Canada | U.S. Department of Transportation Federal Highway Administration | Ontario | MDOT Michigan Department of Transportation

Canada-United States-Ontario-Michigan Border Transportation Partnership

Draft Archaeology Work Plan

February 2006
Version 2

PREFACE

The Canada - U.S. – Ontario - Michigan Border Transportation Partnership (The Partnership) is composed of the Federal Highway Administration and Transport Canada representing the federal levels of government, and the Ontario Ministry of Transportation and the Michigan Department of Transportation representing the provincial/state level. The purpose of the Partnership is to improve the movement of people, goods, and services across the United States and Canadian border within the region of Southeast Michigan and Southwestern Ontario.

This international transportation improvement project will require approvals from governments on both sides of the border. The Partnership has developed a coordinated process that will enable the joint selection of a recommended river crossing location that meets the requirements of *Ontario Environmental Assessment Act* (OEA), *Canadian Environmental Assessment Act* (CEAA), and *National Environmental Policy Act* (NEPA).

The goal of the partnership is to:

- obtain government approval for a new or expanded crossing with connections to the provincial highway system in Ontario and the interstate freeway system in Michigan, including provisions for processing plazas to improve traffic and trade movements at the Windsor-Detroit border;
- completion of comprehensive engineering to support approvals, property acquisition, design and construction; and,
- submit environmental assessment documents to request approval by December 2007.

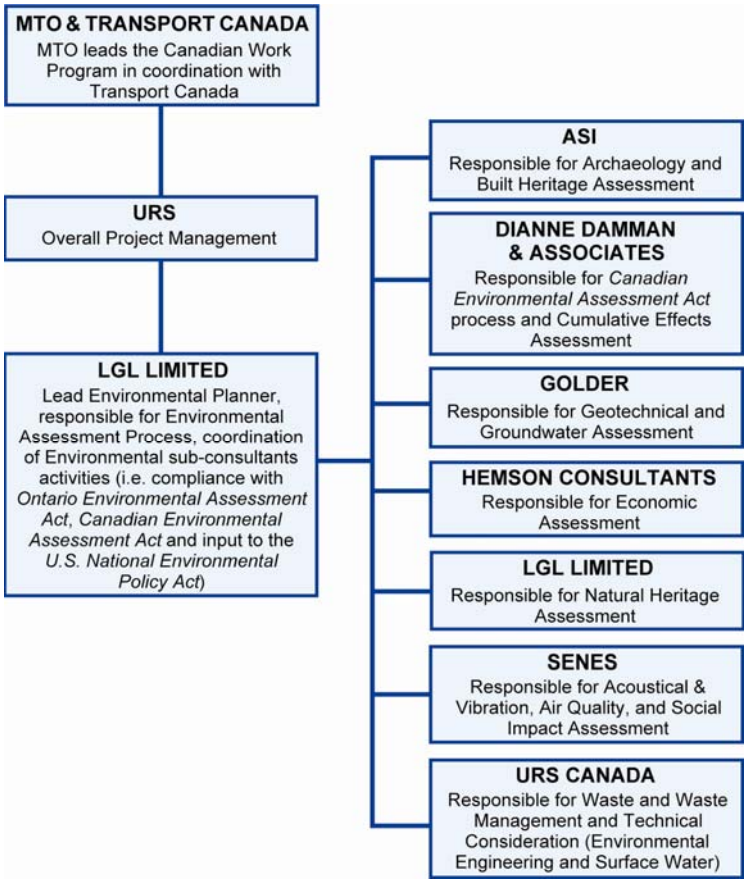
The Partnership completed a *Planning/Need and Feasibility Study* (P/NF) in January 2004 to address cross-border transportation demands for a 30-year planning period. Included in the documentation for that study was an Environmental Overview Report which provided an inventory of the existing condition in a Focused Analysis Area. Subsequently, in accordance with the *Ontario Environmental Assessment Act,* MTO prepared and submitted in May 2004 an environmental assessment Terms of Reference to the Ontario Ministry of the Environment for review and approval. The Terms of Reference was approved by the Ontario Minister of the Environment on September 17, 2004. The Terms of Reference outlines the framework that MTO and Transport Canada will follow in completing the Detroit River International Crossing Environmental Assessment (DRIC EA).

The Ontario Ministry of Transportation (MTO) is leading the Canadian work program in coordination with Transport Canada. The Michigan, Department of Transportation (MDOT), in coordination with the Federal Highways Administration (FHWA), is leading the U.S. work program.

The partnership is moving forward with technical and environmental work leading to the selection of a new or expanded border crossing, to address cross-border transportation demands for a 30-year planning period.

As an initial step in the DRIC EA process and to build upon the work completed in-depth secondary source data collection has been conducted. This work has been focused within the Preliminary Analysis Area (PAA) identified in the Environmental Overview Report, (as Amended January 2005). The noted data collection effort has been documented in a series of Working Papers. Working Papers have been prepared for the following topics: social impact assessment; economic assessment; archaeological resources; cultural resources; natural heritage; acoustics and vibration; air quality; waste and waste management; and technical considerations. The Working Papers are presented within the Environmental Overview Report (June 2005).

