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Appendix A

Existing Conditions

Cultural Heritage Report:
Existing Conditions and Preliminary Impact Assessment

Highway 52 and Powerline Road West Intersection Improvements
Municipal Class Environmental Assessment

City of Hamilton, Ontario

Final Report

Prepared for:

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Archaeological Services Inc. File: 24CH-116

August 2025 (Updated February and May 2026)



Executive Summary

Archaeological Services Inc. was contracted by R.J. Burnside & Associates Limited on behalf of the City of Hamilton, to conduct a Cultural Heritage Report: Existing Conditions and Preliminary Impact Assessment (Cultural Heritage Report) as part of the Highway 52 and Powerline Road West Intersection Improvements, City of Hamilton. The Highway 52 and Powerline Road West Intersection Improvements project, being completed under Schedule C of the Municipal Class Environmental Assessment process (M.C.E.A.), is an examination of the feasibility of implementing a roundabout at the intersection of Highway 52 and Powerline Road West, relative to other transportation improvement options. Also under consideration for this project is a review of the intersection of Highway 52 and Powerline Road East, approximately 430 metres south of the above-named intersection, and an assessment of the feasibility of realigning/extending Powerline Road East from a cul-de-sac approximately 200 metres east of the intersection with Highway 52, to coincide with the potential roundabout (City of Hamilton, 2024b).

The purpose of this report is to present an inventory of known and potential built heritage resources (B.H.R.s) and cultural heritage landscapes (C.H.L.s), identify existing conditions of the project study area, provide a preliminary impact assessment, and propose appropriate mitigation measures.

An analysis of available primary and secondary source materials, including historical mapping, reveals a study area with an Indigenous history spanning several millennia and a rural history dating back to the 1770s and the arrival of Loyalist settlers following the close of the American War of Independence. Based on a review of federal, provincial, and municipal registers, inventories, and databases revealed that there is one known C.H.L., two potential C.H.L.s, and three potential B.H.R.s. Two additional potential C.H.L.s were identified during background research and field review.

Based on the results of the assessment, the following recommendations have been developed:

1. Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to identified B.H.R.s and the C.H.L. Avoidance measures may include, but are not limited to: erecting temporary fencing, establishing buffer zones, issuing instructions to construction crews to avoid identified B.H.R.s, etc. should all be considered.

2. Where feasible, the proposed construction activities should be designed in a manner that limits potential indirect impacts to C.H.L. 4. The removal of trees and vegetation within the right-of-way should be limited where possible adjacent to the C.H.L. Where tree removals are required, post-construction rehabilitation with sympathetic plantings should be implemented.

3. Should future work require an expansion of the study area then a qualified heritage consultant with recent and relevant experience should be contacted in order to confirm the impacts of the proposed work on potential heritage resources.

4. This report should be submitted by the proponent to heritage staff at the City of Hamilton and the Ministry of Citizenship and Multiculturalism for review and comment, along with any other local heritage stakeholders that may have an interest in this project.

Report Accessibility Features

This report has been formatted to meet the Information and Communications Standards under the *Accessibility for Ontarians with Disabilities Act*, 2005 (A.O.D.A.). Features of this report which enhance accessibility include: headings, font size and colour, alternative text provided for images, and the use of periods within acronyms. Given this is a technical report, there may be instances where additional accommodation is required in order for readers to access the report's information. If additional accommodation is required, please contact Annie Veilleux, Manager of the Cultural Heritage Practice Area at Archaeological Services Inc., by email at aveilleux@asiheritage.ca or by phone 416-966-1069 ext. 255.

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Glossary

Built Heritage Resource (B.H.R.)
Definition: "…a building, structure, monument, installation or any manufactured or constructed part or remnant that contributes to a property's cultural heritage value or interest as identified by a community, including an Indigenous community" (Ministry of Municipal Affairs and Housing, 2024, p. 40).

Cultural Heritage Landscape (C.H.L.)
Definition: "…a defined geographical area that may have been modified by human activity and is identified as having cultural heritage value or interest by a community, including an Indigenous community. The area may include features such as buildings, structures, spaces, views, archaeological sites or natural elements that are valued together for their interrelationship, meaning or association"(Ministry of Municipal Affairs and Housing, 2024, p. 41).

Known Built Heritage Resource or Cultural Heritage Landscape
Definition: A known built heritage resource or cultural heritage landscape is a property that has recognized cultural heritage value or interest. This can include a property listed on a Municipal Heritage Register, designated under Part IV or V of the *Ontario Heritage Act*, or protected by a heritage agreement, covenant or easement, protected by the *Heritage Railway Stations Protection Act or the Heritage Lighthouse Protection Act*, identified as a Federal Heritage Building, or located within a U.N.E.S.C.O. World Heritage Site (Ministry of Citizenship and Multiculturalism, 2022).

Impact
Definition: Includes negative and positive, direct and indirect effects to an identified built heritage resource and cultural heritage landscape. Direct impacts include destruction of any, or part of any, significant heritage attributes or features and/or unsympathetic or incompatible alterations to an identified resource. Indirect impacts include, but are not limited to, creation of shadows, isolation of heritage attributes, direct or indirect obstruction of significant views, change in land use, and land disturbances (Ministry of Citizenship and

Multiculturalism, 2006b). Indirect impacts also include potential vibration impacts (See Section 2.6 for complete definition and discussion of potential impacts).

Mitigation
Definition: Mitigation is the process of lessening or negating anticipated adverse impacts to built heritage resources or cultural heritage landscapes and may include, but are not limited to, such actions as avoidance, monitoring, protection, relocation, remedial landscaping, and documentation of the cultural heritage landscape and/or built heritage resource if to be demolished or relocated (Ministry of Citizenship and Multiculturalism, 2006a).

Potential Built Heritage Resource or Cultural Heritage Landscape
Definition: A potential built heritage resource or cultural heritage landscape is a property that has the potential for cultural heritage value or interest. This can include properties/project area that contain a parcel of land that is the subject of a commemorative or interpretive plaque, is adjacent to a known burial site and/or cemetery, is in a Canadian Heritage River Watershed, or contains buildings or structures that are 40 or more years old (Ministry of Citizenship and Multiculturalism, 2022).

Significant
Definition: With regards to cultural heritage and archaeology resources, significant means "resources that have been determined to have cultural heritage value or interest. Processes and criteria for determining cultural heritage value or interest are established by the Province under the authority of the *Ontario Heritage Act*" (Ministry of Municipal Affairs and Housing, 2024, p. 52).

Vibration Zone of Influence
Definition: Area within a 50-metre buffer of construction-related activities in which there is potential to affect an identified built heritage resource or cultural heritage landscape. A 50-metre buffer is applied in the absence of a project-specific defined vibration zone of influence based on existing secondary source literature (Carman et al., 2012; Crispino & D'Apuzzo, 2001; P. Ellis, 1987; Rainer,

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1.0 Introduction

Archaeological Services Inc. (A.S.I.) was contracted by R.J. Burnside & Associates Limited on behalf of the City of Hamilton, to conduct a Cultural Heritage Report: Existing Conditions and Preliminary Impact Assessment (Cultural Heritage Report) as part of the Highway 52 and Powerline Road West Intersection Improvements, City of Hamilton Municipal Class Environmental Assessment (M.C.E.A.).

The purpose of this report is to present an inventory of known and potential built heritage resources (B.H.R.s) and cultural heritage landscapes (C.H.L.s), identify existing conditions of the project study area, and provide a preliminary impact assessment appropriate mitigation measures based upon a review of preferred design solutions.

1.1 Project Overview

The Highway 52 and Powerline Road West Intersection Improvements project, being completed under Schedule C of the M.C.E.A. process, is an examination of the feasibility of implementing a roundabout at the intersection of Highway 52 and Powerline Road West, relative to other transportation improvement options. Also under consideration for this project is a review of the intersection of Highway 52 and Powerline Road East, approximately 430 metres south of the above-named intersection, and an assessment of the feasibility of realigning/extending Powerline Road East from a cul-de-sac approximately 200 metres east of the intersection with Highway 52, to coincide with the potential roundabout (City of Hamilton, 2024b).

1.2 Description of Study Area

This Cultural Heritage Report will focus on the project study area (Figure 1). This project study area has been defined as inclusive of those lands that may contain B.H.R.s or C.H.L.s that may be subject to direct or indirect impacts because of

the proposed undertaking. Properties within the study area are located within the City of Hamilton's municipal boundaries.

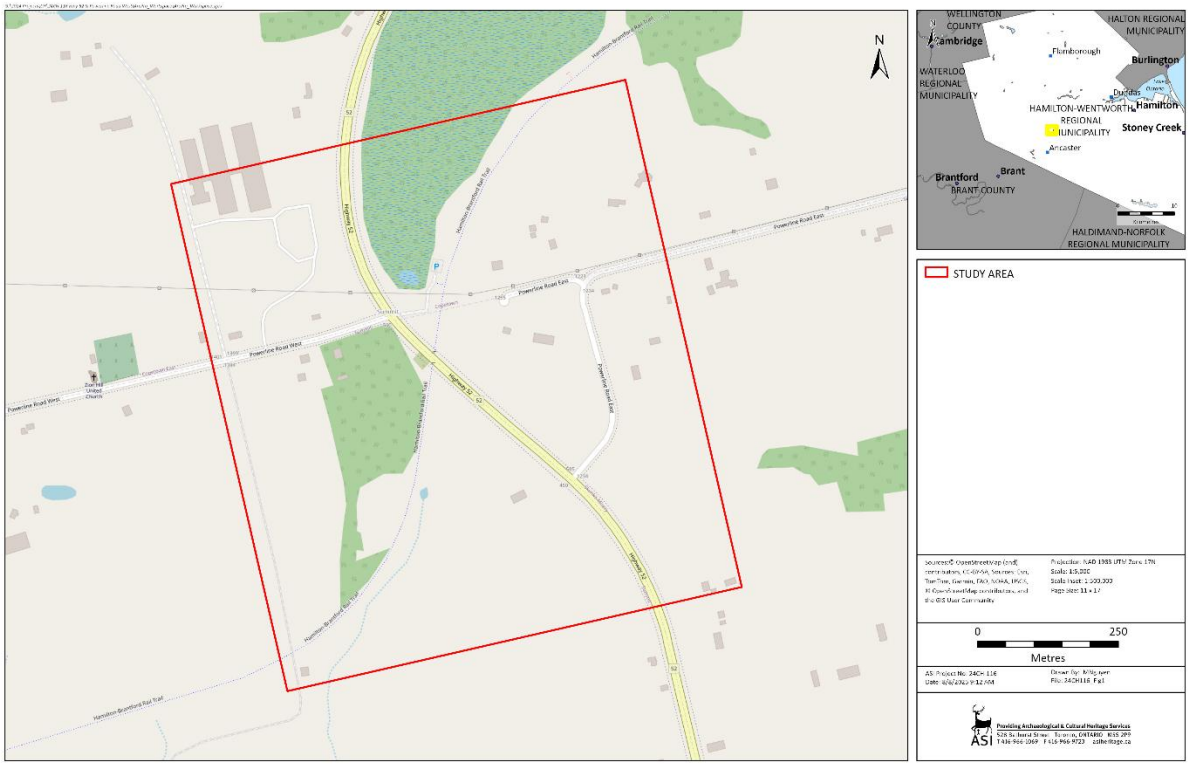


Figure 1: Location of the study area (Base Map: ©OpenStreetMap and contributors, Creative Commons-Share Alike License (C.C.-By-S.A.))

2.0 Methodology

The following sections provide a summary of regulatory requirements and municipal and regional heritage policies that guide this cultural heritage assessment. In addition, an overview of the process undertaken to identify known and potential built heritage resources (B.H.R.s) and cultural heritage landscapes (C.H.L.s) is provided, along with a description of how the preliminary impact assessment will be undertaken.

2.1 Municipal Class Environmental Assessment

A Municipal Class Environmental Assessment (M.C.E.A.) is a process through which municipalities investigate projects related to infrastructure, including transportation, water, wastewater, and stormwater. M.C.E.A.'s generally have five phases:

- Phase 1: Problem or Opportunity Statement
- Phase 2: Alternative Solutions
- Phase 3: Alternative Design Concepts for Preferred Solution
- Phase 4: Environmental Study Report (E.S.R.)
- Phase 5: Implementation (B.M. Ross & Associates Limited, 2018).

As stated above, the Highway 52 and Powerline Road West Intersection Improvements Project is a Schedule C project under the M.C.E.A., and thus has the:

> potential for more significant environmental effects than a Schedule B project and as such a proponent is required to complete the full planning and documentation process set out in the MCEA. For Schedule C projects, proponents are required to prepare an Environmental Study Report for review by the public and review agencies. If there are no outstanding concerns, the proponent may proceed to implementation once the regulatory process has been completed. Schedule C projects generally include the construction of new facilities and major expansions to existing facilities (Municipal Engineers Association, 2024).

2.2 Regulatory Requirements

The *Ontario Heritage Act* (O.H.A.) (Ontario Heritage Act, R.S.O. c. O.18 [as Amended in 2024], 1990) is the primary piece of legislation that determines policies, priorities and programs for the conservation of Ontario's heritage. There are many other provincial acts, regulations and policies governing land

use planning and resource development that support heritage conservation, including:

- The *Planning Act* (Planning Act, R.S.O. 1990, c. P.13, 1990), which states that "conservation of features of significant architectural, cultural, historical, archaeological or scientific interest" is a "matter of provincial interest". The *Provincial Planning Statement* (Ministry of Municipal Affairs and Housing, 2024), issued under the *Planning Act*, requires municipalities and the Crown to conserve significant B.H.R.s and C.H.L.s.
- The *Environmental Assessment Act* (Ministry of the Environment, 1990), which defines "environment" to include cultural conditions that influence the life of humans or a community. Cultural heritage resources, which includes archaeological resources, B.H.R.s and C.H.L.s, are important components of those cultural conditions.

The Ministry of Citizenship and Multiculturalism (hereafter "The Ministry") is charged under Section 2.0 of the O.H.A. with the responsibility to determine policies, priorities, and programs for the conservation, protection, and preservation of the heritage of Ontario. The *Standards and Guidelines for Conservation of Provincial Heritage Properties* (Government of Ontario, 2010) (hereinafter "*Standards and Guidelines")* apply to properties the Government of Ontario owns or controls that have "cultural heritage value or interest" (C.H.V.I.). The *Standards and Guidelines* provide a series of guidelines that apply to provincial heritage properties in the areas of identification and evaluation; protection; maintenance; use; and disposal. For the purposes of this report, the *Standards and Guidelines* provide points of reference to aid in determining potential heritage significance in the identification of B.H.R.s and C.H.L.s. While not directly applicable for use in properties not under provincial ownership, the *Standards and Guidelines* are regarded as best practice for guiding heritage assessments and ensure that additional identification and mitigation measures are considered.

Similarly, the *Ontario Heritage Tool Kit* (Ministry of Citizenship and Multiculturalism, 2025) provides a guide to evaluate heritage properties. To conserve a B.H.R. and C.H.L., the *Ontario Heritage Tool Kit* states that a municipality or approval authority may require a heritage impact assessment and/or a conservation plan to guide the approval, modification, or denial of a proposed development.

2.3 Municipal/Regional Heritage Policies

The study area is located within the City of Hamilton. Policies relating to B.H.R.s and C.H.L.s were reviewed from the following sources:

- Rural Hamilton Official Plan (City of Hamilton, 2021a)
- Built Heritage Inventory Process (City of Hamilton, 2023)
- Greenbelt Act (Greenbelt Act, 2005, 2023)
- Provincial Greenbelt Plan (Government of Ontario, 2017)

2.4 Identification of Built Heritage Resources and Cultural Heritage Landscapes

This Cultural Heritage Report follows guidelines presented in the *Ontario Heritage Tool Kit* (Ministry of Citizenship and Multiculturalism, 2025) and *Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes* (Ministry of Citizenship and Multiculturalism, 2022). The objective of this report is to present an inventory of known and potential B.H.R.s and C.H.L.s, and to provide a preliminary understanding of known and potential B.H.R.s and C.H.L.s located within areas anticipated to be directly or indirectly impacted by the proposed project.

In the course of the cultural heritage assessment process, all potentially affected B.H.R.s and C.H.L.s are subject to identification and inventory. Generally, when conducting an identification of B.H.R.s and C.H.L.s within a study area, three stages of research and data collection are undertaken to appropriately establish

the potential for and existence of B.H.R.s and C.H.L.s in a geographic area: background research and desktop data collection; field review; and identification.

Background historical research, which includes consultation of primary and secondary source research and historical mapping, is undertaken to identify early settlement patterns and broad agents or themes of change in a study area. This stage in the data collection process enables the researcher to determine the presence of sensitive heritage areas that correspond to nineteenth- and twentieth-century settlement and development patterns. To augment data collected during this stage of the research process, federal, provincial, and municipal databases and/or agencies are consulted to obtain information about specific properties that have been previously identified and/or designated as having cultural heritage value. Typically, resources identified during these stages of the research process are reflective of particular architectural styles or construction methods, associated with an important person, place, or event, and contribute to the contextual facets of a particular place, neighbourhood, or intersection.

A field review is then undertaken to confirm the location and condition of previously identified B.H.R.s and C.H.L.s. The field review is also used to identify potential B.H.R.s and C.H.L.s that have not been previously identified on federal, provincial, or municipal databases or through other appropriate agency data sources.

During the cultural heritage assessment process, a property is identified as a potential B.H.R. or C.H.L based on research, the Ministry screening tool, and professional expertise and best practice. In addition, use of a 40-year-old benchmark is a guiding principle when conducting a preliminary identification of B.H.R.s and C.H.L.s. While identification of a resource that is 40 years old or older does not confer outright heritage significance, this benchmark provides a means to collect information about resources that may retain heritage value.

Similarly, if a resource is slightly younger than 40 years old, this does not preclude the resource from having C.H.V.I.

2.5 Background Information Review

To make an identification of previously identified known or potential B.H.R.s and C.H.L.s within the study area, the following sections present the resources that were consulted as part of this Cultural Heritage Report.

2.5.1 Review of Existing Heritage Inventories

Several resources were consulted in order to identify previously identified B.H.R.s and C.H.L.s within the study area. These resources, reviewed on 16 July 2025 include:

- Hamilton *Cultural Heritage Resources* interactive map (City of Hamilton, 2024a);
- Ancaster Pre-Confederation Inventory (City of Hamilton, 2021b);
- The *Ontario Heritage Act Register* (Ontario Heritage Trust, n.d.b);
- The *Places of Worship Inventory* (Ontario Heritage Trust, n.d.c);
- The inventory of Ontario Heritage Trust easements (Ontario Heritage Trust, n.d.a);
- The Ontario Heritage Trust's *An Inventory of Provincial Plaques Across Ontario*: a PDF of Ontario Heritage Trust Plaques and their locations (Ontario Heritage Trust, 2023);
- The Ontario Heritage Trust's *An Inventory of Ontario Heritage Trust-owned properties across Ontario*: a PDF of properties owned by the Ontario Heritage Trust (Ontario Heritage Trust, 2019);
- Inventory of known cemeteries/burial sites in the Ontario Genealogical Society's online databases (Ontario Genealogical Society, n.d.);
- Canada's Historic Places website: available online, the searchable register provides information on historic places recognized for their heritage value at the local, provincial, territorial, and national levels (Parks Canada, n.d.a);

- Directory of Federal Heritage Designations: a searchable on-line database that identifies National Historic Sites, National Historic Events, National Historic People, Heritage Railway Stations, Federal Heritage Buildings, and Heritage Lighthouses (Parks Canada, n.d.b);
- Canadian Heritage River System: a national river conservation program that promotes, protects and enhances the best examples of Canada's river heritage (Canadian Heritage Rivers Board and Technical Planning Committee, n.d.); and,
- United Nations Educational, Scientific and Cultural Organization (U.N.E.S.C.O.) World Heritage Sites (U.N.E.S.C.O. World Heritage Centre, n.d.).

2.5.2 Review of Previous Heritage Reporting

Additional cultural heritage studies undertaken within parts of the study area were also reviewed. These include:

- Ancaster Elevated Water Reservoir Municipal Class Environmental Assessment, City of Hamilton, Ontario (A.S.I., 2018);
- Stage 1 & 2 Archaeological Assessment of 104 Paddy Greene Road, Part of Lot 33, Concession 2, Geographic Township of Ancaster, Wentworth County, Now in the City of Hamilton (A.S.I., 2013); and,
- Stage 1 & 2 Archaeological Assessment – Corrosion Protection Program within the MLV 1301 Pipeline Section, Regional Municipality of Hamilton-Wentworth, Ontario (A.S.I., 2005).

2.5.3 Information Gathering

The following individuals, groups, and/or organizations were contacted to gather information on known and potential B.H.R.s and C.H.L.s, active and inactive cemeteries, and areas of identified Indigenous interest within the study area:

- Andra Popp, Assistant Cultural Heritage Planner, City of Hamilton (email communication 9 July, 2025; and 10 July 2025). Email correspondence requested confirmation of the heritage status of a list of Inventoried Properties and a Registered Non-Designated Property within the study area, as well as any previously conducted cultural heritage studies in the study area. A response confirmed the provided list, indicated there were no prior cultural heritage studies in the area, and that heritage planning staff had no outstanding cultural heritage concerns.
- Mariana Nito, The Ministry of Citizenship and Multiculturalism (email communication 9 July, 2025; and 11 July, 2025). Email correspondence confirmed that there are no properties designated by the Minister and that they have no records of a Provincial Heritage Property within or adjacent to the study area.
- Samuel Bayefsky, The Ontario Heritage Trust (email communications 9 July, 2025; and 10 July, 2025). A response indicated that there are no conservation easements or Trust-owned properties within the study area.

2.6 Community Engagement

The City of Hamilton is undertaking Indigenous engagement for this project. The list of communities notified includes:

- Six Nations of the Grand River;
- Mississaugas of the Credit First Nation;
- Wendat First Nation at Wendake;
- Haudenosaunee Development Institute; and
- The Metis Nation of Ontario.

No feedback has been received regarding the Cultural Heritage Report for this project at the time of report submission (February 2026). Any feedback received will be considered and incorporated into the final report.

2.7 Preliminary Impact Assessment Methodology

To assess the potential impacts of the undertaking, identified B.H.R.s and C.H.L.s are considered against a range of possible negative impacts, based on the *Ontario Heritage Tool Kit InfoSheet #5: Heritage Impact Assessments and Conservation Plans* (Ministry of Citizenship and Multiculturalism, 2006b). These include:

Direct impacts:

- Destruction of any, or part of any, significant heritage attributes or features; and
- Alteration that is not sympathetic, or is incompatible, with the historic fabric and appearance.

Indirect impacts:

- Shadows created that alter the appearance of a heritage attribute or change the viability of a natural feature or plantings, such as a garden;
- Isolation of a heritage attribute from its surrounding environment, context or a significant relationship;
- Direct or indirect obstruction of significant views or vistas within, from, or of built and natural features;
- A change in land use such as rezoning a battlefield from open space to residential use, allowing new development or site alteration to fill in the formerly open spaces; and
- Land disturbances such as a change in grade that alters soils, and drainage patterns that adversely affect an archaeological resource.

Indirect impacts from construction-related vibration have the potential to negatively affect B.H.R.s and C.H.L.s depending on the type of construction methods and machinery selected for the project and proximity and composition of the identified resources. Potential vibration impacts are defined as having

potential to affect an identified B.H.R.s and C.H.L.s where work is taking place within 50 metres of features on the property. A 50-metre buffer is applied in the absence of a project-specific defined vibration zone of influence based on existing secondary source literature (Carman et al., 2012; Crispino & D'Apuzzo, 2001; P. Ellis, 1987; Rainer, 1982; Wiss, 1981). This buffer accommodates any additional or potential threat from collisions with heavy machinery or subsidence (Randl, 2001).

Several additional factors are also considered when evaluating potential impacts on identified B.H.R.s and C.H.L.s. These are outlined in a document set out by the Ministry of Culture and Communications (now Ministry of Citizenship and Multiculturalism) and the Ministry of the Environment entitled *Guideline for Preparing the Cultural Heritage Resource Component of Environmental Assessments* (1992). While this document has largely been superseded in some respects by more current policies and legislation, the guidance provided that continues to be of relevance to this specific project includes the following definitions:

- Magnitude: the amount of physical alteration or destruction which can be expected;
- Severity: the irreversibility or reversibility of an impact;
- Duration: the length of time an adverse impact persists;
- Frequency: the number of times an impact can be expected;
- Range: the spatial distribution, widespread or site specific, of an adverse impact; and
- Diversity: the number of different kinds of activities to affect a heritage resource.

The proposed undertaking should endeavor to avoid adversely affecting known and potential B.H.R.s and C.H.L.s and interventions should be managed in such a way that identified features are conserved. When the nature of the undertaking is such that adverse impacts are unavoidable, it may be necessary to implement alternative approaches or mitigation strategies that alleviate the negative

effects on identified B.H.R.s and C.H.L.s. Mitigation is the process of lessening or negating anticipated adverse impacts and may include, but are not limited to, such actions as avoidance, monitoring, protection, relocation, remedial landscaping, and documentation of the B.H.R.s and C.H.L.s if it is to be demolished or relocated.

Various works associated with infrastructure improvements have the potential to affect B.H.R.s and C.H.L.s in a variety of ways, and as such, appropriate mitigation measures for the undertaking need to be considered.

3.0 Summary of Historical Development Within the Study Area

This section provides a brief analysis of the available primary and secondary source materials regarding this area and was undertaken to produce a contextual overview of the study area, including a general description of physiography, Indigenous land use, and Euro-Canadian settlement.

3.1 Physiography

The study area is located within the Norfolk Sand Plain physiographic region of southern Ontario. The Norfolk Sand Plain physiographic region is a wedge-shaped feature that extends from the Lake Erie shoreline and tapers northward to a point in Brantford on the Grand River (Chapman & Putnam, 1984). The region encompasses an area of 3,134 square kilometres and consists of sands and silts that were deposited as a delta in glacial Lakes Whittlesey and Warren. A massive discharge of meltwater from the Grand River area entered the lakes between the ice front and the moraines to the northwest, building the delta from west to east as the glacier withdrew, thus covering most of the area west of the Galt Moraine with sand. In the vicinity of the subject property, glaciolacustrine deep water sediments belonging to mainly glacial Lake Warren and younger deposits and consisting of stratified to varved silt and clay, minor sand, are overlain by veneer of sand (Zone 10) (Cowan, 1972).

Located to the east of the study area is the Niagara Escarpment. The Niagara Escarpment is by far one of the most prominent features in southern Ontario, and extends from the Niagara River to the northern tip of the Bruce Peninsula, continuing through the Manitoulin Islands (Chapman & Putnam, 1984, pp. 114–122). Vertical cliffs along the brow mostly outline the edge of the dolostone of the Lockport and Amabel Formations, which the slopes below are carved in red shale. Flanked by landscapes of glacial origin, the rock-hewn topography stands in striking contrast, and its steep-sided valleys are strongly suggestive of non-glacial regions. From Queenston, on the Niagara River, westward to Ancaster, the escarpment is a simple topographic break separating the two levels of the Niagara Peninsula. The Niagara Escarpment is a designated U.N.E.S.C.O. World Biosphere Reserve.

The Beverly Swamp, located to the west of the study area, is an important natural landscape that extends into the Flamborough Plain, spanning much of the physiographic region on its west and south sides (Carolinian Canada, 2022). It forms one of the largest forested wetlands in southern Ontario that is crucial to the stability of the region's ecology and water systems. The extensive wetland areas are drained by the Fairchild Creek, Spencer Creek, and Bronte Creek stream systems, which drain into Lakes Erie and Ontario.

Another significant ecological feature is the Copetown Bog/Summit Muskeg Preserve, which is a small, 27-hectare nature reserve located outside of Copetown that runs adjacent to the Hamilton-Brantford Rail Trail (Greenbelt Indigenous Botanical Survey, 2024).

It is the only bog that is known to occur in Hamilton-Wentworth County, and was formed during the last ice age, 12,000 to 18,000 years ago, when glacial scouring created a deep depression in the ground. As the glaciers retreated, the depression filled with meltwater, creating a small lake, and vegetation grew around the periphery. Dying plant matter fell and settled into the lake, and over the course of thousands of years, created a seven-meter-deep mat of peat. The leaching of organic acids from the peat creates an acidic and low nutrient

environment favoring Sphagnum moss, which floats on top of the peat, and unique vegetation assemblages that are rare in southern Ontario. The bog is separated from the surrounding land by a 'moat' of acidic water and is inaccessible by foot but can be observed from several vantage points along the rail trail. Today, Summit Bog is managed by the Hamilton Conservation Authority, and is a popular spot for birding. (Greenbelt Indigenous Botanical Survey, 2024)

3.2 Indigenous Land Use and Settlement

Current archaeological evidence indicates humans were present in southern Ontario approximately 13,000 years before present (B.P.) (Ferris, 2013). Populations at this time would have been highly mobile, inhabiting a boreal-parkland similar to the modern sub-arctic. By approximately 10,000 B.P., the environment had progressively warmed (Edwards & Fritz, 1988) and populations now occupied less extensive territories (C. J. Ellis & Deller, 1990).

Between approximately 10,000-5,500 B.P., the Great Lakes basins experienced low-water levels, and many sites which would have been located on those former shorelines are now submerged. This period produces the earliest evidence of heavy wood working tools, an indication of greater investment of labour in felling trees for fuel, to build shelter, and watercraft production. These activities suggest prolonged seasonal residency at occupation sites. Polished stone and native copper implements were being produced by approximately 8,000 B.P.; the latter was acquired from the north shore of Lake Superior, evidence of extensive exchange networks throughout the Great Lakes region. The earliest archaeological evidence for cemeteries dates to approximately 4,500-3,000 B.P. and is interpreted by archaeologists to be indicative of increased social organization and the investment of labour into social infrastructure (Brown, 1995, p. 13; C. J. Ellis et al., 1990, 2009).

Between 3,000-2,500 B.P., populations continued to practice residential mobility and to harvest seasonally available resources, including spawning fish. The

Woodland period begins around 2,500 B.P. and exchange and interaction networks broaden at this time (Spence et al., 1990, pp. 136, 138) and by approximately 2,000 B.P., evidence exists for small community camps, focusing on the seasonal harvesting of resources (Spence et al., 1990, pp. 155, 164). By 1,500 B.P. there is macro botanical evidence for maize in southern Ontario, and it is thought that maize only supplemented people's diet. There is earlier phytolithic evidence for maize in central New York State by 2,300 B.P. – it is likely that once similar analyses are conducted on Ontario ceramic vessels of the same period, the same evidence will be found (Birch & Williamson, 2013, pp. 13–15). As is evident in detailed Anishinaabek ethnographies, winter was a period during which some families would depart from the larger group as it was easier to sustain smaller populations (Rogers, 1962). It is generally understood that these populations were Algonquian-speakers during these millennia of settlement and land use.

From the beginning of the Late Woodland period at approximately 1,000 B.P., lifeways became more similar to that described in early historical documents. Between approximately 1000-1300 Common Era (C.E.), larger settlement sites focused on horticulture begin to dominate the archaeological record. Seasonal dispersal of the community for the exploitation of a wider territory and more varied resource base was still practised (Williamson, 1990, p. 317). By 1300-1450 C.E., archaeological research focusing on these horticultural societies note that this episodic community dispersal was no longer practised and these populations now occupied sites throughout the year (Dodd et al., 1990, p. 343). By the mid-sixteenth century these small villages had coalesced into larger communities (Birch et al., 2021). Through this process, the socio-political organization of these First Nations, as described historically by the French and English explorers who first visited southern Ontario, was developed. Other First Nation communities continued to practice residential mobility and to harvest available resources across landscapes they returned to seasonally/annually.

By 1600 C.E., the Confederation of Nations were encountered by the first European explorers and missionaries in Simcoe County. Samuel de Champlain in

1615 reported that a group of Iroquoian-speaking people situated between the Haudenosaunee and the Huron-Wendat were at peace and remained "la nation neutre". Like the Huron-Wendat, Petun, and Haudenosaunee, the Neutral or Attawandaron people were settled village agriculturalists.

By the 1640s, devastating epidemics and the traditional enmity between the Haudenosaunee[1] and the Attawandaron and the Huron-Wendat (and their Algonquian allies such as the Nippissing and Odawa) led to their dispersal from southern Ontario. Shortly afterwards, the Haudenosaunee established a series of settlements at strategic locations along the trade routes inland from the north shore of Lake Ontario. Peace was achieved between the Haudenosaunee and the Anishinaabe Nations in August of 1701 when representatives of more than twenty Anishinaabe Nations assembled in Montreal to participate in peace negotiations. Peace was confirmed again at council held at Lake Superior when the Haudenosaunee delivered a wampum belt to the Anishinaabe Nations. This agreement between the Haudenosaunee and Anishinaabe nations is referred to as the Dish with One Spoon.

In 1763, following the fall of Quebec, New France was transferred to British control at the Treaty of Paris. The British government began to pursue major land purchases to the north of Lake Ontario in the early nineteenth century. The Crown acknowledged the Mississaugas of the Credit as the owners of the lands between Georgian Bay and Lake Simcoe and entered into negotiations for additional tracts of land as the need arose to facilitate European settlement.

[1] The Haudenosaunee are also known as the New York Iroquois or Five Nations Iroquois and after 1722 Six Nations Iroquois. They were a confederation of five distinct but related Iroquoian–speaking nations - the Seneca, Onondaga, Cayuga, Oneida, and Mohawk. Each lived in individual territories in what is now known as the Finger Lakes district of Upper New York. In 1722 the Tuscarora joined the confederacy.

3.2.1 Treaty Information

The study area is within Treaty 3, the Between the Lakes Purchase.

Following the American Revolutionary War (1775-1783), the British Crown needed to find lands on which to settle United Empire Loyalists, including approximately 2,000 members of the Six Nations confederacy who had fought alongside British troops. Led by Sir Frederick Haldimand who was the governor of Quebec at that time, the Crown was initially planning on providing lands for Loyalist settlers in Quebec and Southeastern Ontario, including providing land in the Bay of Quinte for Six Nations refugees. This was not suitable for many of the members of Six Nations and a contingent of approximately 1,800 community members, led by Chief Joseph Brant, requested land north of Lake Erie along the Grand River. Brant felt that the location in the Bay of Quinte was too isolated and that his followers could be better served by being closer to the Six Nations communities that chose to remain in the United States in western New York (Surtees, 1984, p. 21).

Recognizing that, under the terms of the Royal Proclamation of 1763, the land needed to be purchased prior to settlement, Colonel John Butler was sent to negotiate with the Mississaugas of the Credit for lands east of Lake Ontario and north of Lake Erie. On May 22, 1784, the Mississaugas of the Credit agreed to cede approximately 3,000,000 acres (1,214,057 hectares) of land containing all or part of Brant, Elgin, Middlesex, Oxford, and Wellington Counties as well as the Regions of Haldimand-Norfolk, Halton, Hamilton-Wentworth, Niagara, and Waterloo. In exchange for these lands, the Mississaugas received £1180.74 worth of trade goods (Crown-Indigenous Relations and Northern Affairs 2016; Surtees 1984). Of the 3,000,000 acres (1,214,057 hectares), approximately 550,000 acres (222,577 hectares) was set aside for the settlement of Six Nations people.

However, due to uncertainties with the description of the lands in the original surrender, Treaty 3 was renegotiated on December 7, 1792, to clarify what was

ceded. This largely revolved around the northern boundary of the Treaty area and in particular the area set aside for Six Nations settlement along the Grand River (see Haldimand Tract and Treaty 4). The signees on the side of the British included Lieutenant Governor John Graves Simcoe, John Butler, Robert Kerr, Peter Russell, John McGill, and Davie William Smith. The signees on the side of the Mississauga included Chiefs Wabakayne, Wabanip, Kautabus, Wabaniship and Mottotow (Crown-Indigenous Relations and Northern Affairs, 2016; Mississaugas of the Credit First Nation, 2017; Surtees, 1984).

The original text stipulated that the north-west boundary of the parcel was an imaginary line between Burlington Bay and the Thames River, which is inconsistent with the geography of the area. The boundaries of the parcel were corrected to create a polygon encompassing the Niagara peninsula up to Burlington Bay and then up north to the present-day town of Arthur then south to the present-day town of Woodstock to finally meet Lake Erie at Port Bruce. Treaty 3 lands exclude a corridor along the Grand River set aside for Six Nations (Crown-Indigenous Relations and Northern Affairs, 2016; Native Land Digital, 2018).

3.3 Historical Euro-Canadian Township Survey and Settlement

The first Europeans to arrive in the area were transient merchants and traders from France and England, who followed Indigenous pathways and set up trading posts at strategic locations along the well-traveled river routes. All of these occupations occurred at sites that afforded both natural landfalls and convenient access, by means of the various waterways and overland trails, into the hinterlands. Early transportation routes continued the use of existing Indigenous trails that typically followed the highlands adjacent to various creeks and rivers (Archaeological Services Inc., 2006). Early European settlements occupied similar locations as Indigenous settlements as they were generally accessible by trail or water routes and would have been in locations with good soil and suitable topography to ensure adequate drainage.

Throughout the period of initial European settlement, Indigenous groups continued to inhabit Southern Ontario, and continued to fish, gather, and hunt within their traditional and treaty territories, albeit often with legal and informal restrictions imposed by colonial authorities and settlers. In many cases, Indigenous peoples acted as guides and teachers, passing on their traditional knowledge to Euro-Canadian settlers, allowing them to sustain themselves in their new homes. Indigenous peoples entered into economic arrangements and partnerships, and often inter-married with settlers. However, pervasive and systemic oppression and marginalization of Indigenous peoples also characterized Euro-Canadian colonization, with thousands being displaced from their lands, denied access to traditional and treaty hunting, fishing, and collecting grounds, and forced to assimilate with Euro-Canadian culture through mandatory attendance at Day and Residential Schools (Ray, 2005; Rogers & Smith, 1994).

Historically, the study area is located in the former Township of Ancaster, County of Wentworth. The study area covers parts of the following lots: Lots 29-31, Concession 1; and Lots 29-31, Concession 2.

3.3.1 County of Wentworth and the Township of Ancaster

The land within Ancaster Township was acquired by the British from the Mississaugas in 1784. The first township survey was undertaken in 1793, and the first Euro-Canadian settlers occupied their land holdings two years later. The township is said to have been named after a town in Lincolnshire, England. Ancaster was one of the largest townships at the Head-of-the-Lake and was quickly settled due to the vast expanse of good land suitable for farming. Ancaster was initially settled by disbanded soldiers, mainly Butler's Rangers, and other Loyalists following the end of the American Revolutionary War. Major settlements in relative proximity to the study area include Copetown and Jerseyville, both of which were founded in the 1770's and 1780's by Loyalist settlers, many of whom were from New Jersey. In 1805, Boulton noted that this township contained both excellent and indifferent soils. By the 1840s, the

township was noted for its fine farms (Armstrong, 1985; Boulton, 1805; Rayburn, 1997; Smith, 1846).

In the second half of the nineteenth century, the township was populated by several industries. By 1875, Ancaster Township was famous for mineral springs, the waters from which were considered therapeutic and medicinal. Ancaster remained a rural township until the mid-twentieth century, when housing subdivision construction began to take up farmland and increase the population (Mika & Mika, 1977; Rayburn, 1997).

The former Toronto, Hamilton, and Buffalo Railway (T.H.&B.) passes through the study area, which, despite the name, never fully reached Toronto or Buffalo. Officially opened in 1894, it was forced to close in 1988 following a landslide that threatened the structural integrity and viability of the rail. Following the closure, portions of the rail were acquired by both the Grand River and Hamilton Conversation Authorities in the mid-1990's and was subsequently turned into the Hamilton to Brantford Trail, "Canada's first fully developed, entirely off-road interurban trail. (Grand River Conservation Authority, 2020)

3.4 Review of Historical Mapping

The 1859 *Map of the County of Wentworth* (Surtees, 1859) and the 1875 *Illustrated Historical Atlas of the County of Wentworth* (Page & Smith, 1875) were examined to determine the presence of historical features within the study area during the nineteenth century (Figure 2 and Figure 3).

It should be noted, however, that not all features of interest were mapped systematically in the Ontario series of historical atlases. For instance, they were often financed by subscription limiting the level of detail provided on the maps. Moreover, not every feature of interest would have been within the scope of the atlases. The use of historical map sources to reconstruct or predict the location of former features within the modern landscape generally begins by using common reference points between the various sources. The historical

maps are geo-referenced to provide the most accurate determination of the location of any property on a modern map. The results of this exercise can often be imprecise or even contradictory, as there are numerous potential sources of error inherent in such a process, including differences of scale and resolution, and distortions introduced by reproduction of the sources.

Historically, the study area is located in the former Township of Ancaster, County of Wentworth. The study area covers parts of the following lots: Lots 29-31, Concession 1; and Lots 29-31 on Concession 2. Some of the more significant families to live on the lots in question were the Kitchen's, Howell's, Richards', Bigg's, Behimer's, and Crawfords. Many members of these families were buried just outside in the study area, in the Zion Hill Wesleyan Methodist Church Cemetery, which were built circa 1861 and 1869.

The study area, like much of the surrounding lots and concessions, was predominantly agricultural in nature, and indeed continues to remain as such. The earliest extant homes in the study area are believed to be from the mid 1850's. While the 1859 Tremaine Map does not include structures on any of the properties, the 1875 Map does show some houses, outbuildings, and churches. A structure is now present in the northwestern corner of the study area on the lot belonging to Issac Kitchen and is likely the extant structure at the current address of 1341 Powerline Road West.

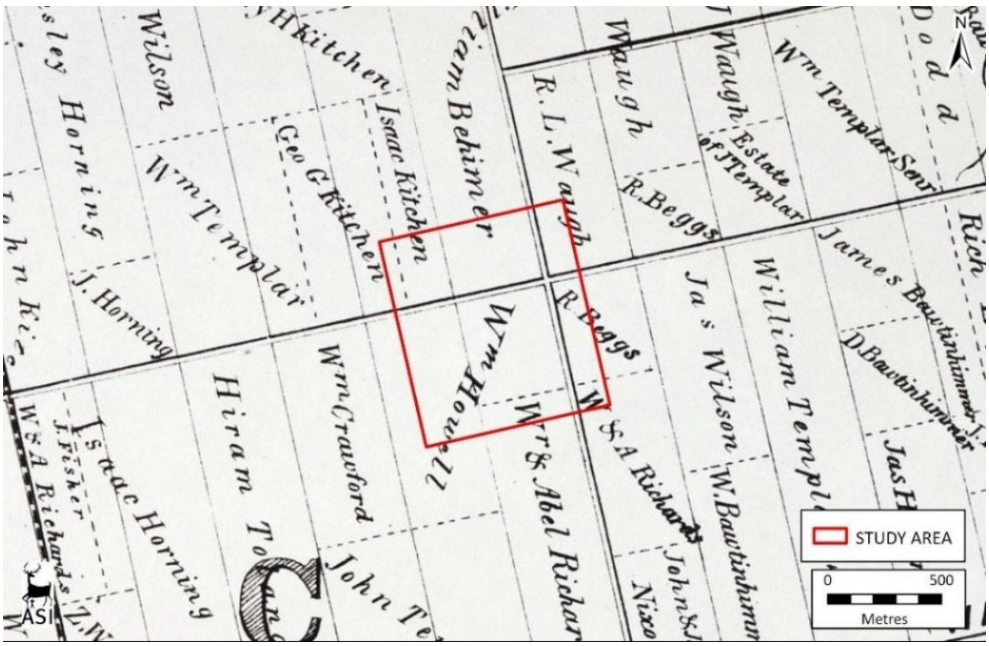


Figure 2: The study area overlaid on the 1859 Wentworth County map (Surtees, 1859).

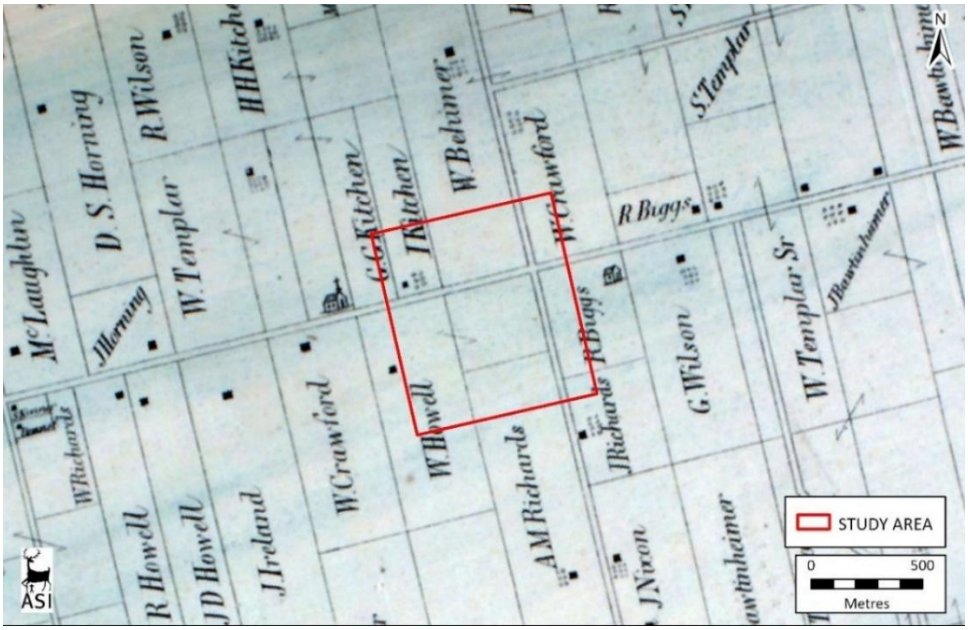


Figure 3: The study area overlaid on the 1875 Illustrated Historical Atlas of the County of Wentworth (Page & Smith, 1875).

Several notable changes occur between the nineteenth century Tremain maps and the 1916 orthographic map. Firstly, what initially appeared to be a straight road in the atlases is more clearly articulated as a winding road that curves around the Summit Muskeg Preserve, which itself was not detailed in the historical atlases.

An additional change between the atlases and topographic maps is the inclusion of the Toronto, Hamilton, and Buffalo Railway. Constructed in the 1890's, the T.H.&B. Rail cut across Powerline Road, whereupon it curved around the Summit Muskeg Preserve on its way to Waterdown and Hamilton. A powerline, in red, is also present in the 1916 and 1934 maps, and is presumed to be the source of the name for Powerline Road. It crosses over Highway 52 and passes just under the Summit Muskeg Preserve, whereupon it follows Powerline Road to the east.

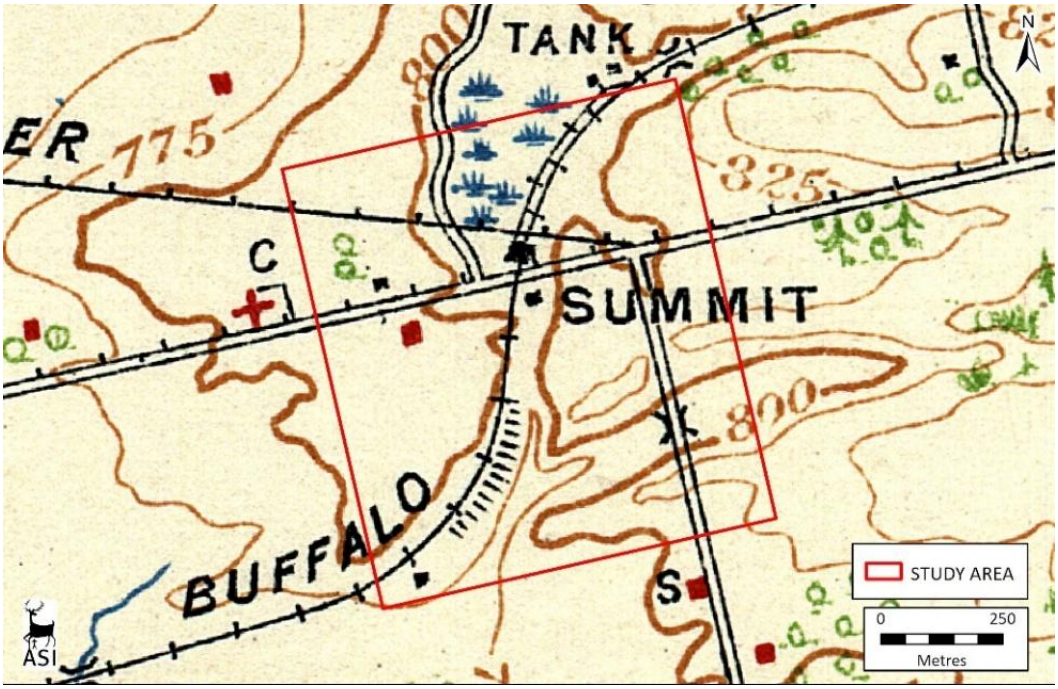


Figure 4: The study area overlaid on the 1916 topographic map, Brantford sheet (Department of Militia and Defence, 1916).

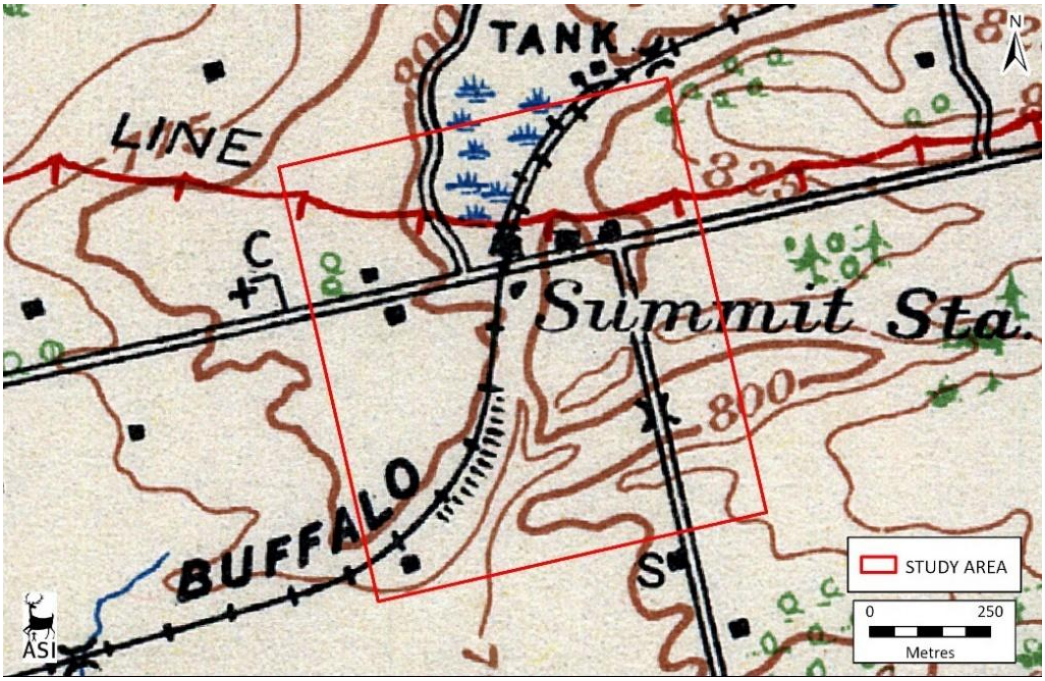


Figure 5: The study area overlaid on the 1934 topographic map, Brantford sheet (Department of Militia and Defence, 1934)

The advent of aerial photography and satellite imagery has proved vital in remediating the inaccuracies and inconsistencies that were earlier discussed and are a useful tool in encapsulating the contextual character of a given area. As preserved in the 1954 aerial photograph displayed below, the study area and its surroundings are made up of rural Southern Ontario's patchwork of agricultural fields and forested areas, interspersed by waterways (Figure 6). Between 1976 and 1994, Powerline Road is severed (Figure 7 and 8), with the northern and southern portions of Highway 52 extended to create a contiguous, unbroken road. This remains the current configuration, as visible in Figure 9. A portion of the road that once connected Powerline Road East and West is currently being used as a parking lot for the rail trail (Plate 9).



Figure 6: The study area overlaid on the 1954 aerial photograph (Hunting Survey Corporation Limited, 1954)

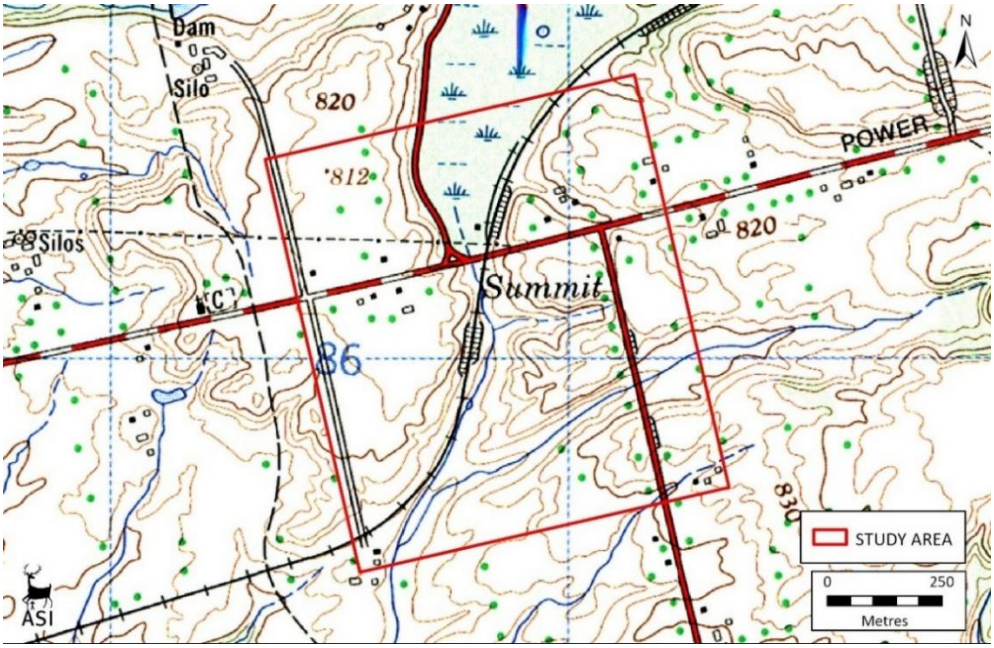


Figure 7: The study area overlaid on the 1976 topographic map, Jerseyville sheet (Department of Energy, Mines and Resources, 1976).

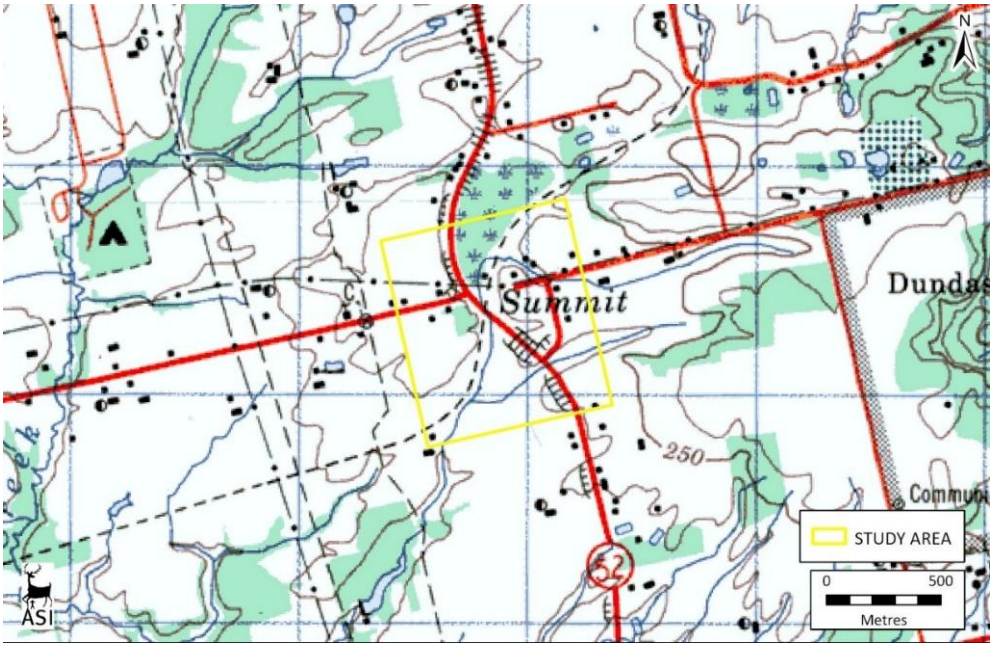


Figure 8: The study area overlaid on the 1994 topographic map, Brantford sheet (Natural Resources Canada, 1994).



Figure 9: The study area overlaid on a current aerial (Orthographic Map, 2025).

4.0 Existing Conditions

A field review of the study area was undertaken by Michael Wilcox and Robert Flewelling on the morning of July 22nd, 2025, during which photographs were taken, as documented in Plates 1-10.

4.1 Description of Field Review

The study area is heavily agricultural in nature, with Summit Station Dairy serving as a commercial hub. The traffic corridor is heavily travelled with a mix of passenger and commercial or industrial vehicles. Highway 52 is a two-lane municipal highway that runs north to south, with a slight S-curve as it passes through the study area. Powerline Road West intersects on the west side of Highway 52, while Powerline Road East meets Highway 52 further south, after taking a sharp curve around the former railroad, which cuts across Highway 52 and the study area on a slight northwesterly/southeasterly angle.

The residential, commercial, and infrastructure elements of the study area are counter-balanced by the presence of the Summit Muskeg Preserve, which is an ecologically significant area of regional and provincial import; it is Hamilton-Wentworth's only bog, and one of only a handful in Southwestern Ontario. The study area is an even mix of agricultural land use practices and heavily wooded areas, particularly around the Summit Muskeg Preserve and the property located at 278 Highway 52.



Plate 1: Powerline Road West, looking east (A.S.I., 2025).



Plate 2: Looking west along Powerline Road West towards the rail trail parking lot on Highway 52 (A.S.I., 2025).



Plate 3: Northwest corner of Highway 52 and Powerline Road West (A.S.I., 2025).



Plate 4: View of rail trail parking lot from intersection of Powerline Road West and Highway 52 (A.S.I., 2025).



Plate 5: Summit Station Dairy, looking southwest from Highway 52.(A.S.I., 2025).



Plate 6: Summit Muskeg Preserve looking southeast from Highway 52 (A.S.I., 2025).



Plate 7: Trail crossing over Highway 52, looking southwest (A.S.I., 2025).



Plate 8: Intersection of rail trail and private laneway at 1228 Powerline Road West, looking east (A.S.I., 2025).



Plate 9: Powerline Road East at hydro transmission lines, looking east at fork (A.S.I., 2025).

4.2 Identification of Known and Potential Built Heritage Resources and Cultural Heritage Landscapes

Based on the results of the background research and field review, three built heritage resources (B.H.R.s) and five cultural heritage landscapes (C.H.L.s) were identified within the study area. A detailed inventory of known and potential B.H.R.s and C.H.L.s within the study area is presented below in Table 1. See Figure 18 and Figure 19 for mapping that details their location.

Table 1: Inventory of Known and Potential Built Heritage Resources and Cultural Heritage Landscapes within the Study Area

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
C.H.L. 1	Residential	1384 Powerline Road West	Potential C.H.L. - Inventoried Property	Two storey, side gable residential unit with brick chimney on western side. Municipal inventory indicates 1850 as an estimated construction date, with the 1875 Tremaine (Figure 3) showing a structure present on the property (City of Hamilton, 2024a). The long laneway, mature trees, and surrounding agricultural fields are characteristic of an early agricultural farmstead in this area. This property, along with 1334 Powerline Road West, is historically associated with the Howell family, who were early Loyalist settlers to the area. Several outbuildings are present behind the home, provenance unknown. The potential heritage attributes of the property include the residence, driveway, and mature trees. The property has the potential to retain C.H.V.I. for its physical, contextual, and historic value as a nineteenth-century farmhouse associated with the pre-Confederation development of Ancaster Township.	 Figure 10: Photograph of residence at C.H.L.1, looking south (A.S.I. 2025).

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
C.H.L. 2	Residential and Agricultural	1341 Powerline Road West	Known C.H.L. – Identified as a Registered non-designated property	This property is located on the north side of Powerline Road West, west of Highway 52. According to information provided by the City of Hamilton, the house on the property was built in 1854 (City of Hamilton, 2024a). The residence is a one-and-a-half storey structure featuring elements of the Classical architectural style. It may be an early log cabin that has been modified over time (City of Hamilton, 2024a). The subject residence features a side gable roof, vinyl siding, a central entrance flanked by symmetrical fenestration, and matching windows on the east and west half-storey. An addition appears to have been built on the west side at an unknown date. The potential heritage attributes of the property include the residence and agricultural landscape features. The property has the potential to retain C.H.V.I. for its physical, contextual, and historic value as a nineteenth-century farmhouse associated with the pre-Confederation development of Ancaster Township.	 Figure 11: Photograph of residence at C.H.L. 2, looking northwards (A.S.I. 2025).

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
C.H.L. 3	Municipal Recreation Trail	Hamilton - Brantford Rail Trail, Hamilton, ON	Potential C.H.L. - Identified during background research/field review	The current recreational trails were built on the former Toronto, Buffalo, and Hamilton Railway, which was constructed between 1892-1892. The railway continued to operate until a landslide in the 1980's closed the section between Brantford and Hamilton. After the closure, sections of the former railbed were purchased by the Hamilton and Brantford Conservation Authorities in the 1990s, whereupon they were converted into recreational trails (Adam Burns, 2022). As per the Grand River Conservation Authority, "the trails linking Hamilton and Cambridge form Canada's first fully developed, multi-use interurban recreational trail system" (Grand River Conservation Authority, 2020). The only extant remains of the railway are the ruins of a water tower that took water from the bog for the trains. Plaques along the trail also indicate a strong potential for Indigenous history, and that the area surrounding the bog was also used as pasture by local farmers. The property has the potential to retain C.H.V.I. for its physical, contextual, and historic value as a late nineteenth-century rail corridor in rural Southern Ontario. Potential heritage attributes include its original alignment in relation to the bog and neighbouring properties, the site of the former water tower, and any remaining physical components of either original rail infrastructure, such as railway ties or industrial slag ballast, or changes to the actual landscape itself through railway embankments and cuttings.	 Figure 12: Photograph of trail entrance, looking northeast (A.S.I. 2025).

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
C.H.L. 4	Nature Reserve	Summit Muskeg Preserve	Potential C.H.L. - Identified during background research/field review	The Summit Muskeg Preserve, otherwise known of as the Copetown Bog, is a provincially significant ecological feature that was likely formed over 10,000 years ago, and it is Hamilton-Wentworth's only know instance of a naturally forming bog. The potential heritage attributes of the property include the presence of a rare and unique "Sphagnum moss, which floats on top of the peat, and unique vegetation assemblages that are rare in southern Ontario", as well as its contextual value to the surrounding area as pasture and as an important water source for the Toronto, Buffalo, and Hamilton Railway (Greenbelt Indigenous Botanical Survey, 2024).	 Figure 13: Photograph of Summit Muskeg Preserve, looking northwards (A.S.I. 2025).

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
C.H.L. 5	Farmstead	278 Highway 52 North	Potential C.H.L. - Inventoried Property	Historical farmstead associated with the Richards family, which farmed on both this lot and the lot across Highway 52. Municipal inventory suggests an 1840 construction date, but further research would be needed to confirm (City of Hamilton, 2024a). Existing conditions include a long, treelined, gravel driveway leading towards a home with a t-shaped plan. The structure is likely one-and-a-half storeys based on the roofline, and the farm itself has at least 5 outbuildings, including a silo. The large lot is dominated by agricultural fields, as is the case with neighbouring lots. The potential heritage attributes of the property include the residence, agricultural outbuildings, and agricultural landscape features. The property has the potential to retain C.H.V.I. for its physical, contextual, and historic value as a nineteenth-century farmhouse associated with the pre-Confederation development of Ancaster Township.	 Figure 14: Photograph of farmscape at C.H.L. 5, looking westwards (A.S.I. 2025).

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 1	Residential	1350 Powerline Road West	Potential B.H.R. – Identified as an Inventoried Property	As per the municipal heritage inventory, this one-and-a-half storey side gabled structure was potentially first constructed in 1890 (City of Hamilton, 2024a). Twin dormers and a brick chimney are present on the roof, and while the façade is covered in white vinyl, the sides are cut stone blocks. Main entry bears mild Neo-Classical and Georgian features, mainly through slight colonnade-lintel combination and sidelights. Unknown as to whether this is an early feature or a later addition. A small garage is situated behind the house, construction date unknown. The potential heritage attributes of the property include the residential structure, and the property has the potential to retain C.H.V.I. for its physical, contextual, and historic value as a late nineteenth-century structure.	 Figure 15: Photograph of B.H.R. 1, looking southwards (A.S.I. 2025).

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 2	Residential	1334 Powerline Road West	Potential B.H.R. – Identified as an Inventoried Property	Located to the west of the Highway 52 – Powerline Road West intersection, the late nineteenth century brick residence sits on a historical farmstead associated with the Howell family. The structure retains original window openings, some of which contain early, if not original, window hardware. Most windows have wood sills, with either stone or carved and arched wooden lintels. The main construction material is pressed red brick, with yellow-white bricks employed in the quoins, and the structure retains several brick chimneys, which are similarly composed of red and yellow pressed brick. A mix of sloping and steep pitched gables and arched windows support a late nineteenth century Gothic style, yet there exists both interior and exterior evidence that the brick structure was built on the footprint of a much older structure, likely from when the Howell's first settled on the lot in the early 1800's. A brick on the east façade is inscribed with the name T.T Miller and the year 1886, thus supporting a late nineteenth century build date. The potential heritage attributes of the property include the residence and surrounding forest, which bears evidence of agricultural use in the form of a cow path, as was discussed with the property owner during a site visit.[2]	 Figure 16: Photograph of B.H.R. 2, looking southwards (A.S.I. 2025).

[2] A Heritage Impact Assessment of 1334 Powerline Road West is being conducted by A.S.I. concurrently to this Cultural Heritage Report. A site visit was conducted on 5 August, 2025 with the owner, which provided valuable insight into the history of both 1334 Powerline Road West and the surrounding area.

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
				The property has the potential to retain C.H.V.I. for its physical, contextual, and historic value as a nineteenth-century farmhouse associated with the development of Ancaster Township over time, in part to the early and continued habitation by the Howell family.	
B.H.R. 3	Residential	1223 Powerline Road East	Potential B.H.R. - Inventoried Property	This lot contains a 1 ½ story residence which, according to municipal inventory records, may have been first constructed in 1850 (City of Hamilton, 2024a). A flat-sloped dormer is present on the roof, and is similar in construction to the twin dormers at 1350 Powerline Road West, and the residence itself is t-shaped with a secondary rear extension. Three outbuildings are present behind the structure, provenance unknown. A large, open yard separates the home from Powerline Road East, and the lot itself backs onto the historical Toronto, Buffalo, and Hamilton railway corridor (Adam Burns, 2022). The potential heritage attributes of the property include the residence, outbuildings, and mature trees. The property has the potential to retain C.H.V.I. for its physical, contextual, and historic value as a nineteenth-century farmhouse associated with the pre-Confederation development of Ancaster Township.	 Figure 17: Photograph of B.H.R. 3, looking northwards (A.S.I. 2025).

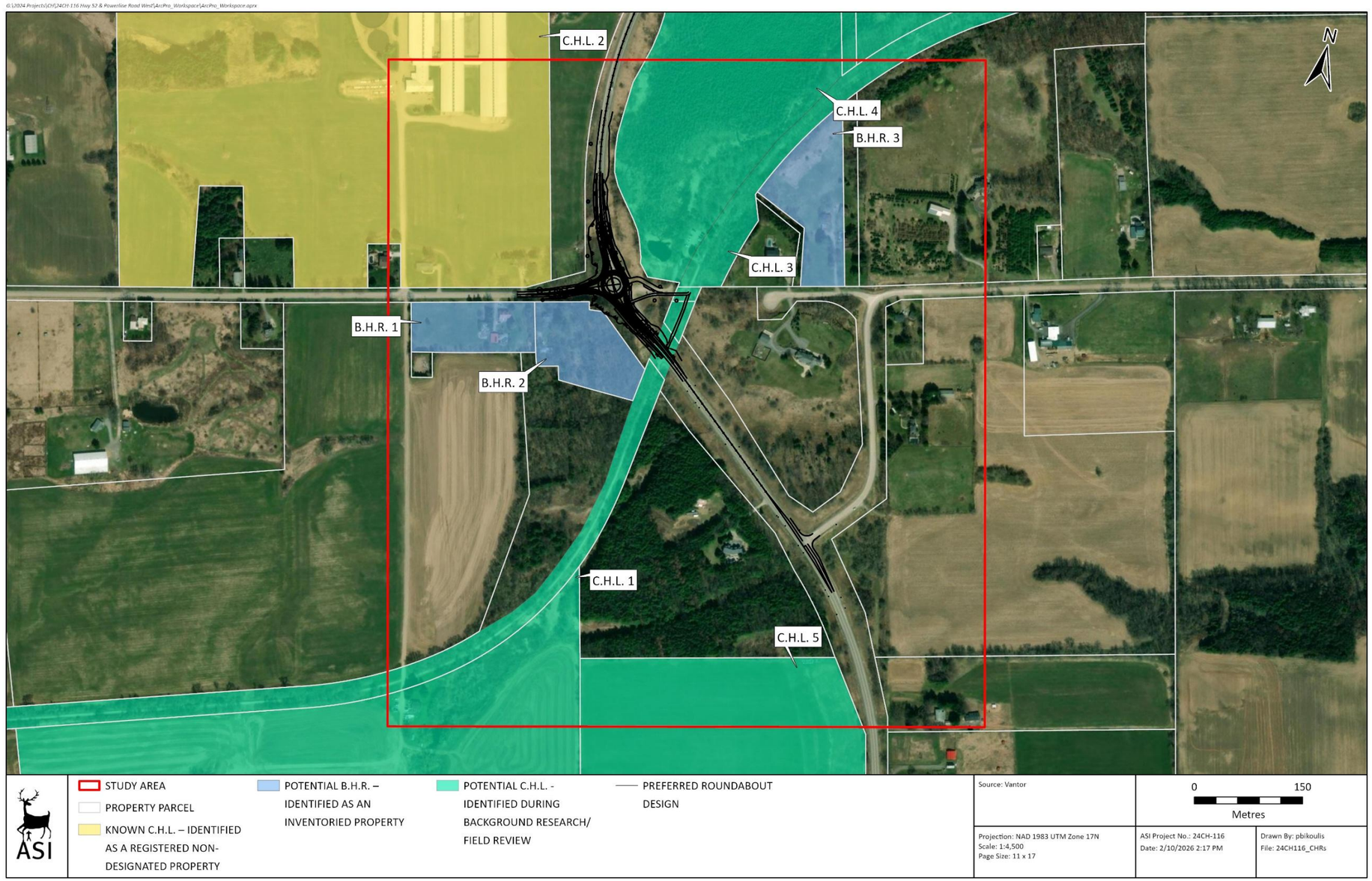


Figure 18: Location of Identified Built Heritage Resources (B.H.R.s) and Cultural Heritage Landscapes (C.H.L.s) in the Study Area (A.S.I. 2026).

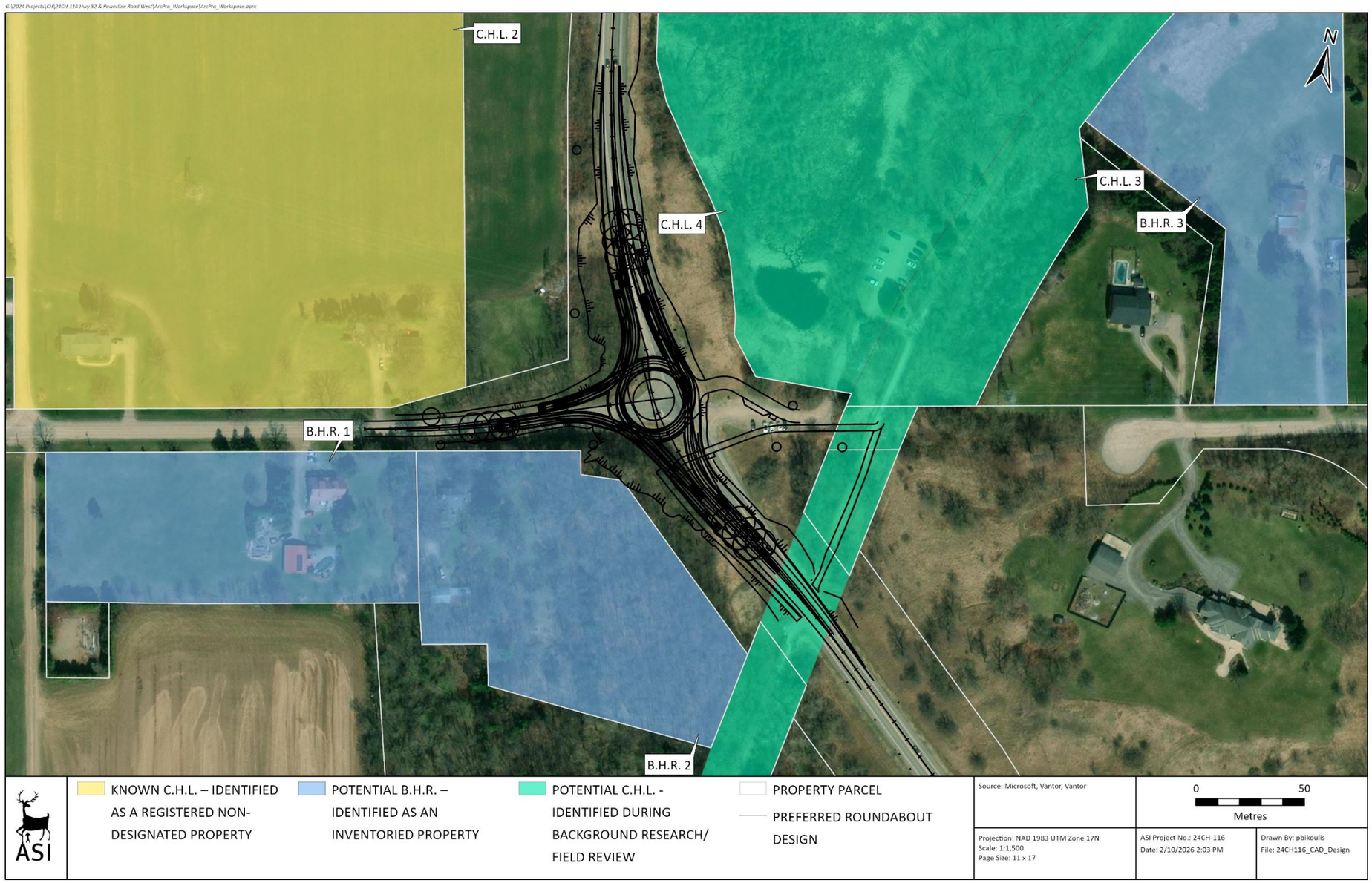


Figure 19: Close-up of preferred roundabout design in relation to Identified Built Heritage Resources (B.H.R.s) and Cultural Heritage Landscapes (C.H.L.s) in the Study Area (A.S.I. 2026).

5.0 Preliminary Impact Assessment

The following sections provide more detailed information regarding the proposed project undertaking and analysis of the potential impacts on identified built heritage resources (B.H.R.s) and the cultural heritage landscape (C.H.L.).

The following sections provide more detailed information regarding the proposed project undertaking and analysis of the potential impacts on identified built heritage resources and cultural heritage landscapes.

5.1 Description of Proposed Undertaking

The proposed construction activities occurring within the study area consists of the construction of a roundabout at the intersection of Highway 52 and Powerline Road West and the creation of a southbound, left-turning lane onto Powerline Road West from Highway 52. Both endeavours will require minor roadway variances, the relocation of public mailboxes, and temporary adjustments to trail access with proposed future implementation of enhanced trail accessibility.

Mapping showing details of the preferred alignment is provided in

Figure 18 and Figure 19, with the current preferred solution alternative plan included in Appendix A.

5.2 Analysis of Potential Impacts

Table 2 outlines the potential impacts on all identified built heritage resources (B.H.R.s) and cultural heritage landscapes (C.H.L.s) within the study area.

Table 2: Preliminary Impact Assessment and Recommended Mitigation Measures

Feature I.D.	Location/Name	Heritage Status and Recognition	Type and Description of Potential/Anticipated Impact	Mitigation Strategies
C.H.L. 1	1384 Powerline Road West	Potential C.H.L. -Inventoried Property	It is understood that the proposed works will not encroach upon, nor occur adjacent to, the property limits of C.H.L. 1. As such, there are no direct or indirect impacts anticipated.	The proposed design and construction activities related to this project should continue to avoid adverse impacts to identified heritage attributes.
C.H.L. 2	1341 Powerline Road West	Known C.H.L. – Identified as a Registered non-designated property	It is understood that the proposed works will not encroach upon, nor occur adjacent to, the property limits of C.H.L. 2. As such, there are no direct or indirect impacts anticipated.	The proposed design and construction activities related to this project should continue to avoid adverse impacts to identified heritage attributes.
C.H.L. 3	Hamilton - Brantford Rail Trail, Hamilton, ON	Potential C.H.L. -Identified during background research/field review	It is understood that the proposed works will result in the closure of an approximately 75 metre segment of the current trail alignment as it exists on the north side of Highway 52, roughly 80 metres southeast of the proposed roundabout. Additionally, the proposed solution requires alterations to be made to the existing rail trail parking lot and public mailboxes located on the eastern side of the current intersection. As the proposed works are limited to a relatively small section of the overall C.H.L., and overall access to the rail trail C.H.L. remains open, the impacts to identified heritage attributes are not anticipated to be adverse. No additional indirect impacts were identified.	The proposed design and construction activities related to this project should continue to avoid adverse impacts to identified heritage attributes.

Feature I.D.	Location/Name	Heritage Status and Recognition	Type and Description of Potential/Anticipated Impact	Mitigation Strategies
C.H.L. 4	Summit Muskeg Preserve	Potential C.H.L. -Identified during background research/field review	It is understood that the proposed works, which include the construction of a roundabout at the intersection of Highway 52 and Powerline Road West and the creation of a southbound, left-turning lane onto Powerline Road West from Highway 52 will be confined to the existing right-of-way adjacent to C.H.L. 4. No direct adverse impacts are anticipated. As noted in Table 1, C.H.L. 4 is a demonstrated area of ecological significance, thus potential indirect impacts could include disturbances to topography resulting in grade changes that alters soil composition or drainage patterns that have the potential to adversely affect the muskeg preserve. No additional indirect impacts were identified	Construction and staging should be suitably planned to ensure that there are no impacts to C.H.L. 4. To reduce or eliminate impacts to the ecological health of the muskeg preserve, suitable ecological mitigation measures should be established by qualified individuals and implemented during construction to ensure their continued ecological health. To reduce the potential for indirect impacts, infrastructure and construction activities such as ground disturbance (including grading and excavation work) or the removal of trees/vegetation should be limited to the extent possible adjacent to C.H.L. 4. Where vegetation and/or tree removals are required, post-construction rehabilitation should also include re-planting with sympathetic, native plant species. In this respect, consultation with a qualified arborist and with Indigenous groups should be completed to determine the most appropriate plant species.
C.H.L. 5	278 Highway 52 North	Potential C.H.L. -Inventoried Property	It is understood that the proposed works will not encroach upon, nor occur adjacent to, the property limits of C.H.L. 5. As such, there are no direct or indirect impacts anticipated.	The proposed design and construction activities related to this project should continue to avoid adverse impacts to identified heritage attributes.
B.H.R. 1	1350 Powerline Road West	Potential B.H.R. – Identified as an Inventoried Property	It is understood that the proposed works will not encroach upon, nor occur adjacent to, the property limits of B.H.R. 1. As such, there are no direct or indirect impacts anticipated.	The proposed design and construction activities related to this project should continue to avoid adverse impacts to identified heritage attributes.

