)	Neutral Negative Positive	***Neutral*** – No net benefit or loss to a valued component. ***Negative*** – Net loss to a particular valued component. ***Positive*** – Net benefit to a valued component.
Magnitude (the extent of the effect in terms of size)	Negligible or Low Medium High	***Negligible or Low*** – Residual effects will have no measurable effects on a landscape or species distribution. ***Medium*** – Residual effects may alter the landscape and species distributions but will not reduce overall diversity. ***High*** – Residual effects are detected and may alter the environmental and socio-economic element.
Duration (the length of the timeframe in which an effect occurs)	Immediate Short Term Medium Term Long Term	***Immediate*** – The timeframe of the effect is one week or less. ***Short Term*** – The timeframe of the effect is approximately one year or less. ***Medium Term*** – The timeframe of the effect is more than a year but within the expected life of the Project. ***Long Term*** – The timeframe of the effect is beyond the life of the Project.
Frequency (how many times the event that causes the effect occurs)	Once Rarely Intermittently Continuous	***Once*** – The effect occurs one time. ***Rarely*** – The effect occurs less than five times during the course of the Project. ***Intermittently*** – The effect occurs several times in a sporadic pattern. ***Continuous*** – The effect occurs constantly.
Reversibility (the degree of permanence)	Reversible Irreversible	***Reversible*** – The valued component is anticipated to recover from an effect caused by the Project. ***Irreversible*** – The valued component will likely not recover from an effect caused by the Project.
Probability (likelihood of residual effects occurring)	Low Medium High	***Low*** – Residual effect will likely not occur. ***Medium*** – Residual effect will likely occur. ***High*** – Residual effect will occur.
Professional Judgment (extent of reliance on professional judgment including Dillon and Enbridge)	Nil Low Moderate High	***Nil*** – No professional judgment was used in determining the significance of Project effects. Determination of significance based solely on scientific data. ***Low*** – Minimal professional judgment was used in determining the significance of Project effects in combination with other sources. ***Moderate*** – An increased level of professional judgment was used to determine the significance of Project effects in combination with other sources. ***High*** – Professional judgment was solely used to evaluate the significance of Project effects.
Prediction Confidence (level of certainty in prediction of residual effects)	Low Moderate High	***Low*** – Level of certainty in prediction of residual effects is poor due to unavailable data. ***Moderate*** – Determination of significance is based on a good understanding of Project effects, but incomplete data. ***High*** – Determination of significance is based on a good understanding of baseline conditions and potential effects using pertinent data.

Significance Criteria	Range of Criteria	Definition
Ecological and Social Context (sensitivity of a particular VEC or VSC)	Sensitive Not Sensitive	***Sensitive*** – The valued component to be affected by a residual effect is considered to be sensitive from an environmental or socio-economic standpoint. ***Not Sensitive*** – The valued component to be affected by a residual effect is not considered to be sensitive from an environmental or socio-economic standpoint.

For the purposes of this ESA, a "significant residual effect" is defined as being negative in direction, has a high probability of being long-term, irreversible, of a high magnitude, will occur continuously and exceeds regulatory requirements to an unacceptable degree. The determination of significance also included a review of Project effects that are predicted to occur in the same area over the same timeframe.

The residual effects assessment included all phases of the Project as well as effects caused by potential accidents and malfunctions and effects of the environment on the Project. The cumulative effects assessment also included the use of the above criteria when assessing residual effects. The Project team used both a qualitative and qualitative approach when completing the residual effects assessment.

3.3. Phase 3: Cumulative Effects Assessment

The cumulative effects assessment focused on predicted residual effects of the Project acting in combination with the effects of other projects that have been, or will be, carried out. The assessment was limited to available information on other projects, distance between the Project and other projects, and their potential for environmental and socio-economic effects.

Several documents were reviewed to help guide the assessment including *CEAA*'s *Operational Policy Statement Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012.* In addition, professional knowledge and experience were used to assess cumulative effects on valued components in the absence of regulatory guidelines or thresholds. Mapping provided by the City of Hamilton (2012 and 2013) was also used to identify current, past and future capital works projects in the area.

Spatial and Temporal Boundaries

The identification of cumulative effects was based on defined spatial and temporal boundaries. While a quantitative approach (completed primarily through the use of GIS to assess areas of potential ground disturbance) was used to assist in the identification of effects, a qualitative approach was also used as a supplement. The spatial boundaries identified as appropriate for the cumulative effects assessment is an approximate 2 km buffer from the pipeline centerline. Temporal boundaries identified for the assessment include recently constructed projects, projects currently under review, under construction or planned within three years before or three years following Project construction.

Residual Cumulative Effects and Significance

The cumulative effects assessment included an evaluation of the significance of residual cumulative effects. The evaluation of significance focused on the total cumulative effect that may be created from all Project effects in combination with the effects of other projects.

3.4. Phase 4: Inspection, Monitoring and Follow-Up

The ESA also includes an overview of the inspection and monitoring program. Enbridge will monitor the biophysical and social environments to determine any adverse effects and to verify that the construction site is returned to pre-construction conditions as soon as possible. Post-construction monitoring will be completed to ascertain the success of the restoration effort and mitigation measures. The knowledge gained from inspection and monitoring will be used in future projects to avoid or minimize similar problems that may arise.

Monitoring will also allow for the comparison of predicted effects with the actual effects. Monitoring should also incorporate the area of the decommissioned pipeline.

4.STAKEHOLDER AND ABORIGINAL CONSULTATION

The stakeholder consultation program was undertaken by Enbridge for this Project. Detailed information relating to the program is provided in the application filed by Enbridge.

Input received as a result of consultation with stakeholders was incorporated in the ESA (where possible) with respect to routing and design, as well as mitigation measures. Enbridge is committed to ongoing consultation with Project stakeholders.

5.ENVIRONMENTAL AND SOCIO-ECONOMIC SETTING

This section provides information on the baseline environment within the spatial boundaries identified for the Project. For the biophysical aspects of this section, detailed field investigations focused on the DFWA, an area of 50 m on either side of the existing corridor and reroute alternative. Less detailed baseline data was collected within the LSA, from 50 m to 500 m on either side of the existing corridor and reroute alternative. Secondary source data was only collected for the RSA outside of the LSA, from approximately 500 m to 2 km.

Existing corridor looking south from Concession Road 5 (Dillon, 2013).

Field studies began in May of 2013 and continued through the summer and fall. Due to a lack of property access, spring field studies did not occur in all areas. Where these data gaps occur, Dillon assumed that the feature (i.e., species and their habitat) was present and therefore prescribed additional mitigation measures accordingly. This allowed Dillon a greater level of confidence in conducting the ESA. Despite this condition, more field study may be required depending on construction timing and techniques to confirm the assumptions made. These studies will be completed prior to construction to inform the EPP.

5.1. Biophysical Environment

The LSA for the existing corridor and reroute alternative is located within the rural area of the City of Hamilton. The region is on the western end of Lake Ontario and is approximately 2.5 km from the Niagara Escarpment, outside of the mapped Niagara Escarpment Plan boundary. The area contains a mix of rural and agricultural fields and natural features, such as wetlands and woodlands. The area is also known to contain wildlife habitat and geological features. Much of the surrounding natural environment contains species typically associated with the Carolinian Forest Zone, and as a result, is known to have high species diversity. The following sections provide information on the environmental setting within the LSA and RSA for the identified valued components including.

- *Physical and meteorological environment;*
- *Soil and soil productivity;*
- *Vegetation;*
- *Water quality and quantity;*

- *Fish and fish habitat;*
- *Wetlands;*
- *Wildlife and wildlife habitat;*
- *Species at Risk and Species of Special Status;*
- *Air emissions;*
- *Greenhouse gas emissions; and,*
- *Acoustic environment.*

In general, the sections describe the biophysical environment from north to south. Tables and figures (including GIS mapping) have been used, where possible, to increase clarity and reduce text.

5.1.1. Physical and Meteorological Environment

A summary of the physical and meteorological setting within the LSA and RSA is described below.

5.1.1.1. Physiography

The existing and reroute corridors are located in two different physiographic regions. The northern portion of the LSA falls within a physiographic region known as the Flamborough Plain, which spans from Flamborough Township, and encompasses an area of approximately 390 km^2.

The remaining portion of the LSA lies within a physiographic area known as the Norfolk Sand Plain. The Norfolk Sand Plain is wedge shaped with a broad, curved base along the shore of Lake Erie and tapers northward to a point at Brantford on the Grand River.

5.1.1.2. Bedrock Geology

In southwestern Ontario and within the LSA, Proterozoic igneous and metamorphic rocks are deeply buried (approximately 1,500 m) beneath Paleozoic (545 million to 300 million years old) sedimentary rocks and Quaternary (2 million years ago to present day) deposits. Along the existing corridor and reroute alternative, regional mapping indicates that Upper Ordovician and Lower Silurian-aged sedimentary bedrock is present. The bedrock surface within the entire LSA is expected to be between 215 to 250 masl. The depth to bedrock ranges from 0 in the northern portion of the LSA to 17 m in the southern portion.

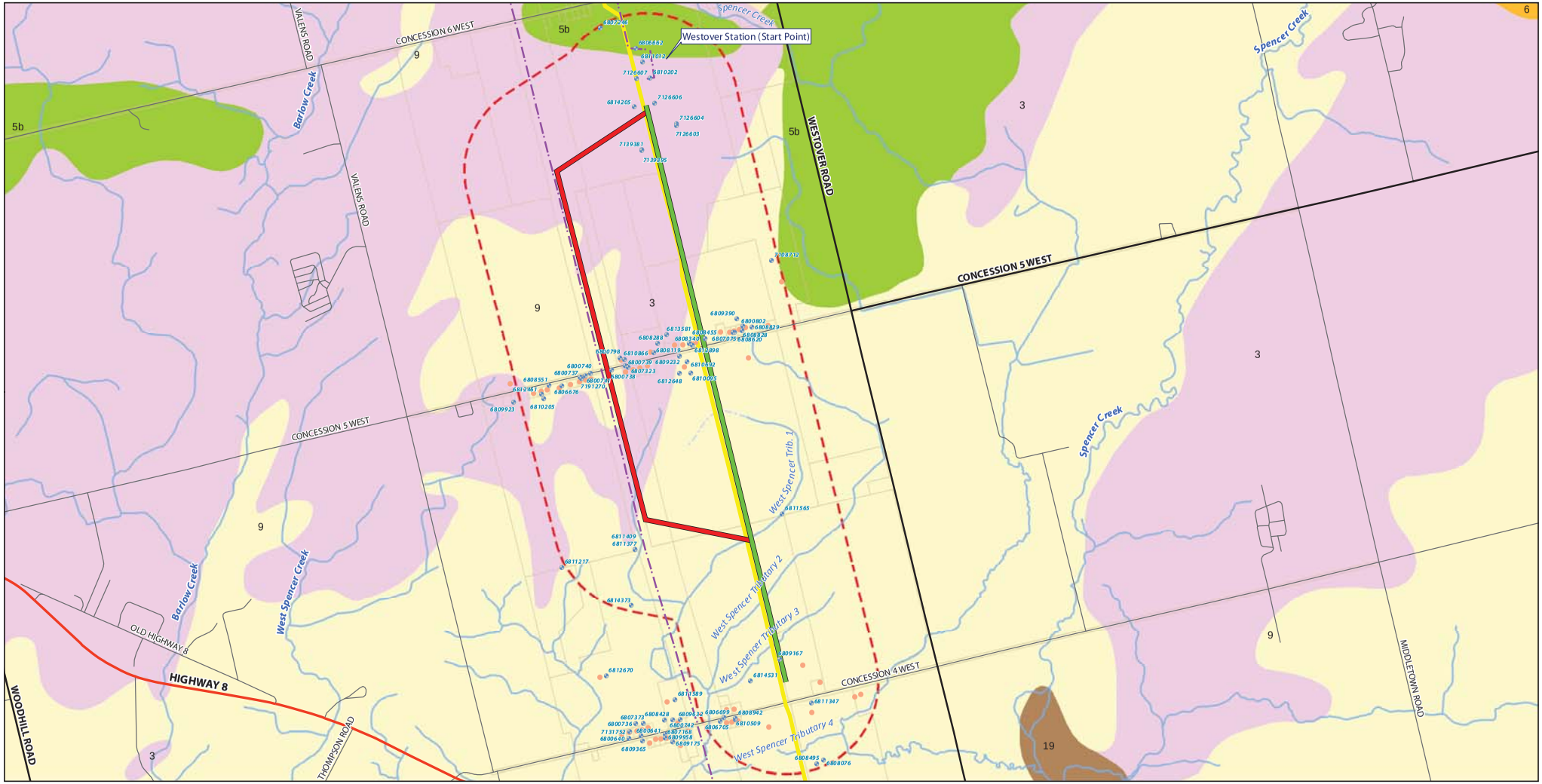
5.1.1.3. Surficial Geology

The following section presents a summary of the surficial geological conditions within the LSA, based on available published Ontario Geologic Survey (OGS, 1991) regional mapping. Surficial geology conditions in the RSA are mapped on **Figure 5: Surficial Geology and Water Well Records**.

Along the upper reach of the LSA, surficial geology mapping indicates that Paleozoic bedrock may be exposed at the surface in certain locations. Mapping indicates that the bedrock type is primarily undifferentiated carbonate and clastic sedimentary rock (i.e., Guelph Formation) either exposed at the surface or covered by a discontinuous, thin layer of drift (between 0 and 5 m thick).

Where overburden exists, it is generally comprised of coarser grained glaciolacustrine deposits (sands and gravels), interspersed with minor amounts of finer-grained silts.

Near the middle to lower reaches of the LSA, mapping generally indicates an increase in overburden thickness, consisting primarily of glaciolacustrine deposits. These Pleistocene-aged deposits consist of sands, gravelly sands, and gravels interspersed with finer silts and clays, with minor amounts of sand (nearshore and quiet water deposits). Overburden thickness in this area is variable, and can range between 50 and 100 m.



ENBRIDGE PIPELINES
LINE 11 WESTOVER SEGMENT
REPLACEMENT AND
DECOMMISSIONING PROJECT

ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT

SURFICIAL GEOLOGY AND WATER WELL RECORDS
FIGURE 5

Project Components
- Potential Line 11 Replacement Alternative (Option 1)
- Potential Line 11 Reroute Alternative (Option 2)
- Existing Line 11
- Local Study Area

Base Map
- MOE Water Well Record
- Location with Potential Water Well
- Hydro Transmission Line
- Highway
- Arterial Road
- Collector Road
- Local Street
- Watercourse
- Dillon Delineated Watercourse
- Parcel
- 3: Paleozoic bedrock
- 5b: Stone-poor, carbonate-derived silty to sandy till
- 6: Ice-contact stratified deposits
- 7b: Gravelly deposits
- 9: Coarse-textured glaciolacustrine deposits
- 19: Modern alluvial deposits

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MAP DRAWING INFORMATION:
DATA PROVIDED BY MNR, Geowarehouse, City of Hamilton, LOID, Google Earth Pro

MAP CREATED BY: GM
MAP CHECKED BY: CC
MAP PROJECTION: NAD 1983 UTM Zone 17N

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5.1.1.4. Ground Stability

According to Natural Resources Canada, the Project is located in the Southern Great Lakes Seismic Zone which generally has a low to moderate level of seismicity. Over the past 30 years, three earthquakes have been recorded in the Southern Great Lakes Region, measured at a magnitude of 2.5 or slightly larger. By comparison, over the same time period, the smaller region of Western Quebec experienced 15 earthquakes per year, each at a magnitude of 2.5 or greater (NRCan, 2012).

5.1.1.5. Climate

The LSA is located in the southern portion of the Great Lakes Climate Zone, which covers southern Ontario. The Great Lakes have a humid continental climate which is influenced by air masses from dry, cold Arctic systems in the north, mild Pacific air masses from the west, and warm, wet tropical systems from the south and Gulf of Mexico. The lakes themselves also have a moderating impact on the climate that can intensify precipitation.

Environment Canada climate normal data from the Hamilton Airport, for the years of 1981 to 2010, were used for this ESA (Environment Canada 2013a). The station is located approximately 10 km away from the LSA and climate information from the airport is considered to be representative of climatic conditions within the LSA given their close proximity to one another and the similarity of site characteristics (i.e., landscape and terrain features) and adjacent land use.