The Canadian Study Team and their tasks are presented below.



The purpose of the Working Papers is to document the secondary source data collection by: describing the data collection/sources used; providing an overview of study area conditions; identifying significance/sensitivity of features in the study area; and, identifying gaps in study area data and developing Work Plans to fill identified data gaps.

In conjunction with the Working Papers, a Work Plan for each discipline has been prepared to structure the filling of identified data gaps. They provide:

- a schedule and order of events for the subject under investigation by phase;
- a rationale for further data collection methodologies;
- data sources;
- methods of assessment, criteria, indicators and measures; and,
- details on the integration of each work plan with the work plans of other disciplines.

The Work Plans have been developed based on current knowledge of existing conditions within the PAA and therefore, should be considered to be living documents which will be subject to agency and public review. The partnership is aware that the assessment and evaluation of alternatives at all phases will require applying the requirements of three pieces of legislation, the OEA, CEAA, and NEPA. Therefore, in preparing the Work Plans, the partnership has sought to integrate the most rigorous requirements from each piece of legislation.

Archaeology Work Plan

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1. INTRODUCTION

1.1 Planning/Need and Feasibility Study – Existing Environmental Conditions

The Partnership jointly commissioned a Planning/Need and Feasibility Study (P/NF) (Canada-US-Ontario-Michigan Border Transportation Partnership 2004), which identified a long-term strategy to address the safe and efficient movement of people and goods between southeast Michigan and southwest Ontario. Although conducted in a manner consistent with the environmental study processes in both countries, the P/NF Study was not completed within the formal environmental study framework. The findings of the P/NF Study, however, serve as an important basis for governments to move forward in the development and improvement of cross border transportation services, including proceeding with the environmental study processes in the U.S. and Canada for major transportation improvements at the Detroit River International Crossing.

A consultation component was incorporated into the P/NF Study process. Canadian and U.S. government departments, ministries and agencies, local municipalities, First Nations groups, private sector stakeholders in border transportation issues, as well as the general public were engaged in the course of the study. Throughout the P/NF Study, the Partnership affirmed that the findings of the P/NF Study may be used to initiate environmental studies in accordance with the requirements of the U.S. *National Environment Policy Act* (NEPA), *Canadian Environmental Assessment Act* (CEAA) and *Ontario Environmental Assessment Act* (OEAA). This step would be followed by completion of the appropriate environmental impact/assessment studies, design of the approved improvements and ultimately, construction.

During preparation of the P/NF Study, background papers were prepared to establish existing conditions within the Preliminary Analysis Area (PAA). The PAA is roughly bounded by 9th Concession Road in the Town of Lakeshore, County Road 18 in the Town of Amherstburg on its southern extent and by the Detroit River on its western and northern extent. An Environmental Overview Working Paper (Canada-US-Ontario-Michigan Border Transportation Partnership 2005) was prepared to document environmental constraints which may preclude or otherwise constrain the generation of feasible transportation alternatives. The information contained in the Environmental Overview Working Paper was gathered from readily available secondary sources. It was noted that several known archaeological sites are situated within the PAA, and the area generally exhibits potential for the presence of archaeological resources. A summary of the archaeological information contained in the Environmental Overview Working Paper is presented below. Information has been supplemented by Archaeological Services Inc.

1.1.1 Registered Archaeological Sites

In Ontario, archaeological sites are registered with the Ministry of Culture (MCL), and information concerning archaeological sites is stored in the Ontario Archaeological Sites Database (OASD) maintained by the MCL.

The OASD contains information on 66 archaeological sites within the PAA. In addition, numerous archaeological sites known to be within the PAA, as documented by the Windsor Archaeological Master Plan, have not been registered with the Ministry of Culture and are not represented in the OASD.

1.1.2 Archaeological Potential

Archaeological potential is the potential for the presence of archaeological remains within a given area, and is determined by the presence of known archaeological sites in combination with predictive modelling based on archaeological site proximity, historic mapping and documentation, environmental factors, and expected behavioural patterns as identified from suitable ethnographic, historical, geographical, ecological, and archaeological analogues. For the purpose of archaeological assessment, the Ontario Ministry of Culture has identified several specific indicators of archaeological potential, including proximity to known archaeological sites, physiographic features, and historic features.

The presence of a known archaeological site is a direct confirmation of archaeological potential, and the locations of archaeological sites in the project area are therefore a primary consideration in the assignation of archaeological potential.

Water is arguably the single most important resource necessary for any extended human occupation or settlement and proximity to water can be regarded as the primary indicator of archaeological site potential. Accordingly, distance from water is one of the most commonly used variables for predictive modelling of archaeological site location.

As well, the MCL has specified that mapped historic features, designated heritage properties, and historic transportation corridors should be considered indicators of potential for the presence of archaeological resources.

Based on the presence of over 68 archaeological sites within the PAA, as well as on the presence of numerous water sources (including most notably the Detroit River, Turkey Creek, and the Canard River), several historic settlement centres (e.g., Amherstburg, the old town of Sandwich, and the City of Windsor), and many historic transportation corridors, the PAA generally exhibits potential for the presence of archaeological resources.