Feature I.D.	Location/Name	Heritage Status and Recognition	Type and Description of Potential/Anticipated Impact	Mitigation Strategies
B.H.R. 2	1334 Powerline Road West	Potential B.H.R. – Identified as an Inventoried Property	It is understood that the proposed works will not encroach upon, nor occur adjacent to, the property limits of B.H.R. 2. As such, there are no direct or indirect impacts anticipated.	The proposed design and construction activities related to this project should continue to avoid adverse impacts to identified heritage attributes.
B.H.R. 3	1223 Powerline Road East	Potential B.H.R. -Inventoried Property	It is understood that the proposed works will not encroach upon, nor occur adjacent to, the property limits of B.H.R. 3. As such, there are no direct or indirect impacts anticipated.	The proposed design and construction activities related to this project should continue to avoid adverse impacts to identified heritage attributes.

6.0 Results and Mitigation Recommendations

The following section provides a summary of identified cultural heritage landscapes (C.H.L.s) and built heritage resources (B.H.R.s), the results of the preliminary impact assessment, and recommended mitigation where required.

6.1 Key Findings

The results of background historical research and a review of secondary source material, including historical mapping, indicate a study area with a rural land use history dating back to the late eighteenth century, and likely was the site of Indigenous land use stretching back before recorded memory. Based on a review of federal, provincial, and municipal registers, inventories, databases and field review, the following B.H.R.s and C.H.L.s were identified in the study area:

- one known C.H.L.;
- four potential C.H.L.s.; and
- three potential B.H.R.s

Identified B.H.R.s and C.H.L.s are historically, architecturally, and contextually associated with early settler-colonial land use patterns in the City of Hamilton, particularly with regards to the influx of Loyalist settlers to the area from former British colonies in America. Additionally, the presence of the railroad infrastructure is indicative of the areas continued importance during the mid-to-late nineteenth century.

6.2 Results of Preliminary Impact Assessment

The preferred design alternative is not anticipated to result in direct adverse impacts to any of the identified B.H.R.s or C.H.L.s., with only minor potential indirect impacts identified with respect to the ecological integrity of C.H.L. 4, as outlined in Table 2, above.

6.3 Recommendations

Based on the results of the assessment, the following recommendations have been developed:

1. Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to identified B.H.R.s and the C.H.L. Avoidance measures may include, but are not limited to: erecting temporary fencing, establishing buffer zones, issuing instructions to construction crews to avoid identified B.H.R.s, etc. should all be considered.

2. Where feasible, the proposed construction activities should be designed in a manner that limits potential indirect impacts to C.H.L. 4. The removal of trees and vegetation within the right-of-way should be limited where possible adjacent to the C.H.L. Where tree removals are required, post-construction rehabilitation with sympathetic plantings should be implemented.

3. Should future work require an expansion of the study area then a qualified heritage consultant with recent and relevant experience should be contacted in order to confirm the impacts of the proposed work on potential heritage resources.

4. This report should be submitted by the proponent to heritage staff at the City of Hamilton and the Ministry of Citizenship and Multiculturalism for review and comment, along with any other local heritage stakeholders that may have an interest in this project.

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Appendix A- Qualified Persons Involved in the Project

Lindsay Graves, M.A., C.A.H.P.
Senior Cultural Heritage Specialist, Manager, Infrastructure - Cultural Heritage

The Senior Project Manager for this Cultural Heritage Report is **Lindsay Graves** (M.A., Heritage Conservation), Senior Cultural Heritage Specialist and Manager of Infrastructure, Cultural Heritage Practice Area. She was responsible for: overall project scoping and approach; development and confirmation of technical findings and study recommendations; application of relevant standards, guidelines and regulations; and implementation of quality control procedures.

Lindsay is academically trained in the fields of heritage conservation, cultural anthropology, archaeology, and collections management and has over 15 years of experience in the field of cultural heritage resource management. This work has focused on the assessment, evaluation, and protection of built heritage resources and cultural heritage landscapes. Lindsay has extensive experience undertaking archival research, heritage survey work, heritage evaluation and heritage impact assessment. She has also contributed to cultural heritage landscape studies and heritage conservation plans, led heritage commemoration and interpretive programs, and worked collaboratively with multidisciplinary teams to sensitively plan interventions at historic sites/places. In addition, she is a leader in the completion of heritage studies required to fulfil Class Environmental Assessment processes and has served as Project Manager for over 100 heritage assessments during her time at Archaeological Services Inc. Lindsay is a member of the Canadian Association of Heritage Professionals.

Robert Flewelling, M.A.
Technical Writer & Researcher | Indigenous Engagement Administrator - Cultural Heritage

Serving as a Technical Writer and Researcher on this project is **Robert Flewelling**, with the primary responsibilities of conducting background research, contributing towards technical report writing, and engaging in field work. Robert received both

his B.A. and M.A. from the University of Guelph, where he specialized in the history of Crown-Indigenous Relations in Upper Canada and the Grand River Valley in the nineteenth century. Following his studies, Robert worked with both the Guelph Civic Museum and City of Guelph, Heritage Planning on a variety of projects spanning from Part IV Designations to museum exhibitions.

Michael Wilcox, P.h.D.
Historian – Cultural Heritage

An additional report writer for this project is **Michael Wilcox** (P.h.D., History), who is a historian within the Cultural Heritage Practice Area. He was responsible for preparing and contributing to background historical research, reviewing existing heritage inventories, and technical reporting for this project. His current responsibilities focus on identifying and researching historical documents as well as background research, assessment, and evaluation of built heritage resources and cultural heritage landscapes in Ontario. He has over a decade of combined academic and workplace experience in conducting historical research and crafting reports, presentations, articles, films, and lectures on a wide range of Canadian history topics.

Appendix B: Plan and Profile for Preliminary Grading Limit of the Preferred Solution, Highway 52

HAMILTON BRANTFORD RAIL TRAIL

HIGHWAY 52

POWERLINE ROAD W

HIGHWAY 52

PROP. ROAD CL

EX. ROAD CL

-0.44%

-0.65%

0.73%

STA 12+408.16
ELEV 240.273

STA 12+462.32
ELEV 239.536

PVI STA = 12+715.54
PVI ELEV = 238.58
LOW POINT STA = 12+714.03
LOW POINT ELEV = 238.68
A1 = -1.38
A2 = 40.0
K = 40.0
L=55.34m VC

BVCS: 12+687.871
BVCE: 238.741

EVCS: 12+743.212
EVCE: 238.782

STA 12+750.75
ELEV 238.881

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12+380 12+390 12+400 12+410 12+420 12+430 12+440 12+450 12+460 12+470 12+480 12+490 12+500 12+510 12+520 12+530 12+540 12+550 12+560 12+570 12+580 12+590 12+600 12+610 12+620 12+630 12+640 12+650 12+660 12+670 12+680 12+690 12+700 12+710 12+720 12+730 12+740 12+750

R.J. Burnside & Associates Limited

web www.burnside.com

PLAN AND PROFILE
HIGHWAY 52

DRAWN BY: R.B.	SCALE: H 1:500 V 1:100
DESIGNED BY: S.P.	PROJECT No. 058803
CHECKED BY: S.P.	DRAWING No.
DATE: 2025-12-09	SHEET No.

File: C:\0000\000000\Autodesk Docs\058803 HDP Preliminary Design_Plan Profile Designer_R_2025_12-09.rvt

Cultural Heritage Impact Assessment

1334 Powerline Road West

City of Hamilton, Ontario

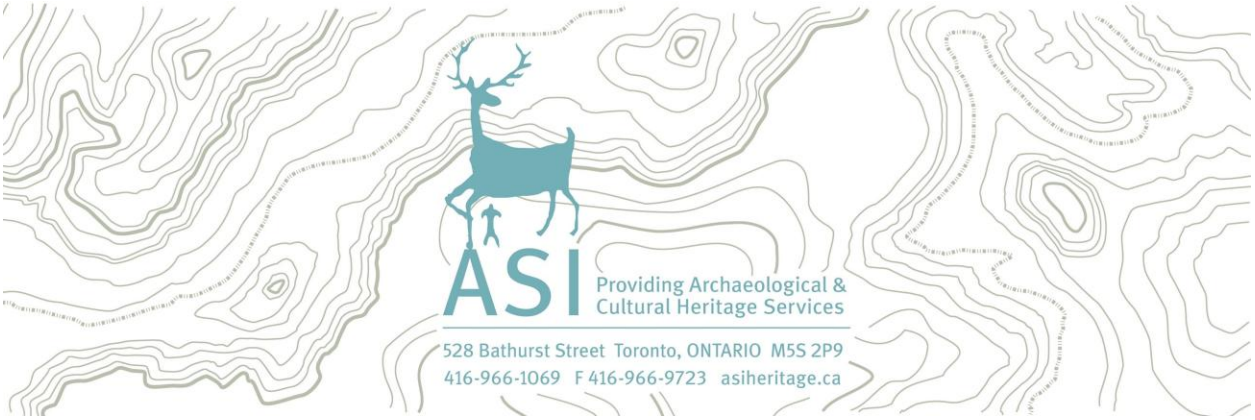
Final Report

Prepared for:

R.J. Burnside & Associates Limited
1465 Pickering Parkway, Suite 200
Pickering, ON L1V 7G7

Archaeological Services Inc. File: 24CH-116

September 2025 (Updated February and May 2026)



Executive Summary

Archaeological Services Inc. was contracted by R.J. Burnside & Associates Limited to conduct a Cultural Heritage Impact Assessment (C.H.I.A.) for the property at 1334 Powerline Road West in the City of Hamilton, Ontario. The C.H.I.A. is being undertaken as part of the Highway 52 and Powerline Road West Intersection Improvements Municipal Class Environmental Assessment. The subject property, which is identified as an Inventoried Property by the City of Hamilton, consists of a wood-framed, brick-clad residence, outbuilding, gravel driveway, and wooded areas. As the proposed intersection improvements have the potential to impact the subject property, and as stated in the Request for Proposal, a C.H.I.A. is required to evaluate the cultural heritage value of the property. Should it meet the criteria outlined in Ontario Regulation 9/06 of the *Ontario Heritage Act*, the C.H.I.A. will provide an assessment of how the proposed intersection will impact the property's cultural heritage value. The C.H.I.A. follows the City of Hamilton's Cultural Heritage Impact Assessment Guidelines (City of Hamilton, 2018a).

This report includes an evaluation of the cultural heritage value of the property as determined by the criteria in Ontario Regulation 9/06 of the *Ontario Heritage Act*. This evaluation determined that the property does not have design and physical, historical and associative, or contextual value. As such, an impact assessment and mitigation recommendations are unnecessary.

The following recommendations are proposed:

1. This report should be submitted by the proponent to heritage staff at the City of Hamilton for their information.

Report Accessibility Features

This report has been formatted to meet the Information and Communications Standards under the *Accessibility for Ontarians with Disabilities Act*, 2005 (A.O.D.A.). Features of this report which enhance accessibility include: headings, font size and colour, alternative text provided for images, and the use of periods within acronyms. Given this is a technical report, there may be instances where additional accommodation is required in order for readers to access the report's information. If additional accommodation is required, please contact Annie Veilleux, Manager of the Cultural Heritage Practice Area at Archaeological Services Inc., by email at aveilleux@asiheritage.ca or by phone 416-966-1069 ext. 255.

Project Personnel

- **Senior Project Manager**: Lindsay Graves, M.A., C.A.H.P., Manager, Infrastructure, Senior Cultural Heritage Specialist - Cultural Heritage
- **Project Coordinator:** Jessica Bisson, B.F.A. (Hon.), Cultural Heritage Technician, Division Coordinator - Cultural Heritage
- **Project Manager**: Lindsay Graves
- **Field Review**: Michael Wilcox, P.h.D., Historian - Cultural Heritage and Robert Flewelling Cultural Heritage Technician, Technical Writer and Researcher - Cultural Heritage
- **Report Production**: Michael Wilcox
- **Graphics Production**: Michelle Nguyen, B.A., Archaeologist, G.I.S. Technician - Operations
- **Report Reviewer(s)**: Lindsay Graves and John Sleath, M.A., Cultural Heritage Specialist, Project Manager - Cultural Heritage

Glossary

Built Heritage Resource (B.H.R.)
Definition: "…a building, structure, monument, installation or any manufactured or constructed part or remnant that contributes to a property's cultural heritage value or interest as identified by a community, including an Indigenous community" (Ministry of Municipal Affairs and Housing, 2024, p. 40).

Cultural Heritage Landscape (C.H.L.)
Definition: "…a defined geographical area that may have been modified by human activity and is identified as having cultural heritage value or interest by a community, including an Indigenous community. The area may include features such as buildings, structures, spaces, views, archaeological sites or natural elements that are valued together for their interrelationship, meaning or association"(Ministry of Municipal Affairs and Housing, 2024, p. 41).

Significant
Definition: With regard to cultural heritage and archaeology resources, significant means "resources that have been determined to have cultural heritage value or interest. Processes and criteria for determining cultural heritage value or interest are established by the Province under the authority of the *Ontario Heritage Act*" (Ministry of Municipal Affairs and Housing, 2024, p. 52).

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1.0 Introduction

Archaeological Services Inc. (A.S.I.) was contracted by R.J. Burnside & Associates Limited to conduct a Cultural Heritage Impact Assessment (C.H.I.A.) for the property at 1334 Powerline Road West in the City of Hamilton, Ontario. The C.H.I.A. is being undertaken as part of the Highway 52 and Powerline Road West Intersection Improvements Municipal Class Environmental Assessment (M.C.E.A.). The subject property, which is identified as an Inventoried Property by the City of Hamilton, consists of a wood-framed, brick-clad residence, outbuilding, gravel driveway, and wooded areas. As the proposed intersection improvements have the potential to impact the subject property, and as stated in the Request for Proposal, a C.H.I.A. is required to evaluate the cultural heritage value of the property. Should it meet the criteria outlined in Ontario Regulation 9/06 of the *Ontario Heritage Act*, the C.H.I.A. will provide an assessment of how the proposed intersection will impact the property's cultural heritage value. The C.H.I.A. follows the City of Hamilton's Cultural Heritage Impact Assessment Guidelines (City of Hamilton, 2018a).

1.1 Project Overview

The Highway 52 and Powerline Road West Intersection Improvements project, being completed under Schedule C of the M.C.E.A. process, is an examination of the feasibility of implementing a roundabout at the intersection of Highway 52 and Powerline Road West, relative to other transportation improvement options.

The M.C.E.A.'s key goal is improved public safety for all road users, including drivers, pedestrians, and cyclists. As such, the study seeks to determine the best path forward "to alleviate operational issues at the intersection, maintain or improve community connectivity, including active transportation, and mitigate impacts to traffic and truck circulation and goods movement to address long-term transportation needs" (City of Hamilton, 2025b). In addition to the intersection realignment, new rumble strips, lighting, and signage are being

considered. Also under consideration for this project is a review of the intersection of Highway 52 and Powerline Road East, approximately 430 metres south of the above-named intersection, as well as the trail crossing associated with the Hamilton-Brantford Rail Trail, located south of the intersection (City of Hamilton, 2024b, 2025b).

The preferred alternative has been determined to be a three-legged roundabout that is located slightly west of the current intersection. This alternative has very good visibility to and from Powerline Road West as the north approach from Highway 52 has a long sight distance. Furthermore, this option, when taken collectively, presents the best approach to address natural and socio-cultural environmental concerns, as well as financial and technical factors (City of Hamilton, 2025b).

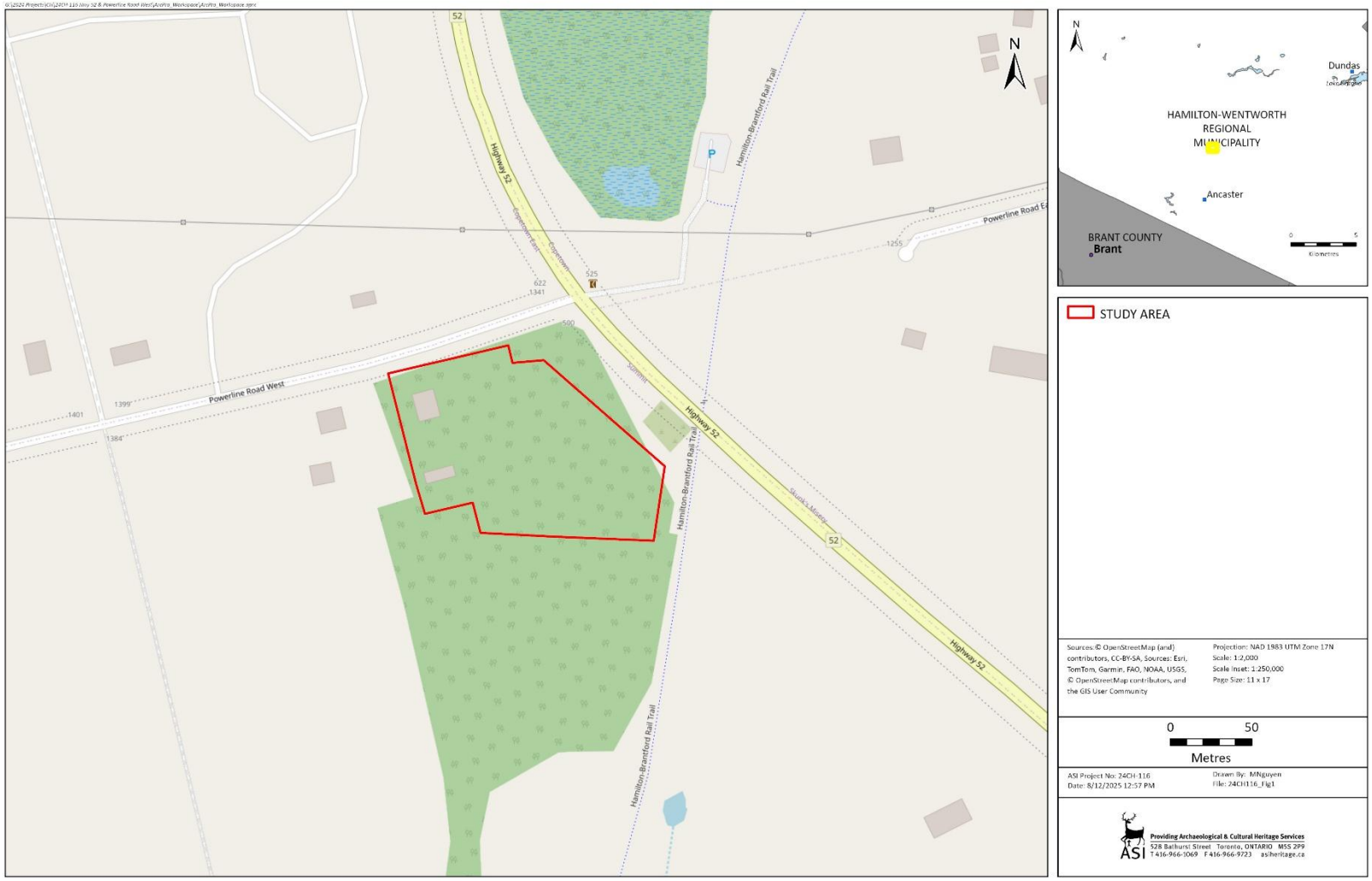


Figure 1: Location of the subject property at 1334 Powerline Road West. Source: (c) Open Street Map contributors, Creative Commons n.d.

1.2 Legislation and Policy Context

The C.H.I.A. for 1334 Powerline Road West is being conducted within the context of the following documents:

- *Ontario Heritage Act* (Ontario Heritage Act, R.S.O. c. O.18 [as Amended in 2024], 1990);
- *Ontario Heritage Tool Kit* (Ministry of Citizenship and Multiculturalism, 2025); and,
- *Planning Act* (Planning Act, R.S.O. 1990, c. P.13, 1990) and the 2024 *Provincial Planning Statement* (Ministry of Municipal Affairs and Housing, 2024).

1.3 Approach to Heritage Impact Assessment Reports

This C.H.I.A. is in accordance with the City of Hamilton's Rural Official Plan (City of Hamilton, 2018b) and its Cultural Heritage Impact Assessment Guidelines (City of Hamilton, 2018a). As such, it includes the following components:

- A general introduction, including the location and brief description of the subject property, project overview, legislation and policy context, and approach to C.H.I.A.s;
- A summary of engagement with relevant agencies and other stakeholders;
- A description of the property under evaluation in this report, as well as its heritage status;
- A discussion of the property's historical or associative value (including historical mapping), physical and design value, and contextual value, as well as representative photographs of the property and a comparative analysis;
- A cultural heritage resource evaluation guided by the *Ontario Heritage Act* criteria;
- A description of the proposed development;

- An impact assessment;
- Recommendations for mitigating impacts to the property and ensuring its conservation; and,
- A list of resources consulted for this report.

A C.H.I.A addresses impacts of a proposed development or site alteration on built heritage resources (B.H.R.s) or cultural heritage landscapes (C.H.L.s). C.H.I.A.s are used to determine the magnitude of these potential impacts and provide recommendations for their avoidance, wherever possible, or their mitigation. C.H.I.A.s are to be completed by qualified heritage professionals who will, through historical research and field work, identify the B.H.R. or C.H.L.'s cultural significance and heritage attributes and, where one is not already in existence, prepare a formal Statement of Significance. Following a thorough review of the proposed development or site alteration plan to measure its potential impacts to the B.H.R. or C.H.L., the C.H.I.A. will issue recommendations on how these impacts may be avoided, mitigated, and how the site may best be conserved. Strategies will then be suggested for their implementation and ongoing monitoring as the development or site alteration progresses.

2.0 Engagement

The following section outlines the community consultation that was undertaken to gather and review information about the subject property during preparation of this Cultural Heritage Impact Assessment (C.H.I.A.).

2.1 Relevant Agencies and/or Stakeholders Engaged

The following stakeholders were contacted with inquiries regarding the heritage status and for information concerning the subject property and any additional adjacent built heritage resources or cultural heritage landscapes:

- Cultural Heritage Staff, City of Hamilton (email communications 9 and 10 July and 12 and 13 August 2025). Email correspondence requested any documentation the City had related to the subject property's heritage status. A response indicated that the City of Hamilton does not have any

reports or assessments related to the subject property and noted that they do not have any further heritage concerns about this property or adjacent properties. A follow-up email requested recommendations for rural Gothic Revival farmhouses in Hamilton, and a list was provided.

- The Ministry of Citizenship and Multiculturalism (email communications 9 and 11 July 2025). Email correspondence confirmed that the subject property nor any adjacent properties have been designated by the Minister, and the Ministry does not have any records of a Provincial Heritage Property within or adjacent to the study area.
- The Ontario Heritage Trust (O.H.T.) (email communications 9 and 10 July 2025). A response indicated that the O.H.T. neither owns nor protects via conservation easement the subject property or any adjacent properties, and that the O.H.T. does not have any heritage plaques within or adjacent to the subject property.
- Saman Goudarzi, Cartographic Resources Librarian, Lloyd Reeds Map Collection, McMaster University Library (email communications 22 and 23 July 2025). A request was made for maps covering the subject property for the period between 1875 and 1916. A response indicated that none were available for review.
- Ancaster Township Historical Society (email communication 8 August 2025). A request was made for information related to the history of the subject property and in particular, information about the original owner (William Howell) and mason (T.T. Miller). No response was provided by the time of report submission.

2.2 Public Meetings/Public Consultation

Two Public Information Centres (P.I.C.s) related to the project have taken place. The first P.I.C. occurred on 8 April 2025 at the Copetown Community Centre and its purpose was to provide an overview of the Municipal Class Environmental Assessment process, provide information about the study area, present six alternative solutions and the preferred alternative, and obtain feedback about the preferred alternative (City of Hamilton, 2025a). The second P.I.C. occurred on 21 October 2025 and it outlined three alternative design options for the

preferred alternative and explained how the preferred alternative was selected (City of Hamilton, 2025b). When the Notice of Study Completion is finalized in the Winter of 2026, a 30-day public review period will begin allowing further public engagement about the project prior to construction.

2.3 Agency Review

The draft report was submitted to municipal heritage staff at the City of Hamilton in October 2025 and February 2026 for review and comment; no comments on the report were received following their review.

The draft report was submitted to the Ministry of Citizenship and Multiculturalism in April 2026 for review and comment; no comments on the report were received following their review.

This C.H.I.A. will be submitted to the City of Hamilton for their information.

2.4 Indigenous Community Engagement

The City of Hamilton is undertaking Indigenous community engagement for this project. The list of communities notified includes Six Nations of the Grand River, Mississaugas of the Credit First Nation, Huron Wendat First Nation at Wendake, Haudenosaunee Development Institute, and the Metis Nation of Ontario.

At the time of final report preparation (May 2026), no information regarding the subject property had been received.

3.0 Description of the Property

The following section provides a description of the subject property.

3.1 General Description of Property

The subject property is located at the southwest corner of the intersection of Highway 52 and Powerline Road West in Hamilton (Figure 2). The property consists of a one-and-a-half storey wood-framed, brick-clad residence in the

northwest corner, an outbuilding near the southwest corner, a gravel driveway along the western boundary, and wooded areas to the east of the buildings and driveway, extending all the way to the southern and eastern boundaries. The southeastern portion of the property abuts the Hamilton-Brantford Rail Trail along the former railway corridor of the Toronto, Hamilton and Buffalo Railway.



Figure 2: Aerial image of the subject property at 1334 Powerline Road West (Google Maps)

3.2 Heritage Recognitions

The subject property is identified as an Inventoried Property by the City of Hamilton (City of Hamilton, 2024a). There are no provincial or federal heritage recognitions.

3.3 Adjacent Lands

In the Rural Hamilton Official Plan, “adjacent” is defined as contiguous to or within 50 metres of a “protected heritage property” (City of Hamilton, 2018b).

As such, for the purposes of this C.H.I.A., there are two properties that are to be considered adjacent to the subject property, namely 1350 Powerline Road West, adjacent to the subject property's western border, which is identified as an Inventoried Property, and 1341 Powerline Road West, across the road from the subject property's northern border, which is identified as a Registered (Non-Designated) Property by the City of Hamilton (email communication with heritage planning staff, 10 July 2025).

4.0 Research

This section provides: the results of primary and secondary research; a discussion of historical or associative value; a discussion of physical and design value; a discussion of contextual value; and results of comparative analysis.

4.1 List of Key Sources and Site Visit Information

The following section describes the sources consulted and research activities undertaken for this report.

4.1.1 Key Sources

Background historical research, which includes consulting primary and secondary source documents, photos, and historic mapping, was undertaken to identify early settlement patterns and broad agents or themes of change in the study area. In addition, online historical research was undertaken through the websites of the following libraries and archives to build upon information gleaned from other primary and secondary materials:

- Library and Archives Canada;
- Hamilton Public Library; and,
- Lloyd Reeds Map Collection at Mills Memorial Library, McMaster University.

Available federal, provincial, and municipal heritage inventories and databases were also consulted to obtain information about the property. These included:

- The City of Hamilton's Cultural Heritage Resources mapping tool (City of Hamilton, 2024a);
- Hamilton's Heritage, Volume 1 (City of Hamilton, 2002);
- Hamilton's Heritage, Volume 5 (City of Hamilton, 2005);
- The *Ontario Heritage Act Register* (Ontario Heritage Trust, 2025);
- The *Places of Worship Inventory* (Ontario Heritage Trust, n.d.b);
- The inventory of Ontario Heritage Trust easements (Ontario Heritage Trust, n.d.a);
- The Ontario Heritage Trust's *An Inventory of Provincial Plaques Across Ontario*: a PDF of Ontario Heritage Trust Plaques and their locations (Ontario Heritage Trust, 2023);
- Parks Canada's *Directory of Federal Heritage Designations*, an on-line database that identifies National Historic Sites, National Historic Events, National Historic People, Heritage Railway Stations, Federal Heritage Buildings, and Heritage Lighthouses (Parks Canada, n.d.b); and
- Parks Canada's *Historic Places* website, an on-line register that provides information on historic places recognized for their heritage value at all government levels (Parks Canada, n.d.a).

Previous consultant reports associated with potential above-ground cultural heritage resources and archaeological resources within and/or adjacent and/or in the vicinity of the subject property in the City of Hamilton, Ontario included the following:

- Ancaster Elevated Water Reservoir Municipal Class Environmental Assessment, City of Hamilton, Ontario (A.S.I., 2018);
- Stage 1 & 2 Archaeological Assessment of 104 Paddy Greene Road, Part of Lot 33, Concession 2, Geographic Township of Ancaster, Wentworth County, Now in the City of Hamilton (A.S.I., 2013); and,
- Stage 1 & 2 Archaeological Assessment – Corrosion Protection Program within the MLV 1301 Pipeline Section, Regional Municipality of Hamilton-Wentworth, Ontario (A.S.I., 2005).

A full list of references consulted can be found in Section 8.0 of this document.

4.1.2 Site Visit

A site visit to the subject property was conducted on 5 August 2025 by Michael Wilcox and Robert Flewelling, both of A.S.I. The site visit included photographic documentation of both the exterior and interior of the residence on the subject property as well as access to the entire property. Permission to Enter (P.T.E.) was granted by the homeowners, Edzard and Wendy Gruppe, to allow A.S.I. to access the property and residence.

4.2 Discussion of Historical or Associative Value

Historically, the property was located on parts of Lots 29 and 30, Concession 2 in the Township of Ancaster, County of Wentworth. It is now located at 1334 Powerline Road West in the City of Hamilton.

4.2.1 Summary of Early Indigenous History in Southern Ontario

Southern Ontario has been occupied by human populations since soon after the retreat of the Laurentide glacier more than 13,000 years before present (B.P.) Populations at this time would have been highly mobile, inhabiting a boreal-parkland similar to the modern sub-arctic. By approximately 11,000 B.P., the environment had progressively warmed and populations now occupied less extensive territories (Ellis, 2013; Ellis & Deller, 1990; Ferris, 2013; Stewart, 2013).

Between approximately 12,000 and 6,000 B.P., the Great Lakes and Lake Simcoe experienced low-water levels, and many sites which would have been located on those former shorelines are now submerged. This period produces the earliest evidence of heavy wood working tools, an indication of greater investment of labour in felling trees for fuel, to build shelter, and watercraft production. These activities suggest prolonged seasonal residency at occupation sites. Polished stone and native copper implements were being produced by approximately 8,000 B.P.; the latter was acquired from the north shore of Lake Superior, evidence of extensive exchange networks throughout the Great Lakes

region. The earliest evidence for cemeteries dates to approximately 4,500-3,000 B.P. and is indicative of increased social organization, investment of labour into social infrastructure, and the establishment of socially prescribed territories (Brown, 1995, p. 13; Ellis et al., 1990, 2009).

For millennia, Indigenous populations continued to practice residential mobility and to harvest seasonally available resources, including spawning fish. The Woodland period begins around 2,500 B.P. and exchange and interaction networks broaden at this time (Spence et al., 1990, pp. 136, 138) and by approximately 2,000 B.P., evidence exists for small community camps, focusing on the seasonal harvesting of resources (Spence et al., 1990, pp. 155, 164). By 1,500 B.P. there is evidence for maize in southern Ontario, and it is thought that initially maize only supplemented people's diet. There is earlier evidence for maize in central New York State by 2,300 B.P., and once further cooking residue analysis is conducted on contemporary ceramic vessels from Ontario, the same evidence may be found (Birch & Williamson, 2013, pp. 13–15). As is clearly evident in the detailed ethnographies of Anishinaabek populations, winter was a period during which some families would disperse from the larger group as it was easier to sustain smaller populations. It is generally understood that these populations were Algonquian speakers during these millennia of settlement and land use.

From the beginning of the Late Woodland period at approximately 1,000 B.P., lifeways became more similar to that described in early historical documents. Between approximately 1000-1300 Common Era (C.E.), the communal site is replaced by the village focused on horticulture. Seasonal dispersal of the community for the exploitation of a wider territory and more varied resource base was still practised (Williamson, 1990, p. 317). By 1300-1450 C.E., this episodic community dispersal was no longer practised and populations now occupied sites throughout the year (Dodd et al., 1990, p. 343). From 1450-1649 C.E. this process continued with the coalescence of these small villages into larger communities (Birch & Williamson, 2013). Through this process, the socio-political organization of the First Nations, as described historically by the French and English explorers who first visited southern Ontario, was developed.

By 1600 C.E., Huron-Wendat communities within Simcoe County had formed the confederacy encountered by the first European explorers and missionaries. In the 1640s, the traditional enmity between the Haudenosaunee and the Huron-Wendat (and their Algonquian allies such as the Nipissing and Odawa) led to their dispersal from southern Ontario. Shortly afterwards, the Haudenosaunee established a series of settlements at strategic locations along the trade routes inland from the north shore of Lake Ontario. By the 1690s however, the Anishinaabeg were the only communities with a permanent presence in southern Ontario. From the beginning of the eighteenth century to the assertion of British sovereignty in 1763, there was no interruption to Anishinaabeg control and use of southern Ontario.

4.3 Treaties and Traditional Territories

The following section provides a discussion of the Treaties and traditional territories within which the study area is situated.

4.3.1 1701 Deed from the Five Nations to the King, of their Beaver Hunting Ground

In the late seventeenth century, the Haudenosaunee of the Five Nations Confederacy residing in upstate New York and Southern Ontario were dealing with military engagements and encroachment from French forces as well as the movement of the Mississaugas and other Anishinaabeg peoples into the area, all of which contributed to fears among the Confederacy about the loss of their beaver hunting grounds (Williams & Nelson, 1995). To address their concerns, the Confederacy met with the Province of New York's acting colonial governor John Nanfan, as well as a British representative on behalf of the Indian Affairs Department, Robert Livingston, in July 1701. The Confederacy hoped to urge the English into action in their disputes with the French and their Indigenous allies. The British hoped that an alliance with the Haudenosaunee would continue to ensure a strong trading relationship, keep French efforts to control the fur trade in check, and assert British control deeper into North America (Brandao & Starna, 1996; Jamieson, 2013).

Ultimately, the Deed from the Five Nations to the King, sometimes referred to as the Treaty of Fort Albany, the Nanfan Treaty, the Albany Deed, or Livingston's Deed, was signed by representatives of the British Crown and the Haudenosaunee Confederacy in 1701 (Williams & Nelson, 1995). The Deed established the Beaver Hunting Grounds as a vast territory spanning much of the lands surrounding the lower Great Lakes, including in Southern Ontario, as well as into the Ohio River Valley (Jamieson, 2013).

There has been significant debate about the terms of the agreement. The Six Nations of the Grand River assert that it is a valid treaty that recognized the Confederacy's ownership of and access to the natural resources within the Beaver Hunting Grounds, while also receiving the Crown's support and protection (Six Nations of the Grand River, 2020). Others, though, note that while the Haudenosaunee fished and hunted in Southern Ontario in the late seventeenth century, these lands were not under their authority at the time and as such, they could not negotiate a formal treaty with the British Crown for this territory (Calverley, 2002; Jennings, 1984; Schmalz, 1984). Research indicates that the British did not formally recognize the agreement, and currently neither the Canadian government nor the British Crown recognize the 1701 Deed as a treaty.

4.3.2 Treaty 3 (Between the Lakes Purchase)

The subject property is located within the territory covered by Treaty #3, the Between the Lakes Purchase (1784/1792).

Following the American Revolutionary War (1775-1783), the British Crown needed to find lands on which to settle United Empire Loyalists, including approximately 2,000 members of the Six Nations confederacy who had fought alongside British troops. Led by Sir Frederick Haldimand who was the governor of Quebec at that time, the Crown was initially planning on providing lands for Loyalist settlers in Quebec and Southeastern Ontario, including providing land in the Bay of Quinte for Six Nations refugees. This was not suitable for many of the members of Six Nations and a contingent of approximately 1,800 community

members, led by Chief Joseph Brant, requested land north of Lake Erie along the Grand River. Brant felt that the location in the Bay of Quinte was too isolated and that his followers could be better served by being closer to the Six Nations communities that chose to remain in the United States in western New York (Surtees, 1984, p. 21).

Recognizing that, under the terms of the Royal Proclamation of 1763, the land needed to be purchased prior to settlement, Colonel John Butler was sent to negotiate with the Mississaugas of the Credit for lands east of Lake Ontario and north of Lake Erie. On May 22, 1784, the Mississaugas of the Credit agreed to cede approximately 3,000,000 acres (1,214,057 hectares) of land containing all or part of Brant, Elgin, Middlesex, Oxford, and Wellington Counties as well as the Regions of Haldimand-Norfolk, Halton, Hamilton-Wentworth, Niagara, and Waterloo. In exchange for these lands, the Mississaugas received £1180.74 worth of trade goods (Crown-Indigenous Relations and Northern Affairs, 2016; Surtees, 1984). Of the 3,000,000 acres (1,214,057 hectares), approximately 550,000 acres (222,577 hectares) was set aside for the settlement of Six Nations people.

However, due to uncertainties with the description of the lands in the original surrender, Treaty 3 was renegotiated on December 7, 1792, to clarify what was ceded. This largely revolved around the northern boundary of the Treaty area, and particularly the area set aside for Six Nations settlement along the Grand River. The signees on the side of the British included Lieutenant Governor John Graves Simcoe, John Butler, Robert Kerr, Peter Russell, John McGill, and Davie William Smith. The signees on the side of the Mississauga included Chiefs Wabakayne, Wabanip, Kautabus, Wabaniship and Mottotow (Crown-Indigenous Relations and Northern Affairs, 2016; Mississaugas of the Credit First Nation, 2017; Surtees, 1984).

The original text stipulated that the north-west boundary of the parcel was an imaginary line between Burlington Bay and the Thames River, which is inconsistent with the geography of the area. The boundaries of the parcel were corrected to create a polygon encompassing the Niagara peninsula up to

Burlington Bay and then up north to the present-day town of Arthur then south to the present-day town of Woodstock to finally meet Lake Erie at Port Bruce. Treaty 3 lands exclude a corridor along the Grand River set aside for Six Nations (Crown-Indigenous Relations and Northern Affairs, 2016; Native Land Digital, 2018).

4.4 Historical Euro-Canadian Township Survey and Settlement

The first Europeans to arrive in the area were transient merchants and traders from France and England, who followed Indigenous pathways and set up trading posts at strategic locations along the well-traveled river routes. All of these occupations occurred at sites that afforded both natural landfalls and convenient access, by means of the various waterways and overland trails, into the hinterlands. Early transportation routes continued the use of existing Indigenous trails that typically followed the highlands adjacent to various creeks and rivers (A.S.I., 2006). Early European settlements occupied similar locations as Indigenous settlements as they were generally accessible by trail or water routes and would have been in locations with good soil and suitable topography to ensure adequate drainage.

Throughout the period of initial European settlement, Indigenous groups continued to inhabit Southern Ontario, and continued to fish, gather, and hunt within their traditional and treaty territories, albeit often with legal and informal restrictions imposed by colonial authorities and settlers. In many cases, Indigenous peoples acted as guides and teachers, passing on their traditional knowledge to Euro-Canadian settlers, allowing them to sustain themselves in their new homes. Indigenous peoples entered into economic arrangements and partnerships, and often inter-married with settlers. However, pervasive and systemic oppression and marginalization of Indigenous peoples also characterized Euro-Canadian colonization, with thousands being displaced from their lands, denied access to traditional and treaty hunting, fishing, and collecting grounds, and forced to assimilate with Euro-Canadian culture through

mandatory attendance at Day and Residential Schools (Ray, 2005; Rogers & Smith, 1994).

4.4.1 Township of Ancaster

Historically, the property is located in the former Township of Ancaster, County of Wentworth, on parts of Lots 29 and 30, Concession 2.

The land within Ancaster Township was acquired by the British from the Mississaugas in 1784. The first township survey was undertaken in 1793, and the first Euro-Canadian settlers occupied their land holdings two years later. The township is said to have been named after a town in Lincolnshire, England. Ancaster was one of the largest townships at the Head-of-the-Lake and was quickly settled due to the vast expanse of good land suitable for farming. Ancaster was initially settled by disbanded soldiers, mainly Butler's Rangers, and other Loyalists following the end of the American Revolutionary War. In 1805, Boulton noted that this township contained both excellent and indifferent soils. By the 1840s, the township was noted for its fine farms (Armstrong, 1985; Boulton, 1805; Smith, 1846).

In the second half of the nineteenth century, the township was populated by several industries. By 1875, Ancaster Township was famous for mineral springs, the waters from which were considered therapeutic and medicinal. Ancaster remained a rural township until the mid-twentieth century, when housing subdivision construction began to take up farmland and increase the population (Mika & Mika, 1977). In 1974, the Township of Ancaster, and various hamlets therein, was absorbed by the Town of Ancaster and became part of the new Regional Municipality of Hamilton-Wentworth. Then, in 2001, the Town of Ancaster amalgamated with surrounding communities, including Dundas, Flamborough, Glanbrook, Hamilton, and Stoney Creek to form the new and expansive City of Hamilton.

4.4.2 Historical Chronology and Setting of the Subject Property

The following provides a brief overview of the historical chronology of the subject property. It includes a history of the people who lived on or owned the property, as provided in available sources, as well as a mapping review. It is based on a variety of primary and secondary source materials, including maps, newspapers, census data, and abstract indexes.

The subject property is located on part of the former northeast corner of Lot 29 and northwest corner of Lot 30 in the Second Concession of Ancaster Township, Wentworth County. The residence on the property is located on Lot 29, and as such, most of the historical chronology outlined below relates to that lot. The crown patent for 200 acres on Lot 29 was allotted to the Honourable Robert Hamilton in 1804 (O.L.R.A., n.d.). It appears that John Howell acquired the subject property prior to 1817 (O.L.R.A., n.d.). Members of the Howell family continued to own the subject property for decades thereafter. John Howell (1785-1849) was born in New Jersey in the United States and married Rachel (nee Kitchen), also born in New Jersey, in the early nineteenth century. It is unknown when they arrived in what was then Upper Canada, though it was likely prior to 1812, as all their known children were born in Ancaster between 1812 and 1833. No information about any land developments on the subject property from the 1820s to the 1850s was uncovered. However, it is known that John died in 1849 and Rachel in 1850 (Buschlen, 2006).

By 1851, it is probable that their son, William Howell (1821-1898), was the owner of the northern half (100 acres) of Lot 29 and the northern-most 50 acres of Lot 30 (O.L.R.A., n.d.). The 1851 census notes that William Howell was a 31-year-old farmer married to 27-year-old Mary (1825-1907) and the couple had three children and two servants living with them in a one-storey frame house in Ancaster Township (Library and Archives Canada, 1851). The 1859 map (Figure 4) shows Howell as the owner of the subject property, though it is unknown where exactly the one-storey frame house was located.

The 1861 census continues to identify William and Mary Howell as the owners of Lot 29. They occupied a one-and-a-half storey frame dwelling on the lot, along with their seven children and one 18-year-old woman named Hannah Robinson. William was identified as a 40-year-old farmer. Of the 210 acres he owned, 170 acres was under cultivation, with 157 acres under crops, 10 acres under pasture, and three acres under orchards or gardens. The other 40 acres were classified as being under wood or wild. The farm yielded wheat, barley, rye, peas, oats, buckwheat, corn, potatoes, turnips, as well as hay and cloverseed (Library and Archives Canada, 1861).

The 1871 census identifies William, aged 50, and Mary, aged 46, as the owners and occupants of 150 acres, with 100 acres on Lot 29 and 50 acres on Lot 30. They lived with their nine children between the ages of 1 and 26 as well as a 17-year-old girl named Anne Gordon. Schedule 3 notes that the Howells owned 415 total acres, three dwellings, one factory, 10 barns/stables, five carriages/sleighs, five cars/wagons/sleds, five ploughs/cultivators, one reaper/mower, one horse rake, and one fanning mill. The census does not distinguish how much of each of the above items was located on Lot 29 or on Lot 30. Schedule 4 notes that of their 150 acres, 120 acres was improved, 20 acres was in pasture, and three acres was in gardens or orchards. It is unknown what the status was of the other seven acres on their property, though it is assumed to have been wooded.[1] The family grew wheat, barley, oats, rye, corn, potatoes, turnips, and hay, and the orchard yielded 200 bushels of apples. The property also included nine horses over three years old, 28 milch cows, seven other horned cattle, 31 sheep, 20 pigs, and three hives of bees which yielded 50 pounds of honey. Schedule 6 notes that Howell owned a cheese factory at an unspecified location, though the Remarks section notes that it “Works in connection with farm”. The factory operated six months of the year, and employed an average of four people (Library and Archives Canada, 1871).

[1] This assumption is based on the fact that Howell’s property yielded 1,200 cubic feet of square pine and 20 cords of firewood in 1871.

The 1875 map (Figure 5) depicts Howell as the owner of the subject property. The house that he resided in with his family was on the west side of Lot 29 and set well back from what is now Powerline Road West. The 1883 *County of Wentworth Gazetteer and Directory* notes that William Howell was the occupant of Lot 29, Concession 2 while his son, Triller Howell, was the occupant of the adjacent Lot 30. Several other people with the surname Howell were located in the vicinity of the subject property (W.H. Irwin & Co., 1883).

The residence on the subject property was very likely built by a mason named T.T. Miller in 1886. This is based on an etching found in a brick on the east side of the residence, identified to A.S.I. staff by the current homeowner (Figure 3). Additional research into T.T. Miller did not yield any further information about his background or if he was a known professional in the area.



Figure 3: Etching with name and date located on the east wall of the house (Provided by Edzard Gruppe to A.S.I., 2025)

Given the inscription by the presumed mason, it can be assumed that the original brick portion of the residence was erected under William Howell's tenure as owner.

The 1891 census identifies William, aged 70, still married to Mary, aged 66. They resided with three children between the ages of 21 and 33, as well as with a 23-year-old farm labourer named Benjamin Mowat. Their residence was listed as a two-storey wood structure with nine rooms (Library and Archives Canada, 1891). It is not known why it is not listed as having brick cladding in line with the 1886 date above. The T.H. & B. Railway came through Lot 29 circa 1894, and William Howell and his wife sold a portion of his property to allow for a deed of right of way to the railway company (O.L.R.A., n.d.). The 1896-1898 *Gazetteer and Directory* notes that both William Howell and his son Charles L. Howell resided on Lot 29 (Vernon, 1898).

William Howell died in 1898, and it appears that the property fell under the ownership of his son William Tiller (W.T.) Howell (1852-1924). The 1899 Tax Assessment for Ancaster Township notes that W.T. Howell was a 46-year-old farmer who owned 67 acres split between Lots 29 and 30. He also owned eight cows, 19 pigs, and three horses (Ancaster Township, 1899). The 1901 census identifies Howell as a 48-year-old farmer, residing with his wife Elizabeth, four children, and a 21-year-old male boarder named Clark Kitchen.[2] Schedule 2 of the census notes that William was residing in a brick house with ten rooms on Lot 29, and that the property, which included parts of Lots 29 and 30, was 66 acres in size and also included two barns, stables, or outbuildings (Library and Archives Canada, 1901). Note that William's brother Charles also resided on the north half of Lot 29 at this time, but in a wood house.

Elizabeth and W.T. Howell sold their property, including the subject residence, to Melvin Ireland in 1910 (O.L.R.A., n.d.). Ireland (1856-1929) married Levina Billiald (1858-1939) in 1888. While they resided in the vicinity of the subject property in 1901, they are listed as residing in Burlington in the 1911 census (Library and Archives Canada, 1911). The 1916 topographic map (Figure 6) depicts a residence made of brick or brick cladding in the northwest corner of the subject property, west of Summit, which appears to include a railway station

[2] Clark Kitchen may have been related to Elizabeth, as that was her maiden name.

or flag stop near where the railway corridor crosses Powerline Road West. The Irelands sold the property to William H. Willson in 1920, but he sold it the following year to E.B. (Edward Bevan) Ratcliffe. Ratcliffe (c. 1883-1946) was born in Colchester England and was a building contractor for 45 years (County of Wentworth, 1946). It is unknown if he ever resided within the residence on the subject property, as he was residing in Hamilton in 1921 and in Bartonville in 1931 (Library and Archives Canada, 1921, 1931).

Edward B. Ratcliffe sold the property to Eric Ward (1895-1969) in 1928. The 1931 census identifies Ward as an immigrant from England who arrived in Canada in 1914. In 1931, he was residing with his wife Mary and son Howard in what was listed as a brick house with ten rooms, which is very likely the residence on the subject property. He was 38 years old at the time and was identified as a station agent for the railroad (Library and Archives Canada, 1931). The station agent role was likely connected with the nearby Summit Station, part of the T.H.&B. Railway, which is clearly depicted east of the subject property on the 1934 topographic map (Figure 7). The 1954 aerial photograph (Figure 8) depicts the property within a rural-agricultural landscape close to Summit Station along the T.H.&B. Railway. There does not appear to be a wooded area east of the house at this time.

The property appears to have been passed down to Howard L. Ward and his wife Mildred in the 1960s and it was then purchased by Harry R. Loewith in 1969. Soon thereafter, Harry's brother Carl J. Loewith, as well as their two wives, were all added to the property title, though they sold it to Edward and Sarah Glanville in 1971. The 1976 topographic map (Figure 9) depicts the residence with a structure to the rear, which may be the garage outbuilding that remains extant on the property today. The surrounding area remains in a rural-agricultural context. The Glanville's sold the property to the current owners, Edzard and Wendy Gruppe, in 1994 (O.L.R.A., n.d.). That year, a topographic map (Figure 10) depicts Highway 52's current alignment, as well as the intersections of Powerline Road West and East with Highway 52, for the first time in this mapping review. Furthermore, the former rail corridor is now depicted as a trail.

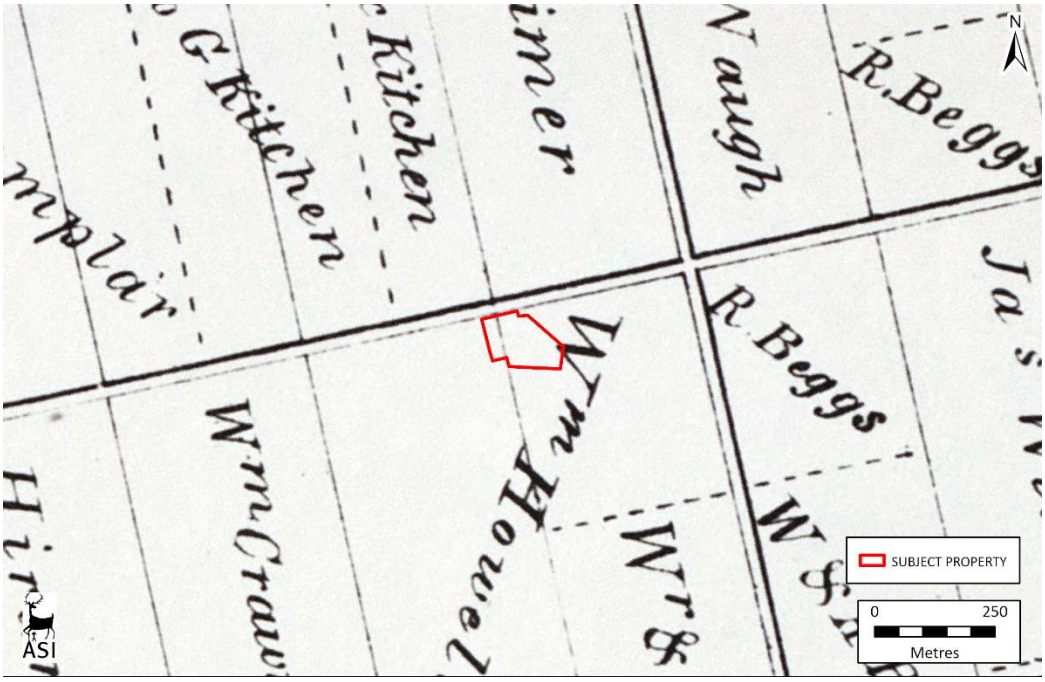


Figure 4: The location of the subject property overlaid on the 1859 *Map of the County of Wentworth, Canada West* (Surtees, 1859)

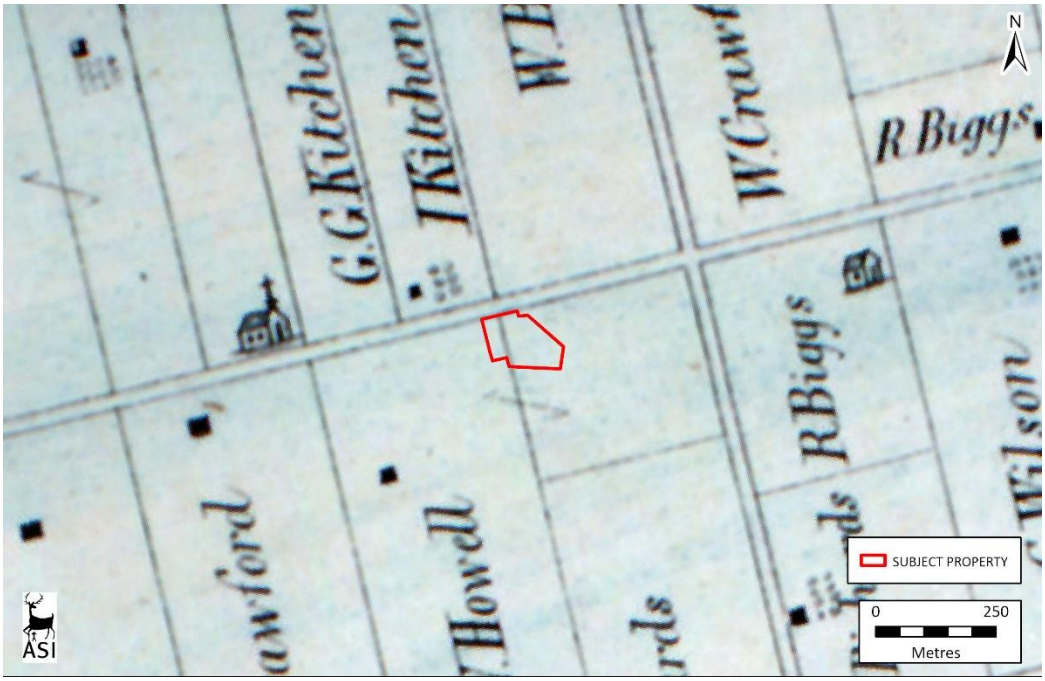


Figure 5: The location of the subject property overlaid on the 1875 *Illustrated Historical Atlas of the County of Wentworth* (Page & Smith, 1875)

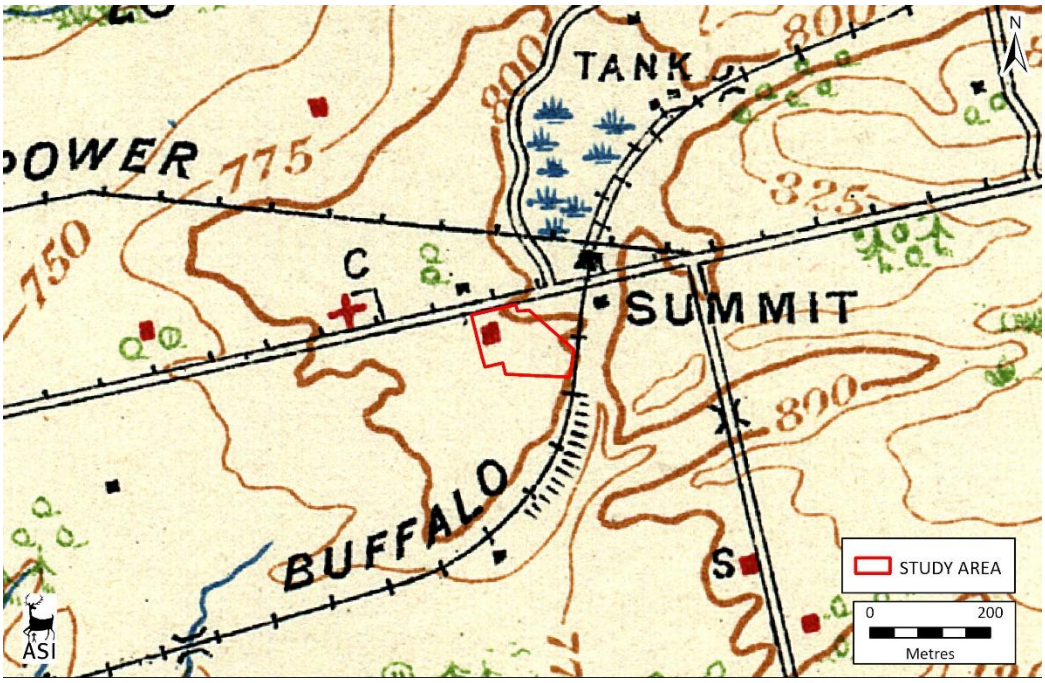


Figure 6: The location of the subject property overlaid on a 1916 topographic map, Brantford sheet (Department of Militia and Defence, 1916)

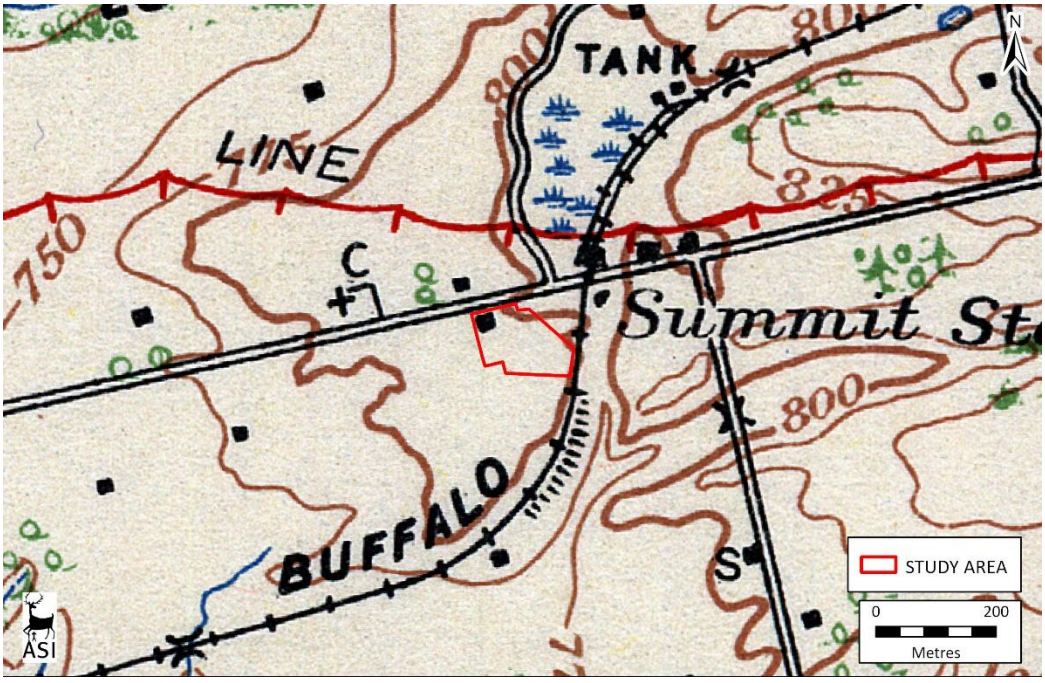


Figure 7: The location of the subject property overlaid on a 1934 topographic map, Brantford sheet (Department of Militia and Defence, 1934)

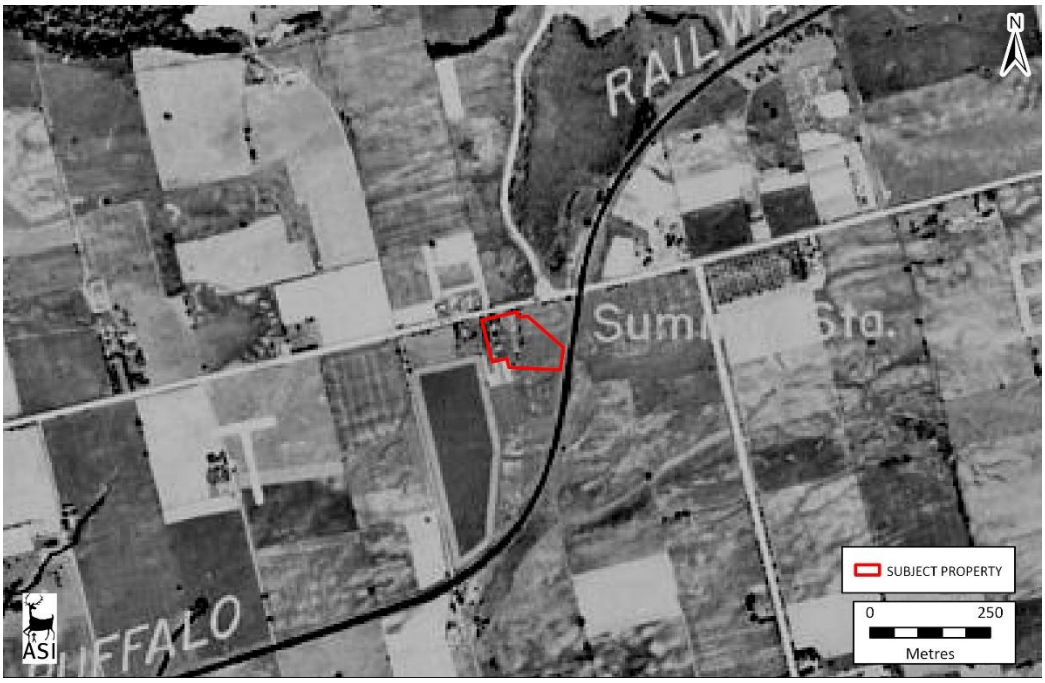


Figure 8: The location of the subject property overlaid on a 1954 aerial photograph (Hunting Survey Corporation Limited, 1954)

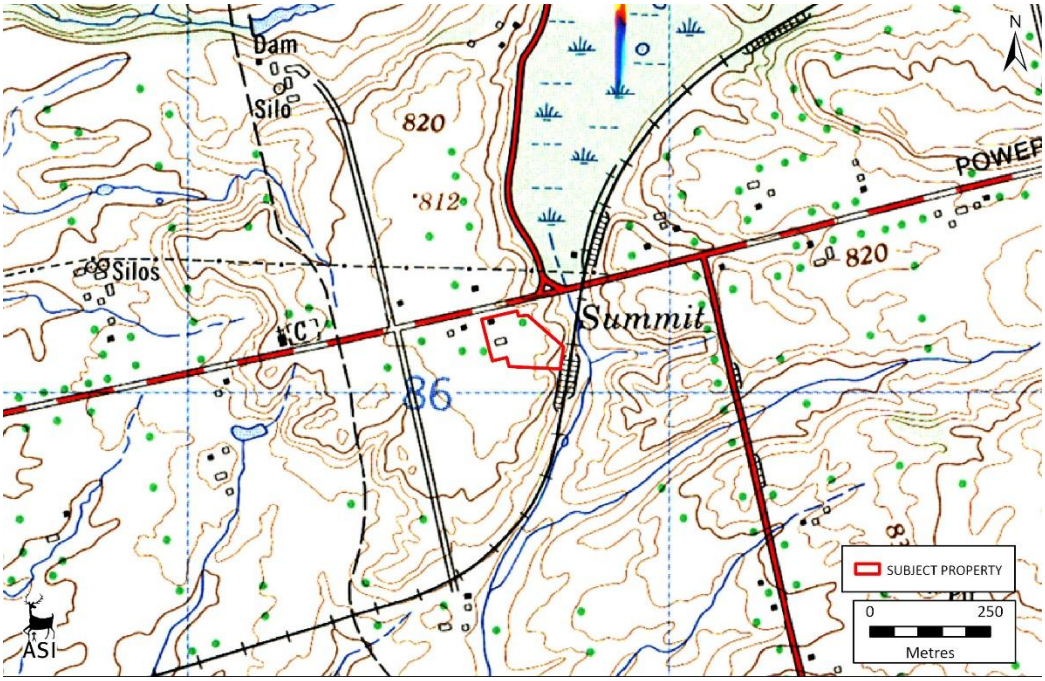


Figure 9: The location of the subject property overlaid on a 1976 topographic map, Jerseyville sheet (Department of Energy, Mines and Resources, 1976)

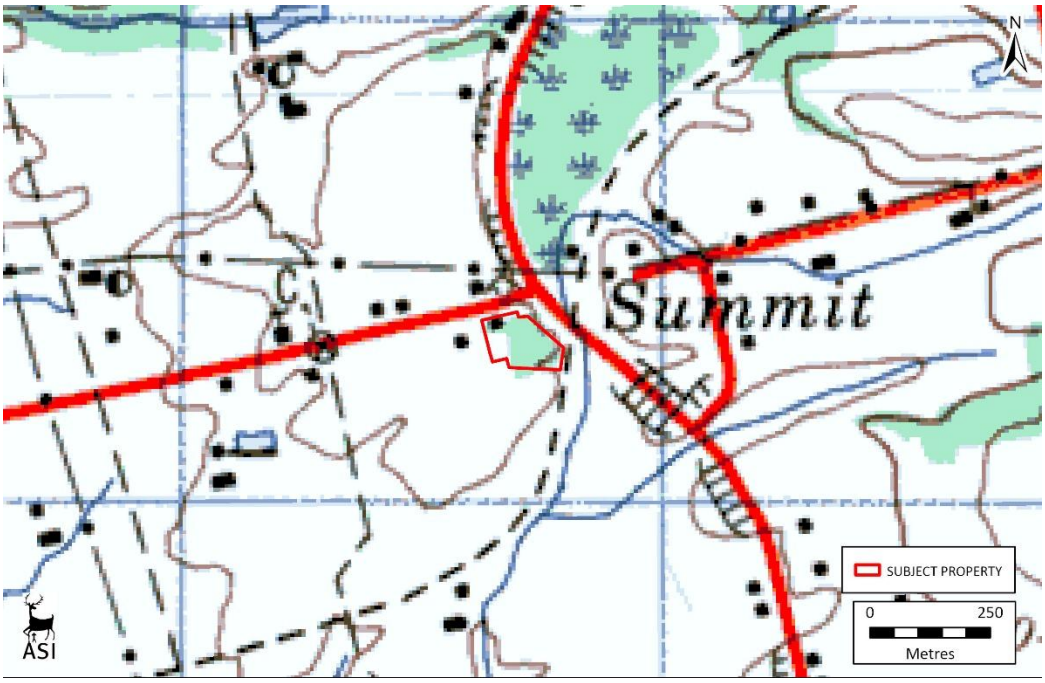


Figure 10: The location of the subject property overlaid on a 1994 topographic map, Brantford sheet (Natural Resources Canada, 1994)

4.5 Discussion of Physical and Design Value

The following discusses the physical and design value of the subject property.

4.5.1 Physical Characteristics

The subject property at 1334 Powerline Road West consists of a late nineteenth century wood-framed, brick-clad residence in the northwest corner, a concrete block outbuilding, a gravel driveway along the western boundary, open lawned areas, large trees, and vegetation. The southeastern portion of the property abuts the Hamilton-Brantford Rail Trail along the former railway corridor of the T.H.&B. Railway (Figure 11).



Figure 11: The location of the subject property with key features identified (Google Maps)

Residence

The original portion of the residence on the subject property is a one-and-a-half storey structure built in a vernacular adaptation of the Gothic Revival architectural style. The residence features stone foundation walls with a four-course string of buff brick above the foundation to accentuate the base of the house. Among the key architectural features are a T-shaped plan with a pitched cross-gable roof, brick veneer exterior walls over a wood frame, three brick chimneys, shutters on the north (front) elevation, two curved windows below the pointed gables on the upper storey, and window openings that have either limestone or wood sills and brick voussoirs which have been painted white. Some of the windows on the front elevation may be original, though this could not be confirmed at the time of report submission. At one time, the house had a front verandah providing access to two entrances, though neither of these entrances appear to be in use. The roof material is asphalt shingle.

Some elements of the original house are typical of the Gothic Revival style, including a central pointed gable above the original front door, the use of red brick cladding for the exterior walls and buff brick accents in the quoining, the use of brick voussoirs over the windows, and symmetrical fenestration.

A rear addition, built circa 2008, extends south from the original house, and replaced a previous addition with a stone foundation at this location. The addition matches the roof angle of the original portion, and features gables and windows designed to emulate the original structure. The exterior cladding features blue wood siding.

A brief tour of the inside of the residence was granted by the homeowner. The stone foundation is visible in the basement. The main floor is divided between old and new sections, with the newer section including a large kitchen and living room and the older section featuring a parlour, laundry room, and a living room. The original location of the kitchen has been repurposed to the laundry room, and the former dining room is now used as a parlour. The main floor features some original wood flooring and baseboards, and possibly two original doors.

The upper floor is also divided between old and new sections, with both featuring bedrooms and a washroom. There may be two original bedroom doors in the older part of the upper floor (Figure 12 to Figure 24).

Outbuilding

A large concrete-block outbuilding is located south of the residence on the property. This building, which appears to have been built at an unknown date prior to 1976 based on available mapping, is rectangular in shape and features a sliding door entrance as well as a regular door, a sheet metal roof, large window openings that have been closed off, and a small window on the south and east sides, as well as a small door opening on the wood-plank gabled end of the east side. Access to the interior was not permitted by the homeowner because of safety concerns (Figure 25 to Figure 26).

Property

The property features densely wooded areas that include mature trees and mixed vegetation. In the wooded area to the south and east of the residence, there are both marked and unmarked trails, a former cow path extending from behind the concrete block outbuilding all the way to the former railway corridor, and a vegetative fence line. The property also features a gravel driveway, open lawned areas, and flower gardens. One of the open spaces east of the residence features a septic bed below the ground, and a pipeline is located along both the north and east property boundaries (Figure 27 to Figure 33).

4.5.2 Builder

The residence appears to have been built by T.T. Miller in July of 1886, as his name and the date is etched into a brick on the east elevation of the residence. No information was uncovered about him.

4.5.3 Building Evolution and Alterations

The residence, erected in 1886, was built in a vernacular adaptation of the Gothic Revival architectural style. When first built, there were at least two

entrances to the residence, both accessed via a front verandah, which was located on the north façade but was removed at an unknown date. There may have originally been a rear entrance that was removed by a later addition, but this could not be confirmed. A former window opening on the west elevation was bricked over at an unknown date and a new window opening was likely added slightly to the south of that original opening. An addition to the rear of the residence was carried out circa 2008 and is broadly complementary to the original structure in terms of the roofline and the Gothic style dormers.

4.5.4 Building Style

The residence on the subject property is a vernacular interpretation of the Gothic Revival architectural style. Gothic Revival residences are notable for their gables and use of Gothic detailing, including arched windows, vergeboards, and finials. This was one of the most common architectural styles in Ontario amongst European settlers, though often taking the form of a vernacular house. While architect-designed Gothic Revival buildings are found throughout Ontario, the prevalence of the Gothic Revival style is owed more to the availability of plans and forms set in pattern books that were popular with the middle class, farmers, and other rural settlers (Mikel, 2004). These Gothic vernacular residences were typically one-and-a-half storeys, would have a gable-end, symmetrically balanced with a central door flanked by a window on either side. The houses would be individualized with available details and finishes (Mikel, 2004). Another feature was the use of two tones of brick, usually a red brick with buff or yellow brick to highlight. This is known as dichromatic brickwork, which was a vernacular attempt at producing the polychromatic effect (Blumenson, 1990).

The residence on the subject property has some of the general elements of the Gothic Revival style, including its footprint, massing, dormer, dichromatic brickwork, and window placement.

4.5.5 Existing Conditions Photographs



Figure 12: Front (north) elevation of the residence, looking south (A.S.I., 2025)



Figure 13: East elevation of the residence, looking west (A.S.I., 2025)



Figure 14: South elevation of the residence, looking north (A.S.I., 2025)



Figure 15: West elevation of the residence, looking east (A.S.I., 2025)



Figure 16: Stone foundation, with four courses of buff brick above (A.S.I., 2025)



Figure 17: Representative window with shutters, wood lintels, and painted brick voussoir (A.S.I., 2025)



Figure 18: Former entrances on the front elevation, and former location of the front verandah (A.S.I., 2025)



Figure 19: Buff brick quoining and painted brick voussoir over the window on the east elevation (A.S.I., 2025)



Figure 20: Rear (south) addition to the residence (A.S.I., 2025)



Figure 21: Rubble stone and parging in basement (A.S.I., 2025)



Figure 22: Parlour room in the northeast corner of the residence, showing original flooring and baseboards (A.S.I., 2025)



Figure 23: Living room in the northwest corner of the residence (A.S.I., 2025)

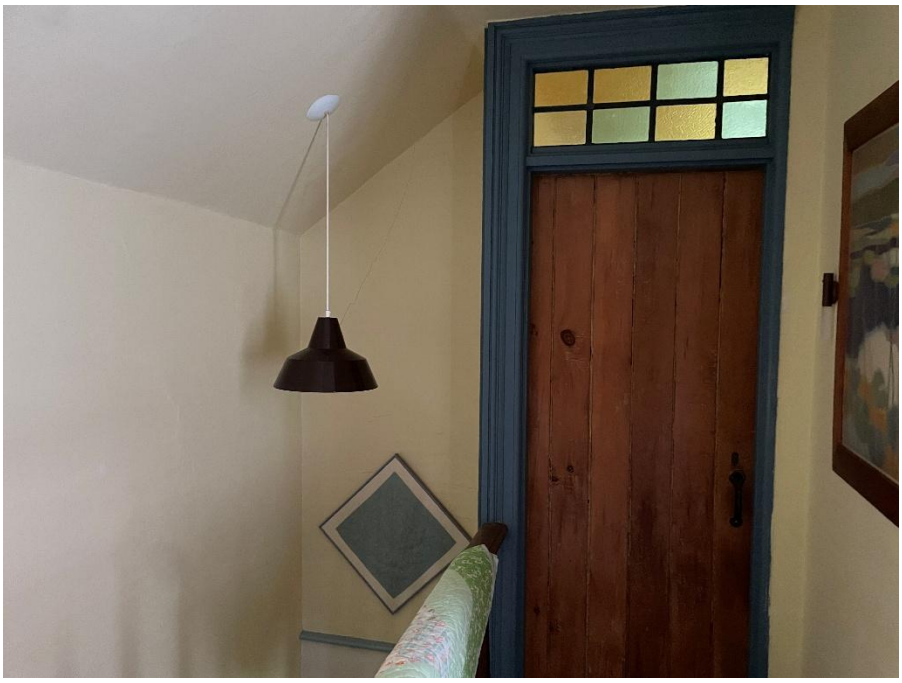


Figure 24: Upstairs bedroom door (A.S.I., 2025)



Figure 25: Concrete block outbuilding south of the residence, looking south (A.S.I., 2025)



Figure 26: Concrete block outbuilding south of the residence, looking west (A.S.I., 2025)



Figure 27: Wooded area west of Highway 52, looking north (A.S.I., 2025)



Figure 28: Location of the former cow path south of the outbuilding at the rear of the property, looking south (A.S.I., 2025)



Figure 29: Entrance driveway to the subject property, looking south from Powerline Road West (A.S.I., 2025)



Figure 30: Manicured gardens and pathways southeast of the residence (A.S.I., 2025)



Figure 31: Small shed southeast of the residence (A.S.I., 2025)



Figure 32: Lawns and trees east of the residence, where the septic tank is located (A.S.I., 2025)



Figure 33: Location of a pipeline running across the front of the property, looking east from the driveway (A.S.I., 2025)

4.6 Discussion of Contextual Value

The following section discusses the contextual value of the subject property.

4.6.1 Setting and Character of the Property and Surroundings

The property is set within a rural-agricultural and rural-residential land use context and does not have a unifying or significant character. Powerline Road West is a two-lane paved east-west roadway with no shoulders or sidewalks. The road ends at its intersection with Highway 52, which is primarily a two-lane paved north-south roadway, albeit with a significant curve in its orientation east of the subject property. Rural-residential properties are located to the east, west, and south of the property while rural-agricultural properties are located to the north and southwest of the property. A large provincially significant wetland and Area of Natural and Scientific Interest called the Summit Muskeg Preserve is located to the northeast of the subject property. The Hamilton-Brantford Rail Trail has a northeast-southwest orientation east of the subject property; a gravel parking lot associated with access to the rail trail is located on the east side of Highway 52 at its intersection with Powerline Road West. Powerline Road East is located on the east side of the rail trail (Figure 34 to Figure 40).



Figure 34: Looking west along Powerline Road West from the driveway of the subject property (A.S.I., 2025)



Figure 35: Looking east along Powerline Road West from the driveway of the subject property (A.S.I., 2025)



Figure 36: Looking north along Highway 52 toward its intersection with Powerline Road West (A.S.I., 2025)



Figure 37: Looking east to gravel parking area at intersection of Highway 52 and Powerline Road West (A.S.I., 2025)



Figure 38: Looking west to the intersection of Powerline Road West and Highway 52 (A.S.I., 2025)



Figure 39: Summit Muskeg Reserve, looking east from Highway 52 (A.S.I., 2025)



Figure 40: Looking northeast along the Hamilton-Brantford Rail Trail (A.S.I., 2025)

4.6.2 Community Landmark

The subject property at 1334 Powerline Road West is not considered to be a landmark within the local context. While the property is located at the intersection of two well-travelled roads (Powerline Road West and Highway 52), the residence is screened by dense tree coverage and vegetation, making it largely unseeable to passing motorists and/or other road users.

4.7 Comparative Analysis

Heritage Planning staff with the City of Hamilton compiled a list of 12 properties with Gothic Revival houses within the general vicinity of the northwest part of Hamilton. In addition, an analysis of the City of Hamilton's Cultural Heritage Resources mapping tool (City of Hamilton, 2024a) was conducted to identify comparable buildings and properties for the purposes of establishing a comparative context for evaluating 1334 Powerline Road West. Ultimately, five Gothic Revival houses in the former Township of Ancaster have been chosen for comparative purposes.

4.7.1 428 Orkney Road

The residence at 428 Orkney Road, called the James Home, is a one-and-a-half storey Gothic Revival farmhouse built in 1860 (Figure 41). The property was originally designated by the Town of Flamborough in 1986, and it remains under a Part IV Designation by the City of Hamilton (By-law 86-88-H). It features red brick with buff brick quoins and voussoirs, rounded arched windows, decorative brackets on the eave, a bay window, and a verandah. The interior features a "fine stairway," two original marble fireplaces, and wide board flooring (Corporation of the Town of Flamborough, 1986). The property remains in a rural-agricultural setting.



Figure 41: 428 Orkney Road (Google Maps)

4.7.2 1719 Powerline Road West

The residence at 1719 Powerline Road West is a Gothic Revival farmhouse built in 1846 (Figure 42). The City of Hamilton recognizes it as an Inventoried Property (City of Hamilton, 2024a). It features a three-bay front façade with a central entranceway that includes a transom and sidelights, red brick with yellow brick quoins and voussoirs, decorative brickwork over the pointed window and below

the central gable, and a smaller side addition that closely matches the main residential structure. The property remains in a rural-agricultural setting.



