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Canada-United States-Ontario-Michigan Border Transportation Partnership

Generation and Assessment of Practical Alternatives and Selection of the Technically and Environmentally Preferred Alternative

Plaza and Crossing Alternatives

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1. Introduction

Based on the findings of the end-to-end evaluation of illustrative alternatives, the Partnership determined that future study of a new border crossing, inspection plaza and access road would be confined to an "Area of Continued Analysis" (ACA). These findings along with the ACA were presented through consultation activities and documented in the *Draft Generation and Assessment of Illustrative Alternatives Report, November 2005*.

The ACA is illustrated in Exhibit 1, and represents the geographic envelope within which the practical crossing, plaza and access road alternatives have been developed. More intensive technical and environmental investigations have been undertaken to support the generation and assessment of practical alternatives.

EXHIBIT 1 – AREA OF CONTINUED ANALYSIS

On the U.S. side of the Detroit River, the Area of Continued Analysis extends from Zug Island to the vicinity of the Ambassador Bridge and from the I-75 to the Detroit River.

The western portion of the ACA on the Canadian side of the Detroit River encompasses a portion of the west Windsor industrial area at the south end of the Sandwich community and along the riverfront. Within this industrial portion of the ACA, which extends from approximately Broadway Street to the vicinity of Brock Street, the study team sited practical inspection plaza alternatives and international bridge crossing alignment alternatives.

East of the west Windsor industrial area, the ACA includes a continuous corridor, approximately 250 metres each side of the E.C. Row Expressway, Huron Church Road, Highway 3 and Highway 401. Within this corridor, the study team developed access road alternatives (consisting of service road and freeway components) to connect Highway 401 to a new plaza inspection facility, as well as maintain local traffic flow and provide for local access to the border crossing system.

This report documents the factors considered in generating the practical crossing and plaza alternatives, as well as descriptions of the specific alternatives considered, an assessment of impacts and benefits associated with these alternatives and the evaluation leading to the identification of a Technically and Environmentally Preferred Alternative (TEPA).

The assessment of the practical access road alternatives is described in additional detail in a number of factor specific reports and working papers that have been prepared. These reports are available under separate cover, and include the following:

- Draft Practical Alternatives Evaluation Working Paper – Air Quality Impact Assessment (May 2008)
- Draft Practical Alternatives Evaluation Working Paper – Noise and Vibration Assessment (May 2008)
- Draft Practical Alternatives Evaluation Working Paper – Social Impact Assessment (April 2008)
- Assessment of Practical Access Road Alternatives Memorandum – Improve Regional Mobility (May 2008)
- Draft Practical Alternatives Evaluation Working Paper – Economic Impact (May 2008)
- Draft Practical Alternatives Evaluation Assessment Report – Existing and Planned Land Use (May 2008)
- Draft Practical Alternatives Evaluation Working Paper – Archaeology (April 2008)
- Draft Practical Alternatives Evaluation Working Paper – Cultural Heritage (April 2008)
- Draft Practical Alternatives Evaluation Working Paper – Natural Heritage (April 2008)
- Draft Practical Alternatives Evaluation Assessment Report – Stormwater Management Plan (March 2008)
- Draft Practical Alternatives Evaluation Working Paper – Waste and Waste Management (May 2008)
- Draft Practical Alternatives Evaluation – Constructability Report for Plaza & Crossing Alternatives (December 2008)
- Draft Practical Alternatives Evaluation – Constructability Report for Access Road Alternatives (May 2008)
- Draft Level 2 Traffic Operations Analysis of Practical Alternatives (December 2008)

The development and analysis of the practical access road alternatives are discussed in a separate document entitled *Generation and Assessment of Practical Alternatives and Selection of the Technically and Environmentally Preferred Alternative – Access Road Alternatives, December 2008*.

The U.S. team published their Draft Environmental Impact Statement (DEIS) in February 2008. The DEIS contains technical analysis of the crossing alternatives, and the U.S. plazas. This report provides a summary of the analysis undertaken by the Canadian Team, as well as a summary of the analysis undertaken by the U.S. team, based on the information in the DEIS, and ongoing collaboration with the U.S. team. The U.S. team announced their final decision through their Final Environmental Impact Statement (FEIS) on December 5, 2008. For the purposes of the work documented in this report, the Canadian study team had the benefit of the information in the DEIS, and the ongoing collaboration with the U.S. team.

2. Practical Crossing and Plaza Alternatives

2.1. Generation Criteria

2.1.1. Crossings

The Canadian and U.S. study teams considered the following technical objectives in generating the practical crossing alternatives:

- Maintain navigational clearances on the Detroit River;
- Locate crossing in an area of sound bedrock;
- Avoid to the extent possible areas sensitive to traffic impacts of the crossing (eg. noise, vibration, air quality) such as residential neighbourhoods;
- Minimize length of crossing;
- Maximum grade of approach to crossing is 5%; and
- Provide for 6 traffic lanes.

These technical objectives were derived based on consultation with agencies (such as the U.S. and Canada Coast Guards), municipalities, specialists (including traffic, highway design, foundations and geotechnical specialists), and the public.

The Detroit River is an important waterway for marine traffic on the Great Lakes. As such, bridges are required to span the river at a clearance of at least 46 m (150 ft) at the shipping channel, defined by the U.S. Coast Guard and Transport Canada – Navigable Waters Division. The height and potential spans on the Detroit River suggest that any bridge on the Detroit River within the ACA will need to be either a suspension bridge or a cable-stayed bridge. Additional consultation with U.S. and Canadian government agencies and shipping operators led to the decision to not place any piers in the Detroit River for a new span. Piers in this section of the Detroit River were considered too hazardous to marine navigation.

The Canadian and U.S. teams developed three practical crossing alternatives which are described in Section 2.2.

2.1.2. Plazas

The following key considerations served as a basis in generating practical plaza alternatives:

- **Proximity to Border**: Canada Border Services Agency (CBSA) and Canada Border Processing (CBP) require that the plazas be located as close to the border (i.e. bridge crossing) as possible, to reduce security / monitoring requirements for border agencies. Where plazas cannot be directly connected to the bridge, secure connections would be required to prevent goods and travellers from avoiding inspection. In Canada, a secure roadway of 1500m (0.9 mi) was considered the guideline for a maximum reasonable distance, subject to consideration of land use and line of sight.

- **Site Area**: The potential site must provide adequate space to accommodate projected traffic demand, as well as turn-around opportunities and the installation of equipment systems prior to and after inspection points, on-site secondary inspection, some storage capacity for traffic queues on the plaza, and the ability to expand in the future.