1.2 Detroit River International Crossing – Terms of Reference

A Terms of Reference was submitted to the Ontario Ministry of the Environment for approval in May 2004. The Terms of Reference identifies the framework that the proponent must follow in completing an individual environmental assessment. The Terms of Reference received approval in September 2004.

The planning process that the Route Planning Study and Environmental Assessment Study will follow is outlined in the Terms of Reference and consists of four stages:

- Stage 1 – Define Study Area;
- Stage 2 – Illustrative Alternatives;
- Stage 3 – Practical Alternatives; and,
- Stage 4 – Concept Design Alternatives.

1.3 Archaeology Work Plan

The Archaeology Work Plan presents the approach and methodology for conducting the Archaeological Assessment for the Detroit River International Crossing Route Planning and Environmental Assessment Study. The proposed approach to completing the Archaeological Assessment is to increase the level of detail used to assess archaeological resources progressively as the geographical area of study is sequentially narrowed down. The proposed level of analysis, resolution, and type of data collection at each stage of the study is designed to maximize efficiency. The Archaeological Assessment is also designed to complement the work to be performed in the U.S. A summary of the Archaeological Assessment in relation to the study stages is presented in Table 1.

At each stage of the study process, similar tasks will occur. These tasks include:

Task 1 – Define Area of Investigation - Identify the study area for the purposes of investigating the potential effects of the project.

Task 2 – Data Collection - Identify the type and source of information, and level of detail and methods to be used to obtain the information.

Task 3 – Data Analysis - Identify how the information will be interpreted to determine the significance and sensitivity of archaeological resources.

Task 4 – Evaluate Alternatives - Identify the archaeological criteria and indicators that will be used to compare alternatives.

Task 5 – Conduct Impact Assessment - Identify the range of potential environmental effects to be assessed.

Task 6 – Recommend Environmental Protection Measures - Identify the range of potential environmental protection measures to be assessed. Environmental protection measures typically include avoidance, minimization, mitigation, compensation and monitoring.

These tasks are summarized for each stage of the study process in Table 1.

TABLE 1. ARCHAEOLOGICAL ASSESSMENT BY STUDY STAGE

Study Stage[1, 2]	Level of Analysis[3]	Task 1 Define Area of Investigation	Task 2 Data Collection	Task 3 Data Analysis	Task 4 Evaluate Alternatives	Task 5 Impact Assessment	Task 6 Environmental Protection Measures
Stage 1 – Define Study Area	Partial Stage 1 Archaeological Assessment – Identify Registered Archaeological Sites (at least 1:250,000 scale & likely 1:50,000 scale)	Preliminary Analysis Area	• Secondary source (Ontario Archaeological Sites Database)	• Identify registered archaeological sites • Prepare contextual history, broadly outlining the history of human occupation up to and including European survey and settlement • Generically identify indicators of archaeological potential	• Avoid, where feasible, archaeological sites identified based on data collection	Opportunities/ Constraints Analysis	• Avoidance
Stage 2 – illustrative Alternatives	Partial Stage 1 Archaeological Assessment – Registered Archaeological Sites and Preliminary Model of Archaeological Potential based on proximity to water (at least 1:250,000 scale & likely 1:50,000 scale)	Illustrative routes, plazas, plaza extensions and crossings rights-of-way, footprints and adjacent zones of influence	• Secondary source (OASD, Windsor Archaeological Master Plan, other archaeological reports, map analysis) • Air photo interpretation	• Continue to identify known archaeological sites based on secondary source information • Identify indicators of archaeological potential and develop GIS model of potential within the area of investigation • Develop a method of comparison of significance/ sensitivity for known archaeological sites (sites of human burial are to be considered of special sensitivity and significance)	• Compare potential loss of or disturbance to known archaeological sites located within rights-of-way and footprint areas in terms of number of sites affected and significance of sites • Compare potential disturbance to areas of archaeological potential as identified during data analysis	Opportunities/ Constraints Analysis	• Avoidance