Figure 42: 1719 Powerline Road West (Google Maps)

4.7.3 3513 Jerseyville Road West

The residence at 3513 Jerseyville Road West is a Gothic Revival house built circa 1850 (Figure 43). The property is identified as a Registered (Non-Designated) Property by the City of Hamilton but is a potential candidate for designation (City of Hamilton, 2024a). It features red brick with buff brick quoins and voussoirs, arched windows, and a verandah where the front entrance is located. The house is “a representative example of a T-Shaped Gothic Revival Farm House” and “displays a high degree of craftsmanship and design integrity.” Moreover, the property is thought to be associated with pre-Confederation development in Ancaster Township, is visually and historically linked to its surroundings, and is important in defining the area’s character (City of Hamilton, 2024a).



Figure 43: 3513 Jerseyville Road West (Google Maps)

4.7.4 2059 Powerline Road West

The residence at 2059 Powerline Road West is a Gothic Revival house built circa 1850 (Figure 44). The property is identified as a Registered (Non-Designated) Property by the City of Hamilton but is a potential candidate for designation (City of Hamilton, 2024a). It features a five-bay front façade, red brick with buff brick quoins and voussoirs, a rounded central window, symmetrical fenestration across the front façade, and a verandah where the front entrance is located. The house is “a representative example of a Gothic Revival Cottage” and “displays a high degree of craftsmanship and design integrity.” Moreover, the property is thought to be associated with pre-Confederation development in Ancaster Township and with a potentially significant person (with the surname Kitchen), is visually and historically linked to its surroundings, and is important in defining the area’s character (City of Hamilton, 2024a).



Figure 44: 2059 Powerline Road West (Google Maps)

4.7.5 1556 Mineral Springs Road

The residence at 1556 Mineral Springs Road is a Gothic Revival house built circa 1850 (Figure 45). The City of Hamilton recognizes it as an Inventoried Property (City of Hamilton, 2024a). It features a three-bay front façade, a central entranceway that includes a transom and sidelights, red brick with yellow brick quoins and voussoirs, and a central gable with arched window below.



Figure 45: 1556 Mineral Springs Road (For the Love of Old Houses Facebook Group, 2024)

4.7.6 Summary

The five comparative examples present the general context and development of Gothic Revival building practices in what is now the City of Hamilton during the mid-nineteenth century. While the residence at the subject property makes use of the Gothic Revival style, it is not a rare, unique, representative or early example of this style in Hamilton. It is not rare or unique, as there are many Gothic Revival style houses within the city of Hamilton; nor is the residence on the subject property an early example of its style, as all five examples in this comparative survey were erected decades earlier. Finally, it is not a fine representative example of the style. It lacks emblematic features such as vergeboards and has had openings modified and the verandah removed. Beyond the residence, the subject property does not express a complete and compelling story of the nineteenth-century farming patterns once extant on this lot. The property was owned and occupied by a series of farmers in the mid-to-late nineteenth century. But while the house remains extant, the connections that linked this property to its nineteenth-century origins have degraded over time. As such, the property as a whole is not a representative example of a nineteenth-century agricultural landscape and/or building complex.

5.0 Heritage Evaluation

The evaluation of the subject property at 1334 Powerline Road West using the criteria set out in Ontario Regulation 9/06 is presented in Section 5.1. The following evaluation has been prepared in consideration of data regarding the physical/design, historical/associative, and contextual values in the City of Hamilton.

5.1 Ontario Regulation 9/06

Evaluation of the subject property at 1334 Powerline Road West using Ontario Regulation 9/06 of the *Ontario Heritage Act.*

1. The property has design value or physical value because it is a rare, unique, representative or early example of a style, type, expression, material or construction method:
   - The subject property does not meet this criterion.
   - The residence on the subject property, constructed in 1886, is a late nineteenth-century vernacular adaptation of the Gothic Revival farmhouse in the City of Hamilton. Its general form, massing, and materials reflect characteristics of the Gothic Revival architectural style. However, the lack of decorative details of the residence which are exhibited in other examples in this general area of Hamilton, combined with the alterations and additions to the residence, mean it is not a finely executed representative example of the Gothic Revival style in the local context. In terms of the property more broadly, it is not representative of a nineteenth-century farm in Hamilton as there are no structures, agricultural lands, or circulation routes that would be expressive of an agricultural landscape. The sole outbuilding, which may have remnant agricultural usage, dates from the latter half of the twentieth century.

2. The property has design value or physical value because it displays a high degree of craftsmanship or artistic merit:
   - The subject property does not meet this criterion.
   - The construction and detailing of the residence are typical of its period of construction.

3. The property has design value or physical value because it demonstrates a high degree of technical or scientific achievement:
   - The subject property does not meet this criterion.
   - The residence on the subject property does not retain any elements or features that exhibit a high degree of technical or scientific achievement.

4. The property has historical value or associative value because it has direct associations with a theme, event, belief, person, activity, organization or institution that is significant to a community:
   - The subject property does not meet this criterion.
   - The property at 1334 Powerline Road West has an association with John Howell, William Howell, and William T. Howell because all three owned the property and it was under William Howell's ownership that the residence was erected. However, their significance within the local context could not be substantively evidenced. While John Howell was an early settler and both William and William T. Howell appear to have been productive local farmers, this does not necessarily demonstrate that their contributions in these contexts were significant in a way that was atypical of the period. A later owner of the property, Eric Ward was a station agent for the railroad according to the 1931 census. It is very probable that this role related to the nearby Summit Station, which was part of the Toronto, Hamilton, and Buffalo (T.H.B.) Railway, and which was locally significant to the community. However, no further information about Ward's role was uncovered, including his

duration or responsibilities in that role. As such, the ability for which the subject property can reasonably express his significance is limited.

5. The property has historical value or associative value because it yields, or has the potential to yield, information that contributes to an understanding of a community or culture:
   - The subject property is not known to meet this criterion at this time.

6. The property has historical value or associative value because it demonstrates or reflects the work or ideas of an architect, artist, builder, designer or theorist who is significant to a community:
   - The subject property does not meet this criterion.
   - The builder of the residence appears to have been T.T. Miller in July of 1886, as his name and the date is etched into a brick on the east elevation of the residence. No information was uncovered about him, so his significance to the local community remains unknown at this time.

7. The property has contextual value because it because it is important in defining, maintaining or supporting the character of an area:
   - The subject property does not meet this criterion.
   - The property is located at the southeast corner of Highway 52 and Powerline Road West in the City of Hamilton. While both are nineteenth-century thoroughfares, its rural-agricultural character associated with nineteenth-century settlement patterns is only evident to a limited extent. The property is located in a mixed rural-agricultural and rural-residential setting that does not have a unifying or significant character.

8. The property has contextual value because it is physically, functionally, visually or historically linked to its surroundings:
   - The subject property does not meet this criterion.
   - The subject property is located in a mixed rural-agricultural and rural-residential setting. While the immediate surroundings of the property are rural in nature, the subject property itself does not contain significant elements that physically, functionally, visually, or historically link it to its surroundings. Though there are elements of the property that are typical of a large rural property, such as the residence, driveway, and trees, these elements alone do not significantly link the property to the surrounding area.

9. The property has contextual value because it is a landmark:
   - The subject property does not meet this criterion.
   - The subject property is not considered to be a landmark within the local context as the residence is screened by trees and vegetation, making it largely unseeable to passing motorists and/or other road users along Powerline Road West and/or Highway 52.

Based on available information, it has been determined that the subject property does not meet Ontario Regulation 9/06 criteria.

6.0 Proposed Development

This section presents a description of the proposed development, an assessment of impacts, mitigation recommendations, and a discussion of alternatives.

6.1 Description of Proposed Development

The Highway 52 and Powerline Road West Intersection Improvements project, being completed under Schedule C of the M.C.E.A. process, is an examination of

the feasibility of implementing a roundabout at the intersection of Highway 52 and Powerline Road West, relative to other transportation improvement options. The M.C.E.A.'s key goal is improved public safety for all road users, including drivers, pedestrians, and cyclists. As such, the study seeks to determine the best path forward "to alleviate operational issues at the intersection, maintain or improve community connectivity, including active transportation, and mitigate impacts to traffic and truck circulation and goods movement to address long-term transportation needs" (City of Hamilton, 2025b). In addition to the intersection realignment, new rumble strips, lighting, and signage are being considered. Also under consideration for this project is a review of the intersection of Highway 52 and Powerline Road East, approximately 430 metres south of the above-named intersection, as well as the trail crossing associated with the Hamilton-Brantford Rail Trail, located south of the intersection (City of Hamilton, 2024b, 2025b).

The preferred alternative has been determined to be a three-legged roundabout that is located slightly west of the current intersection. This alternative has very good visibility to and from Powerline Road West as the north approach from Highway 52 has a long sight distance. Furthermore, this option, when taken collectively, presents the best approach to address natural and socio-cultural environmental concerns, as well as financial and technical factors (City of Hamilton, 2025b).

Preliminary designs of the preferred alternative are provided in Appendix B.

As it has been determined that the subject property did not meet the Ontario Regulation 9/06 criteria, it does not have C.H.V.I., and as such, an impact assessment is not necessary to be completed.

6.2 Impact Assessment

As it has been determined that the subject property did not meet the Ontario Regulation 9/06 criteria, it does not have C.H.V.I., and as such, an impact assessment is not necessary to be completed.

6.3 Alternatives and Mitigation

Preliminary designs for the intersection are available in Appendix B. However, it has been determined that the subject property did not meet the Ontario Regulation 9/06 criteria, and as such, it does not have C.H.V.I. No mitigation recommendations are required.

7.0 Conclusions

This evaluation was prepared in consideration of data regarding the physical/design, historical/associative, and contextual values within the City of Hamilton. This evaluation determined that the property at 1334 Powerline Road West does not meet the criteria outlined in Ontario Regulation 9/06. Therefore, it does not retain cultural heritage value or interest (C.H.V.I.). As such, there will be no impacts to heritage attributes and therefore no mitigation measures are necessary.

The following recommendations are proposed:

1. This report should be submitted by the proponent to heritage staff at the City of Hamilton for their information.

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Appendix A: Qualified Persons Involved in the Project

Lindsay Graves, M.A., C.A.H.P.
Senior Cultural Heritage Specialist, Manager, Infrastructure - Cultural Heritage

The Senior Project Manager for this Cultural Heritage Impact Assessment is **Lindsay Graves** (M.A., Heritage Conservation), Senior Cultural Heritage Specialist and Manager of Infrastructure, Cultural Heritage Practice Area. She was responsible for: overall project scoping and approach; development and confirmation of technical findings and study recommendations; application of relevant standards, guidelines and regulations; and implementation of quality control procedures. Lindsay is academically trained in the fields of heritage conservation, cultural anthropology, archaeology, and collections management and has over 15 years of experience in the field of cultural heritage resource management. This work has focused on the assessment, evaluation, and protection of above ground cultural heritage resources. Lindsay has extensive experience undertaking archival research, heritage survey work, heritage evaluation and heritage impact assessment. She has also contributed to cultural heritage landscape studies and heritage conservation plans, led heritage commemoration and interpretive programs, and worked collaboratively with multidisciplinary teams to sensitively plan interventions at historic sites/places. In addition, she is a leader in the completion of heritage studies required to fulfill Class Environmental Assessment processes and has served as Project Manager for over 100 heritage assessments during her time at A.S.I. Lindsay is a member of the Canadian Association of Heritage Professionals.

Michael Wilcox, P.h.D.
Historian - Cultural Heritage

The report writer for this Cultural Heritage Impact Assessment is **Michael Wilcox** (P.h.D., History), who is a historian within the Cultural Heritage Practice Area. He was responsible for preparing and contributing to background historical research, reviewing existing heritage inventories, and technical reporting for this

project. His current responsibilities focus on identifying and researching historical documents as well as background research, assessment, and evaluation of cultural heritage resources in Ontario. He has over a decade of combined academic and workplace experience in conducting historical research and crafting reports, presentations, articles, films, and lectures on a wide range of Canadian history topics.

Appendix B: Plan and Profile – Highway 52 and Powerline Road West

HAMILTON BRANTFORD RAIL TRAIL

HIGHWAY 52

POWERLINE ROAD W

HIGHWAY 52

PROP. ROAD CL

EX. ROAD CL

-0.44%

-0.65%

0.73%

STA 12+408.16
ELEV 240.273

STA 12+462.32
ELEV 239.536

PVI STA = 12+715.54
PVI ELEV = 238.58
LOW POINT STA = 12+714.03
LOW POINT ELEV = 238.68
A1 = -1.38
A2 = 40.0
K = 40.0
L=55.34m VC

BVCS: 12+687.871
BVCE: 238.741

EVCS: 12+743.212
EVCE: 238.782

STA 12+750.75
ELEV 238.881

248
246
244
242
240
238
236
234
232

12+380 12+390 12+400 12+410 12+420 12+430 12+440 12+450 12+460 12+470 12+480 12+490 12+500 12+510 12+520 12+530 12+540 12+550 12+560 12+570 12+580 12+590 12+600 12+610 12+620 12+630 12+640 12+650 12+660 12+670 12+680 12+690 12+700 12+710 12+720 12+730 12+740 12+750

R.J. Burnside & Associates Limited

web www.burnside.com

PLAN AND PROFILE
HIGHWAY 52

DRAWN BY: R.B.	SCALE: H 1:500 V 1:100
DESIGNED BY: S.P.	PROJECT No. 058803
CHECKED BY: S.P.	DRAWING No.
DATE: 2025-12-09	SHEET No.

File: C:\0000\000000\Autodesk Docs\058803 HDP Preliminary Design_Plan Profile Designer_R_2025_12-09.rvt

Stage 1 Archaeological Assessment: Highway 52 and Powerline Road West Intersection Improvements (Lots 29 and 30, Concessions 1 and 2, Geographical Township of Ancaster, County of Wentworth) City of Hamilton

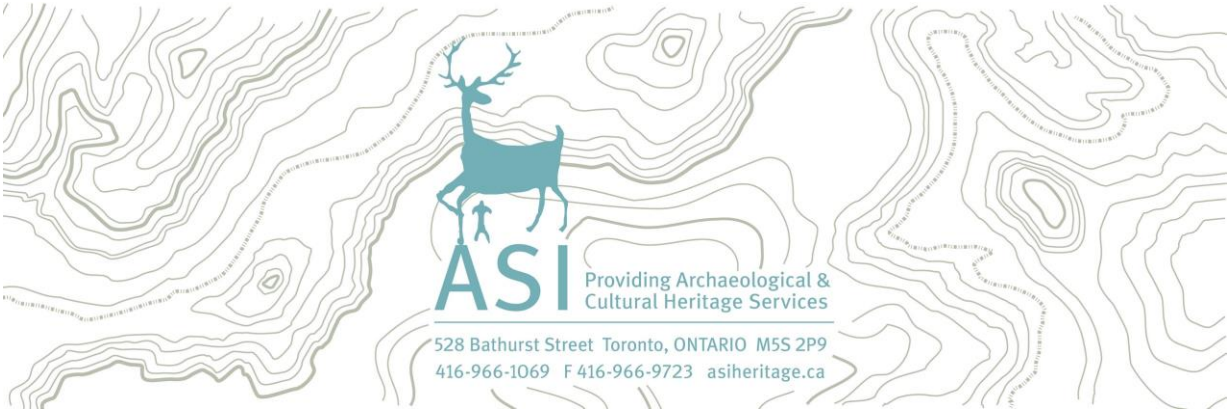
Original Report

Prepared for:

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PIF# P383-0493-2025
Archaeological Services Inc. File: 24EA-161

26 August 2025



Executive Summary

Archaeological Services Inc. was contracted by R.J. Burnside & Associates Limited, on behalf of the City of Hamilton, to conduct a Stage 1 Archaeological Assessment (Background Research and Property Inspection) as part of the Highway 52 and Powerline Road West Intersection Improvements project. This project involves the examination of the feasibility of implementing a roundabout at the intersection of Highway 52 and Powerline Road West, located rurally in the City of Hamilton. The Stage 1 Project Area consists of two non-adjacent polygons.

The Stage 1 background research determined that 15 previously registered archaeological sites are located within one kilometre of the Project Area, one of which (AhHa-153), located within 50 metres, has further CHVI and will require Stage 3 investigations if there will be changes in the project that will impact the site. The Stage 1 property inspection determined that parts of the Project Area preserve archaeological potential and Stage 2 assessment will be required. The following recommendations are made:

1) Parts of the Project Area exhibit archaeological potential. These lands require Stage 2 archaeological assessment by test pit and pedestrian surveys at five-metre intervals, as appropriate. Stage 2 is required prior to any proposed construction activities on these lands;

2) The remainder of the Project Area does not retain archaeological potential on account of deep and extensive land disturbance, permanently wet conditions, or being previously assessed. These lands do not require further archaeological assessment; and

3) Should the proposed work extend beyond the current Project Area, further archaeological assessment should be conducted to determine the archaeological potential of the surrounding lands.

Project Personnel

- **Principal**: Lisa Merritt, MSc. (P094) Principal, Infrastructure
- **Senior Project Manager**: Sarah Jagelewski, BA Hons (R405), Lead Archaeologist, Manager, Infrastructure
- **Division Coordinator**: Katrina Thach, BA Hons. (R1225), Associate Archaeologist, Assistant Manager, Infrastructure
- **Project Administrator**: Catherine Kitchen, BA, Archaeologist (R1364), Project Administrator, Infrastructure
- **Project Director**: Blake Williams, MLitt (P383), Lead Archaeologist, Project Manager, Infrastructure
- **Project Manager**: Jason Barrett, PhD, Lead Archaeologist, Project Manager, Infrastructure
- **Field Director**: Blake Williams (P383)
- **Assistant Field Director**: Ciprian Ardelean, PhD, Senior Associate, Technical Writer and Researcher, Infrastructure
- **Report Preparation**: Ciprian Ardelean
- **Graphics**: Peter Bikoulis, PhD, Archaeologist, GIS Technician, Operations; Michelle Nguyen, BA, Archaeologist, GIS Technician, Operations
- **Report Review**: Jason Barrett; Eliza Brandy, MA (R1109), Lead Archaeologist, Project Manager, Infrastructure; Sarah Jagelewski

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1.0 Project Context

Archaeological Services Inc. (ASI) was contracted by R.J. Burnside & Associates Limited, on behalf of the City of Hamilton, to conduct a Stage 1 Archaeological Assessment (Background Research and Property Inspection) as part of the Highway 52 and Powerline Road West Intersection Improvements project. This project involves the examination of the feasibility of implementing a roundabout at the intersection of Highway 52 and Powerline Road West, located rurally in the City of Hamilton, east of the Copetown neighbourhood and approximately three kilometres north of the Provincial Highway 403 interchange.

The Stage 1 Project Area consists of two non-adjacent polygons located at the intersections of Highway 52 and Powerline Road East, and Highway 52 and Powerline Road West, as indicated by the client. The smaller (south) polygon is rectangle-shaped and measures approximately 225 metres by 148 metres. The larger (north) polygon is irregular in shape, located approximately 90 metres to the north-northwest of the smaller one, and measures approximately 478 metres by 395 metres (Figure 1).

All activities carried out during this assessment were completed in accordance with the *Ontario Heritage Act* (R.S.O. c. O.18, 1990, as amended in 2025) and the 2011 *Standards and Guidelines for Consultant Archaeologists* (S & G), currently administered by the Ministry of Citizenship and Multiculturalism (MCM, 2011).

1.1 Development Context

All work has been undertaken as required by the *Environmental Assessment Act* (R.S.O. c. E.18, 1990, as amended in 2025) and regulations made under the Act, and are therefore subject to all associated legislation. This project is being conducted in accordance with the *Municipal Class Environmental Assessment* process (Municipal Engineers Association, 2023).

The *City of Hamilton Archaeology Management Plan 2016* (City of Hamilton, 2016) was also consulted.

Authorization to carry out the activities necessary for the completion of the Stage 1 archaeological assessment and property inspection was granted by R.J. Burnside & Associates Limited on June 04, 2025.

1.1.1 Treaties and Traditional Territories

1.1.1.1. 1701 Deed from the Five Nations to the King, of their Beaver Hunting

In the late seventeenth century, the Haudenosaunee of the Five Nations Confederacy residing in upstate New York and Southern Ontario were dealing with military engagements and encroachment from French forces as well as the movement of the Mississaugas and other Anishinaabeg peoples into the area, all of which contributed to fears among the Confederacy about the loss of their beaver hunting grounds (Williams & Nelson, 1995). To address their concerns, the Confederacy met with the Province of New York's acting colonial governor John Nanfan, as well as a British representative on behalf of the Indian Affairs Department, Robert Livingston, in July 1701. The Confederacy hoped to urge the English into action in their disputes with the French and their Indigenous allies. The British hoped that an alliance with the Haudenosaunee would continue to ensure a strong trading relationship, keep French efforts to control the fur trade in check, and assert British control deeper into North America (Brandao & Starna, 1996; Jamieson, 2013).

Ultimately, the Deed from the Five Nations to the King, sometimes referred to as the Treaty of Fort Albany, the Nanfan Treaty, the Albany Deed, or Livingston's Deed, was signed by representatives of the British Crown and the Haudenosaunee Confederacy in 1701 (Williams & Nelson, 1995). The Deed established the Beaver Hunting Grounds as a vast territory spanning much of the lands surrounding the lower Great Lakes, including in Southern Ontario, as well as into the Ohio River Valley (Jamieson, 2013).

There has been significant debate about the terms of the agreement. The Six Nations of the Grand River assert that it is a valid treaty that recognized the Confederacy's ownership of and access to the natural resources within the Beaver Hunting Grounds, while also receiving the Crown's support and

protection (Six Nations of the Grand River, 2020). Others, though, note that while the Haudenosaunee fished and hunted in Southern Ontario in the late seventeenth century, these lands were not under their authority at the time and as such, they could not negotiate a formal treaty with the British Crown for this territory (Calverley, 2002; Jennings, 1984; Schmalz, 1984). Research indicates that the British did not formally recognize the agreement, and currently neither the Canadian government nor the British Crown recognize the 1701 Deed as a treaty.

1.1.1.2. Treaty 3, The Between the Lakes Purchase

Following the American Revolutionary War (1775-1783), the British Crown needed to find lands on which to settle United Empire Loyalists, including approximately 2,000 members of the Six Nations confederacy who had fought alongside British troops. Led by Sir Frederick Haldimand who was the governor of Quebec at that time, the Crown was initially planning on providing lands for Loyalist settlers in Quebec and Southeastern Ontario, including providing land in the Bay of Quinte for Six Nations refugees. This was not suitable for many of the members of Six Nations and a contingent of approximately 1,800 community members, led by Chief Joseph Brant, requested land north of Lake Erie along the Grand River. Brant felt that the location in the Bay of Quinte was too isolated and that his followers could be better served by being closer to the Six Nations communities that chose to remain in the United States in western New York (Surtees, 1984, p. 21).

Recognizing that, under the terms of the Royal Proclamation of 1763, the land needed to be purchased prior to settlement, Colonel John Butler was sent to negotiate with the Mississaugas of the Credit for lands east of Lake Ontario and north of Lake Erie. On May 22, 1784, the Mississaugas of the Credit agreed to cede approximately 3,000,000 acres (1,214,057 hectares) of land containing all or part of Brant, Elgin, Middlesex, Oxford, and Wellington Counties as well as the Regions of Haldimand-Norfolk, Halton, Hamilton-Wentworth, Niagara, and Waterloo. In exchange for these lands, the Mississaugas received £1180.74 worth of trade goods (Crown-Indigenous Relations and Northern Affairs, 2016; Surtees, 1984). Of the 3,000,000 acres (1,214,057 hectares), approximately

550,000 acres (222,577 hectares) was set aside for the settlement of Six Nations people.

However, due to uncertainties with the description of the lands in the original surrender, Treaty 3 was renegotiated on December 7, 1792, to clarify what was ceded. This largely revolved around the northern boundary of the Treaty area and in particular the area set aside for Six Nations settlement along the Grand River (see Haldimand Tract and Treaty 4). The signees on the side of the British included Lieutenant Governor John Graves Simcoe, John Butler, Robert Kerr, Peter Russell, John McGill, and Davie William Smith. The signees on the side of the Mississauga included Chiefs Wabakayne, Wabanip, Kautabus, Wabaniship and Mottotow (Crown-Indigenous Relations and Northern Affairs, 2016; Mississaugas of the Credit First Nation, 2017; Surtees, 1984).

The original text stipulated that the north-west boundary of the parcel was an imaginary line between Burlington Bay and the Thames River, which is inconsistent with the geography of the area. The boundaries of the parcel were corrected to create a polygon encompassing the Niagara peninsula up to Burlington Bay and then up north to the present-day town of Arthur then south to the present-day town of Woodstock to finally meet Lake Erie at Port Bruce. Treaty 3 lands exclude a corridor along the Grand River set aside for Six Nations (Crown-Indigenous Relations and Northern Affairs, 2016; Native Land Digital, 2018).

1.2 Historical Context

1.2.1 Indigenous Land Use and Settlement

Current archaeological evidence indicates humans were present in southern Ontario approximately 13,000 years before present (BP) (Ferris, 2013). Populations at this time would have been highly mobile, inhabiting a boreal-parkland similar to the modern sub-arctic. By approximately 10,000 BP, the environment had progressively warmed (Edwards & Fritz, 1988) and populations now occupied less extensive territories (Ellis & Deller, 1990).

Between approximately 10,000-5,500 BP, the Great Lakes basins experienced low-water levels, and many sites which would have been located on those former shorelines are now submerged. This period produces the earliest evidence of heavy wood working tools, an indication of greater investment of labour in felling trees for fuel, to build shelter, and watercraft production. These activities suggest prolonged seasonal residency at occupation sites. Polished stone and native copper implements were being produced by approximately 8,000 BP; the latter was acquired from the north shore of Lake Superior, evidence of extensive exchange networks throughout the Great Lakes region. The earliest archaeological evidence for cemeteries dates to approximately 4,500-3,000 BP and is interpreted by archaeologists to be indicative of increased social organization and the investment of labour into social infrastructure (Brown, 1995, p. 13; Ellis et al., 1990, 2009).

Between 3,000-2,500 BP, populations continued to practice residential mobility and to harvest seasonally available resources, including spawning fish. The Woodland period begins around 2,500 BP and exchange and interaction networks broaden at this time (Spence et al., 1990, pp. 136, 138) and by approximately 2,000 BP, evidence exists for small community camps, focusing on the seasonal harvesting of resources (Spence et al., 1990, pp. 155, 164). By 1,500 BP there is macro botanical evidence for maize in southern Ontario, and it is thought that maize only supplemented people's diet. There is earlier phytolithic evidence for maize in central New York State by 2,300 BP – it is likely that once similar analyses are conducted on Ontario ceramic vessels of the same period, the same evidence will be found (Birch & Williamson, 2013, pp. 13–15). As is evident in detailed Anishinaabek ethnographies, winter was a period during which some families would depart from the larger group as it was easier to sustain smaller populations (Rogers, 1962). It is generally understood that these populations were Algonquin-speakers during these millennia of settlement and land use.

From the beginning of the Late Woodland period at approximately 1,000 BP, lifeways became more similar to that described in early historical documents. Between approximately 1000-1300 Common Era (CE), larger settlement sites focused on horticulture begin to dominate the archaeological record. Seasonal

dispersal of the community for the exploitation of a wider territory and more varied resource base was still practised (Williamson, 1990, p. 317). By 1300-1450 CE, archaeological research focusing on these horticultural societies note that this episodic community dispersal was no longer practised and these populations now occupied sites throughout the year (Dodd et al., 1990, p. 343). By the mid-sixteenth century these small villages had coalesced into larger communities (Birch et al., 2021). Through this process, the socio-political organization of these First Nations, as described historically by the French and English explorers who first visited southern Ontario, was developed. Other First Nation communities continued to practice residential mobility and to harvest available resources across landscapes they returned to seasonally/annually.

By 1600 CE, the Confederation of Nations were encountered by the first European explorers and missionaries in Simcoe County. Samuel de Champlain in 1615 reported that a group of Iroquoian-speaking people situated between the Haudenosaunee and the Wendat were at peace and remained "la nation neutre". Like the Wendat, Petun, and Haudenosaunee, the Neutral or Attawandaron people were settled village agriculturalists.

By the 1640s, devastating epidemics and the traditional enmity between the Haudenosaunee and the Attawandaron and the Huron-Wendat (and their Algonquian allies such as the Nippissing and Odawa) led to their dispersal from southern Ontario. Shortly afterwards, the Haudenosaunee established a series of settlements at strategic locations along the trade routes inland from the north shore of Lake Ontario. Peace was achieved between the Haudenosaunee and the Anishinaabe Nations in August of 1701 when representatives of more than twenty Anishinaabe Nations assembled in Montreal to participate in peace negotiations. Peace was confirmed again at council held at Lake Superior when the Haudenosaunee delivered a wampum belt to the Anishinaabe Nations. This agreement between the Haudenosaunee and Anishinaabe nations is referred to as the Dish with One Spoon.

In 1763, following the fall of Quebec, New France was transferred to British control at the Treaty of Paris. The British government began to pursue major land purchases to the north of Lake Ontario in the early nineteenth century. The

Crown acknowledged the Mississaugas of the Credit as the owners of the lands between Georgian Bay and Lake Simcoe and entered into negotiations for additional tracts of land as the need arose to facilitate European settlement.

1.2.2 Post-Contact Settlement

Historically, the Project Area is located in the Geographical Township of Ancaster, County of Wentworth in Lots 29 and 30, Concessions 1 and 2.

The S & G stipulates that areas of early Euro-Canadian settlement (pioneer homesteads, isolated cabins, farmstead complexes), early wharf or dock complexes, pioneer churches, and early cemeteries are considered to have archaeological potential. Early historical transportation routes (trails, passes, roads, railways, portage routes), properties listed on a municipal register or designated under the Ontario Heritage Act or a federal, provincial, or municipal historic landmark or site are also considered to have archaeological potential.

For the Euro-Canadian period, the majority of early nineteenth century farmsteads (i.e., those that are arguably the most potentially significant resources and whose locations are rarely recorded on nineteenth century maps) are likely to be located in proximity to water. The development of the network of concession roads and railroads through the course of the nineteenth century frequently influenced the siting of farmsteads and businesses. Accordingly, undisturbed lands within 100 metres of an early settlement road are also considered to have potential for the presence of Euro-Canadian archaeological sites.

The first Europeans to arrive in the area were transient merchants and traders from France and England, who followed Indigenous pathways and set up trading posts at strategic locations along the well-traveled river routes. All of these occupations occurred at sites that afforded both natural landfalls and convenient access, by means of the various waterways and overland trails, into the hinterlands. Early transportation routes followed existing Indigenous trails, both along the lakeshore and adjacent to various creeks and rivers (ASI 2006). Early European settlements occupied similar locations as Indigenous settlements as they were generally accessible by trail or water routes and would have been

in locations with good soil and suitable topography to ensure adequate drainage.

Throughout the period of initial European settlement, Indigenous groups continued to fish, gather, and hunt within their traditional and treaty territories, albeit often with legal and informal restrictions imposed by colonial authorities and settlers. In many cases, Indigenous peoples acted as guides and teachers, passing on their traditional knowledge to settlers, allowing them to sustain themselves in their new homes. Indigenous peoples entered into economic arrangements and partnerships, and often inter-married with settlers. However, pervasive and systemic oppression and marginalization of Indigenous peoples also characterized Euro-Canadian colonization, with thousands being displaced from their lands, denied access to traditional and treaty hunting, fishing, and collecting grounds, and forced to assimilate with Euro-Canadian culture through mandatory attendance at Day and Residential Schools (Ray, 2005; Rogers & Smith, 1994).

1.2.2.1. Township of Ancaster

The first township survey was undertaken in 1793, and the first settlers occupied their land holdings two years later. The township is said to have been named after a town in Lincolnshire, England. Ancaster was initially settled by disbanded soldiers, mainly Butler's Rangers, and other Loyalists following the end of the American Revolutionary War. In 1805, Boulton noted that this township contained both excellent and indifferent soils. By the 1840s, the township was noted for its fine farms (Armstrong, 1985; Boulton, 1805; Rayburn, 1997; Smith, 1846).

1.2.2.2. Toronto, Hamilton and Buffalo Railway

The Toronto, Hamilton & Buffalo Railway existed from 1892 through 1987 as a separate railway serving the Hamilton, Ontario area. It joined the lines of its corporate parents, the Canadian Pacific Railway and the New York Central system. It was established largely as an alternate route for businesses in the Hamilton area to ship their products to Canadian customers in Toronto, Montreal, and the west and to American customers via the New York Central

and its subsidiaries. Operations commenced in 1892 with the acquisition of the Brantford, Waterloo and Lake Erie Railway. The Brantford, Waterloo and Lake Erie Railway operated a line between Brantford and Waterford and had been in the process of extending the line eastward from Brantford to Hamilton. The Toronto, Hamilton & Buffalo Railway completed the extension of the line from Brantford, through Cainsville, to Hamilton in 1895. The station at Cainsville (not extant) was located at 1052 Colborne Street East (County of Brant, n.d.). The connection from Hamilton to Toronto was established by the Grand Trunk Railway granting the Toronto, Hamilton & Buffalo Railway running rights to the Canadian Pacific Railway from Toronto and Hamilton in 1896 (Toronto, Hamilton & Buffalo Historical Society, 2016). The line to Brantford was abandoned by the Canadian Pacific Railway in 1965 (Andreae 1997). In 1996, a 32-kilometre section of the railway was converted to multi-use trail. The trail runs from the east end of Brantford to the west side of Hamilton (Grand River Conservation Authority, n.d.).

A portion of approximately 460 metres of the former railroad and the current multi-use trail is located within the northern polygon of the current Project Area and is intersected by Highway 52.

1.2.2.3. Highway 52

Highway 52 crosses both polygons of the current Project Area.

The highway was first designated as King's Highway 52 in 1937-1938 and decommissioned in 1997. Historically, the route started as connector between Highway 2 in the south, west of Ancaster, then to Highway 8 at Peters Corners, continuing north through the Wentworth County to a disconnected spot at the limits with Wellington County, south of Guelph. During the early decades, Highway 52 was a narrow, graveled road. The portion south of Copetown was a mere earth-surfaced road until after World War II, becoming impassable in rainy seasons. The highway was finally paved for the first time during the interval 1953-1955 (Bevers, 2002).

1.2.3 Map Review

The 1859 *Historical Map of Wentworth County* (Gregory, 1859), 1875 *Illustrated Atlas of Wentworth County* (Page & Smith, 1875), 1916 topographic *Brantford Sheet* (Department of Militia and Defence, 1916), and the 1994 National Topographic System (NTS) *Brantford Sheet* (Natural Resources Canada, 1994) were examined to determine the presence of historic features within the Project Area during the nineteenth and twentieth centuries (Figure 2-Figure 5).

It should be noted that not all features of interest were mapped systematically in the Ontario series of historical atlases. For instance, they were often financed by subscription limiting the level of detail provided on the maps. Moreover, not every feature of interest would have been within the scope of the atlases. The use of historical map sources to reconstruct or predict the location of former features within the modern landscape generally begins by using common reference points between the various sources. The historical maps are geo-referenced to provide the most accurate determination of the location of any property on a modern map. The results of this exercise can often be imprecise or even contradictory, as there are numerous potential sources of error inherent in such a process, including differences of scale and resolution, and distortions introduced by reproduction of the sources.

The 1859 historical map (Figure 2) shows both parts of the Project Area intersected by historical road allowances. The east-west historic road crossing the northern polygon corresponds to the trajectory of Powerline Road. The north-south road, adjacent to the east side of the southern polygon, corresponds to the current trajectory of Powerline Road East and part of the modern Highway 52. No landscape features or built structures are shown within the Project Area, but the landowner names are known for all lot subdivisions involved.

The 1875 Illustrated Atlas (Figure 3) shows a homestead with orchard mapped at the west limit of the northern polygon, within 50 metres of the limits of the Project Area, on the Lot 30 Concession 1 subdivision owned by J. Kitchen. No other features are contributed.

The 1916 topographic map (Figure 4) provides a variety of new data about the anthropic and natural features within the Project Area. The southern polygon contained a bridge at its south-eastern corner, probably at the same location currently occupied by a large culvert on Highway 52, immediately south of the intersection with Old Powerline Road. The north polygon reveals multiple changes in comparison with four decades before. A swamp or wetland is represented across the northern-northeastern sector of the north polygon. A railroad had been built in northeast-south-southwest direction across the eastern part of the north polygon, adjacent to the east side of swamp, where the railroad was embanked. It corresponds to the Hamilton-Brantford Railroad branch, part of Toronto, Hamilton and Buffalo Railway (see Section 1.2.2.2). The Summit train station is labeled just east of the Project Area, but unclear whether it refers to the small structure shown south of the east-west road outside the Project Area or the one shown north of the road, within the Project Area. The east-west road (Powerline Road) intersecting the north polygon of the Project Area is lined with a wood pole power line. Another power line crosses the Project Area north polygon in southeast-northwest direction, across the railroad, over the swamp, and intersecting another road laid out on a sinuous trajectory along the west side of the swamp, roughly along the modern trajectory of Highway 52. This is the same trajectory as the power line refurbished and assessed archaeologically in the early 1990s (see Section 1.3.3). Two built structures are depicted in the west sector of the north polygon, north and south of the road.

On the 1994 NTS map (Figure 5), Highway 52 is already built with multiple embanked and engineered slope locations alongside it. The old north-south historic road has been transformed partly into Highway 52 and partly into the Old Powerline Road that intersect each other inside the south polygon of the Project Area. The railroad has been disaffected and transformed into a trail, as it remains today, but the label "Summit" – referring to the old station and community – is still in place. There is one structure in the east sector of the north polygon, near the railroad-power line intersection, without modern correspondent. Three structures are shown in the west sector of the north polygon, likely corresponding to houses currently still in place.

1.2.4 Aerial and Orthoimagery Review

Historical aerial imagery from 1954 (City of Toronto Archives, 1954) (Figure 6) shows a layout of the roads similar to the 1916 topographic map (Figure 4). The railroad is visible and enhanced on the aerial photograph. The Summit station is also labeled, without clarity of where the station is located on the image. The south polygon has no visible structures within its limits, but there are multiple possible residences north and south of Powerline Road in the west sector of the north polygon. However, the resolution of the aerial imagery does not allow for a good appreciation of the structures.

A review of available Google satellite imagery between 2005 and 2025 shows no significant changes within the Project Area, with one exception: the extensive disturbance created by the construction of the Summit Station Dairy and Creamery store and parking lot in the northwest corner of the northern polygon in 2023 (Image 23 and Image 24).

1.3 Archaeological Context

This section provides background research pertaining to previous archaeological fieldwork conducted within and in the vicinity of the Project Area, its environmental characteristics (including drainage, soils or surficial geology and topography, etc.), and current land use and field conditions. Three sources of information were consulted to provide information about previous archaeological research: the site record forms for registered sites available online from the MCM through "Ontario's Past Portal"; published and unpublished documentary sources; and the files of ASI.

1.3.1 Geography

In addition to the known archaeological sites, the state of the natural environment is a helpful indicator of archaeological potential. Accordingly, a description of the physiography and soils are briefly discussed for the Project Area.

The S & G stipulates that primary water sources (lakes, rivers, streams, creeks, etc.), secondary water sources (intermittent streams and creeks, springs,

marshes, swamps, etc.), ancient water sources (glacial lake shorelines indicated by the presence of raised sand or gravel beach ridges, relic river or stream channels indicated by clear dip or swale in the topography, shorelines of drained lakes or marshes, cobble beaches, etc.), as well as accessible or inaccessible shorelines (high bluffs, swamp or marsh fields by the edge of a lake, sandbars stretching into marsh, etc.) are characteristics that indicate archaeological potential.

Water has been identified as the major determinant of site selection and the presence of potable water is the single most important resource necessary for any extended human occupation or settlement. Since water sources have remained relatively stable in Ontario since 5,000 B.P. (Karrow & Warner, 1990, Figure 2.16), proximity to water can be regarded as a useful index for the evaluation of archaeological site potential. Indeed, distance from water has been one of the most used variables for predictive modeling of site location.

Other geographic characteristics that can indicate archaeological potential include elevated topography (eskers, drumlins, large knolls, and plateaux), pockets of well-drained sandy soil, especially near areas of heavy soil or rocky ground, distinctive land formations that might have been special or spiritual places, such as waterfalls, rock outcrops, caverns, mounds, and promontories and their bases. There may be physical indicators of their use, such as burials, structures, offerings, rock paintings or carvings. Resource areas, including food or medicinal plants (migratory routes, spawning areas) are also considered characteristics that indicate archaeological potential (S & G, Section 1.3.1).

1.3.1.1. Physiography

The Project Area is located within the Kame Moraines of the Norfolk San Plain physiographic region of southern Ontario (Chapman & Putnam, 1984).

The Norfolk Sand Plain physiographic region is a wedge-shaped feature that extends from the Lake Erie shoreline and tapers northward to a point in Brantford on the Grand River (Chapman & Putnam, 1984). The region encompasses an area of 3,134 square kilometres and consists of sands and silts that were deposited as a delta in glacial Lakes Whittlesey and Warren. A massive

discharge of meltwater from the Grand River area entered the lakes between the ice front and the moraines to the northwest, building the delta from west to east as the glacier withdrew, thus covering most of the area west of the Galt Moraine with sand. In the vicinity of the subject property, glaciolactustrine deep water sediments belonging to mainly glacial Lake Warren and younger deposits and consisting of stratified to varved silt and clay, minor sand, are overlain by veneer of sand (Zone 10) (Cowan, 1972).

1.3.1.2. Surficial Geology

The surficial geology mapping (Figure 7) shows that the Project Area is underlain mostly by coarse-textured glaciolacustrine deposits (sand, gravel, minor silt and clay) and partially by organic deposits.

1.3.1.3. Soil Types and Drainage

The Project Area sits on the following soil units (Soil Research Institute, 1967) (Figure 8):

- Grimsby sandy loam, a gray-brown podzolic with good drainage;
- Springvale sandy loam, a gray-brown podzolic with good drainage;
- Vineland sandy loam, an imperfectly drained gray-brown podzolic; and
- Muck, poorly drained organic deposits in the swamp.

1.3.1.4. Watershed, Water Sources

The Project Area is within the Big Creek sub-watershed of the Lower Grand River watershed. There is no watercourse within 300 metres of the Project Area, but there is a swamp and bog within the limits of the north polygon of the Project Area.

1.3.2 Previously Registered Archaeological Sites

In Ontario, information concerning archaeological sites is stored in the Ontario Archaeological Sites Database maintained by the MCM. This database contains archaeological sites registered within the Borden system. Under the Borden system, Canada has been divided into grid blocks based on latitude and

longitude. A Borden block is approximately 13 kilometres east to west, and approximately 18.5 kilometres north to south. Each Borden block is referenced by a four-letter designator, and sites within a block are numbered sequentially as they are found. The Project Area under review is located in Borden block *AhHa.*

According to the Ontario Archaeological Sites Database, 15 previously registered archaeological sites are located within one kilometre of the Project Area, one of which (AhHa-153) is within 50 metres and has further cultural heritage value or interest (CHVI) (MCM 2025).. A summary of the sites is provided below in Table 1. The site with further CHVI is indicated as bold. See *Supplementary Documentation (SD)* for detailed site locations.

Table 1: Registered Sites within One Kilometre of the Project Area

Borden number	Site Name	Temporal/ Cultural Affiliation	Site type	Researcher
AhHa-35	UG Kirkwall 17	Pre-Contact	Artifact scatter	Mayer, Pihl, Poulton & Associates (MPPA), 1986; Timmins Martelle Heritage (TMH)
AhHa-36	Union Gas Kirkwall 16	Pre-Contact	Findspot	MPPA, 1986
AhHa-47	UK Kirkwall 17A	Pre-Contact	Campsite	MPPA, 1986; TMH, 2019
AhHa-142	Unnamed	Early Archaic	Campsite	TMH, 1991

Borden number	Site Name	Temporal/ Cultural Affiliation	Site type	Researcher
AhHa-143	Unnamed	Late Woodland	Campsite	TMH, 1991, 2019
AhHa-144	Unnamed	Pre-Contact	Campsite	TMH, 1991
AhHa-153	**Unnamed**	**Pre-Contact**	**Campsite**	**ASI, 1991, 1992**
AhHa-324	Unnamed	Middle Archaic, Late Woodland	Campsite	TMH, 2016, 2017
AhHa-348	Unnamed	Pre-Contact	Campsite	TMH, 2016
AhHa-349	Unnamed	Late Archaic	Campsite	TMH, 2016, 2018
AhHa-369	Unnamed	Pre-Contact	Artifact scatter	TMH, 2016
AhHa-380	Unnamed	Late Woodland	Artifact scatter	TMH, 2016
AhHa-381	Unnamed	Middle Woodland	Findspot	TMH, 2016
AhHa-502	Unnamed	Pre-Contact	Findspot, scatter, campsite	TMH, 2019

1.3.2.1. Registered Sites with CHVI in 50 Metres

AhHa-153 was first identified by ASI in 1991 as Locality 169-P1 during a Stage 2 survey along a hydro corridor (License 91-15). It was defined as a Pre-Contact site with two Onondaga chert lithic materials (one cortical flake and one flake fragment) and one fish bone. The site coordinates recorded in the MCM's PastPort website were found to be incorrect. Based on the fieldwork sketch map of the Stage 3 investigation and the reference points shown in Figure 3.5 at page 17 in the corresponding report (ASI, 1992), new coordinates have been calculated and the site was confirmed to be located within 50 metres of the Project Area. The corrected coordinates and site limits are provided in the accompanying *SD* file.

The site was considered to have further CHVI, and site-specific stage 3 investigations were recommended. Stage 3 was performed by ASI under the same license number 91-15. The Stage 3 for site AhHa-153 consisted in 74 test pits (not one-metre-square test units) excavated at 2.5 metres intervals over an area of 15 by 30 metres, including a narrow area outside the hydro ROW, towards Powerline Road. The AhHa-153 Stage 3 yielded a total of 10 lithic materials (one drill fragment and nine debitage items that include biface thinning flakes). The approximate limits of the site were defined as eight by 27 metres. The report found the site had further CHVI and recommended avoidance or Stage 4 mitigation.

The site AhHa-153 is technically compliant with the current S&Gs requirements for further CHVI triggering Stage 4 mitigation, as per Section 3.4.1 ("Site-specific criteria: Small or diffuse lithic scatters") Standard 1.a (one or more test units yielding 10 or more artifacts). However, the methods used in 1991 under the License 91-15 (see below) were not compliant with the S&Gs for a Stage 3 investigation, but rather an intensified Stage 2 survey, and a new Stage 3 assessment should be performed.

1.3.3 Previous Archaeological Assessments

ASI reviewed previous archaeological assessments that detail fieldwork within 50 metres of the Project Area. Only those specific archaeological assessments of direct relevance to the present undertaking have been included here:

- (ASI, 1991a) *Horning Mountain Junction x Brant TS 115 kV Refurbishment: Stage 2 Archaeological Resource Assessment*; License: #91-15
    - This project followed the recommendations of the previous Stage 1 (ASI, 1991b) performed under the same license number 91-15. The report states the Stage 1 project only performed windshield property inspection and provides no mapping of areas of potential.
    - This Stage 2 project performed test pit survey at five-metre intervals along the 20-metre-wide hydro corridor on areas of potential related to the construction of hydro towers as part of a refurbishment project. The test pit survey was conducted along the entire hydro ROW. 18 Pre-Contact and four Euro-Canadian sites were identified, one within the current Project Area and another within 50m.
    - 171-P1 (AhHa-B, not formally registered with a Borden number) is a single-lithic findspot and was recommended for Stage 3 investigations.
    - 169-P1, a Pre-Contact site registered as AhHa-153, consists of two Onondaga chert lithic materials and one fish bone. Based on the mapping the site is within 50 metres of the current Project Area. The site was considered to have further CHVI, and site-specific stage 3 investigations were recommended.
    - Despite the report pre-dating the S&Gs, the methods of this project were compliant.
- (ASI, 1992) *Horning Mountain Junction x Brant TS 115kV Refurbishment: Stage 3 Archaeological Resource Assessment*; License 91-15 (Part 2)
    - The Stage 3 investigations of site 171-P1 (AhHa-B) consisted of 47 test pits (not one-metre units) placed at 2.5 metre intervals. Five lithic artifacts were discovered in a nine-by-nine metre area, with no diagnostics. The location was cleared of further concerns. The

site does not have CHVI as per the S&Gs Section 2.2 and Section 3.4.1 Standard 1 Guideline 1; no further work is required.
    - The Stage 3 of site AhHa-153 consisted of 74 test pits (not one-square-metre units) excavated at 2.5 metres intervals over an area of approximately 15 by 30 metres. The AhHa-153 Stage 3 yielded a total of 10 lithic materials (one drill fragment and nine debitage items that include biface thinning flakes). The approximate limits of the site were defined at eight by 27 metres.
    - The report found the site had further CHVI and recommended avoidance or Stage 4 mitigation.
    - ASI review of this report concluded that the 1991 investigation is not compliant with the 2011 S&Gs and a Stage 3 Site Specific Assessment in accordance with Section 3.0 of the S&G should be completed ahead of any proposed work in this area in the future. (see the accompanying *SD* file).
- (Detritus Consulting Ltd, 2021) *Stage 1-2 Archaeological Assessment Proposed Loewith Farm Expansion, Part of Lots 29 and 30, Concession 1, Geographic Township of Ancaster, Historical County of Wentworth, City of Hamilton*; PIF# P017-0921-2021
    - This project overlapped with the current Project Area in the northwest sector of the northern polygon. Pedestrian survey at five-metre intervals was completed, no archaeological resources on the overlapping lands, and no further assessment was recommended.

2.0 Property Inspection

2.1 Field Methods

A Stage 1 property inspection must adhere to the S & G, Section 1.2, Standards 1-6, which are discussed below. The entire property and its periphery must be inspected. The inspection may be either systematic or random. Coverage must be sufficient to identify the presence or absence of any features of archaeological potential. The inspection must be conducted when weather conditions permit good visibility of land features. Natural landforms and

watercourses are to be confirmed if previously identified. Additional features such as elevated topography, relic water channels, glacial shorelines, well-drained soils within heavy soils and slightly elevated areas within low and wet areas should be identified and documented, if present. Features affecting assessment strategies should be identified and documented such as woodlots, bogs or other permanently wet areas, areas of steeper grade than indicated on topographic mapping, areas of overgrown vegetation, areas of heavy soil, and recent land disturbance such as grading, fill deposits and vegetation clearing. The inspection should also identify and document structures and built features that will affect assessment strategies, such as heritage structures or landscapes, cairns, monuments or plaques, and cemeteries.

The Stage 1 archaeological assessment property inspection was conducted by Ciprian Ardelean under the field direction of Blake Williams (P383) on July 4, 2025, in order to gain first-hand knowledge of the geography, topography, and current conditions and to evaluate and map archaeological potential of the Project Area. It was a systematic visual inspection from publicly accessible lands only and did not include excavation or collection of archaeological resources. Fieldwork was conducted when weather conditions were deemed clear with good visibility (sunny and hot, with seasonal temperatures of up to 28 degrees Celsius), per S & G Section 1.2., Standard 2. Field photography is presented in Section 7.1 (Image 1-Image 22), and field observations are overlaid onto the existing conditions of the Project Area in Section 8.0 (Figure 9).

2.2 Current Land Use and Field Conditions

The Project Area is divided into two separate, non-contiguous polygons. The Highway 52 ROW intersects both polygons, presenting deep stormwater ditches on both sides, embanked sections and steep engineered slope sections.

Inside the south polygon, the north side of the Highway 52 – Powerline Road East intersection is affected by a tall berm following a semi-circular trajectory along the southern side of a natural plateau. The area southeast of Powerline Road East and east of Highway 52 descends gently towards an old creek bed that now behaves as a seasonal stream. Part of the slope, closer to the highway,

is markedly steeper and heavily engineered. West of the highway, the land is covered by a woodlot.

A multi-use (hike and bike) trail crosses the northern polygon in north-south direction, following the narrow embankment of a historic railroad (see section 1.2.2.2 and Image 4, Image 13). The portion of the trail north and east of Highway 52 crosses through a conservation area that also has a graveled parking lot with a pay machine and an information gazebo (Image 8, Image 9). As part of the conservation area, a swamp and bog are contained in between the trail and Highway 52 (Image 5, Image 6). A dense woodlot extends east of the wetland area and across the trail route (Image 7). The west side of the Highway 52 ROW presents considerable berms and engineered slopes parallel to the route (Image 2). The terrain is considerably higher on areas both west and east of the highway, with natural plateaus partly covered by woodlots (Image 7, Image 10, Image 13, Image 17, Image 22). The western margins of the north polygon of the Project Area are occupied by ploughed fields. The northwest sector of the north polygon is occupied by the large building and parking lot of the Summit Station Dairy store, a recently built extension of the nearby Loewith Farms. The facilities include a dairy factory, a dairy and ice-cream store, as well as an outdoor terrace with restaurant tables with live music. A strip of land west of the store is still cultivated and regularly ploughed. There are several houses with front lawns and large backyards on both sides of Powerline Road West south of the farms, in the west of the northern polygon of the Project Area (Image 11, Image 12).

3.0 Analysis of Archaeological Potential

The S & G, Section 1.3.1, lists criteria that are indicative of archaeological potential. The Project Area meets the following criteria indicative of archaeological potential:

- Previously identified archaeological sites within 300 metres;
- Water sources within 300 metres: primary, secondary, or past water source (wetland: swamp, Copetown bog);
- Elevated topography within the Project Area (elevated terrain overlooking wetland);

- Well-drained soils within the Project Area (Grimsby sandy loam and Springvale sandy loam);
- Early settlements within 100 metres (historic Summit Railway Station);
- Early historic transportation routes within 100 metres (The Hamilton-Brantford Rail, part of the Toronto, Hamilton and Buffalo Railway).

According to the S & G, Section 1.4 Standard 1e, no areas within a property containing locations listed or designated by a municipality can be recommended for exemption from further assessment unless the area can be documented as disturbed. The City of Hamilton's Municipal Heritage Register was consulted and two adjacent properties within the Project Area are Listed (but Non-Designated) under the *Ontario Heritage Act*:

- 1300 Powerline Road West, dating to 1857, and
- 1341 Powerline Road West, dating to 1854.

The *City of Hamilton Archaeology Management Plan 2016* (City of Hamilton, 2016) was reviewed for background information and to help inform any indicators of archaeological potential not captured in other research. Archaeological management plans (AMPs) are high-level analyses of archaeological potential for non-specialists but cannot be considered a replacement for Stage 1 archaeological assessments. ASI's review of the above AMP indicates the Project Area is in an area of archaeological potential.

The property inspection determined that parts of the Project Area exhibit archaeological potential. These areas will require Stage 2 archaeological assessment prior to any construction activities or other proposed impacts. According to the S & G Section 2.1.1, pedestrian survey is required in actively or recently cultivated fields (Figure 9: areas highlighted in orange). According to the S & G Section 2.1.2, test pit survey is required on terrain where ploughing is not viable, such as wooded areas, properties where existing landscaping or infrastructure would be damaged, overgrown farmland with heavy brush or rocky pasture, and narrow linear corridors up to 10 metres wide (Image 4, Image 7, Image 10-Image 14, Image 17, Image 19, and Image 22; Figure 9: areas highlighted in green).

Part of the Project Area has been previously assessed (91-15; P017-0921-2021) and does not require further archaeological assessment (Figure 9: areas highlighted in red). A small portion at the east end of the previously assessed hydro corridor (91-15) requires further work, as it is within 50-metres of site AhHa-153 (Figure 9: area highlighted in dashed red).

A part of the Project Area is located within low lying wet areas, and according to the S & G Section 2.1 have low archaeological potential (Image 3, Image 5, and Image 6; Figure 9: areas highlighted in blue). These areas do not require further survey.

Part of the Project Area has been subjected to deep soil disturbance events due to the construction of highway, roads, ditches, culverts, berms, engineered slopes, driveways, houses, parking lot, and industrial-commercial facilities. According to the S & G Section 1.3.2 these areas do not retain archaeological potential (Image 1, Image 2, Image 4, Image 8-Image 10, Image 12, Image 13-Image 15, Image 16, Image 18, Image 20, and Image 21; Figure 9: areas highlighted in yellow) and do not require further survey.

3.1 Conclusions

The Stage 1 background research determined that 15 previously registered archaeological sites are located within one kilometre of the Project Area, one of which (AhHa-153), located within 50 metres, has further CHVI and requires Stage 3 assessment if there will be changes in the project that will impact the site. The Stage 1 property inspection determined that parts of the Project Area preserve archaeological potential and Stage 2 assessment will be required.

4.0 Recommendations

The following recommendations are made:

1) Parts of the Project Area exhibit archaeological potential. These lands require Stage 2 archaeological assessment by test pit and pedestrian surveys at five-metre intervals, as appropriate (Figure 9). Stage 2 is required prior to any proposed construction activities on these lands;

2) The remainder of the Project Area does not retain archaeological potential on account of deep and extensive land disturbance, permanently wet conditions, or being previously assessed. These lands do not require further archaeological assessment; and

3) Should the proposed work extend beyond the current Project Area, further archaeological assessment should be conducted to determine the archaeological potential of the surrounding lands.

NOTWITHSTANDING the results and recommendations presented in this study, ASI notes that no archaeological assessment, no matter how thorough or carefully completed, can necessarily predict, account for, or identify every form of isolated or deeply buried archaeological deposit. If archaeological remains are found during subsequent construction activities, the consultant archaeologist, approval authority, and the Archaeology Programs Unit of the MCM should be immediately notified.

The above recommendations are subject to MCM approval, and it is an offence to alter any archaeological site without MCM concurrence. No grading or other activities that may result in the destruction or disturbance of any archaeological sites are permitted until notice of MCM approval has been received.

5.0 Advice on Compliance with Legislation

- This report is submitted to the Minister as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c 0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Citizenship and Multiculturalism a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.

- It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeological Reports referred to in Section 65.1 of the *Ontario Heritage Act*.
- Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48 (1) of the *Ontario Heritage Act*.
- The *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 requires that any person discovering human remains must notify the police or coroner and the Registrar of Cemeteries at the Ministry of Public and Business Services Delivery.
- Archaeological sites recommended for further archaeological fieldwork or protection remain subject to Section 48 (1) of the *Ontario Heritage Act* and may not be altered, or have artifacts removed from them, except by a person holding an archaeological licence.

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7.0 Images

7.1 Field Photography



Image 1: Project Area disturbed by roadside ditch, berms, extensive grading and construction (see Image 23) – no archaeological potential



Image 2: Project Area partly disturbed by road, ditch, berm, extensive grading, and farm extension constructions (see also Image 23) – no archaeological potential; woodlot in the background and part of the hill preserve archaeological potential – test pit survey required



Image 3: Permanently wet conditions east of Highway 52 ROW – low archaeological potential



Image 4: Built-up multi-use trail along former historic railroad; disturbed – no archaeological potential; adjacent areas hold potential – test pit survey required



Image 5: Permanently low and wet conditions in swamp – low archaeological potential



Image 6: Permanently wet conditions in Copetown (Summit) Bog – low archaeological potential

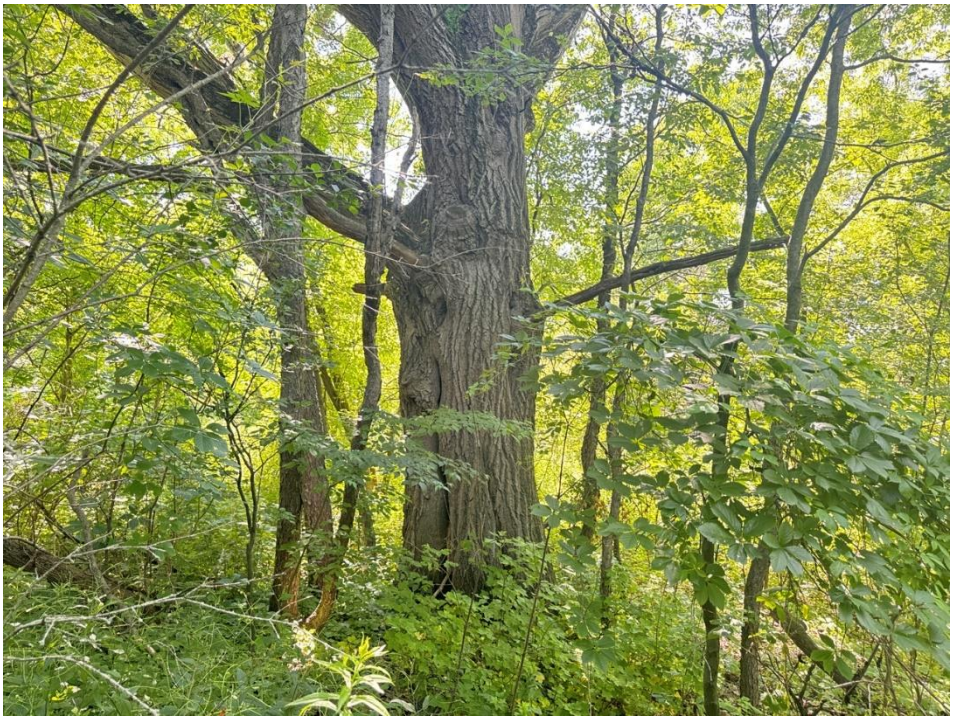


Image 7: Dense woodlot between trail and swamp has archaeological potential – test pit survey required



Image 8: Project Area disturbed by grading and parking lot – no archaeological potential



Image 9: Part of Project Area disturbed by grading, parking meter, and information gazebo – no archaeological potential



Image 10: Parts of the Project Area disturbed by roads – no archaeological potential; woodlots ahead have potential – test pit survey required



Image 11: Residential lawned and treed areas have archaeological potential – test pit survey required



Image 12: Project Area partly disturbed by road, roadside ditch, culvert, and driveway – no archaeological potential; lawned areas have potential – test pit survey required



Image 13: Built-up trail on the trajectory of former railroad – no archaeological potential; adjacent areas have potential – test pit survey required



Image 14: Built-up trail on the trajectory of former railroad – no archaeological potential; adjacent areas have potential – test pit survey required



Image 15: Part of Project Area disturbed by natural gas pipeline – no archaeological potential



Image 16: Project Area disturbed by road construction and roadside ditch – no archaeological potential; adjacent areas have potential – test pit survey required

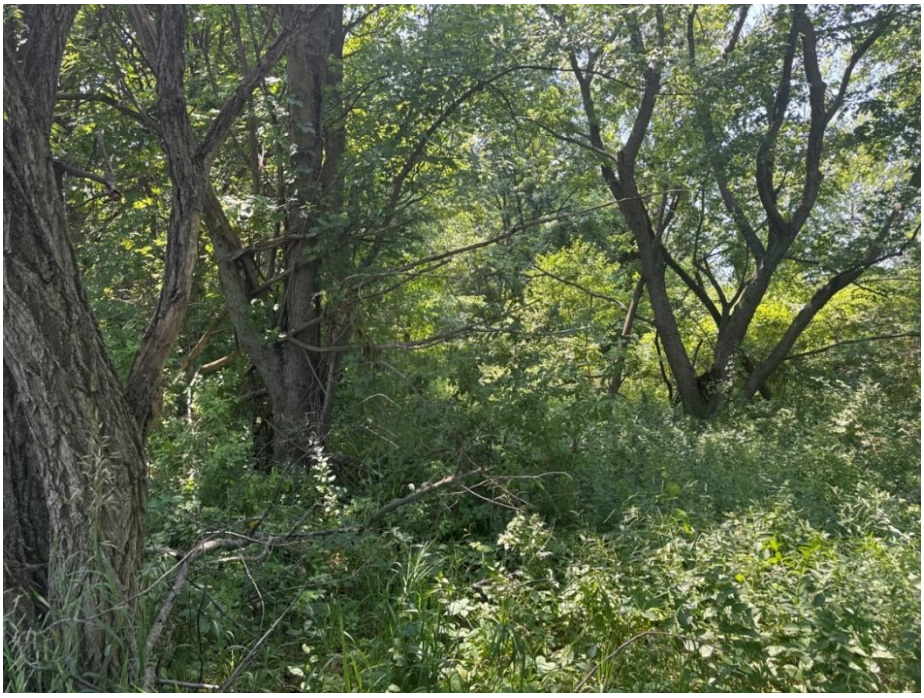


Image 17: Woodlot preserves archaeological potential – test pit survey required



Image 18: Project Area disturbed by road, ditch, and engineered slope – no archaeological potential; higher terrain to the right has potential – test pit survey required



Image 19: Grassed and treed area south of Powerline Road East preserves archaeological potential – test pit survey required



Image 20: Project Area disturbed by Highway 52 and engineered slope – no archaeological potential



Image 21: Project Area disturbed by Highway 52 road cut and a stormwater ditch – no archaeological potential; woodlot to the left has potential – test pit survey required



Image 22: Woodlot west of Highway 52 has archaeological potential – test pit survey required

7.2 Historical Imagery



Image 23: Google Earth Street View from October 2023 shows extensive grading and disturbance within the Project Area related to the construction of the parking lot and building of Summit Station Dairy and Creamery store



Image 24: Google Earth view of the northern polygon of the Project Area from 2023 showing ongoing construction of Summit Station Dairy and Creamery

8.0 Maps

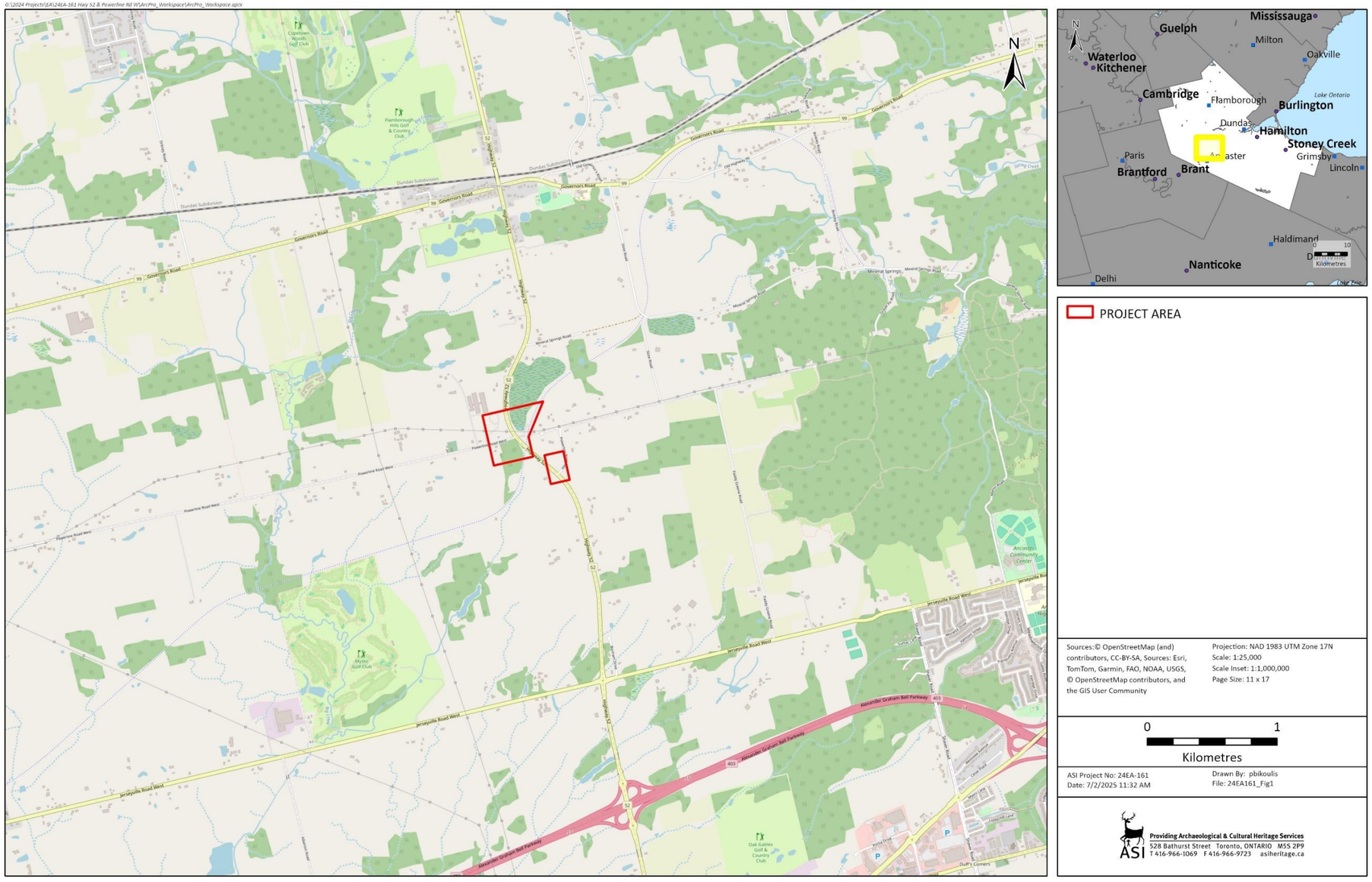


Figure 1: Location of the Project Area

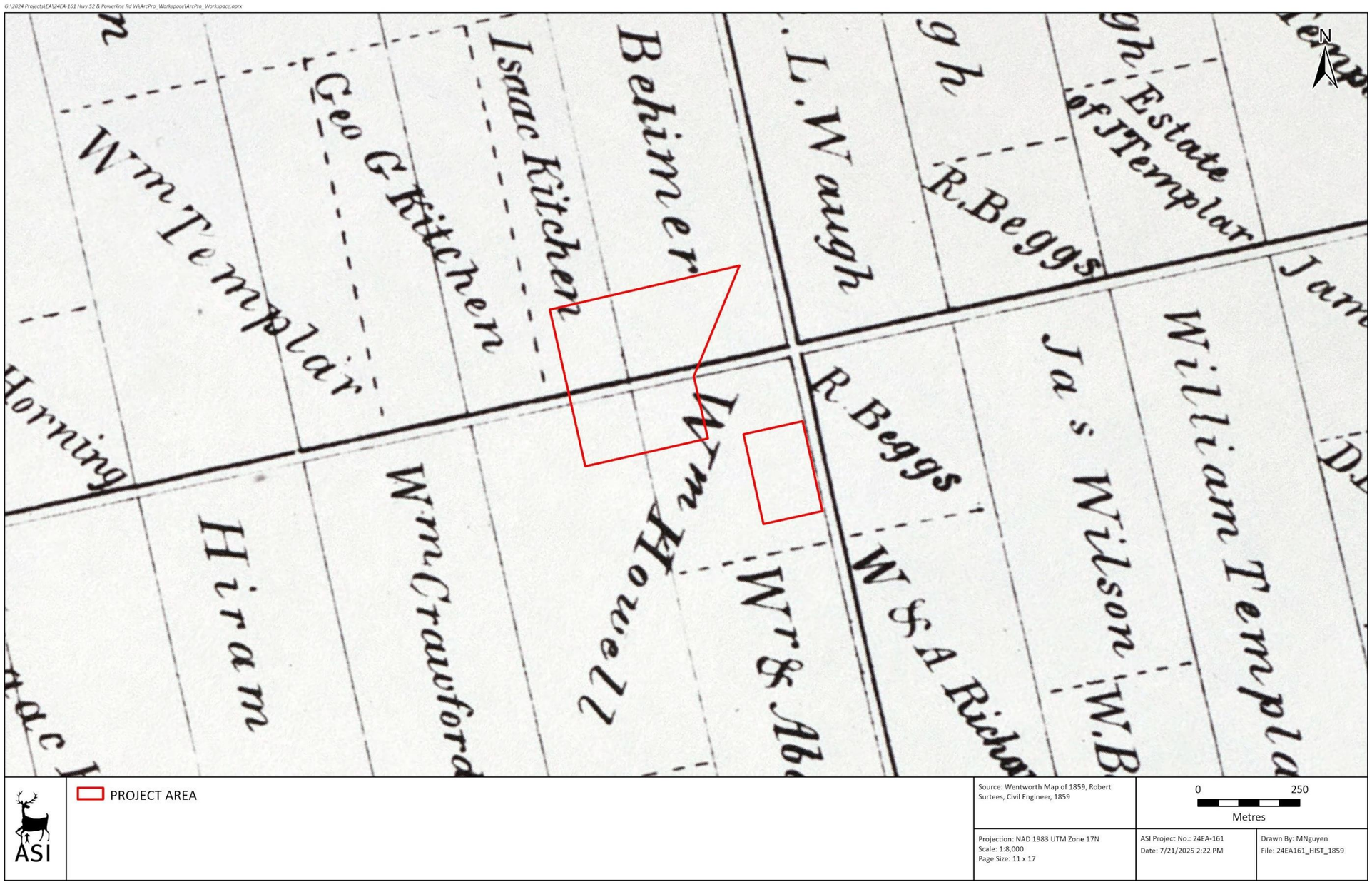


Figure 2: Project Area (Approximate Location) Overlaid on the 1859 Historical Map of Wentworth County

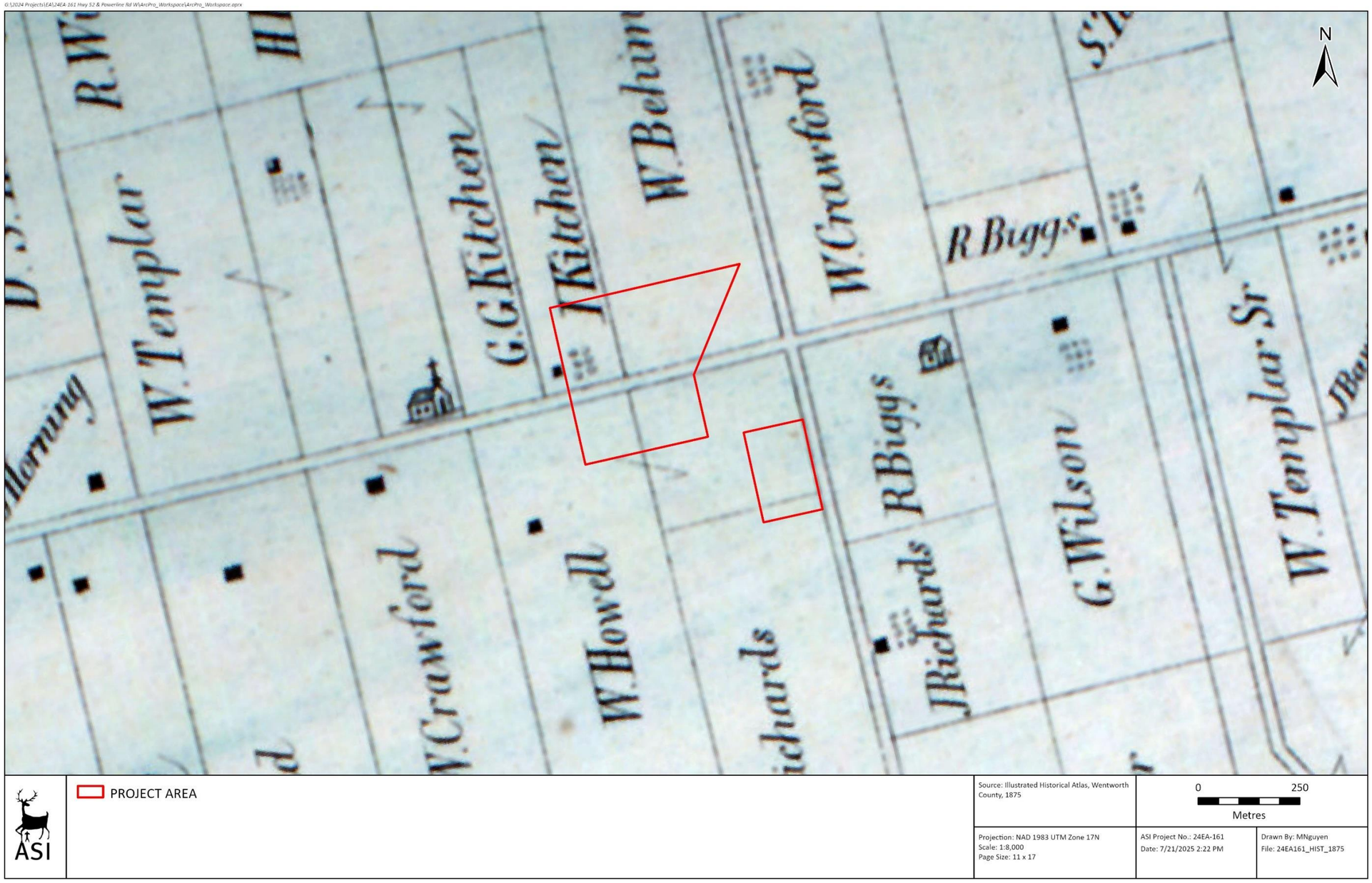


Figure 3: Project Area (Approximate Location) Overlaid on the 1875 Illustrated Atlas of Wentworth County

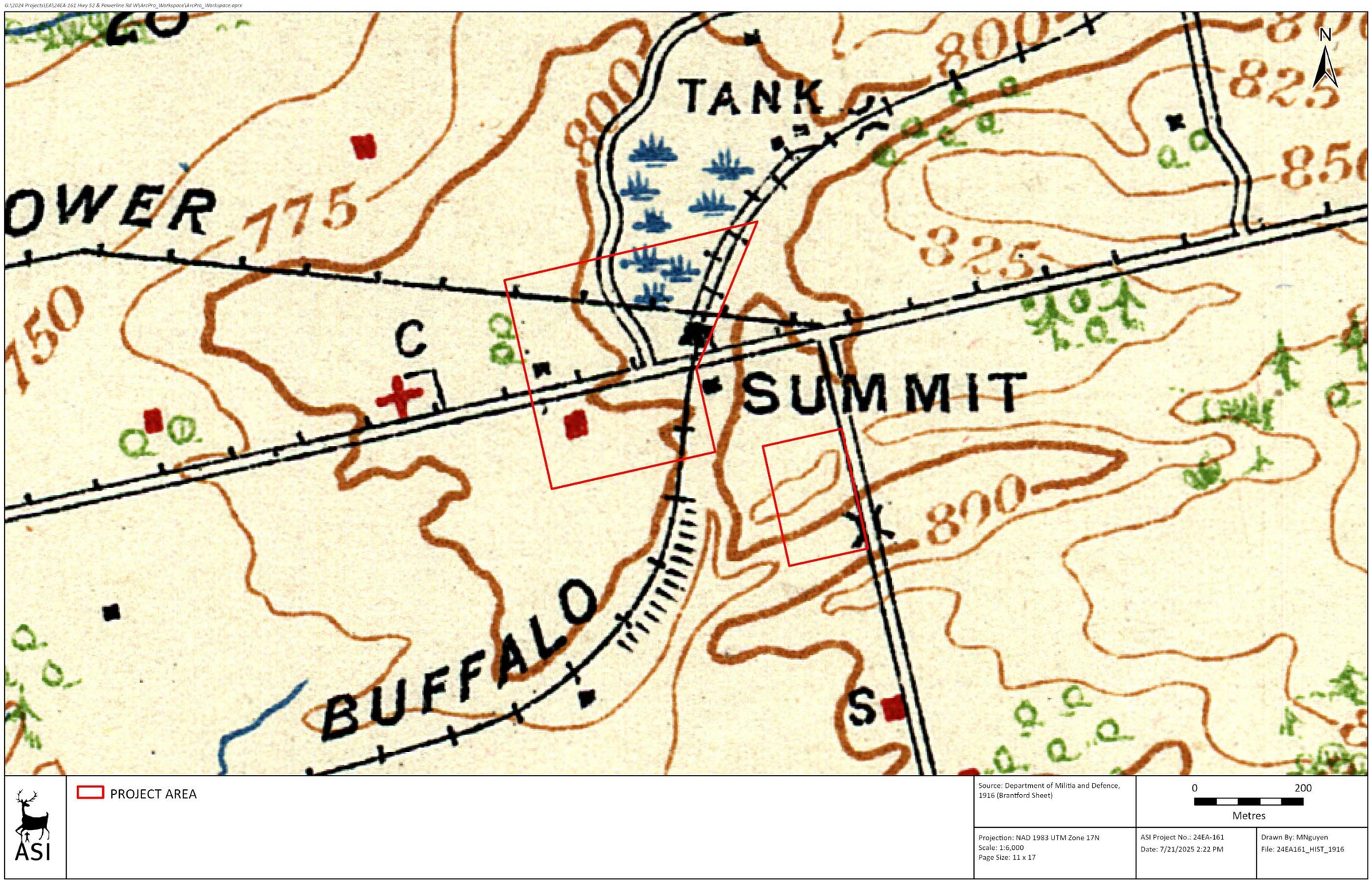


Figure 4: Project Area (Approximate Location) Overlaid on the 1916 Topographic Brantford Sheet

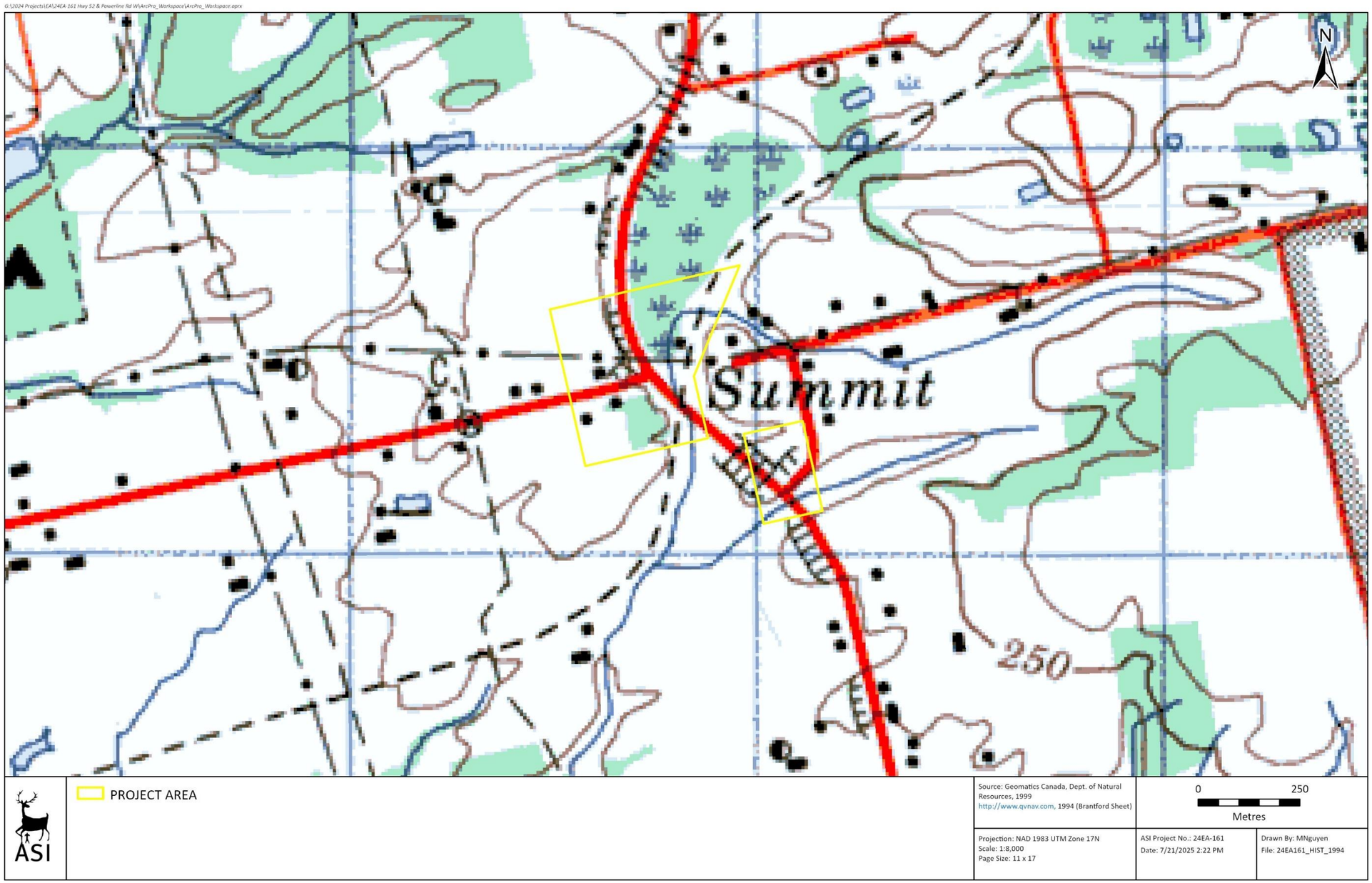


Figure 5: Project Area (Approximate Location) Overlaid on the 1994 NTS Brantford Sheet



Figure 6: Project Area (Approximate Location) Overlaid on the 1954 Aerial Photograph



Figure 7: Project Area – Surficial Geology



Figure 8: Project Area – Soil Drainage

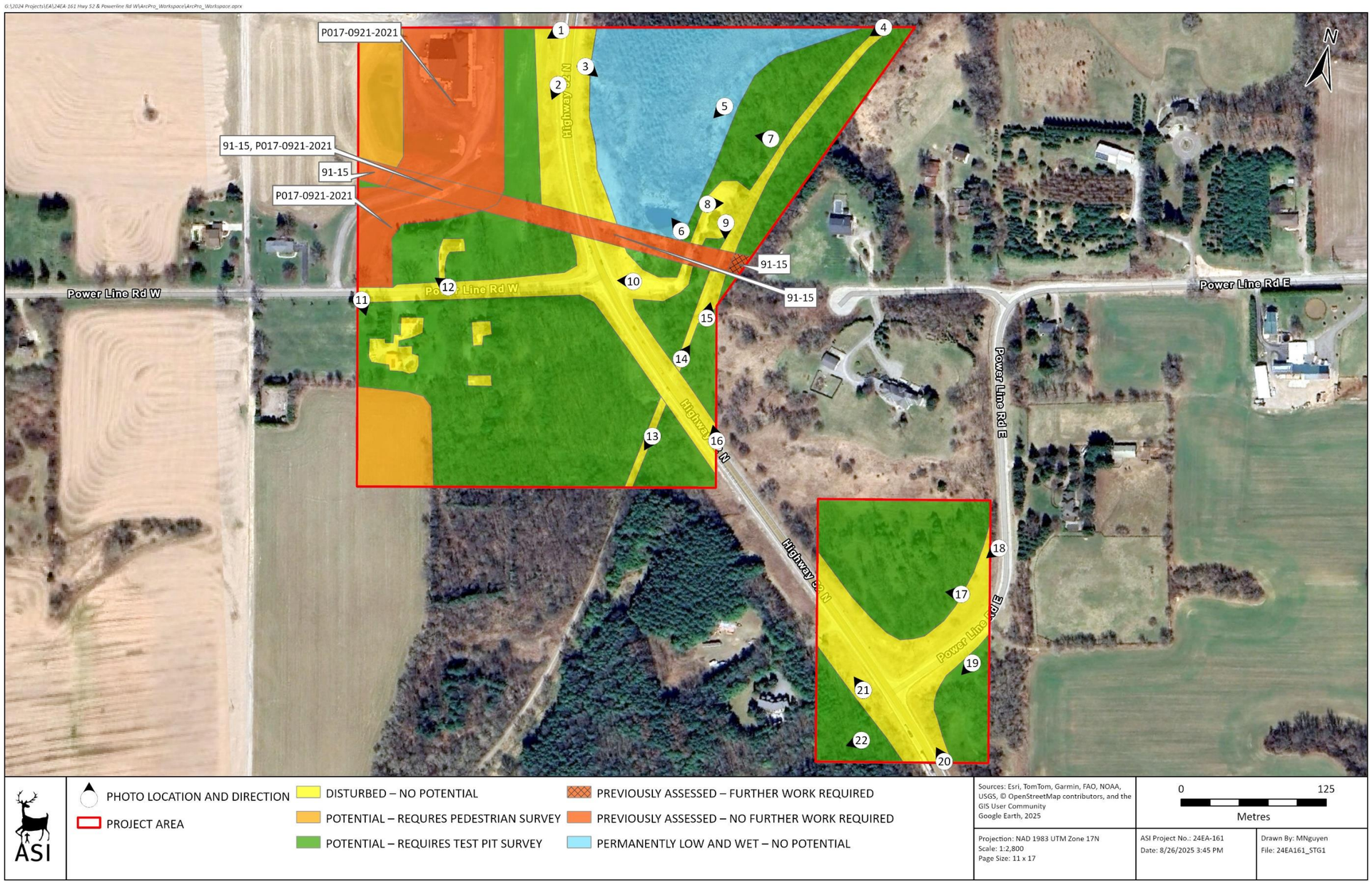


Figure 9: Results of the Stage 1 Archaeological Assessment

Phase 3 Transportation Assessment
Hamilton MCEA Highway 52 and Powerline Intersection

City of Hamilton

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Appendices

Appendix A Roundabout Traffic Operations Analysis Results
Appendix B Synchro Traffic Operations Analysis Results

Disclaimer

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1.0 Introduction

1.1 Background

The City of Hamilton (City) retained R.J. Burnside & Associates Limited (Burnside) to complete a Municipal Class Environmental Assessment (MCEA) for Highway 52 and Powerline Road intersection improvements. The purpose of this MCEA is to assess and recommend a preferred solution and preliminary design for intersection improvements. The transportation assessment for Phase 1 and Phase 2 has been completed. This report advances Phase 3 by providing the transportation analysis required to evaluate the preliminary design concepts.