  Inspection plaza areas of approximately 30 to 40 ha (80 to 100 acres) were considered for new crossings, based on the preliminary assumption that international truck traffic will be distributed equally between the new crossing and the Ambassador Bridge.

  To minimize visual and noise impacts and provide acceptable access for emergency vehicle services (fire, police, etc.), the plaza elevation should not vary significantly from elevations of the adjacent lands and roadways.

  Plaza layouts and locations were influenced by proximity to the new international bridge and/or other bridges over existing highways or rail lines. As an example, the vertical clearance requirements for shipping extend to the edge of the Detroit River. The distance over which an approach structure would descend from the river crossing (assumed to be approximately 46 metres above the riverbank to meet navigational clearance requirements) would be approximately one kilometre with a maximum grade of five percent.

  Geotechnical conditions were also considered in siting plaza alternatives. Specifically, the plaza alternatives were sited away from the known salt extraction areas north of Prospect Avenue.

- **Adjacent Land Use:** Locate the plaza in an area where surrounding land uses would not be overly sensitive to the continuous operation, noise and lighting of "Port-Of-Entry" facilities. Alternatively, the plaza could be located in areas where additional land would be available to screen and buffer the Port-Of-Entry from existing sensitive land uses.

  The site should be located away from residential areas, schools and other community uses. Sites should not be visible from neighbouring lands, but should provide good visibility to surrounding areas and approaches. Areas with significant development should also be avoided.

- **Environmental Issues:** Consideration should also be given to the presence of toxic and/or hazardous materials, wetlands and/or endangered species, cultural, social and economic impacts.

- **Emergency Services and Access:** Site should be served by more than one roadway to allow for roadway interruption; consider response time for medical and fire emergency response; proximity to hospitals.

- **Existing Easements and Right-of-Ways:** Consideration should be given to gas lines, water and sewer lines, power and telecommunication lines, rail lines, and local and private roadways.

- **Water Availability:** Consideration should be given to water source and protection from sabotage or other threats of contamination.

The siting of practical plaza alternatives was based on the results of the assessment of illustrative plaza alternatives, additional study of the ACA and consultation with border agencies, businesses, property owners and the public.

Input received at Public Information Open Houses in November 2005 and workshops in January 2006 and correspondence with the public identified several specific community objectives that were considered in the generation of inspection plaza locations:

- Concern with impacts to Sandwich community; keep plaza south of Prospect Avenue;
- Keep away from natural features (Ojibway Prairie Area, Spring Garden ANSI, Black Oak Woods);
- Place plaza in the Brighton Beach industrial area;
- Keep plaza away from the sinkhole location;
- Place plaza on as much vacant land as possible; and
- Place plazas away from residential areas.

The study team developed three distinct plaza locations and four plaza alternatives which are described in detail in Section 2.2.

2.2. Description of Practical Plaza and Crossing Alternatives

2.2.1. Crossings

Crossing A

Practical Crossing Alternative A (Crossing 'A') is within the X-10 corridor and is illustrated in Exhibit 2. This crossing alternative connects to the south end of the plaza area on the U.S. side of the river. Due to the distance required to touch-down at-grade, the crossing connects only to Practical Plaza Alternative A (Plaza 'A') on the Canadian side of the river.

Crossing A is the longest of the alternatives, with a main span of 1220 metres. Piers within the river were not considered in the crossing alternatives. A clear span of 1220 metres limits the type of bridge possible for Crossing A to a suspension bridge.

Crossing A completely avoids the known salt extraction wells in the area north of Prospect Avenue.

Crossing B

Practical Crossing Alternative B (Crossing 'B') is illustrated in Exhibit 3 and is the other crossing within the X-10 corridor, connecting to the south end of the plaza area on the U.S. side of the river. The crossing connects to Plaza A and Plaza B1 on the Canadian side of the river. Crossing B has a main span of 870 metres. A clear span of 870 metres can be provided by both suspension and cable-stayed bridge types.

On the Canadian side of the river, Crossing B is aligned over an existing aggregate operation (Southwestern Sales) and vacant land owned by Ontario Power Generation (OPG). From these OPG lands, an approach structure connects to Plaza B or Plaza A.

The Crossing B main structure is situated just south of Prospect Avenue, south of the area of known brine wells. The crossing and approach structure avoid the known brine wells area.

Crossing C

Practical Crossing Alternative C (Crossing 'C') is within the X-11 corridor, and is illustrated in Exhibit 4. This alternative features four distinct crossing-plaza combinations, including two ways of connecting to Plaza A (via the Brighton Beach area or via the Ojibway Parkway), a connection to Plaza B, and a connection to Plaza C. A comparison of these four plaza-crossing combinations was made to determine the preferred crossing-plaza combination in the Crossing X11C corridor. Crossing C has a main span of 760 metres. A clear span of 760 metres can be provided by both suspension and cable-stayed bridge types.

On the Canadian side of the river, Crossing C is aligned over an existing fueling depot (Sterling Marine Fuels). The approach to the main crossing passes over the known brine well area between Prospect Avenue and John B. Street.

2.2.2. Plazas

Practical Inspection Plaza Alternative A

Practical Plaza Alternative A ('Plaza A') is approximately 90 acres in size, and is bounded by Ojibway Parkway, E.C. Row Expressway, Malden Road and Armanda Street/Broadway Street. Plaza A connects to all three crossing alternatives via approach roads that are approximately 2.0 km to 3.5 km in length (corresponding to Crossing A and Crossing C, respectively).

The site consists of primarily open space, woodlots and residential units that consist of established and recently constructed houses. Practical Plaza Alternative A is illustrated in Exhibits 2 to 4.

Approximately 150 m south of Plaza A is Armanda Street, a neighbourhood consisting of single-family houses. Plaza A would require existing Matchette Road to be closed between E.C. Row Expressway and just north of Armanda Street. Based on consultation with the municipalities, this portion of Matchette Road would need to realigned so that the current access provided by Matchette Road between Windsor and LaSalle can be maintained.

Practical Inspection Plaza Alternative B

Practical Plaza Alternative B ('Plaza B') is approximately 85 acres in size and located within the Brighton Beach Industrial Area. Plaza B connects to Crossing C via an approach road that is approximately 2.0 km in length.

There are few residential units directly within the site, however, the site is adjacent to primarily industrial area that includes the Nemak Plant (automotive manufacturing plant) to the east, the West Windsor Power Plant to the east and OPG Brighton Beach Power Station to the west. Potential impacts to these utilities and industrial uses need to be considered in the analysis and evaluation of Plaza B.