TABLE 1. ARCHAEOLOGICAL ASSESSMENT BY STUDY STAGE

Study Stage[1, 2]	Level of Analysis[3]	Task 1 Define Area of Investigation	Task 2 Data Collection	Task 3 Data Analysis	Task 4 Evaluate Alternatives	Task 5 Impact Assessment	Task 6 Environmental Protection Measures
Stage 3 – Practical Alternatives	Stages 1 and 2 Archaeological Assessment – Identify known archaeological sites and areas of archaeological potential and conduct field surveys to locate sites (at 1:2000)	Practical routes, plazas, plaza extensions and crossings rights-of-way, footprints and adjacent zones of influence	• Secondary source • Air photo interpretation • Large-scale map analysis • Field review • Detailed archaeological field survey	• Continue to identify known archaeological sites based on secondary source information • Discuss history of investigation on sites within the area of investigation • Continue to develop model of archaeological potential based on map analysis • Based on archaeological survey, confirm the assessment of archaeological potential and identify any sites that may be present in the areas surveyed	• Compare potential loss of or disturbance to known archaeological sites located within rights-of-way and footprint areas in terms of number of sites, significance of sites, and extent of disturbance • Compare potential disturbance to areas of archaeological potential as identified during data analysis	Generic Impacts	• Avoidance • Generic recommendations for archaeological assessment during subsequent stages of design and construction
Stage 4 – Concept Design Alternatives	Stages 1 and 2 Archaeological Assessment – Identify known archaeological sites and areas of archaeological potential and conduct field survey to locate sites (at 1:2000)	Concept design routes, plazas, plaza extensions and crossings rights-of-way, footprints and adjacent zones of influence	• Secondary source • Air photo interpretation • Large-scale map analysis • Field review • Detailed archaeological field survey	• Identify and describe known archaeological sites that may be affected, including any new sites identified during field survey • Identify areas of archaeological potential that may be affected	• Compare potential loss of or disturbance to known archaeological sites located within rights-of-way and footprint areas in terms of number of sites, significance of sites, and extent of disturbance • Compare potential disturbance to areas of archaeological potential as identified during data analysis	Conceptual Site-Specific Impacts	• Avoidance • Conceptual site-specific mitigation and monitoring • Specific recommendations for archaeological assessment during subsequent stages of design and construction

[1] Detail Design is not currently included in the Detroit River International Crossing Route Planning and Environmental Assessment Study.

[2] Study Stage refers to the stages of this Environmental Assessment study, not to stages of archaeological assessment as per the Ministry of Culture guidelines. The MCL stages of archaeological assessment are: Stage 1 (reconnaissance study involving background research and field review), Stage 2 (detailed field survey to locate archaeological sites), Stage 3 (archaeological site–specific testing), and Stage 4 (subsequent archaeological site–specific mitigation, possibly including salvage excavation). Stage 1 and 2 archaeological assessment will be undertaken during this Environmental Assessment study.

[3] Archaeological site – any property that contains an artifact or any other physical evidence of past human use or activity that is of cultural heritage value or interest.
Archaeological potential – the likelihood of an area to contain archaeological sites. Archaeological potential is treated as present or absent.

2. STAGE 1 – DEFINE STUDY AREA

A study area will be established to encompass the stated problems, opportunities and range of feasible alternatives. The study area will be generated based on a review of significant physical and environmental constraints that may preclude the development of feasible alternatives and the ability to provide continuous corridors of sufficient area to generate a range of linear transportation facility alternatives.

2.1 Task 1 – Define Area of Investigation

The area of investigation is the Preliminary Analysis Area identified in the amended Environmental Overview Document. In general, this includes the City of Windsor and the Towns of LaSalle, Tecumseh and Amherstburg.

2.2 Task 2 – Data Collection

During Stage 1 of this Environmental Assessment study, an archaeological reconnaissance study (Stage 1 archaeological assessment) will be initiated under the direction of an archaeologist licensed by the Ministry of Culture (MCL) pursuant to the *Ontario Heritage Act*.

Archaeological site data stored in the Ontario Archaeological Sites Database (OASD) will be collected from the Ontario Ministry of Culture (MCL). Readily available maps including 1:50,000 National Topographic System (NTS) maps and historic atlas mapping will be reviewed to broadly identify indicators of archaeological potential such as water sources, historic settlement centres, and historic transportation corridors. Readily available literature, and the files of Archaeological Services Inc., will be reviewed to prepare a contextual history of human occupation within the Preliminary Analysis Area.

Additional secondary source data will be collected on an ongoing basis as necessary throughout the stages of this environmental assessment. A summary of the major secondary sources of archaeological information is presented in Table 2.

TABLE 2. ARCHAEOLOGICAL INFORMATION FROM SECONDARY SOURCES

Secondary Source Information	Information Source
Ontario Archaeological Sites Database	• Ontario Ministry of Culture
Windsor Archaeological Master Plan	• City of Windsor
Published and unpublished literature, including archaeological assessment and excavation reports	• Files of Archaeological Services Inc. • Library/Archive Research
Historical documents and mapping and summary histories	• Files of Archaeological Services Inc. • Library/Archive Research
Physiographic mapping and summaries of the physical environment	• Files of Archaeological Services Inc. • Available project mapping and GIS data
Information from knowledgeable individuals/ locally-known archaeological sites	• Local contacts (public information openhouses, workgroups, etc.)

2.3 Task 3 – Data Analysis

The locations of registered archaeological sites will be identified and a summary list of site data will be compiled. Potential for the presence of archaeological sites will be discussed in terms of generic indicators.

2.4 Task 4 – Evaluate Alternatives

No evaluation of alternatives will be performed at this stage. Criteria will be used to identify opportunities/constraints located in the area of investigation. The goal at this stage will be to avoid registered archaeological sites where feasible.

2.5 Task 5 – Conduct Impact Assessment

Impact assessment will be carried out using a geographical information system (GIS). Cultural heritage information will be entered into a GIS using geo-referenced polygons and/or points with an attached database. The database will be structured so that new data generated during later phases of the environmental assessment study can be easily added. Information entered into the GIS can be queried and displayed as a table or as a layer on the GIS map.