1.2 Description of Study Area

The study area includes two closely spaced three-legged intersections Highway 52 & Powerline Road West and Highway 52 & Powerline Road East located approximately 430 m apart. Both Powerline Road approaches operate with a single shared lane for left and right turns, while Highway 52 consists of one lane in each direction with dedicated right-turn lanes at both intersections. Access to a parking lot serving the Hamilton-Brantford Rail Trail is located on the east side of Highway 52 at Powerline Road West, with the trail crossing Highway 52 approximately 110 m south of this intersection.

Figure 1: Study Area



2.0 Phase 1 and Phase 2 Summary

Under Phase 1 and Phase 2 of the traffic analysis, existing traffic operations, a five-year collision review, and an evaluation of all five alternative solutions was completed.

Collision data from January 2018 to December 2022 show no consistent or significant collision patterns at the study intersections; however, targeted countermeasures for slow-moving vehicle and rear-end collisions were identified as safety and operational needs. Pedestrian and cyclist activity was observed to be high during long weekends based on seven-day trail count data provided by the City. Highway 52 currently carries an Average Annual Daily Traffic (AADT) of approximately 16,000 vehicles (2024), and turning movement counts collected in May 2024 were used to support the operational analysis.

The existing conditions analysis identified significant delays on the westbound approach at Powerline Road East, with operations at Levels of Service (LOS) E and F, largely due to high Highway 52 through volumes. In contrast, north-south movements along Highway 52 currently operate at LOS A under free-flow conditions. Future condition analyses for 2031 and 2041 were completed with support from the City of Hamilton's demand forecasting model. The analyses indicated that under future conditions, the minor approaches at both intersections are expected to fail, confirming the need for intersection improvements.

Five alternative solutions were evaluated. Alternative Solution 2 and Alternative Solution 3 were identified as the preferred solutions from a transportation perspective. Based on the overall evaluation from all categories of evaluation, including natural environment, social environment, cultural heritage, and economic environment, Alternative Solution 2 was chosen as the preferred solution.

Alternative Solution 2 consists of a roundabout at the intersection of Powerline Road West & Highway 52 and adding a southbound left-turning lane at Powerline Road East and Highway 52. The trail will be relocated northerly to the new roundabout. The lane configuration for Alternative Solution 2 is illustrated in Figure 2. The future traffic volumes are illustrated in Figure 3.

Figure 2: Alternative Solution 2 – Lane Configuration

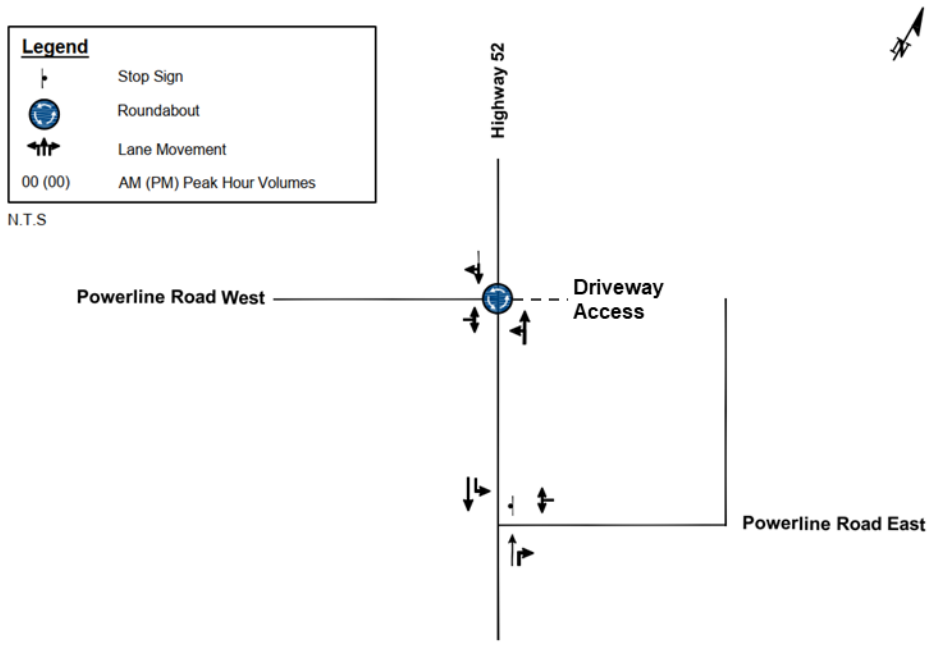
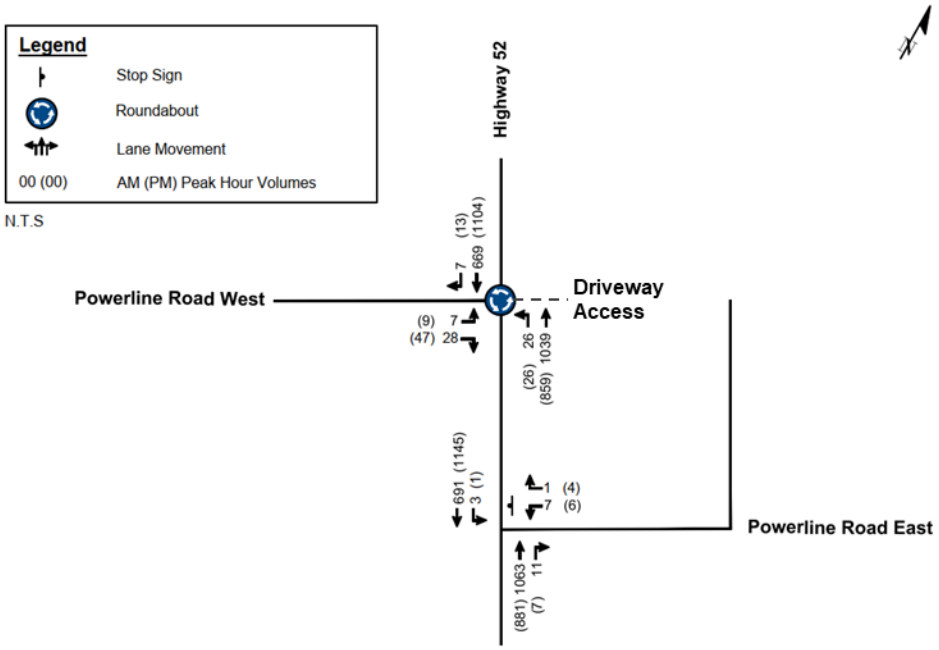


Figure 3: Alternative Solution 2 – Traffic Volumes



3.0 Preferred Design Concept

3.1 Overview of Design Concepts

Three design concepts were developed for Alternative 2, as shown in Figure 4, Figure 5, and Figure 6. All concepts feature identical lane configurations, with the only variation being the placement of the roundabout. As a result, the traffic operational performance is expected to be the same across all three concepts.

Figure 4: Design Concept 1

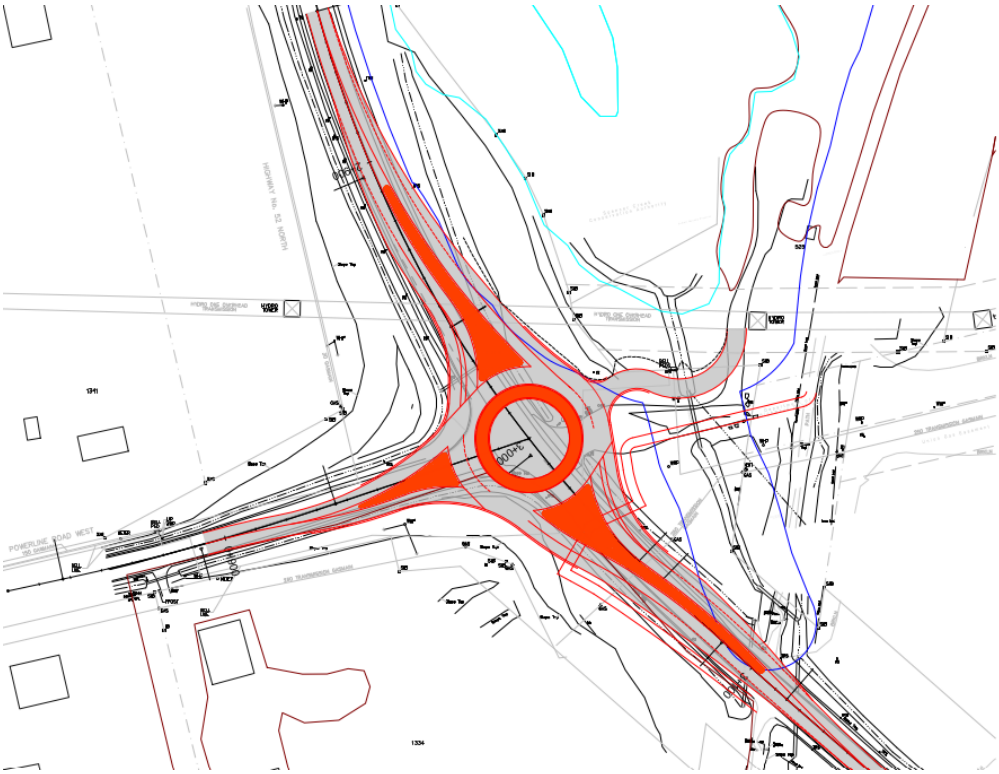
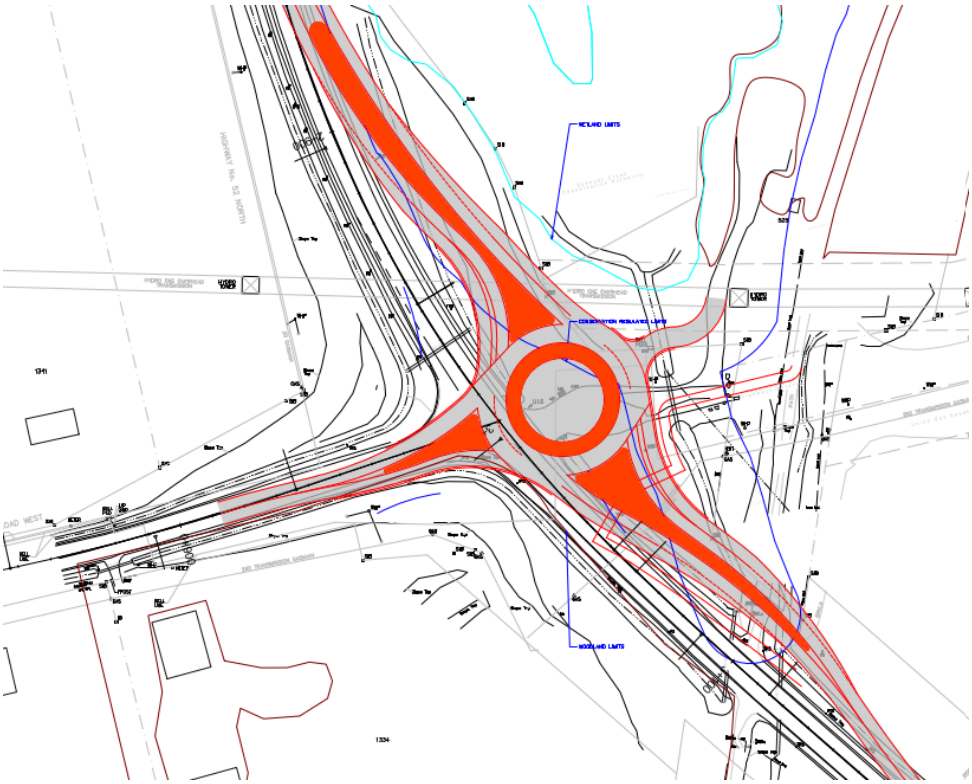


Figure 5: Design Concept 2



Figure 6: Design Concept 3



3.2 Future Traffic Operations Analysis

3.2.1 Highway 52 and Powerline Road West

During Phase 2 of the MCEA, future traffic operations analysis was conducted for a conceptual design developed for Alternative Solution 2. This analysis indicated that the southbound movement was operating at LOS F. As a result, adjustments were made to the roundabout geometry to develop the various design concepts. Traffic operations for the 2031 and 2041 horizon years were then re-evaluated for a single-lane roundabout. Key geometric features including entry width, inscribed circle diameter, and PHI angle were updated accordingly.

Table 1 and Table 2 present the traffic operations analysis results for the 2031 and 2041 horizon year, respectively.

Table 1: 2031 Single Lane Roundabout Traffic Operations Analysis for Hwy 52 and Powerline Road West

Intersection & Movement	Existing Storage / Link Distance (m)	AM v/c	AM LOS	AM Delay (s)	AM 95th Queue (m)	PM v/c	PM LOS	PM Delay (s)	PM 95th Queue (m)
EBLR	635	0.04	A	4	3	0.09	A	6	3
NBLT	435	0.79	B	12	102	0.66	A	7	18
SBTR	365	0.51	A	5	9	**0.84**	C	15	**148**

Table 2: 2041 Single Lane Roundabout Traffic Operations Analysis for Hwy 52 and Powerline Road West

Intersection & Movement	Existing Storage / Link Distance (m)	AM v/c	AM LOS	AM Delay (s)	AM 95th Queue (m)	PM v/c	PM LOS	PM Delay (s)	PM 95th Queue (m)
EBLR	635	0.04	A	4	3	0.10	A	7	3
NBLT	435	**0.84**	C	16	**164**	0.70	A	8	29
SBTR	365	0.54	A	6	9	**0.89**	C	23	**236**

As shown in Table 1, traffic operations for the 2031 horizon year indicated that the roundabout will operate within capacity, but the southbound PM Peak through movement was very close to the 0.85 volume-to-capacity ratio (v/c) threshold and queuing was observed at 148 m (over 20 passenger vehicle equivalents). However, as shown in Table 2, the longer term analysis indicated that the southbound PM Peak movement would operate with a v/c of 0.89 in 2041, indicating it would be nearing capacity in the future. In addition, the queue of 236 m for this movement would also be of concern. Further, the northbound movement during the AM Peak would be approaching the threshold v/c and would have long queues as well. Therefore, it was concluded that a two-lane roundabout configuration is the best option for this roundabout considering the 2041 horizon year.

Table 3 presents the traffic operation results for the two-lane roundabout configuration in 2041.

Table 3: 2041 Two-Lane Roundabout Traffic Operations Analysis for Hwy 52 and Powerline Road West

Intersection & Movement	Existing Storage / Link Distance (m)	AM v/c	AM LOS	AM Delay (s)	AM 95th Queue (m)	PM v/c	PM LOS	PM Delay (s)	PM 95th Queue (m)
EBLR	635	0.05	A	4	3	0.11	A	6	3
NBLT	435	0.73	A	8	31	0.60	A	5	12
SBTR	365	0.43	A	3	13	0.70	A	7	27

As shown in Table 3, the analysis indicated that traffic operations improved significantly with the two-lane roundabout configuration for the critical movements previously identified.

Appendix A shows the roundabout traffic operation analysis results.

3.2.2 Highway 52 and Powerline Road East

The intersection improvement involved adding a southbound left turn lane. The storage length was defined at 25 m given the anticipated left turn volumes by 2041. Table 4 shows the traffic operation analysis for Highway 52 and Powerline Road East for the 2041 horizon year.

Table 4: 2041 Traffic Operations Result for Highway 52 and Powerline Road East

Intersection & Movement	Existing Storage / Link Distance (m)	AM v/c	AM LOS	AM Delay (s)	AM 95th Queue (m)	PM v/c	PM LOS	PM Delay (s)	PM 95th Queue (m)
WBLR	300	0.15	F	68	1	0.13	F	52	0
NBT/NBR	360/65	-	-	-	-	-	-	-	-
SBL	25	0.01	B	13	0	0.02	B	11	0
SBT	435	-	-	-	-	-	-	-	-

As shown in Table 4, the analysis indicated that all the movements operated well with excess capacity. However, the westbound movement is anticipated to operate with a LOS F due to high waiting time (52 seconds) to make a

westbound left turn, as the north-south traffic is high. Given this performance is for a very low volume of traffic on the west leg, there is no recommended mitigative measures.

Appendix B shows the synchro traffic operation analysis results.

3.3 Link Capacity Analysis

The 2041 v/c ratios for the study corridors were calculated for the weekday AM and PM peak hours using the 2041 forecasted traffic volumes. For the link capacity analysis, only auto volumes and auto link capacities were considered in this analysis. The analysis indicated that the corridors operated within traffic capacity.

The results for Highway 52 are presented in Table 5 and Table 6.

Table 5: Highway 52 Link Capacity Analysis (AM)

Highway 52	SB # of Lanes	SB Total Capacity	SB Volume	SB v/c ratio	NB # of Lanes	NB Total Capacity	NB Volume	NB v/c ratio
North of Powerline Road West	1	1400	721	0.52	1	1400	1117	0.80
Between Powerline Road West and Powerline Road East	1	1400	746	0.53	1	1400	1136	0.81
South of Powerline Road East	1	1400	746	0.53	1	1400	1147	0.82

Table 6: Highway 52 Link Capacity Analysis (PM)

Highway 52	SB # of Lanes	SB Total Capacity	SB Volume	SB v/c ratio	NB # of Lanes	NB Total Capacity	NB Volume	NB v/c ratio
North of Powerline Road West	1	1400	1192	0.85	1	1400	927	0.66
Between Powerline Road West and Powerline Road East	1	1400	1223	0.87	1	1400	944	0.67
South of Powerline Road East	1	1400	1229	0.88	1	1400	947	0.68

Table 7: Powerline Road East-West Link Capacity Analysis West of Hwy 52 (AM and PM)

Powerline Road West	EB # of Lanes	EB Total Capacity	EB Volume	EB v/c ratio	WB # of Lanes	WB Total Capacity	WB Volume	WB v/c ratio
West of Highway 52 (AM)	1	700	40	0.06	1	700	34	0.05
West of Highway 52 (PM)	1	700	63	0.09	1	700	41	0.06

Table 8: Powerline Road East-West Link Capacity Analysis East of Hwy 52 (AM and PM)

Powerline Road West	EB # of Lanes	EB Total Capacity	EB Volume	EB v/c ratio	WB # of Lanes	WB Total Capacity	WB Volume	WB v/c ratio
East of Highway 52 (AM)	1	700	16	0.02	1	700	9	0.01
East of Highway 52 (PM)	1	700	8	0.01	1	700	11	0.02

3.4 Pedestrian Crossover (PXO) Warrants

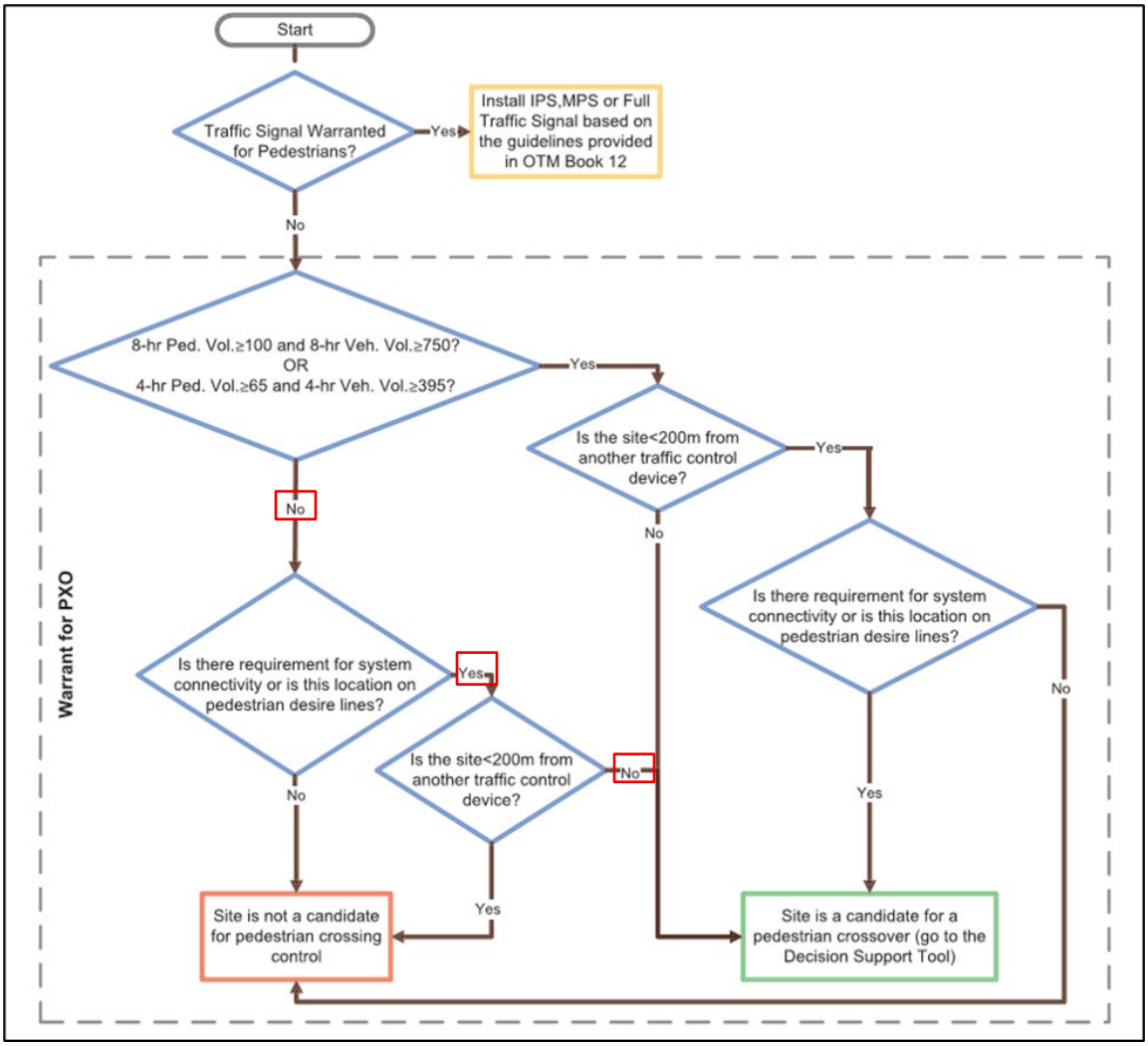
Ontario Traffic Manual (OTM) Book 15 (Pedestrian Crossing Treatments) provides practical guidance and application information on the planning, design, and operation of roadway pedestrian crossovers, to promote uniformity of approaches across Ontario, when a traffic signal or pedestrian signal is not applicable. The process for determining the warrant for a Pedestrian Crossover (PXO) is contained within the Decision Support Tool (DST). This tool is designed to assess pedestrian crossing needs and selecting the most appropriate crossing treatment for controlled crossings. The DST involves two components: (1) Preliminary Assessment and (2) Pedestrian Crossing Selection.

The purpose of the preliminary assessment is to determine whether traffic signals are warranted to address pedestrian delays caused by high vehicle volumes on the main road or a high number of crossing pedestrians.

The design concepts for this study include a two-lane roundabout. The purpose of the PXO is to support pedestrian crossings at this roundabout. Hence this assessment begins with the Pedestrian Crossing Selection.

Pedestrian Crossovers (PXOs) are intended for low to moderate volume, low speed roadways (60 km/h or less posted speed) and must not be used where the road volume exceeds 35,000 AADT. PXOs should not be installed at sites where there are heavy volumes of turning traffic, or where there are more than four lanes of two-way traffic. PXOs should not be within 200 m of other signal-protected pedestrian crossings. Parking and other sight obstructions should be prohibited within at least 30 m of the crossings. The Decision Support Tool (DST) provided in Book 15 is shown Figure 7.

Figure 7: Pedestrian Crossover (PXO) Warrant Process



Source: Figure 2 from OTM Book 15- Pedestrian Crossing Treatment, June 2016

The Pedestrian Crossing Selection of the DST is the guidance for pedestrian crossing treatment selection to assist practitioners to identify which treatment system is applicable to the site based on traffic and geometric characteristics of the site.

The first step is to assess if the corridor volume passes the suggested pedestrian and two-way traffic volume thresholds. The 8-hour and 4-hour pedestrian and vehicular volume was assessed using the existing traffic data collected for the traffic operations analysis. Peak 8-hour and 4-hour pedestrian volumes crossing the main road do not meet the volume thresholds, as shown in Table 9.

Table 9: PXO Warrant Volumes

	8-Hour Volume Pedestrians	8-Hour Volume Vehicles	4-Hour Volume Pedestrians	4-Hour Volume Vehicles
South of Highway 52 and Powerline Road	7	10,803	0	6,118
Threshold	100	750	65	395
Threshold Met?	**No**	**Yes**	**No**	**Yes**

As a second step, the Pedestrian Crossing Selection notes that a pedestrian crossing is still warranted if this crossing plays a key role in enhancing pedestrian connectivity or aligns with natural pedestrian desire lines.

The Hamilton Brantford Rail Trail crossing is just 100 m south of the intersection featuring walking trails that attract a large number of visitors. This PXO would fulfill a missing gap for pedestrians and cyclists who would want to make that crossing, but wants to avoid vehicles travelling 60 km/h and 70 km/h. Pedestrian and cyclist counts were conducted over seven days across May and June 2021. Findings are outlined below:

- There was an average of 65 daily pedestrians travelling along Highway 52 passing the crossing.
- There was an average of 270 daily cyclists travelling along Highway 52 passing the crossing.

A PXO at this location can attract latent demand from these pedestrians and cyclists who may not feel comfortable crossing due to the lack of comfort and security under the existing conditions. Given these factors, implementing a PXO crossing at this location is a suitable option to improve pedestrian accessibility and connectivity.

The next step is to determine the type of pedestrian crossing using the pedestrian crossover selection matrix provided in Figure 8. The posted speed in this assessment was replaced with the anticipated operating speed approaching the roundabout. This anticipated operating speed is expected to be reduced to 50 km/h due the entry deflection naturally slowing down traffic.

Figure 8: Pedestrian Crossover Selection Matrix

Two-way Vehicular Volume			Posted Speed Limit (km/h	Total Number of Lanes for the Roadway Cross Section[1]			
Time Period	Lower Bound	Upper Bound		1 or 2 Lanes	3 lanes	4 lanes w/raised refuge	4 lanes w/o raised refuge
8 Hour	750	2,250	≤50	Level 2 Type D	Level 2 Type C[3]	Level 2 Type D[2]	Level 2 Type B
4 Hour	395	1,185					
8 Hour	750	2,250	60	Level 2 Type C	Level 2 Type B	Level 2 Type C[2]	Level 2 Type B
4 Hour	395	1,185					
8 Hour	2,250	4,500	≤50	Level 2 Type D	Level 2 Type B	Level 2 Type D[2]	Level 2 Type B
4 Hour	1,185	2,370					
8 Hour	2,250	4,500	60	Level 2 Type C	Level 2 Type B	Level 2 Type C[2]	Level 2 Type B
4 Hour	1,185	2,370					
8 Hour	4,500	6,000	≤50	Level 2 Type C	Level 2 Type B	Level 2 Type C[2]	Level 2 Type B
4 Hour	2,370	3,155					
8 Hour	4,500	6,000	60	Level 2 Type B	Level 2 Type B	Level 2 Type C[2]	Level 2 Type B
4 Hour	2,370	3,155					
8 Hour	6,000	7,500	≤50	Level 2 Type B	Level 2 Type B	Level 2 Type C[2]	Level 1 Type A
4 Hour	3,155	3,950					
8 Hour	6,000	7,500	60	Level 2 Type B	Level 2 Type B		
4 Hour	3,155	3,950					
8 Hour	7,500	17,500	≤50	Level 2 Type B	Level 2 Type B		
4 Hour	3,950	9,215					
8 Hour	7,500	17,500	60	Level 2 Type B			
4 Hour	3,950	9,215					

Type A Type B Type C Type D

Figure 8 shows the hatched cell which indicates that a PXO is not recommended for sites with these traffic and geometric conditions. Generally, a traffic signal is warranted for such conditions.

However, to support pedestrian and cyclist crossings, a pedestrian refuge island is available in the roundabout northbound approach island to allow the crossing to be completed in two stages. This two-stage crossing reduces the required vehicular gap needed for the pedestrians to cross safely. Additionally, pedestrian safety will be enhanced if a Level 2 Type B PXO is implemented as it provides the highest level of protective components among the available crossover types. Therefore, a Level 2 Type B pedestrian crossover with a pedestrian refuge island

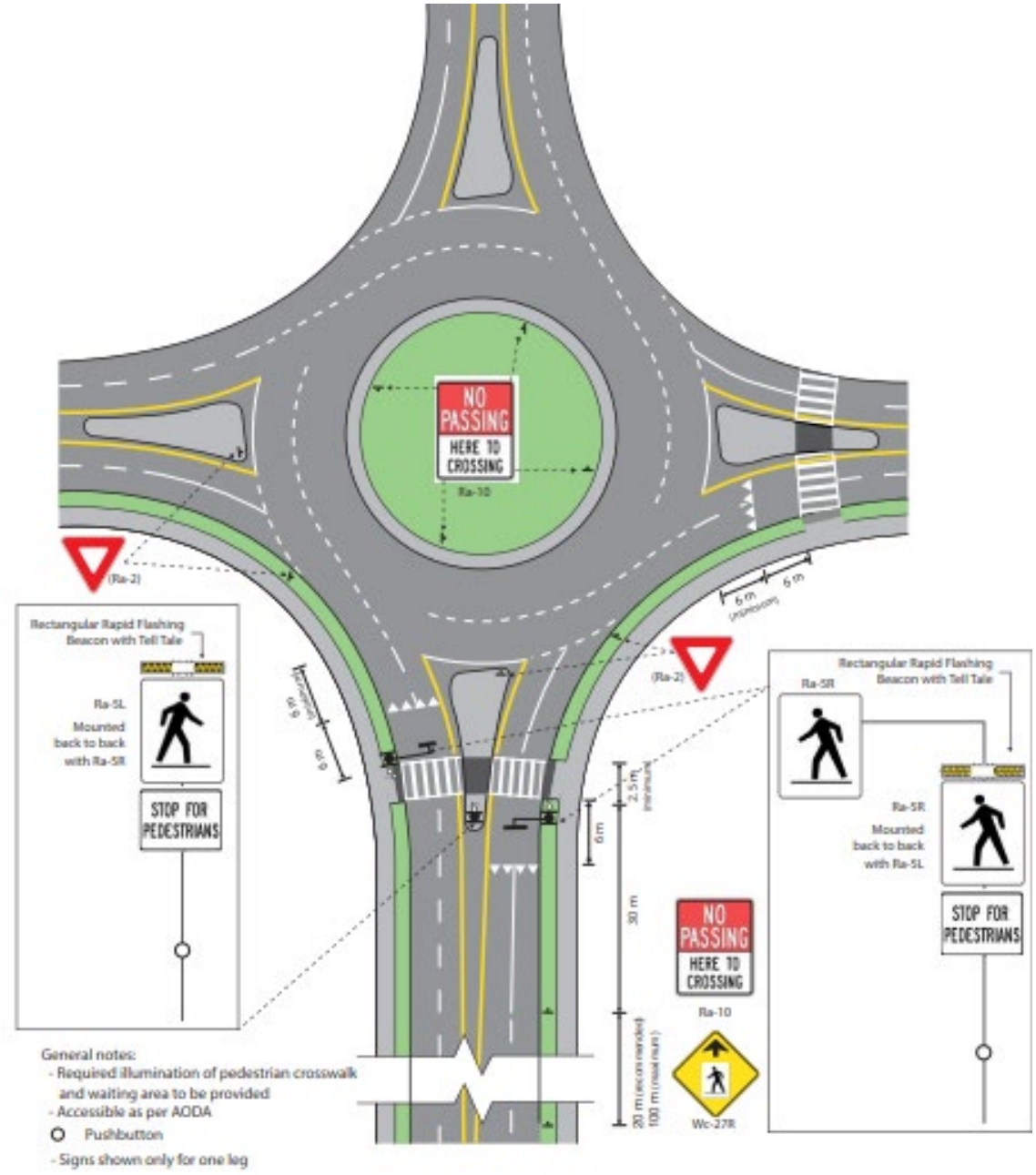
is recommended for the study intersection. Table 10 shows the components of Level 2 Type B pedestrian crossover and Figure 9 shows the Level 2 Type B pedestrian crossover for a double lane roundabout.

It is important to note that OTM Book 15 guidelines were followed for the implementation and selection of the pedestrian crossing type. Although some thresholds were not exactly met, OTM Book 15 stresses that these guidelines are meant to guide a broad range of traffic situations and the practitioner is expected to exercise engineering judgement for specific situations. Under this particular scenario, a Level 2 Type B pedestrian crossover fulfills a necessary gap in the trail network and reduced operating speeds at the entry deflection is anticipated to allow for safe operations.

Table 10: Components of Level 2 Type B Pedestrian Crossing

Required Components	Optional Components
• Side-mounted pedestrian crossover signs, showing a symbol of a person crossing on a road (Ra-5R and Ra-5L), together with their Stop for Pedestrians (Ra-4t) tabs, on both sides of the road mounted back to back (For one-way applications, Stop for Pedestrians tab is required only for the direction of travel) • One over-head mounted pedestrian crossover sign showing a symbol of a person crossing on a road to the right (Ra-5R), for each direction of travel • Ladder Crosswalk Markings • Yield to Pedestrians line markings at 6.0 m from crosswalk • Actuated Double-sided Rectangle Rapid Flashing Beacon with Tell Tale and Pedestrian Pushbutton for pedestrians mounted above each set of side-mounted pedestrian crossover signs installed at the pedestrian crossover • Advanced Pedestrian Crossover Ahead sign (Wc-27R/Wc-27L) at 50.0 m upstream of the crosswalk • Passing restrictions on single lane approaches • Stopping prohibition for a minimum of 15 m on each approach to the crossing, and 10 m following the crossing • Lane change prohibition on multiple lane approaches using solid white lines (not applicable for exiting legs of roundabouts) • No Passing Here to crossing sign (Ra-10) 30 m upstream of the crosswalk	• Textured Crosswalk Markings • Raised Crosswalk • Pedestrian Pushbutton (Ra-11) sign • Safety elements including Barricades, Pedestrian Fencing, Gates, Walls, Bollards, and Barriers • Actuated Double-sided Rectangle Rapid Flashing Beacon with Tell Tale mounted on Overhead Sign

Figure 9: Pedestrian Crossover Level 2 Type B – Double-Lane Roundabout



3.5 Multi-Modal Level of Service

A Multi-Modal Level of Service (MMLOS) analysis was completed in accordance with the Ontario Traffic Manual (OTM) MMLOS Guidelines (20-3587). Highway 52 corridor was found to align most closely with the characteristics of a Rural Connector street type.

According to the MMLOS guidelines, a Rural Connector is a major mobility corridor that links rural areas to nearby urban centres. It carries high volumes of vehicles and trucks over moderate distances and typically prioritizes these modes. Rural Connectors are generally not served by conventional transit, provide limited accommodation for pedestrians and cyclists, and are surrounded by predominantly rural land uses such as agricultural, low-density residential, and commercial properties.

Based on this classification, the target LOS for a Rural Connector was compared against the existing LOS to determine whether each segment and intersection meets the recommended performance criteria. Figure 10 summarizes the target LOS thresholds for the various street types.

Figure 10: Target Level of Service for Different Street Type

	LOS Target				
	Peds	Bikes	Transit	Trucks	Cars
Downtown avenue	B	C	D	D	D
Urban main street	C	C	D	D	D
Urban boulevard	C	B	D	n/a	E
Neighbourhood connector	E	D	B	D	D
Neighbourhood main street	C	C	D	D	D
Neighbourhood boulevard	D	B	D	n/a	E
Industrial connector	E	D	D	B	D
Industrial boulevard	D	D	D	B	E
Rural connector	E	E	n/a[1]	D	D
Custom	X	X	X	X	X

1 Rural roads typically do not serve as transit route corridors where buses stop, which is what the Transit LOS is based on

To evaluate the intersection level of service for pedestrians, several intersection features were assessed. These included the presence of enhanced pedestrian measures, signal cycle length, number of uncontrolled crossings, and average effective turning radius. Enhanced pedestrian measures include pedestrian refuge islands, pedestrian storage space, leading pedestrian intervals, and raised intersections. All study intersections are noted to have marked and protected pedestrian crossings.

To evaluate the level of service for cyclists, intersection features including enhanced bicycle measures, signal length, number of uncontrolled crossings, and average effective turning radius were assessed. Enhanced bicycle measures include cross-rides, green conflict markings, dedicated intersection features, protected intersection features, bicycle signal heads, leading bicycle phases, and protected phases. Out of the three study intersections, only Unity Drive / Unity Gate was equipped with bicycle signal heads.

The level of service is determined based on the average score for each mode. Table 11 summarizes the criteria used to determine the level of service for pedestrian and bike facilities at unsignalized intersection.

Table 11: Criteria for Unsignalized Intersection Level of Service

Mode and Description	Pedestrian Average Crossing Distance (m)	Pedestrian Marked Controlled Crossings	Pedestrian Average Effective Turning Radius (m)	Bike Presence of Bicycle Facilities	Bike Requirement to Stop	Bike Average Effective Turning Radius (m)
LOS A	<7.0	100% of movements	<9.0	Bike facility on all approaches	0-15%	<9.0
LOS B	7.0-8.9	n/a[1]	9.0-10.9	Bike facility on ¾ or ⅔ approaches	16-30%	9.0-10.9
LOS C	n/a[1]	n/a[1]	11.0-12.9	n/a[1]	31-50%	11.0-12.9
LOS D	9.0-10.9	n/a[1]	13.0-14.9	Bike facility on ½ or ⅓ approaches	51-70%	13.0-14.9
LOS E	n/a[1]	50% of movements	15.0-17.9	n/a[1]	71-85%	15.0-17.9
LOS F	>11.0	<50% of movements	≥18	No bike facility	>85%	≥18

Note: [1]For some measures, a limited number of LOS scores are possible. The ones that cannot be obtained for that metric are marked as “n/a”

The following design checks were also considered. Facilities that fail to meet these checks are considered to have a LOS F.

Intersection Checks

- Are marked pedestrian crossings provided to connect all approaching pedestrian facilities?
- Have Accessibility for Ontarians with Disabilities Act (AODA) and municipal accessibility standards (if applicable) been considered?
- Does the approaching bike facility continue at a consistent width up to the edge of the intersection (crosswalk or curb edge of intersecting roadway)?
- Is a continuous amount of space and accompanying pavement markings delineated for cyclists through the intersection?
- Does the intersection design provide features which facilitate all the intended turn movements for cyclists (e.g. bike boxes, queuing space, protected intersection, etc.)?

Table 12 summarizes the pedestrian and bicycle levels of service. While pedestrian and cyclist LOS meet the targets for Highway 52 and Powerline Road West, the targets are not met for Highway 52 and Powerline Road East. However, based on the traffic data collected for this study, there were zero pedestrians that crossed at this intersection highlighting the low pedestrian demand directly surrounding this area. Given the rural nature of this corridor, fulfilling the gap in the trail network via the pedestrian crossover at Highway 52 and Powerline Road West serves a more vital role in the overall active transportation network.

Table 12: Intersection Multi-modal Level of Service Evaluation

Intersection	Control Type	Pedestrian LOS	Pedestrian Target LOS	Bicycle LOS	Bicycle Target LOS
Highway 52 and Powerline Road West	Roundabout	D	E	E	E
Highway 52 and Powerline Road East	Unsignalized	F	E	F	E

4.0 Summary

This report presents the findings of a Municipal Class Environmental Assessment (MCEA) undertaken for the intersections of Highway 52 with Powerline Road West and Powerline Road East. The purpose of the study is to evaluate existing and future transportation conditions and identify recommended improvements to enhance intersection operations, safety, and overall connectivity. The study area consists of two closely spaced three-legged intersections located approximately 430 m apart. Both Powerline Road West and Powerline Road East currently operate with a single shared left- and right-turn lane, while Highway 52 provides one through lane in each direction with exclusive right-turn lanes at both intersections.

A range of criteria were considered in the evaluation of alternative solutions, including traffic operations, safety, connectivity, and other technical factors. Five alternatives were assessed, and Alternative 2 was identified as the preferred solution from a transportation perspective. This report therefore focuses on the operational evaluation of Alternative 2.

For the intersection of Highway 52 and Powerline Road West, a single-lane roundabout was evaluated for the 2031 and 2041 horizon years, along with a two-lane roundabout for the 2041 horizon year. The analysis indicated that while a single-lane roundabout operates acceptably in the near term, it would approach capacity under 2041 conditions. The analysis also indicated a double-lane roundabout operates acceptably under 2041 conditions. At the intersection of Highway 52 and Powerline Road East, the addition of a southbound left-turn lane was assessed for the 2041 horizon year. The results show that the intersection would operate with overall excess capacity; however, the westbound movement is projected to operate at Level of Service (LOS) F due to longer turning delays, despite the v/c ratio indicating sufficient available roadway capacity. However, due to low vehicular volumes and a delay of just 52 seconds, this operation was deemed acceptable.

An active transportation assessment was also conducted in accordance with OTM Book 15. A Level 2 Type B pedestrian crossover with a refuge island for the double-lane roundabout at Highway 52 and Power Line Road West is recommended.

The MMLOS analysis indicated that while pedestrian and cyclist LOS meet the targets for Highway 52 and Powerline Road West, the targets are not met for Highway 52 and Powerline Road East. However, based on the traffic data

collected for this study, there were zero pedestrians that crossed at this intersection highlighting the low pedestrian demand directly surrounding this area. Given the rural nature of this corridor, fulfilling the gap in the trail network via the pedestrian crossover at Highway 52 and Powerline Road West serves a more vital role in the overall active transportation network.

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix A

Roundabout Traffic Operations Analysis Results

Junctions 10

ARCADY 10 - Roundabout Module

Version: 10.1.2.2275
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Filename: Highway 52 and Powerliner Road Alternative 2-2031 Single Lane_19Nov25.j10
Path: \\PCK-RDC-P-01\Shared Work Areas\058409 - Creditview Implementation Strategy\058803 Highway 52 and Powerline Road\19Nov25
Report generation date: 11/19/2025 4:44:27 PM

»Highway 52 and Powerline Road West - 2031, AM
»Highway 52 and Powerline Road West - 2031, PM

Summary of intersection performance

	AM						PM					
	Set ID	Queue (PCE)	95% Queue (PCE)	Delay (s)	VIC Ratio	LOS	Set ID	Queue (PCE)	95% Queue (PCE)	Delay (s)	VIC Ratio	LOS
	Highway 52 and Powerline Road West - 2031											
Leg A	D1	1.1	1.6	5.38	0.51	A	D2	5.0	**25.8**	15.31	0.84	C
Leg B		0.0	0.5	3.92	0.04	A		0.1	0.6	6.28	0.09	A
Leg C		3.9	17.7	12.40	0.79	B		2.0	3.1	7.38	0.66	A

There are warnings associated with one or more model runs - see the 'Data Errors and Warnings' tables for each Analysis or Demand Set.

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

File summary

File Description

Title	Highway 52 and Powerline ROad West Alt 2
Location	
Site number	
Date	4/24/2025
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	RJBURNSIDE\AJunctions
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	PCE	PCE	perHour	s	-Min	perMin

Analysis Options

Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Show lane queues in feet / metres	Show all PICADY stream intercepts	Calculate residual capacity	V/C Ratio Threshold	Average Delay threshold (s)	Queue threshold (PCE)	Use simulation for HCM roundabouts	Use iterations for HCM roundabouts
5.75	✓					0.85	36.00	20.00		

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D1	2031	AM	ONE HOUR	00:00	01:30	15	✓
D2	2031	PM	ONE HOUR	16:00	17:30	15	✓

Analysis Set Details

ID	Name	Description	Include in report	Network flow scaling factor(%)	Network capacity scaling factor(%)
A1	Highway 52 and Powerline Road West	Alternative 2 three legged roundabout at poweline west	✓	100.000	100.000

Highway 52 and Powerline Road West - 2031, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

Intersection Network

Intersections

Intersection	Name	Intersection type	Use circulating lanes	Leg order	Intersection Delay (s)	Intersection LOS
	untitled	Standard Roundabout		A, B, C	9.56	A

Intersection Network

Driving side	Lighting	Network delay (s)	Network LOS
Right	Normal/unknown	9.56	A

Legs

Legs

Leg	Name	Description	No yield line
A	Highway 52 (South Leg)		
B	Powerline Road West		
C	Highway 52 (North Leg)		

Roundabout Geometry

Leg	V - Approach road half-width (m)	E • Entry width (m)	l' • Effective flare length (m)	R • Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Entry only	Exit only
A	3.50	5.50	30.0	40.0	46.0	20.0		
B	3.50	5.50	30.0	40.0	46.0	20.0		
C	3.50	5.50	30.0	40.0	46.0	20.0		

Slope / Intercept / Capacity

Leg Intercept Adjustments

Leg	Type	Reason	Percentage intercept adjustment (%)
A	Percentage		90.00
B	Percentage		90.00
C	Percentage		90.00

Roundabout Slope and Intercept used in model

Leg	Final slope	Final intercept (PCE/hr)
A	0.633	1487
B	0.633	1487
C	0.633	1487

The slope and intercept shown above include any corrections and adjustments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D1	2031	AM	ONE HOUR	00:00	01:30	15	✓

Demand overview (Traffic)

Leg	Linked leg	Profile type	Use 0-D data	Average Demand (PCE/hr)	Scaling Factor (%)
A		ONE HOUR	✓	676	100.000
B		ONE HOUR	✓	35	100.000
C		ONE HOUR	✓	1065	100.000

Origin-Destination Data

Demand (PCE/hr)

J	To			
		A	B	C
From	A	0	7	669
	B	7	0	28
	C	1039	26	0

Vehicle Mix

Truck data entry mode	PCE Factor for a Truck (PCE)
Truck Percentages	2.00

Heavy Vehicle %

J	To			
		A	B	C
From	A	0	50	8
	B	0	0	9
	C	7	17	0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)
A	0.51	5.38	1.1	1.6	A	620	930
B	0.04	3.92	0.0	0.5	A	32	48
C	0.79	12.40	3.9	17.7	B	977	1466

Main Results for each time segment

00:00 • 00:15

Leg	Total Demand (PCE/hr)	Intersection **Arrivals** (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	**V/C Ratio**	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	509	127	19	1475	0.345	507	783	0.0	0.6	4.019	A
B	26	7	501	1170	0.023	26	25	0.0	0.0	3.370	A
C	802	200	5	1484	0.540	797	522	0.0	1.2	5.580	A

00:15 - 00:30

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	V/C Ratio	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	608	152	23	1472	0.413	607	938	0.6	0.8	4.502	A
B	31	8	601	1107	0.028	31	30	0.0	0.0	3.582	A
C	957	239	6	1483	0.646	955	626	1.2	1.9	7.268	A

00:30 - 00:45

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	V/C Ratio	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	744	186	28	1469	0.507	743	1144	0.8	1.1	5.360	A
B	39	10	735	1022	0.038	38	36	0.0	0.0	3.919	A
C	1173	293	8	1482	0.791	1165	766	1.9	3.8	11.884	B

00:45 - 01:00

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	V/C Ratio	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	744	186	29	1469	0.507	744	1151	1.1	1.1	5.380	A
B	39	10	737	1021	0.038	39	36	0.0	0.0	3.922	A
C	1173	293	8	1482	0.791	1172	767	3.8	3.9	12.403	B

01:00 - 01:15

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	V/C Ratio	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	608	152	24	1472	0.413	609	948	1.1	0.8	4.526	A
B	31	8	603	1106	0.028	32	30	0.0	0.0	3.590	A
C	957	239	6	1483	0.646	965	628	3.9	2.0	7.564	A

01:15 - 01:30

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	V/C Ratio	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	509	127	20	1475	0.345	510	790	0.8	0.6	4.045	A
B	26	7	504	1168	0.023	26	25	0.0	0.0	3.378	A
C	802	200	5	1484	0.540	805	526	2.0	1.3	5.710	A

Queue Variation Results for each time segment

00:00 - 00:15

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	0.57	0.57	1.08	1.52	1.57			N/A	N/A
B	0.02	0.00	0.00	0.02	0.02			N/A	N/A
C	1.24	0.59	1.07	1.50	1.55			N/A	NIA

00:15 - 00:30

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	0.76	0.12	0.94	1.49	1.56			NIA	NIA
B	0.03	0.03	0.27	0.48	0.51			NIA	NIA
C	1.91	0.06	0.77	4.85	7.30			NIA	NIA

00:30 - 00:45

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	1.10	0.03	0.28	1.10	1.10			NIA	NIA
B	0.04	0.03	0.27	0.48	0.51			NIA	NIA
C	3.83	0.03	0.33	4.14	17.75			NIA	NIA

00:45 - 01:00

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	1.11	0.03	0.29	1.11	1.31			NIA	NIA
B	0.04	0.00	0.00	0.04	0.04			NIA	NIA
C	3.94	0.03	0.30	3.94	8.37			NIA	NIA

01:00 - 01:15

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	0.77	0.38	1.04	1.51	1.57			N/A	N/A
B	0.03	0.00	0.00	0.03	0.03			N/A	N/A
C	2.00	0.06	0.74	5.14	7.85			N/A	N/A

01:15 - 01:30

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	0.57	0.06	0.65	1.43	1.53			N/A	N/A
B	0.02	0.00	0.00	0.02	0.02			N/A	N/A
C	1.28	0.04	0.41	3.23	5.75			N/A	N/A

Highway 52 and Powerline Road West - 2031, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

Intersection Network

Intersections

Intersection	Name	Intersection type	Use circulating lanes	Leg order	Intersection Delay (s)	Intersection LOS
	untitled	Standard Roundabout		A, B, C	11.66	B

Intersection Network

Driving side	Lighting	Network delay (s)	Network LOS
Right	Normal/unknown	11.66	B

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D2	2031	PM	ONE HOUR	16:00	17:30	15	✓

Demand overview (Traffic)

Leg	Linked leg	Profile type	Use O-D data	Average Demand (PCE/hr)	Scaling Factor (%)
A		ONE HOUR	✓	1117	100.000
B		ONE HOUR	✓	56	100.000
C		ONE HOUR	✓	885	100.000

Origin-Destination Data

Demand (PCE/hr)

J		To		
		A	B	C
From	A	0	13	1104
	B	9	0	47
	C	859	26	0

Vehicle Mix

Truck data entry mode	PCE Factor for a Truck (PCE)
Truck Percentages	2.00

Heavy Vehicle %

J		To		
		A	B	C
From	A	0	0	3
	B	0	0	18
	C	4	0	0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)
A	0.84	15.31	5.0	25.8	C	1025	1537
B	0.09	6.28	0.1	0.6	A	51	77
C	0.66	7.38	2.0	3.1	A	812	1218

Main Results for each time segment

16:00 -16:15

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	V/C Ratio	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	841	210	19	1475	0.570	836	650	0.0	1.3	5.752	A
B	42	11	826	965	0.044	42	29	0.0	0.1	4.473	A
C	666	167	7	1483	0.449	663	861	0.0	0.8	4.544	A

16:15 -16:30

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	V/C Ratio	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	1004	251	23	1472	0.682	1001	779	1.3	2.2	7.810	A
B	50	13	989	861	0.058	50	35	0.1	0.1	5.090	A
C	796	199	8	1482	0.537	794	1031	0.8	1.2	5.427	A

16:30 -16:45

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	V/C Ratio	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	1230	307	29	1469	0.837	1219	953	2.2	4.8	14.248	B
B	62	15	1205	725	0.085	62	43	0.1	0.1	6.221	A
C	974	244	10	1481	0.658	971	1257	1.2	2.0	7.298	A

16:45 -17:00

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	V/C Ratio	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	1230	307	29	1469	0.837	1229	956	4.8	5.0	15.311	C
B	62	15	1215	719	0.086	62	43	0.1	0.1	6.282	A
C	974	244	10	1481	0.658	974	1266	2.0	2.0	7.381	A

17:00 -17:15

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	V/C Ratio	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	1004	251	23	1472	0.682	1015	783	5.0	2.3	8.301	A
B	50	13	1003	852	0.059	50	35	0.1	0.1	5.151	A
C	796	199	8	1482	0.537	799	1046	2.0	1.2	5.496	A

17:15 -17:30

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	V/C Ratio	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	841	210	20	1475	0.570	844	655	2.3	1.4	5.916	A
B	42	11	835	959	0.044	42	29	0.1	0.1	4.503	A
C	666	167	7	1483	0.449	668	870	1.2	0.9	4.598	A

Queue Variation Results for each time segment

16:00 -16:15

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	1.35	0.58	1.15	1.53	1.79			N/A	N/A
B	0.05	0.00	0.00	0.05	0.05			N/A	N/A
C	0.84	0.57	1.04	1.45	1.51			N/A	N/A

16:15 -16:30

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	2.15	0.05	0.66	5.71	8.87			N/A	N/A
B	0.07	0.03	0.29	0.52	0.55			N/A	N/A
C	1.19	0.07	0.91	2.32	3.11			N/A	N/A

16:30 -16:45

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	4.84	0.03	0.35	9.16	25.83			N/A	N/A
B	0.11	0.03	0.30	0.54	0.57			N/A	N/A
C	1.95	0.03	0.28	1.95	1.95			N/A	N/A

16:45 -17:00

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	5.04	0.03	0.30	5.04	17.81			N/A	N/A
B	0.11	0.00	0.00	0.11	0.11			N/A	N/A
C	1.98	0.03	0.28	1.98	1.98			N/A	N/A

17:00 -17:15

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	2.27	0.05	0.50	6.15	10.00			N/A	N/A
B	0.07	0.00	0.00	0.07	0.07			N/A	N/A
C	1.22	0.11	1.08	1.99	2.66			N/A	N/A

17:15 -17:30

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	1.39	0.04	0.37	3.45	6.87			N/A	N/A
B	0.05	0.00	0.00	0.05	0.05			N/A	N/A
C	0.86	0.06	0.67	1.57	2.02			N/A	N/A

Junctions 10

ARCADY 10 - Roundabout Module

Version: 10.1.2.2275
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Filename: Highway 52 and Powerliner Road Alternative 2 - 2041 Single Lane 19Nov25.j 10
Path: \\PCK-RDC-P-01\Shared Work Areas\058409 - Creditview Implementation Strategy\058803 Highway 52 and Powerline Road\19Nov25
Report generation date: 11/19/2025 4:42:31 PM

»Highway 52 and Powerline Road West - 2041, AM
»Highway 52 and Powerline Road West - 2041, PM

Summary of intersection performance

	AM						PM					
	Set ID	Queue (PCE)	95% Queue (PCE)	Delay (s)	VIC Ratio	LOS	Set ID	Queue (PCE)	95% Queue (PCE)	Delay (s)	VIC Ratio	LOS
	Highway 52 and Powerline Road West - 2041											
Leg A	D1	1.3	1.6	5.78	0.54	A	D2	7.8	41.1	22.64	0.89	C
Leg B		0.0	0.5	4.07	0.04	A		0.1	0.6	6.90	0.10	A
Leg C		5.5	28.5	16.48	0.84	C		2.4	5.1	8.48	0.70	A

There are warnings associated with one or more model runs - see the 'Data Errors and Warnings' tables for each Analysis or Demand Set.

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

File summary

File Description

Title	Highway 52 and Powerline ROad West Alt 2
Location	
Site number	
Date	4/24/2025
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	RJBURNSIDE\AJunctions
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	PCE	PCE	perHour	s	-Min	perMin

Analysis Options

Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Show lane queues in feet / metres	Show all PICADY stream intercepts	Calculate residual capacity	V/C Ratio Threshold	Average Delay threshold (s)	Queue threshold (PCE)	Use simulation for HCM roundabouts	Use iterations for HCM roundabouts
5.75	✓					0.85	36.00	20.00		

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D1	2041	AM	ONE HOUR	00:00	01:30	15	✓
D2	2041	PM	ONE HOUR	16:00	17:30	15	✓

Analysis Set Details

ID	Name	Description	Include in report	Network flow scaling factor(%)	Network capacity scaling factor(%)
A1	Highway 52 and Powerline Road West	Alternative 2 three legged roundabout at poweline west	✓	100.000	100.000

Highway 52 and Powerline Road West - 2041, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

Intersection Network

Intersections

Intersection	Name	Intersection type	Use circulating lanes	Leg order	Intersection Delay (s)	Intersection LOS
	untitled	Standard Roundabout		A,B,C	12.15	B

Intersection Network

Driving side	Lighting	Network delay (s)	Network LOS
Right	Normal/unknown	12.15	B

Legs

Legs

Leg	Name	Description	No yield line
A	Highway 52 (South Leg)		
B	Powerline Road West		
C	Highway 52 (North Leg)		

Roundabout Geometry

Leg	V - Approach road half-width (m)	E • Entry width (m)	l' • Effective flare length (m)	R • Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Entry only	Exit only
A	3.50	5.50	30.0	40.0	46.0	20.0		
B	3.50	5.50	30.0	40.0	46.0	20.0		
C	3.50	5.50	30.0	40.0	46.0	20.0		

Slope / Intercept / Capacity

Leg Intercept Adjustments

Leg	Type	Reason	Percentage intercept adjustment (%)
A	Percentage		90.00
B	Percentage		90.00
C	Percentage		90.00

Roundabout Slope and Intercept used in model

Leg	Final slope	Final intercept (PCE/hr)
A	0.633	1487
B	0.633	1487
C	0.633	1487

The slope and intercept shown above include any corrections and adjustments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D1	2041	AM	ONE HOUR	00:00	01:30	15	✓

Demand overview (Traffic)

Leg	Linked leg	Profile type	Use 0-D data	Average Demand (PCE/hr)	Scaling Factor (%)
A		ONE HOUR	✓	721	100.000
B		ONE HOUR	✓	40	100.000
C		ONE HOUR	✓	1136	100.000

Origin-Destination Data

Demand (PCE/hr)

J	To			
		A	B	C
From	A	0	7	714
	B	8	0	32
	C	1109	27	0

Vehicle Mix

Truck data entry mode	PCE Factor for a Truck (PCE)
Truck Percentages	2.00

Heavy Vehicle %

J	To			
		A	B	C
From	A	0	50	8
	B	0	0	9
	C	7	17	0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)
A	0.54	5.78	1.3	1.6	A	662	992
B	0.04	4.07	0.0	0.5	A	37	55
C	0.84	16.48	5.5	**28.5**	C	1042	1564

Main Results for each time segment

00:00 • 00:15

Leg	Total Demand (PCE/hr)	Intersection **Arrivals** (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	**V/C Ratio**	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	543	136	20	1474	0.368	540	835	0.0	0.6	4.164	A
B	30	8	535	1149	0.026	30	25	0.0	0.0	3.445	A
C	855	214	6	1483	0.577	849	559	0.0	1.4	6.037	A

00:15 - 00:30

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	V/C Ratio	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	648	162	24	1472	0.440	647	1001	0.6	0.8	4.724	A
B	36	9	641	1082	0.033	36	30	0.0	0.0	3.685	A
C	1021	255	7	1482	0.689	1018	670	1.4	2.3	8.242	A

00:30 - 00:45

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	V/C Ratio	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	794	198	29	1468	0.541	792	1218	0.8	1.3	5.751	A
B	44	11	784	991	0.044	44	37	0.0	0.0	4.071	A
C	1251	313	9	1481	0.844	1239	820	2.3	5.3	15.214	C

00:45 - 01:00

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	V/C Ratio	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	794	198	30	1468	0.541	794	1229	1.3	1.3	5.780	A
B	44	11	786	990	0.045	44	37	0.0	0.0	4.075	A
C	1251	313	9	1481	0.844	1250	821	5.3	5.5	16.476	C

01:00 - 01:15

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	V/C Ratio	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	648	162	25	1471	0.440	650	1016	1.3	0.9	4.755	A
B	36	9	643	1080	0.033	36	31	0.0	0.0	3.694	A
C	1021	255	7	1482	0.689	1033	672	5.5	2.4	8.819	A

01:15 - 01:30

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	V/C Ratio	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	543	136	20	1474	0.368	544	845	0.9	0.6	4.195	A
B	30	8	538	1146	0.026	30	26	0.0	0.0	3.452	A
C	855	214	6	1483	0.577	859	563	2.4	1.5	6.221	A

Queue Variation Results for each time segment

00:00 - 00:15

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	0.63	0.60	1.08	1.52	1.57			N/A	N/A
B	0.03	0.00	0.00	0.03	0.03			N/A	N/A
C	1.44	0.61	1.25	1.71	1.93			N/A	NIA

00:15 - 00:30

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	0.84	0.11	0.94	1.54	1.62			NIA	NIA
B	0.04	0.03	0.27	0.48	0.51			NIA	NIA
C	2.31	0.06	0.74	6.12	9.46			NIA	NIA

00:30 - 00:45

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	1.26	0.03	0.28	1.26	1.26			NIA	NIA
B	0.05	0.03	0.27	0.49	0.52			NIA	NIA
C	5.26	0.04	0.37	10.91	28.51			NIA	NIA

00:45 - 01:00

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	1.27	0.03	0.29	1.27	1.49			NIA	NIA
B	0.05	0.00	0.00	0.05	0.05			NIA	NIA
C	5.51	0.03	0.32	5.51	21.37			NIA	NIA

01:00 - 01:15

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	0.86	0.29	1.03	1.51	1.57			N/A	N/A
B	0.04	0.00	0.00	0.04	0.04			N/A	N/A
C	2.44	0.05	0.51	6.67	10.95			N/A	NIA

01:15 - 01:30

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	0.64	0.07	0.75	1.45	1.54			N/A	N/A
B	0.03	0.00	0.00	0.03	0.03			N/A	N/A
C	1.48	0.04	0.38	3.65	7.44			N/A	N/A

Highway 52 and Powerline Road West - 2041, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

Intersection Network

Intersections

Intersection	Name	Intersection type	Use circulating lanes	Leg order	Intersection Delay (s)	Intersection LOS
	untitled	Standard Roundabout		A, B, C	16.11	C

Intersection Network

Driving side	Lighting	Network delay (s)	Network LOS
Right	Normal/unknown	16.11	C

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D2	2041	PM	ONE HOUR	16:00	17:30	15	✓

Demand overview (Traffic)

Leg	Linked leg	Profile type	Use O-D data	Average Demand (PCE/hr)	Scaling Factor (%)
A		ONE HOUR	✓	1192	100.000
B		ONE HOUR	✓	63	100.000
C		ONE HOUR	✓	944	100.000

Origin-Destination Data

Demand (PCE/hr)

J		To		
		A	B	C
From	A	0	14	1178
	B	10	0	53
	C	917	27	0

Vehicle Mix

Truck data entry mode	PCE Factor for a Truck (PCE)
Truck Percentages	2.00

Heavy Vehicle %

J		To		
		A	B	C
From	A	0	0	3
	B	0	0	18
	C	4	0	0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)
A	0.89	22.64	7.8	41.1	C	1094	1641
B	0.10	6.90	0.1	0.6	A	58	87
C	0.70	8.48	2.4	5.1	A	866	1299

Main Results for each time segment

16:00 -16:15

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	V/C Ratio	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	897	224	20	1474	0.609	891	694	0.0	1.6	6.292	A
B	47	12	881	930	0.051	47	31	0.0	0.1	4.677	A
C	711	178	7	1482	0.479	707	920	0.0	0.9	4.801	A

16:15 -16:30

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	V/C Ratio	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	1072	268	24	1472	0.728	1067	832	1.6	2.7	9.065	A
B	57	14	1055	820	0.069	57	37	0.1	0.1	5.410	A
C	849	212	9	1481	0.573	847	1102	0.9	1.4	5.880	A

16:30 -16:45

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	V/C Ratio	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	1312	328	30	1468	0.894	1294	1017	2.7	7.2	19.511	C
B	69	17	1279	678	0.102	69	45	0.1	0.1	6.782	A
C	1039	260	11	1480	0.702	1035	1337	1.4	2.4	8.333	A

16:45 -17:00

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	V/C Ratio	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	1312	328	30	1468	0.894	1310	1021	7.2	7.8	22.638	C
B	69	17	1295	668	0.104	69	45	0.1	0.1	6.896	A
C	1039	260	11	1480	0.702	1039	1353	2.4	2.4	8.476	A

17:00 -17:15

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	V/C Ratio	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	1072	268	24	1472	0.728	1091	837	7.8	2.9	10.220	B
B	57	14	1079	805	0.070	57	37	0.1	0.1	5.524	A
C	849	212	9	1481	0.573	853	1126	2.4	1.4	5.987	A

17:15 -17:30

Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Circulating flow (PCE/hr)	Capacity (PCE/hr)	V/C Ratio	Throughput (PCE/hr)	Throughput (exit side) (PCE/hr)	Start queue (PCE)	End queue (PCE)	Delay (s)	Unsignalised level of service
A	897	224	20	1474	0.609	902	700	2.9	1.6	6.536	A
B	47	12	892	923	0.051	48	31	0.1	0.1	4.717	A
C	711	178	8	1482	0.479	712	932	1.4	1.0	4.869	A

Queue Variation Results for each time segment

16:00 -16:15

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	1.57	0.61	1.52	1.90	2.01			N/A	N/A
B	0.06	0.00	0.00	0.06	0.06			N/A	N/A
C	0.95	0.57	1.04	1.45	1.51			N/A	N/A

16:15 -16:30

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	2.66	0.05	0.71	7.22	11.41			N/A	N/A
B	0.08	0.03	0.29	0.53	0.56			N/A	N/A
C	1.37	0.06	0.86	3.01	4.28			N/A	N/A

16:30 -16:45

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	7.21	0.04	0.45	19.79	38.64			N/A	N/A
B	0.13	0.03	0.30	0.54	0.57			N/A	N/A
C	2.38	0.03	0.29	2.38	5.12			N/A	N/A

16:45 -17:00

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	7.81	0.03	0.35	13.63	41.12			N/A	N/A
B	0.13	0.00	0.00	0.13	0.13			N/A	N/A
C	2.41	0.03	0.28	2.41	2.41			N/A	N/A

17:00 -17:15

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	2.86	0.05	0.45	7.94	13.88			N/A	N/A
B	0.09	0.00	0.00	0.09	0.09			N/A	N/A
C	1.41	0.08	1.07	2.84	3.84			N/A	N/A

17:15 -17:30

Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
A	1.63	0.03	0.34	3.51	8.49			N/A	N/A
B	0.06	0.00	0.00	0.06	0.06			N/A	N/A
C	0.97	0.05	0.51	2.02	3.00			N/A	N/A

Junctions 10

ARCADY 10 - Roundabout Module

Version: 10.1.2.2275
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Filename: Highway 52 Phase 3 Alternative solution 2- two lane 19Nov25.j10
Path: \\PCK-RDC-P-01\Shared Work Areas\058409 - Creditview Implementation Strategy\058803 Highway 52 and Powerline Road\19Nov25
Report generation date: 11/19/2025 4:47:15 PM

»Highway 52 and Powerline Road - 2041, AM

»Highway 52 and Powerline Road - 2041, PM

Summary of intersection performance

	AM									PM								
	Set ID	Queue (Veh)	95% Queue (Veh)	Delay (s)	VIC Ratio	LOS	Intersection Delay (s)	Intersection LOS	Network Residual Capacity	Set ID	Queue (Veh)	95% Queue (Veh)	Delay (s)	VIC Ratio	LOS	Intersection Delay (s)	Intersection LOS	Network Residual Capacity
	Highway 52 and Powerline Road - 2041																	
Leg 1	D1	0.7	2.3	3.36	0.43	A	5.93	A	31 % [Leg 3]	D2	2.4	4.7	6.53	0.70	A	5.99	A	36% [Leg 1]
Leg 2		0.0	0.5	3.97	0.05	A					0.1	0.5	6.37	0.11	A			
Leg 3		2.6	5.4	7.63	0.73	A					1.5	2.1	5.28	0.60	A			

There are warnings associated with one or more model runs - see the 'Data Errors and Warnings' tables for each Analysis or Demand Set.

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages. Network Residual Capacity indicates the amount by which network flow could be increased before a user-definable threshold (see Analysis Options) is met.