Practical Inspection Plaza Alternative B1

Practical Plaza Alternative B1 ('Plaza B1') is approximately 80 acres in size, and is a variation of Plaza B. Plaza B1 connects to Crossing B via an approach road that is

approximately 0.8 km in length, and is illustrated in Exhibit 3. This alternative has a different layout and footprint than Plaza B due to the alignment of the connection of Crossing B at the north end of the plaza.

This site is also situated within the Brighton Beach Industrial Area, bounded by the Detroit River, Chappus Street, Ojibway Parkway and Broadway Street.

Practical Inspection Plaza Alternative C

Practical Plaza Alternative C ('Plaza C') is approximately 105 acres in size. Plaza C connects to Crossing C via an approach road that is approximately 1.2 km in length, and is illustrated in Exhibit 4.

Plaza C is located on vacant lands owned by OPG, Southwestern Sales (an existing aggregate operation) and on the Keith Transformer Station, which would require relocation.

The plaza is sited directly adjacent to the Detroit River shoreline. Along the north limit is Prospect Avenue; on the east side is Sandwich Street and a trucking operation and the West Windsor Power Plant; and to the south is Chappus Street and the Brighton Beach industrial area.

EXHIBIT 2 – PRACTICAL CROSSING ALTERNATIVE A AND CORRESPONDING PRACTICAL PLAZA ALTERNATIVES

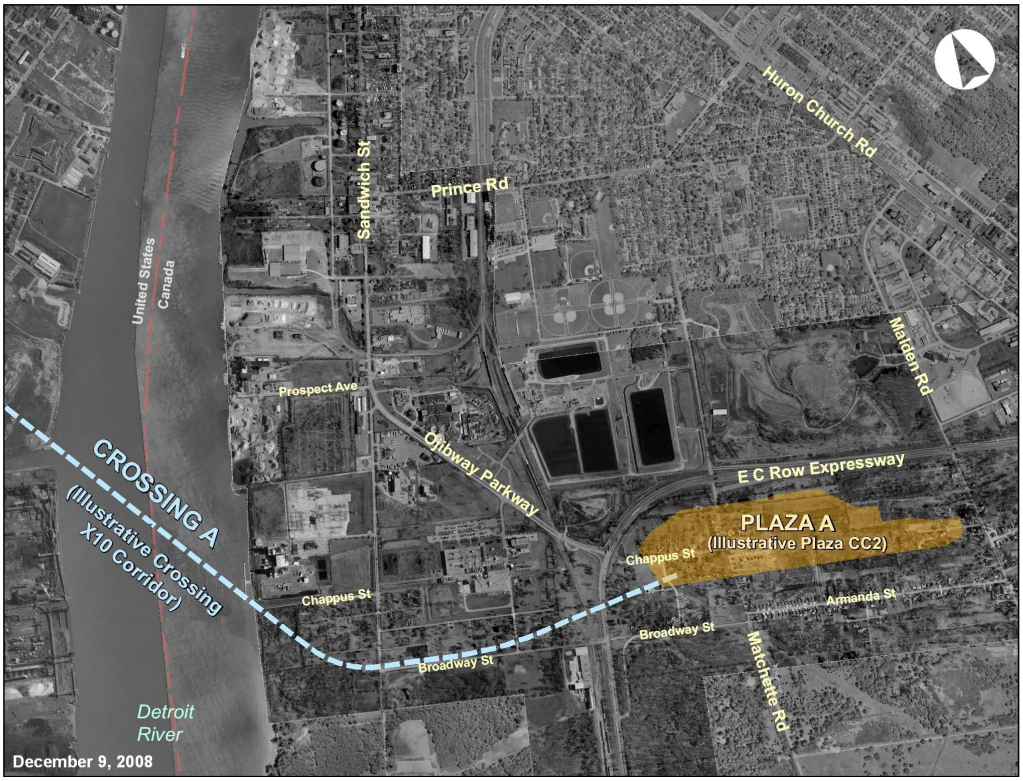


EXHIBIT 3 – PRACTICAL CROSSING ALTERNATIVE B AND CORRESPONDING PRACTICAL PLAZA ALTERNATIVES

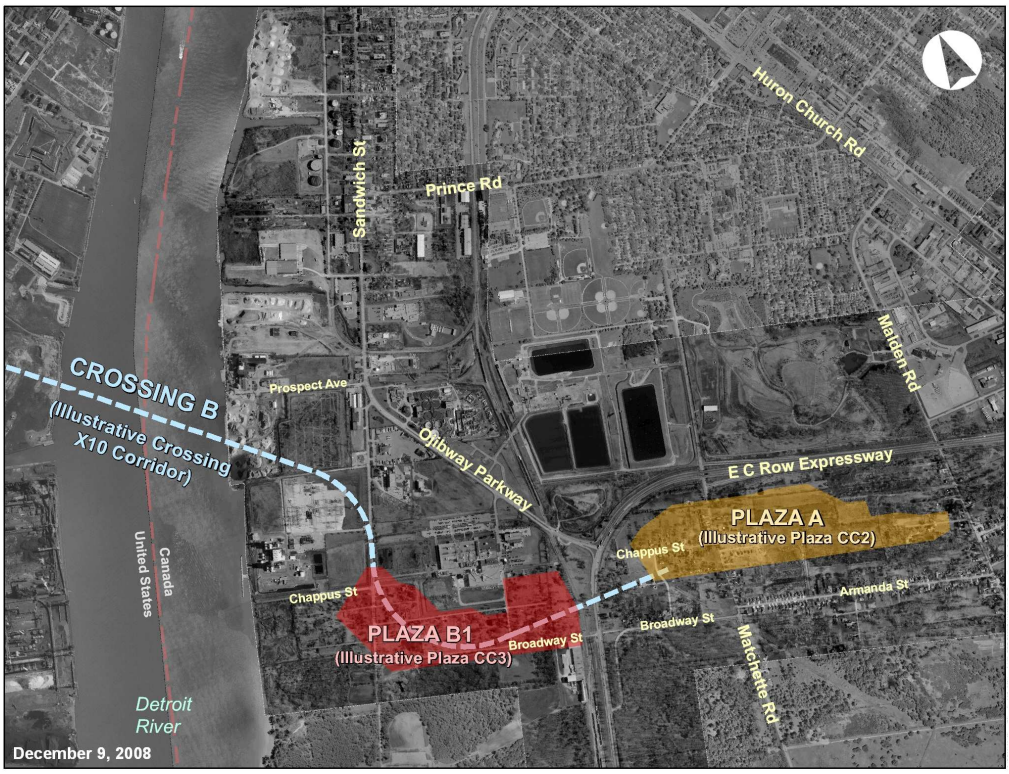
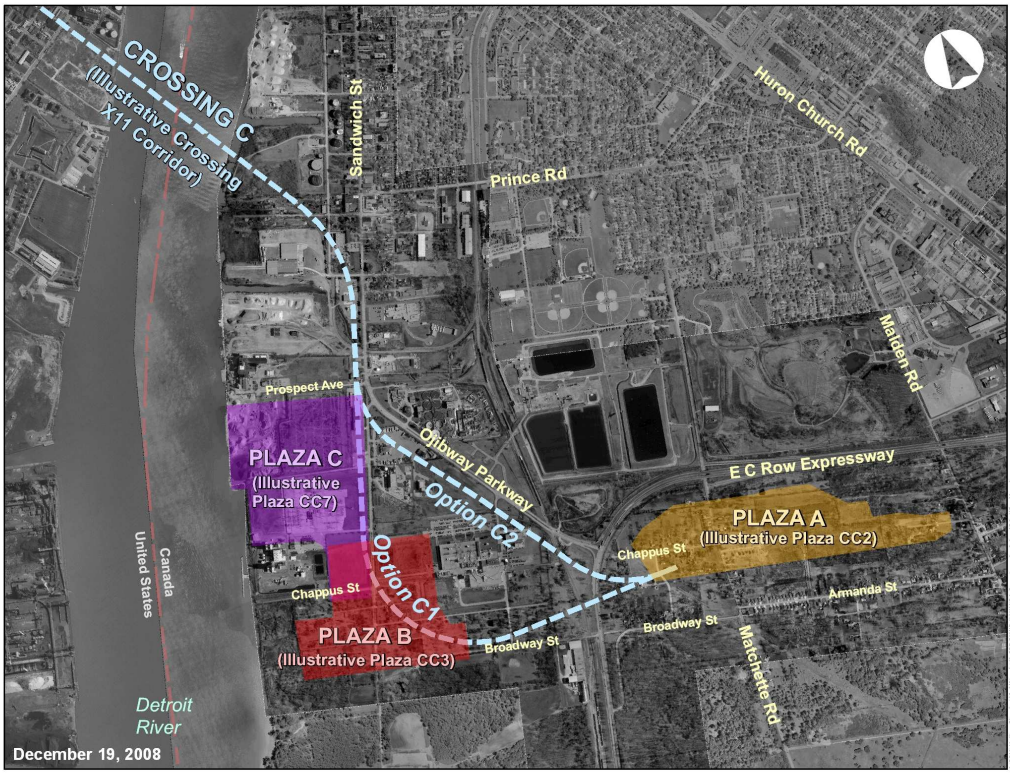


EXHIBIT 4 – PRACTICAL CROSSING ALTERNATIVE C AND CORRESPONDING PRACTICAL PLAZA ALTERNATIVES



3. Assessment of Crossing and Plaza Alternatives

The Canadian study team examined each crossing/Canadian plaza combination to determine the preferred Canadian plaza site for each crossing.

In December 2006, the initial analysis of these seven crossing/plaza combinations was presented together with the U.S. plaza/crossing analysis at the fourth round of Public Information Open Houses. The Canadian side information was updated over the summer of 2007 and presented at the fifth round of Public Information Open Houses in August 2007.

For the purposes of the assessment, the alternatives were organized by crossing corridor to determine best plaza/crossing combination by corridor.

- Crossing A-Plaza A
- Crossing B/Plaza A
- Crossing B/Plaza B1
- Crossing C/Plaza A via Brighton Beach
- Crossing C/Plaza A via Ojibway Parkway
- Crossing C/Plaza B
- Crossing C/Plaza C

The approved OEA TOR for the DRIC Study identified two evaluation methods to be employed in the evaluation process: reasoned argument method and arithmetic method. The assessment and evaluation of these alternatives was undertaken following both a reasoned argument method, and an arithmetic method (weighted scoring). These methods are described in more detail below. The reasoned argument method was the primary method, while the arithmetic method was the secondary method, which served as a basis of comparison for the evaluation findings.

Reasoned Argument Method