The individual layers within the GIS will be overlaid to create a composite map. The composite map will be used as a basis for examination of environmental and technical feasibility of opportunity corridors, illustrative and practical alternatives. Archaeological sites will be mapped based on geographic coordinates, if available, and otherwise on map or air photo interpretation based on comparison with secondary source data and mapping, if available. Archaeological sites will be represented by point data indicating the location of the sites, rather than polygon data indicating the extent of the sites. The accuracy of data representation in the GIS will depend on the accuracy of the data collected. If geographic coordinates are available, it is anticipated that registered archaeological site location will be accurate at 1:50,000 scale. If mapping of archaeological sites is available in the absence of geographic coordinates, accuracy will depend on the accuracy and scale of the source—likely at least 1:250,000 scale.

2.6 Task 6 – Recommend Environmental Protection Measures

Avoidance of archaeological sites is the only practical environmental protection measure to be considered at this stage.

2.7 Results

The Preliminary Analysis Area will be refined based on a review of archaeological constraints to the development of a linear transportation facility. Illustrative alternatives will be generated and carried forward for further evaluation.

3. STAGE 2 – ILLUSTRATIVE ALTERNATIVES

Illustrative alternatives represent the full set of alternative highway alignments/crossing locations to be considered. Illustrative alternatives will be generated by identifying routes, plazas, plaza extensions and crossings extending from Highway 401 to the Canada/U.S. border.

3.1 Task 1 – Define Area of Investigation

The area of investigation is illustrative routes, plazas, plaza extensions and crossings within the Preliminary Analysis Area. In general, this includes the City of Windsor and the Towns of LaSalle, Tecumseh and Amherstburg.

3.2 Task 2 – Data Collection

The archaeological reconnaissance study (Stage 1 archaeological assessment) initiated during Stage 1 of this Environmental Assessment study will be continued during this stage of the EA.

Collection of secondary-source archaeological information (see Table 2) will continue. Archaeological information collected from secondary sources will form the basis for evaluation of illustrative alternatives.

During the illustrative alternatives stage, historical data and environmental data including available project mapping and GIS data will be collected for the development of a GIS model of archaeological potential within the area of investigation.

3.3 Task 3 – Data Analysis

A method for ranking and comparing archaeological site significance and sensitivity will be developed to facilitate alternatives evaluation. Sites of human burial will be considered to have special sensitivity and significance and will be ranked as the most significant and sensitive archaeological sites during the evaluation of illustrative alternatives.

Development of a model of archaeological potential for the area of investigation will begin, using indicators of archaeological potential published by the Ministry of Culture (1997 [Conserving a Future for our Past: Archaeology, Land Use Planning and Development in Ontario]), and including the results of the Windsor Archaeological Master Plan study. Development of the model of archaeological potential will be ongoing throughout the subsequent stages of this environmental assessment. At this stage, archaeological potential will be preliminarily modelled based on proximity to water sources.

3.4 Task 4 – Evaluate Alternatives

Alternatives will be evaluated using comparative criteria. The evaluation of illustrative alternatives will be based on the potential disruption or displacement of registered archaeological sites within rights-of-way and footprint areas, and on potential disturbance to areas of archaeological potential within rights-of-way and footprint areas. GIS data will be used to determine the location of areas of archaeological potential. Secondary source information will be used to determine the location and significance of registered archaeological sites.

3.5 Task 5 – Conduct Impact Assessment

Impact assessment will be carried out using a geographical information system (GIS). Archaeological sites will be mapped based on geographic coordinates, if available, and otherwise on map or air photo interpretation based on comparison with secondary source data, if available. Archaeological sites will be represented by point data indicating the location of the sites, rather than polygon data indicating the extent of the sites. Areas of archaeological potential will be represented by polygons generated as buffers around archaeological potential indicators such as water sources.

The accuracy of data representation in the GIS will depend on the accuracy of the data collected. If geographic coordinates are available, it is anticipated that the location of archaeological sites will be accurate at approximately 1:50,000 scale. In the absence of geographic coordinates, if mapping of archaeological sites is available, accuracy will depend on the accuracy and scale of the source—likely at least 1:250,000 scale. Mapping of archaeological potential as buffers around GIS-data will depend on the accuracy of the GIS data received. It is anticipated that such data will be accurate at large scale (greater than 1:50,000).

3.6 Task 6 – Recommend Environmental Protection Measures

Avoidance of archaeological sites and areas of archaeological potential is the only practical environmental protection measure to be considered at this stage.

3.7 Results

The illustrative alternatives will be evaluated to select a technically preferred illustrative alternative(s). Practical alternatives will be generated and carried forward for further evaluation.

4. STAGE 3 – PRACTICAL ALTERNATIVES

Practical alternatives represent the set of illustrative alternatives that, upon evaluation of impacts and benefits, are carried forward for further consideration. Practical alternatives are generated through more detailed design (although still at a preliminary level) to better identify property requirements, infrastructural implications, construction staging impacts and mitigation measures.

4.1 Task 1 – Define Area of Investigation

The area of investigation is practical routes, plazas, plaza extensions and crossings within the technically preferred illustrative alternative(s). This area is known as the Area of Continued Analysis (ACA) and is illustrated in Figure 1.