File summary

File Description

Title	Highway 52 and Powerline Road
Location	
Site number	
Date	*912412025*
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	RJBURNSIDEIAJunctions
Description	Phase 3-Alternative Solution 2

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	Veh	Veh	perHour	s	-Min	perMin

Analysis Options

Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Show lane queues in feet / **metres**	Show all PICADY stream intercepts	Calculate residual capacity	Residual capacity criteria type	VIC Ratio Threshold	Average Delay threshold (s)	Queue threshold (PCE)	Use simulation for HCM roundabouts	Use iterations forHCM roundabouts
5.75	✓				✓	Delay	0.85	36.00	20.00		

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D1	2041	AM	ONE HOUR	07:15	08:45	15	✓
D2	2041	PM	ONE HOUR	16:30	18:00	15	✓

Analysis Set Details

ID	Name	Include in report	Network flow scaling factor(%)	Network capacity scaling factor(%)
A1	Highway 52 and Powerline Road	✓	100.000	100.000

Highway 52 and Powerline Road - 2041, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		Truck% is zero for all movements / time segments. Vehicle **Mix** matrix should be completed whether working in PCUs or Vehs. If Truck% at the intersection is genuinely zero, please ignore this warning.
Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

Intersection Network

Intersections

Intersection	Name	Intersection type	Use circulating lanes	Leg order	Intersection Delay (s)	Intersection LOS
	Highway 52 and Powerline Road	Standard Roundabout		1, 2, 3	5.93	A

Intersection Network

Driving side	Lighting	Network residual capacity (%)	First leg reaching threshold	Network delay (s)	Network LOS
Right	Normal/unknown	31	Leg 3	5.93	**A**

Legs

Legs

Leg	Name	Description	No yield line
1	Highway 52 (South Bound)		
2	Powerline Road West		
3	Highway 52 (North bound)		

Roundabout Geometry

Leg	V • Approach road half-width (m)	E • Entry width (m)	l' • Effective flare length (m)	R • Entry radius (m)	D - Inscribed circle diameter (m)	PHI • Conflict (entry) angle (deg)	Entry only	Exit only
1	3.50	8.00	30.0	36.0	52.0	20.0		
2	3.50	5.50	20.0	30.0	46.0	20.0		
3	3.50	8.00	30.0	8.5	52.0	20.0		

Slope / Intercept / Capacity

Leg Intercept Adjustments

Leg	Type	Reason	Percentage intercept adjustment (%)
1	Percentage		90.00
2	Percentage		90.00
3	Percentage		90.00

Roundabout Slope and Intercept used in model

Leg	Final slope	Final intercept (PCE/hr)
1	0.689	1884
2	0.619	1437
3	0.631	1727

The slope and intercept shown above include any corrections and adjustments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D1	2041	AM	ONE HOUR	07:15	08:45	15	✓

Demand overview (Traffic)

Leg	Linked leg	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor(%)
1		ONE HOUR	✓	721	100.000
2		ONE HOUR	✓	40	100.000
3		ONE HOUR	✓	1136	100.000

Origin-Destination Data

Demand (Veh/hr)

J	To			
		1	2	3
From	1	0	7	714
	2	8	0	32
	3	1109	27	0

Vehicle Mix

Truck data entry mode	PCE Factor for a Truck (PCE)
Truck Percentages	2.00

Heavy Vehicle %

J	To			
		1	2	3
From	1	0	0	0
	2	0	0	0
	3	0	0	0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Intersection Arrivals (Veh)
1	0.43	3.36	0.7	2.3	A	662	992
2	0.05	3.97	0.0	0.5	A	37	55
3	0.73	7.63	2.6	5.4	A	1042	1564

Main Results for each time segment

07:15 • 07:30

Leg	Total Demand (Veh/hr)	Intersection Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	543	136	20	1870	0.290	541	837	0.0	0.4	2.704	A
2	30	8	536	1105	0.027	30	25	0.0	0.0	3.347	A
3	855	214	6	1724	0.496	851	560	0.0	1.0	4.109	A

07:30 • 07:45

Leg	Total Demand (Veh/hr)	Intersection Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput **(exit** side) (Veh/hr)	Start queue (Veh)	End queue **(Veh)**	Delay (s)	Unsignalised level of service
1	648	162	24	1868	0.347	648	1002	0.4	0.5	2.949	A
2	36	9	641	1040	0.035	36	31	0.0	0.0	3.584	A
3	1021	255	7	1723	0.593	1019	670	1.0	1.4	5.103	A

07:45 • 08:00

Leg	Total Demand (Veh/hr)	Intersection Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue **(Veh)**	Delay (s)	Unsignalised level of service
1	794	198	30	1864	0.426	793	1225	0.5	0.7	3.357	A
2	44	11	785	951	0.046	44	37	0.0	0.0	3.969	A
3	1251	313	9	1722	0.726	1246	820	1.4	2.6	7.496	A

08:00 • 08:15

Leg	Total Demand (Veh/hr)	Intersection Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	794	198	30	1864	0.426	794	1230	0.7	0.7	3.363	A
2	44	11	786	950	0.046	44	37	0.0	0.0	3.971	A
3	1251	313	9	1722	0.726	1251	821	2.6	2.6	7.630	A

08:15 • 08:30

Leg	Total Demand (Veh/hr)	Intersection Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	648	162	24	1867	0.347	649	1009	0.7	0.5	2.958	A
2	36	9	643	1039	0.035	36	31	0.0	0.0	3.587	A
3	1021	255	7	1723	0.593	1026	671	2.6	1.5	5.198	A

08:30 • 08:45

Leg	Total Demand (Veh/hr)	Intersection Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	543	136	20	1870	0.290	543	843	0.5	0.4	2.715	A
2	30	8	538	1104	0.027	30	26	0.0	0.0	3.351	A
3	855	214	6	1724	0.496	857	562	1.5	1.0	4.165	A

Queue Variation Results for each time segment

07:15 • 07:30

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
	0.41	0.00	0.00	0.41	0.41			N/A	N/A
2	0.03	0.00	0.00	0.03	0.03			N/A	N/A
3	0.98	0.55	1.00	1.40	1.45			N/A	N/A

07:30 • 07:45

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile **message**	Marker **message**	Probability of reaching or exceeding **marker**	Probability of exactly reaching **marker**
	0.53	0.53	1.00	1.40	1.45			N/A	NIA
2	0.04	0.03	0.25	0.45	0.48			NIA	NIA
3	1.44	0.05	0.64	3.49	5.18			NIA	NIA

07:45 • 08:00

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
	0.74	0.03	0.25	0.74	0.74			NIA	NIA
2	0.05	0.03	0.25	0.46	0.48			NIA	NIA
3	2.58	0.03	0.28	2.58	5.42			NIA	NIA

08:00 • 08:15

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile **message**	Marker **message**	Probability of reaching or exceeding **marker**	Probability of exactly reaching **marker**
	0.74	0.03	0.28	0.74	2.26			NIA	NIA
2	0.05	0.00	0.00	0.05	0.05			NIA	NIA
3	2.61	0.03	0.27	2.61	2.61			NIA	NIA

08:15 • 08:30

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
	0.53	0.53	1.00	1.40	1.45			NIA	NIA
2	0.04	0.00	0.00	0.04	0.04			NIA	NIA
3	1.48	0.08	1.07	2.99	4.11			NIA	NIA

08:30 • 08:45

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile **message**	Marker **message**	Probability of reaching or exceeding **marker**	Probability of exactly reaching **marker**
	0.41	0.00	0.00	0.41	0.41			NIA	NIA
2	0.03	0.00	0.00	0.03	0.03			NIA	NIA
3	0.99	0.05	0.49	2.20	3.30			NIA	NIA

Highway 52 and Powerline Road - 2041, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		Truck% is zero for all movements / time segments. Vehicle **Mix** matrix should be completed whether working in PCUs or Vehs. If Truck% at the intersection is genuinely zero, please ignore this warning.
Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

Intersection Network

Intersections

Intersection	Name	Intersection type	Use circulating lanes	Leg order	Intersection Delay (s)	Intersection LOS
	Highway 52 and Powerline Road	Standard Roundabout		1, 2, 3	5.99	A

Intersection Network

Driving side	Lighting	Network residual capacity (%)	First leg reaching threshold	Network delay (s)	Network LOS
Right	Normal/unknown	36	Leg 1	5.99	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D2	2041	PM	ONE HOUR	16:30	18:00	15	✓

Demand overview (Traffic)

Leg	Linked leg	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor(%)
1		ONE HOUR	✓	1192	100.000
2		ONE HOUR	✓	63	100.000
3		ONE HOUR	✓	944	100.000

Origin-Destination Data

Demand (Veh/hr)

From \ To	1	2	3
1	0	14	1178
2	10	0	53
3	917	27	0

Vehicle Mix

Truck data entry mode	PCE Factor for a Truck (PCE)
Truck Percentages	2.00

Heavy Vehicle %

From \ To	1	2	3
1	0	0	0
2	0	0	0
3	0	0	0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Intersection Arrivals (Veh)
1	0.70	6.53	2.4	4.7	A	1094	1641
2	0.11	6.37	0.1	0.5	A	58	87
3	0.60	5.28	1.5	2.1	A	866	1299

Main Results for each time segment

16:30 • **16:45**

Leg	Total Demand (Veh/hr)	Intersection Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	897	224	20	1870	0.480	894	695	0.0	0.9	3.673	A
2	47	12	883	890	0.053	47	31	0.0	0.1	4.269	A
3	711	178	7	1723	0.413	708	923	0.0	0.7	3.539	A

16:45 -17:00

Leg	Total Demand (Veh/hr)	Intersection Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	1072	268	24	1868	0.574	1070	832	0.9	1.3	4.504	A
2	57	14	1057	782	0.072	57	37	0.1	0.1	4.959	A
3	849	212	9	1722	0.493	848	1105	0.7	1.0	4.112	A

17:00 -17:15

Leg	Total Demand (Veh/hr)	Intersection Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	1312	328	30	1864	0.704	1308	1019	1.3	2.3	6.436	A
2	69	17	1293	636	0.109	69	45	0.1	0.1	6.345	A
3	1039	260	11	1721	0.604	1037	1351	1.0	1.5	5.251	A

17:15 -17:30

Leg	Total Demand (Veh/hr)	Intersection Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	1312	328	30	1864	0.704	1312	1021	2.3	2.4	6.525	**A**
2	69	17	1297	634	0.109	69	45	0.1	0.1	6.374	A
3	1039	260	11	1721	0.604	1039	1355	1.5	1.5	5.284	**A**

17:30 -17:45

Leg	Total Demand (Veh/hr)	Intersection Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	1072	268	24	1868	0.574	1076	835	2.4	1.4	4.569	A
2	57	14	1063	779	0.073	57	37	0.1	0.1	4.985	A
3	849	212	9	1722	0.493	851	1111	1.5	1.0	4.142	A

17:45 -18:00

Leg	Total Demand (Veh/hr)	Intersection Arrivals (Veh)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
1	897	224	20	1870	0.480	899	699	1.4	0.9	3.715	A
2	47	12	889	887	0.053	48	31	0.1	0.1	4.290	A
3	711	178	8	1723	0.413	712	929	1.0	0.7	3.566	A

Queue Variation Results for each time segment

16:30 • 16:45

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
	0.92	0.55	1.00	1.40	1.45			N/A	N/A
2	0.06	0.00	0.00	0.06	0.06			N/A	N/A
3	0.70	0.55	1.00	1.40	1.45			N/A	N/A

16:45 -17:00

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
	1.33	0.05	0.63	3.13	4.69			N/A	N/A
2	0.08	0.03	0.26	0.47	0.50			N/A	**N/A**
3	0.96	0.07	0.84	1.69	2.13			N/A	N/A

17:00 -17:15

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
	2.33	0.03	0.27	2.33	2.75			N/A	N/A
2	0.12	0.03	0.26	0.47	0.49			N/A	N/A
3	1.50	0.03	0.26	1.50	1.50			N/A	N/A

17:15 -17:30

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
	2.35	0.03	0.26	2.35	2.35			N/A	N/A
2	0.12	0.00	0.00	0.12	0.12			N/A	N/A
3	1.51	0.03	0.26	1.51	1.51			N/A	N/A

17:30 -17:45

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
	1.36	0.10	1.12	2.54	3.29			N/A	N/A
2	0.08	0.00	0.00	0.08	0.08			N/A	N/A
3	0.98	0.24	1.01	1.12	1.58			N/A	N/A

17:45 -18:00

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
	0.93	0.05	0.61	1.85	2.67			N/A	N/A
2	0.06	0.00	0.00	0.06	0.06			N/A	N/A
3	0.71	0.07	0.76	1.40	1.48			N/A	N/A

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix B

Synchro Traffic Operations Analysis Results



Lane Configurations						
Traffic Volume (vph)	8	1	1135	12	4	738
Future Volume (vph)	8	1	1135	12	4	738
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)	0%		0%			0%
Storage Length (m)	0.0	0.0		65.0	25.0	
Storage Lanes	1	0		1	1	
Taper Length (m)	7.6				25.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.986			0.850		
Flt Protected	0.957				0.950	
Satd. Flow (prot)	1813	0	1921	1633	1372	1762
Flt Permitted	0.957				0.950	
Satd. Flow (perm)	1813	0	1921	1633	1372	1762
Link Speed (k/h)	60		48			70
Link Distance (m)	299.7		358.7			431.5
Travel Time (s)	18.0		26.9			22.2
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	33%	9%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	9	1	1234	13	4	802
Shared Lane Traffic (%)						
Lane Group Flow (vph)	10	0	1234	13	4	802
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 69.7%		ICU Level of Service C	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	8	1	1135	12	4	738
Future Vol, veh/h	8	1	1135	12	4	738
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	65	25	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	33	9
Mvmt Flow	9	1	1234	13	4	802

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2044	1234	0	0	1247	0
Stage 1	1234	-	-	-	-	-
Stage 2	810	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.43	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.497	-
Pot Cap-1 Maneuver	63	218	-	-	464	-
Stage 1	277	-	-	-	-	-
Stage 2	441	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	62	218	-	-	464	-
Mov Cap-2 Maneuver	62	-	-	-	-	-
Stage 1	277	-	-	-	-	-
Stage 2	437	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	67.7	0	0.1
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	67	464	-
HCM Lane V/C Ratio	-	-	0.146	0.009	-
HCM Ctrl Dly (s/v)	-	-	67.7	12.8	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q (veh)	-	-	0.5	0	-



Lane Configurations						
Traffic Volume (vph)	4	7	940	7	1	1222
Future Volume (vph)	4	7	940	7	1	1222
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)	0%		0%			0%
Storage Length (m)	0.0	0.0		65.0	25.0	
Storage Lanes	1	0		1	1	
Taper Length (m)	7.6				25.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.910			0.850		
Flt Protected	0.984				0.950	
Satd. Flow (prot)	1720	0	1921	1633	1372	1762
Flt Permitted	0.984				0.950	
Satd. Flow (perm)	1720	0	1921	1633	1372	1762
Link Speed (k/h)	60		48			70
Link Distance (m)	299.7		358.7			431.5
Travel Time (s)	18.0		26.9			22.2
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	33%	9%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	4	8	1022	8	1	1328
Shared Lane Traffic (%)						
Lane Group Flow (vph)	12	0	1022	8	1	1328
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 74.3%		ICU Level of Service D	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	7	940	7	1	1222
Future Vol, veh/h	4	7	940	7	1	1222
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	65	25	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	33	9
Mvmt Flow	4	8	1022	8	1	1328

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2352	1022	0	0	1030	0
Stage 1	1022	-	-	-	-	-
Stage 2	1330	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.43	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.497	-
Pot Cap-1 Maneuver	40	289	-	-	568	-
Stage 1	350	-	-	-	-	-
Stage 2	249	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	40	289	-	-	568	-
Mov Cap-2 Maneuver	40	-	-	-	-	-
Stage 1	350	-	-	-	-	-
Stage 2	249	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	51.6	0	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	89	568	-
HCM Lane V/C Ratio	-	-	0.134	0.002	-
HCM Ctrl Dly (s/v)	-	-	51.6	11.4	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q (veh)	-	-	0.4	0	-

Hamilton MCEA Highway 52 and Powerline Road West Intersection Improvements

Preliminary Stormwater Management Study

City of Hamilton
71 Main Street West
Hamilton ON L8P 4Y5

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February 2026
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Appendix E Stormwater Management

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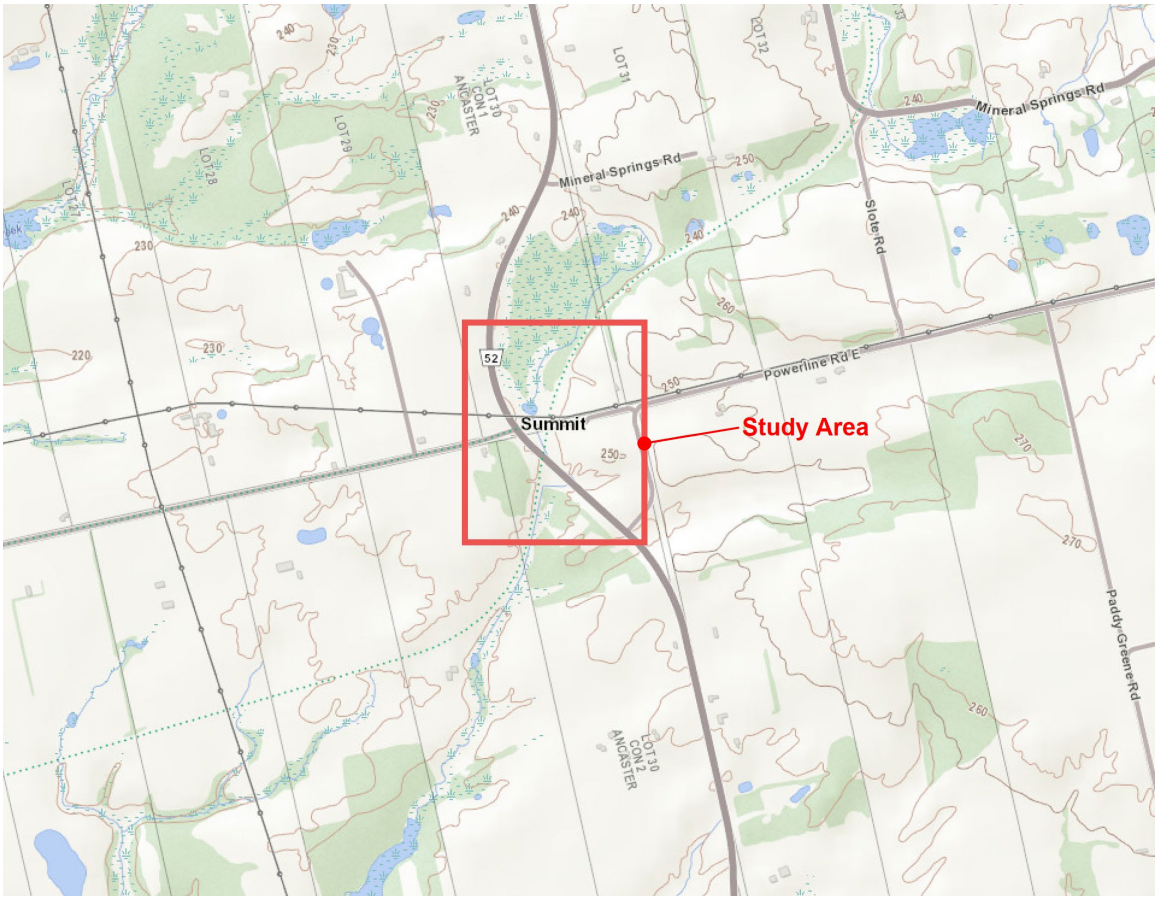
1.0 Introduction

1.1 Background

R.J. Burnside & Associates Limited (Burnside) has been retained by City of Hamilton (City) to undertake a Schedule C Municipal Class Environmental Assessment (MCEA) to review intersection improvement options at the intersections of Highway 52 and Powerline Road West, and Highway 52 and Powerline Road East.

The purpose of this report is to provide a review of existing drainage conditions, assess the proposed alternatives, and summarize the stormwater management requirements for the preferred alternative design. The study area is shown in Figure 1 below.

Figure 1: Study Area Plan



1.2 Site Context

Highway 52 runs in a northwest to southeast direction, and Powerline Road West in a west to east direction. Land use adjacent to the ROW varies including farmlands, conservation areas, and a dairy farm on the northwest side.

The existing Highway 52 and Powerline Road West have rural two-lane cross sections, with a designated right-turn lane on Highway 52 at the intersection. There are no pedestrian or cyclist facilities, and the right-of-way (ROW) width varies.

2.0 Design Criteria

The relevant stormwater management and drainage design criteria and guideline documents are listed below:

- Comprehensive Development Guidelines and Financial Policies Manual, City (2019)
- Storm Drainage Policy, City (2004)
- Stormwater Master Plan – Class Environmental Assessment Report (SWMMP), City (2007)
- Highway Drainage Design Standards (HDDS), Ontario Ministry of Transportation (MTO) (2024)
- Stormwater Management Planning and Design Manual, Ministry of Environment Conservation and Parks (MECP) (2003)

The design criteria are summarized in Table 1 below.

Table 1: Design Criteria

Document	Standard	Criteria
-	Road Classification	Existing: Rural Arterial Undivided
Non-watercourse Culvert		
MTO	Design Flow (SD-1, 1.1)	Minor System: 10% Annual Exceedance Probability (AEP) (i.e., Ten-Year Return Period) Major System: 1% AEP (i.e., 100-Year Return Period)
MTO	Flow Depth - Major System (SD-9, 2.2)	No roadway overtopping
MTO	Freeboard to Top of Subgrade - Minor System (WC-7, 3.3)	Minimum 0.3 m
Watercourse Culvert		
MTO	Design Flow (WC-1)	Design Storm: 4% AEP (i.e., 25-Year Return Period) - span less than 6 m
MTO	Freeboard to Edge of Travelled Lane - Design Storm (WC-7, 3.2)	Minimum 1 m
MTO	Maximum Depth of Flow on Roadway - Regional Storm (WC-13, 3.2.1)	Maximum 0.3 m
MTO	Velocity x Depth on Roadway - Regional Storm (WC-13, 3.2.2)	Maximum 0.8 m^2/s
Stormwater Management		
City / MECP	Quantity Control	Post to Pre-Development Peak Flow Control
City	Quality Control	Level 2 – Normal

Additionally, a permit may be required from the Grand River Conservation Authority (GRCA), and Niagara Escarpment Commission (NEC) if proposed improvements extend into the NECs Development Control Area.

Although the Copetown Bog is GRCA regulated, the Bog and Hamilton – Brantford Rail Trail within the study area are owned by the Hamilton Conservation Authority (HCA), therefore design of the preferred alternative is to be circulated to the HCA.

3.0 Existing Conditions

The study area is located within the headwaters of Big Creek within the Lower Middle Grand River Subwatershed. The area is within the jurisdiction of the Grand River Conservation Authority (GRCA) with GRCA regulated areas adjacent to the roadway. There is one watercourse crossing within the project limits. Two Provincially Significant Wetlands (PSW), the Copetown Bog and the Big Creek Headwaters Wetland Complex, are present within the study area.

Existing drainage is conveyed through roadside ditches and crossing and entrance culverts to a GRCA regulated watercourse which drains to the Big Creek Headwaters Wetland Complex.

3.1 Hydrologic Analysis

Contributing catchment areas were determined using LiDAR contours and the Ontario Watershed Information Tool (OWIT) from the Ministry of Natural Resources and Forestry. The catchment generally consists of overland flow and drainage within the road right-of-way. Refer to Appendix A for the drainage area plan.

The Soil Survey Complex, prepared by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), was used to determine soil types. Each soil type has been categorized into hydrological soil groups in accordance with the MTO soil classification system. Refer to Appendix B for soil groups breakdown.

The 24-hour SCS Type-II Storm rainfall distributions govern the two-year to 100-year storm peak flow calculations. The SCS storm distributions were based on the IDF curves found in the City's Development Guidelines. The study area is located within the GRCA jurisdiction; therefore, the Hurricane Hazel regional storm event has also been included in the analysis for watercourse culverts.

Time of concentration (Tc) was calculated with consideration of the catchment runoff coefficient (C). When C is less than 0.40 then the Airport Method was used, and the Bransby-Williams Formula was used when C is greater than or equal to 0.40. The overland flow lengths and slopes were determined through the topographic survey and OWIT. Peak flows were determined using the Unit Hydrograph method in Visual OTTHYMO 6.2 (VO).

The existing hydrology parameters for each catchment and peak flow rates for each culvert are summarized in Table 2 and Table 3, respectively. Detailed calculations and VO outputs can be found in Appendix B.

Table 2: Existing Culvert Catchment Hydrologic Modelling Parameters

Catchment ID	Area (ha)	Runoff Coefficient	Curve Number (CNII / CNIII)	Initial Abstraction Ia (mm)	Time to Peak Tp (hr)
100	10.16	0.30	70 / 84	6.40	0.50
101	1.64	0.23	54 / 73	8.68	0.31
102	30.54	0.22	60 / 78	8.44	0.80
103	2.44	0.30	66 / 82	6.17	0.19
104	63.64	0.26	66 / 82	7.53	1.08
105	40.46	0.17	73 / 86	5.55	0.79
106	3.71	0.29	69 / 84	7.03	0.25
107	22.53	0.25	62 / 79	8.10	1.45

Table 3: Culvert Peak Flow Rates (m^3/s)

Design Storm	Return Period	Culvert 1	Culvert 2	Culvert 3	Culvert 4	Culvert 5
24-hour SCS Type II	2-Year	0.18	0.02	1.34	0.25	0.10
24-hour SCS Type II	5-Year	0.34	0.04	2.53	0.49	0.19
24-hour SCS Type II	10-Year	0.45	0.06	3.43	0.68	0.26
24-hour SCS Type II	25-Year	0.62	0.09	4.69	0.96	0.36
24-hour SCS Type II	50-Year	0.74	0.11	5.61	1.17	0.43
24-hour SCS Type II	100-Year	0.86	0.13	6.57	1.39	0.50
Hurricane Hazel	Regional Storm	1.23	0.19	13.74	3.10	0.50

The Lower Middle Grand River Subwatershed Natural Heritage Characterization Report by GRCA dated July 14, 2017, states that the ponds and wetlands within the Copetown Bog are generally hydrologically isolated from Big Creek, except for intermittent outflow via the southern culvert. The watercourse south of the

Copetown Bog within the study limits was found to be fairly dry during multiple field visits conducted throughout the year by Burnside staff. Runoff control / storage in the Copetown Bog has not been accounted for in the above flows. Flows are recommended to be refined during detailed design, including review of the Copetown Bog storage impacts.

3.2 Hydraulic Analysis

Only existing crossing culverts on Highway 52 have been assessed. Hamilton-Brantford Rail Trail, driveway, and entrance culverts and Culvert 5 are to be assessed during detailed design

The existing crossing culverts were assessed using CulvertMaster hydraulic software (CVM). Existing culvert and roadway parameters were obtained from the topographic survey provided by the City and Geotechnical Investigation (October 2025) completed by JLP Services Inc. (JLP).

In the existing condition, Culvert 1 outlets to a low spot within the roadside ditch that has no outlet. The ditch is anticipated to provide storage prior to runoff ultimately spilling over towards the Copetown Bog and east watercourse.

Based on OWIT, the watercourse alignment flows from the Copetown Bog to the Big Creek Headwaters Wetland Complex through Culvert 5. However, based on the topographic survey, there is a high point in the watercourse between Culverts 3 and 5, indicating that the watercourse may be conveyed through Culvert 3 instead. Therefore, Culvert 3 was assessed using watercourse criteria.

The existing culvert parameters and a summary of the hydraulic analysis are provided below in Table 4 and Table 5, respectively. Detailed analysis and CVM outputs can be found in Appendix C.

Based on the analysis, Culverts 2 and 4 meet all applicable standards. Culvert 1 has less than the required 0.30 m of freeboard to top of subgrade during the design storm. Although Culvert 3 does not meet the standards, as discussed in Section 3.1, no drainage issues or flooding were identified during multiple field visits throughout the year; therefore, the flows from the Copetown Bog (i.e. Catchment Areas 104, 105, and 107) are to be refined during detailed design.

Table 4: Existing Culvert Parameters

Culvert ID	Material	Dia. (mm)	Up stream Invert (m)	Down stream Invert (m)	Length (m)	Slope (%)	Edge of Shoulder (m)	Top of Subgrade (m)
1	CSP	750	237.58	237.46	25.99	0.48	239.23	238.54
2	CSP	800	236.84	236.38	29.81	1.53	238.61	237.92
3	CSP	900	236.06	235.76	30.51	0.98	238.65	238.08
4	CSP	1000	236.49	236.30	44.71	0.42	243.57	242.88

Table 5: Existing Hydraulic Analysis

Culvert ID	Return Period	Headwater Elevation (m)	Freeboard (m) [1]	Velocity (m/s)
1	10-Yr	238.32	0.22	1.24
1	100-Yr	238.91	0.32	2.34
2	10-Yr	237.08	0.84	1.00
2	100-Yr	237.19	1.42	1.25
3	25-Yr	238.94	-0.29	3.27
3	100-Yr	239.06	-0.41	3.23
3	Regional	239.43	-0.78	1.49[2]
4	10-Yr	237.31	5.57	1.20
4	100-Yr	237.93	5.64	2.43

[1] For the 10-year storm freeboard is measured from the top of subgrade, whereas for the remaining storms, freeboard is measured from the edge of the travelled lane.
[2] Velocity of flow on the roadway. Regional storm velocity x depth on roadway for Culvert 3, is greater than 0.8 m^2/s.

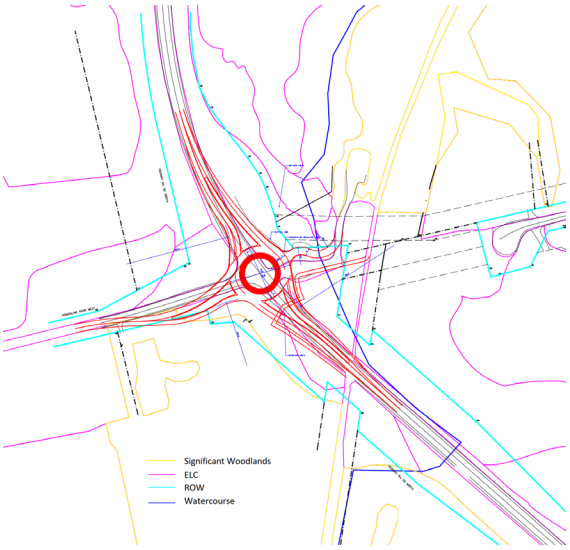
4.0 Alternatives Comparison

Three alternative designs for the preliminary preferred alternative solution were evaluated, involving a roundabout at the intersection and Hamilton-Brantford Rail Trail adjustments. The proposed roundabout may result in potential increases in the impervious area; however, increases are anticipated to be similar in all three alternatives.

4.1 Option 1

Option 1 involves a roundabout centered on the existing Highway 52 and Powerline Road intersection. Four culverts may be impacted and require extension or replacement, and ditch regrading will be required. However, as the roundabout will be centered in the existing intersection center, Option 1 is anticipated to have the least significant drainage impacts.

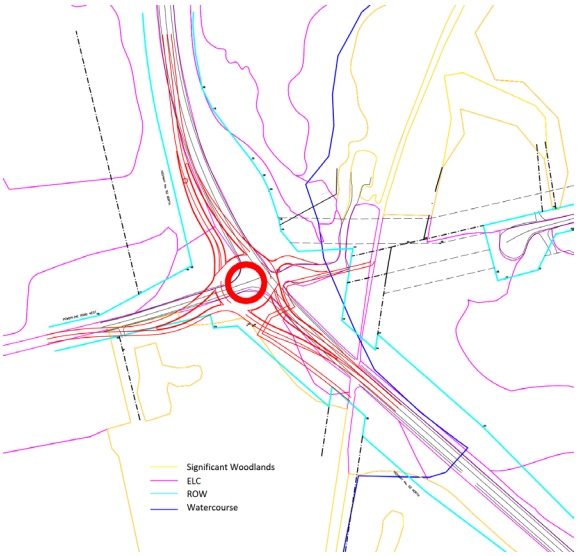
Figure 2: Option 1



4.2 Option 2

Option 2 involves a roundabout shifted west of the existing Highway 52 and Powerline Road intersection. Four culverts may be impacted and require extension or replacement, and as the roundabout center will be shifted compared to the existing intersection center, Option 2 is anticipated to require more additional ditch regrading than Option 1.

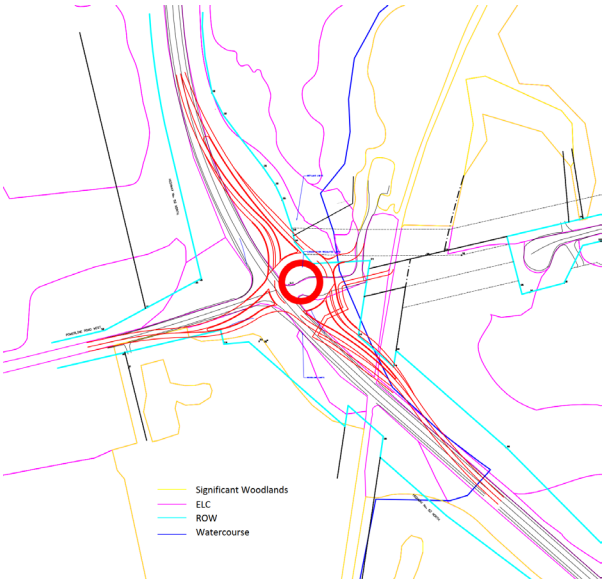
Figure 3: Option 2



4.3 Option 3

Option 3 involves a roundabout shifted east of the existing Highway 52 and Powerline Road intersection. Six culverts may be impacted and require extension or replacement, ditch regrading and watercourse realignment will be required, and the proposed grading may encroach into the Provincially Significant Wetland (PSW) Copetown Bog. Option 3 is anticipated to have the most significant drainage impacts.

Figure 4: Option 3



5.0 Preferred Alternative

Based on the overall evaluation, Option 2 was found to be the preferred alternative, due to the limited impact on the natural environment including the PSWs, significant woodlands, GRCA regulated lands, NEC protection area, and Hamilton environmentally sensitive area, no required property acquisition, moderate cost, greatest sight distance, and no impact to the potential cultural heritage landscape associated with the Hamilton-Branford Rail Trail. SWM was not the determining factor. Details regarding the SWM impacts of the preferred alternative are provided below.

5.1 Conveyance

The existing drainage patterns and outlet locations will generally be maintained in the proposed condition. Drainage will continue to be conveyed through roadside ditches and culverts to the regulated watercourse. Roundabout drainage is anticipated to be conveyed to roadside ditches by curb outlets or catch basin (CB) outlets, a preliminary layout has been included in the design drawings, however layout is to be refined pending detailed grading to be done during detailed design.

The improvements for the preferred alternative are anticipated to impact Culverts 1 to 3. The widening required to accommodate intersection improvements at Highway 52 and Powerline Road East is minor and not anticipated to impact Culvert 4. Culvert 5 is not anticipated to be impacted, however, only the upstream end of the culvert was identified in the topographic survey.

A functional design of Culverts 1 to 3 has been completed based on preliminary grading, however the need for culvert replacements or extensions, and design is to be confirmed at detailed design, based on culvert condition and detailed grading. As mentioned below in Section 5.2, impervious area and peak flows are not anticipated to significantly increase as a result of the proposed improvements, therefore existing flows were utilized to size the proposed culverts. Proposed culverts are of equal or larger diameter than existing to ensure existing conditions are not worsened. Road subgrade was assumed based on the proposed pavement structure identified for the interim left turn detailed design project for the same location (C15-27-26 (TR)).

Culvert 1 is proposed to be shifted north to accommodate the proposed roundabout. Preliminary ditch grading for Culvert 1 is provided in the 30% design drawings, however, alternatives such as retaining wall, slope stabilization, etc.

are to be investigated during detailed design. Culverts 2 and 3 are to remain in the same location, with lengthening on one or both sides as a result of the preliminary grading.

The proposed culvert parameters and a summary of the hydraulic analysis are provided below in Table 6 and Table 7, respectively. Detailed analysis and CVM outputs can be found in Appendix D.

Table 6: Proposed Culvert Parameters

Culvert ID	Material	Dia. (mm)	Upstream Invert (m)	Downstream Invert (m)	Length (m)	Slope (%)	Edge of Shoulder (m)	Top of Subgrade (m)
1	HDPE	750	238.34	237.49	41.89	2.04	240.33	239.55
2	HDPE	900	236.82	236.51	36.26	0.84	238.83	238.05
3	HDPE	2x1350	236.06	235.89	34.11	0.50	238.78	238.01

Table 7: Proposed Hydraulic Analysis

Culvert ID	Return Period	Headwater Elevation (m)	Freeboard (m)[1]	Velocity (m/s)
1	10-Yr	238.96	0.59	1.00
1	100-Yr	239.25	1.08	1.90
2	10-Yr	237.01	1.04	1.30
2	100-Yr	237.10	1.73	1.62
3	25-Yr	237.28	1.50	2.38
3	100-Yr	237.56	1.22	2.90
3	Regional	238.93	-0.15	0.68 [2]

[1] For the 10-year storm freeboard is measured from the top of subgrade, whereas for the remaining storms, freeboard is measured from the edge of the travelled lane.

[2] Velocity of flow on the roadway. Regional storm velocity x depth on roadway for Culvert 3, is less than 0.8 m^2/s.

Based on the analysis, all culverts meet the applicable standards. As discussed in Sections 3.1 and 3.2, flows draining to Culvert 3 from the Copetown Bog and culvert sizing are to be confirmed during detailed design. Provided culvert designs are preliminary and to be confirmed in detailed design based on detailed road design and grading. Preliminary ditches have been provided in the design for the proposed culverts, refinement to be addressed in detailed design based on detailed roadway grading.

The culvert under the parking access will need to be replaced or extended due to the proposed improvements. Design is to be completed during detailed design based on the grading of the new access and realigned rail trail.

As discussed in Section 3.2, existing ditch storage is present at the outlet of Culvert 1. Based on preliminary grading, the proposed improvements are anticipated to have a minor impact on the provided storage, and no impact to the Bog or watercourse. Further confirmation is to be provided during detailed design.

5.2 Stormwater Management

In the existing condition, there are no forms of quantity control and quality control is provided via roadside ditches.

As per the City's and MECP standards, on-site post-development to pre-development peak flow control is required for all storms. A breakdown of the existing and proposed ROW impervious area is shown in Table 8 below. Refer to the design drawings for details regarding the proposed design.

Table 8: ROW Impervious Area

Scenario	Total Area (ha)	Impervious Area (ha)	Total Impervious Percentage	Increase in Impervious Area (ha)	% Increase in Impervious Area
Existing	5.86	1.37	23.4%	-	-
Proposed	5.86	1.53	26.1%	0.16	12%

The increase in impervious area is only anticipated to result in a ROW peak flow increase of approximately 5% based on rational method. Although the ROW flows are anticipated to increase by 5%, the ROW only accounts for a small portion of the total drainage area contributing to the outlet. As a result of the

large external catchments, the increased ROW impervious area is anticipated to have a negligible impact on peak flows at the outlets. Therefore, stormwater quantity control is not recommended for this project. Detailed calculations are provided in Appendix E.

Table 10.3 in the City's SWMMMP states that Level 2 – Normal quality control is required for the Big Creek watershed. However, as the project falls under a retrofit scenario with minor changes to impervious area, a best-efforts approach is recommended. Quality control is recommended to continue being provided through roadside ditches at a minimum. Additionally, CB treatment devices such as CB Shield or EnviroBasin can be utilized. These devices are verified through ETV Canada (Environmental Technology Verification) to provide up to 60% TSS removal.

Quantity and quality control can be supplemented through Low Impact Development measures (LIDs). Typically, LID features are infiltration based and include infiltration trenches, bioswales, vegetated swales, etc. These measures are to be implemented where it is determined they will be functional, will achieve the desired goal or protection, and will not conflict with utilities. Implementation of LID features is highly dependent on soil type and groundwater levels.

Five boreholes (BH) were drilled as part of the Geotechnical Investigation completed by JLP as part of the interim left turn detailed design project for the same location
(C15-27-26 (TR)). The BHs typically revealed a surface layer of topsoil or pavement structure, with silty sand to sandy silt below. Groundwater was not encountered in any of the BHs; however, it is important to note that seasonal fluctuation of groundwater level is expected.

Location specific percolation rates and seasonally high groundwater elevations should be determined to complete a more comprehensive design of proposed LID infiltration measures. This information will determine where functional infiltration-based LID measures are achievable. Feasibility and locations of LIDs are to be assessed as part of detailed design.

6.0 Conclusions and Recommendations

This report provides a review of existing drainage conditions and assesses the proposed intersection improvement options at the intersections of Highway 52 and Powerline Road West, and Highway 52 and Powerline Road East in the City

of Hamilton. The following findings and recommendations have been stated in the report:

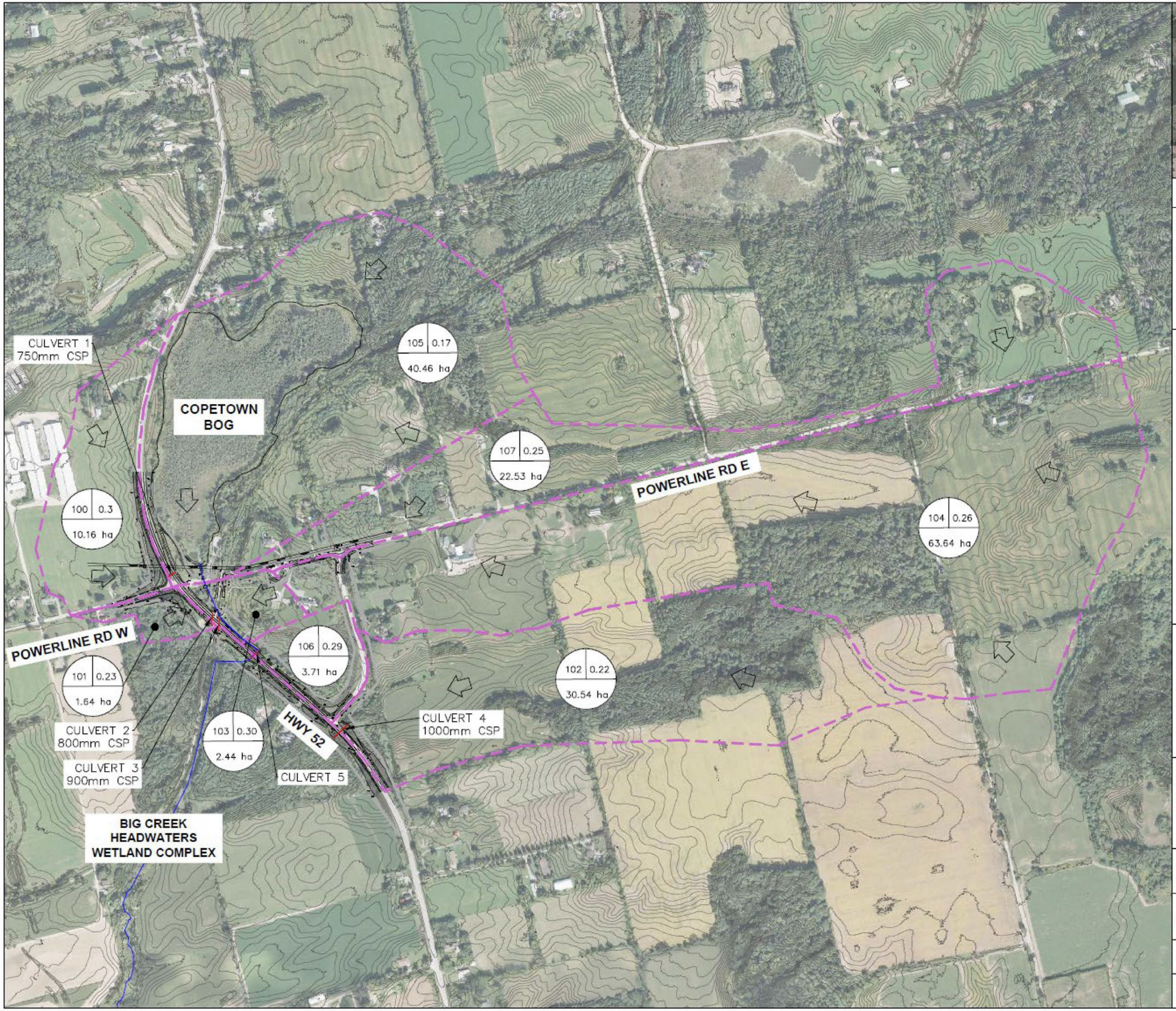
- Existing drainage is conveyed via ditches and culverts. The existing drainage patterns and outlet locations will generally be maintained in the proposed condition.
- Refined peak flows from the Copetown Bog are to be determined in detailed design.
- Proposed intersection improvements are anticipated to impact ditches and culverts.
- Culverts 1 to 3 are anticipated to be replaced with pipes of equal or larger diameters.
- Proposed ditches are to be designed during detailed design.
- Impacts to the Copetown Bog and watercourse are not anticipated based on the preliminary grading, to be confirmed in detailed design.
- Stormwater quantity control is not recommended for the site.
- Stormwater quality control is recommended to be provided through a “Best Efforts” approach including maintaining roadside ditches and CB treatment devices.
- LID feasibility is to be assessed as part of detailed design to supplement stormwater quantity and quality control.

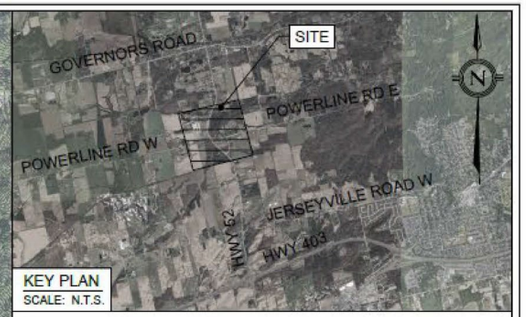
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Appendix A

Drainage Area Plan





KEY PLAN
SCALE: N.T.S.

Notes

1. This drawing is the exclusive property of R. J. Burnside & Associates Limited. The reproduction of any part without prior written consent of this office is strictly prohibited.
2. The contractor shall verify all dimensions, levels, and datums on site and report any discrepancies or omissions to this office prior to construction.
3. This drawing is to be read and understood in conjunction with all other plans and documents applicable to this project.

LEGEND:

- DRAINAGE BOUNDARY
- WATERCOURSE
- EXISTING CROSSING CULVERT
- OVERLAND FLOW ROUTE
- DRAINAGE AREA NUMBER
- RUNOFF COEFFICIENT
- DRAINAGE AREA (ha)

SITE1 | 0.90 | 0.68 ha

BURNSIDE

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Client
CITY OF HAMILTON
71 MAIN STREET WEST
HAMILTON, ON L8P 4Y5

Project Name
HAMILTON MCEA HWY 52 & POWERLINE RD W INTERSECTION IMPROVEMENTS

Drawing Title
DRAINAGE AREA PLAN

Drawn	Checked	Date	Drawing No.
MRT/HB	HF	25/11/27	A1
Scale		Project No.	
1:8000		300058803.0000	

File Name: 058803 - DRAINAGE PLAN.dwg Date Plotted: November 27, 2025 - 6:05 PM

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Appendix B

Existing Hydrologic Analysis

LEGEND

- Grimsby Sandy Loam
- Springvale Sandy Loam
- Tuscola Silt Loam
- Ancaster Silt Loam
- Vineland Sandy Loam
- Alberton Silt Loam
- Muck
- Ravine
- Brantford Silt Loam



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Appendix C

Existing Hydraulic Analysis

Project Name: Highway 52 and Powerline Road West - Left Turn Detailed Design
Project No.: 59911
Completed By: MRT/HB
Date: 11/6/2025

CulvertMaster - Hydraulic Output Summary
Structure: Culvert 1 - 12+540 Existing Condition

Culvert Data Summary

Shape	Circular	
Material	CSP	
Size	750	mm
# of Barrels	1	
Manning's n	0.024	
Inlet Entrance	Projecting	
US Invert	237.58	m
DS Invert	237.47	m
Length	22.77	m
Slope	0.48	%

Tailwater Channel Data

Method	Constant	
100yr Critical Depth	0.57	m
Tailwater Elevation	238.04	m

Weir

Method	Roadway (Constant Elevation)	
Roadway Type	Paved	
Length	10	m
US Shoulder Elevation	239.23	m
Roadway Width	13.86	m
Depth to Top of Subgrade	0.695	m
Top of Subgrade Elevation	238.54	m

Summary of Culvert Flows for Existing Condition

Storm Return Period	Headwater Elevation (m)	Total Discharge (cms)	Culvert Discharge (cms)	Roadway Discharge (cms)	FB* (m)	Velocity (m/s)
10 Year	238.32	0.45	0.45	0	0.22	1.24
100 Year	238.91	0.86	0.86	0	0.32	2.34

*For the design storm, freeboard is measured from top of subgrade elevation. For major, measured from edge of shoulder elevation

Project Name: Highway 52 and Powerline Road West - Left Turn Detailed Design
Project No.: 59911
Completed By: MRT/HB
Date: 11/6/2025

CulvertMaster - Hydraulic Output Summary
Structure: Culvert 2 - 12+668 Existing Condition

Culvert Data Summary

Shape	Circular	
Material	CSP	
Size	800	mm
# of Barrels	1	
Manning's n	0.024	
Inlet Entrance	Projecting	
US Invert	236.84	m
DS Invert	236.42	m
Length	27.5	m
Slope	1.53	%

Tailwater Channel Data

Method	Triangular	
Channel Slope	0.087	m/m
Manning's n	0.035	
Left Side Slope	2.4	
Right Side Slope	16.1	
Bottom Width	0	m
Bottom Elevation	236.42	m

Weir

Method	Roadway (Constant Elevation)	
Roadway Type	Paved	
Length	10	m
US Shoulder Elevation	238.61	m
Roadway Width	15.20	m
Depth to Top of Subgrade	0.695	m
Top of Subgrade Elevation	237.92	m

Summary of Culvert Flows for Existing Condition

Storm Return Period	Headwater Elevation (m)	Total Discharge (cms)	Culvert Discharge (cms)	Roadway Discharge (cms)	FB* (m)	Velocity (m/s)
10 Year	237.08	0.06	0.06	0	0.84	1.00
100 Year	237.19	0.13	0.13	0	1.42	1.25

*For the design storm, freeboard is measured from top of subgrade elevation. For major, measured from edge of shoulder elevation

Project Name: Hamilton MCEA Hwy 52 & Powerline Intersection
Project No.: 58803
Completed By: MRT/HB
Date: 11/27/2025

CulvertMaster - Hydraulic Output Summary
Structure: Culvert 3 - 12+690 Existing Condition

Culvert Data Summary

Shape	Circular	
Material	CSP	
Size	900	mm
# of Barrels	1	
Manning's n	0.024	
Inlet Entrance	Projecting	
US Invert	236.06	m
DS Invert	235.76	m
Length	30.51	m
Slope	0.98	%

Tailwater Channel Data

Method	Triangular	
Channel Slope	0.010	m/m
Manning's n	0.035	
Left Side Slope	3.6	
Right Side Slope	4.2	
Bottom Width	0	m
Bottom Elevation	235.76	m

Weir

Method	Roadway (Constant Elevation)	
Roadway Type	Paved	
Length	10	m
US Shoulder Elevation	238.65	m
Roadway Width	16.05	m

Summary of Culvert Flows for Existing Condition

Storm Return Period	Headwater Elevation (m)	Total Discharge (cms)	Culvert Discharge (cms)	Roadway Discharge (cms)	FB* (m)	Velocity (m/s)
25 Year	238.94	4.69	2.11	2.58	-0.29	3.27
100 Year	239.06	6.57	2.12	4.45	-0.41	3.23
Regional	239.43	13.75	2.15	11.60	-0.78	3.27

*Freeboard is measured from edge of roadway elevation

Regional

Length of Roadway	Depth of Flow on Roadway (m)	Road Discharge (m^3/s)	Velocity of Flow on Roadway (m/s)	Velocity x Depth on Roadway (m^2/s)
10	0.78	11.60	1.49	1.16

Project Name: Hamilton MCEA Hwy 52 & Powerline Intersection
Project No.: 58803
Completed By: MRT/HB
Date: 9/17/2025

CulvertMaster - Hydraulic Output Summary
Structure: Culvert 4 - 13+030 Existing Condition

Culvert Data Summary			**Tailwater Channel Data**		
Shape	Circular		Method	Constant	
Material	CSP		100yr Critical Depth	0.680	m
Size	1000	mm	Tailwater Elevation	236.983	m
# of Barrels	1				
Manning's n	0.024				
Inlet Entrance	Projecting				
US Invert	236.49	m			
DS Invert	236.30	m			
Length	44.71	m	**Weir**		
Slope	0.42	%	Method	Roadway (Constant Elevation)	
			Roadway Type	Paved	
			Length	10	m
			US Shoulder Elevation	243.57	m
			Roadway Width	12.78	m
			Depth to Top of Subgrade	0.695	m
			Top of Subgrade Elevation	242.88	m

Summary of Culvert Flows for Existing Condition

Storm Return Period	Headwater Elevation (m)	Total Discharge (cms)	Culvert Discharge (cms)	Roadway Discharge (cms)	FB* (m)	Velocity (m/s)
10 Year	237.31	0.68	0.68	0	5.57	1.20
100 Year	237.93	1.39	1.39	0	5.64	2.43

*For the design storm, freeboard is measured from top of subgrade elevation. For major, measured from edge of roadway elevation

Culvert Designer/Analyzer Report
Culvert 1 (750mm) - EX

Analysis Component			
Storm Event	Design	Discharge	0.4540 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	0.4540 m³/s	Check Discharge	0.8630 m³/s

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	238.04 m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-750 mm Circular	0.4541 m³/s	238.32 m	1.24 m/s
Weir	Roadway (Constant Elevation)	0.0000 m³/s	238.32 m	N/A
Total	----------	0.4541 m³/s	238.32 m	N/A

Culvert Designer/Analyzer Report
Culvert 1 (750mm) - EX

Component:Culvert-1

Culvert Summary					
Computed Headwater Eleva	238.32	m	Discharge	0.4541	m³/s
Inlet Control HW Elev.	238.23	m	Tailwater Elevation	238.04	m
Outlet Control HW Elev.	238.32	m	Control Type	Outlet Control	
Headwater Depth/Height	0.97				

Grades					
Upstream Invert	237.58	m	Downstream Invert	237.47	m
Length	22.77	m	Constructed Slope	0.004831	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.57	m
Slope Type	Mild		Normal Depth	0.65	m
Flow Regime	Subcritical		Critical Depth	0.41	m
Velocity Downstream	1.24	m/s	Critical Slope	0.016026	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.76	m
Section Size	750 mm		Rise	0.76	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	238.32	m	Upstream Velocity Head	0.07	m
Ke	0.90		Entrance Loss	0.06	m

Inlet Control Properties					
Inlet Control HW Elev.	238.23	m	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	0.5	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Designer/Analyzer Report
Culvert 1 (750mm) - EX

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)					
Discharge	0.0000	m³/s	Allowable HW Elevation	238.32	m
Roadway Width	13.86	m	Overtopping Coefficient	1.60	SI
Length	10.00	m	Crest Elevation	239.23	m
Headwater Elevation	N/A	m	Discharge Coefficient (Cr)	2.90	
Submergence Factor (Kt)	1.00				

Sta (m)	Elev. (m)
0.00	239.23
10.00	239.23

Culvert Designer/Analyzer Report
Culvert 1 (750mm) - EX

Analysis Component			
Storm Event	Check	Discharge	0.8630 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	0.4540 m³/s	Check Discharge	0.8630 m³/s

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	238.04 m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-750 mm Circular	0.8631 m³/s	238.91 m	2.34 m/s
Weir	Roadway (Constant Elevation)	0.0000 m³/s	238.91 m	N/A
Total	----------	0.8631 m³/s	238.91 m	N/A

Culvert Designer/Analyzer Report
Culvert 1 (750mm) - EX

Component:Culvert-1

Culvert Summary					
Computed Headwater Eleva	238.91	m	Discharge	0.8631	m³/s
Inlet Control HW Elev.	238.65	m	Tailwater Elevation	238.04	m
Outlet Control HW Elev.	238.91	m	Control Type	Outlet Control	
Headwater Depth/Height	1.74				

Grades					
Upstream Invert	237.58	m	Downstream Invert	237.47	m
Length	22.77	m	Constructed Slope	0.004831	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.57	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.57	m
Velocity Downstream	2.34	m/s	Critical Slope	0.022440	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.76	m
Section Size	750 mm		Rise	0.76	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	238.91	m	Upstream Velocity Head	0.18	m
Ke	0.90		Entrance Loss	0.16	m

Inlet Control Properties					
Inlet Control HW Elev.	238.65	m	Flow Control	Transition	
Inlet Type	Projecting		Area Full	0.5	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Designer/Analyzer Report
Culvert 1 (750mm) - EX

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)					
Discharge	0.0000	m³/s	Allowable HW Elevation	238.91	m
Roadway Width	13.86	m	Overtopping Coefficient	1.60	SI
Length	10.00	m	Crest Elevation	239.23	m
Headwater Elevation	N/A	m	Discharge Coefficient (Cr)	2.90	
Submergence Factor (Kt)	1.00				

Sta (m)	Elev. (m)
0.00	239.23
10.00	239.23

Culvert Designer/Analyzer Report
Culvert 2 (800mm) - EX

Analysis Component			
Storm Event	Design	Discharge	0.0600 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	0.0600 m³/s	Check Discharge	0.1250 m³/s

Tailwater properties: Triangular Channel

Tailwater conditions for Design Storm.

Discharge	0.0600 m³/s	Bottom Elevation	236.42 m
Depth	0.08 m	Velocity	0.98 m/s

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-800 mm Circular	0.0600 m³/s	237.08 m	1.00 m/s
Weir	Roadway (Constant Elevation)	0.0000 m³/s	237.08 m	N/A
Total	----------	0.0600 m³/s	237.08 m	N/A

Culvert Designer/Analyzer Report
Culvert 2 (800mm) - EX

Component:Culvert-1

Culvert Summary					
Computed Headwater Eleva	237.08	m	Discharge	0.0600	m³/s
Inlet Control HW Elev.	237.03	m	Tailwater Elevation	236.50	m
Outlet Control HW Elev.	237.08	m	Control Type	Entrance Control	
Headwater Depth/Height	0.30				

Grades					
Upstream Invert	236.84	m	Downstream Invert	236.42	m
Length	27.50	m	Constructed Slope	0.015273	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.14	m
Slope Type	Steep		Normal Depth	0.14	m
Flow Regime	Supercritical		Critical Depth	0.14	m
Velocity Downstream	1.00	m/s	Critical Slope	0.014493	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.80	m
Section Size	800 mm		Rise	0.80	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	237.08	m	Upstream Velocity Head	0.05	m
Ke	0.90		Entrance Loss	0.04	m

Inlet Control Properties					
Inlet Control HW Elev.	237.03	m	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	0.5	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Designer/Analyzer Report
Culvert 2 (800mm) - EX

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)					
Discharge	0.0000	m³/s	Allowable HW Elevation	237.08	m
Roadway Width	15.20	m	Overtopping Coefficient	1.60	SI
Length	10.00	m	Crest Elevation	238.61	m
Headwater Elevation	N/A	m	Discharge Coefficient (Cr)	2.90	
Submergence Factor (Kt)	1.00				

Sta (m)	Elev. (m)
0.00	238.61
10.00	238.61

Culvert Designer/Analyzer Report
Culvert 2 (800mm) - EX

Analysis Component			
Storm Event	Check	Discharge	0.1250 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	0.0600 m³/s	Check Discharge	0.1250 m³/s

Tailwater properties: Triangular Channel

Tailwater conditions for Check Storm.			
Discharge	0.1250 m³/s	Bottom Elevation	236.42 m
Depth	0.11 m	Velocity	1.18 m/s

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-800 mm Circular	0.1251 m³/s	237.19 m	1.25 m/s
Weir	Roadway (Constant Elevation)	0.0000 m³/s	237.19 m	N/A
Total	----------	0.1251 m³/s	237.19 m	N/A

Culvert Designer/Analyzer Report
Culvert 2 (800mm) - EX

Component:Culvert-1

Culvert Summary					
Computed Headwater Eleva	237.19	m	Discharge	0.1251	m³/s
Inlet Control HW Elev.	237.13	m	Tailwater Elevation	236.53	m
Outlet Control HW Elev.	237.19	m	Control Type	Entrance Control	
Headwater Depth/Height	0.44				

Grades					
Upstream Invert	236.84	m	Downstream Invert	236.42	m
Length	27.50	m	Constructed Slope	0.015273	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.20	m
Slope Type	Steep		Normal Depth	0.20	m
Flow Regime	Supercritical		Critical Depth	0.21	m
Velocity Downstream	1.25	m/s	Critical Slope	0.013932	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.80	m
Section Size	800 mm		Rise	0.80	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	237.19	m	Upstream Velocity Head	0.07	m
Ke	0.90		Entrance Loss	0.07	m

Inlet Control Properties					
Inlet Control HW Elev.	237.13	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.5	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Designer/Analyzer Report
Culvert 2 (800mm) - EX

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)					
Discharge	0.0000	m³/s	Allowable HW Elevation	237.19	m
Roadway Width	15.20	m	Overtopping Coefficient	1.60	SI
Length	10.00	m	Crest Elevation	238.61	m
Headwater Elevation	N/A	m	Discharge Coefficient (Cr)	2.90	
Submergence Factor (Kt)	1.00				

Sta (m)	Elev. (m)
0.00	238.61
10.00	238.61

Culvert Designer/Analyzer Report
Culvert 3 (900mm) - EX

Analysis Component			
Storm Event	Design	Discharge	4.6900 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	4.6900 m³/s	Check Discharge	6.5700 m³/s

Tailwater properties: Triangular Channel

Tailwater conditions for Design Storm.

Discharge	4.6900 m³/s	Bottom Elevation	235.76 m
Depth	0.87 m	Velocity	1.60 m/s

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-900 mm Circular	2.1076 m³/s	238.94 m	3.27 m/s
Weir	Roadway (Constant Elevation)	2.5643 m³/s	238.94 m	N/A
Total	----------	4.6920 m³/s	238.94 m	N/A

Culvert Designer/Analyzer Report
Culvert 3 (900mm) - EX

Component:Culvert-1

Culvert Summary					
Computed Headwater Eleva	238.94	m	Discharge	2.1076	m³/s
Inlet Control HW Elev.	238.42	m	Tailwater Elevation	236.63	m
Outlet Control HW Elev.	238.94	m	Control Type	Outlet Control	
Headwater Depth/Height	3.15				

Grades					
Upstream Invert	236.06	m	Downstream Invert	235.76	m
Length	30.51	m	Constructed Slope	0.009833	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.87	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.83	m
Velocity Downstream	3.27	m/s	Critical Slope	0.037231	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.91	m
Section Size	900 mm		Rise	0.91	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	238.94	m	Upstream Velocity Head	0.53	m
Ke	0.90		Entrance Loss	0.47	m

Inlet Control Properties					
Inlet Control HW Elev.	238.42	m	Flow Control	Submerged	
Inlet Type	Projecting		Area Full	0.7	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Designer/Analyzer Report
Culvert 3 (900mm) - EX

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)					
Discharge	2.5843	m³/s	Allowable HW Elevation	238.94	m
Roadway Width	16.05	m	Overtopping Coefficient	1.68	SI
Length	10.00	m	Crest Elevation	238.65	m
Headwater Elevation	238.94	m	Discharge Coefficient (Cr)	3.04	
Submergence Factor (Kt)	1.00				

Sta (m)	Elev. (m)
0.00	238.65
10.00	238.65

Culvert Designer/Analyzer Report
Culvert 3 (900mm) - EX

Analysis Component			
Storm Event	Check	Discharge	6.5700 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	4.6900 m³/s	Check Discharge	6.5700 m³/s

Tailwater properties: Triangular Channel

Tailwater conditions for Check Storm.

Discharge	6.5700 m³/s	Bottom Elevation	235.76 m
Depth	0.98 m	Velocity	1.74 m/s

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-900 mm Circular	2.1200 m³/s	239.06 m	3.23 m/s
Weir	Roadway (Constant Elevation)	4.4525 m³/s	239.06 m	N/A
Total	----------	6.5725 m³/s	239.06 m	N/A

Culvert Designer/Analyzer Report
Culvert 3 (900mm) - EX

Component:Culvert-1

Culvert Summary					
Computed Headwater Eleva	239.06	m	Discharge	2.1200	m³/s
Inlet Control HW Elev.	238.44	m	Tailwater Elevation	236.74	m
Outlet Control HW Elev.	239.06	m	Control Type	Outlet Control	
Headwater Depth/Height	3.28				

Grades					
Upstream Invert	236.06	m	Downstream Invert	235.76	m
Length	30.51	m	Constructed Slope	0.009833	m/m

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	0.98	m
Slope Type	N/A		Normal Depth	N/A	m
Flow Regime	N/A		Critical Depth	0.83	m
Velocity Downstream	3.23	m/s	Critical Slope	0.037618	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.91	m
Section Size	900 mm		Rise	0.91	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	239.06	m	Upstream Velocity Head	0.53	m
Ke	0.90		Entrance Loss	0.48	m

Inlet Control Properties					
Inlet Control HW Elev.	238.44	m	Flow Control	Submerged	
Inlet Type	Projecting		Area Full	0.7	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Designer/Analyzer Report
Culvert 3 (900mm) - EX

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)					
Discharge	4.4525	m³/s	Allowable HW Elevation	239.06	m
Roadway Width	16.05	m	Overtopping Coefficient	1.68	SI
Length	10.00	m	Crest Elevation	238.65	m
Headwater Elevation	239.06	m	Discharge Coefficient (Cr)	3.04	
Submergence Factor (Kt)	1.00				

Sta (m)	Elev. (m)
0.00	238.65
10.00	238.65

Culvert Designer/Analyzer Report
Culvert 3 (900mm) - EX (Regional)

Analysis Component			
Storm Event	Design	Discharge	13.7400 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	13.7400 m³/s	Check Discharge	0.0000 m³/s

Tailwater properties: Triangular Channel

Tailwater conditions for Design Storm.

Discharge	13.7400 m³/s	Bottom Elevation	235.76 m
Depth	1.30 m	Velocity	2.10 m/s

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-900 mm Circular	2.1459 m³/s	239.43 m	3.27 m/s
Weir	Roadway (Constant Elevation)	11.3005 m³/s	239.43 m	N/A
Total	----------	13.7464 m³/s	239.43 m	N/A

Culvert Designer/Analyzer Report
Culvert 3 (900mm) - EX (Regional)

Component:Culvert-1

Culvert Summary					
Computed Headwater Eleva	239.43	m	Discharge	2.1459	m³/s
Inlet Control HW Elev.	238.49	m	Tailwater Elevation	237.06	m
Outlet Control HW Elev.	239.43	m	Control Type	Outlet Control	
Headwater Depth/Height	3.69				

Grades					
Upstream Invert	236.06	m	Downstream Invert	235.76	m
Length	30.51	m	Constructed Slope	0.009833	m/m

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	1.30	m
Slope Type	N/A		Normal Depth	N/A	m
Flow Regime	N/A		Critical Depth	0.83	m
Velocity Downstream	3.27	m/s	Critical Slope	0.038444	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.91	m
Section Size	900 mm		Rise	0.91	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	239.43	m	Upstream Velocity Head	0.54	m
Ke	0.90		Entrance Loss	0.49	m

Inlet Control Properties					
Inlet Control HW Elev.	238.49	m	Flow Control	Submerged	
Inlet Type	Projecting		Area Full	0.7	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Designer/Analyzer Report
Culvert 3 (900mm) - EX (Regional)

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)					
Discharge	11.6005	m³/s	Allowable HW Elevation	239.43	m
Roadway Width	16.05	m	Overtopping Coefficient	1.67	SI
Length	10.00	m	Crest Elevation	238.65	m
Headwater Elevation	239.43	m	Discharge Coefficient (Cr)	3.03	
Submergence Factor (Kt)	1.00				

Sta (m)	Elev. (m)
0.00	238.65
10.00	238.65

Culvert Designer/Analyzer Report
Culvert 4 (1000mm) - EX

Analysis Component			
Storm Event	Design	Discharge	0.6830 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	0.6830 m³/s	Check Discharge	1.3870 m³/s

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	236.98 m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-1000 mm Circular	0.6832 m³/s	237.31 m	1.20 m/s
Weir	Roadway (Constant Elevation)	0.0000 m³/s	237.31 m	N/A
Total	----------	0.6832 m³/s	237.31 m	N/A

Culvert Designer/Analyzer Report
Culvert 4 (1000mm) - EX

Component:Culvert-1

Culvert Summary					
Computed Headwater Eleva	237.31	m	Discharge	0.6832	m³/s
Inlet Control HW Elev.	237.21	m	Tailwater Elevation	236.98	m
Outlet Control HW Elev.	237.31	m	Control Type	Outlet Control	
Headwater Depth/Height	0.82				

Grades					
Upstream Invert	236.49	m	Downstream Invert	236.30	m
Length	44.71	m	Constructed Slope	0.004250	m/m

Hydraulic Profile					
Profile	M1		Depth, Downstream	0.68	m
Slope Type	Mild		Normal Depth	0.68	m
Flow Regime	Subcritical		Critical Depth	0.47	m
Velocity Downstream	1.20	m/s	Critical Slope	0.013747	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.00	m
Section Size	1000 mm		Rise	1.00	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	237.31	m	Upstream Velocity Head	0.07	m
Ke	0.90		Entrance Loss	0.07	m

Inlet Control Properties					
Inlet Control HW Elev.	237.21	m	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	0.8	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Designer/Analyzer Report
Culvert 4 (1000mm) - EX

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)					
Discharge	0.0000	m³/s	Allowable HW Elevation	237.31	m
Roadway Width	12.78	m	Overtopping Coefficient	1.60	SI
Length	10.00	m	Crest Elevation	243.57	m
Headwater Elevation	N/A	m	Discharge Coefficient (Cr)	2.90	
Submergence Factor (Kt)	1.00				

Sta (m)	Elev. (m)
0.00	243.57
10.00	243.57

Culvert Designer/Analyzer Report
Culvert 4 (1000mm) - EX

Analysis Component			
Storm Event	Check	Discharge	1.3870 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	0.6830 m³/s	Check Discharge	1.3870 m³/s

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	236.98 m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-1000 mm Circular	1.3869 m³/s	237.93 m	2.43 m/s
Weir	Roadway (Constant Elevation)	0.0000 m³/s	237.93 m	N/A
Total	----------	1.3869 m³/s	237.93 m	N/A

Culvert Designer/Analyzer Report
Culvert 4 (1000mm) - EX

Component:Culvert-1

Culvert Summary					
Computed Headwater Eleva	237.93	m	Discharge	1.3869	m³/s
Inlet Control HW Elev.	237.67	m	Tailwater Elevation	236.98	m
Outlet Control HW Elev.	237.93	m	Control Type	Outlet Control	
Headwater Depth/Height	1.44				

Grades					
Upstream Invert	236.49	m	Downstream Invert	236.30	m
Length	44.71	m	Constructed Slope	0.004250	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.68	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.68	m
Velocity Downstream	2.43	m/s	Critical Slope	0.017639	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.00	m
Section Size	1000 mm		Rise	1.00	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	237.93	m	Upstream Velocity Head	0.16	m
Ke	0.90		Entrance Loss	0.14	m

Inlet Control Properties					
Inlet Control HW Elev.	237.67	m	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	0.8	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Designer/Analyzer Report
Culvert 4 (1000mm) - EX

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)					
Discharge	0.0000	m³/s	Allowable HW Elevation	237.93	m
Roadway Width	12.78	m	Overtopping Coefficient	1.60	SI
Length	10.00	m	Crest Elevation	243.57	m
Headwater Elevation	N/A	m	Discharge Coefficient (Cr)	2.90	
Submergence Factor (Kt)	1.00				

Sta (m)	Elev. (m)
0.00	243.57
10.00	243.57

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix D

Proposed Hydraulic Analysis

Project Name: Hamilton MCEA Hwy 52 & Powerline Intersection
Project No.: 58803
Completed By: HB
Date: 2/6/2026

CulvertMaster - Hydraulic Output Summary
Structure: Culvert 1 - 12+535 Proposed Condition

Culvert Data Summary

Shape	Circular	
Material	HDPE	
Size	750	mm
# of Barrels	1	
Manning's n	0.012	
Inlet Entrance	Projecting	
US Invert	238.34	m
DS Invert	237.49	m
Length	41.89	m
Slope	2.04	%

Tailwater Channel Data

Method	Constant	
Flow Regime	Supercritical	*Assume submerged
Tailwater Elevation	238.24	m

Weir

Method	Roadway (Constant Elevation)	
Roadway Type	Paved	
Length	10	m
US Shoulder Elevation	240.33	m
Roadway Width	30.207	m
Depth to Top of Subgrade	0.775	m
Top of Subgrade Elevation	239.55	m

Summary of Culvert Flows for Proposed Condition

Storm Return Period	Headwater Elevation (m)	Total Discharge (cms)	Culvert Discharge (cms)	Roadway Discharge (cms)	FB* (m)	Velocity (m/s)
10 Year	238.96	0.45	0.45	0	0.59	1.00
100 Year	239.25	0.86	0.86	0	1.08	1.90

*For the design storm, freeboard is measured from top of subgrade elevation. For major, measured from edge of shoulder elevation

Project Name: Hamilton MCEA Hwy 52 & Powerline Intersection
Project No.: 58803
Completed By: HB
Date: 2/11/2026

CulvertMaster - Hydraulic Output Summary
Structure: Culvert 2 - 12+668 Proposed Condition

Culvert Data Summary

Shape	Circular	
Material	HDPE	
Size	900	mm
# of Barrels	1	
Manning's n	0.012	
Inlet Entrance	Projecting	
US Invert	236.818	m
DS Invert	236.512	m
Length	36.26	m
Slope	0.84	%

Tailwater Channel Data

Method	Triangular	
Channel Slope	0.067	m/m
Manning's n	0.035	
Left Side Slope	11	
Right Side Slope	2.4	
Bottom Width	0	m
Bottom Elevation	236.51	m

Weir

Method	Roadway (Constant Elevation)	
Roadway Type	Paved	
Length	10	m
US Shoulder Elevation	238.83	m
Roadway Width	18.54	m
Depth to Top of Subgrade	0.775	m
Top of Subgrade Elevation	238.05	m

Summary of Culvert Flows for Proposed Condition

Storm Return Period	Headwater Elevation (m)	Total Discharge (cms)	Culvert Discharge (cms)	Roadway Discharge (cms)	FB* (m)	Velocity (m/s)
10 Year	237.01	0.06	0.06	0	1.04	1.30
100 Year	237.10	0.13	0.13	0	1.73	1.62

*For the design storm, freeboard is measured from top of subgrade elevation. For major, measured from edge of shoulder elevation

Project Name: Hamilton MCEA Hwy 52 & Powerline Intersection
Project No.: 58803
Completed By: HB
Date: 2/6/2026

CulvertMaster - Hydraulic Output Summary
Structure: Culvert 3 - 12+690 Proposed Condition

Culvert Data Summary

Shape	Circular	
Material	HDPE	
Size	1350	mm
# of Barrels	2	
Manning's n	0.012	
Inlet Entrance	Projecting	
US Invert	236.06	m
DS Invert	235.89	m
Length	34.11	m
Slope	0.50	%

Tailwater Channel Data

Method	Triangular	
Channel Slope	0.010	m/m
Manning's n	0.035	
Left Side Slope	3.6	
Right Side Slope	4.2	
Bottom Width	0	m
Bottom Elevation	235.89	m

Weir

Method	Roadway (Constant Elevation)	
Roadway Type	Paved	
Length	10	m
US Shoulder Elevation	238.78	m
Roadway Width	17.41	m

Summary of Culvert Flows for Proposed Condition

Storm Return Period	Headwater Elevation (m)	Total Discharge (cms)	Culvert Discharge (cms)	Roadway Discharge (cms)	FB* (m)	Velocity (m/s)
25 Year	237.28	4.69	4.69	0.00	1.50	2.38
100 Year	237.56	6.57	6.57	0.00	1.22	2.90
Regional	238.93	13.75	12.73	1.01	-0.15	4.40

*Freeboard is measured from edge of roadway elevation

Regional

Length of Roadway	Depth of Flow on Roadway (m)	Road Discharge (m^3/s)	Velocity of Flow on Roadway (m/s)	Velocity x Depth on Roadway (m^2/s)
10	0.15	1.01	0.68	0.10

Culvert Designer/Analyzer Report
Culvert 1 (750mm) - PROP

Analysis Component			
Storm Event	Design	Discharge	0.4540 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	0.4540 m³/s	Check Discharge	0.8630 m³/s

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	238.24 m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-750 mm Circular	0.4541 m³/s	238.96 m	1.00 m/s
Weir	Roadway (Constant Elevation)	0.0000 m³/s	238.96 m	N/A
Total	----------	0.4541 m³/s	238.96 m	N/A

Culvert Designer/Analyzer Report
Culvert 1 (750mm) - PROP

Component:Culvert-1

Culvert Summary					
Computed Headwater Elev	238.96	m	Discharge	0.4541	m³/s
Inlet Control HW Elev.	238.93	m	Tailwater Elevation	238.24	m
Outlet Control HW Elev.	238.96	m	Control Type	Entrance Control	
Headwater Depth/Height	0.80				

Grades					
Upstream Invert	238.34	m	Downstream Invert	237.49	m
Length	41.89	m	Constructed Slope	0.020385	m/m

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	0.75	m
Slope Type	Steep		Normal Depth	0.26	m
Flow Regime	N/A		Critical Depth	0.41	m
Velocity Downstream	1.00	m/s	Critical Slope	0.004006	m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	HDPE (Smooth Interior)	Span	0.76 m
Section Size	750 mm	Rise	0.76 m
Number Sections	1		

Outlet Control Properties					
Outlet Control HW Elev.	238.96	m	Upstream Velocity Head	0.17	m
Ke	0.20		Entrance Loss	0.03	m

Inlet Control Properties					
Inlet Control HW Elev.	238.93	m	Flow Control	Unsubmerged	
Inlet Type	Groove end projecting		Area Full	0.5	m²
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

Culvert Designer/Analyzer Report
Culvert 1 (750mm) - PROP

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)					
Discharge	0.0000	m³/s	Allowable HW Elevation	238.96	m
Roadway Width	30.21	m	Overtopping Coefficient	1.60	SI
Length	10.00	m	Crest Elevation	240.33	m
Headwater Elevation	N/A	m	Discharge Coefficient (Cr)	2.90	
Submergence Factor (Kt)	1.00				

Sta (m)	Elev. (m)
0.00	240.33
10.00	240.33

Culvert Designer/Analyzer Report
Culvert 1 (750mm) - PROP

Analysis Component			
Storm Event	Check	Discharge	0.8630 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	0.4540 m³/s	Check Discharge	0.8630 m³/s

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	238.24 m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-750 mm Circular	0.8628 m³/s	239.25 m	1.90 m/s
Weir	Roadway (Constant Elevation)	0.0000 m³/s	239.25 m	N/A
Total	----------	0.8628 m³/s	239.25 m	N/A

Culvert Designer/Analyzer Report
Culvert 1 (750mm) - PROP

Component:Culvert-1

Culvert Summary					
Computed Headwater Elev	239.25	m	Discharge	0.8628	m³/s
Inlet Control HW Elev.	239.24	m	Tailwater Elevation	238.24	m
Outlet Control HW Elev.	239.25	m	Control Type	Entrance Control	
Headwater Depth/Height	1.19				

Grades					
Upstream Invert	238.34	m	Downstream Invert	237.49	m
Length	41.89	m	Constructed Slope	0.020385	m/m

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	0.75	m
Slope Type	Steep		Normal Depth	0.37	m
Flow Regime	N/A		Critical Depth	0.57	m
Velocity Downstream	1.90	m/s	Critical Slope	0.005609	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	0.76	m
Section Size	750 mm		Rise	0.76	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	239.25	m	Upstream Velocity Head	0.28	m
Ke	0.20		Entrance Loss	0.06	m

Inlet Control Properties					
Inlet Control HW Elev.	239.24	m	Flow Control	Transition	
Inlet Type	Groove end projecting		Area Full	0.5	m²
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

Culvert Designer/Analyzer Report
Culvert 1 (750mm) - PROP

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)					
Discharge	0.0000	m³/s	Allowable HW Elevation	239.25	m
Roadway Width	30.21	m	Overtopping Coefficient	1.60	SI
Length	10.00	m	Crest Elevation	240.33	m
Headwater Elevation	N/A	m	Discharge Coefficient (Cr)	2.90	
Submergence Factor (Kt)	1.00				

Sta (m)	Elev. (m)
0.00	240.33
10.00	240.33

Culvert Designer/Analyzer Report
Culvert 2 (900mm) - PROP

Analysis Component			
Storm Event	Design	Discharge	0.0600 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	0.0600 m³/s	Check Discharge	0.1250 m³/s

Tailwater properties: Triangular Channel

Tailwater conditions for Design Storm.