The reasoned argument method highlights the differences in net impacts associated with the various alternatives. Based on these differences, the advantages and disadvantages of each alternative are identified. The relative importance of the impacts is examined to provide a clear rationale for the selection of a preferred alternative. The rationale that favours the selection of one alternative over all others is derived from the following sources:

- Government legislation, policies and guidelines;
- Existing Land Use and Municipal policy (i.e., Official Plans);
- Technical Considerations (i.e. degree to which the identified transportation problems are solved);

- Issues and concerns identified during consultation with ministries, departments and agencies, municipalities, ratepayer and interest groups and the general public (including input obtained through the weighting of the relative level of importance of evaluation criteria); and
- Study team expertise.

Arithmetic Method

The arithmetic method incorporates numeric values for both the level of importance of each environmental attribute (referred to as the weight) and the magnitude of the impact or benefit associated with an alternative (referred to as the score). The weight is multiplied by the score to obtain a total weighted score. The totals for each alternative are compared to determine the preferred alternative. The Arithmetic Method also allows for sensitivity testing as numerous weighting scenarios can be developed.

Weighting (Level of Importance)

Generally, more weight is assigned to those factors that are felt to be more important in assessing impacts and benefits generated by alternatives, and less weight is given to those factors that are considered to be less important.

As discussed in the report entitled *Draft Generation and Assessment of Illustrative Alternatives Report, November 2005,* three different weighting scenarios were developed for the arithmetic method. One weighting scenario was developed by the Canadian study team, and separate weighting scenarios were developed based on input received from individuals of the general public and members of the Community Consultation Group established for this study. The weighting scenarios used for the arithmetic evaluation are provided in subsequent sections of this report.

Scoring (Degree of Impact)

Qualified study team specialists with expertise in impact assessment assessed the degree of impact and benefit and assigned a score for each alternative. The score assigned to each environmental attribute by the qualified specialist is relative to the impact or benefit generated. Relative impacts can range from those that are positive (benefit the environment) to negative (detrimental to the environment).

The assessment of impacts was derived from field measurements, results of prediction models, secondary data sources and other means as appropriate.

3.1. Implementation of Evaluation Methods

As previously noted, the reasoned argument method was the primary evaluation tool to select a preferred alternative, while the arithmetic method was used to substantiate the findings of the reasoned argument evaluation. The two evaluation approaches were implemented concurrently.