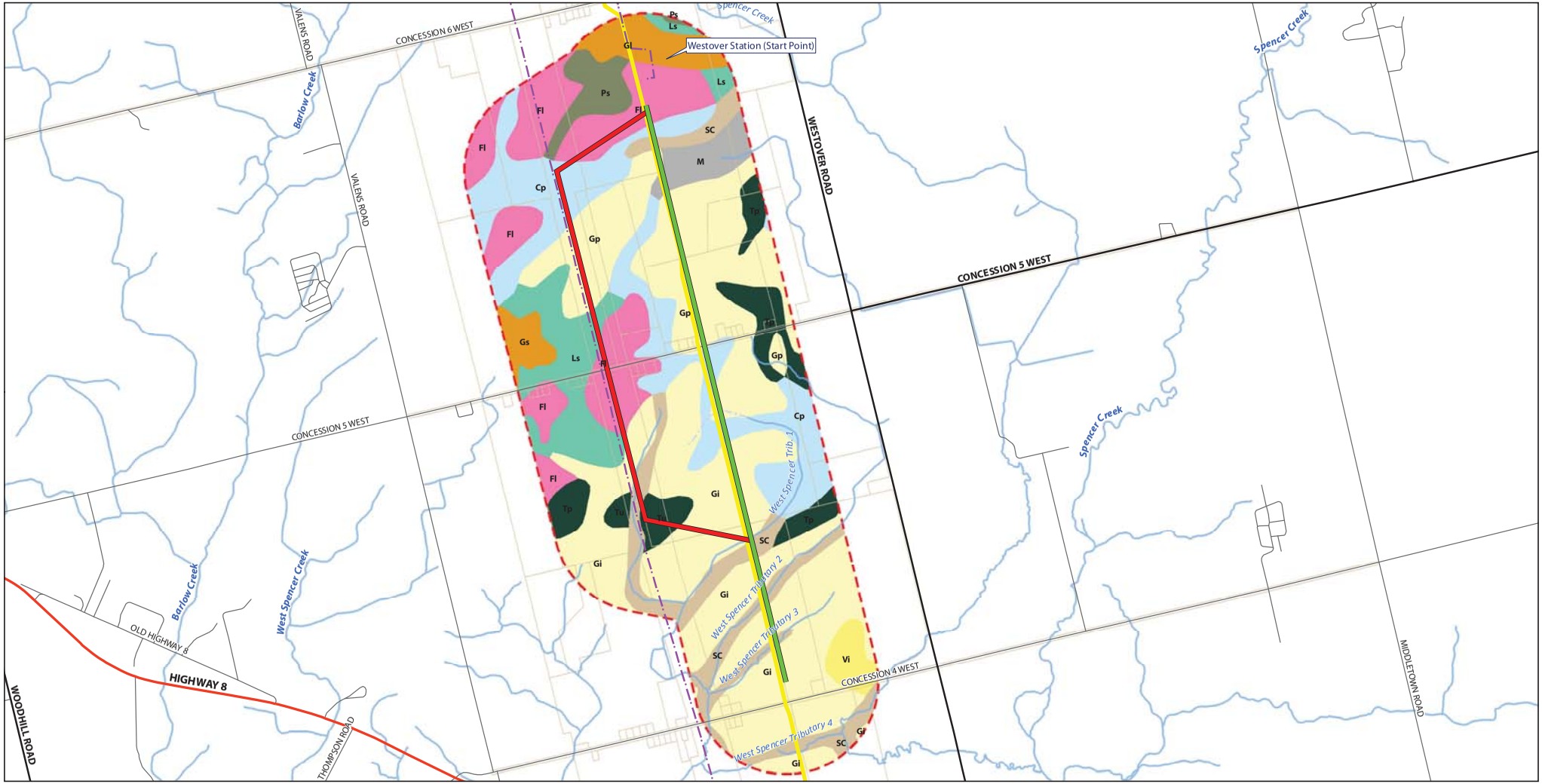
5.1.1.6. Summary of the Physical or Meteorological Environment

Impacts to the physical and meteorological environment as a result of the Project are not anticipated, and as such, will not be considered in the effects assessment.

5.1.2. Soil and Soil Productivity

For the purpose of providing a summary of soil existing conditions in the LSA, the Wentworth County Soil Report (No. 32) was reviewed along with associated mapping. The soils mapped within the LSA are provided in **Figure 5.1: Soils**.

A summary of each soil type mapped within the DFWA is presented in **Table 5.** The table provides information on the soil series and family, parent material, drainage characteristics, area comprised of each soil type within the DFWA, and percentage of each soil type within the DFWA. This table should be read in conjunction with **Figure 5.1: Soils.** A brief synopsis of each soil type is provided after the table.



ENBRIDGE PIPELINES
LINE 11 WESTOVER SEGMENT REPLACEMENT AND DECOMMISSIONING PROJECT

ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT

SOILS

FIGURE 5.1

Project Components
- Potential Line 11 Replacement Alternative (Option 1)
- Potential Line 11 Reroute Alternative (Option 2)
- Existing Line 11
- Local Study Area

Base Map
- Hydro Transmission Line
- Highway
- Arterial Road
- Collector Road
- Local Street
- Watercourse
- Dillon Delineated Watercourse
- Parcel

- Vineland sandy loam (Vi)
- Tuscola silt loam (Tu) - shallow phase (Tp)
- Stream Courses (SC)
- Parkhill loam (Ps)
- Muck (M)
- London loam (Ls)
- Guelph loam (Gl) - shallow phase (Gs)
- Grimsby sandy loam (Gi) - shallow phase (Gp)
- Farmington loam (Fl)
- Colwood silt loam (Co)

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MAP CREATED BY: GM
MAP CHECKED BY: CC
MAP PROJECTION: NAD 1983 UTM Zone 17N

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNR, Geowarehouse, City of Hamilton, LOID, Google Earth Pro

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Table 5:
Soils within the DFWA Identified for the Project

Series, Family, and Symbol	Order	Parent Material	Drainage	Area (m^2)	Area (percent)
Existing Corridor					
Grimsby sandy loam (Gi) - shallow phase (Gp)	Grey-Brown Podzolic	Loam till	Well Drained	226,200	68.6
Colwood silt loam - shallow phase (Cp)	Humic Gleysol	Water deposited silt loam and fine sandy loam	Poorly Drained	42,500	12.9
Stream Courses (Sc)	-	-	-	31,000	9.4
Muck	Organic	-	Very Poorly Drained	15,400	4.7
Farmington loam (Fl)	Brown Forest	Less than 12" loam till over bedrock	Well Drained	14,600	4.4
Reroute Alternative					
Grimsby sandy loam (Gi) - shallow phase (Gp)	Grey-Brown Podzolic	Loam till	Well Drained	106,400	33.3
Farmington loam (Fl)	Brown Forest	Less than 12" loam till over bedrock	Well Drained	103,500	32.4
Colwood silt loam - shallow phase (Cp)	Humic Gleysol	Water deposited silt loam and fine sandy loam	Poorly Drained	38,800	12.1
Tuscola silt loam (Tu)	Grey-Brown Podzolic	Water deposited silt loam and fine sandy loam	Imperfectly Drained	25,400	7.9
London loam (Ls)	Grey-Brown Podzolic	Loam till	Imperfectly Drained	23,900	7.5
Stream Courses (Sc)	-	-	-	21,800	6.8

Source: OMAF

Grimsby sandy loam was mapped across 68.6 percent of the existing corridor and 33.3 percent of the reroute alternative. These soils were developed on alluvial and lacustrine deposits of medium and fine sandy loam and have a gently to moderately sloping topography which allows the soils to drain well. Erosion and drought are problems on moderate to steep sloping areas. Grimsby soils are used for growing forages, grain corn, spring grains and fall wheat, as well as sweet corn, tomatoes, strawberries and tree fruits. Crop yields may be limited as a result of the drainage conditions and may require additional irrigation to overcome the low soil moisture.

Farmington loam was mapped across 4.4 percent of the existing corridor and 32.4 percent of the reroute alternative. These are shallow soils that overlie bedrock and do not exceed 0.3 m in depth. They are characterized as well drained, generally have loam textures and silt, sand and gravel inclusions are common. Farmington soils are not often used for cultivation due to the shallow depth, low moisture content and numerous stones and bedrock outcroppings.

Colwood silt loam was mapped across 12.9 percent of the existing corridor and 12.1 percent of the reroute alternative. These soils were formed on lacustrine silt loams and fine sandy loam deposits. Both deep and shallow Colwood soil deposits are present within the LSA. Deeper soils are found in depressional areas near the Dundas valley and shallow soils occur on the Flamborough plain. These soils usually have up to 0.2 m of muck overlying organic-rich silt loam and are usually too wet, small or shallow for agricultural purposes. These lands are likely uncleared or used for pasture.

Tuscola silt loam was mapped across 7.9 percent of the reroute alternative. These soils were formed on lacustrine silt and fine sandy loams and occur in level areas or valleys. This soil usually consists of alternating layers of silt loam and fine sandy loam and has a reddish hue. Mottling is also often found in the subsoil horizons. These soils have imperfect drainage which allows for the growing of forage and row crops, especially grain corn, sweet corn and strawberries.

London loam was mapped across 7.5 percent of the reroute alternative. These soils are generally associated with the Guelph soils as they mainly occur on level areas within drumlin fields. These soils are sandier than the Guelph soils and used more extensively for growing row and market crops as they have a better moisture supply, are less subject to erosion and have fewer stones.

Muck was mapped across 4.7 percent of the existing corridor. Muck deposits consist of black, friable, well decomposed organic debris and are generally greater than 0.3 m thick. Areas with these soils are typically left uncleared and not used for agricultural purposes.

Stream courses are mapped across 9.4 percent of the existing corridor and 6.8 percent of the reroute alternative. They are defined as boulder beds or bedrock over which stream activity occurs for most of the year. Stream activity has eroded and or removed most of the fine materials leaving gravel, boulders and bedrock as the prime constituents of the stream bed.

5.1.2.1. Soil Hazards

Grimsby Sandy Loam soils are susceptible to high wind erosion. The remaining sections of the existing corridor and reroute alternative may experience moderate wind erosion as they have a loam or silt loam surface texture.

Soils having slopes greater than 15 percent are considered to have high water erosion hazard. Soils having slopes greater than 15 percent along the existing corridor include Grimsby sandy loam, Farmington loam and the stream courses. Soils having slopes greater than 15 percent along the reroute alternative include Grimsby sandy loam and Farmington loam. The majority of the soils are considered to have gentle to moderate water erosion hazard. Water erosion is not considered to be of great concern during construction activities.

Soils comprised of fine textured materials (silt and clay) are susceptible to soil compaction and include Colwood silt loam, Tuscola silt loam and London loam. These soils comprise approximately 12.9 percent of the existing corridor and 27.5 percent of the reroute alternative.

5.1.2.2. Contaminated Soils

No known contaminated sites were identified through a search of the Federal Contaminated Sites Inventory (Treasury Board, 2013). During construction of the Project, there is a possibility that contaminated soils could be unexpectedly encountered due to the presence of previously unknown contaminated sites. Potentially contaminated sites may include but are not limited to existing and former gas stations, vehicle repair shops, waste disposal sites, railway RoW, public works yards, transformer stations, utility pole storage yards and lumber yards. The likelihood of encountering these facilities is low as the area is primarily rural and agricultural. Potential contaminants that may be encountered include hydrocarbons (gas, diesel fuel, oil), lead, trace heavy metals, phenols, polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyl (PCBs) and fuel additives.

Other areas that exhibit potential for contaminated sites include road RoWs, utility corridors, and industrial and commercial areas.

5.1.2.3. Diseases

Crop diseases can be problematic in some fields when cultural/physical or chemical control methods are not effective or adverse weather conditions (i.e., excessive rain) are severe. To-date, no supporting documentation or personal communications indicate that diseases are present in the LSA.

5.1.2.4. Summary of Soil and Soil Productivity

Soil and soil productivity will be considered in the effects assessment. Information relating to potential Project effects and mitigation is provided in **Section 7** of this ESA.

5.1.3. Vegetation

5.1.3.1. Ecological Land Classification

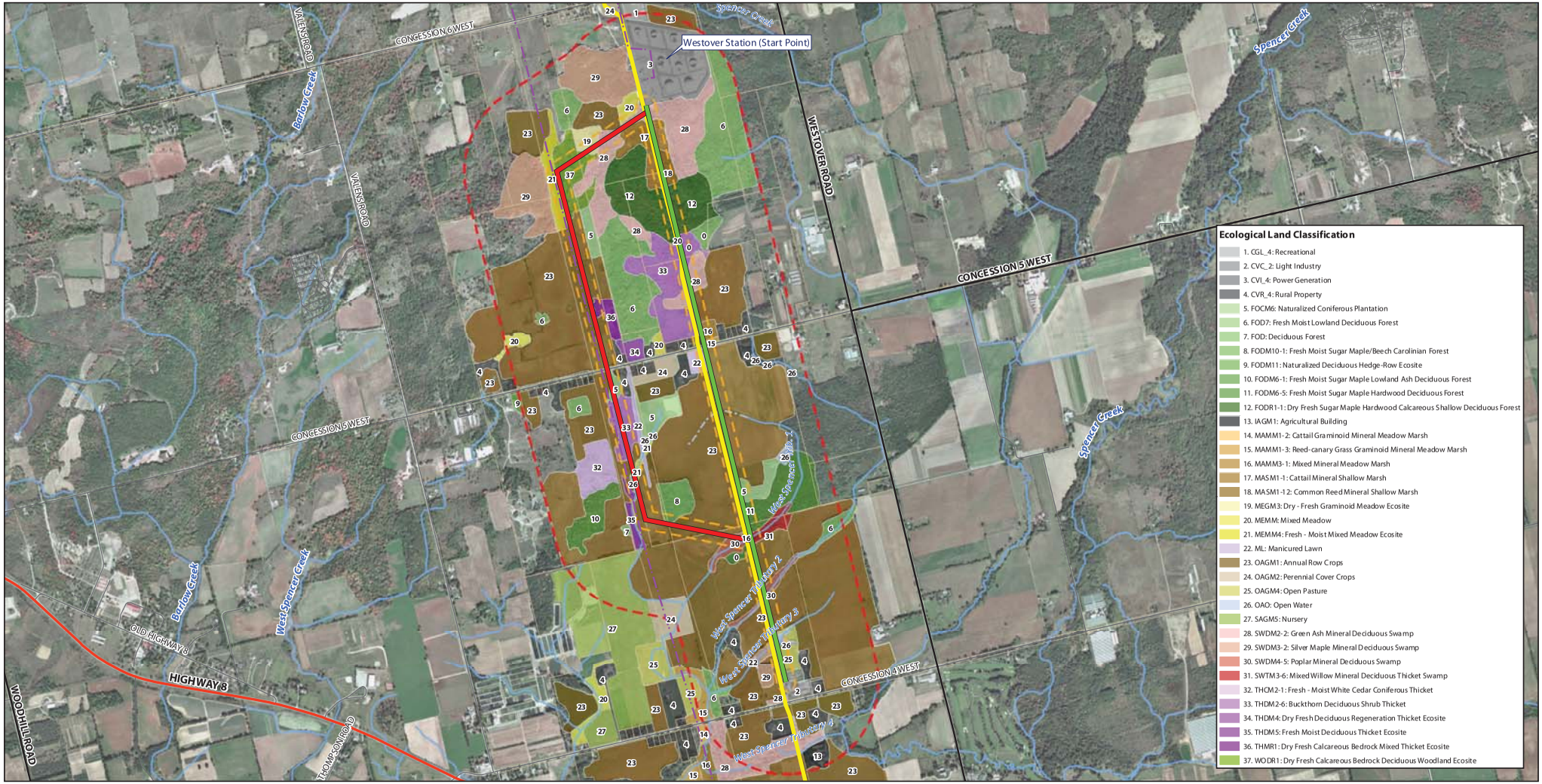
During field investigations between May and September, 2013, vegetation along both the existing corridor and reroute alternative was characterized using the Ecological Land Classification (ELC) System for Southern Ontario (Lee et al., 1998). Field data collection was undertaken in order to classify and map ecological communities to the vegetation level and to assist with the identification of wildlife habitats (see **Section 5.1.7**).