Discharge	0.0600 m³/s	Bottom Elevation	236.51 m
Depth	0.10 m	Velocity	0.97 m/s

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-900 mm Circular	0.0601 m³/s	237.01 m	1.30 m/s
Weir	Roadway (Constant Elevation)	0.0000 m³/s	237.01 m	N/A
Total	----------	0.0601 m³/s	237.01 m	N/A

Culvert Designer/Analyzer Report
Culvert 2 (900mm) - PROP

Component:Culvert-1

Culvert Summary					
Computed Headwater Elev	237.01	m	Discharge	0.0601	m³/s
Inlet Control HW Elev.	237.00	m	Tailwater Elevation	236.61	m
Outlet Control HW Elev.	237.01	m	Control Type	Entrance Control	
Headwater Depth/Height	0.21				

Grades					
Upstream Invert	236.82	m	Downstream Invert	236.51	m
Length	36.26	m	Constructed Slope	0.008439	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.11	m
Slope Type	Steep		Normal Depth	0.11	m
Flow Regime	Supercritical		Critical Depth	0.14	m
Velocity Downstream	1.30	m/s	Critical Slope	0.003573	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	0.91	m
Section Size	900 mm		Rise	0.91	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	237.01	m	Upstream Velocity Head	0.05	m
Ke	0.20		Entrance Loss	0.01	m

Inlet Control Properties					
Inlet Control HW Elev.	237.00	m	Flow Control	Unsubmerged	
Inlet Type	Groove end projecting		Area Full	0.7	m²
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

Culvert Designer/Analyzer Report
Culvert 2 (900mm) - PROP

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)					
Discharge	0.0000	m³/s	Allowable HW Elevation	237.01	m
Roadway Width	18.54	m	Overtopping Coefficient	1.60	SI
Length	10.00	m	Crest Elevation	238.83	m
Headwater Elevation	N/A	m	Discharge Coefficient (Cr)	2.90	
Submergence Factor (Kt)	1.00				

Sta (m)	Elev. (m)
0.00	238.83
10.00	238.83

Culvert Designer/Analyzer Report
Culvert 2 (900mm) - PROP

Analysis Component			
Storm Event	Check	Discharge	0.1250 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	0.0600 m³/s	Check Discharge	0.1250 m³/s

Tailwater properties: Triangular Channel

Tailwater conditions for Check Storm.

Discharge	0.1250 m³/s	Bottom Elevation	236.51 m
Depth	0.13 m	Velocity	1.16 m/s

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-900 mm Circular	0.1250 m³/s	237.10 m	1.62 m/s
Weir	Roadway (Constant Elevation)	0.0000 m³/s	237.10 m	N/A
Total	----------	0.1250 m³/s	237.10 m	N/A

Culvert Designer/Analyzer Report
Culvert 2 (900mm) - PROP

Component:Culvert-1

Culvert Summary					
Computed Headwater Elev	237.10	m	Discharge	0.1250	m³/s
Inlet Control HW Elev.	237.09	m	Tailwater Elevation	236.64	m
Outlet Control HW Elev.	237.10	m	Control Type	Entrance Control	
Headwater Depth/Height	0.31				

Grades					
Upstream Invert	236.82	m	Downstream Invert	236.51	m
Length	36.26	m	Constructed Slope	0.008439	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.16	m
Slope Type	Steep		Normal Depth	0.16	m
Flow Regime	Supercritical		Critical Depth	0.20	m
Velocity Downstream	1.62	m/s	Critical Slope	0.003379	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	0.91	m
Section Size	900 mm		Rise	0.91	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	237.10	m	Upstream Velocity Head	0.07	m
Ke	0.20		Entrance Loss	0.01	m

Inlet Control Properties					
Inlet Control HW Elev.	237.09	m	Flow Control	Unsubmerged	
Inlet Type	Groove end projecting		Area Full	0.7	m²
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

Culvert Designer/Analyzer Report
Culvert 2 (900mm) - PROP

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)					
Discharge	0.0000	m³/s	Allowable HW Elevation	237.10	m
Roadway Width	18.54	m	Overtopping Coefficient	1.60	SI
Length	10.00	m	Crest Elevation	238.83	m
Headwater Elevation	N/A	m	Discharge Coefficient (Cr)	2.90	
Submergence Factor (Kt)	1.00				

Sta (m)	Elev. (m)
0.00	238.83
10.00	238.83

Culvert Designer/Analyzer Report
Culvert 3 (2x1350mm) - PROP

Analysis Component			
Storm Event	Design	Discharge	4.6900 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	4.6900 m³/s	Check Discharge	6.5700 m³/s

Tailwater properties: Triangular Channel

Tailwater conditions for Design Storm.

Discharge	4.6900 m³/s	Bottom Elevation	235.89 m
Depth	0.87 m	Velocity	1.60 m/s

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	2-1350 mm Circular	4.6896 m³/s	237.28 m	2.38 m/s
Weir	Roadway (Constant Elevation)	0.0000 m³/s	237.28 m	N/A
Total	----------	4.6896 m³/s	237.28 m	N/A

Culvert Designer/Analyzer Report
Culvert 3 (2x1350mm) - PROP

Component:Culvert-1

Culvert Summary					
Computed Headwater Elev	237.28	m	Discharge	4.6896	m³/s
Inlet Control HW Elev.	237.24	m	Tailwater Elevation	236.76	m
Outlet Control HW Elev.	237.28	m	Control Type	Entrance Control	
Headwater Depth/Height	0.89				

Grades					
Upstream Invert	236.06	m	Downstream Invert	235.89	m
Length	34.11	m	Constructed Slope	0.004984	m/m

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	0.87	m
Slope Type	Steep		Normal Depth	0.73	m
Flow Regime	N/A		Critical Depth	0.81	m
Velocity Downstream	2.38	m/s	Critical Slope	0.003488	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	1.37	m
Section Size	1350 mm		Rise	1.37	m
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	237.28	m	Upstream Velocity Head	0.34	m
Ke	0.20		Entrance Loss	0.07	m

Inlet Control Properties					
Inlet Control HW Elev.	237.24	m	Flow Control	Unsubmerged	
Inlet Type	Groove end projecting		Area Full	3.0	m²
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

Culvert Designer/Analyzer Report
Culvert 3 (2x1350mm) - PROP

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)					
Discharge	0.0000	m³/s	Allowable HW Elevation	237.28	m
Roadway Width	17.41	m	Overtopping Coefficient	1.60	SI
Length	10.00	m	Crest Elevation	238.78	m
Headwater Elevation	N/A	m	Discharge Coefficient (Cr)	2.90	
Submergence Factor (Kt)	1.00				

Sta (m)	Elev. (m)
0.00	238.78
10.00	238.78

Culvert Designer/Analyzer Report
Culvert 3 (2x1350mm) - PROP

Analysis Component			
Storm Event	Check	Discharge	6.5700 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	4.6900 m³/s	Check Discharge	6.5700 m³/s

Tailwater properties: Triangular Channel

Tailwater conditions for Check Storm.

Discharge	6.5700 m³/s	Bottom Elevation	235.89 m
Depth	0.98 m	Velocity	1.74 m/s

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	2-1350 mm Circular	6.5700 m³/s	237.56 m	2.90 m/s
Weir	Roadway (Constant Elevation)	0.0000 m³/s	237.56 m	N/A
Total	----------	6.5700 m³/s	237.56 m	N/A

Culvert Designer/Analyzer Report
Culvert 3 (2x1350mm) - PROP

Component:Culvert-1

Culvert Summary					
Computed Headwater Elev	237.56	m	Discharge	6.5700	m³/s
Inlet Control HW Elev.	237.54	m	Tailwater Elevation	236.87	m
Outlet Control HW Elev.	237.56	m	Control Type	Entrance Control	
Headwater Depth/Height	1.09				

Grades					
Upstream Invert	236.06	m	Downstream Invert	235.89	m
Length	34.11	m	Constructed Slope	0.004984	m/m

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	0.98	m
Slope Type	Steep		Normal Depth	0.90	m
Flow Regime	N/A		Critical Depth	0.97	m
Velocity Downstream	2.90	m/s	Critical Slope	0.004160	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	1.37	m
Section Size	1350 mm		Rise	1.37	m
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	237.56	m	Upstream Velocity Head	0.44	m
Ke	0.20		Entrance Loss	0.09	m

Inlet Control Properties					
Inlet Control HW Elev.	237.54	m	Flow Control	Unsubmerged	
Inlet Type	Groove end projecting		Area Full	3.0	m²
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

Culvert Designer/Analyzer Report
Culvert 3 (2x1350mm) - PROP

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)					
Discharge	0.0000	m³/s	Allowable HW Elevation	237.56	m
Roadway Width	17.41	m	Overtopping Coefficient	1.60	SI
Length	10.00	m	Crest Elevation	238.78	m
Headwater Elevation	N/A	m	Discharge Coefficient (Cr)	2.90	
Submergence Factor (Kt)	1.00				

Sta (m)	Elev. (m)
0.00	238.78
10.00	238.78

Culvert Designer/Analyzer Report
Culvert 3 (2x1350mm) - PROP (Regional)

Analysis Component			
Storm Event	Design	Discharge	13.7400 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	13.7400 m³/s	Check Discharge	0.0000 m³/s

Tailwater properties: Triangular Channel

Tailwater conditions for Design Storm.			
Discharge	13.7400 m³/s	Bottom Elevation	235.89 m
Depth	1.30 m	Velocity	2.10 m/s

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	2-1350 mm Circular	12.7344 m³/s	238.93 m	4.40 m/s
Weir	Roadway (Constant Elevation)	1.0066 m³/s	238.93 m	N/A
Total	----------	13.7410 m³/s	238.93 m	N/A

Culvert Designer/Analyzer Report
Culvert 3 (2x1350mm) - PROP (Regional)

Component:Culvert-1

Culvert Summary					
Computed Headwater Elev	238.93	m	Discharge	12.7344	m³/s
Inlet Control HW Elev.	238.93	m	Tailwater Elevation	237.19	m
Outlet Control HW Elev.	238.74	m	Control Type	Inlet Control	
Headwater Depth/Height	2.10				

Grades					
Upstream Invert	236.06	m	Downstream Invert	235.89	m
Length	34.11	m	Constructed Slope	0.004983	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	1.30	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	1.27	m
Velocity Downstream	4.40	m/s	Critical Slope	0.009642	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	1.37	m
Section Size	1350 mm		Rise	1.37	m
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	238.74	m	Upstream Velocity Head	0.95	m
Ke	0.20		Entrance Loss	0.19	m

Inlet Control Properties					
Inlet Control HW Elev.	238.93	m	Flow Control	Submerged	
Inlet Type	Groove end projecting		Area Full	3.0	m²
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

Culvert Designer/Analyzer Report
Culvert 3 (2x1350mm) - PROP (Regional)

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)					
Discharge	1.0066	m³/s	Allowable HW Elevation	238.93	m
Roadway Width	17.41	m	Overtopping Coefficient	1.66	SI
Length	10.00	m	Crest Elevation	238.78	m
Headwater Elevation	238.93	m	Discharge Coefficient (Cr)	3.01	
Submergence Factor (Kt)	1.00				

Sta (m)	Elev. (m)
0.00	238.78
10.00	238.78

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix E

Stormwater Management

BURNSIDE

CALCULATION SHEET

Project: Hamilton MCEA Highway 52 and Powerline Road West Intersection Improvements

Existing ROW

Prepared by: HB
Project No: 058803
Date: November 27, 2025

Runoff Equation Q = 2.78CIA (l/s)

where,
C = runoff coefficient
I = rainfall intensity (mm/hr) (based on City of Hamilton IDF Curve)
A = area (ha)
2.78= conversion factor

C Adjustment Factor	
25 year	1.1
50 year	1.2
100 year	1.25

	Return Period					
Coefficient	2	5	10	25	50	100
A	646.0	1049.5	1343.7	1719.5	1954.8	2317.4
B	6	8	9	10	10	11
C	0.781	0.803	0.814	0.823	0.826	0.836

Existing Flows			**C**	**% Imp**
Pervious	44891	m^2	0.20	0
Impervious	13682	m^2	0.90	100
Total Area	**58572**	**m^2**	0.36	23

Return Period	**T (min)**	**T (hour)**	**I**		**Q**	
2 year	10.0	0.17	74.10	mm/hr	**438.3**	**L/s**
5 year	10.0	0.17	103.04	mm/hr	**609.5**	**L/s**
10 year	10.0	0.17	122.29	mm/hr	**723.3**	**L/s**
25 year	10.0	0.17	146.10	mm/hr	**950.6**	**L/s**
50 year	10.0	0.17	164.61	mm/hr	**1168.4**	**L/s**
100 year	10.0	0.17	181.81	mm/hr	**1344.2**	**L/s**

BURNSIDE

CALCULATION SHEET

Project: Hamilton MCEA Highway 52 and Powerline Road West Intersection Improvements

Proposed ROW

Prepared by: HB
Project No: 058803
Date: November 27, 2025

Runoff Equation Q = 2.78CIA (l/s)

where,
C = runoff coefficient
I = rainfall intensity (mm/hr) (based on City of Hamilton IDF Curve)
A = area (ha)
2.78= conversion factor

C Adjustment Factor	
25 year	1.1
50 year	1.2
100 year	1.25

	Return Period					
Coefficient	2	5	10	25	50	100
A	646.0	1049.5	1343.7	1719.5	1954.8	2317.4
B	6	8	9	10	10	11
C	0.781	0.803	0.814	0.823	0.826	0.836

Proposed Flows			C	% Imp			Imp. Increase ha	Imp. Increase %
Pervious	43313	m^2	0.20	0			0.16	**12%**
Impervious	15260	m^2	0.90	100				
Total Area	**58572**	**m^2**	0.38	26				

Return Period	T (min)	T (hour)	I		Q		Peak Flow Increase L/s	Peak Flow Increase %
2 year	10.0	0.17	74.10	mm/hr	**461.0**	L/s	22.7	
5 year	10.0	0.17	103.04	mm/hr	**641.1**	L/s	31.6	
10 year	10.0	0.17	122.29	mm/hr	**760.9**	L/s	37.5	**5%**
25 year	10.0	0.17	146.10	mm/hr	**999.9**	L/s	49.3	
50 year	10.0	0.17	164.61	mm/hr	**1229.0**	L/s	60.6	
100 year	10.0	0.17	181.81	mm/hr	**1414.0**	L/s	69.7	

Hamilton MCEA Highway 52 and Powerline Intersection Natural Environment Report Revision 1

City of Hamilton
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Hamilton ON L8P 4Y5

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0	September 19, 2025	Initial Submission to City of Hamilton
1	April 30, 2026	Revisions based on City comments

R.J. Burnside & Associates Limited

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1.0 Introduction

R.J. Burnside & Associates Limited (Burnside) was retained by the City of Hamilton (the City) to undertake a Municipal Class Environmental Assessment (MCEA) to assess a recommended solution for intersection improvements at the intersection of Highway 52 (Hwy 52) and Powerline Road West, including the feasibility of implementing a roundabout among other improvement options such as traffic signals or stop control, and the possible relocation or extension of Powerline Road East. The Study Area Intersection improvement options within the study area (Figure 1) will be considered with respect to existing physical constraints, including profile changes and steep grades, a trail crossing, and parking lot entrance to access the rail trail. Several significant ecological features are present including Provincially Significant Wetland, Area of Natural and Scientific Interest, Significant Woodlands, and a watercourse and waterbody, and associated regulated areas of the Grand River Conservation Authority. The study area also includes lands designated under the Provincial Greenbelt Plan and the Niagara Escarpment Plan and contains areas of known and potential cultural heritage features.

The following report summarizes the findings of the desktop review and ecological field investigations to characterize natural heritage features within the study area that may be impacted by the proposed intersection improvements.

2.0 Background Information Review

The following sources of background information were reviewed to identify ecological features which may be impacted by the proposed works:

- Aerial photography (2024)
- Ministry of Natural Resources (MNR) Land Information Ontario (LIO) database
- MNR Natural Heritage Information Centre (NHIC) database for significant species and designated natural features within 120 m of the study area
- The Rural Hamilton Official Plan (2012) Schedules B, B-1, B-2, and B-4 to B-8.
- GRCA regulated features, mapping and information.
- MNR Aquatic Resources Area (ARA) mapping (2017).
- MNR Ontario Hydrologic Network (OHN) mapping (2020).
- MNR Aquatic Resources Area (ARA) mapping (2017).
- MNR Ontario Hydrologic Network (OHN) mapping (2020).
- Hamilton Natural Areas Inventory Project 3rd Edition.

- Hamilton Natural Heritage Database (overseen by Hamilton Conservation Authority).
- The Ontario Reptile and Amphibian Atlas (ORAA).
- The Ontario Breeding Bird Atlas (OBBA) (2001-2005).
- Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), AgMaps mapping (2021).
- iNaturalist
- eBird

2.1 Rural Hamilton Official Plan (RHOP) (2021)

Based on Burnside's review of the Rural Hamilton Official Plan (RHOP), the following components of the City's Natural Heritage System (NHS) are present within the study area:

- Core Areas.
- Greenbelt Plan:
  - Greenbelt Protected Countryside.
  - Greenbelt Natural Heritage Systems.
- Niagara Escarpment Plan:
  - Niagara Escarpment Natural Area.
  - Escarpment Protection Area.
  - Escarpment Rural Area.
- Key Natural Heritage Feature – Significant Woodlands.
- Key Natural Heritage Feature Life Sciences Area of Natural Scientific Interest (ANSI).
- Key Natural Heritage and Key Hydrologic Feature – Wetlands.
- Local Natural Area – Environmentally Significant Area.
- Key Natural Heritage and Key Hydrologic Feature – Streams.

Core Areas include key natural heritage features, key hydrologic features, local natural areas and their associated vegetation protection zones. It is understood that not all Core Areas have been included within the natural heritage schedules of the RHOP. This includes significant wildlife habitat, significant habitat for threatened and endangered species, significant valleylands, and fish habitat.

A summary of the City of Hamilton NHS features present within the study area can be found on Figures 2a and 2b.

2.2 Lower-Middle Grand Natural Heritage Characterization Report (2017)

The study area is located within the headwaters of Big Creek within the Lower-Middle Grand Subwatershed. Big Creek is a warmwater system that supports a wide variety of sportfish including Largemouth Bass, Northern Pike, and White Crappie.

The Big Creek Headwaters Wetland Complex is characterized by deciduous swamp and marsh. The wetland complex functions as a habitat linkage between this Big Creek Headwaters Wetland and Copetown Woods and Southwest Summit Woods. Provincially significant species reported with the Big Creek Headwaters Wetland Complex include White Wood Aster (*Eurybia divaricata*; threatened), Monarch Butterfly (*Danaus plexippus*, special concern), and Golden-winged Warbler (*Vermivora chrysoptera*, special concern).

The Copetown Bog consists of a raised Tamarack-Leatherleaf Treed Kettle Bog (BOT2-1; S3), Buttonbush Organic Deciduous Thicket Swamp (SWT3-4; S3), and a Highbush Blueberry-Leatherleaf-Chokecherry Shrub Fen (FES1-8; S2S3). Per the OWES evaluation, the ponds and wetlands within the bog are generally hydrologically isolated from Big Creek. An intermittent outflow, which is present within the study area, is present at the southern extent of the wetland complex. The Copetown Bog is the only remaining bog within the city of Hamilton. Significant species known to be supported within the bog includes Yellow Wild Indigo (*Baptisia tinctoria*; S1S2) and Dion Skipper (*Euphyes dion*; S3).

The ponds and wetlands in the kettle depression are hydrologically isolated from the stream system except for intermittent outflow into the Big Creek system from the western kettle bog via a drainage culvert located at the southern end (GRCA, 2017).

2.3 Hamilton Natural Areas Inventory (NAI) Project 3rd Edition

Per the Hamilton Natural Areas Inventory (NAI) Project 3rd Edition, the Copetown Bog was identified within the study area. The Copetown Bog is an Environmentally Significant Area (ESA) and only one of two isolated kettle bogs within the city of Hamilton. The bog spans 11.0 ha and consists of a Leatherleaf Shrub Kettle Bog Type (BOS1-1; S3) and Tamarack – Leatherleaf Treed Kettle Bog Type (BOT2-1; S3). The bog is the largest kettle wetland in the Dundas Valley. It is also the only bog present along the southern section of the Niagara Escarment. A number of regionally rare (H) and uncommon (h) species have been documented within the Copetown Bog including:

- Chain Fern (*Woodwardia virginica* - H).
- Black Spruce (*Picea mariana* - H).
- Three-seeded Sedge (*Carex trisperma var. trisperma* - H).
- Billing's Three-seeded Sedge (*Carex trisperma var. billingsii* – S2S3, H).
- Few-flowered Sedge (*Carex oligosperma* – H).
- Tawny Cotton-grass (*Eriophorum virginicum* - H).
- Bog Buckbean (*Menyanthes trifoliata* – H).
- Pitcher-plant (*Sarracenia purpurea* – H).
- Round-leaved Sundew (*Drosera rotundifolia* - H).
- Mountain-holly (*Nemopanthus mucronatus* - H).
- Bog-rosemary (*Andromeda polifolia ssp. glaucophylla* - H).
- Leatherleaf (*Chamaedaphne calyculata* - H).
- Labrador-tea (*Ledum groenlandicum* - H).
- Mustard White (*Pieris oleracea* – h).
- West Virginia White (*Pieris virginensis* - h).
- Bog Copper (*Lycaena epixanthe* – H).
- Aphrodite Fritillary (*Speyeria Aphrodite* – h).
- Silver-bordered Fritillary (*Boloria selene* – h).
- Milbert's Tortoiseshell (*Nymphalis milberti* – H).
- Jefferson Salamander (*Ambystoma jeffersonianum* – END, H).
- American Bittern (*Botaurus lentiginosus* – H).
- Virginia Rail (*Rallus limicola* – H).
- Sora (*Porzana Carolina* – H).
- Black-and-white Warbler (*Mniotilta varia* – h).

2.4 Hamilton Natural Heritage Database

HCA was contacted on March 11, 2026 to obtain relevant the Natural Heritage Database information as it relates to the study area. Ecological Land Classification and botanical information was provided for the Copetown Bog area specifically, on March 27, 2026. Burnside has completed detailed ELC and will compare results to the ELC communities provided by HCA. The botanical list included one rare species (S3), Field Thistle (*Cirsium discolor*). This species was looked for during the botanical inventory completed by Burnside.

2.5 Greenbelt Indigenous Botanical Survey (2024)

The Greenbelt Indigenous Botanical Survey and Field Guide was developed to create a digital atlas of ethnobotanical vegetative communities at a variety of locations along historic Indigenous trails within the Greenbelt. Phytosociological plant community surveys were conducted by graduate students from the

University of Guelph. Surveys were completed at the Summit Bog (Copetown Bog) as a part the project. The findings of these surveys were consistent with those identified within the Hamilton NAI Surveys and Lower-Middle Grand Natural Heritage Characterization Report (2017).

Of note, these surveys characterized the terrestrial communities surrounding Summit Bog. The southern portion of the forested lands at the southernmost point of the Summit Bog is dominated by Manitoba Maple (*Acer negundo*) and Black Walnut (*Juglans nigra*) within the canopy layer. The subcanopy later is dominated by European Buckthorn (*Rhamnus cathartica*) and Chokecherry (*Prunus virginiana*) while the groundcover layer is dominated by Garlic Mustard (*Alliaria petiolata*).

3.0 Methodology

Field investigations were conducted in 2025, according to the schedule listed in Table 1. The purpose of field investigations was to verify whether the features identified in the background data review are present and, if so, to confirm their boundaries. The purpose was also to identify any other natural features not previously documented.

For the purposes of field investigations, the study area is defined as the areas within 120 m of the greatest extent of all the potential alignment options.

Table 1: Field Study Methodology

Field Study	Methodology	Staff Involved	Date(s)	Time of Day	Weather Conditions Precipitation / Cloud Cover	Weather Conditions Temperature (°C)	Weather Conditions Wind (Beaufort Wind Scale)[1]
Spring Botanical Inventory	Meandering survey throughout publicly accessible areas within 30 m of ON-52 and Powerline Road	Erica Mekli, Ecologist	June 12, 2025	1030 to 1410	No precipitation Clear	16°C on arrival 24°C on departure	4
Summer Botanical Inventory	Meandering survey throughout publicly accessible areas within 30 m of ON-52 and Powerline Road	Sarah Yoshida, Ecologist	July 23, 2025	1110 to 1515	No precipitation Clear	25°C on arrival 28°C on departure	3
Fall Botanical Inventory	Meandering survey throughout publicly accessible areas within 30 m of ON-52 and Powerline Road	Sarah Yoshida, Ecologist	September 3, 2025	1220 to 1604	No precipitation Clear	24°C on arrival 26°C on departure	1
Ecological Land Classification	Ecological Land Classification for Southern Ontario (Lee et al.,1998) of entire property	Sarah Yoshida, Ecologist	July 23, 2025	1110 to 1515	No precipitation Clear	25°C on arrival 28°C on departure	3
Breeding Bird Surveys	Ontario Breeding Bird Atlas point count protocol (Bird Studies Canada, March 2019). Conservation Authority Baseline Ecological Assessment Requirements for MECAs (Conservation Ontario, n.d.)	Sarah Yoshida, Ecologist	May 27, 2025	0750 to 1000	No precipitation Clear	11°C on arrival 17°C on departure	2
Breeding Bird Surveys	Ontario Breeding Bird Atlas point count protocol (Bird Studies Canada, March 2019). Conservation Authority Baseline Ecological Assessment Requirements for MECAs (Conservation Ontario, n.d.)	Sarah Yoshida, Ecologist	June 23, 2025	0620 to 0830	No precipitation Clear	23°C on arrival 26°C on departure	0
Amphibian Breeding Call Surveys	Marsh Monitoring Program Participant's Handbook for Surveying Amphibians (BSC, 2009)	Sarah Yoshida, Ecologist	April 17, 2025	2100 to 2110	No precipitation Overcast	9°C on arrival 8°C on departure	1

Field Study	Methodology	Staff Involved	Date(s)	Time of Day	Weather Conditions Precipitation / Cloud Cover	Weather Conditions Temperature (°C)	Weather Conditions Wind (Beaufort Wind Scale)[1]
Amphibian Breeding Call Surveys	Marsh Monitoring Program Participant's Handbook for Surveying Amphibians (BSC, 2009)	Elly Hind-Smith, Ecologist	May 22, 2025	2147 to 2157	Light rain Overcast	10°C on arrival 10°C on departure	1
Amphibian Breeding Call Surveys	Marsh Monitoring Program Participant's Handbook for Surveying Amphibians (BSC, 2009)	Elly Hind-Smith, Ecologist	June 19, 2025	2154 to 2200	No precipitation Overcast	18°C on arrival 18°C on departure	1
Wetland Boundary Delineation	Ontario Wetland Evaluation System	Sarah Yoshida, Ecologist	June 26, 2025	1220 to 1515	Cloudy, light precipitation	21°C on arrival 20°C on departure	1
Search for potential wildlife habitats	Survey throughout study areas to search for features that could provide habitat for wildlife or SAR habitat such as nests, reptile hibernacula, old barns, structures, uncapped chimneys, foundations, mature forest areas with cavities or other features suitable for bat roosting, turtle nesting or overwintering sites.	All staff	All site visits				
Incidental flora and fauna observations	Visual observations of animals, tracks or scat and compilation of a plant inventory during all site visits	Sarah Yoshida, Ecologist	June 11, 2025	1000 to 1620	No precipitation Clear	17°C on arrival 25°C on departure	3
Aquatic Habitat Assessment	Ontario Ministry of Transportation (MTO) Fisheries Protocol - Environmental Guide for Fish and Fish Habitat (June 2009)	Sarah Yoshida, Ecologist	June 26, 2025	1220 to 1515	Light precipitation, cloudy	21°C on arrival 20°C on departure	1
Headwater Drainage Feature Assessment	Headwater Drainage Feature Assessment and Management Guidelines (TRCA and CVC, 2014)	Sarah Yoshida, Ecologist Mark Saunders, Aquatic Ecologist	March 19, 2025	1015 to 1355	No precipitation Clear	13°C on arrival 19°C on departure	3

[1] Beaufort Wind Scale: 0 = calm, smoke rises vertically (0 to 2 km/h); 1 = light air movement, smoke drifts (3 to 5); 3 = gentle breeze, wind felt on face; leaves rustle (6 to 11); 4 = moderate breeze, small branches moving, raises dust and loose paper (20 to 30); 5 = fresh breeze, small trees begin to sway (31 to 39); 6 = strong breeze, large branches in motion (40 to 50).

3.1 Vegetation Communities and Botanical Inventories

Burnside ecology staff conducted three-season site investigations to identify and map vegetation communities. All communities on-site and immediately adjacent to the property lands were reviewed to characterize their composition based on Lee et. al, 1998 and the Vegetation Type List of the Southern Ontario Ecological Land Classification (Lee, May 2008). The limits of these communities are shown on Figure 3. Vegetation surveys were conducted within 30 m of right-of-way (ROW) within publicly accessible lands that directly abutted the extent of the alignment options. Surveys were conducted from the ROW for any communities located on privately owned lands.

3.2 Wetland Boundary Delineation

Wetland boundary delineation in accordance with the Ontario Wetland Evaluation System (OWES) protocol with a GRCA ecologist, Tony Zammit, on June 26, 2025.

3.3 Breeding Bird Surveys

Standard breeding bird surveys were completed by Avian Biologists according to the Ontario Breeding Bird Atlas (OBBA) Guide for Participants (Bird Studies Canada, March 2019), tailored to the needs of the project.

- Two surveys were conducted at least one week apart between May 24 to July 10. Per the *Conservation Authority Baseline Ecological Assessment Requirements for Municipal Class Environmental Assessmen*t (Conservation Ontario, n.d.) outlined within the RFP, the second survey was completed between June 15 to July 10.
- Surveys were conducted during periods of no rain, no thick fog, and when winds were less than 19 km/h (i.e., <3 on the Beaufort Scale). Weather conditions were conducive for auditory and visual surveys for all visits.
- Standard breeding bird surveys were conducted at the designated point count locations within all vegetation communities present within the study area that may be indirectly impacted by the proposed project. Point count locations are shown on Figure 3.
- All birds observed and heard were recorded at each habitat unit location, including level of breeding evidence.
- Field data was collected using a mobile data collection application (Fulcrum) on an iOS device.

The dates, timing, and weather conditions of the three surveys can be found in Table 1.

3.4 Amphibian Call Count Surveys

A review of aerial photographs and mapping identified the presence of a shallow marsh and bog within the study area. A single survey location was chosen to provide information on potential amphibian breeding habitat within the shallow marsh community within the study area. The survey location for amphibian breeding surveys is shown on Figure 3.

Amphibian breeding call surveys were conducted in accordance with the protocols outlined in Environment Canada's Marsh Monitoring Program for Surveying Amphibians protocol (BSC, 2009). Three surveys were conducted between April and June 2025 to detect potential early-mid, and late-season amphibian breeding activity in Central Ontario. The dates, timing, and weather conditions of the three surveys can be found in Table 1.

Amphibian call surveys are utilized to verify species presence and specify abundance of calling anurans by assigning a call code and estimate of calling individuals. This information is then used to determine what species are present as well as the presence / absence of SWH.

3.5 Incidental Wildlife Sightings

Incidental wildlife sightings were limited to the study area and were documented during all field investigations in order to provide a general characterization of the habitat functions of the study area. Incidental observations were those recorded during targeted surveys for other aquatic or terrestrial investigations. Examples include tracks, carcasses, live sightings, etc.

3.6 Aquatic Habitat Characterization

Existing fish habitat conditions were observed on June 26, 2025. Fish habitat conditions with respect to form, function and fish habitat were recorded using a modified MTO Fisheries protocol. Weather conditions on the day of the survey are described above in Table 1 above. The location of aquatic habitat characterization is shown on Figure 4.

3.7 Headwater Drainage Feature Surveys

Field investigations were conducted based on procedures outlined in the Evaluation and Classification of Headwater Drainage Features Guideline (TRCA 2014) guidance, as well as the supporting Ontario Stream Assessment Protocol (OSAP) Section 4: Module 10 (S4:M10) and Section 4: Module 11 (OSAP, 2017). Limited accessibility to privately owned lands within the study area enabled a reach-based approach primarily utilizing S4:M10. A background review of existing hydro layer mapping, ArcHydro data and satellite imagery were utilized to identify potential HDF features based on desktop review. Each potential HDF location was investigated during the initial site visit during the spring freshet, with the subsequent monitoring visit completed at sites based on observations from previous visits. Only a single site visit during the spring freshet was completed as all features were determined to be dry during the initial site visit.

The evaluation methods outlined in the HDF Guideline utilize flow conditions, riparian vegetation, fish and fish habitat, and terrestrial assessments as components in the determination of HDF classification. The HDF Guideline implemented was primarily based on the “Standard Survey Type”. The results of calling amphibian surveys and vegetation inventories, as detailed in Sections 3.1 and 3.4 above were also utilized to assess the significance of the HDF features.

Since HDF’s can vary significantly on a seasonal basis, multiple site visits are typically needed to correctly assess their hydrology and riparian conditions. As the features were all found to be dry during the spring freshet, only one site visit was conducted.

Following field investigations, findings of the HDF evaluations were then translated into a classification of the HDF, with respect to the hydrology and the riparian vegetation conditions of the features.

4.0 Existing Conditions

The following sections document the terrestrial and aquatic natural heritage features and functions within the study area.

4.1 Environmental Land Classification and Vegetation Inventory

In total, 19 different ecological communities were identified within the study area. Of the identified communities, one is considered to be rare (S3) within Ontario in association with the Copetown Bog. A summary of ecological communities can be found in Table 2 below.

No provincially rare species were documented during the course of the Burnside's field investigations.

A detailed list of plants identified on the study area during the three-season botanical inventory can be found in Appendix B. The following summarizes the flora observed in the study area:

- 133 plant taxa were observed. Of those, 133 were identified to species, or subspecies level.
- Of those species, 74 (56%) were native and 59 (44%) were non-native to Ontario.
- All of the native species observed are considered 'apparently secure' (uncommon but not rare) (S4) or 'secure' (common, widespread and abundant) (S5) in Ontario.
- One species, Giant Ragweed (*Ambrosia trifida*) is considered to be uncommon and one species, Northern Watermeal (*Wolffia borealis*), is considered to be rare in Hamilton.
- Natural Heritage Database recorded Field Thistle (S3) within the Copetown Bog. This species was not recorded during Burnside field investigations.

Table 2: Summary of ELC Communities Within the Study Area

ELC	ELC Description	Community Composition	Provincially Significant Wetlands / Other Wetlands	Significant Woodlands
MAM	Meadow Marsh	These communities are located west of ON-52 and the TAGM1a community and south of Powerline Road West. These communities were not characterized by Burnside as they are located well away from the proposed intersection improvements. This community was identified through the MNRF wetland mapping. Targeted wildlife inventories and vegetation inventories were not completed within this community.	PSW – Big Creek Headwaters Wetland Complex	No
MASM1-14 / SAF_1-3	Reed Canary Grass Mineral Shallow Marsh Type / Duckweed Floating-leaved Shallow Aquatic Type	This community consists of an impoundment associated with the downstream extents of the lagg around the Copetown bog. Standing water was present within this area year-round and is presumed to be less than 1.0 m deep. This community consists of a shallow impoundment dominated by Common Duckweed (*Lemna minor*) and Northern Watermeal (*Wolffia borealis*). The impoundment area was surrounded by densely growing Reed Canary Grass with lesser associates of Spotted Jewelweed (*Impatiens capensis*), Redtop (*Agrostis gigantea*), and Fringed Sedge (*Carex crinita*). Red Osier Dogwood (*Cornus sericea*) occasionally occurs within this community but does not provide >20% cover.	PSW – Copetown Bog	No
MAS / SWT	Shallow Marsh / Thicket Swamp	These communities are located in association with the lagg of the Copetown Bog northwest of the existing parking lot. These communities were not characterized by Burnside as they are located well away from the proposed intersection improvements. No species were specifically identified within this community the Hamilton NAI (3rd edition) or Greenbelt Indigenous Botanical Survey. Per the *Lower Middle Grand Subwatershed Natural Heritage Characterization Report*, the open water marsh supports various emergent marsh vegetation species including Common Cattail, Rice Cut Grass, Water Arum, and Spotted Jewelweed[14]. This community was identified through the MNRF wetland mapping. Targeted wildlife inventories and vegetation inventories were not completed within this community.	PSW – Copetown Bog	No

ELC	ELC Description	Community Composition	Provincially Significant Wetlands / Other Wetlands	Significant Woodlands
BOTC2-1 / BOSD1-1	Tamarack – Leatherleaf Treed Kettle Bog Type / Leatherleaf Shrub Bog Type	This community represents an area of the Provincially Significant Copetown Bog. This feature is a kettle wetland, is the only known bog that occurs within the city of Hamilton and was characterized within the Hamilton NAI (3rd edition). This community was not assessed by Burnside staff. The outer portion of this community consists of a band of Black Spruce (*Picea abies*) and Tamarack (*Larix laricema*) while the interior is dominated by ericaceous shrubs that form the Leatherleaf Shrub Bog Type (BOS1-1). Ericaceous shrubs occurring in association with this community include Bog-rosemary (*Andromeda polifolia*), Leatherleaf (*Chamaedaphne calyculata*), Bog Laurel (*Kalmia polifolia*) and Labrador Tea (*Ledum groenlandicum*). Groundcover species present include many species that are considered to be rare within the city of Hamilton including Pitcher Plant (*Sarracenia purpurea*), Round-leaved Sundew (*Drosera rotundifolia*), Bog Buckbean (*Menyanthes trifoliata*), Lesser Bladderwort (*Utricularia minor*), and various sedge species including the provincially-rare Biling's Three-seeded Sedge (*Carex trisperma var. billingsii*)[3]. Targeted wildlife inventories and vegetation inventories were not completed within this community.	PSW – Copetown Bog	No
MEGM3	Dry - Fresh Graminoid Meadow Ecosite	This community represents the ROWs present along ON-52 and Powerline Road East and West. This community consists of common meadow species and is dominated by Kentucky Bluegrass (*Poa pratensis*) with lesser associates of Smooth Brome (*Bromus inermis*), White Campion (*Silene latifolia*), and Goldenrod (*Solidago spp.*). Shrub species including Multiflora Rose (*Rosa multiflora*), Staghorn Sumac (*Rhus typhina*), European Buckthorn (*Rhamnus cathartica*), and Tatarian Honeysuckle (*Lonicera tatarica*) occur occasionally within the ROW but do not exceed 10% cover.	No	No
MEMM3	Dry - Fresh Mixed Meadow Ecosite	This community is present east of the Hamilton-Brantford Rail Trail north of Powerline Road East. This community consists of common meadow species and is dominated by Canada Goldenrod (*Solidago canadensis*), with lesser associates of Kentucky Bluegrass, Smooth Brome, and Queen Anne's Lace (*Daucas carota*). Regenerating Manitoba Maple (*Acer negundo*) as well as shrub species including Staghorn Sumac and European Buckthorn as well as Wild Grape (*Vitis riparia*) are present within the understory layer but do not exceed 20% cover.	No	No
MEFM1 / THDM4	Dry - Fresh Forb Meadow Ecosite Dry - Fresh Deciduous Regeneration Thicket Ecosite	This community represents the meadow / thicket community bordering the Copetown Bog and its associated impoundment. This community consists of open areas dominated by forbs interspersed by dense areas of shrub and tree regeneration. This community has been subject to dumping. A distinct canopy and subcanopy are absent from this community with a few mid-aged to mature trees including White Spruce (*Picea glauca*), Manitoba Maple, and Black Walnut (*Juglans nigra*). The understory is patchy, consisting of dense patches of regenerating Manitoba Maple with lesser associates of Black Raspberry (*Rubus occidentalis*), Black Walnut regeneration, and Staghorn Sumac. The groundcover is dominated by Tall Goldenrod (*Solidago altissima*) with lesser associates of Kentucky Bluegrass, Hedge Bedstraw (*Galium mollugo*), and Dame's Rocket (*Hesperis matronalis*).	No	No

ELC	ELC Description	Community Composition	Provincially Significant Wetlands / Other Wetlands	Significant Woodlands
WODM4a	Dry - Fresh Deciduous Woodland Ecosite	This community occurs east of ON-52 north of Powerline Road East. This community is largely present on privately owned lands and was assessed from the ROW. An established canopy is absent from this community. Canopy trees consist of a small number of Northern Catalpa (*Catalpa speciosa*) with lesser associates of mature Silver Maple (*Acer saccharinum*) and Black Cherry (*Prunus serotina*). The subcanopy provides approximately 50% cover and is dominated by Northern Catalpa with lesser associates of Manitoba Maple. The understory is moderately dense and consists of Tatarian Honeysuckle, Manitoba Maple regeneration, European Buckthorn, and Black Raspberry. The groundcover is consistent with the MEGM3 community.	No	No
WODM4b	Dry - Fresh Deciduous Woodland Ecosite	This community occurs west of ON-52 north of Powerline Road West. Invasive species dominate this community. An established canopy is absent from this community. The subcanopy provides approximately 70% cover and is dominated by Black Locust with lesser associates of Black Walnut and Manitoba Maple. The understory provides 60% cover and consists of regenerating Black Locust (*Robinia pseudoacacia*), Black Walnut, Multiflora Rose, and Red Ash (*Fraxinus pennsylvanica*). The groundcover is dominated by Garlic Mustard (*Alliaria petiolata*), Dame's Rocket, Tall Goldenrod, and Yellow Avens (*Geum aleppicum*).	No	No
WODM4-4	Dry - Fresh Black Walnut Deciduous Woodland Type	This community occurs east and west of ON-52 and is associated with the Hamilton-Brantford Rail Trail. This community occurs in association with the unnamed tributary. This community has moderately steep slopes, likely due to the construction of the rail trail. Invasive species are pervasive throughout this community. The canopy layer provides approximately 20% cover and consists of Black Walnut, Trembling Aspen (*Populus tremuloides*), Eastern Cottonwood (*Populus deltoides*), and Balsam Poplar (*Populus balsamifera*). The subcanopy provides 60% cover and is dominated by Black Walnut with lesser associates of Manitoba Maple, Trembling Aspen, and Black Cherry. The understory is dense, providing 60-70% cover consisting of regenerating Manitoba Maple, European Buckthorn, Black Walnut, and Black Raspberry. The groundcover layer is well established, providing >60% cover and is dominated by Garlic Mustard with lesser associates of Dame's Rocket, Enchanter's Nightshade (*Circaea lutetiana*), and Yellow Avens.	No	No
WODM5-3	Fresh - Moist Manitoba Maple Deciduous Woodland Type	This community occurs west of ON-52 and is associated with the Hamilton-Brantford Rail Trail. Standing Ash snags and deadfall logs are common within this community. This community has moderately steep slopes, likely due to the construction of the rail trail. Invasive species are pervasive throughout this community. The canopy layer provides approximately 10% cover and consists of Manitoba Maple, Black Walnut, Eastern Cottonwood, and Norway Spruce (*Picea abies*). The subcanopy provides 40-50% cover and is dominated by Manitoba Maple with lesser associates of Black Walnut, Black Locust, and Green Ash. The understory is dense, providing >70% cover and consists of regenerating Manitoba Maple, European Buckthorn, Wild Grape (*Vitis riparia*), and Green Ash. The groundcover layer is well established, providing >60% cover and is dominated by Garlic Mustard with lesser associates of Thicket Creeper (*Parthenocissus vitacea*), Enchanter's Nightshade, and Purple Crown Vetch (*Securigera varia*).	No	No

ELC	ELC Description	Community Composition	Provincially Significant Wetlands / Other Wetlands	Significant Woodlands
FOM	Mixed Forest	This community is located immediately south of the TAGM1 community and west of ON-52. This community consists of both coniferous species such as White Pine (*Pinus strobus*) and deciduous species. This community was not characterized by Burnside.	No	Yes
FOD	Deciduous Forest	These communities are located east of ON-52 and north of Powerline Road East. These communities were not characterized by Burnside as they are located well away from the proposed intersection improvements. Per the Greenbelt Indigenous Botanical Survey, the forested areas present at the southern extent of the Copetown Bog which fall within the study area are dominated by Black Walnut and Manitoba Maple while the understory is dominated by European Buckthorn (and Chokecherry (*Prunus virginiana*) while the groundcover was documented to be dominated by Garlic Mustard (Plenty Canada, 2024). Per the Lower Middle Grand Subwatershed Natural Heritage Characterization Report, the upland deciduous forests adjacent to the Copeland bog consists of most Red Oak Forest.	No	Yes
FODM5	Dry - Fresh Sugar Maple Deciduous Forest Ecosite	This community is located west of ON-52, immediately south of Powerline Road West and is largely located on private property. This community consists of a young to mid-aged deciduous forest. Standing snags and deadfall logs rarely occur within this community. Road noise is still prevalent within this community. Invasives are also common in both the understory and groundcover layers. The canopy layer provides >70% cover and is dominated by Sugar Maple (*Acer saccharum*) with lesser associates of Black Walnut, Red Oak (*Quercus rubra*), and Black Cherry. A distinct subcanopy has not become established, providing approximately 20-30% cover, and is dominated by Sugar Maple with lesser associates of Black Walnut, Black Cherry, and White Pine. The understory is relatively open, providing 20-30% cover consisting of European Buckthorn, Chokecherry, Red Currant (*Ribes rubrum*), and regenerating canopy species. The groundcover layer provides approximately 30% cover and is dominated by Garlic Mustard, Enchanter's Nightshade, Thicket Creeper, and Rough Avens (*Geum laciniatum*).	No	Yes
TAGM1a	Coniferous Plantation	This community is located west of ON-52 and south of Powerline Road West. This community consists of a mid-aged White Pine Plantation. An established understory is absent due to the density of the Pine plantings and consists of rarely occurring Staghorn Sumac, Black Walnut regeneration, Black Raspberry, and Manitoba Maple along the margins of this community. A groundcover layer is largely absent and consists of rarely occurring Poison Ivy (*Toxicodendron radicans*), Herb Robert (*Geranium robertianum*), Garlic Mustard, and Virginia Stickseed (*Hackelia virginiana*).	No	Yes
TAGM1b	Coniferous Plantation	This community is located east of the Hamilton-Brantford Rail Trail and north of Powerline Road East. This community is located on privately owned lands and was identified through air photo review.	No	No
IAG	Agricultural Infrastructure	This community consists of a dairy farm and creamery.	No	No
OAGM1	Agricultural	This community consists of row crops.	No	No
CVR_4	Residential	This community consists of rural residences and their associated outbuildings and structures.	No	No

4.2 Breeding Bird Surveys

A total of 35 resident bird species, exhibiting some level of breeding evidence (possible, probable or confirmed) were observed on the study area during targeted breeding bird surveys in 2025 (see Appendix C). Five species were observed on the study area; however, no level of breeding evidence was observed: American Crow (*Corvus brachyrhynchos),* Blackpoll Warbler (*Setophaga striata*), Eastern Bluebird (*Sialia sialis*), Purple Martin (*Progne subis*), and Tennessee Warbler (*Leiothlypis peregrina*).

According to MNR's Significant Wildlife Habitat Technical Guide (2000), "area sensitive" species are defined as species that require large areas of suitable habitat for long term population survival. Fragmentation of essential habitats can result in overall declines in populations. Four "area sensitive" bird species, as defined by the MNR, were observed on the study area during the breeding bird surveys: American Redstart (*Setophaga ruticilla*), Red-breasted Nuthatch (*Sitta canadensis*), Savannah Sparrow (*Passerculus sandwichensis*), and White-breasted Nuthatch (*Setophaga petechia*).

One 'rare' species to the city of Hamilton, Carolina Wren, was documented during the course of breeding bird surveys at BBS02, BBS03, and BBS05.

One species listed as both provincially and federally significant, was observed on the study area during breeding bird surveys: Eastern Wood-pewee (*Contopus virens*) (Special Concern). Eastern Wood-pewee was recorded at BBS3 during both breeding bird surveys. Purple Martin (*Progne subis*, S3), which is considered "vulnerable" in Ontario, was also observed foraging overhead during breeding bird surveys. This species almost exclusively nest in human-provided housing in Ontario and forage within approximately 3 km of their colony. No nesting boxes were observed in the study area; therefore, it is assumed they are breeding well beyond the ROW within rural residential or agricultural communities.

SAR and SWH Screening Tables for the study area are included in Appendices D and E.

4.3 Amphibian Call Count Surveys

In total, three species of amphibians were recorded calling during targeted amphibian breeding surveys including: Spring Peeper (*Pseudacros crucifer*), Wood Frog (*Lithobates sylvaticus*), and Green Frog (*Lithobates clamitans*). All

three species are ranked as S5 (Secure) within Ontario and are considered common and widespread. A summary of species observed can be found in Table 3 below.

Spring Peeper was the most commonly recorded species and was documented in both the early and mid-season survey at a Call Code of 3. As two species were not reported to be calling at a Call Code 3, SWH Amphibian Breeding Habitat (Wetland) is confirmed absent.

Table 3: Summary of Amphibian Breeding Surveys

Survey Date	Station ID	Species Observed	No. of Individuals	MMP Call Code[1]
April 17, 2025	001	Spring Peeper	Full chorus	3
April 17, 2025	001	Wood Frog	4	1
May 22, 2025	001	Spring Peeper	Full chorus	3
May 22, 2025	001	Green Frog	1	1
June 19, 2025	001	N/A	N/A	0

[1]Marsh Monitoring Protocol Call Codes
1: Calls not simultaneous, number of individual can be accurately counted.
2: Some calls simultaneous, number of individuals can be reliably estimated
3: Full chorus, calls continuous and overlapping, number of individuals cannot be reliably estimated

4.4 Incidental Wildlife

Incidental wildlife recorded in the study area are listed in Table 4 below. With the exception of Monarch, all species are ranked as S5 (apparently secure) within Ontario and are considered common and widespread throughout the province. Monarchs are designated as “Endangered” under COSEWIC and the *Federal Species at Risk Act* and “Special Concern” under the provincial ESA.

Table 4: Incidental Wildlife Observations

Common Name	Scientific Name	S-Rank/ESA	Location	Comments
Red Squirrel	*Sciurus vulgaris*	S5	WODM5	
Gray Squirrel	*Sciurus carolinensis*	S5	FODM5, WODM4-4	
Autumn Meadowhawk	*Sympetrum vicinum*	S5	MASM1-14	

Common Name	Scientific Name	S-Rank/ESA	Location	Comments
Monarch	*Danaus plexippus*	S2N,S4B (SC)	WODM5, MEFM1 / THDM4, MEMM3	Adult foraging. No Monarch larvae were incidentally observed.
Twelve-spotted Skimmer	*Libellula pulchella*	S5	MASM1-14	
Green Frog	*Rana clamitans*	S5	MASM1-14	

4.5 Aquatic Habitat Characterization

An unnamed tributary of Big Creek is present within the study area and originates at the northern margin of the Summit Muskeg Preserve. This watercourse flows along the eastern margin of the bog through a thicket swamp before becoming an impoundment immediately west of the parking area for the Hamilton Brantford Rail Trail. The watercourse then flows southwards underneath the existing driveway for the Rail Trail Parking before flowing southwards underneath Hwy 52.

The unnamed tributary of Big Creek is classified as a warmwater thermal regime. Based on the MNRF's ARA mapping, seven species of fish have been reported within the tributary. The MNRF ARA Watercourse summary information is listed in Table 5 below. The OHN mapping also identifies this watercourse as intermittent. Based on the DFO SAR mapping, no aquatic species at risk occur within the watercourse.

Table 5: Species Within the Unnamed Tributary of Big Creek

Common Name	Scientific Name	Thermal Regime
Brook Stickleback	*Culaea inconstans*	Cool
Central Mudminnow	*Umbra limi*	Cool
Common Carp	*Cyprinus carpio*	Warm
Common Shiner	*Luxilus cornutus*	Cool
Fathead Minnow	*Pimephales promelas*	Warm
Pumpkinseed	*Lepomis gibbosus*	Warm
White Sucker	*Catostomus commersoni*	Cool

Burnside assessed three reaches of the unnamed tributary within the study area spanning from the impoundment outlet to the margin of the TAGM1 Community. Sections 4.5.1 to 4.5.3 summarizes the channel dimensions (i.e., information

pertaining to the morphology, wetted width / depth, substrate etc.) and conditions observed by Burnside's aquatic ecologist on June 26, 2025. Common sources of pollution that may apply to the site include the roadway (i.e., gravel road sources of fine sediments and salts) and agricultural lands (i.e. nutrient runoff, fine sediments). A photo page that references the observations in Sections 4.5.1 to 4.5.3 is provided in Appendix A.

Based on the *Lower-Middle Grand Natural Heritage Characterization Report* (GRCA, 2017), the ponds and wetlands in the kettle depression are hydrologically isolated from the unnamed tributary of Big Creek system except for intermittent outflow into the Big Creek system from the western kettle bog via a drainage culvert located at the southern end.

Based on Burnside's observations, the unnamed tributary of Big Creek, this watercourse should be considered a headwater drainage feature. The portions of the unnamed tributary occurring within the study area were found to be dry during each of Burnside's site visit, including during the March 2025 site visit. Standing water was observed south of the study area in association with marsh community the Big Creek Headwaters Wetland Complex well beyond the study area during the spring freshet. Upland vegetation species, including shrub and tree regeneration is present within all the assessed reaches of the watercourse. Although defined banks are present, no evidence of sediment sorting is present within all four reaches. No evidence of groundwater contribution is present within any of the assessed reaches.

4.5.1 Reach 1 (R1)

This reach originates at the outlet of the SAF_1-3/MAS impoundment. R1 flows north to south towards the parking lot access road where flows are then conveyed through a 1.0 m diameter CSP (CR1). This reach is classified as a vegetated swale. The northern portion of the swale is dominated by Reed Canary Grass and Spotted Jewelweed. The southernmost portion of the swale is vegetated with upland species including White Avens (*Geum canadense*), Yellow Avens, Ground Ivy, and Tall Goldenrod. The majority (>90%) of the channel is shaded by shrubs along the eastern bank.

The banks of this reach are well vegetated with herbaceous vegetation species on the west bank as well as shrubs along the eastern bank. No evidence of bank slumping or undercut banks are present.

4.5.2 Reach 2 (R2)

Downstream of CR1, the watercourse continues to consist of a well-vegetated swale, becoming increasing less defined downstream of Crossing CR1, flowing through the WODM5 community before flowing through a 1.0 m CSP (CR2). Immediately upstream of CR2, the watercourse is marginally defined. The adjacent valley walls of the WODM5 community are moderately steep.

Woody vegetation is pervasive within the channel consisting of European Buckthorn, American Black Currant (*Ribes americanum*), and Poison Ivy. Upland herbaceous species including Yellow and White Avens as well as garlic mustard are also present. The riparian areas consist of deciduous woodland with several mature Eastern Cottonwood and White Willows bordering Reach 2. The adjacent riparian trees provide >90% cover to the watercourse.

The banks of this reach are well vegetated with herbaceous vegetation species on the west bank as well as shrubs along the eastern bank. No evidence of bank slumping or undercut banks are present.

4.5.3 Reach 3 (R3)

The outlet of CR2 is embedded with the bed of the watercourse with abundant sediments visible from the outlet. This reach consists of a grassed swale running parallel to ON-52. This feature is well vegetated by upland meadow species (see the description for the MEGM3 Community) and likely functions as a stormwater conveyance for ON-52. No evidence of active erosion was present during the course of Burnside's field investigations.

4.5.4 Reach 4 (R4)

Downstream of CR3, the channel form of the watercourse becomes almost imperceivable as R4 flows through the WODM4-4 Community, eventually becoming undefined before flowing parallel to the Hamilton-Brantford Rail Trail adjacent to the TAGM1 Community. The CR3 outlet is damaged with minor amounts of sediment accumulation visible from the outlet. The adjacent valley walls of the TAGM1 Community are moderately steep. The portion of the mapped watercourse flowing adjacent to the TAGM1 Community were not able to be accessed safely, all observations were instead made from the trail.

Within the portion of the watercourse flowing through the ROW and WODM4-4 community, woody Vegetation is pervasive within the channel consisting of European Buckthorn, Black Raspberry, native tree regeneration,

and Poison Ivy. Upland herbaceous species including Cleavers, Enchanter's Nightshade, and Thicket Creeper are well established and provide extensive cover. The riparian areas consist of deciduous woodland with young Black Walnut and Manitoba Maple. The adjacent riparian trees provide >90% cover to the watercourse. The channel of the watercourse is undefined with no visible bed or banks. The mapped watercourse lacks defined bed and banks throughout this area.

Along the portion of the watercourse that flows along the rail trail adjacent to the TAGM1 community, the mapped watercourse is well vegetated with cool season grasses and Goldenrod sp. The banks bordering the rail trail, while steep, are stable and well vegetated. No evidence of bank slumping or undercut banks are present.

Where defined banks are present, the banks of this reach are well vegetated with herbaceous vegetation species on the west bank as well as shrubs along the eastern bank. No evidence of bank slumping or undercut banks are present.

A summary of the channel morphology and instream vegetation can be found in Table 6 and Table 7 below.

Table 6: Unnamed Tributary of Big Creek Channel Morphology Summary

Reach	Percentage of Area	Mean Bankfull Width (m)	Mean Bankfull Depth (m)	Substrate
R1	Vegetated swale: 100%	3.75	0.87	Topsoil (vegetated)
R2	Vegetated swale: 100%	3.2	0.6	Topsoil (vegetated)
R3	Vegetated swale: 100%	3.3	0.6	Topsoil (vegetated)
R4	Vegetated swale: 100%	n/a	n/a	Topsoil (vegetated)

Table 7: In-stream Habitat Percent Cover Summary Within the Unnamed Tributary of Big Creek

Reach	Undercut Banks	Boulders	Cobble	Woody Debris	Organic Debris	Vascular Macrophytes (Instream)
R1	0%	0%	0%	20%	100%	100% (terrestrial vegetation)
R2	0%	0%	0%	10% (fallen logs)	0%	90% (terrestrial vegetation)
R3	0%	0%	0%	0%	0%	100% (terrestrial vegetation)
R4	0%	0%	0%	30% (fallen logs)	0%	90% (terrestrial vegetation)

4.5.5 Fish Habitat

Based on Burnside's assessment of field conditions, the MASM1-14/SAF_1-3 Community associated with the Copetown Bog Lagg may support permanent fish habitat and may be considered fish habitat as defined under the federal *Fisheries Act*. The outfall at the impoundment represents a physical barrier to fish passage.

As the reaches immediately downstream of the impoundment were found to not contain any water and are hydrologically isolated from the lagg with the exception of intermittent flows. Due to the extent of vegetation growth and establishment of woody species within the channel, and lack of sediment sorting, it is unlikely that this portion of the unnamed tributary of Big Creek is subject to regular flows with water rarely being present. Furthermore, given the extent of vegetation growth and lack of connectivity to the downstream reaches of the watercourse south of the TAGM1 Community, the portions of the unnamed tributary of Big Creek downstream of the impoundment should be considered indirect fish habitat. The mapped watercourse may provide minor amounts of sediment transport and conveyance of overland flows to downstream areas.

4.6 Headwater Drainage Features (HDF)

HDFs within the study area varied in structure and permanence ranging from undefined channels to swales. Drainage features were assessed from constriction points (i.e., culverts) from the ROWs. A total of two features were identified within the study area.

A photographic summary of the reviewed HDFs can be found in Appendix A.

Reach Based Classification

The classification of each HDF reach was assessed based on the hydrological classification, riparian characteristics, potential fish habitat, and capacity to provide terrestrial linkages. Of the reaches in each HDF feature, three are classified as ‘No Management Concern’ and four are classified as ’Maintain Terrestrial Linkage’. Management recommendations were based on the management decision matrix on Figure 2 of the Evaluation, Classification, and Management of Headwater Drainage Features Guidelines (CVC and TRCA, 2014). A summary of the reach-based classifications can be found below in Table 8 and Figure 4.

Table 8: Headwater Drainage Feature Reach-Based Classification

Feature	Feature Condition	Feature Type	Hydrology	Riparian Classification	Fish and Habitat	Terrestrial Habitat	Management Recommendations
H1R1 (Powerline Road East) – Upstream 1 (0 to 5)	Dry	Undefined	Limited	Limited	Contributing	Limited	No Management Required
H1R2 (Powerline Road East) – Upstream 2 (5 to 20)	Dry	Undefined	Limited	Limited	Contributing	Limited	No Management Required
H1R3 (Powerline Road East) – Downstream	Dry	Undefined	Limited	Limited	Contributing	Limited	No Management Required
H1R4 (Hamilton-Brantford Rail Trail) – Upstream, Feature 1	Dry	Swale	Limited	Important	Contributing	Contributing	Maintain / Replicate Terrestrial Linkage
H1R5 (Hamilton-Brantford Rail Trail) – Upstream, Feature 2	Dry	Undefined	Limited	Important	Contributing	Contributing	Maintain / Replicate Terrestrial Linkage
H1R6 (Hamilton-Brantford Rail Trail) – Downstream	Dry	Swale	Limited	Important	Contributing	Contributing	Maintain / Replicate Terrestrial Linkage
H2R1 – Upstream	Dry	Swale	Limited	Important	Contributing	Contributing	Maintain / Replicate Terrestrial Linkage
H2R2 - Downstream	Standing Water	Undefined	Limited	Important	Contributing	Contributing	Maintain / Replicate Terrestrial Linkage

Feature H1

The H1 feature crosses two constriction points, once along the Powerline Road East and again across the Hamilton-Brantford Rail Trail.

Feature H1 originates within an agricultural field on privately owned lands and was identified using LiDAR data. The first constriction point occurs at a roadside culvert that receives flows from the agricultural field as well as roadside drainage from Powerline Road. The upstream section consists of an undefined feature lacking a defined bed and banks that passes through an agricultural field from 5 to 20 m upstream of the culvert (H1R1) and maintained lawn ROW from 0 to 5 m upstream of the culvert (H1R2). No standing water was present during the freshet. Minimal amounts of sediment were visible within the culvert. Downstream of the crossing structure, the feature flows through maintained turfgrass yards (H1R3) towards the forested areas associated within the rail trail. No sediment was observed within the dry feature.

The second constriction point along Feature H1 consists of two 700 mm corrugated steel culvert (CSP) and is located along the rail trail. The upstream reach consists of two features, the primary feature being a swale that flows east to west towards the culvert through a cultural woodland and cultural plantation (H1R4), and a secondary feature, a vegetated swale. A constructed wooden barrier is located approximately 7 m upstream of the culvert crossing of the primary feature, upstream of the barrier the feature becomes undefined. Woody vegetation and herbaceous was observed growing within the channel of the feature. The secondary feature (H1R5) is a vegetated swale that flows from south to north along the rail trail towards the culvert crossing through a cultural woodland. A wooden footbridge was observed approximately 10 m upstream of the crossing. Woody vegetation and herbaceous vegetation is growing within the channel. No evidence of active erosion or sediment deposition was observed within either the primary or secondary features. Both features were dry during the spring 2025 freshet. No sediment transport was visible from the adjacent lands. Based on Burnside's review of LiDAR imagery this feature appears to connect to the lagg of the summit bog.

The downstream end of the culverts of the second constriction point are compromised structurally and are partially buried (H1R6). Former rail ties are also blocking the channel approximately 4 m downstream of the culvert outlet that would impede flows.

Feature H2

This feature (H2R1) is present south of the intersection of Powerline Road East and ON-52 and originates within the agricultural field before flowing westwards through a cultural woodland before crossing ON-52 before flowing through a White Pine plantation before eventually connecting to the Big Creek provincially significant wetland complex. The constriction point of this feature is a 1,000 mm CSP. Upstream of the culvert with moderately steep valley walls, only a single feature is present, a vegetated swale that passes through a cultural thicket. The swale possesses defined bed and banks, but shrubs and small trees have become established in the channel. Moderate amounts of sediment deposition was noted at the culvert inlet. The roadside drainage networks that direct stormwater flows towards the HDF feature have caused gully erosion to occur along the valley walls north of the feature, contributing sediments to the feature.

Downstream of the culvert crossing, the feature (H2R2) becomes undefined, flowing through a maintained grass area bordered by a White Pine plantation. Minor amounts of standing water spanning 1.5 m and <0.1 deep is present at the culvert outlet. No flows or standing water is present downstream of the pool. Rill erosion is visible on either side of the culvert outlet, contributing sediments to the feature.

Table 9: Summary of HDF Characteristics

Feature	Bankfull Width (m)	Bankfull Depth (m)	Feature Vegetation	Riparian Vegetation
H1R1: (Powerline Road East) – Upstream 1	n/a	n/a	Cropped	Cropped
H1R2: (Powerline Road East) – Upstream 2	n/a	n/a	Lawn	Lawn
H1R3 (Powerline Road East) – Downstream	n/a	n/a	Cropped	Cropped
H1R4 (Hamilton-Brantford Rail Trail) – Upstream, Feature 1	4.50	1.14	Woodland	Woodland, forest, thicket, lawn
H1R5 (Hamilton-Brantford Rail Trail) – Upstream, Feature 2	1.9	0.47	Woodland	Woodland, forest, thicket, lawn
H1 (Hamilton-Brantford Rail Trail) – Downstream	2.00	4.50	Woodland	Woodland
H2 – Upstream	1.40	2.00	Thicket	Thicket
H2 – Downstream	n/a	n/a	Lawn	Lawn, Forest

Overall, all the assessed reaches provide indirect fish habitat, as the feature provides sediment transport, overland flows, and allochthonous inputs (minerals and nutrients) to downstream fish habitat. Features H1 and H2 are impacted by agricultural activities and also heavily impacted by agricultural operations and off-site developments upstream of the feature. Both features also receive stormwater flows from roadside drainage features, likely contributing contaminants from the roads.

5.0 City of Hamilton Natural Heritage System

5.1 Niagara Escarpment Plan (2017)

The lands located east of Hwy 52 are located within the Niagara Escarpment Plan (NEP) Areas. NEP Natural Areas include the Summit Muskeg Preserve ANSI. The forested communities and cultural meadow communities located east of Hwy 52 and north of Powerline Road are designated as Escarpment Protection areas while rural residential and agricultural communities are designated as Escarpment Rural Areas.

5.2 Greenbelt Plan (2017)

The land located south of Powerline Road is located within the Greenbelt Plan Natural Heritage System. Within the study area, these lands border the Niagara Escarpment Plan Area east of Hwy 52 and south of Powerline Road. The lands west of Hwy 52 beyond the NEP Natural Areas and Greenbelt Plan Natural Heritage System are designated as Greenbelt Protected Countryside.

5.3 Provincially Significant Wetlands (PSW)

Two PSWs, the Copetown Bog and the Big Creek Headwaters Wetland Complex, are present in the study area.

The Copetown Bog is an isolated kettle bog located within the largest kame in the kettle topography within the Dundas Valley[1] and is located north of Powerline Road. The Big Creek Headwaters Wetland Complex occurs in association with the unnamed tributary of Big Creek and occurs south of Powerline Road.

5.4 Significant Woodlands

Significant Woodlands are defined by the RHOP as woodlands that are “ecologically important” with regards to the following:

1

a) *"Features such as species composition, age of trees, stand history;*
b) *Functionally important due to its contribution to the broader landscape because of its location, size, or due to the amount of forest cover in the planning area; and*
c) *Economically important due to site quality, species composition or past management history"*

For a woodland to be considered significant, it must meet two or more of the following criteria outlined in Table 10 below.

Table 10: Criteria for Woodland Significance (RHOP, 2024) Relative To the Conditions Present Within the Study Area

Criterion	Description	Applicable to FOD, FOM, and TAGM1 Communities
Size	Forest Cover (by planning unit) <5% (Min. Patch Size for Significance, 1 ha) 5 to 10% (Min. Patch Size for Significance, 2 ha) 11 to 15% (Min. Patch Size for Significance, 4 ha) 16 to 20% (Min. Patch Size for Significance, 10 ha) 21 to 30% (Min. Patch Size for Significance, 15 ha)	The FOD, FODM5, FOM, TAGM1a, and TAGM1b communities south of Powerline Road and west of Hwy 52 are separated by a rail trail with a distance <20 m. Per the Natural Heritage Reference Manual (MNRF, 2005), "*A bisecting opening 20 metres or less in width between crown edges is not considered to divide a woodland into two separate woodlands*". When considering the area of all three communities minus the area of the developed opening and PSW features, the total area is >4 ha.
Interior Forest	Woodlands that contain interior forest habitat. Interior forest habitat is defined as 100 m from edge.	Absent.
Proximity / Connectivity	Woodlands that are located within 50 m of a significant natural area (defined as wetlands 0.5 ha or greater in size, ESAs, PSWs, and Life Science ANSIs).	Confirmed present. The FOD community is located within 50 m of the Copetown Bog ANSI / PSW. The FODM5, FOM, and TAGM1a communities are located within 50 m of the Big Creek Headwaters Complex PSW and unnamed tributary of Big Creek.
Proximity to Water	Woodlands where any portion is within 30 m of any hydrological feature, including all streams, headwater areas, wetlands, and lakes.	The FODM5, FOM, and TAGM1 communities located south of Powerline Road are located within 30 m of the Big Creek Headwaters Wetland Complex PSW and the unnamed tributary of Big Creek.
Age	Woodlands with ten or more native trees / hectare greater than 100-years old.	Unknown
Rare Species	Any woodland containing threatened, endangered, special concern, provincially, or locally rare species.	Confirmed present. Eastern Wood-pewee is present in association with the FODM5 Community. Carolina Wren, a locally rare species, also occurs in association with the FODM5 Community. No locally or provincially rare plant species occur within the FOD, FODM5, FOM, or TAGM1a, or TAGM1b communities. There is high potential for SAR bats to be supported within all forest and plantation communities within the study area.

Based on the criteria outlined within Table 10 above and Burnside's review of air photos and the RHOP Schedule B-2, it is likely that FODM5, FOD, FOM, TAGM1a, and TAGM1b Communities are considered to be significant within the city of Hamilton.

5.5 Significant Valleylands

Significant Valleylands are absent from within the study area.

5.6 Areas of Natural Scientific Interest (ANSI)

One Life Sciences provincial ANSI, the Summit Muskeg Preserve, is present within the study area. The Dundas Valley Earth Sciences provincial ANSI is also present within the study area. Only the Earth Sciences ANSI is present within the existing ROW.

5.7 Significant Habitat of Species at Risk

To identify potential Habitat of Endangered and Threatened Species, a review of aerial photography, the Ontario Reptile and Amphibian Atlas, Ontario Breeding Bird Atlas and Natural Heritage Information Centre on-line databases was conducted.

Based on Burnside's desktop review of the on-site conditions, it is anticipated that the deciduous forest, thicket swamp, and bog communities may support terrestrial SAR species. The locations of END and THR species cam can be found in Table 11 below. A more detailed summary can be found in Appendix D.

The following END and THR species may be supported within the study area:

- Eastern Red Bat (*Lasiurus borealis*) – END.
- Hoary Bat (*Lasiurus cinereus*) – END.
- Northern Myotis (*Myotis septentrionalis*) – END.
- Little Brown Myotis (*Myotis lucifugus*) – END.
- Silver-haired Bat (*Lasionycteris noctivagans*) – END.
- Tri-colored Bat (*Perimyotis subflavus*) – END.
- Black Ash (*Fraxinus nigra*) – END.
- Butternut (*Juglans cinerea*) – END.

Of the above listed species, both Black Ash and Butternut are absent from the existing ROW. Black Ash and Butternut may occur in association with wetland and upland communities respectively communities well beyond the ROW identified through Burnside's desktop review that were not subject to field review. These unevaluated communities and any regulated Butternut / Black Ash regulated habitats are located well beyond the proposed limits of disturbance. As such, further consideration for both species will not be provided within this report.

Candidate habitat for SAR bats may be supported; however, targeted surveys have not been completed to confirm the presence / absence of this habitat feature.

Table 11: Summary of Potential Locations of END and THR species

ELC	ELC Description	Endangered and Threatened Species
MAM	Meadow Marsh	Candidate: • Black Ash (END)
MASM1-14 / SAF_1-3	Reed Canary Grass Mineral Shallow Marsh Type / Duckweed Floating-leaved Shallow Aquatic Type	END and THR species are confirmed absent within this community.
MAS / SWT	Shallow Marsh / Thicket Swamp	None identified.
BOTC2-1 / BOSD1-1	Tamarack – Leatherleaf Treed Kettle Bog Type / Leatherleaf Shrub Bog Type	Candidate: • Hoary Bat (END) • Silver-haired Bat (END)
MEGM3	Dry – Fresh Graminoid Meadow Ecosite	END and THR species are confirmed absent within this community.
MEMM3	Dry – Fresh Mixed Meadow Ecosite	END and THR species are confirmed absent within this community.
MEFM1 / THDM4	Dry – Fresh Forb Meadow Ecosite Dry – Fresh Deciduous Regeneration Thicket Ecosite	END and THR species are confirmed absent within this community.
WODM4a	Dry – Fresh Deciduous Woodland Ecosite	Candidate: • Eastern Red Bat (END) • Hoary Bat (END) • Northern Myotis (END) • Little Brown Myotis (END) • Silver-haired Bat (END) • Tri-colored Bat (END)
WODM4b	Dry – Fresh Deciduous Woodland Ecosite	Candidate: • Eastern Red Bat (END) • Hoary Bat (END) • Northern Myotis (END) • Little Brown Myotis (END) • Silver-haired Bat (END) • Tri-colored Bat (END)

ELC	ELC Description	Endangered and Threatened Species
WODM4-4	Dry – Fresh Black Walnut Deciduous Woodland Type	Candidate: • Eastern Red Bat (END) • Hoary Bat (END) • Northern Myotis (END) • Little Brown Myotis (END) • Silver-haired Bat (END) • Tri-colored Bat (END)
WODM5-3	Fresh – Moist Manitoba Maple Deciduous Woodland Type	Candidate: • Eastern Red Bat (END) • Hoary Bat (END) • Northern Myotis (END) • Little Brown Myotis (END) • Silver-haired Bat (END) • Tri-colored Bat (END)
FOM	Mixed Forest	Candidate: • Eastern Red Bat (END) • Hoary Bat (END) • Northern Myotis (END) • Little Brown Myotis (END) • Silver-haired Bat (END) • Tri-colored Bat (END) • Butternut (END)
FOD	Deciduous Forest	Candidate: • Eastern Red Bat (END) • Hoary Bat (END) • Northern Myotis (END) • Little Brown Myotis (END) • Silver-haired Bat (END) • Tri-colored Bat (END) • Butternut (END)
FODM5	Dry – Fresh Sugar Maple Deciduous Forest Ecosite	Candidate: • Eastern Red Bat (END) • Hoary Bat (END) • Northern Myotis (END) • Little Brown Myotis (END) • Silver-haired Bat (END) • Tri-colored Bat (END)

ELC	ELC Description	Endangered and Threatened Species
TAGM1a	Coniferous Plantation	Candidate: • Hoary Bat (END)
TAGM1b	Coniferous Plantation	Candidate: • Hoary Bat (END)
IAG	Agricultural Infrastructure	Candidate: • Eastern Small-footed Myotis (END) • Northern Myotis (END) • Little Brown Myotis (END) • Tri-colored Bat (END)
OAGM1	Agricultural	None identified.
CVR_4	Residential	Candidate: • Eastern Small-footed Myotis (END) • Northern Myotis (END) • Little Brown Myotis (END) • Tri-colored Bat (END)

5.8 Significant Wildlife Habitat (SWH)

The Natural Heritage Reference Manual (MNR, 2010), Significant Wildlife Habitat Technical Guide (MNR, 2000) and Ecoregion 7E Criteria Schedules list a number of different types of habitat that are considered significant. A screening of potential habitats in the study area relative to SWH criteria is provided in Appendix E. In summary the following Candidate or Confirmed habitats are present:

- Bat maternity colonies (Candidate).
- Turtle wintering areas (Confirmed).
- Deer Wintering Areas (Confirmed).
- Bald Eagle and Osprey Nesting, Foraging and Perching Habitat (Candidate).
- Other rare vegetation communities (Confirmed):
  - BOS1-1 and BOT2-1.
- Seeps and springs (Candidate).
- Amphibian Breeding Habitat – Woodland (Candidate)
- Marsh Breeding Bird Habitat (Candidate).
- Terrestrial Crayfish (Candidate).

- Special Concern and Rare Wildlife (Confirmed):
  - Monarch (SC).
  - Eastern Wood-pewee (SC).
  - Purple Martin (S3).
  - Billing's Three-seeded Sedge (S2S3).
- Special Concern and Rare Wildlife (Candidate):
  - Eastern Ribbonsnake (SC).
  - Snapping Turtle (SC).
  - Perfoliate Bellwort (S1S2).

The locations of all confirmed or candidate SWH features can be found in Table 12 below.

Bat Maternity Colonies

All woodlands within Ontario have the potential to provide suitable habitat for bat maternity colonies for Ontario's eight bat species. Characteristics of forest lands that best support bat maternity colonies include mature to old-growth forest stands with >10 ha large diameter (>25 cm dbh) snag trees.

Within the study area, this feature may be supported within deciduous and mixed forest communities. It should be noted that one of the indicator species, Silver-haired Bat, has recently been uplisted under the *Endangered Species Act* (ESA) as 'Endangered'.

Turtle Wintering Areas

Turtles overwinter in the mucky bottom of deep pools or slow-moving streams. The impoundment along the unnamed tributary of Big Creek immediately west of the Hamilton Brantford Rail Trail has been confirmed to provide overwintering habitat for Midland Painted Turtle. Based on iNaturalist research grade records from March 21, 2021, a minimum of five Midland Painted Turtles were reported within the MAS/SAF_1-3 Community. This species is ranked provincially as S4 "apparently secure" and is not listed under SARO.

Deer Wintering Areas

Deer winter congregation areas considered significant are mapped by the MNR. White-tailed Deer Wintering Area (Stratum 2) areas are present in association with the TAGM1a, FOM, and MAM Communities south of Powerline Road West.

Bald Eagle and Osprey Nesting, Foraging, and Perching Habitat

Nests for Bald Eagle and Osprey are associated with lakes, ponds, rivers, and wetlands along forested shoreline. Given the proximity to the Copetown Bog and unnamed watercourse, there is potential for this SWH to be supported on-site within the FODM5, FOM, and TAGM1 Communities. It should be noted that Bald Eagle observations in the immediate proximity to the study area are limited to a single observation in March. No Osprey observations have been made in the area.

No stick nests were encountered by Burnside during the course of all field investigations. The forested communities may continue to function as foraging and perching habitat.

Alterations to vegetation within Bald Eagle and Osprey nesting, foraging and perching habitat through vegetation removal can influence prey availability.

Other Rare Vegetation Communities

Both the BOS1-1 and BOT2-1 Communities associated with the Summit Bog ANSI are considered to be rare in Ontario and are ranked as S3.

Seeps and Springs

Seeps and springs are areas where ground water comes to the surface and are typically found within headwater areas within forested habitats. As the study area is located within the headwaters of Big Creek, seeps and springs may be supported within the FODM5 or FOM Communities. No seeps or springs were documented by Burnside within the ROW but may be located on inaccessible privately owned lands.