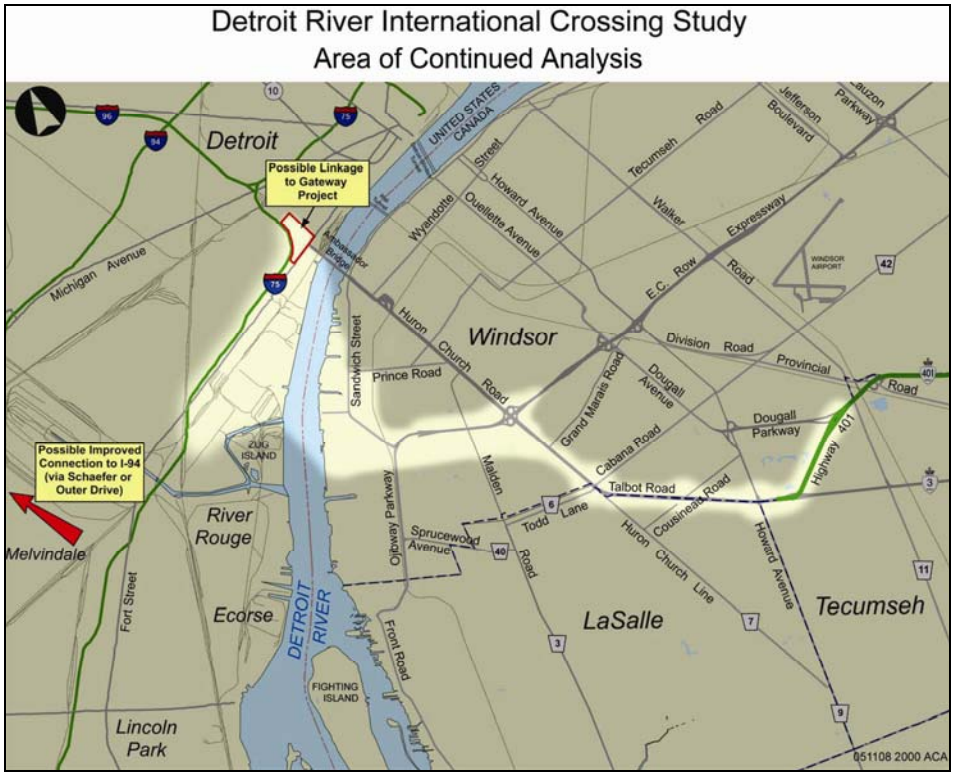

FIGURE 1. KEY PLAN OF THE AREA OF CONTINUED ANALYSIS.

4.2 Task 2 – Data Collection

The Stage 1 archaeological assessment of the study area will be continued during this stage of the EA and a Stage 2 archaeological assessment (detailed field survey) will be initiated. Stage 2 archaeological assessment will be conducted on lands for which permission to enter has been obtained, within the area of a limited number of alternative practical routes, plazas, plaza extensions and crossings. The Stages 1 and 2 archaeological assessments will be conducted under the direction of an archaeologist licensed by the MCL pursuant to the *Ontario Heritage Act*, and will be carried out in accordance with the Stages 1 to 3 archaeological assessment technical guidelines of the MCL.

Initially, collection of secondary-source archaeological information (see Table 2) will continue and will be supplemented by preliminary drive-by "windshield" review. The preliminary field review will be used to generate an initial characterization of the landscape and of the likely integrity of any archaeological sites that may be present, and to confirm or update the assessment of archaeological potential within the area of investigation. The field review will be conducted by a licensed archaeologist. The tasks of secondary-source data collection and field review constitute the Stage 1 archaeological assessment during this stage of the EA study.

Subsequently, archaeological information collected during the Stage 1 archaeological assessment will be supplemented by preliminary, detailed archaeological field survey on properties for which permission to enter has been obtained. The archaeological survey will be used to confirm the determination of archaeological potential and to identify any archaeological sites that may be present in areas of archaeological potential. In areas of archaeological potential, detailed archaeological field survey will involve pedestrian survey at 5-metre intervals on ploughed land and test pit excavation (by hand shovel) at 5-metre intervals on land that cannot be ploughed (e.g., woodlots, residential lawns). The strategy for archaeological field survey will be devised based on analysis of detailed topographic mapping at a scale of 1:2000 or greater. In addition, topographic mapping at a scale of at least 1:2000 will be used in the field to record the results of archaeological survey.

The detailed archaeological survey work constitutes Stage 2 archaeological assessment.

4.3 Task 3 – Data Analysis

The list of archaeological sites will be expanded to include unregistered archaeological sites, and descriptions of archaeological sites within the area of investigation will be augmented with a discussion of the history of investigation at each site.

Available project mapping, GIS data, and secondary source mapping including physiographic and topographic maps and historic maps will be analyzed to develop the GIS model of archaeological potential.

The results of field review will be compiled into a summary characterization of the landscape within the area of investigation, including a discussion of the likely integrity of any archeological resources that may be present.