The LSA has fragmented natural features interspersed amongst an agricultural landscape. Natural features within the LSA include woodlands, wetlands, meadows and open spaces, which together, provide a diversity of plant life and wildlife habitat. Two Environmentally Significant Areas, including Westover Southwest Complex and Rockton Northeast Woodlot, fall within the boundaries of the LSA and generally overlap woodlands. The exact boundaries of these features are detailed in Map 4 of the City of Hamilton Official Plan,

The Sheffield-Rockton Provincially Significant Wetland Complex overlaps these two Environmental Significant Areas. Habitat associated with the wetland complex includes mid-aged to mature deciduous forests, graminoid and mixed meadows, marsh habitat dominated by herbaceous floating and emergent plants, as well as Green Ash swamps. A total of four wetlands were identified in association with the Sheffield-Rockton Complex, of which two have been previously evaluated as provincially significant.

The majority of the southern portion of the LSA (south of Concession 5 West) consists of agricultural fields (i.e., annual row crops); however, deciduous forests, thickets, naturalized coniferous plantations and swamps are present. The three most southern natural features (just north of Concession 4 West) fall within the boundaries of the Hayesland-Christie Provincially Significant Wetland Complex. Three wetlands were identified, all of which are part of the Hayesland-Christie Complex, and have been previously evaluated as provincially significant.

ELC surveys conducted within the LSA identified 21 natural communities and five cultural classifications. The location, type, and boundaries of these communities are delineated on **Figure 5.2: Ecological Land Classification**. All vegetation communities surveyed in the LSA are considered very common in Ontario.



ENBRIDGE PIPELINES
LINE 11 WESTOVER SEGMENT
REPLACEMENT AND
DECOMMISSIONING PROJECT

ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT

ECOLOGICAL LAND CLASSIFICATION

FIGURE 5.2

Project Components
- Potential Line 11 Replacement Alternative (Option 1)
- Potential Line 11 Reroute Alternative (Option 2)
- Existing Line 11
- Local Study Area
- 50 m Detailed Field Work Area

Base Map
- Hydro Transmission Line
- Highway
- Arterial Road
- Collector Road
- Local Street
- Watercourse
- Dillon Delineated Watercourse
- Parcel

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MAP CREATED BY: GM
MAP CHECKED BY: CC
MAP PROJECTION: NAD 1983 UTM Zone 17N

MAP DRAWING INFORMATION:
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5.1.3.2. Botanical Survey

A review of secondary sources was undertaken to determine plant species with the potential to occur in or in close proximity to the LSA. Following this background review, botanical surveys occurred over two seasons (summer and fall).

A review of secondary sources revealed occurrence records for 13 plant species, of which 12 are Species at Risk. All plant species identified in the background review are listed in **Appendix B**.

A total of 268 plant species were documented during site visits. A list of plant species observed during field studies within the LSA is included in **Appendix B**. Of the 268 species identified, 61 percent are considered native species, 29 percent are considered non-native species, and 10 percent are considered cryptogenic species, meaning their origins are unknown.

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

There were 19 plant species observed within the DFWA with a CC of 7 or greater. These species include:

- Black Maple *(Acer saccharum* ssp. *Nigrum);*
- Buttonbush *(Cephalanthus occidentalis);*
- Long-hairy Chickweed *(Cerastium velutinum);*
- Turtlehead *(Chelone glabra);*
- Crest Wood Fern *(Dryopteris cristata);*
- Common Oak Fern *(Gymnocarpium dryopteris);*
- Pale Touch-me-not *(Impatiens pallida);*
- Tamarack *(Larix laricina);*
- Michigan Lily *(Lilium michiganense);*
- Cinnamon Fern *(Osmunda cinnamomea);*
- Hairy Beard-tongue *(Penstemon hirsutus);*
- Northern Beech Fern *(Phegopteris connectilis);*
- Red Pine *(Pinus resinosa);*
- Marsh Cinquefoil *(Potentilla palustris);*
- Alder-leaved Buckthorn *(Rhamnus alnifolia);*
- Sage-leaved Willow *(Salix candida);*

- Rough-leaved Goldenrod *(Solidago patula);*
- Skunk Cabbage *(Symplocarpus foetidus); and,*
- Blue Vervain *(Verbena hastata).*

These species were found within meadows, wetlands, open habitats and mature forests.

All of the native plant species found in the LSA are considered very secure or secure in the Province of Ontario (SRank of S5 or S4), with the exception of Honey Locust (*Gleditsia triacanthos*), and Butternut (*Juglans cinerea*). Honey Locust is considered Imperiled (SRank S2) due to its restricted range, steep declines and few populations. Butternut is considered Vulnerable (SRank S3) due to its restricted range, few populations and recent and widespread declines. Additionally, of the 268 plant species observed within the LSA, Butternut is the only plant Species at Risk observed, listed as Endangered both federally and provincially.

Species that are considered Species at Risk are identified as Endangered, Threatened or Special Concern, under the federal *Species at Risk Act* (*SARA*). Species that are considered Species of Special Status are identified as Endangered, Threatened or Special Concern, under the provincial *Endangered Species Act* (*ESA, 2007*). Species that are considered Species of Conservation Concern are identified provincially as S1, S2, or S3, and are not listed federally or provincially as Endangered, Threatened or Special Concern. Species at Risk are further discussed in **Section 5.1.8**.

5.1.3.3. Woodlands

Information with respect to the attributes and composition of woodlands was captured in the data collected and recorded in the field during the ELC assessment. Woodlands that are separated by more than 20 m are considered non-contiguous and are considered separate woodlands. The amount of interior habitat present in each of the woodlands was determined using desktop GIS methods (i.e., woodland area occurring 100 m or more from edge).

The City of Hamilton's Rural Official Plan outlines criteria for defining significant woodlands. This local framework has been used to evaluate the significance of woodlands. For a woodland to be evaluated as significant, it must meet two or more of the following criteria:

- *Size: >10 ha (due to forest cover in Hamilton of 17.7 percent);*
- *Interior Forest: woodlands that contain interior forest habitat (interior forest habitat is defined as 100 m from the edge);*
- *Proximity/Connectivity: woodlands that are located within 50 m of a significant natural area (defined as wetlands 0.5 ha or greater in size, Ecologically Sensitive Areas, PSWs, and Life Science Areas of Natural and Scientific Interest (ANSIs);*
- *Proximity to water: woodlands where any portion is within 20 m of any hydrological feature, including all streams, headwater areas, wetlands and lakes;*

- *Age: woodlands with trees of 100 years or more in age (woodlands identified as mature and/or containing trees > 50 cm diameter at breast height (DBH) during ELC surveys were presumed to contain trees older than 100 years); and,*
- *Rare species: any woodlands containing Threatened, Endangered, Special Concern, provincially or locally rare plant or wildlife species.*

As shown on **Figure 5.3: Woodlands**, a total of 10 woodlands (shown as woodlands A through J) have been identified within the LSA. Of the 10 woodlands identified, five are along the existing corridor and six are along the reroute alternative (one woodland is along both route options). Of these 10 woodlands, six meet at least two of the criteria listed above, and have been evaluated as significant (see **Appendix B** for details pertaining to woodland evaluations). Furthermore, two Environmentally Significant Areas, the Westover South Complex and the Rockton Northeast Woodlot, (identified by the City of Hamilton) associated with woodlands overlap the LSA.

Westover Southwest Complex

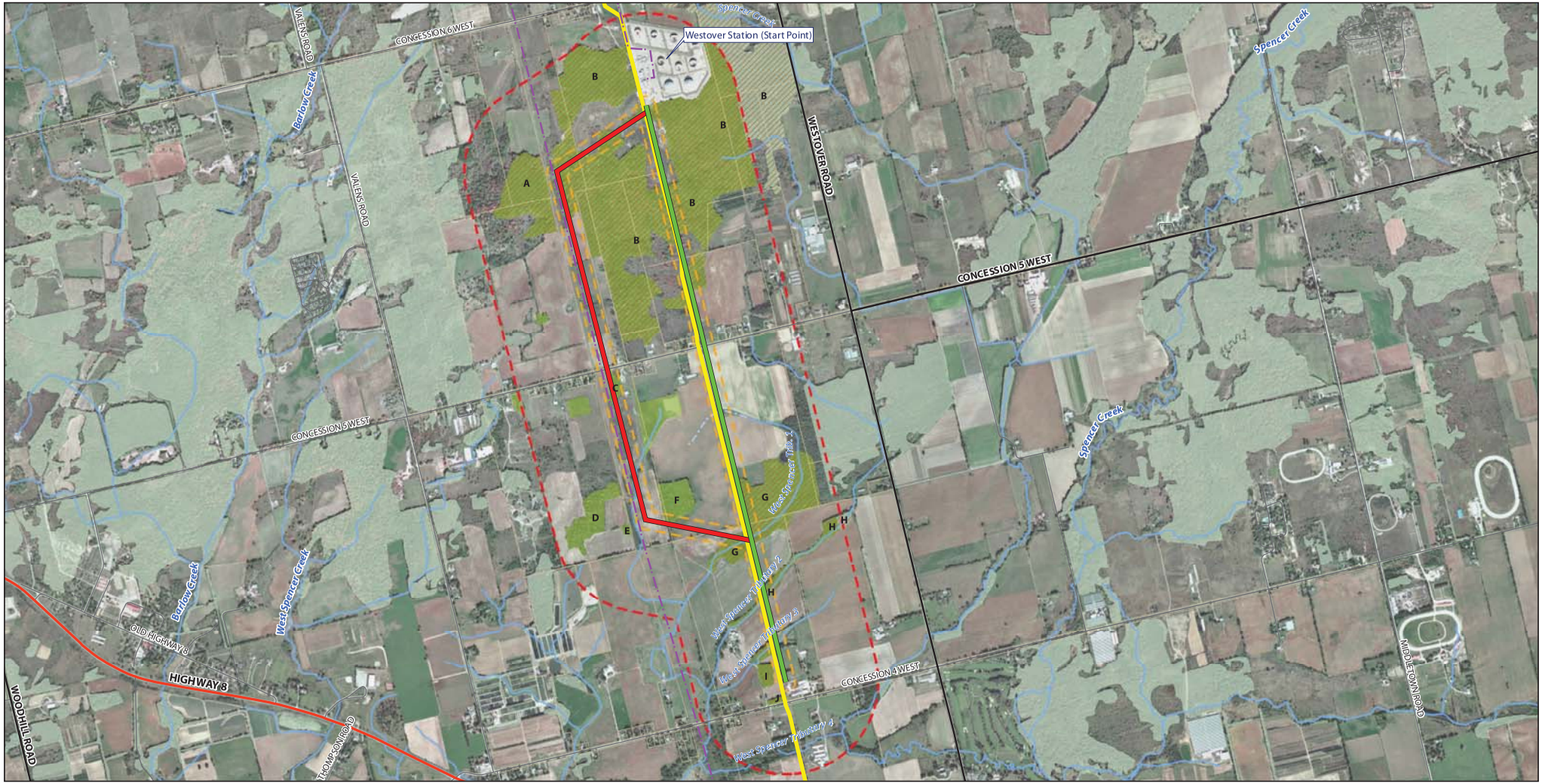
The Westover Southwest Complex is a Life Science Site located southwest of the hamlet of Westover, in central Flamborough Township. This area encompasses a mix of previously disturbed terrestrial communities and wetland areas in the southeast corner of the large bedrock plain in the Westover-Rockton-Kirkwall district. The complex extends across the divide between the Grand River and Spencer Creek watersheds and provides a continuous greenspace corridor linking other natural areas. The wetlands in this Site have been included in two wetland complexes: the swamp in the northwest corner is part of the Provincially Significant Sheffield-Rockton Wetland Complex and the swamp in the eastern end is included in the Westover Swamp (a non-provincially significant wetland).

Rockton Northeast Woodlot

The Rockton Northeast Woodlot is a Life Science Site situated 1.5 km northeast of the community of Rockton, in western Flamborough. The small wetlands in this area are included within the Provincially Significant Sheffield-Rockton Wetland Complex.

5.1.3.4. Summary of Vegetation

Vegetation will be considered in the effects assessment. Information relating to potential Project effects and mitigation is provided in **Section 7** of this ESA.



ENBRIDGE PIPELINES
LINE 11 WESTOVER SEGMENT
REPLACEMENT AND
DECOMMISSIONING PROJECT

ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT

WOODLANDS

FIGURE 5.3

Project Components
- Potential Line 11 Replacement Alternative (Option 1)
- Potential Line 11 Reroute Alternative (Option 2)
- Existing Line 11
- Local Study Area
- 50 m Detailed Field Work Area

Base Map
- Hydro Transmission Line
- Highway
- Arterial Road
- Collector Road
- Local Street
- Watercourse
- Dillon Delineated Watercourse
- Parcel
- Significant Woodland
- A Delineated Woodland
- Undelineated Woodland

DILLON CONSULTING

MAP CREATED BY: GM
MAP CHECKED BY: CC
MAP PROJECTION: NAD 1983 UTM Zone 17N

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNR, Geowarehouse, City of Hamilton, LOID, Google Earth Pro

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FILE LOCATION: I:\GIS\137662 - Enbridge Line 10 and 11 Replacement\Mapping

PROJECT: 137662 STATUS: FINAL DATE: 11/18/2013

5.1.4. Water Quality and Quantity

The following sections outline the surface water and groundwater quality and quantity within the LSA. A total of five watercourses, two fish bearing watercourses within wetlands, and a total of 24 documented groundwater wells are located within the LSA.

5.1.4.1. Groundwater

In the vicinity of the LSA, available sources of groundwater with adequate quality and quantity are limited. As discussed in previous sections, soil cover is often thin, particularly near the northern section of the LSA, and typically consists of thin layers of coarse grained deposits (sands and gravels) interspersed with layers of silts and clays. The Queenston Formation shale is characterized as a regionally significant aquitard; however, it is usually weathered in the upper 5 m and fractures transmit water at a sufficient rate to provide adequate yields for individual domestic wells (Hamilton Region Source Protection Area Assessment Report, 2012). Although most of the sources of groundwater in the LSA are generally classified as poor aquifers, they are locally important.

The most significant groundwater source in the vicinity of the LSA is the dolomite bedrock aquifer of the Guelph Formation (Grand River Watershed Characterization Report, 2008). Most domestic wells in the vicinity of the LSA access this aquifer.

Groundwater flow in the LSA is complex and variable. Shallow groundwater flow is likely a reflection of topography and geology, and can be influenced by a variety of factors including the presence of surface waterbodies, the presence (or absence) of permeable geologic units (i.e., sands and gravels), or the interconnectivity of fracture networks in exposed bedrock surfaces. In general, the depth to the uppermost water table in the LSA is expected to be less than 4 m, and often experiences seasonal fluctuations between 0.5 and 2 m (Hamilton Region Source Protection Area Assessment Report, 2012). In general, local and regional groundwater flow in the vicinity of the pipeline is expected to be to the east towards Lake Ontario, while a small component of flow near the southern reaches of the pipeline may be directed to the southeast towards Lake Erie.

According to the Assessment Report for the Hamilton Region Source Protection Area (2012), the LSA and surrounding lands have been assigned a low to moderate annual groundwater stress level, and a low monthly groundwater stress level. The Assessment Report (2012) has indicated that the entire LSA generally lies in areas assigned with a high groundwater vulnerability index.

A search of the MOE (MOE, 2012) water well records was also completed to determine the number of groundwater users in the area, as well as establish the relative depths of wells in the vicinity of the LSA. According to the water well records, there are 24 documented wells within the LSA. As the water well records are often incomplete with respect to the actual number of groundwater

users, the number of residences was also tabulated within the LSA (38 households). **Figure 5: Surficial Geology and Water Well Records** presents wells and households within the LSA. The water well records indicate that wells were drilled between 1955 and 2012, and are predominantly described as fresh water wells. The majority of the wells are generally used for domestic purposes, with some likely used for irrigation, livestock or other commercial purposes. A relatively small number of the wells were abandoned, or did not have any information regarding completion details (i.e. depth, geology, casing material, etc.). In general, wells within the LSA are drilled to an average depth of 12.5 m. The depth to bedrock, where bedrock was encountered, ranged between 0 mbgs (northern portion of the existing RoW) to 16.8 m (southern portion of the existing RoW). Static water levels across the LSA are variable, and are highly dependent on well depth, however values generally ranged between 0 and 8.0 mbgs, with an average value of 2.4 mbgs.