If the two approaches resulted in the identification of different preferred alternatives, the differences between the two alternatives were identified. The results of the arithmetic method were analyzed to determine the key weight-score combinations in the arithmetic evaluation. Similarly, the rationale for each trade-off decision was revisited to determine if

the study team decision was appropriate. If the rationale supporting the trade-off decisions was determined to be valid and appropriate, the preferred alternative identified by the reasoned argument method would stand. However, if the results of the arithmetic evaluation lead to modifications to the trade-off decision rationale, the conclusions of the reasoned argument method would be revised.

3.2. Evaluation Criteria – Canadian Side

Table 3.4 of the OEA TOR provided a listing of 18 proposed evaluation factors and 35 criteria for the DRIC Study (refer to Table 1).

The Canadian and U.S. study teams jointly developed a revised evaluation table that simplifies the number of factor areas to be considered from 18 to 7, to enable the public to more easily provide input to the study teams in terms of rating the importance of the factors.

The seven factors in the revised evaluation table are consistent with those of the OEA TOR and cover a broad range of issues, including the ability of the alternative to meet the Partnership's underlying transportation objectives, as well as natural, social, cultural, economic, and technical considerations. Performance measures used in the analysis of illustrative alternatives include the 35 criteria from the OEA TOR. These were retained and added to, based on comments received during the public consultations. The seven evaluation factors and the performance measures used for the DRIC Study, as well as the corresponding criteria reference from Table 3.4 of the OEA TOR (where applicable) are shown in Table 2 and discussed briefly in the following pages.

TABLE 1 – TABLE 3.4 OF OEA TOR – CRITERIA FOR EVALUATING ILLUSTRATIVE AND PRACTICAL ALTERNATIVES

FACTOR	CRITERIA
Socio-Economic Environment	
Property and Access	1) Impacts to residential areas (i.e. property, access impacts) 2) Impacts to commercial/industrial areas (i.e. property, access impacts) 3) Impacts to agricultural operations
Community Effects	4) Nuisance impacts (e.g.. noise, lighting) 5) Impacts to cemeteries, schools, places of worship, unique community features 6) Effects on community activity / mobility 7) Effects on aesthetics / community character
Governmental Land Use Strategies	8) Compatibility with government goals / objectives / policies 9) Effects on approved private development proposals
Cultural Environment	
Archaeology	10) Impacts to historic/archaeological sites
Heritage and Recreation	11) Impacts to built heritage features and cultural landscape units 12) Impacts to National, State/Provincial and local parks/recreation sites
Groundwater	13) Impacts to groundwater recharge and discharge areas, as well as identified wellhead and source protection areas and areas susceptible to groundwater contamination

FACTOR	CRITERIA
Aquatic Habitat, Fisheries, and Surface Water	14) Impacts to critical fish habitat features (spawning, rearing, nursery, important feeding areas) 15) Number of watercourse crossings required 16) Impacts to water bodies, including channel realignments and fill
Agricultural	17) Impacts to prime agricultural areas
Wetlands	18) Impacts to Provincially Significant Wetlands and wetland function 19) Impacts to evaluated and unevaluated wetlands
Wildlife	20) Effects on species at risk / endangered species (vegetation, fish and wildlife) 21) Effects on ecologically functional areas such as connective corridors or travel ways
Special Areas	22) Impacts to important wildlife areas such as deeryards, heronries, waterfowl areas, important bird areas (IBA). Other areas to be considered are any identified wildlife management, rehabilitation and research program sites. 23) Impacts to environmentally significant features such as Environmentally Sensitive Areas (ESAs), Areas of Natural and Scientific Interest (ANSIs) or other areas of provincial, regional or local significance and the functions of these features 24) Impacts to special spaces including the Detroit River, Conservation Authority Lands and NEPA 4(f) lands including the function of these features
Air Quality	25) Effects on sensitive receptors to air quality 26) Air pollutants and GHG emissions
Woodlands	27) Impacts to significant forest stands and woodlots (including interior forest habitat)
Resources	28) Impacts to mineral, petroleum and mineral aggregate resources
Property Waste & Contamination	29) Effect on operating and closed waste disposal sites 30) Impacts to other known contaminated sites
Transportation	31) Transportation Operations 32) Network Compatibility 33) Border Processing
Engineering	34) Constructability Issues
Cost	35) Cost

Note: The OEA TOR identified that this set of factors and criteria represents the minimum criteria to be considered during the evaluation of alternatives (practical and illustrative alternatives) and are subject to refinement and modification during the Integrated Environmental Study Process based on study findings and input received from stakeholders.

TABLE 2 – PRACTICAL ALTERNATIVES EVALUATION FACTORS AND PERFORMANCE MEASURES – CANADIAN SIDE

Rating Factor	Performance Measure Categories	Performance Measure	Corresponding Criteria Reference in OEA TOR Table 3.4
Changes in Air Quality	Regional Burden	Analysis based on traffic model results.	25, 26
	Dispersion (CO and $PM_{2.5}$ and other Green House Gases/pollutants)	Analysis for key roadway links [to be measured at practical alternatives stage].	25, 26
Protect Community/ Neighborhood Characteristics	Traffic Impacts Volumes by Vehicle Type	Peak period volumes on specific links by mode (cars, trucks, and int'l. trucks).	31, 33
	Local Access	Number of streets crossed, closed, or connected with an interchange.	31, 33
	Noise	Analysis based on traffic model results for key roadway links.	4
	Community Cohesion/Community Character	Encroachment/severance on neighborhood based on professional judgment. Impact on delivery of community services (function of road closures) based on professional judgment.	7
	Acquisitions (Whole or Partial) Residential	Number of dwelling units by type; population estimate based on average persons per dwelling unit	1
	Business	Number of business establishments; employment estimate based on average employees per business for area.	2
	Institutions	Number of institutions by type (church, schools, etc.).	5
	Farm Property / Structures	Operations/structures affected.	3