Seeps and springs that are located in close proximity to roadways can reduce the use of the spring by wildlife, particularly if treed cover is removed. Roads are also known to act as a barrier to the movement of surface and shallow groundwater and can alter the discharge from seep / spring. Water quality can also be altered as surface water runoff from roadways often contain contaminants and excess nutrients. The construction of roadways may result in the reduction or redirection of flows away from the seep or spring (MNR, 2014).

Amphibian Breeding Habitat (Woodland)

The Amphibian Breeding Habitat (Woodland) type of habitat is described as a wetland, pond, or woodland pool (including vernal pools) >500 m^2 within or adjacent (within 120 m) to a woodland (no minimum size). Breeding pools within the woodland or the shortest distance from forest habitat are more significant because they are more likely to be used due to reduced risk to migrating amphibians. Woodlands with permanent water or those with hydroperiods extending into mid-July are most likely to be used by breeding amphibians.

Suitable breeding habitat may be supported in association with the SWT/MAS community. This community was not surveyed by Burnside for amphibians due to its distance from the proposed intersection improvements.

This type of habitat is vulnerable to changes in water levels and sedimentation from construction.

Marsh Breeding Bird Habitat

All marsh habitats may be considered significant breeding habitat provided standing water and emergent aquatic vegetation are present. Although this feature was confirmed absent in association with the MASM1-14/SAF_1-3 community, the MAM community may meet the criteria for significance. This SWH feature is sensitive to road runoff and salt spray as well as alterations to water levels.

This community is located well away from the location of the proposed intersection improvements.

Terrestrial Crayfish

Suitable habitats for terrestrial crayfish include meadow marsh, shallow marsh, or swamp. Terrestrial crayfish are confirmed absent in association with the MASM1-14 community. Suitable habitat may occur in association with the MAM and MAS/SWT communities that were not subject to Burnside's field review.

Burrowing crayfish can be vulnerable to increases in road runoff quantity or quality.

Habitat for Special Concern and Rare Wildlife

Based on the conditions observed within the study area, it is anticipated that the forest, swamp, and open water communities may support species of special concern and rare wildlife. Results are presented in Appendix D. The locations of candidate and confirmed SWH features can be found in Table 12 below.

Table 12: Locations of Candidate and Confirmed SWH Features within Study Area

ELC	ELC Description	Significant Wildlife Habitat
MAM	Meadow Marsh	Candidate: • Amphibian breeding habitat (wetland) • Marsh Breeding Bird Habitat • Terrestrial Crayfish • Eastern Ribbonsnake (SC) Confirmed: • Deer Winter Congregation Areas

ELC	ELC Description	Significant Wildlife Habitat
MASM1-14 / SAF_1-3	Reed Canary Grass Mineral Shallow Marsh Type / Duckweed Floating-leaved Shallow Aquatic Type	Confirmed: • Turtle Wintering Areas Candidate: • Snapping Turtle (SC) • Eastern Ribbonsnake (SC)
MAS / SWT	Shallow Marsh / Thicket Swamp	Candidate: • Turtle Wintering Areas • Amphibian breeding habitat (woodland) • Marsh Breeding Bird Habitat • Terrestrial Crayfish • Eastern Ribbonsnake (SC) • Snapping Turtle (SC)
BOTC2-1 / BOSD1-1	Tamarack – Leatherleaf Treed Kettle Bog Type / Leatherleaf Shrub Bog Type	Confirmed: • Other Rare Vegetation Communities • Billing's Three-seeded Sedge (S2S3) Candidate: • Eastern Ribbonsnake (SC)
MEGM3	Dry – Fresh Graminoid Meadow Ecosite	Candidate: • Monarch (SC)
MEMM3	Dry – Fresh Mixed Meadow Ecosite	Confirmed: • Monarch (SC)
MEFM1 / THDM4	Dry – Fresh Forb Meadow Ecosite Dry – Fresh Deciduous Regeneration Thicket Ecosite	Candidate: • Monarch (SC)
WODM4a	Dry – Fresh Deciduous Woodland Ecosite	None identified.
WODM4b	Dry – Fresh Deciduous Woodland Ecosite	None identified.
WODM4-4	Dry – Fresh Black Walnut Deciduous Woodland Type	None identified.
WODM5-3	Fresh – Moist Manitoba Maple Deciduous Woodland Type	None identified.

ELC	ELC Description	Significant Wildlife Habitat
FOM	Mixed Forest	Candidate: • Bat Maternity Colonies • Bald Eagle and Osprey Nesting, Foraging and Perching Habitat • Seeps and Springs • Eastern Wood-pewee (SC) • Tufted Titmouse (S3B) • Wood Thrush (SC) • Perfoliate Bellwort (S1S2) Confirmed: • Deer Winter Congregation Areas
FOD	Deciduous Forest	Candidate: • Bat Maternity Colonies • Bald Eagle and Osprey Nesting, Foraging and Perching Habitat • Seeps and Springs • Eastern Wood-pewee (SC) • Tufted Titmouse (S3) • Wood Thrush (SC) • Perfoliate Bellwort (S1S2)
FODM5	Dry – Fresh Sugar Maple Deciduous Forest Ecosite	Confirmed: • Eastern Wood-pewee (SC) Candidate: • Bat Maternity Colonies • Bald Eagle and Osprey Nesting, Foraging and Perching Habitat • Seeps and Springs
TAGM1a	Coniferous Plantation	Confirmed: • Deer Winter Congregation Areas
TAGM1b	Coniferous Plantation	None identified.
IAG	Agricultural Infrastructure	None identified.
OAGM1	Agricultural	None identified.
CVR_4	Residential	None identified.

6.0 Impacts, Mitigation, and Monitoring Guidelines

The preferred alternative includes a three-legged roundabout is shifted to the west of the existing intersection (Option 2, see Appendix F for details). Overall, the preferred alternative will avoid impacts to wetlands, significant woodlands, and SWH. A watercourse realignment is not required. Anticipated impacts are limited to minor encroachment into meadow and woodland communities. Considerations for impacts to the Earth Sciences ANSI should be provided.

Impacts, mitigation measures, and monitoring must be considered when selecting the preferred alternative. Table 13 below provides a summary of impacts that are anticipated with intersection improvements, with guidelines for mitigation measures and monitoring.

Table 13: Summary of Impacts, Mitigation, and Monitoring for Natural Features; Effects on Ecological Features and Functions

Feature	Description of Potential Effects	Mitigation Measures	Monitoring Activities
Wildlife (General)	Temporary displacement and disturbance to wildlife and habitat during the construction phase. May include SAR and Species of Special Concern.	The footprint of the proposed disturbed area shall be minimized as much as possible. In the event an animal is encountered during construction and does not move from the construction zone, the Contract Administrator should be notified. If the construction activities are such that continuing construction in the area would result in harm to wildlife, construction activities in that location should temporarily stop and the MNR or MECP can be contacted for direction. If temporary perimeter exclusion fencing is used at a location, it should be installed to allow wildlife to leave the fenced area during vegetation clearing. Once the work area has been cleared, it can be securely fenced to prevent wildlife from returning. The excluded area should be searched immediately following fencing installation for any wildlife (including SAR) that may have become trapped. Any wildlife should be safely relocated or permitted to escape, to a suitable habitat. All works should stop immediately and MECP should be contacted if SAR is encountered within the area to ensure compliance with the Endangered Species Act (ESA). Avoid vegetation clearing during sensitive times of the year for local wildlife, such as spring and early summer (April 1 - September 30). The new structure will allow for wildlife passage below the structure if feasible. Fencing to delineate the work zone will prevent encroachment into adjacent habitat supporting SAR and Species of Special Concern.	The Contractor will conduct regular monitoring of the erosion and sediment control measures to ensure they are acting as intended and are containing the work area.
Migratory Breeding Birds	Disturbance or destruction of migratory breeding bird nests / habitat may occur during construction phase (vegetation clearing)	To reduce the risk of contravening the federal Migratory Bird Convention Act, 1994 (MBCA), timing constraints shall be applied to avoid any limited vegetation clearing (including grubbing) and/or structure works (construction) during the active window for breeding birds, broadly from April 1 to August 31 for most species. Active nests (nests with eggs or young birds) of protected migratory birds, including SAR protected under the ESA, cannot be destroyed at any time of the year. If a nesting migratory bird (or SAR protected under ESA) is identified within or adjacent to the construction site (or during operations and maintenance activities) and the activities are such that continuing works in that area would result in a contravention of the MBCA or ESA, all activities should stop and the Contract Administrator (with assistance from an Avian Biologist) should discuss mitigation measures with the City. If SAR are identified, all activities should stop and MECP should be contacted to ensure compliance with the ESA. The Contract Administrator can instruct the Contractor on how to proceed based on the mitigation measures established through discussions with the City, the MECP and/or Environment Canada.	None.

Feature	Description of Potential Effects	Mitigation Measures	Monitoring Activities
SAR bat maternity roosting habitat.	Minor encroachment into the WODM4b and WODM4-4 communities may be required to accommodate the proposed intersection improvements. Although both the WODM4b and WODM4-4 communities may support SAR bats, these communities consist of young vigorous trees with few standing snags and are unlikely to provide high quality bat maternity roost habitat.	Trees that are identified as candidate bat maternal roosting habitat must be taken down outside the active bat window (active window is March 31 to October 1).	Further studies (i.e. bat maternity roost surveys) are required to confirm the extent of impacts and whether surveys are required to determine absence or presence of SAR bats during the detailed design phase.
Upland SWH (Bat Maternity colonies, Eastern Wood-pewee, Monarch)	Vegetation removals could impact wildlife	Trees that are identified as candidate bat maternal roosting habitat must be taken down outside the active bat window (active window is March 31 to October 1). An edge management plan and restoration plan should be implemented to ensure the integrity and continued ecological functioning of any impacted Significant Woodlands. Where feasible, seeding within impacted areas within the ROW should include Common Milkweed and other forage species that can support pollinators.	Further studies (i.e. bat maternity roost surveys) are required to confirm the extent of impacts to bat maternity roosting habitat during the detailed design phase.
Area-sensitive bird species	Vegetation removals could impact the suitability of the forested and upland communities that support area-sensitive species	Evidence of Savannah Sparrow breeding were encountered from privately owned lands beyond the ROW. The limited clearing required is unlikely to impact the ability for area-sensitive forest birds including American Redstart, Red-breasted Nuthatch, and White-breasted Nuthatch to continue persisting within the study area. Impacts to forested habitats will be mitigated through restoration plantings and an edge management plan. Any clearing activities should also be minimized to the greatest extent possible. Any clearing must be completed outside of the core breeding bird window.	Monitoring of mitigation / compensation plantings will be associated with plant warranty inspections.
Wetland SWH (Turtle Wintering Areas, Eastern Ribbonsnake)	Impacts of construction (noise, dust) on wildlife	As required, dust from the work area will be controlled using suppressants. ESC measures will be instated to prevent the ingress of sediments into the wetland communities. Environmental noise will be reduced through the standard operating practices and conformity with noise by-law requirements.	Dust levels shall be regularly monitored for the duration of construction by an environmental monitor. The Environmental Inspector will ensure that all operational plans and construction timing associated with noise reduction are being followed.

Feature	Description of Potential Effects	Mitigation Measures	Monitoring Activities
Wetland SWH (Turtle Wintering Areas, Eastern Ribbonsnake)	Reptiles (snakes and turtles) may be drawn to cleared areas to bask, increasing the risk of mortality from collisions with construction equipment and vehicles. Due to the proximity of development activities to potential turtle habitat in the adjacent wetland, there is also potential for turtles to nest in exposed soils within the construction limits.	The proposed ESC fencing will double as wildlife exclusion fencing. Fencing should be designed appropriately to exclude Snapping Turtles and Eastern Ribbonsnake. Fencing shall be designed per the recommendations listed within the *Reptile and Amphibian Exclusion Fencing: Best Practices* (MNRF, 2020). Fencing in combination with inspections by an environmental inspector will mitigate the potential for turtles to nest within the development envelope. Inspections shall be carried out daily during the active season for turtles (April to October) while there is adjacent construction.	An Environmental Inspector should be engaged during the construction phase to review ESC and other protection measures for deficiencies.
Dundas Valley Earth Science ANSI	Grading activities may impact the form of the Earth Sciences ANSI	Grading activities to accommodate the proposed intersection improvements will not include significant chances to topography or major changes to the landscape. Significant changes to topography or major earth moving activities are not anticipated.	None.
Summit Muskeg Preserve Provincial Life Sciences ANSI	Indirect impacts from future proposed construction activities	Direct impacts to the Summit Muskeg Preserve Provincial Life Sciences ANSI are not proposed. The proposed alignment will include a roundabout shifted westwards with minor encroachments into the MEFM1 / THDM4 community. Indirect impacts (i.e. sedimentation, erosion, invasive species encroachment) can be readily mitigated through the implementation of standard mitigation measures such as ESC fencing and monitoring, as described below.	An Environmental Inspector should be engaged during the construction phase to review ESC and other protection measures for deficiencies.
Rare species	Rare species may be directly and indirect impacts from proposed construction activities	The MASM1-14 and SAF_1-3 communities which supports Northern Watermeal will not be directly impacted by the proposed intersection improvements. ESC fencing will prevent sedimentation to the feature which impact its suitability to support Northern Watermeal. Grading will be required within the WODM4b and WODM4-4communities ‘possible’ evidence of breeding activity for Carolina Wren was observed. Impacts to these communities will be mitigated through restoration plantings and edge management activities, ensuring that habitats remain suitable to support Carolina Wren. The proposed mitigation measures described within this table including offsetting plantings, edge managements, timing of vegetation removals, ESC measures, and associated monitoring activities will mitigate indirect impacts to these communities. Furthermore similar habitats capable of support Carolina Wren is supported within the WODM4-4 south the Brantford-Hamilton Rail Trail, the FODM5, and WODM5-3 communities	An Environmental Inspector should be engaged during the construction phase to review ESC and other protection measures for deficiencies. Monitoring of mitigation / compensation plantings will be associated with plant warranty inspections.

Feature	Description of Potential Effects	Mitigation Measures	Monitoring Activities
Trees	Loss of woody vegetation along the WODM4-4 and WODM4b boundaries and creation of new woodland edges causing new growing conditions such as sun exposure and weed invasion.	A tree inventory will be completed during the detailed design to characterize and confirm required removals. Impacts will be minimized to remaining trees by implementing measures such as tree protection or ESC fencing to protect trees from grading impacts near adjacent construction. ESC measures and other specified protection measures must be installed prior to commencement of any construction or vegetation disturbance. No access, storage or stockpile of materials or equipment should occur within the area protected by the ESC and other protection measures. A replanting plan may be required to compensate for tree loss.	An Environmental Inspector should be engaged during the construction phase to review ESC and other protection measures for deficiencies. Monitoring of mitigation / compensation plantings will be associated with plant warranty inspections.
Vegetation	Temporary disturbance of meadow, thicket, and woodland vegetation may be required for access and construction.	Tree protection fence and ESC measures will delineate the areas of access and construction to reduce impacts extending unnecessarily into adjacent lands. Seeding of native grasses and wildflowers may be required to revegetate the disturbed areas that will be illustrated in replanting plan.	An Environmental Inspector should be engaged during the construction phase to review ESC and other protection measures for deficiencies. Monitoring of mitigation / compensation plantings will be associated with plant warranty inspections.
Groundwater	Potential for localized groundwater quality impacts as a result of spills. Temporary dewatering in the work area.	Refueling of equipment and fuel storage shall be conducted in designated areas, at least 30 m away from the watercourses and any existing wells, with spill protection provided. The work area shall be dewatered as per recognized provincial standards and pumped into acceptable dewatering traps. These dewatering traps will be placed away from the watercourse to allow for infiltration prior to discharging to the watercourse.	ESC monitoring throughout construction. Spill management plan to be created and measures to contain potential spills are to be on-site throughout construction.

Feature	Description of Potential Effects	Mitigation Measures	Monitoring Activities
Surface Water / Hydrology / Stormwater	Potential for sediments to enter the water course due to stockpiling, excavation, and construction. Potential for localized water quality impacts in the case of spills. Potential for invasive species to enter the environment	The footprint of the disturbed area shall be minimized as much as possible, for example, vegetated buffers / setbacks will remain untouched adjacent to the watercourse, wherever possible. An ESC Plan shall be developed during the detailed design phase of the project, prior to construction. Implementation of the erosion and sediment control measures shall conform to recognized standard specifications, such as Ontario Provincial Standards Specification (OPSS), and the requirements of GRCA. A permit from the GRCA under the Prohibited Activities, Exemptions and Permits Regulation (O. Reg. 41/24) will be required prior to conducting the proposed works as work is proposed within a flood regulated area. Stockpiled material will be stored and stabilized a minimum of 30 m from the watercourse and wetlands. All materials and equipment used for the purpose of site preparation and project completion will be operated and stored in a manner that prevents any deleterious substance (e.g., petroleum products, silt, etc.) from entering the water. ESC measures (silt fence, rock check dams, etc.) shall be installed and maintained during the work phase, until the site has been stabilized. ESC measures will be inspected daily to ensure they are functioning and maintained as required. If ESC measures are not functioning properly, no further work will occur until the problem is resolved. Temporary mitigation measures shall be installed prior to the commencement of any clearing, grubbing, excavation, filling, or grading works and must be maintained on a regular basis, prior to, and after precipitation events. Water quality impacts related to surface water runoff shall be mitigated to avoid downstream impacts by controlling surface water run off within the boundaries of the site. All disturbed areas of the work site shall be stabilized immediately and revegetated as soon as conditions allow. All equipment fueling and maintenance shall be done at least 30 m from the watercourse to ensure that no deleterious substances enter the waterway. The Contractor shall be required to develop Spill Prevention and Contingency Plans for construction and operational phases of the project. Personnel will be trained in how to apply the Plans, and the Plans will be reviewed to strengthen their effectiveness and ensure continuous improvement. Spills will be immediately contained and cleaned up in accordance with provincial regulatory requirements and the contingency plan. A hydrocarbon spill response kit will be on site at all times during the work. Spills will be reported to the Ontario Spills Action Center at 1-800-268-6060. All equipment and personal protective equipment must arrive on-site clean to prevent the potential transfer of invasive species (i.e., phragmites) to the local environment.	Monitoring of surface water quality will be completed along with regular ESC monitoring as outlined above. Spill management plan to be created and measures to contain potential spills are to be on-site throughout construction.
Invasive Species	Natural heritage features could be impacted through the introduction of invasive species during the construction process.	An environmental monitor shall ensure that all equipment entering the construction limits shall be clean and washed free of dirt, mud, and plant material. Contractors shall follow the *Clean Equipment Protocol for Industry* (Halloran et al. 2013).	Monitoring of vehicles and equipment entering the worksite by the environmental monitor.

7.0 Future Commitments

The following future commitments are recommended to be addressed following the selection of the preferred alternative, as detailed design is being carried out:

- A review of proposed grading areas of the site for SAR wildlife habitats such as bat roost trees should be completed.
- Agency permits, licenses and approvals should be determined that are required to carry out the work, including GRCA permit to do work in regulated areas.
- A tree inventory will be completed to determine and characterize required removals.
- If encroachment into woodlands are anticipated, an edge management plan and restoration plan should be prepared during the detailed design to ensure the ecological integrity and function of Significant Woodlands are maintained. The edge management plan should include techniques and principles outlined within the TRCA's *Forest Edge management Plan Guidelines* (2004) and the City of Hamilton *Tree Protection Guidelines*. The restoration plan will be informed by the extent of woodland/ tree removals. Site appropriate native plant species loss should be minimized where possible, and a re-vegetation plan using native species and seed mix should be created. Opportunities for invasive species management such as European Buckthorn removal along newly created woodland margins should be explored during the detailed design phase of the project.
- If any Provincial SAR are identified during the tree inventory and/or associated detailed design studies, potential impacts will be mitigated to the extent possible and the MECP will be consulted with as needed to determine next steps and permitting requirements.
- Although not anticipated, any culvert replacements requiring impacts to the riparian areas of the near-bank cover plantings along the unnamed watercourse shall be included in the re-planting landscaping plan where possible, while considering the required offset of plantings from structures.
- An Erosion and Sediment Control (ESC) Plan shall be developed during the detailed design phase of the project in consultation with GRCA and will conform to industry best management practices and recognized standard specifications such as Ontario Provincial Standards Specification (OPSS).

- Further investigations should be undertaken to ensure the proposed alternatives will not impact potential erosion hazards that may be present due to the presence of the unnamed watercourse banks riverine slopes and/or the meander belt of the watercourse. The requirement for engineering assessments such as geotechnical or fluvial geomorphology should be confirmed with GRCA at the detailed design stage.
- The geometry and alignment of structures should be reviewed during the detailed design stage.
- All SWM-related components of the project shall be designed with consideration for increased precipitation due to climate change.
- Where erosion protection, channel regrading / stabilization or earth retaining structures are determined to be required, the use of “softer” means of protection shall be preferred over the use of hard surfaces unless it is unfeasible to do so.
- The required ESC measures shall be determined during detailed design to limit sediment migration and protect receiving watercourses. All disturbed areas of the construction site shall be stabilized and re-vegetated as soon as conditions allow.

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Figures



Study Area (120m)

Extent of Alignment Options



Sources:

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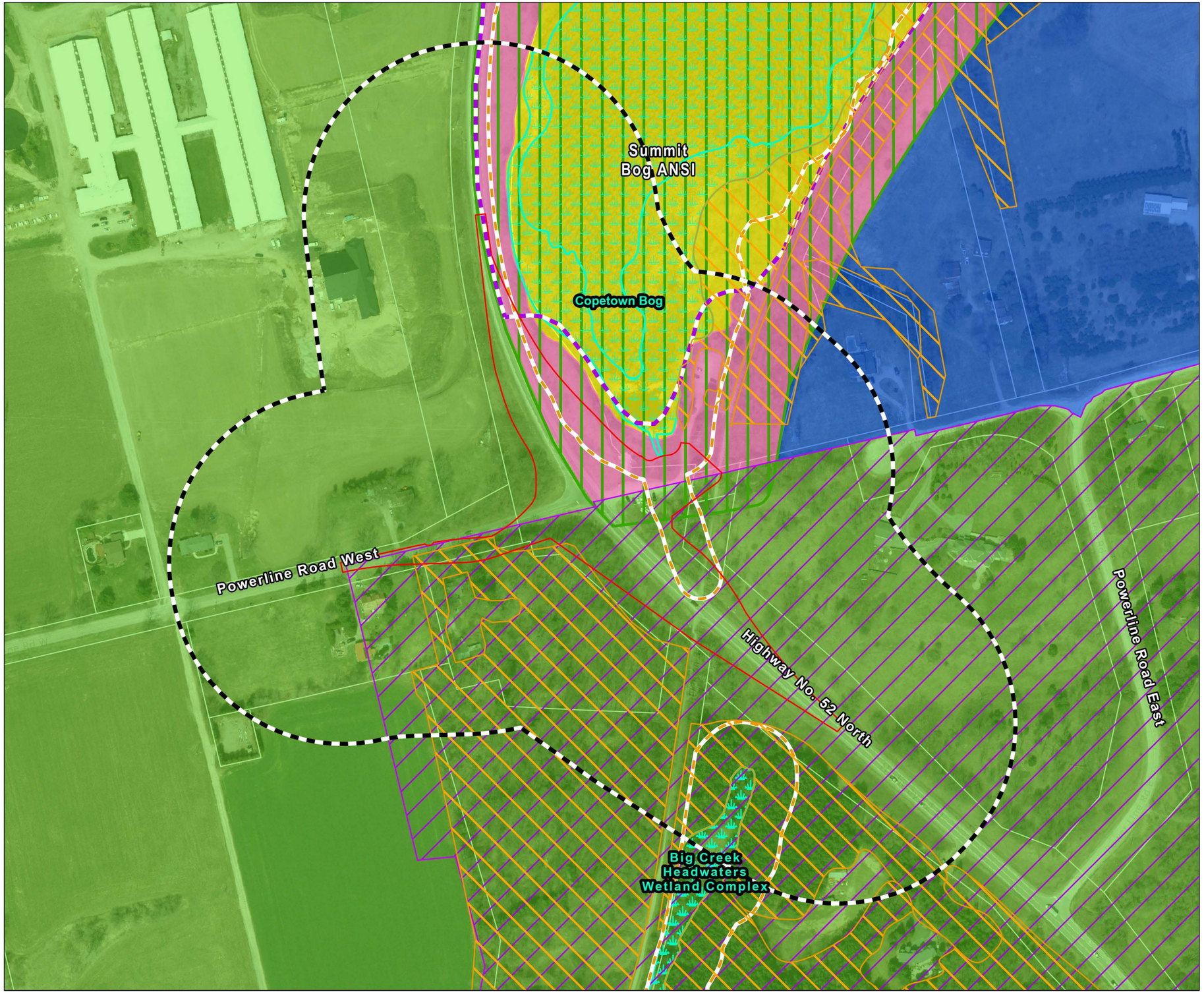
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HAMILTON MCEA HWY 52 & POWERLINE INTERSECTION
NATURAL ENVIRONMENT REPORT

STUDY AREA

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- Study Area (120m)
- Extent of Alignment Options
- Area of Natural and Scientific Interest - Life Science (MNRF)
- Greenbelt Protected Countryside
- Greenbelt Natural Heritage System
- Wetland
- Environmentally Significant Area (Rural Hamilton Official Plan)
- GRCA Regulated Area
- Significant Woodlands

Niagara Escarpment Plan Designation:

- Escarpment Natural Area
- Escarpment Protection Area
- Escarpment Rural Area

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Figure Title

HAMILTON MCEA HWY 52 & POWERLINE INTERSECTION
NATURAL ENVIRONMENT REPORT

POLICY CONSTRAINTS

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Study Area (120m)

Extent of Alignment Options

Ecological Land Classification

Breeding Bird Survey Station

Amphibian Survey Station

ELC Descriptions

BOTC2-1: Tamarack - Leatherleaf Treed Kettle Bog
CUM1: Mineral Cultural Meadow
CVR_4: Rural Property
FOD: Fresh - Moist Manitoba Maple Deciduous Woodland
FODM5: Dry - Fresh Sugar Maple Deciduous Forest
FOM: Mixed Forest
IAG: Agricultural Infrastructure
MAM: Meadow Marsh
MAS: Shallow Marsh
MASM1-14: Reed Canary Grass Mineral Shallow Marsh
MEFM1: Dry - Fresh Forb Meadow
MEGM3: Dry - Fresh Graminoid Meadow
MEMM3: Dry - Fresh Mixed Meadow
OAG: Open Agriculture
SAF_1-3: Duckweed Floating-leaved Shallow Aquatic
SWT: Thicket Swamp
TAGM1: Coniferous Plantation
THDM4: Dry - Fresh Deciduous Regeneration Thicket
WOD: Deciduous Woodland
WODM4: Dry - Fresh Deciduous Woodland
WODM4-4: Dry - Fresh Black Walnut Deciduous Woodland
WODM5-3: Fresh - Moist Manitoba Maple Deciduous Woodland

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Figure Title

HAMILTON MCEA HWY 52 & POWERLINE INTERSECTION NATURAL HERITAGE NATURAL ENVIRONMENT REPORT

ECOLOGICAL LAND CLASSIFICATION AND FIELD SURVEYS

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- Crossing
- Watercourse: Thermal Regime - Warm (MNRF and GRCA)
- Reach Break
- Constriction Point

Headwater Drainage Feature Classification:

- Mitigation
- No Management Concern
- Extent of Alignment Options
- Study Area (120m)

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Figure Title

HAMILTON MCEA HWY 52 & POWERLINE INTERSECTION
NATURAL ENVIRONMENT REPORT

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Appendix A

Photo Log



Photo 1: Representative photo of the MEFM1 / THDM4 community



Photo 2: Representative photo of the MASM1-14 / SAF_1-3 communities



Photo 3: Representative photo of the MEMM3 community



Photo 4: Representative photo of the WODM5-3 community



Photo 5: Representative photo of the WODM5-3 community



Photo 6: Representative photo of the MEMM3 community



Photo 7: Representative photo the WODM4a community and MEGM3 community



Photo 8: Representative photo of the MEGM3 and TAGM1 communities



Photo 9: Representative photo of the TAGM1 community



Photo 10: Representative photo of the WODM4-4 community



Photo 11: Representative photo of the WODM4-4 community



Photo 12: Representative photo of the FODM5 community



Photo 13: Representative photo of the FODM4b community



Photo 14: The unnamed tributary of Big Creek during the March 19, 2025, site visit (spring freshet). Note the lack of standing water within the channel of R1



Photo 15: R1 of the unnamed tributary of Big Creek during the June 2025 site visit



Photo 16: Crossing CR1 (upstream). Note the extensive vegetation growth



Photo 17: Crossing CR1 (downstream). Note the extensive vegetation growth



Photo 18: Representative photo of reach R2. Note the extensive vegetation growth



Photo 19: Crossing CR2 inlet



Photo 20. Crossing CR2 outlet



Photo 21. Downstream of CR2.



Photo 22: Additional culvert outlet at the ON-52 and Hamilton-Brantford Rail Crossing (west side of ON-52)



Photo 23: CR3 inlet.



Photo 24: CR3 outlet.



Photo 25: Apparent location of the Reach R4 channel. The channel through this reach is largely undefined other than the culvert outlet



Photo 26: Location of Reach R4 channel



Photo 27: Upstream of constriction point 1 along Powerline Road East of feature H1



Photo 28: Downstream of constriction point 1 along Powerline Road East of feature H1



Photo 29: Ditchline that directs flows towards constriction point of feature H1 along Powerline Road East



Photo 30: Upstream conditions of constriction point 2 for feature H1 along the Hamilton-Brantford Rail Trail. This represents the primary feature of the two upstream features. Note the constructed wooden barrier



Photo 31: Upstream of constriction point 2 of feature H1 along the Hamilton-Brantford Rail Trail. This is the secondary feature upstream of constriction point 2



Photo 32: Conditions of feature H1 downstream of constriction point 2 along the Hamilton-Brantford Rail Trail



Photo 33: Rail ties within the channel of feature H1 downstream of constriction point 2 along the Hamilton-Brantford Rail Trail



Photo 34: Constriction point 2 of feature H1 along the Hamilton-Brantford Rail Trail



Photo 35: Conditions within feature H2 upstream of the constriction point 1 along ON-52 of feature H2



Photo 36: Conditions within feature H2 immediately upstream of the constriction point 1 along ON-52 of feature H2



Photo 37: The extensive vegetation growth within the upstream portion of feature H2



Photo 38: Constriction point 1 (crossing structure) of feature H2



Photo 39: Conditions of feature H2 downstream of constriction point along ON-52. Note the pool of standing water at the outlet

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Appendix B

Plant List

Botanical Inventory Plant List

Scientific Name	Common Name	ESA	COSEWIC	SARA	G-Rank	S-Rank	Native/ Introduced	Carolinian Zone - Hamilton (Oldham, 2017)	Hamilton-Brant-Wentworth-Oxford (Riley et al. 1989)	Hamilton NAI 3rd Ed. (Hamiton Field Naturalists Club 2014)
Abutilon theophrasti	Velvetleaf	-	-	-	GNR	SNA	I	IX	X	I
Acer negundo	Manitoba Maple	-	-	-	G5	S5	N	C	X	-
Acer saccharinum	Silver Maple	-	-	-	G5	S5	N	C	X	-
Acer saccharum	Sugar Maple	-	-	-	G5	S5	N	C	X	-
Achillea millefolium	Common Yarrow	-	-	-	G5	SNA	I	IX	X	I
Aegopodium podagraria	Goutweed	-	-	-	GNR	SNA	I	IX	-	I
Agrostis gigantea	Redtop	-	-	-	G4G5	SNA	I	IX	X	I
Alliaria petiolata	Garlic Mustard	-	-	-	GNR	SNA	I	IC	X	I
Ambrosia artemisiifolia	Common Ragweed	-	-	-	G5	S5	N	C	X	-
Ambrosia trifida	Great Ragweed	-	-	-	G5	S5	N	U	-	h
Apocynum androsaemifolium	Spreading Dogbane	-	-	-	G5	S5	N	C	X	-
Arctium minus	Common Burdock	-	-	-	GNR	SNA	I	IC	X	I
Asarum canadense	Canada Wild-ginger	-	-	-	G5	S5	N	C	X	-
Asclepias syriaca	Common Milkweed	-	-	-	G5	S5	N	C	X	-
Bidens connata	Purple-stemmed Beggarticks	-	-	-	G5	S4?	N	-	-	-
Bromus inermis	Smooth Brome	-	-	-	G5T5	SNA	I	IC	X	I
Carex blanda	Woodland Sedge	-	-	-	G5	S5	N	C	X	-
Carex crinita	Fringed Sedge	-	-	-	G5	S5	N	C	X	-
Carex gracillima	Graceful Sedge	-	-	-	G5	S5	N	C	X	-
Carex rosea	Rosy Sedge	-	-	-	G5	S5	N	C	X	-
Catalpa speciosa	Northern Catalpa	-	-	-	G4?	SNA	I	IR	-	I
Centaurea stoebe	Spotted Knapweed	-	-	-	GNR	SNA	I	IX	-	I
Centaurea stoebe ssp. micranthos	Spotted Knapweed	-	-	-	GNRTNR	SNA	I	-	X	I
Cichorium intybus	Wild Chicory	-	-	-	GNR	SNA	I	IC	X	I
Circaea canadensis	Broad-leaved Enchanter's Nightshade	-	-	-	G5	S5	N	C	X	-
Cirsium arvense	Canada Thistle	-	-	-	G5	SNA	I	IC	X	I
Cirsium vulgare	Bull Thistle	-	-	-	GNR	SNA	I	IX	X	I
Dactylis glomerata	Orchard Grass	-	-	-	GNR	SNA	I	IC	X	I
Daucus carota	Wild Carrot	-	-	-	GNR	SNA	I	IC	X	I
Dianthus deltoides	Maiden Pink	-	-	-	GNR	SNA	I	-	-	-
Dipsacus fullonum	Common Teasel	-	-	-	GNR	SNA	I	IX	X	I
Dryopteris carthusiana	Spinulose Wood Fern	-	-	-	G5	S5	N	C	X	-
Echinocystis lobata	Wild Cucumber	-	-	-	G5	S5	N	C	X	-
Elaeagnus umbellata	Autumn Olive	-	-	-	GNR	SNA	I	IX	-	I
Epilobium coloratum	Purple-veined Willowherb	-	-	-	G5	S5	N	C	X	-
Epipactis helleborine	Broad-leaved Helleborine	-	-	-	GNR	SNA	I	IX	X	I

Scientific Name	Common Name	ESA	COSEWIC	SARA	G-Rank	S-Rank	Native/ Introduced	Carolinian Zone - Hamilton (Oldham, 2017)	Hamilton-Brant-Wentworth-Oxford (Riley et al. 1989)	Hamilton NAI 3rd Ed. (Hamiton Field Naturalists Club 2014)
Equisetum arvense	Field Horsetail	-	-	-	G5	S5	N	C	X	-
Erigeron canadensis	Canada Horseweed	-	-	-	G5	S5	N	C	X	-
Erigeron philadelphicus	Philadelphia Fleabane	-	-	-	G5	S5	N	C	X	-
Euphorbia esula	Leafy Spurge	-	-	-	GNR	SNA	I	-	-	I
Eurybia macrophylla	Large-leaved Aster	-	-	-	G5	S5	N	C	X	-
Euthamia graminifolia	Grass-leaved Goldenrod	-	-	-	G5	S5	N	C	X	-
Fallopia dumetorum	Hedge Bindweed	-	-	-	GU	SNA	I	-	-	I
Fraxinus americana	White Ash	-	-	-	G4	S4	N	C	X	-
Fraxinus pennsylvanica	Red Ash	-	-	-	G4	S4	N	C	-	-
Galium mollugo	Smooth Bedstraw	-	-	-	GNR	SNA	I	IX	X	I
Geranium robertianum	Herb-Robert	-	-	-	G5	S5	N	C	X	I
Geum aleppicum	Yellow Avens	-	-	-	G5	S5	N	C	X	-
Geum canadense	Canada Avens	-	-	-	G5	S5	N	C	X	-
Geum laciniatum	Rough Avens	-	-	-	G5	S4	N	C	X	-
Geum macrophyllum	Large-leaved Avens	-	-	-	G5	S5	N	-	-	-
Geum macrophyllum var. perincisum	Large-leaved Avens	-	-	-	G5T5	S5	N	-	-	-
Glechoma hederacea	Ground-ivy	-	-	-	GNR	SNA	I	IC	X	I
Hackelia virginiana	Virginia Stickseed	-	-	-	G5	S5	N	C	X	-
Helenium autumnale	Common Sneezeweed	-	-	-	G5	S4	N	-	-	-
Hemerocallis fulva	Orange Daylily	-	-	-	GNA	SNA	I	IX	X	I
Hesperis matronalis	Dame's Rocket	-	-	-	G4G5	SNA	I	IC	X	I
Hypericum perforatum	Common St. John's-wort	-	-	-	GNR	SNA	I	IC	X	I
Impatiens capensis	Spotted Jewelweed	-	-	-	G5	S5	N	C	X	-
Juglans nigra	Black Walnut	-	-	-	G5	S4?	N	C	X	-
Lactuca canadensis	Canada Lettuce	-	-	-	G5	S5	N	C	X	-
Larix laricina	Tamarack	-	-	-	G5	S5	N	C	X	-
Leersia oryzoides	Rice Cutgrass	-	-	-	G5	S5	N	C	X	-
Leonurus cardiaca	Common Motherwort	-	-	-	GNR	SNA	I	IC	X	I
Leucanthemum vulgare	Oxeye Daisy	-	-	-	GNR	SNA	I	IX	X	I
Linaria vulgaris	Butter-and-eggs	-	-	-	GNR	SNA	I	IC	X	I
Lolium perenne	Perennial Ryegrass	-	-	-	GNR	SNA	I	IC	X	I
Lonicera tatarica	Tatarian Honeysuckle	-	-	-	GNR	SNA	I	IX	X	I
Lotus corniculatus	Garden Bird's-foot Trefoil	-	-	-	GNR	SNA	I	IC	-	I
Monarda fistulosa	Wild Bergamot	-	-	-	G5	S5	N	C	X	-
Morus alba	White Mulberry	-	-	-	GNR	SNA	I	IC	X	I
Oenothera biennis	Common Evening-primrose	-	-	-	G5	S5	N	C	X	-
Onoclea sensibilis	Sensitive Fern	-	-	-	G5	S5	N	C	X	-

Scientific Name	Common Name	ESA	COSEWIC	SARA	G-Rank	S-Rank	Native/ Introduced	Carolinian Zone - Hamilton (Oldham, 2017)	Hamilton-Brant-Wentworth-Oxford (Riley et al. 1989)	Hamilton NAI 3rd Ed. (Hamiton Field Naturalists Club 2014)
Oxalis stricta	Upright Yellow Wood-sorrel	-	-	-	G5	SNA	I	C	X	-
Parthenocissus quinquefolia	Virginia Creeper	-	-	-	G5	S4?	N	C	P. inserta = X	-
Parthenocissus vitacea	Thicket Creeper	-	-	-	G5	S5	N	C	X	-
Persicaria sagittate	Arrow-leaved Smartweed	-	-	-	G5	S4S5	N	C	X	-
Phalaris arundinacea	Reed Canarygrass	-	-	-	G5	S5	N	C	X	-
Phleum pratense	Common Timothy	-	-	-	GNR	SNA	I	IC	X	I
Picea abies	Norway Spruce	-	-	-	G5	SNA	I	IR	-	I
Picea glauca	White Spruce	-	-	-	G5	S5	N	C	-	I/N
Pinus strobus	Eastern White Pine	-	-	-	G5	S5	N	C	X	-
Plantago lanceolata	English Plantain	-	-	-	G5	SNA	I	IC	X	I
Poa pratensis	Kentucky Bluegrass	-	-	-	G5	S5	N	IC	X	I
Populus balsamifera	Balsam Poplar	-	-	-	G5	S5	N	C	X	-
Populus deltoides	Eastern Cottonwood	-	-	-	G5	S5	N	C	X	-
Populus grandidentata	Large-toothed Aspen	-	-	-	G5	S5	N	C	X	-
Populus tremuloides	Trembling Aspen	-	-	-	G5	S5	N	C	X	-
Prunus serotina	Black Cherry	-	-	-	G5	S5	N	C	X	-
Prunus virginiana	Chokecherry	-	-	-	G5	S5	N	C	X	-
Quercus rubra	Northern Red Oak	-	-	-	G5	S5	N	C	X	-
Ranunculus recurvatus	Hooked Buttercup	-	-	-	G5	S5	N	C	X	-
Reynoutria japonica	Japanese Knotweed	-	-	-	GNR	SNA	I	IX	-	-
Rhamnus cathartica	European Buckthorn	-	-	-	GNR	SNA	I	IC	X	I
Rhus typhina	Staghorn Sumac	-	-	-	G5	S5	N	C	X	-
Ribes americanum	American Black Currant	-	-	-	G5	S5	N	C	X	-
Ribes oxyacanthoides	Canada Gooseberry	-	-	-	G5	S5	N	-	-	-
Ribes rubrum	European Red Currant	-	-	-	G4G5	SNA	I	IX	X	I
Robinia pseudoacacia	Black Locust	-	-	-	G5	SNA	I	IC	-	-
Rosa multiflora	Multiflora Rose	-	-	-	GNR	SNA	I	IC	X	I
Rubus occidentalis	Black Raspberry	-	-	-	G5	S5	N	C	X	-
Rumex crispus	Curled Dock	-	-	-	GNR	SNA	I	IX	X	I
Salix alba	White Willow	-	-	-	G5	SNA	I	IX	X	I
Schoenoplectus tabernaemontani	Soft-stemmed Bulrush	-	-	-	G5	S5	I	C	X	-
Securigera varia	Purple Crown-vetch	-	-	-	GNR	SNA	N	IC	-	-
Silene latifolia	White Campion	-	-	-	GNR	SNA	N	IX	X	I
Silene vulgaris	Bladder Campion	-	-	-	GNR	SNA	N	IC	X	I
Solidago altissima	Tall Goldenrod	-	-	-	G5	S5	I	-	-	-
Solidago canadensis	Canada Goldenrod	-	-	-	G5	S5	I	C	X	-
Solidago canadensis var. canadensis	Canada Goldenrod	-	-	-	G5T5	S5	I	C	X	-

Scientific Name	Common Name	ESA	COSEWIC	SARA	G-Rank	S-Rank	Native/ Introduced	Carolinian Zone - Hamilton (Oldham, 2017)	Hamilton-Brant-Wentworth-Oxford (Riley et al. 1989)	Hamilton NAI 3rd Ed. (Hamiton Field Naturalists Club 2014)
Sonchus arvensis	Field Sow-thistle	-	-	-	GNR	SNA	I	IX	-	I
Stellaria media	Common Chickweed	-	-	-	GNRTNR	SNA	N	IC	X	I
Symphyotrichum ericoides	White Heath Aster	-	-	-	G5	S5	N	C	-	-
Symphyotrichum lanceolatum	Panicled Aster	-	-	-	G5	S5	N	C	-	-
Symphyotrichum lateriflorum	Calico Aster	-	-	-	G5	S5	I	C	-	-
Symphyotrichum novae-angliae	New England Aster	-	-	-	G5	S5	N	C	X	-
Symphyotrichum ontarionis	Ontario Aster	-	-	-	G5	S5	N	R	-	-
Syringa vulgaris	Common Lilac	-	-	-	GNR	SNA	N	IR	X	I
Taraxacum officinale	Common Dandelion	-	-	-	G5	SNA	N	IC	X	I
Thalictrum pubescens	Tall Meadow-rue	-	-	-	G5	S5	I	C	X	-
Torilis japonica	Erect Hedge-parsley	-	-	-	GNR	SNA	N	IX	X	I
Toxicodendron radicans	Poison Ivy	-	-	-	G5	S5	N	-	X	-
Tragopogon dubius	Yellow Goatsbeard	-	-	-	GNR	SNA	N	IX	X	I
Trifolium pratense	Red Clover	-	-	-	GNR	SNA	N	IC	X	I
Typha latifolia	Broad-leaved Cattail	-	-	-	G5	S5	I	C	X	-
Verbascum thapsus	Common Mullein	-	-	-	GNR	SNA	I	IC	X	I
Verbena urticifolia	White Vervain	-	-	-	G5	S5	I	C	X	-
Viburnum opulus	Cranberry Viburnum	-	-	-	G5	S5	I	-	-	I
Vicia cracca	Tufted Vetch	-	-	-	GNR	SNA	N	IC	X	I
Vinca minor	Lesser Periwinkle	-	-	-	GNR	SNA	I	IX	X	I
Vincetoxicum rossicum	European Swallowwort	-	-	-	GNR	SNA	I	IX	X	I
Vitis riparia	Riverbank Grape	-	-	-	G5	S5	I	C	X	-
Wolffia borealis cf	Northern Watermeal	-	-	-	G5	S5	I	R	X	H

Natural Heritage Information Centre. 2023. Vascular Plant Species List (September 20, 2023). Downloaded on September 20, 2023.

Varga, S., Leadbeater, D., Webber, J., Kaiser, J., Crins, B., Kamstra, J., Banville, D., Ashley, E., Miller, G., Kingsley, C., Jacobsen, C., Mewa, K., Tebby, L., Mosley, E., and E. Zajc. 2000. Distribution and Status of the Vascular Plants of the Greater Toronto Area. Ontario Ministry of Natural Resources Aurora District. 103 pp.

ESA Status
Species at Risk in Ontario list: The list of species that are classified as species at risk under the Endangered Species Act (2007).
EXT: Extinct – A species that no longer exists anywhere
EXP: Extirpated – A species that no longer exists in the wild in Ontario but still occurs elsewhere
END: Endangered – A species facing imminent extinction or extirpation in Ontario which is a candidate for regulation under Ontario's Endangered Species Act (ESA)
THR: Threatened – A species that is at risk of becoming endangered in Ontario if limiting factors are not reversed
SC: Special Concern (formerly Vulnerable) – A species with characteristics that make it sensitive to human activities or natural events
NAR: Not at Risk – A species that has been evaluated and found to be not at risk
DD: Data Deficient (formerly Indeterminate) – A species for which there is insufficient information for a provincial status recommendation

COSEWIC Status
Committee on the Status of Endangered Wildlife in Canada status: Species has been assessed by COSEWIC as having status, but status is not necessarily adopted on the official Schedule 1 to SARA.
EXT: Extinct – A species that no longer exists
EXP: Extirpated – A species no longer existing in the wild in Canada but occurring elsewhere
END: Endangered – A species facing imminent extirpation or extinction
THR: Threatened – A species likely to become endangered if limiting factors are not reversed
SC: Special Concern (formerly Vulnerable) – A species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats
NAR: Not at Risk – A species that has been evaluated and found to be not at risk of extinction given the current circumstances
DD: Data Deficient (formerly Indeterminate) – Available information is insufficient to resolve a species' eligibility for assessment or to permit an assessment of the species' risk of extinction

SARA Schedule 1 Status
Species at Risk Act Schedule 1 Status: Schedule 1 is the official list of species that are classified as extirpated, endangered, threatened, and of special concern. The Act establishes Schedule 1, as the official list of species at risk. It classifies those species as being either Extirpated, Endangered, Threatened, or a Special Concern. Once listed, the measures to protect and recover a listed species are implemented.
EXT: Extinct – A species that no longer exists
EXP: Extirpated – A species that no longer exists in the wild in Canada but exists elsewhere in the wild
END: Endangered – A species that is facing imminent extirpation or extinction
THR: Threatened – A species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction
SC: Special Concern – A species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats

Global Rank
GX: Presumed Extinct (species)/Eliminated (ecological communities and systems) — Species not located despite intensive searches and virtually no likelihood of rediscovery. Ecological community or system eliminated throughout its range, with no restoration potential
GH: Possibly Extinct (species)/ Eliminated (ecological communities and systems) — Known from only historical occurrences but still some hope of rediscovery. There is evidence that the species may be extinct or the ecosystem may be eliminated throughout its range, but not enough to state this with certainty
G1: Critically Imperiled—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2: Imperiled—At high risk of extinction or elimination due to very restricted range, very few populations, steep declines, or other factors.
G3: Vulnerable—At moderate risk of extinction or elimination due to a restricted range, relatively few populations, recent and widespread declines, or other factors.
G4: Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5: Secure—Common; widespread and abundant

Variant Ranks
G#G#: Range Rank – A numeric range rank (e.g., G2G3, G1G3) is used to indicate the range of uncertainty about the exact status of a taxon or ecosystem type. Ranges cannot skip more than two ranks (e.g., GU should be used rather than G1G4)
GU: Unrankable – Currently unrankable due to lack of information or due to substantially conflicting information about status or trends. NOTE: Whenever possible (when the range of uncertainty is three consecutive ranks or less), a range rank (e.g., G2G3) should be used to delineate the limits (range) of uncertainty
GNR: Unranked – Global rank not yet assessed
GNA: Not Applicable – A conservation status rank is not applicable because the species is not a suitable target for conservation activities

Rank Qualifiers
?: Inexact Numeric Rank – Denotes inexact numeric rank; this should not be used with any of the Variant Global Conservation Status Ranks or GX or GH
Q: Questionable taxonomy that may reduce conservation priority – Distinctiveness of this entity as a taxon or ecosystem type at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon or type in another taxon or type, with the resulting taxon having a lower priority (numerically higher) conservation status rank. The "Q" modifier is only used at a global level and not at a national or subnational level
C: Captive or Cultivated Only – Taxon or ecosystem at present is presumed or possibly extinct or eliminated in the wild across their entire native range but is extant in cultivation, in captivity, as a naturalized population (or populations) outside their native range, or as a reintroduced population or ecosystem restoration, not yet established. The "C" modifier is only used at a global level and not at a national or subnational level. Possible ranks are GXC or GHC. This is equivalent to "Extinct" in the Wild (EW) in IUCN's Red List terminology (IUCN 2001)

Subnational Rank

S-Rank: Provincial (or Subnational) ranks are used by the Natural Heritage Information Centre (NHIC) to set protection priorities for rare species and natural communities. These ranks are not legal designations. Provincial ranks are assigned in a manner similar to that described for global ranks but consider only those factors within the political boundaries of Ontario.

S1: Critically Imperiled – Critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province

S2: Imperiled – Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province

S3: Vulnerable – Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation

S4: Apparently Secure – Uncommon but not rare; some cause for long-term concern due to declines or other factors

S5: Secure – Common, widespread, and abundant in the nation or state/province

S#S#: Range Rank – A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4)

SX: Presumed Extirpated – Species or community is believed to be extirpated from the nation or state/province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered

SH: Possibly Extirpated (Historical) – Species or community occurred historically in the nation or state/province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become NH or SH without such a 20-40 year delay if the only known occurrences in a nation or state/province were destroyed or if it had been extensively and unsuccessfully looked for. The NH or SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences

SE: Species is considered exotic in Ontario

SNR: Unranked – Nation of state/province conservation status not yet assessed

SU: Unrankable – Currently unrankable due to lack of information or due to substantially conflicting information about status or trends

SNA: Not Applicable – A conservation status rank is not applicable because the species is not a suitable target for conservation activities

Native?

N: Native to Ontario. Species do not have exotic status under NHIC database

I: Introduced to Ontario. Species has exotic status rank under NHIC database

Nature Counts 2 Project (2014)

Nature Counts 2 Project. 2014. Hamilton Natural Areas Inventory, 3rd Edition. Hamilton Field Naturalists.

The Hamilton status was updated on the basis of new information obtained during field work from 2011-2013 and other observations recorded since 2003. The significance listed in this table is for Rare and Uncommon in the City of Hamilton.

Codes are defined as follows:

h: Uncommon (found in 11-25 survey stations)

H: Rare (found in 1-10 survey stations)

i: Introduced

The Distribution and Status of the Vascular Plants of Central Region (Riley et. al.1989).

Riley, J. et al. 1989. The Distribution and Status of the Vascular Plants of Central Region. Ontario Ministry of Natural Resources, Central Region, Richmond Hill, ON.

Codes are defined as follows:

E: Endangered – Cucumber Tree (*Magnolia acuminata*)

N: Nationally Rare – Rare in every province in which it occurs. A rare species is one that because of biological characteristics, occurs at edge of range, exists in low numbers, or in very restricted areas in the region under consideration

P: Provincially Rare – A species S-ranked (S1-SX) from the National Museum's "Atlas of Rare Vascular Plants of Ontario" (Argus et.al. 1982-88)

R: Regionally Rare – Native species are considered regionally rare if the species in considered rare wherever it occurs in Central Region especially in areas where recent local determinations of rarity have been made and/or if it is considered provincially rare in the portions in which species' status is insufficiently documented. Only naturally occurring populations are considered

X:

+ or I: Introduced species

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Appendix C

Breeding Bird Summary Table

Breeding Bird Survey Summary Table

Common Name	Scientific Name	Provincial S-Rank[1]	City of Hamilton NAI, 3rd Ed.[7]	Provincial SARO (Endangered Species Act, 2007)[2]	Federal COSEWIC[3]	Federal SARA (Species at Risk Act)[3]	Federal SARA Schedule[4]	Provincial MNR Area Sensitive Species[5]	Highest Number Recorded (All Habitat Units Combined)	Highest Recorded Breeding Evidence[6]	Comments
American Crow	*Corvus brachyrhynchos*	S5	Common	-	-	-	-	-	1	Observed, X	Flyover.
American Goldfinch	*Spinus tristis*	S5	Abundant	-	-	-	-	-	10	Probable, T	-
American Redstart	*Setophaga ruticilla*	S5B	Uncommon	-	-	-	-	Yes	10	Probable, T	-
American Robin	*Turdus migratorius*	S5	Abundant	-	-	-	-	-	7	Probable, T	-
Baltimore Oriole	*Icterus galbula*	S4B	Common	-	-	-	-	-	6	Possible, S/H	-
Black-capped Chickadee	*Poecile atricapillus*	S5	Abundant	-	-	-	-	-	5	Probable, T	-
Blackpoll Warbler	*Setophaga striata*	S5B		-	-	-	-	-	1	Observed, X	Late migrant, overheard from bog near parking lot during BBS 1
Blue Jay	*Cyanocitta cristata*	S5	Abundant	-	-	-	-	-	3	Possible, S	-
Brown-headed Cowbird	*Molothrus ater*	S5	Abundant	-	-	-	-	-	4	Possible, S	-
Carolina Wren	*Thryothorus ludovicianus*	S4	Rare	-	-	-	-	-	3	Possible, S	-
Cedar Waxwing	*Bombycilla cedrorum*	S5	Common	-	-	-	-	-	10	Possible, S/H	-
Chestnut-sided Warbler	*Setophaga pensylvanica*	S5B	Uncommon	-	-	-	-	-	2	Possible, S	-
Chipping Sparrow	*Spizella passerina*	S5B, S3N	Abundant	-	-	-	-	-	2	Probable, T	-
Common Yellowthroat	*Geothlypis trichas*	S5B, S3N	Common	-	-	-	-	-	5	Probable, T	-
Cuckoo spp.	*Coccyzus spp.*			-	-	-	-	-	1	Possible, H	Observed flying overhead of wetland feature and during wetland boundary delineation, no calls overheard. The individual bird was not able to identified to species level.
Downy Woodpecker	*Dryobates pubescens*	S5	Common	-	-	-	-	-	1	Possible, S	-
Eastern Bluebird	*Sialia sialis*	S5B,S4N	Uncommon	-	-	-	-	-	1	Observed, X	Encountered foraging near wetlands within the Study Area during watercourse characterization (June 26, 2025).
Eastern Kingbird	*Tyrannus tyrannus*	S4B	Abundant	-	-	-	-	-	2	Probable, T	-
Eastern Phoebe	*Sayornis phoebe*	S5B	Uncommon	-	-	-	-	-	2	Possible, S	-
Eastern Wood-pewee	*Contopus virens*	S4B	Common	SC	SC	SC	1	-	3	Probable, T	-

Common Name	Scientific Name	Provincial S-Rank[1]	City of Hamilton NAI, 3rd Ed.[7]	Provincial SARO (Endangered Species Act, 2007)[2]	Federal COSEWIC[3]	Federal SARA (Species at Risk Act)[3]	Federal SARA Schedule[4]	Provincial MNR Area Sensitive Species[5]	Highest Number Recorded (All Habitat Units Combined)	Highest Recorded Breeding Evidence[6]	Comments
Field Sparrow	*Spizella pusilla*	S4B, S3N	Common	-	-	-	-	-	3	Possible, S	-
Gray Catbird	*Dumetella carolinensis*	S5B, S3N	Abundant	-	-	-	-	-	7	Probable, T	-
Great Crested Flycatcher	*Myiarchus crinitus*	S5B	Common	-	-	-	-	-	1	Probable, T	-
House Sparrow	*Passer domesticus*	SNA	Abundant	-	-	-	-	-	1	Possible, S	-
House Wren	*Troglodytes aedon*	S5B	Common	-	-	-	-	-	5	Possible, S	-
Indigo Bunting	*Passerina cyanea*	S5B	Common	-	-	-	-	-	10	Probable, T	-
Mourning Dove	*Zenaida macroura*	S5	Abundant	-	-	-	-	-	2	Possible, S	-
Northern Cardinal	*Cardinalis cardinalis*	S5	Abundant	-	-	-	-	-	5	Probable, T	-
Purple Martin	*Progne subis*	S3B	Uncommon	-	-	-	-	-	1	Observed, X	Flyover, observed foraging over lawns / agricultural field. Nesting boxes may be present in association with rural residential and farm properties.
Red-breasted Nuthatch	*Sitta canadensis*	S5	Uncommon	-	-	-	-	Yes	1	Possible, S	-
Red-eyed Vireo	*Vireo olivaceus*	S5B	Common	-	-	-	-	-	8	Probable, T	-
Red-winged Blackbird	*Agelaius phoeniceus*	S5	Abundant	-	-	-	-	-	13	Probable, T/A	-
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	S5B	Common	-	-	-	-	-	1	Possible, S	-
Savannah Sparrow	*Passerculus sandwichensis*	S5B, S3N	Abundant	-	-	-	-	Yes	3	Probable, T	-
Song Sparrow	*Melospiza melodia*	S5	Abundant	-	-	-	-	-	10	Probable, T	-
Swamp Sparrow	*Melospiza georgiana*	S5B, S4N	Common	-	-	-	-	-	1	Probable, T	-
Tennessee Warbler	*Leiothlypis peregrina*	S5B		-	-	-	-	-	1	Observed, X	Late migrant, observed incidentally near parking lot after BBS 1
Warbling Vireo	*Vireo gilvus*	S5B	Common	-	-	-	-	-	1	Possible, S	-
White-breasted Nuthatch	*Sitta carolinensis*	S5	Common	-	-	-	-	Yes	1	Possible, S	-
Yellow Warbler	*Setophaga petechia*	S5B	Abundant	-	-	-	-	-	10	Probable, T	-
TOTAL SPECIES	**40**										

[1]S-Ranks (provincial)
Provincial (or Subnational) ranks are used by the Natural Heritage Information Centre (NHIC) to set protection priorities for rare species and natural communities. These ranks are not legal designations. Provincial ranks are assigned in a manner similar to that described for global ranks, but consider only those factors within the political boundaries of Ontario (Please refer to: Conservation Status Categories | NatureServe Explorer)

SX — Presumed Extirpated - Species or community is believed to be extirpated from the province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
SH — Possibly Extirpated (Historical) - Species or community occurred historically in the province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20–40 years. A species or community could become SH without such a 20–40-year delay if the only known occurrences in a province were destroyed or if it had been extensively and unsuccessfully looked for. The SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.
S1 — Critically Imperiled - Critically imperiled in the province or state because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the province.
S2 — Imperiled - Imperiled in the province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the province.
S3 — Vulnerable - Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
S4 — Apparently Secure - Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5 — Secure - Common, widespread, and abundant in the province.
SNR — Unranked - Province conservation status not yet assessed.
SU — Unrankable - Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
SNA — Not Applicable - A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
S#S# — Range Rank - A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).
S#? – Inexact or Uncertain - Denotes inexact or uncertain numeric rank.

Breeding Status Qualifiers
B – Breeding Conservation status refers to the breeding population of the species in the nation or state/province.
N – Nonbreeding Conservation status refers to the non-breeding population of the species in the province.
M – Migrant species occurring regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. Conservation status refers to the aggregating transient population of the species in the province.

[2]SARO *Endangered Species Act, 2007*
(provincial status from http://www.ontario.ca/environment-and-energy/how-species-risk-are-listed#section-3)
The provincial review process is implemented by the MNR's Committee on the Status of Species at Risk in Ontario (COSSARO).

Extinct - A species that no longer exists anywhere.
Extirpated (EXT) - Lives somewhere in the world, and at one time lived in the wild in Ontario but no longer lives in the wild in Ontario.
Endangered (END) - Lives in the wild in Ontario but is facing imminent extinction or extirpation.
Threatened (THR) - Lives in the wild in Ontario, is not endangered, but is likely to become endangered if steps are not taken to address factors threatening it.
Special concern (SC) - Lives in the wild in Ontario, is not endangered or threatened, but may become threatened or endangered due to a combination of biological characteristics and identified threats.
Not at Risk (NAR) - A species that has been evaluated and found to be not at risk.
Data Deficient (DD) - A species for which there is insufficient information for a provincial status recommendation.

[3]SARA (Federal *Species at Risk Act*) Status and Schedule (includes COSEWIC Status)
The Act establishes Schedule 1, as the official list of wildlife species at risk. It classifies those species as being either Extirpated, Endangered, Threatened, or Special Concern. Once listed, the measures to protect and recover a listed wildlife species are implemented.

Extinct - A wildlife species that no longer exists.
Extirpated (EXT) - A wildlife species that no longer exists in the wild in Canada but exists elsewhere.
Endangered (END) - A wildlife species facing imminent extirpation or extinction.
Threatened (THR) - A wildlife species that is likely to become an endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
Special Concern (SC) - A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.
Data Deficient (DD) - A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction.
Not At Risk (NAR) - A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.

[4]SARA Schedule
Schedule 1: is the official list of species that are classified as extirpated, endangered, threatened, and of special concern.
Schedule 2: species listed in Schedule 2 are species that had been designated as endangered or threatened and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.
Schedule 3: species listed in Schedule 3 are species that had been designated as special concern and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.

The Act establishes Schedule 1 as the official list of wildlife species at risk. However, please note that while Schedule 1 lists species that are extirpated, endangered, threatened and of special concern, the prohibitions do not apply to species of special concern.

[5]Source: Ontario Ministry of Natural Resources. 2000. *Significant Wildlife Habitat Technical Guide* & Appendices.

[7]Nature Counts 2 Project. 2014. Hamilton Natural Areas Inventory, 3rd Edition. Hamilton Field Naturalists.

Appendix C - Breeding Bird Survey Summary Table
300058803 – Hamilton MCEA Hwy 52 & Powerline Intersection

[6]Ontario Breeding Bird Atlas - Breeding Evidence Codes

Observed	
X	Species observed during its breeding season, but NOT in suitable nesting habitat (no breeding evidence found). Note that this code is rarely used as birds tend to occupy nesting habitat during the breeding season. Do not use for species known to be migrants.

Possible	
H	Species observed in suitable nesting Habitat during its breeding season.
S	Singing male or adult producing other sounds associated with breeding (e.g., calls or drumming) in suitable nesting habitat during the species' breeding season.

Probable	
M	Multiple singing/calling/drumming individuals (7 or more) heard during one visit to a single square and in suitable nesting habitat during the species' breeding season. Use with caution to avoid counting migrants.
P	Pair observed in suitable nesting habitat during the species' breeding season.
T	Presumed Territory based on the presence of an adult bird (usually singing, but not necessarily so), in the same suitable nesting habitat patch on at least two visits, one week or more apart, during the species' breeding season. Use discretion when using this code. "T" is not to be used for colonial birds, or species that might forage or loaf a long distance from their nesting site (e.g., Turkey Vulture, and male waterfowl).
D	Courtship or displays involving a male and female (e.g., courtship feeding, copulation) or antagonistic behavior between two or more individuals (e.g., territorial disputes or chases), in suitable nesting habitat during the species' breeding season.
V	Bird Visiting a probable nest site in suitable nesting habitat during the species' breeding season.
A	Agitated behavior or alarm calls of an adult in suitable nesting habitat during the species' breeding season.
B	Brood patch or cloacal protuberance on an adult in suitable nesting habitat during the species' breeding season.
N	Nest-building by wrens or nest hole excavation by woodpeckers (both may build dummy or roosting nests, so nest-building alone is not enough to confirm breeding).

Confirmed	
NB	Nest building, including the carrying of nesting material, by all species except wrens and woodpeckers.
DD	Distraction Display, injury-feigning, or other displays attempting to draw attention away from a nest or young.
NU	Empty Nest Used or identifiable eggshells from earlier in the same nesting season.
FY	Recently Fledged Young (nidicolous species – whose young are raised in a nest) or downy young (nidifugous species – whose young leave the nest soon after hatching) incapable of sustained flight.
AE	Adult Entering, occupying, or leaving a nest site (visible or not) or whose behavior suggests the presence of an occupied nest.
FS	Adult carrying a Faecal Sac.
CF	Adult carrying food for young.
NE	Nest containing eggs.
NY	Nest with young (seen or heard).

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix D

SAR Screening Table

Background Review of Potential Species at Risk and Species of Conservation Concern on the Subject Lands and/or Adjacent Lands

COMMON NAME **(Source)	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present on the Subject Lands and/or Adjacent Lands?	Species observed?
Birds									
Acadian Flycatcher (Source: OBBA)	*Empidonax virescens*	S1B	END	END	END	Schedule 1	Generally requires large areas of mature, undisturbed forest; avoids the forest edge; often found in well wooded swamps and ravines.[7]	No potential. Forested areas are unlikely to be sufficiently large. Configuration of the forested / swamp area may support interior forest birds but is well beyond the Study Area. No records for this species.	Confirmed absent.
Bank Swallow (Source: OBBA)	*Riparia riparia*	S4B	THR	THR	THR	Schedule 1	Prefers open habitats including, farmland, lake/river shorelines, grasslands, and wetlands. Nests in exposed earthen banks along shorelines and in artificial sites such as gravel pits.[7]	No potential. Suitable habitat is absent from the Study Area.	Confirmed absent.
Barn Swallow (Source: OBBA)	*Hirundo rustica*	S4B	SC	SC	THR	Schedule 1	Prefers farmland, lake/river shorelines, wooded clearings, urban populated areas, rocky cliffs, and wetlands. Nests inside or on exterior of buildings; under bridges and in road culverts; on rock faces, and in caves, etc.[8]	No potential. Suitable habitat to support this species is absent from the Study Area.	Confirmed absent.
Bobolink (Source: OBBA, NHIC)	*Dolichonyx oryzivorus*	S4B	THR	SC	THR	Schedule 1	Generally prefers open grasslands and hay fields for nesting, typically featuring relatively tall vegetation. Sometimes uses large fields of winter wheat and rye in southwestern Ontario. Sensitive to vegetation structure and composition. Positively associated with high grass-to-forb ratios; moderate litter depth; tolerate wetter portions of fields compared to Eastern Meadowlark (EAME) and more likely to nest closer to field centres rather than field margins. Lower tolerance to presence of patches of bare ground. Appear to prefer larger fields than EAME.[9]	No potential. Suitable habitat to support this species is absent from the Study Area.	Confirmed absent.

COMMON NAME **(Source)	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present on the Subject Lands and/or Adjacent Lands?	Species observed?
Caspian Tern (Source: eBird, July 2022)	*Hydroprogne caspia*	S3B,S5M	-	-	-	-	Nest along large lakes and coastal areas.[7]	No. Suitable habitat to support this species is absent from the Study Area. Previous observations are from outside the core breeding bird window.	Confirmed absent.
Cerulean Warbler (Source: OBBA)	*Setophaga cerulea*	S2B	THR	END	END	Schedule 1	Generally found in mature deciduous forests with an open understorey; also nests in older, second-growth deciduous forests.[7]	No potential. Forested areas are unlikely to be sufficiently large. The configuration of the forested / swamp area may support interior forest birds but interior habitats are located well beyond the Study Area.	Confirmed absent.
Chimney Swift (Source: OBBA)	*Chaetura pelagica*	S3B	THR	THR	THR	Schedule 1	Historically nested in large hollow trees, other tree cavities and cracks in cliffs. Currently, most are found in developed areas in large, uncapped chimneys. Proximity to lakes is also a preferred habitat feature as they will forage for flying insects close to water.[7]	No potential. Suitable habitat to support this species is absent from the Study Area.	Confirmed absent.
Eastern Meadowlark (Source: OBBA)	*Sturnella magna*	S4B, S3N	THR	THR	THR	Schedule 1	Generally prefers grassy pastures, meadows and hay fields. Prefers moderately tall grass with abundant litter cover, a high proportion of grass cover, moderate forb density, low proportions of shrub and woody vegetation cover, and low percent of bare ground. Prefers to nest in drier sites and frequently nests around field margins.[9]	No potential. Suitable habitat to support this species is absent from the Study Area.	Confirmed absent.
Eastern Wood-pewee (Source: OBBA, eBird)	*Contopus virens*	S4B	SC	SC	SC	Schedule 1	Prefers open space near the nest in the form of forest edges, clearings, roadways, and water. Does not require large areas of woods but occurs less frequently in woodlots surrounded by development than in those without.[7]	High potential. Suitable habitat present that may support this species. eBird records for this species indicate possible breeding based on 2024 observations completed within the appropriate breeding bird window.	Confirmed present within the FODM5 community.

COMMON NAME **(Source)	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present on the Subject Lands and/or Adjacent Lands?	Species observed?
Golden-winged Warbler (Source: OBBA)	*Vermivora chrysoptera*	S3B	SC	THR	THR	Schedule 1	Generally prefer areas of early successional vegetation, found primarily on field edges, hydro or utility rights-of-way, or recently logged areas.[7]	Low potential. Suitable habitat may occur along the margins of the Copetown Bog within the SWT community. No eBird or NHIC records for this species occur within the Study Limits.	Confirmed absent.
Great Egret (source: eBird, April 1993)	*Ardea alba*	S2B,S3M	-	-	-	-	Treed and shrubs of wetlands.[7]	No potential. The most recent report for this species is from 1993. No known Great Egret breeding locations associated with the Summit Muskeg Preserve per the OBBA Atlas 2. Great Egrets were also not reported within the City of Hamilton NAI (3rd Edition)	Confirmed absent.
Olive-sided Flycatcher (Source: OBBA)	*Contopus cooperi*	S4B	SC	SC	THR	Schedule 1	Generally prefers natural forest edges and openings. The breeding habitat usually consists of mixed forest adjacent to rivers or wetlands. This species commonly nests in conifers such as White and Black Spruce, Jack Pine and Balsam Fir.[10]	Moderate potential. May be supported within FOD, SWT and BOT2-1 communities. Records present for this species are from 2009.	Confirmed absent within the ROW.
Prothonotary Warbler (Source: OBBA)	*Protonotaria citrea*	S1B	END	END	END	Schedule 1	Generally found in the dead trees of flooded woodlands or deciduous swamp forests of the Carolinian Zone.[7]	No potential. Suitable habitat to support this species is absent from the Study Area.	Confirmed absent.
Purple Martin (Source: OBBA)	*Progne subis*	S3	-	-	-	-	In Ontario, typically nest within nesting boxes.[7]	Moderate potential. Nesting habitat may be supported beyond the ROW on privately owned residential areas.	Observed foraging within the Study Area. Suitable breeding habitat is not supported within the ROW.

COMMON NAME **(Source)	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present on the Subject Lands and/or Adjacent Lands?	Species observed?
Tufted Titmouse (Source: OBBA, NHIC	*Baeolophus bicolor*	S3	-	-	-	-	Woodlands with large diameter trees and mast-producing species.[7]	Moderate potential. Suitable habitat may occur in association within all forested communities.	Confirmed absent. In association with the FODM5, WODM4a, WODM4b, and WODM4-4 communities. May be supported within the FOD and FOM communities that were not subject to targeted breeding bird surveys.
Upland Sandpiper (Source: NHIC)	*Bartramia longicauda*	S2B	-	-	-	-	Nests within unused pastures, old fields with scattered tall shrubs, hayfields, and airports. Habitats must span >30 ha.[7]	No potential. The upland communities present within the Study Area are insufficiently large to support this species.	-
Wood Thrush (Source: OBBA)	*Hylocichla mustelina*	S4B	SC	THR	THR	Schedule 1	Inhabits and breeds in woodlands ranging from small (3 ha) and isolated to large and contiguous. The presence of tall trees and a thick understorey are usually prerequisites for site occupancy.[7]	Moderate potential. Suitable habitat may occur in association with the FOD and FOM communities.	Confirmed absent. In association with the FODM5, WODM4a, WODM4b, and WODM4-4 communities. May be supported within the FOD and FOM communities that were not subject to targeted breeding bird surveys.
Yellow-breasted Chat (Source: OBBA)	*Icteria virens*	SNA	-	END	END	Schedule 1	Prefers scrubby, early successional habitats. In Ontario, the Yellow-breasted Chat uses regenerating old fields, forest edges, railway and hydro rights-of-way, young coniferous reforestations and occasionally wet willow-ash-elm thickets bordering wetlands. Tangles of grape and raspberry are also a habitat feature of most breeding sites.[7]	Unlikely to be supported. Suitable habitat is limited to the margins of the swamp communities. No recent records of this species.	Confirmed absent.

COMMON NAME **(Source)	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present on the Subject Lands and/or Adjacent Lands?	Species observed?
Insects									
Monarch Butterfly (Source: NAI)	*Danaus plexippus*	S2N,S4B	SC	END	SC	Schedule 1	Throughout their life cycle, Monarchs use three different types of habitat. Only the caterpillars (larvae) feed on milkweed plants and are confined to meadows and open areas where milkweed grows. Adult butterflies can be found in more diverse habitats where they feed on nectar from a variety of wildflowers. Monarchs spend the winter in Oyamel Fir forests found in central Mexico. The largest threat to Ontario Monarchs is habitat loss and fragmentation at overwintering sites in central Mexico where forests are being logged and converted into agricultural fields and pastures. Widespread pesticide and herbicide use throughout the Monarch's range may also limit recovery.[10]	Moderate potential. Sightings of the species have been observed within the Copetown Bog.	Confirmed present. Adult monarchs observed foraging within the CUT1 and MAM communities.
Mammals									
Eastern Small-footed Myotis (Source: RJB)	*Myotis leibii*	S2	END	END	END	Schedule 1	Overwintering habitat: Caves and abandoned mines. According to the Recovery Strategy for the Eastern Small-footed Myotis in Ontario, summer / roosting habitats used by the species in Ontario are poorly understood, but elsewhere in its range it primarily roosts in open, sunny rocky habitats, and, occasionally, in buildings. Summer roosts for this species are believed to be located in close proximity to their hibernacula (i.e., less than 100 m). The species' preference for rocky habitats in summer may limit an individual's home range to those rocky areas which also contain hibernacula (i.e., karst areas and Canadian Shield areas containing abandoned mines with adits).[16]	No potential. Rockpiles or naturally occurring features that may support Eastern Small-footed Myotis are absent within the ROW Outbuildings associated with rural residential properties may support this species.	Not observed.

COMMON NAME **(Source)	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present on the Subject Lands and/or Adjacent Lands?	Species observed?
Eastern Red Bat (Source: RJB)	*Lasiurus borealis*	S4	END	END	0	0	Roost within the foliage of trees and shrubs in both deciduous and coniferous trees in forests of any age class. Eastern Red bats are known to avoid roosting within conifer species if deciduous trees are present. Typical roost trees are large in diameter and are as tall or taller than the surrounding canopy. Roost sites tend to be along southern aspects and are sheltered from the wind, with Eastern Red Bats being known to be select locations are that unlikely to experience temperature extremes. This species is known to utilize a number of roost trees during the season with average roosting areas spanning < 1 ha during the summer months. [26]	Moderate potential. May be supported within deciduous woodlands, deciduous forests, and mixed forest communities.	Not observed.
Hoary Bat (Source: RJB)	*Lasiurus cinereus*	S4	END	END	0	0	Roost within the foliage of trees and shrubs in both deciduous and coniferous trees in forests of any age class. Typical roost trees are large in diameter and are as tall or taller than the surrounding canopy. Roost sites tend to be along southern aspects and are sheltered from the wind.[26]	Moderate potential. May be supported within deciduous woodlands, deciduous forests, mixed forest, TAGM1, and BOT2-1 / BOTC2-1 communities.	Not observed.
Little Brown Myotis (Source: RJB)	*Myotis lucifugus*	S3	END	END	END	Schedule 1	Overwintering habitat: Caves and mines that remain above 0 degrees Celsius. Maternal Roosts: Often associated with buildings (attics, barns etc.). Occasionally found in trees (25-44 cm dbh).[15]	Moderate potential. May be supported within deciduous woodlands, deciduous forests, mixed forest, TAGM1, and BOT2-1 / BOTC2-1 communities .	Not observed.
Northern Myotis (Source: RJB)	*Myotis septentrionalis*	S3	END	END	END	Schedule 1	Overwintering habitat: Caves and mines that remain above 0 Maternal Roosts: Often associated with cavities of large diameter trees (25-44 cm dbh). Occasionally found in structures (attics, barns etc.).[15]	Moderate potential. May be supported within deciduous forests, mixed forest, TAGM1, and BOT2-1 / BOTC2-1 communities.	Not observed.

COMMON NAME **(Source)	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present on the Subject Lands and/or Adjacent Lands?	Species observed?
Silver-haired Bat (Source: RJB)	*Lasionycteris noctivagans*	S4	END	END	0	0	Primarily roost under large sheets of exfoliating bark and within tree cavities. This species will typically roost within a variety of large diameter coniferous and deciduous roost trees. High-quality roost trees include trees with heart-rot infections at the site of limb breakages that have resulted in the creation of well-protected inner chambers. Members of this species, including lactating females, are well documented to roost switch. Silver-haired bats are also known to occasionally roost on or within buildings but only when treed habitats are scarce. [26]	Moderate potential. May be supported within deciduous woodlands, deciduous forests, mixed forest, TAGM1, and BOT2-1 / BOTC2-1 communities.	Not observed.
Tri-colored Bat (Source: RJB)	*Perimyotis subflavus*	S3?	END	END	END	Schedule 1	Overwintering habitat: Deepest parts of caves and mines where temperature is the least variable. Maternal Roosts: Less is known about roosts of Tri-colored Bats. Most roost sites found within forested habitats. May roost in clumps of dead foliage and lichens. In more anthropogenically modified landscapes, maternity roosts may be barns or similar human-made structures.[15]	Moderate potential. May be supported within deciduous woodlands, deciduous forests, and mixed forest communities.	Not observed.
Plants									
American Chestnut (Source: NHIC)	*Castanea dentata*	S1S2	END	END	END	Schedule 1	Found in deciduous forest communities; this tree prefers arid forests with acid and sandy soils.[20]	Low potential. Suitable habitat may occur in association with upland forest communities.	Confirmed absent within the ROW.
American Columbo (Source: Oldham and Brinker, 2009)	*Frasera caroliniensis*	S2	END	END	END	Schedule 1	Occurs on dry mesic to mesic clay and clay-loam as well as mesic silty clay soils in open deciduous woodlands, forests, dense thickets, and meadows.[25]	No potential. Suitable soils to support this species are absent.	Confirmed absent within the ROW.