5.1.4.2. Surface Water

Broadly, the LSA is located within the Spencer Creek watershed and overlaps two sub-watersheds. The Spencer Creek Watershed drains approximately 49,000 ha of agricultural lands, with highly developed urban lands below the escarpment. The watershed catchment originates above the Niagara Escarpment and outlets to Lake Ontario through Hamilton Harbour. The main branches of the watershed begin in wetlands and forested swamps, flowing generally from the northwest to the southeast through natural, agricultural, rural, and urban lands. The northern portion of the LSA lies within the middle section of the Spencer Creek Watershed, crossing a portion of the Westover Creek and West Spencer Creek subwatersheds.

Westover Creek Subwatershed has a catchment area of 1,065 ha and drains the Westover Lowland Forest Southwest Wetland Complex, and the Hayesland Swamp Ecologically Sensitive Area. Portions of the Sheffield-Rockton and Hayesland-Christie PSW complexes are also within the Westover Creek subwatershed (HCA, 2011a). Headwaters descend from Upper Westover to Lower Westover before their confluence with Middle Spencer Creek. In the headwater tributaries of the Westover Creek Subwatershed, groundwater upwelling was noted in the upper reaches indicating coldwater conditions, but reduced forest cover and land-use practices in the area have altered their thermal regime and degraded the existing water quality to coolwater conditions.

The existing corridor crosses through a portion of the Sheffield-Rockton Complex PSW, which drains into a first order stream of Westover Creek. The reroute alternative does not intersect Westover Creek.

The West Spencer Creek Subwatershed drains 17.95 km of land and is comprised of five catchment basins that range in size from 0.73 to 2.27 km^2. The subwatershed contains large forested areas, farm fields and wetlands. Located in the northern portion of the subwatershed, the Westover Southwest Complex Environmentally Sensitive Area, which includes the Sheffield-Rockton Wetland Complex PSW, serves as the headwater source for West Spencer Creek (HCA, 2011b). In the headwater tributaries, groundwater upwelling has been noted in the upper reaches indicating

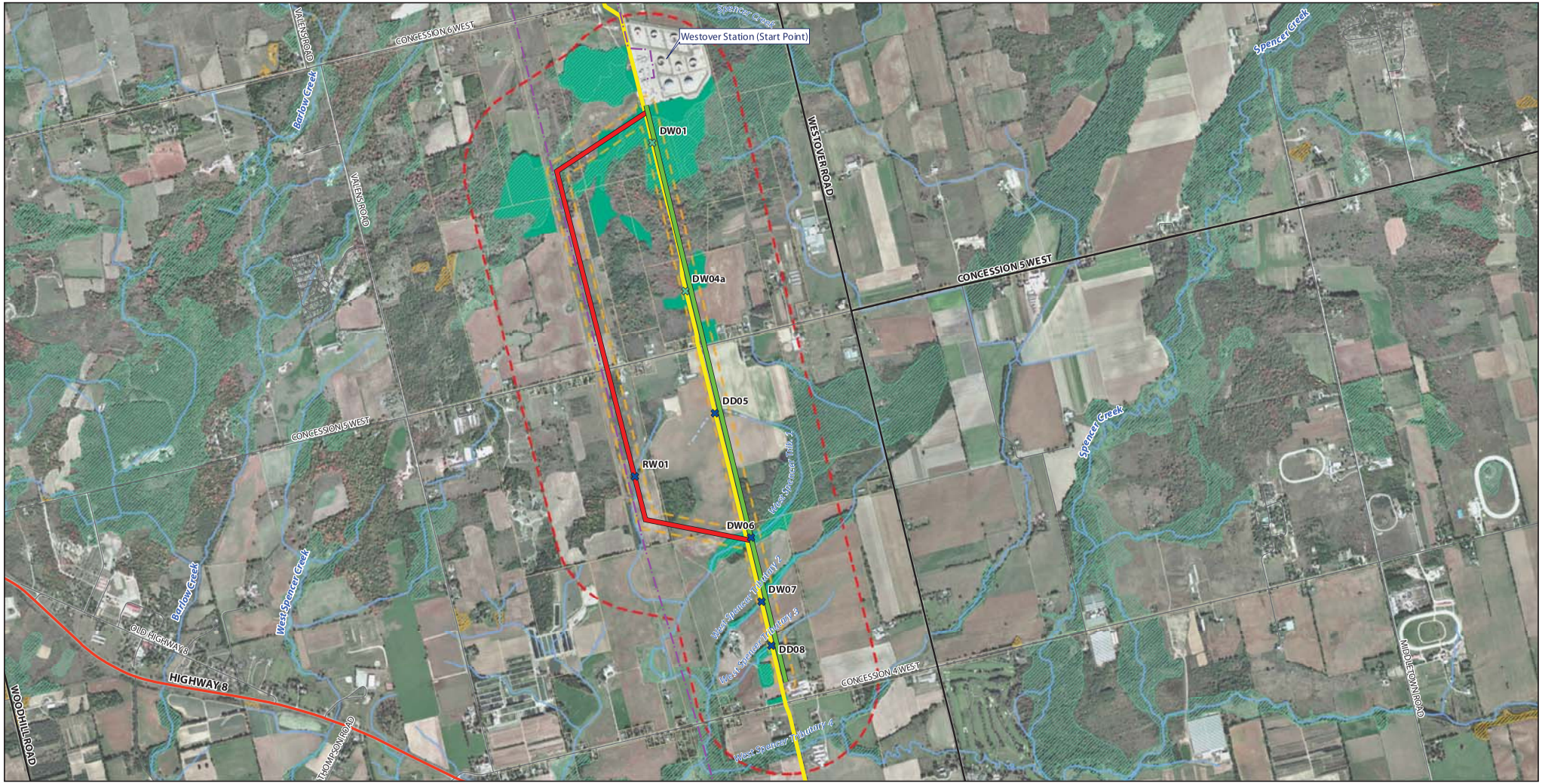
coldwater conditions, but reduced forest cover and land-use practices in the area have altered their thermal regime and degraded the existing water quality to coolwater conditions.

Surface water flow in West Spencer Creek is predominantly derived from storm runoff, as many of the upper reaches of the tributaries are intermittent and flow over imperfectly drained soils. Groundwater contributions are considered to be minimal. These smaller watercourses are poorly shaded with muck and detritus substrates. The larger, lower portion of West Spencer Creek is permanent, has a wide bankfull width, is well shaded and has a more consistent flow regime. Silt, sand, and detritus comprise the bottom substrates.

As shown on **Figure 5.4: Watercourses,** the existing corridor passes through five first-order tributaries, and one second-order tributary. Two of the first-order tributaries are located within fish bearing wetlands and are not distinguishable as linear crossings. The reroute alternative crosses one first-order tributary and one second-order tributary.

For the purpose of documenting surface water quality and quantity, as well as to support the assessment of fish and fish habitat, the areas where the existing corridor and/or reroute alternative pass through the watercourse was assessed between June 3 and August 21, 2013. During the course of field investigations, it was noted that wetlands in the northern part of the LSA contained fish or contained appropriate fish habitat, and as such have been included as "fish bearing wetland crossings" in this assessment. Methodology for the assessments was adapted from the Ontario Stream Assessment protocol and the Pipeline Associated Watercourse Crossings manual (Stanfield, 2010; CAPP/CEPA/CGA, 2005). Biological and physical measurements 50 m upstream and 50 m downstream of each crossing of the existing corridor and reroute alternative was collected. Current data on fish occurrence, by species, was collected from the MNR – Guelph District Office. Specific information collected in the field included:

- *waterbody type (i.e., naturalized, channelized, permanent, intermittent);*
- *habitat type (i.e., riffle, run, flat, pool);*
- *substrate type;*
- *stream order;*
- *geomorphic stream measurements (i.e., average annual high water mark, wetted width, wetted depth);*
- *dominant in-stream vegetation and cover; and,*
- *riparian corridor vegetation coverage.*



ENBRIDGE PIPELINES
LINE 11 WESTOVER SEGMENT REPLACEMENT AND DECOMMISSIONING PROJECT

ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT

WATERCOURSES

FIGURE 5.4

Project Components
- Potential Line 11 Replacement Alternative (Option 1)
- Potential Line 11 Reroute Alternative (Option 2)
- Existing Line 11
- Local Study Area
- 50 m Detailed Field Work Area

Base Map
- Watercourse Crossing
- Fish Bearing Wetland Crossing
- DD - Existing Corridor and Dry
- DW - Existing Corridor and Wet
- RW - Reroute Alternative and Wet
- Hydro Transmission Line
- Highway
- Arterial Road
- Collector Road
- Local Street
- Watercourse
- Dillon Delineated Watercourse
- Parcel
- Provincially Significant Wetland (MNR)
- Dillon Delineated Wetland
- Unevaluated Wetland

DILLON CONSULTING

MAP CREATED BY: GM
MAP CHECKED BY: CC
MAP PROJECTION: NAD 1983 UTM Zone 17N

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNR, Geowarehouse, City of Hamilton, LOID, Google Earth Pro

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FILE LOCATION: I:\GIS\137662 - Enbridge Line 10 and 11 Replacement\Mapping

PROJECT: 137662 STATUS: FINAL DATE: 12/12/2013

Information pertaining to each crossing can be found in **Appendix B** and should be read in conjunction with **Figure 5.4: Watercourses**, which depicts each watercourse location along with its specific watercourse code reference. Code references were determined based on initial review of the waterbodies using aerial imagery (DD- existing corridor and dry; DW- existing corridor and wet;; and, RW- reroute alternative and wet). Note that each crossing is assigned a surface water sensitivity and fish habitat sensitivity rank (see **Appendix B**). The criteria justifying the ranking of each watercourse crossing is provided below in **Section 5.1.4.3.**

In total five watercourses and two fish bearing watercourses within wetlands are located within the LSA. The intersecting watercourses range from small ephemeral or intermittent streams, to the larger permanent main stem of West Spencer Creek. Each has varying degrees of environmental sensitivities, yet are very similar in nature as a result of the topography and geology of the headwaters where they arise. Of the seven watercourses within the LSA, six bisect the existing corridor and two bisect the reroute alternative (one watercourse is common to both options).

5.1.4.3. Surface Water Sensitivity

Using the physical properties of each assessed watercourse and fish bearing watercourse within a wetland, one of five sensitivity categories to possible habitat degradation by the Project and its effects on downstream water quality were assigned. Specifically, the level of sensitivity is based on surrounding land use, potential for erosion, collected water quality parameters, stream type (watershed hierarchy), permanence, and the factors that contribute to thermal regulation. Each watercourse and fish bearing wetland was placed into one of the following five classifications:

Level 5: High Quality- named river or permanent stream; clear evidence of groundwater discharge, maximum temperature below 18°C; dissolved oxygen exceeding 5.0 mg/L; Total Dissolved Solids (TDS) undetectable or below 0.1 g/L; heavily shaded (90-100 percent); no apparent sources of pollutants; no obvious in-stream algae; substrates sand and gravel with detritus.

Level 4: Moderate Quality- natural, permanent stream; some vegetative evidence of a high groundwater table and potential discharge, maximum temperature between 18-22°C; some obvious in-stream algae; dissolved oxygen between 4-5 mg/L; TDS >0.5 g/L; moderately shaded (60-90 percent); substrates sand and silt or detritus.

Level 3: Low Quality- intermittent or ephemeral natural watercourse or naturalized channel; overlays deep aquifer, no obvious evidence of groundwater discharge; maximum temperature between 22-28°C; dissolved oxygen between 3-4 mg/L; TDS > 0.5 but < 1.0 g/L; lightly shaded (30-60 percent); substrates muck, silt, or topsoil.

Level 2: Degraded- channelized drain; imperfectly drained solids; no evidence of groundwater discharge, maximum temperature exceeds 28°C; dissolved oxygen < 3.0 mg/L; TDS > 1.0 but < 1.5 g/L; minimal shade (10-30 percent); abundant in-stream algae; substrates muck, silt, or topsoil.

Level 1: Highly Degraded- Dry watercourse, with no clearly defined channel or flow path, often covered by crops; flow is entirely storm-driven with no standing water in pools; if water present, maximum temperature exceeds 28°C; dissolved oxygen is < 2.0 mg/L; TDS > 1.5 g/L; no shade (0 percent).

Since streams do not often flow uninterrupted through wetlands, where flooded vegetation is the dominant feature, the wetlands with clear inlets and outlets connecting to watercourses were considered as fish-bearing for the purposes of this assessment. Wetlands are seldom sampled for fish because of the difficulty accessing the waters with nets, however wetland environments provide abundant food resources, seasonal refuge, diverse spawning substrates and for some fish species, wetlands provide many of the necessities to carry out their life cycles. With respect to water quality, wetlands are full of colonies of plants, protozoan and bacteria that transform pollutants into harmless constituents, and are well known for their water-cleansing properties. For their ecological values of supporting fish and aquatic organisms, as well as purifying surface waters, fish bearing wetlands were therefore considered of high quality and sensitive to change.

The classification of the 6 watercourses and fish bearing wetlands related to the existing corridor resulted in one being of High Quality (Level 5), two were Moderate Quality (Level 4), none were Low Quality (Level 3), three were Degraded (Level 2), and none were Highly Degraded (Level 1).

The classification of the two watercourses in relation to the reroute alternative resulted in one being of High Quality (Level 5), none being Moderate Quality (Level 4), one being Low Quality (Level 3), none being Degraded (Level 2), and none being Highly Degraded (Level 1).

5.1.4.4. Summary of Water Quality and Quantity

Water quality and quantity will be considered in the effects assessment. Information relating to potential Project effects and mitigation is provided in **Section 7** of this ESA.

5.1.5. Fish and Fish Habitat

Fish and fish habitat are present in the watercourses and fish bearing wetlands throughout the LSA. As outlined above, five watercourses and two fish bearing wetlands were identified in the LSA. Many of the watercourses observed are small, unnamed tributaries that have varying degrees of sensitivity. To assess the potential for the watercourses and fish bearing wetlands in the LSA to support fish and fish habitat, an aquatic assessment was completed during appropriate periods when water would be present. The assessment involved the completion of the following:

- *literature review and agency consultation;*
- *benthic Invertebrate assessment;*
- *fish community assessment;*
- *habitat mapping and characterization;*
- *aquatic ecosystem assessment; and,*
- *aquatic resources impact assessment.*

Details and observations pertaining to fish and fish habitat made during the aquatic assessments are provided in **Appendix B.** Based on literature review and agency consultation, all of the permanent and intermittent streams within the LSA are known to contain fish. As identified through consultation with the MNR, common warm and cool water fish that are known to occur within the LSA include (Bowlby et al, 2009):

- Blacknose Dace *(Rhinichthys astratulus);*
- Brook Stickleback *(Culaea inconstans);*
- Central Mudminnow *(Umbra limi);*
- Common Shiner *(Luxilus cornutus);*
- Creek Chub *(Semotilus atromaculatus);*
- Fathead Minnow *(Pimephales promelas);*
- Finescale Dace *(Phoxinus neogaeus);*
- Johnny Darter *(Etheostoma nigrum);*
- Largemouth Bass *(Micropterus salmoides);*
- Northern Pike *(Esox lucius);*
- Pearl Dace *(Semotilus margarita);*
- Pumpkinseed *(Lepomis gibbosus);*
- Redside Dace *(Clinostomus elongates); and*
- White Sucker *(Catostomus commersonii).*

Of these 14 fish species identified through consultation with the MNR, none are considered Species at Risk or Species of Special Status, with the exception of Redside Dace. Through consultation with the MNR, it has been identified that mapped habitat for Redside Dace is located beyond the LSA to the east within Spencer Creek and need not be carried forward to the effects assessment.

Using the data collected in the field to assess the potential for fish presence and fish habitat (mainly biophysical characteristics, the presence of benthic macroinvertebrates, and fish community) each watercourse and fish bearing wetland was evaluated to determine fish habitat sensitivity (see **Appendix B**). Parameters used included: fish presence, Species of Special Status or Species at Risk, apparent presence of pollution sources, thermal regime, permanence, habitat type, substrates, shading, stream order, stream morphology, and bankfull width.