Rating Factor	Performance Measure Categories	Performance Measure	Corresponding Criteria Reference in OEA TOR Table 3.4
	Public Safety/Security (Plaza Only)	Assessment based on professional judgment.	NEW
Maintain Consistency with Existing and Planned Land Use	Land Use (existing and planned)	Designation of "consistent," "not consistent," or "not applicable" with goals, objectives and/or policies based on review of official planning documents.	8
	Development Plans	Designation of "compatible," "not compatible," or "not applicable" with plans for upcoming development that may not be covered by official plans.	9
	Contaminated Sites/Disposal Sites	Number of documented sites affected.	29, 30
Protect Cultural Resources	Historical	Number of listed sites affected.	10
	Parklands	Number of parks by type; number of hectares affected. Includes subset for Coastal Zone Management sites.	11
	Archaeological Sites	Number of known sites affected.	12
Protect the Natural Environment	Environmental Significant Features	Area (in hectares) affected by type.	14-19, 21, 24, 27
	Surface Water Quality/Groundwater	Area of floodplains affected (hectares); number of water crossings (including secondary rivers and streams); Detroit River channel alteration; number and general location of in-water piers; wells/groundwater sources affected; number of water intakes affected.	13, 16
	Environmentally Significant Species/ Habitat	Area of habitat (hectares) affected by type; list of species; other significant features.	20

Rating Factor	Performance Measure Categories	Performance Measure	Corresponding Criteria Reference in OEA TOR Table 3.4
	Farmland/Prime Agricultural Soils	Area affected (hectares) by soil type	17
	Other Natural Resources	Area affected measured by area of right-of-way.	28
Improve Regional Mobility	Highway Network Effectiveness Service Levels	Level of Service (LOS) classification by major facility type.	31, 32
	Vehicle kilometres of Travel	By major facility type.	31, 32
	Vehicle Hours of Travel	By major facility type.	31, 32
	Distance Traveled	Average km for car, local truck, and international truck.	31, 32
	Continuous/ongoing river crossing capacity (i.e. redundancy)	Assessment of availability of crossing options.	32, 33
	Operational Considerations of Crossing System (River Crossing and Plaza)	Distance to plaza from international border; accessibility; serviceability; security; flexibility for expansion.	32, 33
Cost and Construct-ability[1]	Millions of $CAD (expressed in year 2011 dollars)	Length of alternative, preliminary construction costs, constructability including site constraints; geotechnical constraints; construction staging/ duration; traffic maintenance; risk assessment.	34, 35

3.2.1. Changes to Air Quality

The Partnership recognizes air quality is a key concern for those that live and work in the Detroit River area. Air quality effects of the practical alternatives were assessed using a combination of existing air monitoring data and air dispersion modelling. Air dispersion modelling was used to assess the impacts of future changes, such as implementation of the alternatives, and changes in fuels, vehicle technologies and traffic volumes. The

[1] In the evaluation of illustrative alternatives, this factor was entitled Minimize Cost; for the evaluation of practical alternatives, the title of this factor was revised to Cost and Constructability to more accurately reflect the basis of the assessment.

predictive air quality model used is specifically designed to assess impacts from roads and highways. The model incorporates the differences between moving vehicles, and queued vehicles that are idling, as well as differences in roads that are at-grade, below-grade, and end-to-end tunnelled or elevated on bridges.

Existing concentrations of gaseous pollutants in Windsor such as sulphur dioxide (SO2), carbon monoxide (CO), volatile organic compounds (VOCs) such as acrolein, were examined as part of the assessment of illustrative alternatives conducted in 2005, and found to be well below Ontario Ministry of the Environment Ambient Air Quality Criteria. Due to the number and length of practical access road alternatives being assessed, two indicator pollutants, one gaseous compound and one particulate compound, were selected for the analysis of the practical access road alternatives. These indicator pollutants are nitrogen oxides (NO_x) and particulate matter less than 2.5 microns ($PM_{2.5}$). These pollutants are the typical air pollutant indicator compounds with respect to transportation vehicle emissions. Changes in the total predicted concentrations of these two air pollutants were examined for each alternative in relation to the future no-build alternative. The assessment of the practical access road alternatives is described in detail in the *Air Quality Impact Assessment Practical Alternatives Evaluation Working Paper, DRAFT May 2008* available under separate cover. Additional pollutants will be examined when assessing the technically and environmentally preferred alternative (TEPA).

3.2.2. Protection of Community and Neighbourhood Characteristics

Social impacts occur when a project negatively or positively affects the way of life or lifestyle enjoyed by people, their social patterns, the social structure or character of communities, and/or the local or regional services and facilities. The social impact assessment (SIA) examined the effects to the community of South and West Windsor, as well as portions of LaSalle and Tecumseh as a result of the proposed project activities. For the purposes of the SIA, within the larger community of South and West Windsor and LaSalle, a number of smaller neighbourhood communities were identified. The effects on these smaller neighbourhoods were considered in addition to the assessment of the effects to the greater community.

The assessment of impacts to community and neighbourhood characteristics included an analysis of property impacts as well as impacts to community and neighbourhood features; noise impacts to sensitive receptors along the access road corridor; and economic impacts to businesses within and in the vicinity of the area of continued analysis. The results of the analysis are documented in several technical reports, including the *Draft Level 2 Traffic Operations Analysis of Practical Alternatives (December 2008), Draft Noise and Vibration Assessment Working Paper (May 2008)*; and the *Draft Economic Impact Working Paper (May 2008)*. The results of the various studies touching on the impacts to community and neighbourhood features are compiled in the *Draft Social Impact Assessment Working Paper (April 2008)*.

3.2.3. Maintain Consistency with Existing and Planned Land Use

Local plans shape the look and feel of a community, its aspirations and visions for growth. It is important to consider how a new roadway connection to a new crossing will impact on these local planning objectives. The existing and future land use patterns of affected communities were examined to assess the degree of consistency with the proposed transportation improvements. This included a review of Official Plans and other planned

developments. As well, the intrusion of a plaza or new roadway that is part of the border crossing system on contaminated sites/disposal sites was evaluated.

3.2.4. Protect Cultural Resources

Various laws/regulations govern the impact of transportation facilities on properties of historic or archaeological significance and publicly owned parklands. The potential impacts of the access road on such sites/properties were defined for each practical alternative.

3.2.5. Protect the Natural Environment

The project will affect natural heritage features including terrestrial, aquatic and wetland ecosystems and their inhabitants. Within the ACA, these features include Areas of Natural and Scientific Interest, provincially and non-provincially significant wetlands, Environmentally Sensitive Areas, Candidate Natural Heritage Areas, fish habitat, species-at-risk and other designated/regulated natural heritage features. The number, extent and significance of natural heritage features that may be affected by the access road alternatives were determined. Likewise, the potential impacts to productive resources, such as prime farmland (Ontario Class 1-3 soils) or mineral mines, were determined. Water quality issues have been addressed in this category by defining the water crossings affected, floodplain areas affected, groundwater impacts, and possible impacts to the Detroit River, including the release of contaminated sediments.