Subsequently, detailed topographic mapping at a scale of 1:2000 or greater will be analyzed to refine the assessment of archaeological potential and develop the strategy for detailed archaeological field survey.

The results of the detailed archaeological field survey will be used to confirm and refine the assessment of archaeological potential within the area of investigation and to determine the location of all known archaeological sites in the areas surveyed, including any new sites identified during the course of the survey.

4.4 Task 4 – Evaluate Alternatives

Alternatives will be evaluated using comparative criteria. The evaluation of practical alternatives will be based on the potential disruption or displacement of registered archaeological sites within rights-of-way and footprint areas, and on potential disturbance to areas of archaeological potential within rights-of-way and footprint areas. GIS data, map analysis, and field survey will be used to determine the location of areas of archaeological potential. Secondary source information and field survey will be used to determine the location and significance of archaeological sites.

4.5 Task 5 – Conduct Impact Assessment

Impact assessment will be carried out using a geographical information system (GIS). Archaeological sites will be mapped based on geographic coordinates, if available, and otherwise on map or air photo interpretation based on comparison with secondary source data, if available. Archaeological sites will be represented by point data indicating the location of the sites, rather than polygon data indicating the extent of the sites. However, if the specific location of archaeological sites is not known, but it is possible to delimit an area within which the site is located, than that area will be represented as a polygon. Areas of archaeological potential will be represented as polygons.

The accuracy of data representation in the GIS will depend on the accuracy of the data collected. If geographic coordinates are available, it is anticipated that the location of archaeological sites as identified by secondary sources will be accurate at approximately 1:50,000 scale. If detailed mapping of archaeological sites is readily available, accuracy may be even greater. Mapping of archaeological potential based on proximity to archaeological sites identified by secondary sources will therefore be accurate to at least 1:50,000 scale.

During Stage 1 archaeological assessment, areas of archaeological potential will be generated based on data derived from a variety of sources including analysis of both modern and historic maps and of aerial photography; the archaeological potential model will be based on the criteria established by the Ministry of Culture, and the areas of potential identified in the Windsor Archaeological Master Plan will be included. It is estimated that mapping of areas of archaeological potential based on Stage 1 archaeological assessment will be accurate to at least 1:10,000 scale.

The results of Stage 2 archaeological assessment, including the locations of archaeological finds and the determination of archaeological potential will be accurate at 1:2000 scale.

A Stages 1 and 2 archaeological assessment report will be submitted to the Ministry of Culture (MCL) for review. The aim of this submission to the MCL will be to obtain MCL concurrence with the recommendations generated by the assessment and presented in the report, rather than to obtain MCL clearance for the proposed undertaking. MCL clearance for an undertaking of this nature is typically not received until after detail design, which is not part of this EA study.

4.6 Task 6 – Recommend Environmental Protection Measures

Archaeological resources protection measures to be incorporated at this stage include avoidance of archaeological sites and areas of archaeological potential and generic recommendations for further archaeological assessment work typically presented in Stages 1 and 2 archaeological assessment reports for linear transportation linear transportation facilities.

4.7 Results

The practical alternatives will be evaluated to select a technically preferred practical alternative(s). Concept design alternatives will be generated and carried forward for further evaluation.

5. STAGE 4 – CONCEPT DESIGN ALTERNATIVES

Concept design alternatives represent the set of practical alternatives that, upon evaluation of impacts and benefits, are carried forward for further consideration. Concept design includes the consideration and development of specific engineering and environmental issues to further understand very particular implications of the recommended alternative. The level of engineering detail is sufficient to develop environmental protection measures in consultation with the appropriate agencies and to secure environmental assessment approvals. However, the Ministry of Culture will not give clearance to the undertaking until after detail design, which is not part of this EA study.

5.1 Task 1 – Define Area of Investigation

The area of investigation is concept design routes, plazas, plaza extensions and crossings within the technically preferred practical alternative(s) of the ACA (Figure 1).

5.2 Task 2 – Data Collection

The Stages 1 and 2 archaeological assessment begun during Stage 3 of the Environmental Assessment study will be continued during this stage of the EA.

Archaeological information collected previously from secondary sources and field survey will be augmented as necessary by additional data collection, and by additional drive-by windshield review or detailed archaeological field survey. Field work will be used to confirm or update the assessment of archaeological potential, to document current land use within the areas of concept design alternatives, and to describe the likely integrity of any archaeological resources that may be present in the area of investigation.

Stage 2 archaeological field survey will be conducted on properties for which permission to enter has been obtained, in areas not surveyed during the previous EA study stage. The archaeological survey will be used to confirm the determination of archaeological potential, to document current land uses, and to identify any archaeological sites that may be present in areas of archaeological potential. In areas of archaeological potential, detailed archaeological field survey will involve pedestrian survey at 5-metre intervals on ploughed land and test pit excavation (by hand shovel) at 5-metre intervals on land that cannot be ploughed (e.g., woodlots, residential lawns). The strategy for archaeological field survey will be devised based on the results of previous archaeological assessment work carried out during this EA study, together with an analysis of available project mapping and detailed topographic mapping at a scale of 1:2000 or greater. In addition, topographic mapping at a scale of at least 1:2000 will be used in the field to record the results of archaeological survey.