Along the existing corridor, one (1) of the assessed crossings is Moderate Quality fish habitat, two (2) are Low Quality fish habitat, and two (2) are Degraded fish habitat. Along the reroute alternative, one watercourse is of Moderate Quality fish habitat, and one (1) is Degraded fish habitat. Definitions for the fish habitat sensitivities include the following:

Level 4: High Quality – High order streams with permanent water flow; warm, cool, or cold water thermal regime, over 90 percent shaded with diverse substrate composition; no pollution sources; meandering present and wide bankful width; potential for species of conservation concern and species at risk.

Level 3: Moderate Quality – High order streams with permanent water flow; warm, cool, or cold water thermal regime; high shade cover and meandering present; minimal pollution; potential for habitat of fish species for species of conservation concern or Species at Risk.

Level 2: Low Quality – Low or high order streams with channelized or intermittent stream permanence; shading between 30-60 percent; suitable substrate with slight meandering; pollution present; presence of fish species but not habitat for species of conservation concern or species at risk.

Level 1: Degraded – Lower order streams with narrow bankful widths and channelized morphology; warm thermal regime with less than 30 percent shading; likely to be dry during warmest periods of the year; poor substrate composition; no habitat for species of special conservation concern or species at risk.

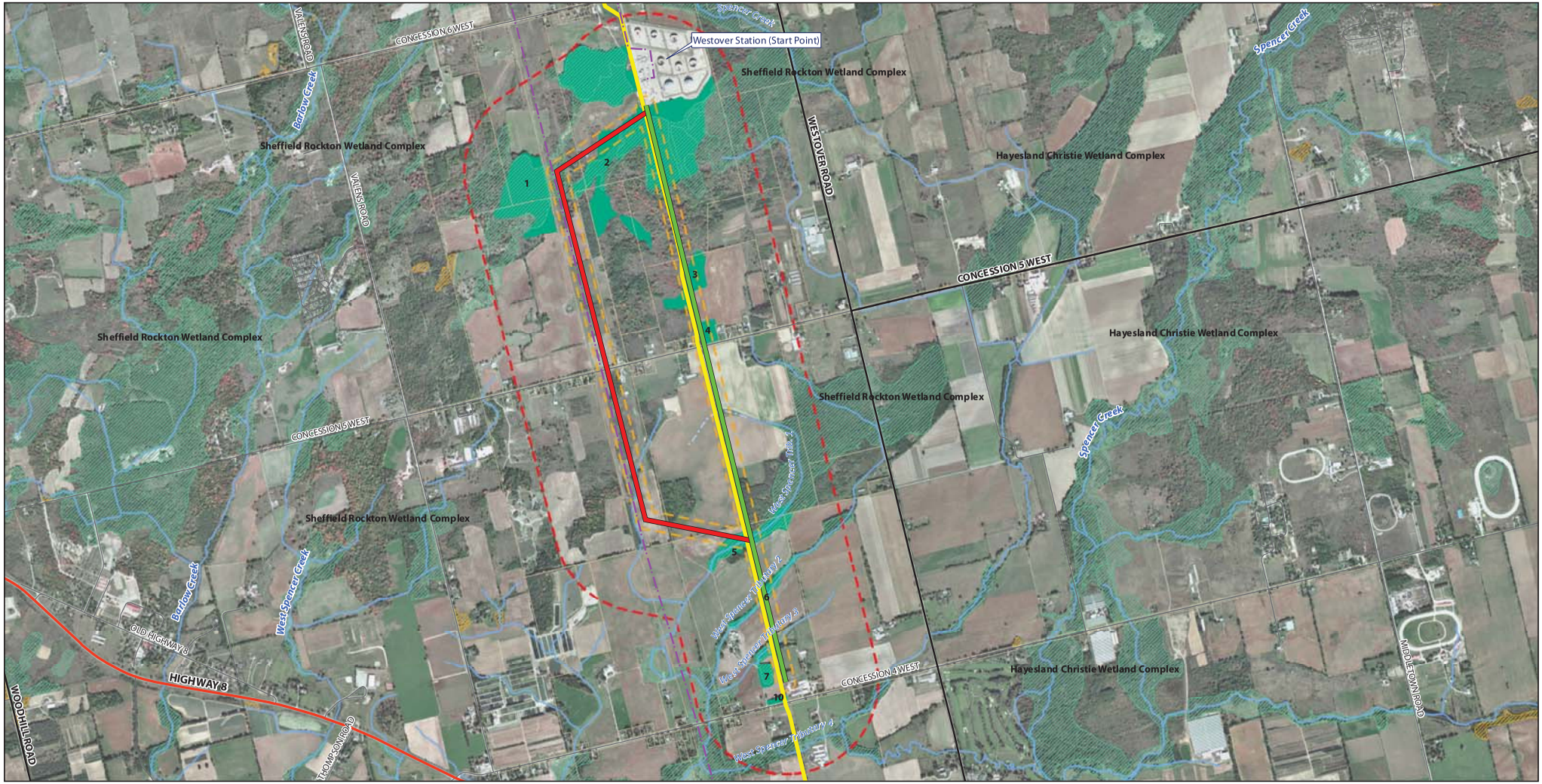
Level 0: Highly Degraded – Lower order streams with small bankful widths; warm thermal regime likely dry for long periods of time; less than 10 percent shaded; straight stream morphology; poor substrate composition; no habitat for species of special conservation concern or species at risk.

5.1.5.1. Summary of Fish and Fish Habitat

Fish and fish habitat will be considered in the effects assessment. Information relating to potential Project effects and mitigation is provided in **Section 7** of this ESA.

5.1.6. Wetlands

A review of existing background information identified two PSW complexes within the LSA (**Figure 5.5: Wetlands**). Attributes of each PSW complex is described below.



ENBRIDGE PIPELINES
LINE 11 WESTOVER SEGMENT REPLACEMENT AND DECOMMISSIONING PROJECT

ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT

WETLANDS

FIGURE 5.5

Project Components
- Potential Line 11 Replacement Alternative (Option 1)
- Potential Line 11 Reroute Alternative (Option 2)
- Existing Line 11
- Local Study Area
- 50 m Detailed Field Work Area

Base Map
- Hydro Transmission Line
- Highway
- Arterial Road
- Collector Road
- Local Street
- Watercourse
- Dillon Delineated Watercourse
- Parcel
- Provincially Significant Wetland (MNR)
- 1 Dillon Delineated Wetland
- Unevaluated Wetland

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MAP CREATED BY: GM
MAP CHECKED BY: CC
MAP PROJECTION: NAD 1983 UTM Zone 17N

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNR, Geowarehouse, City of Hamilton, LOID, Google Earth Pro

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FILE LOCATION: I:\GIS\137662 - Enbridge Line 10 and 11 Replacement\Mapping

PROJECT: 137662 STATUS: FINAL DATE: 11/18/2013

Sheffield-Rockton Wetland Complex

The Sheffield-Rockton Wetland Complex is located at the northern two thirds of the LSA (wetland units 1, 2, 3, 4, 5 on **Figure 5.5: Wetlands**). The complex is made up of 28 individual wetlands, composed of two wetland types (94 percent swamp and 6 percent marsh). The complex has been known to support nesting and feeding of colonial waterbirds, winter cover for wildlife and small game, and waterfowl production. Refer to **Appendix B**, **Table B8** for details on wetland units overlapping the LSA.

Hayesland-Christie Wetland Complex

The Hayesland-Christie Wetland Complex is located at the southern end of the LSA, just north of Concession 4 West (wetland units 6, 7 and 10 on **Figure 5.5: Wetlands**). The complex is made up of 86 percent swamp and 14 percent marsh. The complex has been known to support nesting sites for colonial waterbirds, active feeding of Great Blue Heron (*Ardea Herodias*), winter cover for wildlife, waterfowl staging and moulting, suitable waterfowl breeding habitat and stopover areas for migratory passerine, shorebird, and raptors.

Wetlands found within the LSA were initially identified from MNR mapping and further assessed during ELC investigations. Following this initial assessment, wetland boundaries were delineated using protocols outlined in the Southern Manual of the Ontario Wetland Evaluation System (MNR, 2002) by a certified wetland evaluator. **Figure 5.5: Wetlands** provides a comparison between Dillon delineated wetland boundaries and those identified during the background review. For the purpose of this report, Dillon wetland boundary mapping will be used from this point forward, including in the effects assessment. Refer to **Appendix B**, **Table B8** for details on wetland units overlapping the LSA

5.1.6.1. Summary of Wetlands

Wetlands will be considered in the effects assessment. Information relating to potential Project effects and mitigation is provided in **Section 7** of this ESA.

5.1.7. Wildlife and Wildlife Habitat

5.1.7.1. Wildlife Species Diversity

Using readily available secondary source databases and wildlife atlases, various plant and animal species have been identified as potentially occurring in, or in close proximity to, the LSA. These species are discussed below and are outlined in **Appendix B**. The likelihood of these species to occur in the LSA was determined during field surveys, including the presence of appropriate habitat or observation of the species.

After reviewing records in the OBBA (Cadman et al., 2005; OBBA Mapping Square 17NJ79), 118 avian species have been identified as potentially occurring in the areas within and adjacent to the LSA (**Appendix B**). These birds depend on a wide range of habitats from agricultural areas to woodlands to wetlands. The majority of the bird species identified in the OBBA that have the potential to occur in the general LSA are considered Secure (SRank of S5) or Apparently Secure in Ontario (Srank of S4). Of the 118 species with the potential to occur in the general LSA, three are listed as Species at Risk and four are considered Species of Special Status.

After reviewing records in the Mammals of the Western Hemisphere (Patterson et al, 2007), 48 mammalian species have the potential to occur in the LSA (**Appendix B**). The majority of the mammal species that have the potential to occur in the LSA are considered Secure (SRank of S5) or Apparently Secure (SRank of S4). Of the 48 species with the potential to occur in the LSA, six are Species at Risk and none are considered Species of Special Status.

The Ontario Herpetofaunal Atlas (Oldham and Weller, 2000) was used to determine possible reptile and amphibian species occurring within or adjacent to the LSA. A total of 34 herpetozoa species were identified with occurrence records in the LSA (**Appendix B**). The majority of the herpetozoa species that have the potential to occur in the LSA are considered Secure (SRank of S5) or Apparently Secure (SRank of S4). Of the 34 species with the potential to occur in the LSA, 10 are Species at Risk and none are considered Species of Special Status.

The Ontario Odonata Atlas (2005) and the MNR's NHIC database were reviewed to determine the potential for dragonflies and damselflies to occur in the LSA (**Appendix B**). A total of 49 species had occurrence records in the general vicinity of the LSA. The majority of the odonata species that have the potential to occur in the LSA are considered Secure (SRank of S5) or Apparently Secure (SRank of S4). Of the 49 species with the potential to occur in the LSA, none are considered Species at Risk or Species of Special Status. Two odonata species were observed during field studies, neither of which are considered Species at Risk or Species of Special Status.

Breeding Bird Surveys

Breeding bird surveys were undertaken to determine which bird species are present and displaying breeding behaviour in the PF. Diurnal breeding bird surveys followed methods outlined in the OBBA Guide for Participants (OBBA, 2001), with surveys conducted over two visits during the peak of the breeding bird season (between late May and the first week of July).

Point counts and area searches were conducted within the PF in both forested and non-forested environments. During surveys, 59 bird species were observed in or immediately adjacent to the PF. Of the birds observed, all were possible or probable breeding birds with exception of seven species which were observed only as flyovers. A list of the birds identified during the 2013 breeding season is available in **Appendix B**.

Of the 59 bird species observed, one Species at Risk including the Least Bittern (*Ixobrychus exilis*), listed as federally Threatened and two Species of Special Status including the Barn Swallow (*Hirundo rustica*) and Eastern Meadowlark (*Sturnella magna*), both listed as provincially Threatened.

Amphibian Survey

Amphibian surveys followed the Marsh Monitoring Program protocol (Bird Studies Canada et al., 2008) and included point counts placed in proximity to potential breeding habitat (i.e., wetlands, woodlands with vernal pools, etc.) within the PF. Generally, three separate survey events are conducted between April and June covering the early, middle and late breeding amphibian groups (i.e., Visit 1, Visit 2 and Visit 3), with at least two weeks between each survey event. However, the first survey event did not take place as property access was not granted in time. Targeted surveys for salamanders may be completed in the spring of 2014 if required.

There were six amphibian monitoring stations for the second visit and eight amphibian monitoring stations for the third visit within the PF. Additional monitoring stations were added to the third visit as a result of additional property access obtained after the second visit. The calls of three amphibian species were heard during amphibian surveys. Of the three species heard calling, all are considered to be Secure (SRank of S5) in the Province of Ontario, and none of them are considered Species at Risk or Species of Special Status. A list of the amphibian species identified is available in **Appendix B**.

Although salamanders were actively searched for in areas where appropriate habitat existed during ELC and other field surveys, none were observed.

Incidental Observations of Reptiles

Throughout the execution of the field program, Dillon's natural environment staff recorded observations of reptiles within the PF. These observations supported the identification of wildlife habitat such as turtle overwintering and nesting habitat, and snake hibernaculum, which are discussed in **Section 5.1.7.1** and **Section 5.1.8.**

During field investigations, a single Midland Painted Turtle (*Chrysemys picta marginata*) as well as a Common Snapping Turtle (*Chelydra serpentina*) along with several scavenged Common Snapping Turtle nests were observed within the marsh south of Westover Station. Additionally, two Eastern Garter Snakes (*Thamnophis sirtalis sirtalis*) were observed during ELC surveys. A list of the reptile species identified is available in **Appendix B**. Of the species observed during field studies, Common Snapping Turtle is considered a Species at Risk.

5.1.7.2. Wildlife Habitat

Wildlife habitat generally falls into one of four categories including: Seasonal Concentration Areas of Animals, Rare Vegetation Communities or Specialized Habitat for Wildlife, Habitat for Species of Conservation Concern, and Animal Movement Corridors. As part of the field program, Dillon identified and delineated wildlife habitat applicable to Ecoregion 7E and confirmed the presence or absence of wildlife habitat identified in the background review.

Background Review

Prior to conducting field surveys in 2013, Dillon undertook a background review to identify existing significant wildlife habitat in the LSA using readily available secondary source information. Based on this information, existing records of wildlife habitat and applicable species potentially occurring in the LSA are discussed in the sections below. Other potential candidate wildlife habitat related to this Ecoregion was reviewed during field studies. The wildlife habitat that has been identified within and/or adjacent to the project area (i.e., within 1 km), based on a review of background information, is discussed below.

Seasonal Concentration Areas

The Hayesland-Christie Wetland Complex is known to serve as a stopover area of migratory passerines, shorebirds, and raptors. Upon site investigation, this habitat was not found to be within the Complex.

Rare Vegetation Communities

A search and analysis of the records and resources did not identify any Rare Vegetation Communities in or in close proximity to the Project. This search (including field studies) included sand barrens, savannahs, tallgrass prairies, and alvars.

Specialized Wildlife Habitat

A search and analysis of the records and resources identified the Hayesland-Christie Wetland Complex as a nesting site for colonial waterbirds, including active feeding of Great Blue Heron. The Sheffield-Rockton Complex has been known to support nesting and feeding of colonial waterbirds. No colonial bird nesting areas were found to be within the Project area during field investigations in 2013.

Habitat of Species of Special Concern

A search and analysis of the records and resources identified several Species of Conservation Concern with the potential to occur in the LSA. Species of Conservation Concern are those species that are identified provincially as S1, S2, or S3, and are not listed federally or provincially as Endangered, Threatened or Special Concern. Potential habitat for these species is further discussed below.

Animal Movement Corridors

A search and analysis of available secondary sources did not identify any Animal Movement Corridors in or in close proximity to the LSA.