COMMON NAME **(Source)	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present on the Subject Lands and/or Adjacent Lands?	Species observed?
American Ginseng (Source: Oldham and Brinker, 2009)	*Panax quinquefolius*	S2	END	END	END	Schedule 1	Grows in rich, moist, undisturbed and relatively mature deciduous woods in areas of neutral soil (such as over limestone or marble bedrock).[20]	No potential. Suitable habitat to support this species is absent.	Confirmed absent within the ROW.
Bashful Clubrush (Source: Oldham and Brinker, 2009)	*Trichophorum planifolium*	S1	END	END	END	Schedule 1	Open forests with open understory. Typically associated with tallgrass prairies. Common associates include White Oak (Quercus alba), Black Oak (Quercus velutina), and White Pine (Pinus strobus).[24]	No potential. Suitable habitat to support this species is absent.	Confirmed absent within the ROW.
Black Ash (Source: RJB)	*Fraxinus nigra*	S4	END	END	-	0	Commonly occurs within wetlands including swamps, floodplains and fens.[13]	Moderate potential. Suitable habitat may occur in association with the MAM community.	Confirmed absent within the ROW.
Billing's Three-seeded Sedge	*Carex trisperma var. billingsii*	S2S3	-	-	-	-	Occurs within bogs and conifer swamps. [24]	Known to occur within the Copetown Bog.	Assumed present. Vegetation surveys were not carried out within the Copetown Bog.
Butternut (Source: Oldham and Brinker, 2009)	*Juglans cinerea*	S2?	END	END	END	Schedule 1	Butternut grows best in rich, moist and well-drained soils or limestone gravel sites. They are less commonly found in dry, rocky and sterile soils. They generally grow alone or in small groups in deciduous forests that are commonly comprised of Basswood, Black Cherry, Beed, Black Walnut, Elm, Hemlock, Hickory, Oak, Red Maple, Sugar Maple, Poplar, White Ash and Yellow Birch.6 In Ontario, they can be found throughout the southern Ontario, south of the Canadian Shield.[10]	Moderate potential. May be supported within deciduous forest and woodlands	Confirmed absent within the ROW.
Downy yellow false foxglove (Source: Oldham and Brinker, 2009)	*Aureolaria virginica*	S1	END	END	0	0	Well drained soils in dry, open to semi-open, upland oak forests, woodlands and savanna. Known to grow on sand dunes, sand plains, clay ridges, slopes, stony loams on moraines, and shallow soils over carbonate bedrock.[25]	No potential. Suitable habitat is absent from the Study Area.	Confirmed absent within the ROW.

COMMON NAME **(Source)	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present on the Subject Lands and/or Adjacent Lands?	Species observed?
Eastern Flowering Dogwood (Source: Oldham and Brinker, 2009)	*Cornus florida*	S2?	END	END	END	Schedule 1	Generally grows in deciduous and mixed forests, in the drier areas of its habitat, although it is occasionally found in slightly moist environments; Also grows around forest edges and hedgerows.[20]	Low potential. May be supported within deciduous forests.	Confirmed absent within the ROW.
Eastern Prairie Fringed Orchid (Source: Oldham and Brinker, 2009)	*Platanthera leucophaea*	S2	END	END	END	Schedule 1	Occurs within wet prairies and fens. Also known to occur within Tamarack Swamps along the Bruce Peninsula and Ottawa area.[22]	No potential. Suitable habitat is absent.	Confirmed absent within the ROW.
Fern-leaved Yellow False Foxglove (Source: Oldham and Brinker, 2009)	*Aureolaria pedicularia*	S3?	THR	THR	0	0	Occurs on dry sandy soils of open woodlands and savannahs, particularly Black Oak savannahs. Common associates include Hickory and Pine.[25]	No potential. Suitable habitat is absent.	Confirmed absent within the ROW.
Green Dragon (Source: Oldham and Brinker, 2009)	*Arisaema dracontium*	S3	SC	SC	SC	0	Floodplain forests, swamps. and along watercourses.[25]	Unlikely to be supported.	Confirmed absent within the ROW.
Hoary mountain-mint (Source: Oldham and Brinker, 2009)	*Pycnanthemum incanum*	S1	END	END	END	Schedule 1	Open, dry, sandy-clay soils in open woodlands, often along slopes.[25]	No potential. Suitable habitat is absent.	Confirmed absent within the ROW.
Perfoliate Bellwort (Source: NHIC)	*Uvularia perfoliata*	S1S2	-	-	-	-	Occurs within rich woods and thickets.[24]	Moderate potential/ May be supported within the forested communities.	Confirmed absent within the publicly accessible portions of the FODM5, WODM4a, WODM4b, and WODM4-4 communities. May be supported within the FOM and FOD communities that within the Study Area beyond the ROW that were not included within RJB's field program.
Red Mulberry (Source: Oldham and Brinker, 2009)	*Morus rubra*	S2	END	END	END	Schedule 1	Generally grows in moist forest habitats. In Ontario, these include slopes and ravines of the Niagara Escarpment, and sand spits and bottom lands; Can grow in open areas such as hydro corridors.[20]	No potential. This species is known to occur along the Escarpment within the City of Hamilton.	Confirmed absent within the ROW.
Smooth Yellow False Foxglove (Source: Oldham and Brinker, 2009)	*Aureolaria flava*	S2?	THR	THR	THR	1	Dry, open to semi-open upland oak forests and oak woodlands with well-drained soils, hemi-parasitic with White Oak.[25]	No potential. Suitable habitat is absent.	Confirmed absent within the ROW.

COMMON NAME **(Source)	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present on the Subject Lands and/or Adjacent Lands?	Species observed?
White Wood Aster (Source: Oldham and Brinker, 2009)	*Eurybia divaricata*	S3	THR	THR	THR	Schedule 1	Generally grows in open, dry, deciduous forests. It has been suggested that it may benefit from some disturbance, as it often grows along trails.[20]	No potential. Extirpated from the Hamilton area.	Confirmed absent within the ROW.
Reptiles and Amphibians									
Midland Painted Turtle (Source: ORAA, iNaturalist)	*Chrysemys picta marginata*	S4	No Status	SC	SC	1	Generally, prefers waterbodies such as ponds, marshes, lakes and slow-moving creeks that have a soft bottom and provide abundant basking sites and aquatic vegetation.[10]	Confirmed present. Several scientific grade observations made within the SAS/MAS community of the Copetown Bog.	Confirmed absent within the ROW.
Eastern Hog-nosed Snake (Source: ORAA)	*Heterodon platirhinos*	S3	THR	THR	THR	Schedule 1	The Eastern Hog-nosed Snake specializes in hunting and eating toads, and usually only occurs where toads can be found. Eastern Hog-nosed Snakes prefer sandy, well-drained habitats such as beaches and dry forests where they can lay their eggs and hibernate. They use their up-turned snout to dig burrows below the frost line in the sand where eggs are deposited.[10]	No potential. No NHIC or iNaturalist records within the vicinity of the project limits. Records for this species are historical. Per the Hamilton NAI (3rd edition), this species is not known to occur within the City of Hamilton.	Confirmed absent within the ROW.
Eastern Milksnake (Source: ORAA)	*Lampropeltis triangulum*	S4	No status	SC	SC	1	Habitat generalist. Found in wide variety of habitats, from open woodlands, bogs, swamps, woodland edges, marshes, lakeshores, old fields, pastures, farmyards, parks, gardens. Often in or near farm outbuildings, barns, and sheds, and are attracted to piles of rocks, logs, firewood, or building materials, or any place that offers shelter to snakes and their prey (rodents).[10]	Moderate potential. May occur in all upland communities. Eastern Milksnake was not incidentally encountered throughout the course of field investigations.	Confirmed absent within the ROW.

COMMON NAME **(Source)	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present on the Subject Lands and/or Adjacent Lands?	Species observed?
Eastern Ribbonsnake (Source: ORAA)	*Thamnophis sauritus*	S4	SC	SC	SC	Schedule 1	Generally occur along the edges of shallow ponds, streams, marshes, swamps, or bogs bordered by dense vegetation that provides cover. Abundant exposure to sunlight is also required, and adjacent upland areas may be used for nesting.[20]	Moderate potential. Suitable habitat occurs in association with the MASM1-14 / SAF_1-3, MAM, MAS, and SWT communities.	Not observed. Although this species was not incidentally encountered within the MASM1-14 / SAF_1-3 community, targeted reptile surveys were not included within the scope of field investigations. This species may be supported within the MASM1-14 / SAF_1-3, MAM, MAS, and SWT communities.
Jefferson salamander (Source: ORAA)	*Ambystoma jeffersonianum*	S2	END	END	END	Schedule 1	Inhabits deciduous and mixed deciduous forests with suitable breeding areas which generally consist of ephemeral (temporary) bodies of water that are fed by spring runoff, groundwater, or springs.[14]	Unlikely to be supported. Suitable habitats are absent within the Study Area.	Confirmed absent within the ROW.
Unisexual Ambystoma	*Ambystoma laterale - (2) jeffersonianum*	0	-	END	END	Schedule 1	Live in leaf litter, under logs and in underground cavities in deciduous and mixed forests, typically within close proximity to breeding habitats. Adults breed in vernal pools or fish-free permanent wetlands. Juveniles will leave the pond after transforming from the larval stage and head into the surrounding forest. These salamanders overwinter underground where they can get below the frost line and avoid freezing temperatures such as in mammal burrows, rock crevices or other underground cavities.[10]	Unlikely to be supported. Suitable habitats are absent within the Study Area.	Confirmed absent within the ROW.
Midland Painted Turtle (Source: ORAA, iNaturalist)	*Chrysemys picta marginata*	S4	No Status	SC	SC	1	Generally, prefers waterbodies such as ponds, marshes, lakes and slow-moving creeks that have a soft bottom and provide abundant basking sites and aquatic vegetation.[10]	Confirmed present. Several scientific grade observations made within the SAS/MAS community of the Copetown Bog.	Confirmed absent within the ROW.

COMMON NAME **(Source)	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present on the Subject Lands and/or Adjacent Lands?	Species observed?
Snapping Turtle (Source: ORAA)	*Chelydra serpentina*	S4	SC	SC	SC	1	Generally, inhabit shallow waters where they can hide under the soft mud and leaf litter. Nesting sites usually occur on gravely or sandy areas along streams. Snapping Turtles often take advantage of man-made structures for nest sites, including roads (especially gravel shoulders), dams and aggregate pits.[9]	Moderate potential. Suitable habitat occurs in association with the MASM1-14 / SAF_1-3, MAS / SWT communities.	Not observed. Although this species was not incidentally encountered within the MASM1-14 / SAF_1-3 community, targeted reptile surveys were not included within the scope of field investigations. This species may be supported within the MASM1-14 / SAF_1-3, MAM, MAS, and SWT communities.
Western Chorus Frog (Source: ORAA)	*Pseudacris maculata*	S4	No status	THR (Great Lakes - St Lawrence population in Canada)	THR (Great Lakes - St Lawrence population in Canada)	*1*	The Western Chorus Frog is primarily a lowland terrestrial species. In marshes or wooded wetland areas, it is found on the ground or in low shrubs and grass. Like all other frogs, the Western Chorus Frog requires both terrestrial and aquatic habitats in close proximity. For breeding and tadpole development, it requires seasonally dry temporary ponds devoid of predators, particularly fish. It is very rarely found in permanent ponds. In southern Ontario, its range is bounded by the United States border in the south, Georgian Bay in the northwest, and south of Algonquin Park and up the Ottawa River valley to the vicinity of Eganville in the east. [7, 8, 10]	Moderate potential. Suitable habitat occurs in association with the unnamed tributary, SAS, MAS, and SWT communities.	Confirmed absent within the MASM1-14 / SAF_1-3 communities. May be supported within the MAS / SWT communities as well as the MAM communities that were not subject to RJB review.

**Sources: Natural Heritage Information Centre (NHIC) database of records searched on February 7, 2025 (4- 1x1 km2 Squares: 17NH7685, 17NH7686, 17NH7785, 17NH7786); Ontario Breeding Bird Atlas (2001-2005) searched on February 7, 2025 (Squares 17NH78); Ontario Reptile and Amphibian Atlas (ORAA) searched on February 7, 2025 (Squares 17NH78); Nature Counts 2 Project. Hamilton Natural Areas Inventory, 3rd Edition (, R.J. Burnside & Associates (Burnside) observations during ecological field surveys in 2025.

[1]S-Ranks (provincial)
Provincial (or Subnational) ranks are used by the Natural Heritage Information Centre (NHIC) to set protection priorities for rare species and natural communities. These ranks are not legal designations. Provincial ranks are assigned in a manner similar to that described for global ranks, but consider only those factors within the political boundaries of Ontario (Please refer to: http://explorer.natureserve.org/nsranks.htm)

SX — Presumed Extirpated - Species or community is believed to be extirpated from the province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
SH — Possibly Extirpated (Historical) - Species or community occurred historically in the province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20–40 years. A species or community could become SH without such a 20-40 year delay if the only known occurrences in a province were destroyed or if it had been extensively and unsuccessfully looked for. The SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.
S1 — Critically Imperiled - Critically imperiled in the province or state because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the province.

S2 — Imperiled - Imperiled in the province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the province.
S3 — Vulnerable - Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
S4 — Apparently Secure - Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5 — Secure - Common, widespread, and abundant in the province.
SNR — Unranked - Province conservation status not yet assessed.
SU — Unrankable - Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
SNA — Not Applicable - A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
S#S# — Range Rank - A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).
S#? – Inexact or Uncertain - Denotes inexact or uncertain numeric rank.

Breeding Status Qualifiers
B – Breeding Conservation status refers to the breeding population of the species in the nation or state/province.
N – Nonbreeding Conservation status refers to the non-breeding population of the species in the province.
M – Migrant species occurring regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. Conservation status refers to the aggregating transient population of the species in the province.

[2]**SARO *Endangered Species Act, 2007***
(provincial status from http://www.ontario.ca/environment-and-energy/how-species-risk-are-listed#section-3)
The provincial review process is implemented by the MNRF's Committee on the Status of Species at Risk in Ontario (COSSARO).

Extinct - A species that no longer exists anywhere.
Extirpated (EXT) - Lives somewhere in the world, and at one time lived in the wild in Ontario but no longer lives in the wild in Ontario.
Endangered (END) - Lives in the wild in Ontario but is facing imminent extinction or extirpation.
Threatened (THR) - Lives in the wild in Ontario, is not endangered, but is likely to become endangered if steps are not taken to address factors threatening it.
Special concern (SC) - Lives in the wild in Ontario, is not endangered or threatened, but may become threatened or endangered due to a combination of biological characteristics and identified threats.
Not at Risk (NAR) - A species that has been evaluated and found to be not at risk.
Data Deficient (DD) - A species for which there is insufficient information for a provincial status recommendation.

[3]**SARA (Federal *Species at Risk Act*) Status and Schedule (includes COSEWIC Status)**
The Act establishes Schedule 1, as the official list of wildlife species at risk. It classifies those species as being either Extirpated, Endangered, Threatened, or Special Concern. Once listed, the measures to protect and recover a listed wildlife species are implemented.

Extinct - A wildlife species that no longer exists.
Extirpated (EXT) - A wildlife species that no longer exists in the wild in Canada but exists elsewhere.
Endangered (END) - A wildlife species facing imminent extirpation or extinction.
Threatened (THR) - A wildlife species that is likely to become an endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
Special Concern (SC) - A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.
Data Deficient (DD) - A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction.
Not At Risk (NAR) - A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.

[4]**SARA Schedule**
Schedule 1: is the official list of species that are classified as extirpated, endangered, threatened, and of special concern.
Schedule 2: species listed in Schedule 2 are species that had been designated as endangered or threatened and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.
Schedule 3: species listed in Schedule 3 are species that had been designated as special concern and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.

The Act establishes Schedule 1 as the official list of wildlife species at risk. However, please note that while Schedule 1 lists species that are extirpated, endangered, threatened and of special concern, the prohibitions do not apply to species of special concern.

Species that were designated at risk by COSEWIC prior to October 1999 (Schedule 2 & 3) must be reassessed using revised criteria before they can be considered for addition to Schedule 1 of SARA. After they have been assessed, the Governor in Council may on the recommendation of the Minister, decide on whether or not they should be added to the List of Wildlife Species at Risk.

[5]**Sources:**
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[8] Species at Risk Public Registry http://www.sararegistry.gc.ca
[9] McCracken, J.D. et al. 2013. Recovery Strategy for the Bobolink (*Dolichonyx oryzivorus*) and Eastern Meadowlark (*Sturnella magna*) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario, viii + 88 pp
[10] MNR SARO List Species Descriptions (http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/MNR_SAR_CSSR_SARO_LST_EN.html)
[11] COSEWIC Species Assessment Report
[12] Naughton, Donna. 2012. The Natural History of Canadian Mammals. Canadian Museum of Nature and University of Toronto Press, Toronto, + 784 pp
[13] Farrar, John Laird, 2017, Trees in Canada, Natural Resources Canada | Canada Forest Services, and, Fitchenry & Whiteside Limited, pp.238 - 239
[14] Ontario Nature Reptile and Amphibian Atlas (https://ontarionature.org/programs/citizen-science/reptile-amphibian-atlas/species/)
[15] Environment Canada. 2015. Recovery Strategy for Little Brown Myotis (*Myotis lucifugus*), Northern Myotis (*Myotis septentrionalis*) and Tri-colored Bat (*Perimyotis subflavus*) in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. Ix + 110 pp
[16] Humphrey, C. 2017. Recovery Strategy for the Eastern Small-footed Myotis (*Myotis leibii*) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario. vii + 76 pp
[17] Department of Fisheries and Oceans (DFO) Aquatic Species at Risk found online at: http://www.dfo-mpo.gc.ca/species-especes/sara-lep/identify-eng.html
[18] Paulson, D. 2011. Dragonflies and Damselflies of the East. Princeton University Press, Princeton, NJ
[19] Harding, J.H., 1997. Amphibians and Reptiles of the Great Lakes Region. The University of Michigan Press. Ann Arbor, Michigan
[20] MNRF. 2018. City of Niagara Falls Species at Risk Table. Guelph District
[21] Michigan Flora found online at https://michiganflora.net/search.aspx
[22] Natural Heritage Information Centre (https://www.ontario.ca/page/get-natural-heritage-information)
[23] McKnight, K.B. et al. 2013. Common Mosses of the Northeast and Appalachians. Princeton University Press. Princeton, New Jersey
[24] Oldham, M.J., and S.R. Brinker. 2009. Rare Vascular Plants of Ontario, Fourth Edition. Natural Heritage Information Centre, Ontario Ministry of Natural Resources. Peterborough, Ontario. 188 pp
[25] Leslie, J. 2018. Vascular Plants at Risk in Ontario. https://static1.squarespace.com/static/5a6531d312abd9ae318d7cbf/t/5bfd60278985836d7a274a9d/1543331903837/2018.11.22_Vascular+Plants+At+Risk+In+Ontario_Low+Resolution.pdf
[26] COSEWIC. 2023. COSEWIC assessment and status report on the Hoary Bat (*Lasiurus cinereus*), Eastern Red Bat (*Lasiurus borealis*) and Silver-haired Bat (*Lasionycteris noctivagans*), in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xxi + 100 pp. (Species at risk public registry)

BURNSIDE

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Appendix E

Significant Wildlife Habitat Screening Table

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Table 1.1: Seasonal Concentration Areas of Animals						
Waterfowl Stopover & Staging Areas (Terrestrial) **<u>Rationale:</u>** Habitat important to migrating waterfowl.	CUM1 CUT1 - Plus evidence of annual spring flooding from melt water or run-off within these ecosites. Fields with seasonal flooding and waste grains in the Long Point, Rondeau, Lake St. Clair, Grand Bend and Point Pelee areas may be important to Tundra Swans.	Fields with sheet water during Spring (mid-March to May). • Fields flooding during spring melt and run-off provide important invertebrate foraging habitat for migrating waterfowl. • Agricultural fields with waste grains are commonly used by waterfowl, these are not considered SWH unless they have spring sheet water available.	No potential • Suitably large CUT1 and CUM1 communities to support large aggregations of waterfowl are absent.	American Black Duck Northern Pintail Gadwall Blue-winged Teal Green-winged Teal American Wigeon Northern Shoveler Tundra Swan	Studies carried out and verified presence of an annual concentration of any listed species, evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects. • Any mixed species aggregations of 100 or more individuals required. • The flooded field ecosite habitat plus a 100300 m radius area, dependent on local site conditions and adjacent land use is the SWH. • Annual use of habitat is documented from information sources or field studies (annual use can be based on studies or determined by past surveys with species numbers and dates). • **SWHMiST Index #7** provides development effects and mitigation measures.	No potential. Suitable communities to support this feature are absent.

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Waterfowl Stopover & Staging Areas (Aquatic) **<u>Rationale:</u>** Important for local and migrant waterfowl populations during the spring or fall migration or both periods combined. Sites identified are usually only one of a few in the eco-district.	MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7	• Ponds, marshes, lakes, bays, coastal inlets, and watercourses used during migration. Sewage treatment ponds and SWM ponds do not qualify as a SWH, however a reservoir managed as a large wetland or pond/lake does qualify. • These habitats have an abundant food supply (mostly aquatic invertebrates and vegetation in shallow water).	No potential • SWD communities are limited to the margins of a SWC community. MAS communities are present but are unlikely to be sufficiently large to support aggregations of waterfowl.	Canada Goose Cackling Goose Snow Goose American Black Duck Northern Pintail Northern Shoveler American Wigeon Gadwall Green-winged Teal Blue-winged Teal Hooded Merganser Common Merganser Lesser Scaup Greater Scaup Long-tailed Duck Surf Scoter White-winged Scoter Black Scoter Ring-necked duck Common Goldeneye Bufflehead Redhead Ruddy Duck Red-breasted Merganser Brant Canvasback Ruddy Duck	**Studies carried out & verified presence of:** • Aggregations of 100 or more of listed species for 7 days, results in >700 waterfowl use days. • Areas with annual staging of ruddy ducks, canvasbacks, and redheads are SWH. • The combined area of the Ecological Land Classification (ELC) ecosites and a 100 m radius area is the SWH. • Wetland area and shorelines associated with sites identified within the SWHTG Appendix K are SWH. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”. • Annual Use of Habitat is Documented from Information Sources or Field Studies (Annual can be based on completed studies or determined from past surveys with species numbers and dates recorded). • **SWHMiST Index #7** provides development effects and mitigation measures.	No potential. Suitable communities to support this feature are absent. • This area is a frequently trafficked trail with numerous eBird records and has been subject to numerous reviews as a part of the Hamilton NAI. This area is not documented as a known Waterfowl Stopover & Staging Areas.

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Shorebird Migratory Stopover Area **<u>Rationale:</u>** High quality shorebird stopover habitat is extremely rare and typically has a long history of use.	BBO1 BBO2 BBS1 BBS2 BBT1 BBT2 SDO1 SDS2 SDT1 MAM1 MAM2 MAM3 MAM4 MAM5	• Shorelines of lakes, rivers and wetlands, including beach areas, bars and seasonally flooded, muddy and unvegetated shoreline habitats. • Great Lakes coastal shorelines, including groynes and other forms of armour rock lakeshores, are extremely important for migratory shorebirds in May to mid-June and early July to October. • Sewage treatment ponds and storm water ponds do not qualify as a SWH.	No potential • Suitably large communities to support this feature are absent.	Greater Yellowlegs Lesser Yellowlegs Marbled Godwit Hudsonian Godwit Black-bellied Plover American Golden-Plover Semipalmated Plover Solitary Sandpiper Spotted Sandpiper Semipalmated Sandpiper Pectoral Sandpiper White-rumped Sandpiper Baird's Sandpiper Least Sandpiper Purple Sandpiper Stilt Sandpiper Short-billed Dowitcher Red-necked Phalarope Whimbrel RuddyTurnstone Sanderling Dunlin	**Studies confirming:** • Presence of 3 or more of listed species and >1000 shorebird use days during spring or fall migration period (shorebird use days are the accumulated number of shorebirds counted per day over the course of the fall or spring migration period). • Whimbrel stop briefly (<24 hrs.) during spring migration, any site with >100 Whimbrel used for 3 years or more is significant. • The area of significant shorebird habitat includes the mapped ELC shoreline ecosites plus a 100 m radius area. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects". • **SWHMiST Index #8** provides development effects and mitigation measures.	No potential. Suitable communities to support this feature are absent.

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	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Raptor Wintering Area **Rationale:** Sites used by multiple species, a high number of individuals and used annually are most significant.	Hawks/Owls: Combination of ELC Community Series; need to have present one Community Series from each land class Forest: FOD FOM FOC Upland: CUM CUT CUS CUW Bald Eagle: Forest community Series: FOD FOM FOC SWD SWM SWC on shoreline areas adjacent to large rivers or adjacent to lakes with open water (hunting area).	• The habitat provides a combination of fields and woodlands that provide roosting, foraging and resting habitats for wintering raptors. • Raptor wintering sites (hawk/owl) need to be **>** 20 ha, with a combination of forest and upland. • Least disturbed sites, idle/fallow or lightly grazed field/meadow (>15ha) with adjacent woodlands. • Field area of the habitat is to be wind swept with limited snow depth or accumulation. • Eagle sites have open water, large trees and snags available for roosting.	No potential Confirmed absent • Suitably large forest communities are present; however, suitably large meadow communities are absent.	Rough-legged Hawk Red-tailed Hawk Northern Harrier American Kestrel Snowy Owl **Special Concern:** Short-eared Owl Bald Eagle	**Studies confirm the use of these habitats by:** • One or more Short-eared Owls or; One or more Bald Eagles or; At least 10 individuals and two of the listed hawk/owl species. • To be significant a site must be used regularly (3 in 5 years) for a minimum of 20 days by the above number of birds. • The habitat area for an Eagle winter site is the shoreline forest ecosites directly adjacent to the prime hunting area. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects.” • **SWHMiST Index #10 and #11** provides development effects and mitigation measures.	No potential. Suitable communities to support this feature are absent. Raptors are know to occur within the winter months within the general area.
Bat Hibernacula **Rationale:** Bat hibernacula are rare habitats in all Ontario landscapes.	**Bat Hibernacula may be found in these ecosites:** CCR1 CCR2 CCA1 CCA2 (Note: buildings are not considered to be SWH)	• Hibernacula may be found in caves, mine shafts, underground foundations and Karsts. • Active mine sites should not be considered as SWH. • The locations of bat hibernacula are relatively poorly known.	No potential • Suitable communities to support this feature are absent.	Big Brown Bat Tri-coloured Bat	• All sites with confirmed hibernating bats are SWH. • The habitat area includes a 200 m radius around the entrance of the hibernaculum for most development types and 1000 m for wind farms. • Studies are to be conducted during the peak swarming period (August to September). Surveys should be conducted following methods outlined in the “Bats and Bat Habitats: Guidelines for Wind Power Projects”. • **SWHMiST Index #1** provides development effects and mitigation measures.	No potential. Suitable communities to support this feature are absent.

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Bat Maternity Colonies **<u>Rationale:</u>** Known locations of forested bat maternity colonies are extremely rare in all Ontario landscapes.	Maternity colonies considered SWH are found in forested ecosites. **All ELC ecosites in ELC Community Series:** FOD FOM SWD SWM	• Maternity colonies can be found in tree cavities, vegetation and often in buildings are not considered to be SWH). • Maternity roosts are not found in caves and mines in Ontario. • Maternity colonies located in Mature deciduous or mixed forest stands with >10/ha large diameter (>25 cm dbh) wildlife trees. • Female Bats prefer wildlife tree (snags) in early stages of decay, class 1-3 or class 1 or 2. • Silver-haired Bats prefer older mixed or deciduous forest and form maternity colonies in tree cavities and small hollows. Older forest areas with at least 21 snags/ha are preferred.	Moderate potential. • May be supported in association with deciduous forest and mixed forest communities	Big Brown Bat Silver-haired Bat	• Maternity Colonies with confirmed use by: – >10 Big Brown Bats – >5 Adult Female Silver- haired Bats • The area of the habitat includes the entire woodland, or a forest stand ELC ecosite or an ecoelement containing the maternity colonies. • Evaluation methods for maternity colonies should be conducted following methods outlined in the "Bats and Bat Habitats: Guidelines for Wind Power Projects". • **SWHMiST Index #12** provides development effects and mitigation measures.	Candidate SWH. Detailed surveys to confirm the presence of this feature were not included in the scope of field investigations.

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	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Turtle Wintering Areas **<u>Rationale:</u>** Generally, sites are the only known sites in the area. Sites with the highest number of individuals are most significant.	Snapping and Midland Painted Turtles. **ELC Community Classes:** SW MA OA and SA **ELC Community Series:** FEO and BOO For Northern Map Turtle: Open Water areas such as deeper rivers or streams and lakes with current can also be used as over-wintering habitat.	• For most turtles, wintering areas are in the same general area as their core habitat. Water has to be deep enough not to freeze and have soft mud substrates. • Over-wintering sites are permanent water bodies, large wetlands, and bogs or fens with adequate Dissolved Oxygen. • Man-made ponds such as sewage lagoons or storm water ponds should not be considered SWH.	Moderate potential • May be supported in association with the watercourse impoundment	Midland Painted Turtle **<u>Special Concern:</u>** Northern Map Turtle Snapping Turtle	• Presence of 5 over-wintering Midland Painted Turtles is significant. • One or more Northern Map Turtle or Snapping Turtle over-wintering within a wetland is significant. • The mapped ELC ecosite area with the over wintering turtles is the SWH. If the hibernation site is within a stream or river, the deep-water pool where the turtles are over wintering is the SWH. • Over wintering areas may be identified by searching for congregations (Basking Areas) of turtles on warm, sunny days during the fall (September–October) or spring (March–May). • Congregation of turtles is more common where wintering areas are limited and therefore significant. • **SWHMiST Index #28** provides development effects and mitigation measures for turtle wintering habitat.	Confirmed present. Based on iNaturalist research grade records from March 21, 2021, a minimum of 5 Midland Painted Turtles were reported within the SAS community.

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	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Reptile Hibernaculum **<u>Rationale;</u>** Generally, sites are the only known sites in the area. Sites with the highest number of individuals are most significant.	For all snakes, habitat may be found in any ecosite other than very wet ones. Talus, Rock Barren, Crevice, Cave, and Alvar sites may be directly related to these habitats. Observations or congregations of snakes on sunny warm days in the spring or fall is a good indicator.	• For snakes, hibernation takes place in sites located below frost lines in burrows, rock crevices and other natural or naturalized locations. The existence of features that go below frost line; such as rock piles or slopes, old stone fences, and abandoned crumbling foundations assist in identifying candidate SWH. • Areas of broken and fissured rock are particularly valuable since they provide access to subterranean sites below the frost line. • Wetlands can also be important over-wintering habitat in conifer or shrub swamps and swales, poor fens, or depressions in bedrock terrain with sparse trees or shrubs with sphagnum moss or sedge hummock groundcover.	Low potential • No hibernacula features were observed within the publically accessible areas of the Study Area. May be supported on private property.	**<u>Snakes:</u>** Eastern Gartersnake Northern Watersnake Northern Red-bellied Snake Northern Brownsnake Smooth Green Snake Northern Ring-necked Snake **<u>Special Concern:</u>** Milksnake Eastern Ribbonsnake	**Studies confirming:** • Presence of snake hibernacula used by a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. • Congregations of a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. near potential hibernacula (e.g., foundation or rocky slope) on sunny warm days in Spring (April/May) and Fall (September/October). • **Note:** If there are Special Concern Species present, then site is SWH. • **Note:** Sites for hibernation possess specific habitat parameters (e.g., temperature, humidity, etc.) and consequently are used annually, often by many of the same individuals of a local population (i.e., strong hibernation site fidelity). Other critical life processes (e.g., mating) often take place in close proximity to hibernacula. The feature in which the hibernacula is located plus a 30 m radius area is the SWH. • **SWHMiST Index #13** provides development effects and mitigation measures for snake hibernacula.	Confirmed absent. Discrete hibernaulca structures are absent within the ROW. Large aggregations of snakes were not encountered by RJB during the course of early spring field invetsigations. Hibernacula features may be supported beyond the ROW but will not be impacted by the proposed development.

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Colonially - Nesting Bird Breeding Habitat (Bank & Cliff) **<u>Rationale:</u>** Historical use and number of nests in a colony make this habitat significant. An identified colony can be very important to local populations. All swallow population are declining in Ontario.	Eroding banks, sandy hills, borrow pits, steep slopes, and sand piles. Cliff faces, bridge abutments, silos, barns. **Habitat found in the following ecosites:** CUM1 CUT1 CUS1 BLO1 BLS1 BLT1 CLO1 CLS1 CLT1	• Any site or areas with exposed soil banks, undisturbed or naturally eroding that is not a licensed/permitted aggregate area. • Does not include man-made structures (bridges or buildings) or recently (2 years) disturbed soil areas, such as berms, embankments, soil or aggregate stockpiles. • Does not include a licensed/permitted Mineral Aggregate Operation.	No potential • Suitable communities to support this feature are absent.	Cliff Swallow Northern Rough-winged Swallow (this species is not colonial but can be found in Cliff Swallow colonies)	**Studies confirming:** • Presence of 1 or more nesting sites with 8 or more cliff swallow pairs and/or rough-winged swallow pairs during the breeding season. • A colony identified as SWH will include a 50 m radius habitat area from the peripheral nests. • Field surveys to observe and count swallow nests are to be completed during the breeding season. Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”. • **SWHMiST Index #4** provides development effects and mitigation measures.	Confirmed absent. Bank Swallows and Cliff Swallows were not documented duringthe course of breeding bird invetsigations.
Colonially - Nesting Bird Breeding Habitat (Tree/Shrubs) **<u>Rationale:</u>** Large colonies are important to local bird population, typically sites are only known colony in area and are used annually.	SWM2 SWM3 SWM5 SWM6 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7 FET1	• Nests in live or dead standing trees in wetlands, lakes, islands, and peninsulas. Shrubs and occasionally emergent vegetation may also be used. • Most nests in trees are 11 to 15 m from ground, near the top of the tree.	No potential. • Suitable habitat may be support this community is absent.	Great Blue Heron Black-crowned Nigh-Heron Great Egret Green Heron	**Studies confirming:** • Presence of 2 or more active nests of Great Blue Heron or other listed species. • The habitat extends from the edge of the colony and a minimum 300 m radius or extent of the Forest ecosite containing the colony or any island <15.0 ha with a colony is the SWH. • Confirmation of active heronries are to be achieved through site visits conducted during the nesting season (April to August) or by evidence such as the presence of fresh guano, dead young and/or eggshells. • **SWHMiST Index #5** provides development effects and mitigation measures.	No potential. Suitable communities to support this feature are absent. • This area is a frequently trafficked trail with numerous eBird records and has been subject to numerous reviews as a part of the Hamilton NAI. No evidence of breeding by the listed indicators species were documented by Burnside during the course of fbreeding bird surveys.

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Colonially - Nesting Bird Breeding Habitat (Ground) **<u>Rationale;</u>** Colonies are important to local bird population, typically sites are only known colony in area and are used annually.	Any rocky island or peninsula (natural or artificial) within a lake or large river (two-lined on a 1;50,000 NTS map). Close proximity to watercourses in open fields or pastures with scattered trees or shrubs (Brewer's Blackbird). MAM1 – 6 MAS1 – 3 CUM CUT CUS	• Nesting colonies of gulls and terns are on islands or peninsulas associated with open water or in marshy areas. • Brewers Blackbird colonies are found loosely on the ground in low bushes in close proximity to streams and irrigation ditches within farmlands.	No potential • Suitable communities to support this feature are absent.	Herring Gull Great Black-backed Gull Little Gull Ring-billed Gull Common Tern Caspian Tern Brewer's Blackbird	**Studies confirming:** • Presence of > 25 active nests for Herring Gulls or Ring-billed Gulls, >5 active nests for Common Tern or >2 active nests for Caspian Tern. • Presence of 5 or more pairs for Brewer's Blackbird. • Any active nesting colony of one or more Little Gull, and Great Black-backed Gull is significant. • The edge of the colony and a minimum 150 m radius area of habitat, or the extent of the ELC ecosites containing the colony or any island <3.0 ha with a colony is the SWH. • Studies would be done during May/June when actively nesting. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects". • **SWHMiST Index #6** provides development effects and mitigation measures.	No potential. Suitable communities to support this feature are absent. • No evidence of breeding by the listed indicators species were documented by Burnside during the course of field investigations.

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	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Migratory Butterfly Stopover Areas **<u>Rationale:</u>** Butterfly stopover areas are extremely rare habitats and are biologically important for butterfly species that migrate south for the winter.	Combination of ELC Community Series; need to have present one Community Series from each land class. <u>Field</u>: CUM CUT CUS <u>Forest</u>: FOC FOD FOM CUP Anecdotally, a candidate site for butterfly stopover will have a history of butterflies being observed.	• A butterfly stopover area will be a minimum of 10 ha in size with a combination of field and forest habitat present and will be located within 5 km of Lake Erie or Ontario. • The habitat is typically a combination of field and forest and provides the butterflies with a location to rest prior to their long migration south. • The habitat should not be disturbed, fields/meadows with an abundance of preferred nectar plants and woodland edge providing shelter are requirements for this habitat. • Staging areas usually provide protection from the elements and are often spits of land or areas with the shortest distance to cross the Great Lakes.	No potential • The Study Area is not located within 5km of Lake Ontario	Painted Lady Red Admiral <u>Special Concern</u> Monarch	**Studies confirm:** • The presence of Monarch Use Days (MUD) during fall migration (August/October). MUD is based on the number of days a site is used by Monarchs, multiplied by the number of individuals using the site. Numbers of butterflies can range from 100-500/day, significant variation can occur between years and multiple years of sampling should occur. • Observational studies are to be completed and need to be done frequently during the migration period to estimate MUD. • MUD of >5000 or >3000 with the presence of Painted Ladies or Red Admiral's is to be considered significant. • **SWHMiST Index #16** provides development effects and mitigation measures.	No potential. The Study Area is not located within 5km of Lake Ontario.

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Landbird Migratory Stopover Areas **<u>Rationale:</u>** Sites with a high diversity of species as well as high numbers are most significant.	**All ecosites associated with these ELC Community Series:** FOC FOM FOD SWC SWM SWD	• Woodlots >5 ha in size and within 5 km of Lake Erie and Ontario. • If woodlands are rare in an area of shoreline, woodland fragments 2-5 ha can be considered for this habitat. • If multiple woodlands are located along the shoreline those Woodlands <2 km from Lake Ontario are more significant. • Sites have a variety of habitats; forest, grassland and wetland complexes. • The largest sites are more significant. • Woodlots and forest fragments are important habitats to migrating birds, these features located along the shore and located within 5 km of Lake Erie and Ontario are Candidate SWH.	No potential. • The Study Area is not located within 5km of Lake Ontario.	All migratory songbirds. Canadian Wildlife Service Ontario website: http://www.ec.gc.ca/nature/default.asp?lang=En&n=421B7A9D-1 All migrant raptors species: *Ontario Ministry of Natural Resources: Fish and Wildlife Conservation Act, 1997.* Schedule 7: Specially Protected Birds (Raptors)	**Studies confirm:** • Use of the habitat by >200 birds/day and with >35 spp with at least 10 bird spp. recorded on at least 5 different survey dates. This abundance and diversity of migrant bird species is considered above average and significant. • Studies should be completed during spring (April/May) and fall (August/October) migration using standardized assessment techniques. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects". • **SWHMiST Index #9** provides development effects and mitigation measures.	No potential. The Study Area is not located within 5km of Lake Ontario.

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Deer Winter Congregation Areas **<u>Rationale:</u>** Deer movement during winter in the southern areas of Ecoregion 7E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands to reduce or avoid the impacts of winter conditions.	**All Forested ecosites with these ELC Community Series:** FOC FOM FOD SWC SWM SWD Conifer plantations much smaller than 50 ha may also be used.	• Woodlots >100 ha in size or if large woodlots are rare in planning area woodlots >50 ha. • Deer movement during winter in the southern areas of Ecoregion 7E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands. • Large woodlots > 100 ha and up to 1500 ha are known to be used annually by densities of deer that range from 0.1-1.5 deer/ha. • Woodlots with high densities of deer due to artificial feeding are not significant.	Confirmed present. • White-tailed Deer Wintering Area (Stratum 2) are present South of Powerline Rd W.	White-tailed Deer	**Studies confirm:** • Deer management is an MNRF responsibility, deer winter congregation areas considered significant will be mapped by MNRF. • Use of the woodlot by white- tailed deer will be determined by MNRF, all woodlots exceeding the area criteria are significant, unless determined not to be significant by MNRF. • Studies should be completed during winter (January/February) when >20 cm of snow is on the ground using aerial survey techniques, ground or road surveys. or a pellet count deer density survey. • **SWHMiST Index #2** provides development effects and mitigation measures.	Confirmed SWH. The TAGM1a, FOM, and MAM communities have been identified by the MNR as White-tailed Deer Wintering Area (Stratum 2).

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Table 1.2.1: Rare Vegetation Communities						
Cliffs and Talus Slopes **Rationale:** Cliffs and Talus Slopes are extremely rare habitats in Ontario.	**Any ELC ecosite within Community Series:** TAO CLO TAS CLS TAT CLT	• Most cliff and talus slopes occur along the Niagara Escarpment. • A Cliff is vertical to near vertical bedrock >3 m in height. • A Talus Slope is rock rubble at the base of a cliff made up of coarse rocky debris.	No potential • Suitable communities to support this feature are absent.	-	• Confirm any ELC Vegetation Type for Cliffs or Talus Slopes. • **SWHMiST Index #21** provides development effects and mitigation measures.	Confirmed absent.
Sand Barren **Rationale;** Sand barrens are rare in Ontario and support rare species. Most Sand Barrens have been lost due to cottage development and forestry.	**ELC ecosites:** SBO1 SBS1 SBT1 Vegetation cover varies from patchy and barren to continuous meadow (SBO1), thicket-like (SBS1), or more closed and treed (SBT1). Tree cover always ≤ 60%.	A sand barren area >0.5 ha in size. • Sand Barrens typically are exposed sand, generally sparsely vegetated and caused by lack of moisture, periodic fires and erosion. Usually located within other types of natural habitat such as forest or savannah. Vegetation can vary from patchy and barren to tree covered, but less than 60%.	No potential • Suitable communities to support this feature are absent.	-	• Confirm any ELC Vegetation Type for Sand Barrens • Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotic sp.). • **SWHMiST Index #20** provides development effects and mitigation measures.	Confirmed absent.

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Alvar **<u>Rationale;</u>** Alvars are extremely rare habitats in Ecoregion 7E.	ALO1 ALS1 ALT1 FOC1 FOC2 CUM2 CUS2 CUT2-1 CUW2 **Five Alvar Indicator Species:** *Carex crawei* *Panicum philadelphicum* *Eleocharis compressa* *Scutellaria parvula* *Trichostema brachiatum* These indicator species are very specific to Alvars within Ecoregion 7E.	• An alvar is typically a level, mostly unfractured calcareous bedrock feature with a mosaic of rock pavements and bedrock overlain by a thin veneer of soil. The hydrology of alvars is complex, with alternating periods of inundation and drought. Vegetation cover varies from sparse lichen-moss associations to grasslands and shrublands and comprising a number of characteristic or indicator plants. Undisturbed alvars can be phyto- and zoogeographically diverse, supporting many uncommon or are relict plant and animals species. Vegetation cover varies from patchy to barren with a less than 60% tree cover. • An Alvar site > 0.5 ha in size. • Alvar is particularly rare in Ecoregion 7E where the only known sites are found in the western islands of Lake Erie.	No potential • Suitable communities to support this feature are absent.	-	**Field studies that identify:** • Four of the five Alvar Indicator Species at a Candidate Alvar site is Significant. • Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotic sp.). • The alvar must be in excellent condition and fit in with surrounding landscape with few conflicting land uses. • **SWHMiST Index #17** provides development effects and mitigation measures.	Confirmed absent.

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Old Growth Forest **<u>Rationale;</u>** Due to historic logging practices and land clearance for agriculture, old growth forest is rare in the Ecoregion 7E.	**Forest Community Series:** FOD FOC FOM SWD SWC SWM	• Old Growth forests are characterized by heavy mortality or turnover of over-storey trees resulting in a mosaic of gaps that encourage development of a multi-layered canopy and an abundance of snags and downed woody debris.	No potential • Suitable communities to support this feature are absent.	-	**Field Studies will determine:** • If dominant trees species of the are >140 years old, then the area containing these trees is SWH. • The forested area containing the old growth characteristics will have experienced no recognizable forestry activities (cut stumps will not be present). • The area of forest ecosites combined or an eco-element within an ecosite that contains the old growth characteristics is the SWH. • Determine ELC vegetation types for the forest forest area containing the old growth characteristics. • **SWHMiST Index #23** provides development effects and mitigation measures.	Confirmed absent.
Savannah **<u>Rationale:</u>** Savannahs are extremely rare habitats in Ontario.	TPS1 TPS2 TPW1 TPW2 CUS2	• No minimum size to site. Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH. • A Savannah is a tallgrass prairie habitat that has tree cover between 25–60%. • In Ecoregion 7E, known Tallgrass Prairie and savannah remnants are scattered between Lake Huron and Lake Erie, near Lake St. Clair, north of and along the Lake Erie shoreline, in Brantford and in Toronto area (north of Lake Ontario).	No potential • Suitable communities to support this feature are absent.	-	**Field studies confirm:** • one or more of the Savannah indicator species listed in Appendix N should be present. **Note**: Savannah plant spp. list from Ecoregion 7E should be used. • Area of the ELC ecosite is the SWH. • Site must not be dominated by exotic or introduced species (<50% vegetative cover is exotic sp.). • **SWHMiST Index #18** provides development effects and mitigation measures.	Confirmed absent.

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Tallgrass Prairie **<u>Rationale:</u>** Tallgrass Prairies are extremely rare habitats in Ontario.	TPO1 TPO2	• No minimum size to site. Site must be restored or a natural site. Remnant sites such as railway Right of Ways (ROW) are not considered to be SWH. • A Tallgrass Prairie has ground cover dominated by prairie grasses. An open Tallgrass Prairie habitat has < 25% tree cover. • In Ecoregion 7E, known Tallgrass Prairie and savannah remnants are scattered between Lake Huron and Lake Erie, near Lake St. Clair, north of and along the Lake Erie shoreline, in Brantford and in Toronto area (north of Lake Ontario).	No potential • Suitable communities to support this feature are absent.	-	**Field studies confirm:** • One or more of the Prairie indicator species listed in Appendix N should be present. **Note:** Prairie plant spp. list from Ecoregion 7E should be used. • Area of the ELC ecosite is the SWH. • Site must not be dominated by exotic or introduced species (<50% vegetative cover is exotic sp.). • **SWHMiST Index #19** provides development effects and mitigation measures.	Confirmed absent.
Other Rare Vegetation Communities **<u>Rationale:</u>** Plant communities that often contain rare species which depend on the habitat for survival.	• Provincially Rare S1, S2 and S3 vegetation communities are listed in Appendix M of the SWHTG. • Any ELC ecosite Code that has a possible ELC Vegetation Type that is Provincially Rare is Candidate SWH.	• ELC ecosite codes that have the potential to be a rare ELC Vegetation Type as outlined in Appendix M. • The MNRF/Natural Heritage Information Centre (NHIC) will have up to date listing for rare vegetation communities. • Rare Vegetation Communities may include beaches, fens, forest, marsh, barrens, dunes and swamps.	Confirmed present. • The BOS1-1 and BOT2-1 communities within the Study Area are ranked as S3 within Ontario. • All other ecological communities are considered common in southern Ontario.	-	**Field studies should confirm:** • If an ELC Vegetation Type is a rare vegetation community based on listing within Appendix M of SWHTG. • Area of the ELC Vegetation Type polygon is the SWH. • **SWHMiST Index #37** provides development effects and mitigation measures.	Confirmed present.

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Table 1.2.2: Specialized Habitat for Wildlife considered Significant Wildlife Habitat						
Waterfowl Nesting Area **<u>Rationale;</u>** Important to local waterfowl populations, sites with greatest number of species and highest number of individuals are significant.	**All upland habitats located adjacent to these wetland ELC ecosites are Candidate SWH:** MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SWT1 SWT2 SWD1 SWD2 SWD3 SWD4 Note: includes adjacency to Provincially Significant Wetlands (PSW).	• A waterfowl nesting area extends 120 m from a wetland (> 0.5 ha) or a wetland (>0.5ha) and any small wetlands (0.5ha) within 120 m or a cluster of 3 or more small (<0.5 ha) wetlands within 120 m of each individual wetland where waterfowl nesting is known to occur. • Upland areas should be at least 120 m wide so that predators such as racoons, skunks, and foxes have difficulty finding nests. • Wood Ducks and Hooded Mergansers utilize large diameter trees (>40 cm dbh) in woodlands for cavity nest sites.	No potential • Although suitable wetland communities are present, upland communities are not sufficiently large to meet the defining criteria to support significant waterfowl nesting areas.	American Black Duck Northern Pintail Northern Shoveler Gadwall Blue-winged Teal Green-winged Teal Wood Duck Hooded Merganser Mallard	**Studies confirmed:** • Presence of 3 or more nesting pairs for listed species excluding Mallards. • Presence of 10 or more nesting pairs for listed species including Mallards. • Any active nesting site of an American Black Duck is considered significant. • Nesting studies should be completed during the spring breeding season (April - June). Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”. • A field study confirming waterfowl nesting habitat will determine the boundary of the waterfowl nesting habitat for the SWH, this may be greater or less than 120 m from the wetland and will provide enough habitat for waterfowl to successfully nest. • **SWHMiST Index #25** provides development effects and mitigation measures.	Confirmed absent. No evidence of breeding by the listed indicators species were documented by Burnside during the course of breeding bird surveys.

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Bald Eagle & Osprey Nesting, Foraging & Perching Habitat **<u>Rationale;</u>** Nest sites are fairly uncommon in Eco-region 7E and are used annually by these species. Many suitable nesting locations may be lost due to increasing shoreline development pressures and scarcity of habitat.	**ELC Forest Community Series:** FOD FOM FOC SWD SWM and SWC (directly adjacent to riparian areas – rivers, lakes, ponds and wetlands.	• Nests are associated with lakes, ponds, rivers or wetlands along forested shorelines, islands, or on structures over water. • Osprey nests are usually at the top a tree whereas Bald Eagle nests are typically in super canopy trees in a notch within the tree's canopy. • Nests located on man-made objects are not to be included as SWH (e.g., telephone poles and constructed nesting platforms).	Low potential • An FOD community is located adjacent to a watercourse. • No stick nests or individuals birds observed during the course of Burnside's field investigations.	Osprey **Special Concern** Bald Eagle	**Studies confirm the use of these nests by:** • One or more active Osprey or Bald Eagle nests in an area. • Some species have more than one nest in a given area and priority is given to the primary nest with alternate nests included within the area of the SWH. • For an Osprey, the active nest and a 300 m radius around the nest or the contiguous woodland stand is the SWH, maintaining undisturbed shorelines with large trees within this area is important. • For a Bald Eagle the active nest and a 400-800 m radius around the nest is the SWH. Area of the habitat from 400800 m is dependent on-site lines from the nest to the development and inclusion of perching and foraging habitat. • To be significant a site must be used annually. When found inactive, the site must be known to be inactive for >3 years or suspected of not being used for >5 years before being considered not significant. • Observational studies to determine nest site use, perching sites and foraging areas need to be done from mid-March to mid-August. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects". • **SWHMiST Index #26** provides development effects and mitigation measures.	Candidate SWH • No bald Eagle or Osprey nests or individuals were documented by Burnside during the course of all on-site surveys • Previous Bald Eagle eBird observations are present in the area

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Woodland Raptor Nesting Habitat **<u>Rationale:</u>** Nests sites for these species are rarely identified; these area sensitive habitats and are often used annually by these species.	May be found in all forested ELC ecosites. **May also be found in:** SWC SWM SWD and CUP3	• All natural or conifer plantation woodland/forest stands >30 ha with >4ha of interior habitat. Interior habitat determined with a 200 m buffer. • Stick nests found in a variety of intermediate-aged to mature conifer, deciduous or mixed forests within tops or crotches of trees. Species such as Coopers hawk nest along forest edges sometimes on peninsulas or small off-shore islands. • In disturbed sites, nests may be used again, or a new nest will be in close proximity to old nest.	No potential • SWC / SWD communities within the Study Area do not span >30 ha	Northern Goshawk Cooper's Hawk Sharp-shinned Hawk Red-shouldered Hawk Barred Owl Broad-winged Hawk	**Studies confirm:** • Presence of 1 or more active nests from species list is considered significant. • Red-shouldered Hawk and Northern Goshawk – A 400 m radius around the nest or 28 ha area of habitat is the SWH (the 28 ha habitat area would be applied where optimal habitat is irregularly shaped around the nest). • Barred Owl – A 200 m radius around the nest is the SWH. • Broad-winged Hawk and Coopers Hawk– A 100 m radius around the nest is the SWH. • Sharp-Shinned Hawk – A 50 m radius around the nest is the SWH. • Conduct field investigations from early March to end of May. The use of call broadcasts can help in locating territorial (courting/nesting) raptors and facilitate the discovery of nests by narrowing down the search area. • **SWHMiST Index #27** provides development effects and mitigation measures.	No potential. Forested communities are not sufficiently large to support interior forest breeding habitat.

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Turtle Nesting Areas **<u>Rationale;</u>** These habitats are rare and when identified will often be the only breeding site for local populations of turtles.	**Exposed mineral soil (sand or gravel) areas adjacent (<100 m) or within the following ELC ecosites:** MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 BOO1 FEO1	• Best nesting habitat for turtles are close to water and away from roads and sites less prone to loss of eggs by predation from skunks, raccoons or other animals. • For an area to function as a turtle-nesting area, it must provide sand and gravel that turtles are able to dig in and are located in open, sunny areas. Nesting areas on the sides of municipal or provincial road embankments and shoulders are not SWH. • Sand and gravel beaches adjacent to undisturbed shallow weedy areas of marshes, lakes, and rivers are most frequently used.	No potential • Areas of bare soils are absent within 100m of a suitable MAS community. The sole suitable substrates present are associated with a gravel parking lot and roadsides which do no constitute SWH.	Midland Painted Turtle <u>Special Concern Species:</u> Northern Map Turtle Snapping Turtle	**Studies confirm:** • Presence of 5 or more nesting Midland Painted Turtles. • One or more Northern Map Turtle or Snapping Turtle nesting is a SWH. • The area or collection of sites within an area of exposed mineral soils where the turtles nest, plus a radius of 30-100 m around the nesting area dependent on slope, riparian vegetation and adjacent land use is the SWH. • Travel routes from wetland to nesting area are to be considered within the SWH as part of the 30-100 m area of habitat. • Field investigations should be conducted in prime nesting season typically late spring to early summer. Observational studies observing the turtles nesting is a recommended method. • **SWHMiST Index #28** provides development effects and mitigation measures for turtle nesting habitat.	No potential. Suitable nesting habitat, excluding gravel shoulders and the rail trail, are absent from the Study Area.
Seeps and Springs **<u>Rationale</u>:** Seeps/Springs are typical of headwater areas and are often at the source of coldwater streams.	Seeps/Springs are areas where ground water comes to the surface. Often, they are found within headwater areas within forested habitats. Any forested ecosite within the headwater areas of a stream could have seeps/springs.	• Any forested area (with <25% meadow/field/ pasture) within the headwaters of a stream or river system. • Seeps and springs are important feeding and drinking areas especially in the winter will typically support a variety of plant and animal species.	Moderate potential • May be supported within FOM and FOD communities	Wild Turkey Ruffed Grouse Spruce Grouse White-tailed Deer Salamander spp.	**Field Studies confirm:** • Presence of a site with 2 or more seeps/springs should be considered SWH. • The area of a ELC forest ecosite or an ecoelement within ecosite containing the seeps/springs is the SWH. The protection of the recharge area considering the slope, vegetation, height of trees and groundwater condition need to be considered in delineation the habitat. • **SWHMiST Index #30** provides development effects and mitigation measures.	Candidate SWH. No seeps or springs observed during the course of Burnside's field investigations. It should be noted that surveys were only constrained to ROWs. Seeps and springs may be supported within the FOM and FOD communities beyond the Study Area. Natural springs are known to occur in the general area. The Study Area is also located within the Big Creek headwaters area.

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Amphibian Breeding Habitat (Woodland) **<u>Rationale:</u>** These habitats are extremely important to amphibian biodiversity within a landscape and often represent the only breeding habitat for local amphibian populations.	All ecosites associated with these ELC Community Series: FOC FOM FOD SWC SWM SWD Breeding pools within the woodland or the shortest distance from forest habitat are more significant because they are more likely to be used due to reduced risk to migrating amphibians.	• Presence of a wetland, pond or woodland pool (including vernal pools) >500 m^2 (about 25 m diameter) within or adjacent (within 120 m) to a woodland (no minimum size). Some small wetlands may not be mapped and may be important breeding pools for amphibians. • Woodlands with permanent ponds or those containing water in most years until mid-July are more likely to be used as breeding habitat.	Moderate potential • The MAS1-14/SAF_1-3 and MAS / SWT occurring adjacent to the FOD community may support this SWH feature.	Eastern Newt Blue-spotted Salamander Spotted Salamander Gray Treefrog Spring Peeper Western Chorus Frog Wood Frog	**Studies confirm:** • Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog species with at least 20 individuals (adults or eggs masses) or 2 or more of the listed frog species with Call Level Codes of 3. • A combination of observational study and call count surveys will be required during the spring (March-June) when amphibians are concentrated around suitable breeding habitat within or near the woodland/wetlands. • The habitat is the wetland area plus a 230 m radius of woodland area. If a wetland area is adjacent to a woodland, a travel corridor connecting the wetland to the woodland is to be included in the habitat. • **SWHMiST Index #14** provides development effects and mitigation measures.	Candidate SWH in association with the MAS / SWT community.

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Amphibian Breeding Habitat (Wetlands) **<u>Rationale;</u>** Wetlands supporting breeding for these amphibian species are extremely important and fairly rare within Central Ontario landscapes.	**ELC Community Classes:** SW MA FE BO OA and SA. Typically, these wetland ecosites will be isolated (>120m) from woodland ecosites, however larger wetlands containing predominantly aquatic species (e.g., Bull Frog) may be adjacent to woodlands.	• Wetlands >500 m2 (about 25 m diameter), supporting high species diversity are significant; some small or ephemeral habitats may not be identified on MNRF mapping and could be important amphibian breeding habitats. • Presence of shrubs and logs increase significance of pond for some amphibian species because of available structure for calling, foraging, escape and concealment from predators. • Bullfrogs require permanent water bodies with abundant emergent vegetation.	Moderate potentail • Amphibian breeding habitat may occur in association with the MAS / SWT community	Eastern Newt American Toad Spotted Salamander Four-toed Salamander Blue-spotted Salamander Gray Treefrog Western Chorus Frog Northern Leopard Frog Pickerel Frog Green Frog Mink Frog Bullfrog	**Studies confirm:** • Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog/toad species with at least 20 individuals (adults or eggs masses) or 2 or more of the listed frog/toad species with Call Level Codes of 3 or; Wetland with confirmed breeding Bullfrogs are significant. • The ELC ecosite wetland area and the shoreline are the SWH. • A combination of observational study and call count surveys will be required during the spring (March-June) when amphibians are concentrated around suitable breeding habitat within or near the wetlands. • If a SWH is determined for Amphibian Breeding Habitat (Wetlands) then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule. • **SWHMiST Index #15** provides development effects and mitigation measures.	Confirmed absent within the MAS / SAF_1-3 communities.
Woodland Area-Sensitive Bird Breeding Habitat **<u>Rationale</u>:** Large, natural blocks of mature woodland habitat within the settled areas of Southern Ontario are important habitats for area sensitive interior forest song birds.	**All ecosites associated with these ELC Community Series:** FOC FOM FOD SWC SWM SWD	• Habitats where interior forest breeding birds are breeding, typically large mature (>60 yrs. old) forest stands or woodlots >30 ha. • Interior forest habitat is at least 200 m from forest edge habitat.	No potential • FOD and SWC communities do not span >30 ha.	Yellow-bellied Sapsucker Red-breasted Nuthatch Veery Blue-headed Vireo Northern Parula Black-throated Green Warbler Blackburnian Warbler Black-throated Blue Warbler Ovenbird Scarlet Tanager Winter Wren Pileated Woodpecker **Special Concern:** Cerulean Warbler Canada Warbler	**Studies confirm:** • Presence of nesting or breeding pairs of 3 or more of the listed wildlife species. • **Note:** any site with breeding Cerulean Warblers or Canada Warblers is to be considered SWH. • Conduct field investigations in spring and early summer when birds are singing and defending their territories. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”. • **SWHMiST Index #34** provides development effects and mitigation measures.	Confirmed absent. No evidence of breeding by the listed indicators species were documented by Burnside during the course of breeding bird surveys.

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Table 1.3: Habitat for Species of Conservation Concern considered Significant Wildlife Habitat						
Marsh Breeding Bird Habitat **<u>Rationale;</u>** Wetlands for these bird species are typically productive and fairly rare in Southern Ontario landscapes.	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SAS1 SAM1 SAF1 FEO1 BOO1 **For Green Heron:** All SW MA and CUM1 sites	• Nesting occurs in wetlands. • All wetland habitat is to be considered as long as there is shallow water with emergent aquatic vegetation present. • For Green Heron, habitat is at the edge of water such as sluggish streams, ponds and marshes sheltered by shrubs and trees. Less frequently, it may be found in upland shrubs or forest a considerable distance from water.	Low potential • May occur in association with the SAF/MAS and MAM communities.	American Bittern Virginia Rail Sora Common Moorhen American Coot Pied-billed Grebe Marsh Wren Sedge Wren Common Loon Green Heron Trumpeter Swan **Special Concern:** Black Tern Yellow Rail	**Studies confirm:** • Presence of 5 or more nesting pairs of Sedge Wren or Marsh Wren or breeding by any combination of 4 or more of the listed species. • **Note**: any wetland with breeding of 1 or more Black Terns, Trumpeter Swan, Green Heron or Yellow Rail is SWH. • Area of the ELC ecosite is the SWH. • Breeding surveys should be done in May/June when these species are actively nesting in wetland habitats. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”. • **SWHMiST Index #35** provides development effects and mitigation measures.	Confirmed absent from the MASM1-14 / SAF_1-3 communities. Candidate habitat in association with the MAM and community. Breeindg Bird Surveys were not completed in the vicinity of this feature.

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Open Country Bird Breeding Habitat **<u>Rationale;</u>** This wildlife habitat is declining throughout Ontario and North America. Species such as the Upland Sandpiper have declined significantly the past 40 years based on CWS (2004) trend records.	CUM1 CUM2	• Large grassland areas (includes natural and cultural fields and meadows) >30 ha. • Grasslands not Class 1 or 2 agricultural lands, and not being actively used for farming (i.e., no row cropping or intensive hay or livestock pasturing in the last 5 years). • Grassland sites considered significant should have a history of longevity, either abandoned fields, mature hayfields and pasturelands that are at least 5 years or older. • The Indicator bird species are area sensitive requiring larger grassland areas than the common grassland species.	No potential • Suitable communities to support this feature are absent.	Upland Sandpiper Grasshopper Sparrow Vesper Sparrow Northern Harrier Savannah Sparrow **Special Concern** Short-eared Owl	**Field Studies confirm:** • Presence of nesting or breeding of 2 or more of the listed species. • A field with 1 or more breeding Short-eared Owls is to be considered SWH. • The area of SWH is the contiguous ELC ecosite field areas. • Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”. • **SWHMiST Index #32** provides development effects and mitigation measures.	No potential. Suitable communities to support this feature are absent.

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Shrub/Early Successional Bird Breeding Habitat **<u>Rationale;</u>** This wildlife habitat is declining throughout Ontario and North America. The Brown Thrasher has declined significantly over the past 40 years based on CWS (2004) trend records.	CUT1 CUT2 CUS1 CUS2 CUW1 CUW2 Patches of shrub ecosites can be complexed into a larger habitat for some bird species.	• Large field areas succeeding to shrub and thicket habitats >10 ha in size. • Shrub land or early successional fields, not class 1 or 2 agricultural lands, not being actively used for farming (i.e., no row-cropping, haying or live-stock pasturing in the last 5 years). • Shrub thicket habitats (>10 ha) are most likely to support and sustain a diversity of these species. • Shrub and thicket habitat sites considered significant should have a history of longevity, either abandoned fields or pasturelands.	No potential • Suitably large communities to support this feature are absent.	**Indicator Spp:** Brown Thrasher Clay-coloured Sparrow **Common Spp.** Field Sparrow Black-billed Cuckoo Eastern Towhee Willow Flycatcher **Special Concern:** Yellow-breasted Chat Golden-winged Warbler	**Field Studies confirm:** • Presence of nesting or breeding of 1 of the indicator species and at least 2 of the common species. • A habitat with breeding Yellow-breasted Chat or Golden-winged Warbler is to be considered as SWH. • The area of the SWH is the contiguous ELC ecosite field/thicket area. • Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”. • **SWHMiST cxlix Index #33** provides development effects and mitigation measures.	No potential. Suitable communities to support this feature are absent.

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Terrestrial Crayfish **<u>Rationale:</u>** Terrestrial Crayfish are only found within SW Ontario in Canada and their habitats are very rare.	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 MAS1 MAS2 MAS3 SWD SWT SWM CUM1 with inclusions of above meadow marsh or swamp ecosites can be used by terrestrial crayfish.	• Wet meadow and edges of shallow marshes (no minimum size) should be surveyed for Terrestrial Crayfish. • Constructs burrows in marshes, mudflats, meadows, the ground can't be too moist. Can often be found far from water. • Both species are a semi-terrestrial burrower which spends most of its life within burrows consisting of a network of tunnels. Usually the soil is not too moist so that the tunnel is well formed.	Moderate potential • May occur in association with the SWT and MAS communities	Chimney or Digger Crayfish (*Fallicambarus fodiens*) Devil Crayfish or Meadow Crayfish (*Cambarus Diogenes*)	**Studies Confirm:** • Presence of 1 or more individuals of species listed or their chimneys (burrows) in suitable meadow marsh, swamp or moist terrestrial sites. • Area of ELC ecosite or an ecoelement area of meadow marsh or swamp within the larger ecosite area is the SWH. • Surveys should be done April to August in temporary or permanent water. **Note** the presence of burrows or chimneys are often the only indicator of presence, observance or collection of individuals is very difficult. • **SWHMiST Index #36** provides development effects and mitigation measures.	Confirmed absent in association with the MASM1-14 community. Candidate SWH feature in association with the MAM and MAS / SWT communities located beyond the RJB survey limits.
Special Concern and Rare Wildlife Species **<u>Rationale:</u>** These species are quite rare or have experienced significant population declines in Ontario.	All plant and animal Element Occurrences (EO) within a 1 or 10 km grid. Older element occurrences were recorded prior to GPS being available, therefore location information may lack accuracy.	When an element occurrence is identified within a 1 or 10 km grid for a Special Concern or provincially Rare species; linking candidate habitat on the site needs to be completed to ELC ecosites.	Candidate habitat to support the following Special Concern and Rare Wildlife Species • Monarch (SC) • Eastern Wood-pewee (SC) • Golden-winged Warbler (SC) • Olive-sided Flycatcher (SC) • Purple Martin (S3) • Tufted Titmouse (S3) • Wood Thrush (SC) • Eastern Ribbonsnake (SC) • Snapping Turtle (SC) • Billing's Three-seeded Sedge (S2S3) • Green Dragon (SC) • Perfoliate Bellwort (S1S2)	All Special Concern and Provincially Rare (S1-S3, SH) plant and animal species. Lists of these species are tracked by the NHIC.	**Studies Confirm:** • Assessment/inventory of the site for the identified Special Concern or rare species needs to be completed during the time of year when the species is present or easily identifiable. • The area of the habitat to the finest ELC scale that protects the habitat form and function is the SWH, this must be delineated through detailed field studies. The habitat needs be easily mapped and cover an important life stage component for a species e.g., specific nesting habitat or foraging habitat. • **SWHMiST Index #37** provides development effects and mitigation measures.	Confirmed present for the following species: • Monarch (SC) • Eastern Wood-pewee (SC) • Purple Martin (S3) • Billing's Three-seeded Sedge (S2S3) Candidate habitat for the following species: • Eastern Ribbonsnake (SC) • Snapping Turtle (SC) • Perfoliate Bellwort (S1S2) Confirmed absent for the remaining species within the ROW.

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Table 1.4.1: Animal Movement Corridors						
Amphibian Movement Corridors **<u>Rationale;</u>** Movement corridors for amphibians moving from their terrestrial habitat to breeding habitat can be extremely important for local populations.	Corridors may be found in all ecosites associated with water. Corridors will be determined based on identifying the significant breeding habitat for these species in Table 1.1.	• Movement corridors between breeding habitat and summer habitat. • Movement corridors must be determined when Amphibian breeding habitat is confirmed as SWH from Table 1.2.2 (Amphibian Breeding Habitat–Wetland) of this Schedule.	Moderate potential • May occur in association with the unnamed watercourse	Eastern Newt American Toad Spotted Salamander Four-toed Salamander Blue-spotted Salamander Gray Treefrog Western Chorus Frog Northern Leopard Frog Pickerel Frog Green Frog Mink Frog Bullfrog	• Field Studies must be conducted at the time of year when species are expected to be migrating or entering breeding sites. • Corridors should consist of native vegetation, with several layers of vegetation. • Corridors unbroken by roads, waterways or bodies, and undeveloped areas are most significant. • Corridors should have at least 15 m of vegetation on both sides of waterway or be up to 200 m wide of woodland habitat and with gaps <20 m. • Shorter corridors are more significant than longer corridors, however amphibians must be able to get to and from their summer and breeding habitat. • **SWHMiST Index #40** provides development effects and mitigation measures.	Confirmed absent. Amphibian Breeding Habitat (wetland) is confirmed absent within the Study Area.
Table 1.5.1: Significant Wildlife Habitat Exceptions for Ecodistricts within EcoRegion 7E						
7E-2 - Bat Migratory Stopover Area **Rationale:** Stopover areas for long distance migrant bats are important during fall migration.	No specific ELC types	• Long distance migratory bags typically migrate during late summer and early fall from summer breeding habitats throughout Ontario to southern wintering areas. Their annual fall migration may concentrate these species of bats at stopover areas. • This is the only known bat migratory stopover habitats based on current information.	No potential • The Study Area is not located at Long Point.	Hoary Bat Eastern Red Bat Silver-haird Bat	• Long Point ($42^0$35'N, 80^0 30'E, to $42^0$33'N, $80^0$03'E) has been identified as a significant stop-over habitat for fall migrating Silver-haired Bats, due to significant increases in abundance, activity and feeding that was documented during fall migration. • The confirmantion criteria and habitat areas for this SWH are still being determined. • **SWH MIST Index #38** provides development effects and mitigation measures.	No potential. The Study Area is not located at Long Point.

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix F

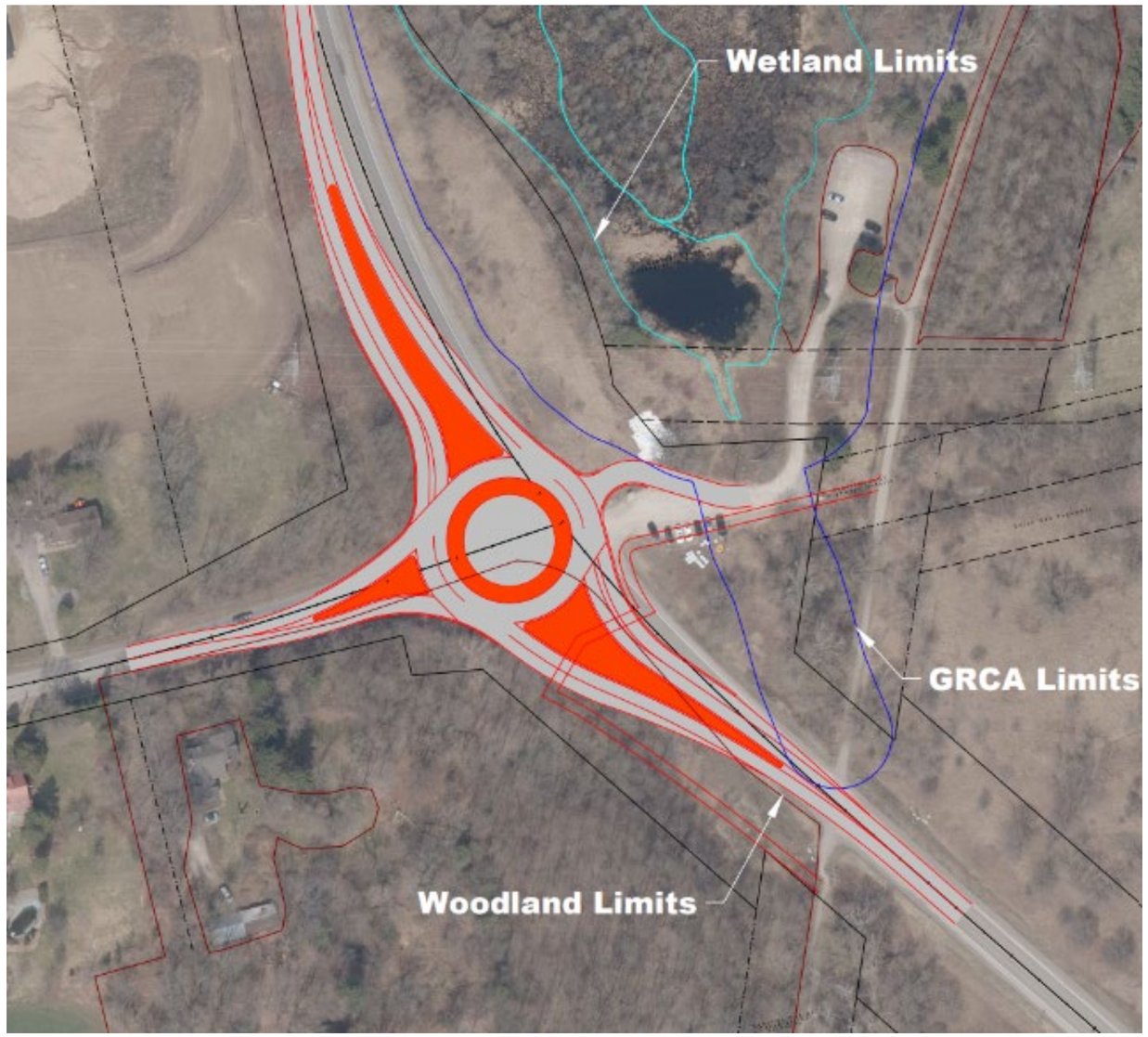
Proposed Alternatives

Option 1 – Centred Roundabout
Alternative Designs



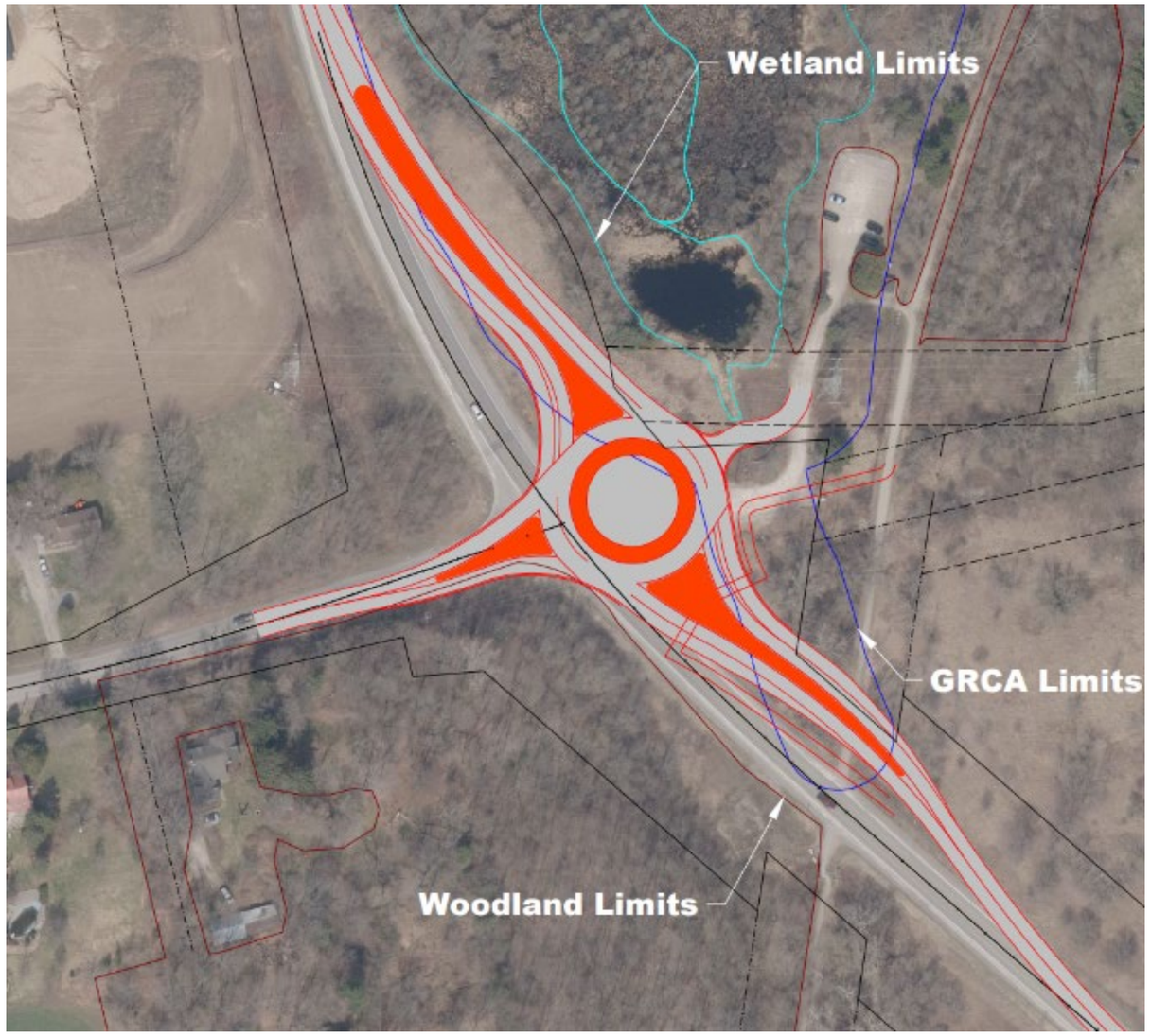
In this option, the three-legged roundabout is centred at the current Highway 52 and Powerline Road intersection and has good visibility for drivers as the north approach has a moderate sight distance. The Super Mailbox will be relocated in the same general area.

Option 2 – Roundabout Shifted West



In this option, the three-legged roundabout is shifted to the west and has very good visibility to/from Powerline Road W as the north approach has a long sight distance. The Super Mailbox will be relocated in the same general area.

Option 3 – Roundabout Shifted East



In this option, the three-legged roundabout is shifted to the east and has low visibility for drivers as the north approach has a short sight distance. The Super Mailbox will be relocated in the same general area. Some property acquisition is required to accommodate the shift for this option.

Southbound Left Turn Lane at Highway 52 and Powerline Road East



Intersection improvements at Highway 52 and Powerline Road East consist of the installation of a new southbound left turn lane and inclusion of a painted median on the south leg to offset the left turn lane from northbound through-traffic. Minor shift of the roadway to the east is required within the existing right-of-way.