5.3 Task 3 – Data Analysis

Previously-known and newly-identified archaeological sites within the area of investigation will be described. Areas of archaeological potential will be delimited based on GIS analysis and the results of field work. A discussion of the likely integrity of any archaeological resources will be presented based on observations made during field review and detailed survey, with respect to more recent alterations of the landscape.

5.4 Task 4 – Evaluate Alternatives

Alternatives will be evaluated using comparative criteria. The evaluation of concept design alternatives will be based on the potential disturbance to known archaeological sites within or directly adjacent to rights-of-way and footprint areas, and on potential disturbance to areas of archaeological potential within rights-of-way and footprint areas. The determination of archaeological potential will be based on GIS data and map analysis, augmented by field review and detailed archaeological survey. Secondary source information and the results of detailed archaeological field survey will be used to determine the location and significance of archaeological sites.

5.5 Task 5 – Conduct Impact Assessment

Impact assessment will be carried out using a geographical information system (GIS). Archaeological sites will be mapped based on geographic coordinates, if available, and otherwise on map or air photo interpretation based on comparison with secondary source data, if available. If detailed archaeological assessment mapping of known sites is available, plotting of sites will be based on or supplemented by such map analysis, and sites will be represented as polygons. If detailed archaeological assessment mapping is not available, archaeological site will be represented by point data.

If the specific location of archaeological sites is not known, but it is possible to delimit an area within which the site is located, than that area will be represented as a polygon.

Areas of archaeological potential will be represented as polygons.

The accuracy of data representation in the GIS will depend on the accuracy of the data collected. If geographic coordinates are available, it is anticipated that the location of archaeological sites as identified by secondary sources will be accurate at approximately 1:50,000 scale. If detailed mapping of archaeological sites is readily available, accuracy may be even greater. Mapping of archaeological potential based on proximity to archaeological sites will therefore be accurate to at least 1:50,000 scale.

For land not covered by detailed archaeological field survey, areas of archaeological potential will be generated based on data derived from a variety of sources including analysis of both modern and historic maps and of aerial photography; the archaeological

potential model will be based on the criteria established by the Ministry of Culture, and the areas of potential identified in the Windsor Archaeological Master Plan will be included. It is estimated that mapping of areas of archaeological potential based on Stage 1 archaeological assessment will be accurate to at least 1:10,000 scale.

The results of Stage 2 archaeological assessment, including the locations of archaeological finds and the determination of archaeological potential will be accurate at 1:2000 scale.

A final Stages 1 and 2 archaeological assessment report for this EA study will be submitted to the Ministry of Culture (MCL) for review. The aim of this submission to the MCL will be to obtain MCL concurrence with the recommendations generated by this environmental assessment with respect to archaeological resources, rather than to obtain MCL clearance for the undertaking being designed. MCL clearance for an undertaking of this nature is typically not received until after detail design, which is not part of this EA study.

A cumulative effects assessment will be conducted in accordance with the requirements of the *Canadian Environmental Assessment Act*.

5.6 Task 6 – Recommend Environmental Protection Measures

Environmental protection measures to be incorporated at this stage include avoidance of archaeological sites and areas of archaeological potential; minimization of disturbance to areas of archaeological potential; conceptual archaeological site-specific assessment and mitigation; and monitoring measures for the proposed project. Conceptual archaeological site-specific assessment and mitigation will be in accordance with Ministry of Culture guidelines and are outlined in Table 3. Further archaeological assessment will be recommended for subsequent stages of design and construction, in accordance with Ministry of Culture guidelines, in order to confirm or update determinations of archaeological potential, to identify any archaeological sites that may be affected by the project, and to properly assess any such sites identified.

TABLE 3. ENVIRONMENTAL IMPACTS AND PROTECTION MEASURES TO BE ADDRESSED AT THE CONCEPT DESIGN ALTERNATIVES STAGE

Archaeological Resources Component	Environmental Impacts	Environmental Protection Measures
Archaeological Site	Disturbance of archaeological site by physical alteration of land or water	• Additional Stage 1 archaeological assessment (reconnaissance study), if required • Additional Stage 2 archaeological assessment (field survey) to locate site, if required • Stage 3 archaeological assessment (site-specific testing) to determine site extents/nature/significance (if required) • Avoidance, including protection during construction • Stage 4 archaeological assessment (additional mitigative work, possibly including long-term protection measures and salvage excavation of all or part of the site) • Monitoring during construction
Areas of Archaeological Potential	Disturbance of archaeological sites that may be present in areas of archaeological potential	• Avoidance where feasible and minimization of areas affected where feasible • Additional Stage 1 archaeological assessment (reconnaissance study), if required during Preliminary Design and Detail design • Additional Stage 2 archaeological assessment (field survey) if required during Preliminary Design and Detail design to locate any archaeological sites that may be present.

5.7 Results

The concept design alternatives will be evaluated to select a technically preferred concept design alternative(s). Detail design is not included in the current scope of work for the Detroit River International Crossing Route Planning and Environmental Assessment Study.