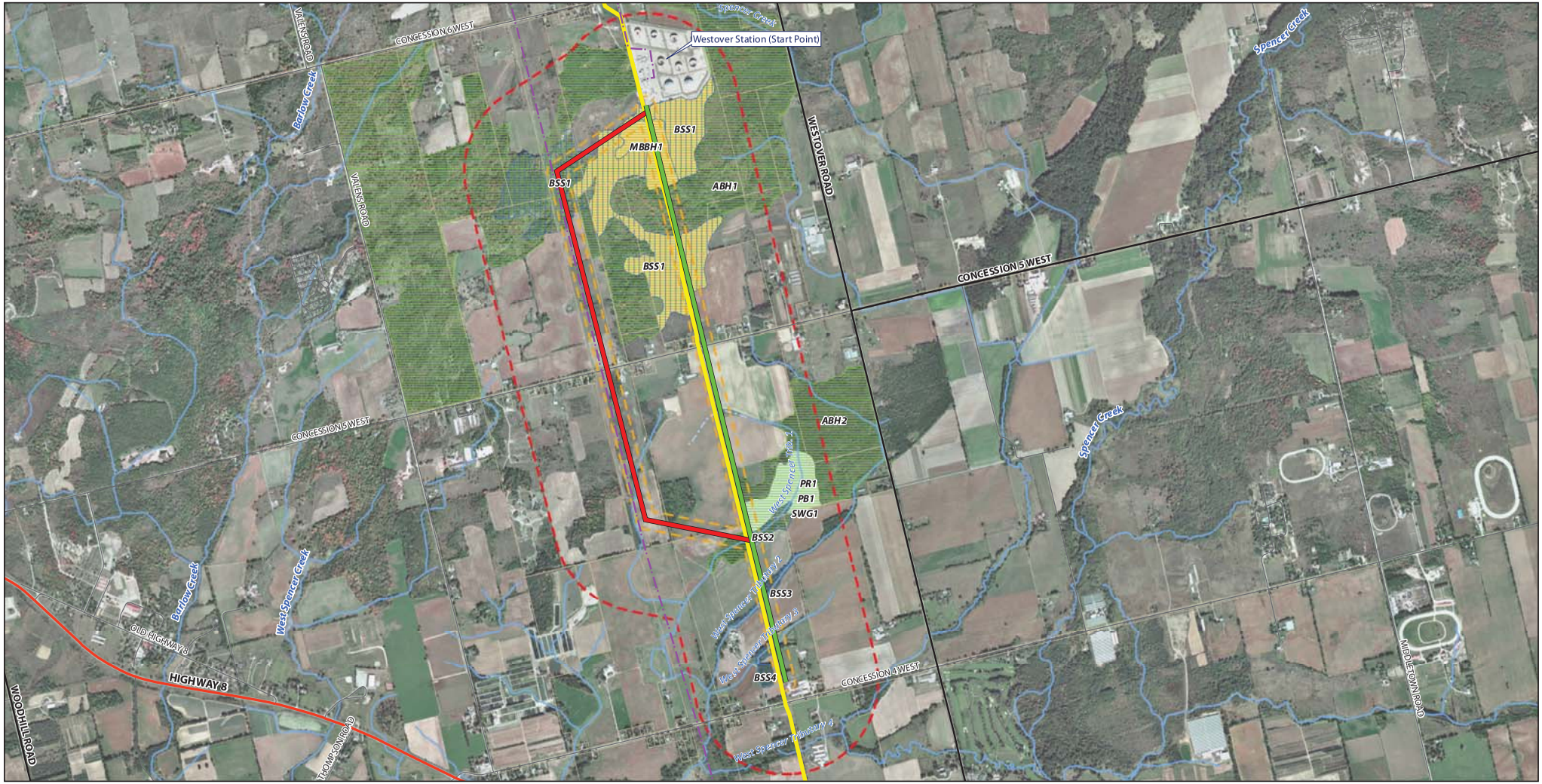
Site Investigation

Wildlife habitat was identified and delineated during ELC investigations and further refined using information gathered during other surveys in the LSA. Delineation of wildlife habitat was completed using a combination of information contained in the Significant Wildlife Habitat Technical Guide (MNR, 2000) and the associated Ecoregion 7E Criterion Schedule (MNR, 2012). In addition, knowledge of species or habitats that are important locally within the municipality or watershed was incorporated into the evaluation of wildlife habitat.

During the site investigation, the potential for the following habitats was identified within the LSA:

- *Turtle Overwintering Area;*
- *Turtle Nesting Area;*
- *Reptile Hibernaculum;*
- *Waterfowl Nesting Area;*
- *Marsh Breeding Bird Habitat;*
- *Amphibian Breeding Habitat; and,*
- *Habitat for Species of Conservation Concern.*

These habitats are evaluated in **Appendix B** and are mapped on **Figure 5.6: Wildlife Habitat A** and **Figure 5.7: Wildlife Habitat B**.



ENBRIDGE PIPELINES
LINE 11 WESTOVER SEGMENT REPLACEMENT AND DECOMMISSIONING PROJECT

ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT

WILDLIFE HABITAT A

FIGURE 5.6

Project Components
- Potential Line 11 Replacement Alternative (Option 1)
- Potential Line 11 Reroute Alternative (Option 2)
- Existing Line 11
- Local Study Area
- 50 m Detailed Field Work Area

Base Map
- Hydro Transmission Line
- Highway
- Arterial Road
- Collector Road
- Local Street
- Watercourse
- Dillon Delineated Watercourse
- Parcel
- Amphibian Breeding Habitat (ABH)
- Blue-spotted Salamander (BSS)
- Marsh Breeding Bird Habitat (MBBH)
- Puttyroot (PR) / Shiny Wedge Grass (SWG) / Perfoliate Bellwort (PB)

DILLON CONSULTING

MAP CREATED BY: GM
MAP CHECKED BY: CC
MAP PROJECTION: NAD 1983 UTM Zone 17N

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNR, Geowarehouse, City of Hamilton, LOID, Google Earth Pro

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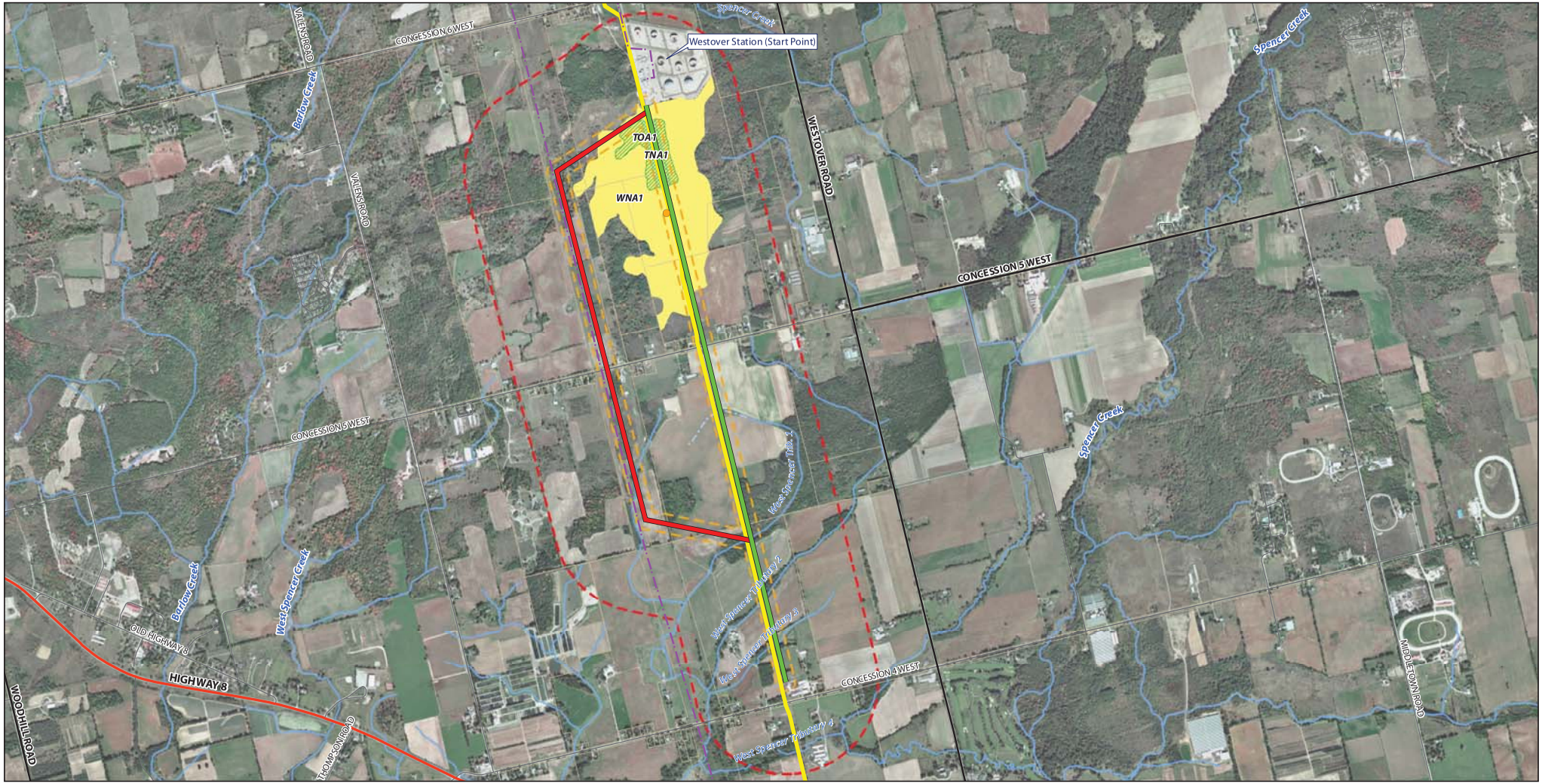
FILE LOCATION: I:\GIS\137662 - Enbridge Line 10 and 11 Replacement\Mapping

PROJECT: 137662 STATUS: FINAL DATE: 11/18/2013



ENBRIDGE PIPELINES
LINE 11 WESTOVER SEGMENT REPLACEMENT AND DECOMMISSIONING PROJECT

ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT

WILDLIFE HABITAT B

FIGURE 5.7

Project Components
- Potential Line 11 Replacement Alternative (Option 1)
- Potential Line 11 Reroute Alternative (Option 2)
- Existing Line 11
- Local Study Area
- 50 m Detailed Field Work Area

Base Map
- Reptile Hibernaculum
- Hydro Transmission Line
- Highway
- Arterial Road
- Collector Road
- Local Street
- Watercourse
- Dillon Delineated Watercourse
- Parcel
- Turtle Nesting Area (TNA)
- Turtle Overwintering Area (TOA)
- Waterfowl Nesting Area (WNA)

DILLON CONSULTING

MAP CREATED BY: GM
MAP CHECKED BY: CC
MAP PROJECTION: NAD 1983 UTM Zone 17N

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNR, Geowarehouse, City of Hamilton, LOID, Google Earth Pro

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FILE LOCATION: I:\GIS\137662 - Enbridge Line 10 and 11 Replacement\Mapping

PROJECT: 137662 STATUS: FINAL DATE: 11/18/2013

5.1.7.3. Summary of Wildlife and Wildlife Habitat

Wildlife and wildlife habitat will be considered in the effects assessment. Information relating to potential Project effects and mitigation is provided in **Section 7** of this ESA.

5.1.8. Species at Risk and Species of Special Status

Several sources formed the basis of the background review to establish the possible presence of Species at Risk and Species of Special Status within the LSA. These sources included:

- *Natural Heritage Information Centre database;*
- *Ontario Breeding Bird Atlas (Cadman et al., 2007);*
- *Mammals of the Western Hemisphere (Patterson et al. 2007);*
- *Ontario Herptofaunal Atlas (Oldham and Weller, 2000);*
- *Ontario Odonata Atlas (MNR, 2005); and,*
- *Distribution of Fish and Mussel Species at Risk Mapping for HCA.*

Consultation was also undertaken with the MNR and HCA regarding Species at Risk and Species of Special Status with the potential to occur in the LSA.

Background records were cross-referenced with collected survey data to determine if Species at Risk and/or Species of Special Status, or their habitats were present within the LSA. Species that are considered Species at Risk are identified as Endangered, Threatened or Special Concern, under the federal *Species at Risk Act* (*SARA*). Species that are considered Species of Special Status are identified as Endangered, Threatened or Special Concern, under the provincial *Endangered Species Act* (*ESA, 2007*).

Background Review

Based on the secondary sources, a total of 47 Species at Risk and 11 Species of Special Status have been identified as having the potential to occur in the LSA. These species are listed in **Table 5.1** below:

Table 5.1:

Species at Risk and Species of Special Status with the Potential for Occurring in the LSA

Scientific Name	Common Name	S-Rank	*Sara**	*ESA*	Information Source**
PLANTS					
Arisaema dracontium	Green Dragon	S3	SC	SC	MNR
Aster divaricatus	White Wood Aster	S1	THR	THR	MNR
Castanea dentata	American Chestnut	S2	END	END	MNR, NHIC
Chimaphila maculata var. maculata	Spotted Wintergreen	S1	END	END	MNR
Cornus florida	Eastern Flowering Dogwood	S4	END	END	MNR
Frasera caroliniensis	American Columbo	S2	END	END	MNR
Juglans cinerea	Butternut	S3	END	END	MNR
Morus rubra	Red Mulberry	S2	END	END	MNR
Panax quinquefolius	Ginseng	S3	END	END	MNR
Phegopteris hexagonoptera	Broad Beech Fern	S3	SC	SC	MNR
Pycnanthemum incanum var. incanum	Hoary Mountain Mint	S1	END	END	MNR
Trichophorum planifolium	Few-flowered Club-rush	END	END	S1	MNR
BIRDS					
Ammodramus henslowi	Henslow's Sparrow	SHB	END	END	MNR, NHIC
Asio flammeus	Short-eared Owl	S2N, S4B	SC	SC	MNR
Chaetura pelagica	Chimney Swift	S4B, S4N	THR	THR	MNR, OBBA
Chordeiles minor	Common Nighthawk	S4B	THR	SC	MNR, OBBA
Empidonax virescens	Acadian Flycatcher	S2S3B	END	END	MNR, NHIC, OBBA
Falco peregrinus	Peregrine Falcon	S2S3B, ZN	THR	SC	MNR
Icteria virens	Yellow-breasted Chat	S2B	SC	END	MNR
Ixobrychus exilis	Least Bittern	S4B	THR	THR	MNR, OBBA
Melanerpes erythrocephalus	Red-headed Woodpecker	S4B	THR	SC	MNR, OBBA
Protonotaria citrea	Prothonotary Warbler	S1B	END	END	MNR
Rallus elegans	King Rail	S2B	END	END	MNR
Seiurus motacilla	Louisiana Waterthrush	S3B	SC	SC	MNR
Tyto alba	Barn Owl	S1	END	END	MNR
Vermivora chrysoptera	Golden-winged Warbler	S4B	THR	SC	MNR
Wilsonia canadensis	Canada Warbler	S4B	THR	SC	MNR
Wilsonia citrina	Hooded Warbler	S3B	THR	SC	MNR
Caprimulgus vociferus	Whip-poor-will	S4B	---	THR	MNR, OBBA
Chlidonias niger	Black Tern	S3B	---	SC	MNR
Dolichonyx oryzivorus	Bobolink	S4B	---	THR	MNR, OBBA
Haliaeetus leucocphalus	Bald Eagle	S4B, SZN	---	SC	MNR
Hirundo rustica	Barn Swallow	S4B	---	THR	MNR, OBBA
Sturnella magna	Eastern Meadowlark	S4B	---	THR	MNR, OBBA
MAMMALS					
Microtus pinetorum	Woodland Vole	S3	SC	SC	MNR, AMO
Myotis lucifugus	Little Brown Myotis	S4	END	END	MNR, AMO
Myotis septentrionalis	Northern Myotis	S3	END	END	MNR, AMO
Pipistrellus subflavus	Eastern Pipistrelle	S3	END	---	AMO
Taxidea taxus	Badger	S2	END	END	MNR, AMO

Scientific Name	Common Name	S-Rank	*Sara**	*ESA*	Information Source**
Urocyon cinereoargenteus	Gray Fox	S1	THR	THR	AMO
HERPETOZOA					
Ambystoma jeffersonianum	Jefferson Salamander	S2	THR	THR	MNR, NHIC, HA
Apalone spinifera spinifera	Eastern Spiny Softshell	S3	THR	THR	MNR, HA
Chelydra serpentina	Common Snapping Turtle	S4	SC	SC	MNR, HA
Emydoidea blandingii	Blanding's turtle	S3	THR	THR	MNR, HA
Glyptemys insculpta	Wood Turtle	S2	THR	END	HA
Graptemys geographica	Map Turtle	S3	SC	SC	MNR, HA
Heterodon platirhinos	Eastern Hognose Snake	S3	THR	THR	MNR
Lampropeltis triangulum	Eastern Milksnake	S3	SC	SC	MNR, HA
Sternotherus odoratus	Common Musk turtle	S3	THR	THR	HA
Thamnophis sauritus septentrionalis	Northern Ribbon Snake	S3	SC	SC	MNR, HA
LEPIDOPTERANS					
Danaus plexippus	Monarch	S2N, S4B	SC	SC	MNR
Pieris virginiensis	West Virginia White	S3	---	SC	MNR
AQUATIC					
Clinostromus elongatus	Redside Dace	S2	END	END	MNR, NHIC
Esox americanus spp. vermiculatus	Grass Pickerel	S3	SC	SC	MNR
Anguilla rostrata	American Eel	S1	---	END	MNR
Ligumia nasuta	Eastern Pondmussel	S1	---	END	MNR
Notropis photogenis	Silver Shiner	S2S3	---	THR	MNR
Villosa Iris	Rainbow Mussel	S2S3	---	THR	MNR

**SC = Special Concern, THR = Threatened, END = Endangered; **MNR = consultation with the MNR; NHIC = Natural Heritage Information Centre database; OBBA = Ontario Breeding Bird Atlas; AMO = Atlas of the Mammals of Ontario; HA = Ontario Herpetofaunal Atlas*

Existing Conditions

The evaluation of the LSA for likelihood of occurrence and the suitability of available habitat for the above noted Species at Risk and Species of Special Status is provided in **Appendix B**. Information provided within **Appendix B** relates to existing conditions within the LSA as identified through field surveys.