3.2.6. Improve Regional Mobility

The purpose of the Detroit River International Crossing Study is, in part, "to provide safe, efficient and secure movement of people and goods across the Canadian-U.S. border in the Detroit River area to support the economies of Michigan, Ontario, Canada and the U.S." Within this purpose, the regional transportation and mobility needs include: new border crossing capacity, improved system connectivity; improved operations and processing capabilities, and reasonable and secure crossing options. The degree to which the options under consideration assist in efficient operation of the overall highway network has been evaluated for the study horizon year of 2035. This evaluation will in part be based on standard methodology of the Highway Capacity Manual 2000 (e.g., level of service, capacity).

3.2.7. Cost and Constructability

Construction of a new plaza and international crossing of the Detroit River will represent a major financial investment. While it is recognized that the crossing serves an important trade corridor between Canada and the U.S., the costs to construct, operate and maintain it are eventually paid by the users of the crossing, whether it is by individual users through tolls, or governments through the use of public funds derived from taxpayers. Minimizing costs, while balancing the natural, social, economic, cultural, and technical considerations is an important consideration. Construction risks can lead to unforeseen delays and significant additional costs. An assessment has been made of the constructability of the plaza and crossing alternatives. Some of the considerations considered include site constraints, geotechnical constraints, construction staging/duration, traffic maintenance, and an implementation risk assessment.

3.3. Evaluation Process

During the illustrative alternatives stage of the work, and in consultation with stakeholders, the seven factors described above were weighted, giving more weight to factors whose impacts are considered to be more important. These factors guided the technical studies and helped the study team focus on the issues that matter most to the host communities. Evaluation throughout the study has consistently been measured against these seven factors to provide a fair and replicable evaluation process for identifying a solution that best balances project objectives, community needs and technical requirements.

The practical alternatives have been evaluated in the overall context of the international and national significance of the Detroit River crossing in terms of the economy, security, and ability to provide continuous river crossing capacity. A full evaluation, however, cannot be completed without input from the community. Throughout the study, the study team met with the members of the community to gain a local perspective on these issues. The public has helped the study team identify key areas of interest, historical features, and natural areas that need preserving. Through community consultation the study team gained a greater understanding of the importance of air quality to the community and added a field measurement component into the air quality work plan. Residents have told the study team how they feel about their community, how they use their property and how the proposed project may impact those uses. These are just a few examples of the influences the people of Windsor-Essex County have had on the DRIC study.

Data gathered from public meetings, open houses, workshops, focus groups and other correspondence has been included as important information to be considered in relation to the seven major factors groups in the analysis of practical alternatives.

Table 3 below lists how the various factors have been used in evaluating alternatives against each other and in comparison with future conditions without a new crossing (or the "do nothing" alternative). For complete details regarding the factors, refer to the later sections and appendices of this document.

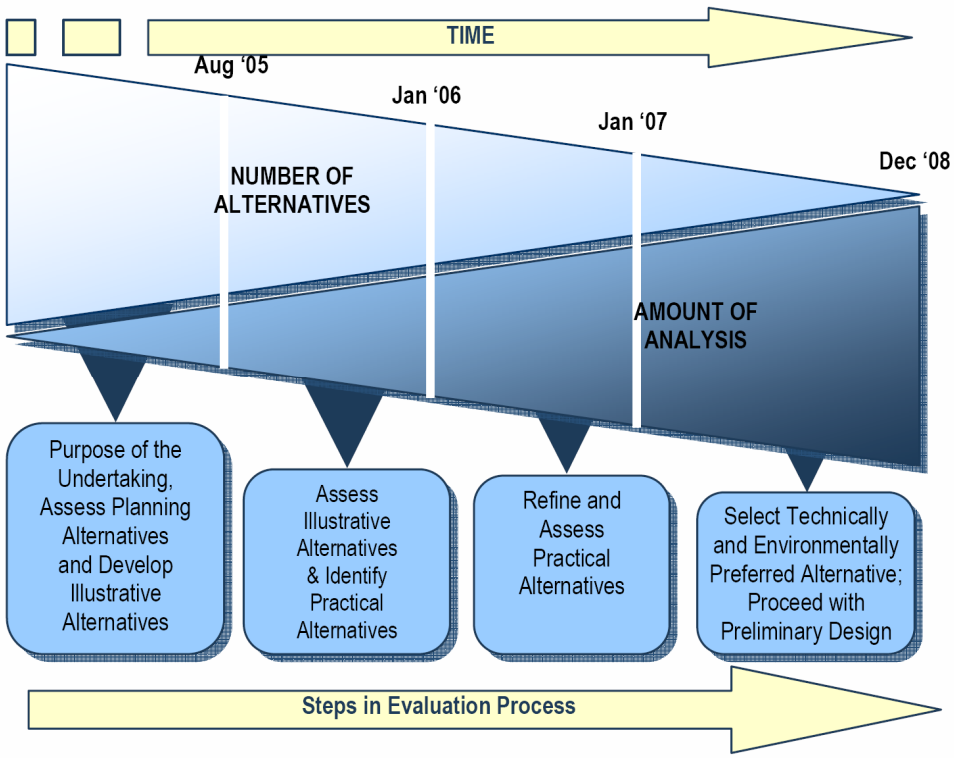
TABLE 3 – FACTORS USED IN PRACTICAL ALTERNATIVES EVALUATION – CANADIAN SIDE

FACTORS	ISSUES
Changes to Air Quality	What is the air like now and will there be changes in the levels of pollutants in the atmosphere in the next 10, 20, and 30 years?
Protection of Community and Neighbourhood Characteristics	How will each alternative affect homes and businesses? How will traffic change? Will there be additional noise and vibration? Can they be mitigated?
Consistency with Existing and Planned Land Use	What currently exists in this area? What is planned for the future of this area? Will introducing any of the alternatives into this area radically change the current uses of the area?
Protection of Cultural Resources	What historical, cultural and archaeological features exist in this area? Are there parks and recreation sites in the area? How will these be impacted by any of the alternatives and how can these be avoided or impacts be mitigated?

FACTORS	ISSUES
Protection of the Natural Environment	What is the natural environment composed of in this area? What species inhabit this area? Will the introduction of any of the alternatives negatively impact ecosystems, species, water systems or other important natural resources? Are there areas of environmental significance or species at risk that may be affected? Are impacts avoidable or can they be reduced or mitigated?
Improvements to Regional Mobility	What will be needed to improve traffic flows in this area? How can a new river crossing and plaza be efficiently managed?
Cost and Constructability	What is the cost of each alternative? Is each alternative constructable? Will each alternative provide value for the tax dollar?