Based on information collected during field investigations the list of Species at Risk that occur, or have the potential to occur, in the LSA were able to be narrowed down to those bulleted below. **Appendix B**, **Table B10** provides the rationale for these species to be carried forward in the evaluation process.

- *Chimney Swift;*
- *Little Brown Myotis;*
- *Northern Myotis;*
- *Eastern Pipistrelle;*
- *Woodland Vole;*
- *Common Snapping Turtle;*
- *Blanding's Turtle;*
- *Eastern Musk Turtle;*
- *Wood Turtle;*

- *Hognose Snake;*
- *Eastern Milksnake; and,*
- *Northern Ribbon Snake.*

5.1.8.1. Summary of Species at Risk and Species of Special Status

Species at Risk and Species of Special Status will be considered in the effects assessment. Information relating to potential Project effects, and mitigation is provided in **Section 7** of this ESA.

5.1.9. Air Emissions

Air quality in the Hamilton area is influenced by local sources from the Hamilton region as well as long-range transport of contaminants from other regions. This includes air emissions from industrial and commercial sources as well as traffic from local roads and highways. Characterization of current air quality conditions in the RSA was based on data collected at the MOEs Hamilton western (NO_2, Ozone, $PM_{2.5}$), Hamilton downtown (CO) and Hamilton mountain (SO_2) stations from 2010 to 2012 (Ontario Ministry of the Environment, 2013). All these stations are in close proximity to the RSA and are considered to be representative of the existing (baseline) air quality.

Air quality criteria, standards and objectives in Ontario have been established by the MOE and Environment Canada. The purpose of air quality objectives and standards is to limit impacts from permitted sources on the local airshed.

The maximum 24-hour $PM_{2.5}$ concentration was around the Ontario AAQC and Canada Wide Standard. However, the compliance for Canada Wide Standard of $PM_{2.5}$ is assessed based on the 98th percentile annual ambient measurement, averaged over three consecutive years which was 16 µg/m^3 at Hamilton west station between 2010 and 2012, and therefore below the Canada Wide Standard. There were a few smog days in the Hamilton area due to elevated ozone concentrations which might have been attributable to trans-boundary air pollution.

Existing air quality in the Hamilton area is characterized as good. Typical air emission sources include vehicles, farming equipment, light industrial activities and manufacturing facilities in the RSA.

5.1.9.1. Summary of Air Emissions

Air emissions will be considered in the effects assessment. Information relating to potential Project effects and mitigation is provided in **Section 7** of this ESA.

5.1.10. Greenhouse Gas Emissions

Climate change or global warming is connected to increasing quantities of GHGs in the atmosphere that trap heat from the sun. Some GHGs occur naturally, but additional contributions are generated from human activities, including the burning of fossil fuels that release carbon dioxide into the atmosphere. Typical GHG emission sources include vehicles, farming equipment, light industrial activities and manufacturing facilities in the RSA.

5.1.10.1. Summary of Greenhouse Gas Emissions

Greenhouse gas emissions will be considered in the effects assessment. Information relating to potential Project effects and mitigation is provided in **Section 7** of this ESA.

5.1.11. Acoustic Environment

The existing corridor and reroute alternative fall within an area dominated by farmland (i.e., rural setting). The existing acoustic environment within the RSA and the surrounding lands is characterized by sounds of nature, traffic noise along nearby roads (i.e., Westover Road, Concession 5 West), noise from farm related activities, and noise from light industrial activities (i.e., Enbridge's Westover Station).

5.1.11.1. Summary of Acoustic Environment

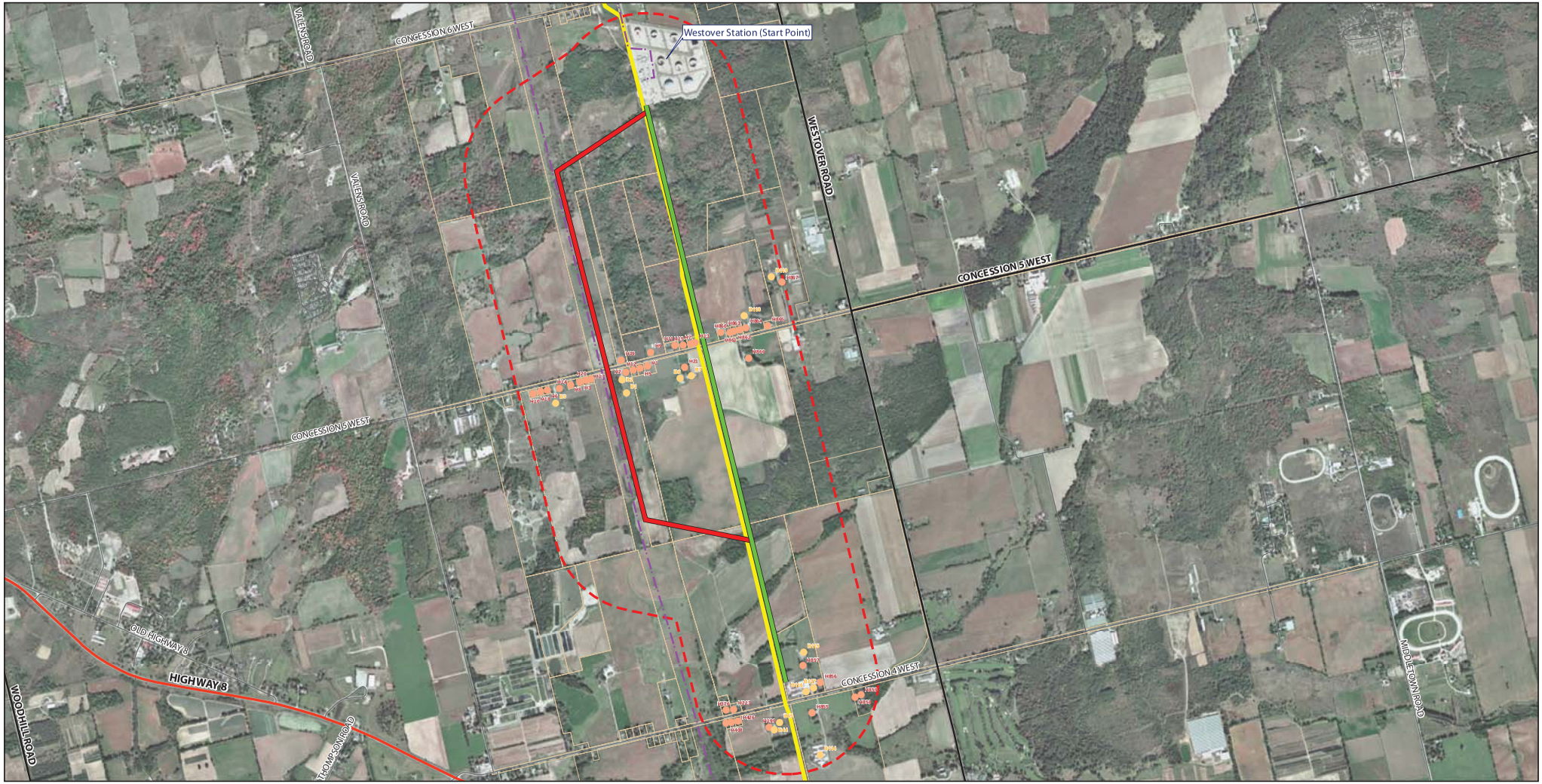
The acoustic environment will be considered in the effects assessment. Information relating to potential Project effects and mitigation is provided in **Section 7** of this ESA.

5.2. Socio-Economic Environment

The LSA and RSA were used for the collection of socio-economic data. Data collected focuses primarily on the social, economic and cultural features present in the vicinity of the Project. The following provides the socio-economic setting within the LSA and RSA for the following components:

- *Human occupancy and resource use;*
- *Heritage resources;*
- *Navigation and navigation safety;*
- *Traditional land and resource use;*
- *Social and cultural well-being;*
- *Human health and aesthetics;*
- *Infrastructure and services; and,*
- *Employment and economy.*

Figure 5.8: Major Socio-Economic Features provides an overview of the major socio-economic features identified in the LSA.



ENBRIDGE PIPELINES
LINE 11 WESTOVER SEGMENT
REPLACEMENT AND
DECOMMISSIONING PROJECT

ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT

MAJOR SOCIO-ECONOMIC FEATURES
FIGURE 5.8

Project Components
- Potential Line 11 Replacement Alternative (Option 1)
- Potential Line 11 Reroute Alternative (Option 2)
- Existing Line 11
- Local Study Area

Base Map
- Barn
- House
- Hydro Transmission Line
- Highway
- Arterial Road
- Collector Road
- Local Street
- Parcel

DILLON CONSULTING

MAP CREATED BY: GM
MAP CHECKED BY: CC
MAP PROJECTION: NAD 1983 UTM Zone 17N

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNR, Geowarehouse, City of Hamilton, LOID, Google Earth Pro

ENBRIDGE

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FILE LOCATION: I:\GIS\137662 - Enbridge Line 10 and 11 Replacement\Mapping

PROJECT: 137662 STATUS: FINAL DATE: 11/18/2013

5.2.1. Human Occupancy and Resource Use

5.2.1.1. Human Occupancy

The Project is located entirely within the single-tier City of Hamilton, Ontario, Canada. The City of Hamilton is located in Southern Ontario on the western end of the Niagara Peninsula and Lake Ontario and covers approximately 1,117 km^2 (Statistics Canada, 2012). The existing corridor and reroute alternative are located primarily in a rural and agricultural setting and no major communities were identified in the LSA. Approximately 30 residences and farmhouses are located along Concession 5 West and Concession 4 West.

According to Statistics Canada (2012), the City of Hamilton experienced a population increase of approximately 3.1 percent between 2006 (504,559 people) and 2011 (519,949 people). Comparatively, the Province of Ontario experienced a population increase of approximately 5.7 percent between 2006 and 2011 The median age of the population is 40.9 with 83.5 percent over the age of 15 (Statistics Canada, 2012). The Population in the City of Hamilton is expected to grow to 680,000 in 2031 and 780,000 in 2041.

Aboriginal Communities

No Aboriginal communities were identified within the LSA. The closest Aboriginal communities to the Project include the Mississaugas of New Credit (located approximately 40 km south of the Project) and Six Nations of the Grand River (located approximately 25 km south of the Project).

5.2.1.2. Resource Use

A land use survey was completed for the Project on June 3, 2013. The purpose of the land use survey was to confirm land uses identified in secondary sources.

The LSA is primarily rural and agricultural interspersed with farmhouses and natural features (i.e., woodlands, watercourses, wetlands, open space). There is a mix of agricultural fields that are both actively farmed and fallow.

Section 3.4.2 (General Provisions) in the Rural Hamilton Official Plan permits utilities in all land use designations. The lands located in the LSA are primarily designated as Agriculture, Rural and Open Space in the Rural Hamilton Official Plan, March 7, 2012 (Schedule D: Rural Land Use Designations). The primary intent of lands designated as Agriculture is to protect prime agricultural areas for agriculture use. Permitted uses are limited to agricultural uses, agricultural-related commercial and agricultural-related industrial uses and on-farm secondary uses. According to the City of Hamilton Zoning Index Map (November 2006), the Project LSA also traverses several zones ranging from Agricultural (dominant) to Open Space and Residential.

The majority of the LSA is located on lands designated as Protected Countryside in the Ontario Greenbelt Plan, 2005. Sections of the existing corridor and reroute alternative also cross lands designated as Natural Heritage System. The Protected Countryside is comprised of an agricultural system and a natural system, together with a series of settlement areas. The Natural Heritage

System includes areas of the Protected Countryside with the highest concentration of the most sensitive and/or significant natural features.

As per Section 4.2.1 (General Infrastructure Policies) of the Greenbelt Plan, infrastructure projects approved by the NEB are permitted on lands designated as Protected Countryside in the Greenbelt Plan provided it serves the significant growth and economic development expected in southern Ontario beyond the Greenbelt by providing for the appropriate infrastructure connections among urban growth centres and between these centers and Ontario's borders. As per the Greenbelt Plan, infrastructure includes oil pipelines and associated facilities.

5.2.1.3. Summary of Human Occupancy and Resource Use

Human occupancy and resource use will be considered in the effects assessment. Information relating to potential Project effects and mitigation is provided in **Section 7** of this ESA.

5.2.2. Heritage Resources

A Stage 1 archaeological assessment was undertaken by D.R. Poulton & Associates Incorporated (D.R. Poulton) in accordance with the provisions of the *Ontario Heritage Act* and the *Standards and Guidelines for Consultant Archaeologists* formulated by the Ministry of Tourism, Culture and Sport, 2011. The spatial boundary used for the Stage 1 archaeological assessment was an approximate 1 km buffer around of the Project consistent with the requirements of the *Standards and Guidelines for Consultant Archaeologists*. The findings of the assessment are organized into four subsections including the following:

- *registered sites of demonstrable or potential significance;*
- *unregistered archaeological sites;*
- *historically mapped structures; and,*
- *potential for as-yet undiscovered sites.*

Registered Sites of Demonstrable or Potential Significance

No registered sites of demonstrable or potential significance were identified within 100 m of the existing corridor. One registered site of demonstrable or potential significance was identified within 100 m of the reroute alternative. It is the Zap 6 site (AhHa-96). Zap 6 is a First Nations site of unknown age, cultural affiliation and type. No thorough archaeological assessment has ever been carried out at this site. However, since the preferred route will not include the reroute alternative, then the Zap 6 site is not a concern for the Project.

Unregistered Archaeological Sites

The Stage 1 also considered data on one unregistered First Nations site (James Rae Site) located north of the LSA. The site was documented in the course of the background research conducted as part of the assessment of prior studies completed in the area. Information is available on the general location of the site, but the exact location is unknown. However, the stated lots and concession for the site place it somewhere within a 160 ha block of land some 500 m to 2 km north of the north end of the Project.

Historically Mapped Structures

Historic Atlas maps were used to identify historical structures. They do not depict their locations with precision, but are reasonably accurate. Determining whether a particular historically documented structure is now an archaeological site and actually straddles or falls within either the existing corridor or reroute alternative will be one of the tasks for the Stage 2 archaeological assessment.

Granting the limitations of the mapping and the fact that a survey will be required to confirm the presence or absence of sites, the available data indicate that there is one historically mapped structure (F. Madder homestead) on, or adjacent to, the reroute alternative. None were identified along the existing corridor.

Potential for As-Yet Undiscovered Sites

The Stage 1 archaeological assessment included a review of site potential mapping compiled as part of the municipal archaeological master plan of the City of Hamilton and an independent review of the potential for as-yet undiscovered archaeological remains. The results confirmed that the spatial boundary identified for the Project as part of the Stage 1 archaeological assessment has potential for archaeological remains.

5.2.2.1. Summary of Heritage Resources

Heritage Resources will be considered in the effects assessment. Potential Project effects and mitigation is provided in **Section 7** of this ESA.

A copy of the Stage 1 archaeological assessment report prepared for the Project is provided in **Appendix C.**

5.2.3. Navigation and Navigation Safety

The NEB is responsible for the administration of the *Navigable Waters Protection Act (NWPA)* which prohibits the construction or placement of any works in navigable waters without first obtaining approval.

Under the *NEB Act*, "navigable water" has the same meaning as in the *NWPA*, and is defined to include "a canal and any other body of water created or altered as a result of the construction of any work" (NEB, 2013a).

The NEB will also be guided by the following: "navigable water will be considered as any body of water capable, in its natural state, of being navigated by floating vessels of any description for the purpose of transportation, recreation or commerce, and may also be a human-made feature such as a canal or reservoir" (NEB, 2013a).

Based upon a review of the *NWPA* as well as the characteristics and potential use of these watercourses, no navigable waterways were identified within the LSA.

5.2.3.1. Summary of Navigation and Navigation Safety

Navigation and navigation safety will not be considered in the effects assessment for the Project.

5.2.4. Traditional Land and Resource Use

Enbridge's consultation program included contact with Aboriginal communities in proximity to the Project. Details are provided in Enbridge's Application. A review of applicable mapping provided by the Ministry of Aboriginal Affairs (MAA) and Aboriginal Affairs and Northern Development Canada (AANDC) revealed no Aboriginal communities located in the LSA.

5.2.4.1. Summary of Traditional Land and Resource Use

Traditional lands and resource will not be considered as part of the effects assessment.

5.2.5. Social and Cultural Well-Being

The LSA is primarily agricultural and rural with interspersed residences and farmhouses.

5.2.5.1. Summary of Social and Cultural Well-Being

Social and cultural well-being will not be considered in the effects assessment.

5.2.6. Human Health and Aesthetics

This section describes the Project-related activities that could result in human health effects to the public and workers as a result of the Project as well as aesthetics.

5.2.6.1. Human Receptors

Human receptors include the public, workers and others who may be present in the LSA during the construction, operation or decommissioning of the Project. Human receptors might be present temporarily (i.e., workers) or permanently (i.e., homeowners) and of any age and includes primarily local residents. There are approximately thirty receptors within the LSA.

5.2.6.2. Aesthetics

The Project is located primarily in a rural and agricultural area. There are some residences located near the existing corridor along intersecting roads.

5.2.6.3. Summary of Human Health and Aesthetics

Human health and aesthetics will be considered in the effects assessment. Potential Project effects and mitigation is provided in **Section 7** of this ESA.

5.2.7. Infrastructure and Services

The City of Hamilton is located at the western end of Ontario's Golden Horseshoe and provides access to several highways and rail lines, as well as the Port of Hamilton and the John C. Munro Hamilton Airport. The following section provides information relating to infrastructure and services in relation to the Project.

5.2.7.1. Infrastructure

Local and regional linear infrastructure corridors were noted within the RSA during desktop and land use surveys including a utility corridor, pipelines, and two roads (Concession Road 5 West and Concession Road 4 West). Some of the infrastructure (i.e., local roads) will be used during the construction phase of the Project to transport equipment.

The majority of local roads in the area are two lanes and paved however there are some connecting roads which are unpaved consistent with a typical rural area. Electricity is distributed and managed by Hydro One Networks Incorporated.

Infrastructure located in the LSA includes the following:

- *north-south hydro transmission corridor (between Westover Road and Valens Road);*
- *Concession Road 5 West;*
- *Concession Road 4 West; and,*
- *existing pipelines located within the existing corridor as well as the utility RoW located approximately 300 m west of the Westover Station.*

5.2.7.2. Services

Community services are provided in the LSA and RSA by the City of Hamilton and include local police, fire services and emergency medical services (EMS) services. The RSA also includes hospitality services including motels and restaurants. Other services provided by the City of Hamilton include construction and maintenance of roads, wastewater and sewage.

The closest fire station to the LSA is Fire Station # 27 located at 795 Old Highway #8 (Old Highway 8 and Valens Road). There are also several hospitals that service the LSA and RSA including The LSA is also located within Police Division Three, located at 400 Rymal Road East between Upper Wentworth and Upper Wellington (Hamilton Police, 2013).

5.2.7.3. Summary of Infrastructure and Services

Infrastructure and services will be considered in the effects assessment. Potential Project effects and mitigation is provided in **Section 7** of this ESA.

5.2.8. Employment and Economy

The City of Hamilton has a labour participation rate of 62.8 (compared with 64.7 in 2006) with an unemployment rate of 8.7 percent in 2011 (compared with 6.5 percent in 2006). Of the total population aged 15 years and over, approximately 235,420 people identified themselves as an employee and 23,465 identified themselves as self-employed (Statistics Canada, 2012a).

The top three occupations in the City of Hamilton in 2011 were Sales and Service Occupations, Business, Finance and Administration, and Trades, Transport and Equipment Operators (Statistics Canada, 2012a). Top employers in the City of Hamilton included the Hamilton Health Sciences Corporation, McMaster University, City of Hamilton, Hamilton-Wentworth District School Board and ArcelorMittal Dofasco Incorporated (steel manufacturer) (Hamilton Economic Development, 2013).

Aboriginal Communities

When considering Aboriginal people in the core-aged working population (25 to 54 years old), employment fell by 2.8 percent (-7,300) in 2009 and by 4.9 percent (-12,400) in 2010 (Statistics Canada Survey, 2013). In contrast, for non-Aboriginal core-aged workers, employment fell by 1.7 percent (-198,000) in 2009; however, in 2010, it rebounded by 0.8 percent (+93,000) (Statistics Canada Survey 3701, 2013).

In 2010, the participation rate for core-aged Aboriginal workers was 75 percent compared with 86.7 percent for their non-Aboriginal counterparts. This 11.7 percentage-point gap was the largest between these two groups over the four-year period for which comparable data are available (Statistics Canada Survey 3701, 2013).

5.2.8.1. Summary of Employment and Economy

Employment and economy will be considered in the effects assessment. Potential Project effects and mitigation is provided in **Section 7** of this ESA.

6.ROUTE EVALUATION

The route evaluation involved comparing the existing corridor with the reroute alternative with the objective of identifying a Preferred Route for the Project. The route evaluation provided an opportunity to minimize or eliminate potential adverse effects of the Project on the biophysical and socio-economic environment. The evaluation included input received from the stakeholder consultation program and was used to address stakeholder concerns, where possible. The following provides an overview of the route evaluation process.

6.1. Methodology

A methodology was applied to identify the Preferred Route for the Project including a visual analysis, feedback received from stakeholders, local knowledge of the area, reviews of available secondary source information (mapping and aerial photographs), land use and data collected during field visits. The route evaluation included the comparison of the existing corridor with the reroute alternative to determine which would have the least environmental and socio-economic impact and that met Enbridge's technical and economic requirements. It is important to note that a Preferred Route may not satisfy every established criteria; however, mitigation techniques may be implemented to minimize the effects.

The evaluation began with a high-level review followed by a more detailed evaluation of routes. The route evaluation included a buffer from the existing corridor and reroute alternative to account for potential minor deviations should they be required at a future point in time.

6.2. Route Evaluation Process

The purpose of the evaluation was to compare sections of the existing corridor and the potential reroute alternative. The route evaluation was guided by route selection criteria as provided in **Section 6.2.1** of this ESA and reflected:

- *the general planning principles and route selection considerations provided in the NEB Filing Manual (2013);*
- *Enbridge's Environmental Guidelines for Construction (2012);*
- *stakeholder consultation;*
- *professional experience of the Project team from previous project; and,*
- *technical constraints.*

6.2.1. Route Selection Criteria

Routing of the pipeline was based on the following criteria as well as Enbridge's practice to avoid, to the extent possible, any environmentally sensitive areas and minimize disturbances to the socio-economic environment. **Table 6** provides the general considerations that were used to assess the existing corridor and reroute alternative.

Table 6:
Routing Criteria

Criteria	Rule
Biophysical	Avoid significant natural features (i.e., ANSIs, Species at Risk, environmentally sensitive areas, and waterbodies) and adhere to appropriate setback requirements.
	Minimize watercourse crossings and reduce impacts to woodlands, wetlands, fish and wildlife habitats, and natural areas. Avoid areas with unsafe or hazardous slopes.
	Select best topographical/terrain areas for the route (i.e., dry, flat and stable ground).
Socio-Economic	Maximize distance to cultural heritage resources such as cemeteries, registered archaeological sites, heritage buildings, and other resources.
	Minimize incompatibility with existing land uses (i.e., prime agricultural land).
	Minimize access and use of private properties (i.e., use of Enbridge-owned RoWs is favoured to minimize disruption to property owners).
	Minimize potential disturbance to adjacent residences which may be affected by construction activities.
	Minimize potential disturbance to adjacent institutional and recreational properties which may be affected by construction activities.
	Conformity with local land use policy.
	Minimize disruption to traffic for residents and businesses, which may be affected by construction activities as well as safety risks.
	Consultation feedback from agencies, landowners, the public and Aboriginal groups.
	Avoid impact to water wells, aquifer recharge areas and active farming operations (including structures such as barns and sheds) and livestock grazing areas (if possible).
Technical	Find the shortest and most direct routes, to the extent possible, to reduce the length, environmental and socio-economic constraints and costs of the potential route.
	Use existing linear RoWs to connect the start and end points, including major roads, railways, and utility corridors to the best extent possible to reduce potential wildlife fragmentation and other disturbances.
	Minimize road crossings.
	Avoid areas with insufficient amount of construction work space or uneven terrain.
	Consideration for regulatory requirements (input).
	Avoid contaminated soils along the RoW or contaminated sediments at water crossings.
	Minimize the number of overhead electric transmission line crossings.
	Avoid road corridors with high traffic volumes, to the extent possible.
	Minimize the number of private driveways crossed.
	Reduce proximity to areas with numerous municipal projects and prolonged construction activities.

6.3. Preferred Route Rationale

The following section provides an overview of the Preferred Route selected for the Project. Information relating to temporary facilities is also provided.

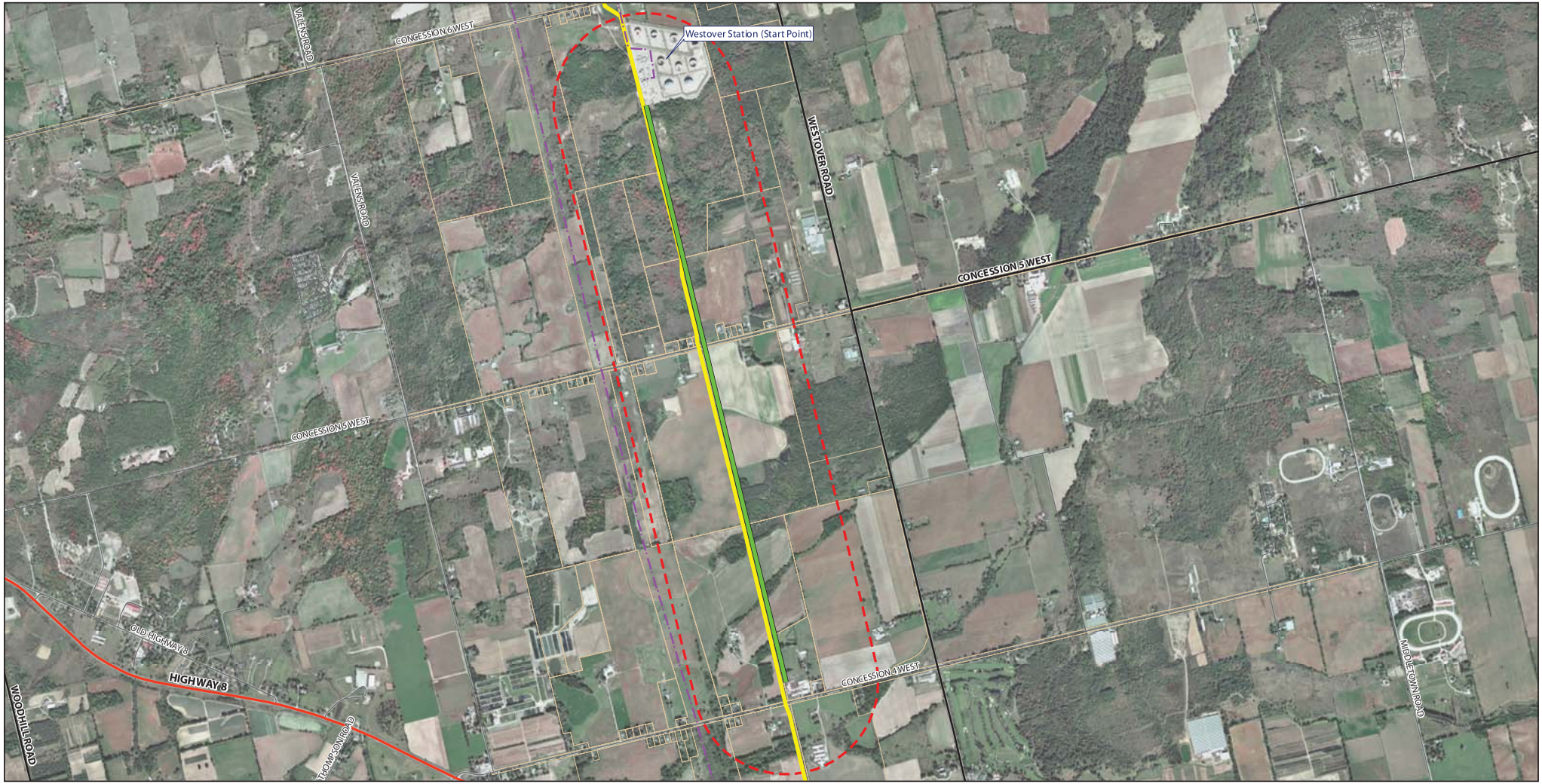
6.3.1. Preferred Pipeline Route

Following the evaluation, it was determined that the new pipeline should be located within the existing corridor and thus was selected as the Preferred Route. The existing corridor was selected for constructing the new pipeline primarily because it:

- *is shorter;*
- *is previously disturbed;*
- *has been in use by Enbridge for over 50 years;*
- *has an existing Enbridge easement and was suggested as a feasible and logical approach by landowners;*
- *provides working space and access; and,*
- *potential effects to environmental and socio-economic features can be effectively mitigated.*

Additional minor deviations to the pipeline location may be required based on continued consultation and detailed engineering. The pipeline located in the existing corridor will be decommissioned in place with no ground disturbance anticipated.

Figure 6: Preferred Route provides an overview of the Preferred Route for the Project.



ENBRIDGE PIPELINES
LINE 11 WESTOVER SEGMENT
REPLACEMENT AND
DECOMMISSIONING PROJECT

ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT

PREFERRED ROUTE

FIGURE 6

Project Components
- Line 11 Replacement (Option 1) (Preferred Route)
- Existing Line 11
- Local Study Area

Base Map
- Hydro Transmission Line
- Highway
- Arterial Road
- Collector Road
- Local Street
- Parcel

DILLON CONSULTING

MAP CREATED BY: GM
MAP CHECKED BY: CC
MAP PROJECTION: NAD 1983 UTM Zone 17N

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNR, Geowarehouse, City of Hamilton, LOID, Google Earth Pro

1:20,000

0 250 500 1,000 m

N W E S

ENBRIDGE

FILE LOCATION: I:\GIS\137662 - Enbridge Line 10 and 11 Replacement\Mapping

PROJECT: 137662 STATUS: FINAL DATE: 11/15/2013

6.3.2. Temporary Facilities

Temporary facilities for the purpose of the Project may include equipment staging areas, soil stockpile areas, temporary bridges to facilitate watercourse crossings and temporary access roads. Temporary facilities will be required prior to, and during, the construction period. The location of the temporary facilities will be determined by Enbridge and their contractor(s) during construction planning.

Field work completed for the Project included lands located approximately 50 m on either side of the existing corridor and can be used to site temporary facilities. When siting temporary facilities, the following criteria should be used to minimize environmental and socio-economic impacts:

- *identify locations within previously disturbed areas;*
- *select locations close to the area of construction to minimize ground disturbance;*
- *avoid areas with native vegetation and other natural features such as woodlands;*
- *avoid, where possible, known locations of Species at Risk or Species of Special Status;*
- *avoid sloped and poorly drained areas;*
- *avoid areas with known heritage resources; and,*
- *avoid residential receptors to the extent possible.*

Mitigation measures provided in **Section 7** of this ESA should also be considered when siting temporary facilities. Applicable agency approvals will have to be obtained.