It is important to note that the criteria and indicators implemented in the evaluation of practical alternatives reflect the level of detail available on the alternatives. Additional study will be undertaken for the Technically and Environmentally Preferred Alternative during future stages of design (refer to Exhibit 5).

EXHIBIT 5 – EVALUATION PROCESS



3.3.1. Public Weighting

The Partnership recognized that input from the public, government ministries, departments and agencies, local municipalities and other stakeholders is essential to successful planning of major transportation improvements, such as the Detroit River International Crossing study. Stakeholders and interested individuals were encouraged to provide input to the evaluation of alternatives.

Pubic input to the weighting of the seven evaluation factors was obtained through a rating tool distributed at the first round of public consultation in June 2005 (refer to sample in Exhibit 6). Rating tools were made available at Public Information Open Houses as well as at the local Project Office and on the project website. Interested members of the public were asked to provide the study teams with their opinion as to how highly (on a scale of 0 to 100) the study team should consider each of the factors in deciding on what alternatives to carry forward and which alternatives are to be set aside.

A total of sixty-one valid rating tools were received, including 45 responses from the general public, 15 responses from members of the Community Consultation Group (CCG) and one from a government agency.

The rating tools received from the public and other stakeholders were arithmetically combined and normalized to percents. It is important to note that the public and CCG weighting scenarios were developed mathematically. The weighting scenarios therefore do not reflect a consensus among study participants; individuals that participated in the rating exercise may hold views that vary significantly from those represented in the weighting scenarios.

In addition, over 150 comment sheets were received during the first round of consultation. The most frequent comments received included concerns with:

- Protection of natural features;
- Reduction of impacts to residential areas; and
- Air quality/human health.

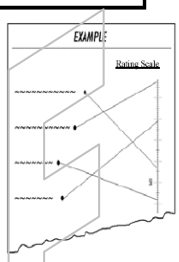
The range of views represented in the rating tools and comment sheets received from the first round of consultation provided the Canadian study team with an understanding of community values with respect to the relative importance of each environmental feature, which subsequently was considered in the study team weighting.

EXHIBIT 6 – RATING TOOL

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

Detroit River International Crossing
Evaluation Factors Rating Tool – Canadian Version, June 2005

The evaluation of alternatives will be considered in the context of the international and national significance of the Detroit River crossing in terms of the economy, security, and ability to provide continuous river crossing capacity. An alternative must meet the stated purpose of the undertaking:
To provide for the safe, efficient and secure movement of people and goods across the Canadian-U.S. border in the Detroit River area to support the economies of Michigan, Ontario, Canada and the U.S.



How Important Are These Factors?

We want to know how you value the evaluation factors listed below. These factors are derived from the listing of factors proposed for the evaluation of illustrative alternatives provided in the approved Terms of Reference for the DRIC Project. To provide us with your opinion, please rate them on the scale of "1" to "100", with the highest rating for the item you believe is the most important. Draw a line from the dot following each factor on the left, to the scale on the right, to indicate your opinion. When finished, return your form to a project representative, or by fax to the number listed at the bottom of this form.

Your opinions will be used to assist the Project Team in the evaluation of the Canadian Illustrative Alternatives of the Detroit River International Crossing Study.

Factor Rating Scale

Changes to Air Quality ●
Protection of Community and Neighborhood Characteristics ●
Consistency with Existing and Planned Land Use ●
Protection of Cultural Resources ●
Protection of Natural Environment ●
Improve Regional Mobility ●
Minimize Cost ●
Other _____ ●

100 90 80 70 60 50 40 30 20 10 0

Comments: _____

Please complete this form and return by July 28th 2005 to:

Mr. Len Kozachuk, P.Eng.,
Consultant Deputy Project Manager
URS Canada Inc.,
75 Commerce Valley Drive East
Markham, Ontario, L3T 7N9
Fax: (905) 882-4399 or (519) 969-5012
info@partnershipborderstudy.com

Submitted By:

Name: _____
Address: _____
City: _____ Postal Code: _____
Phone No.: _____ Fax No.: _____
E-mail: _____

3.3.2. Canadian Study Team Weighting

Canadian study team weighting of the relative importance of the evaluation factors was used in establishing decision rules for the reasoned argument evaluation method, as well as developing weighted scores for the arithmetic evaluation method. Prior to the evaluation of illustrative alternatives, the Canadian study team met to establish the numerical weight (representing level of importance) to assign each of the seven evaluation factors to be used to assess the illustrative alternatives.

Members of the Canadian study team participating in the factor weighting exercise included representatives from the Ontario Ministry of Transportation, Transport Canada and the Consultant Team. The list of participants is as follows:

Study Team Member	Organization	Project Role
Dave Wake	MTO	Project Director, Windsor Projects
Roger Ward	MTO	Project Manager
Joel Foster	MTO	Senior Environmental Planner
Kaarina Stiff	TC	Environmental Assessment Project Manager
Andrew Shea	TC	Senior Policy Advisor
Murray Thompson	URS Canada	Consultant Team Project Manager
Len Kozachuk	URS Canada	Consultant Team Deputy Project Manager
Audrey Steele	LGL Limited	Consultant Team Lead Environmental Planner

The Canadian study team assessed the relative importance of the evaluation factors based on the purpose and objectives of the project as well as data collected on area features; the results of this assessment is summarized as follows:

Firstly, the study team recognized that all seven factors are important to consider in the assessment of alternatives. In assigning a rating (between 0 and 100) for each of the factors, the study team was able to distinguish a degree of importance among the factors, as noted in the following:

Factor	Rationale	Rating
Improve Regional Mobility	The study team considered this factor of highest importance as it reflects one of the primary purposes of the project; a new or expanded crossing and associated inspection plazas and freeway connections are essential to the international economies of Canada and the U.S., Ontario and Michigan and the local economies in the Windsor/Essex County-Detroit/Wayne County region. The new facility will serve the border transportation network well beyond the 30-year planning horizon of this study. Given that this project is likely to generate substantial impacts to the local communities, and over time, communities will adjust to the new transportation network, it is imperative that the improvement that provides the most benefits to the border transportation network be implemented.	100

Factor	Rationale	Rating
Protection of Community & Neighbourhood Characteristics	The study team considered this factor of high importance on the basis that the community and neighbourhoods are sensitive to impacts associated with a major transportation project such as the DRIC. The DRIC will provide direct freeway access from Highway 401 to the new/expanded crossing; as a high-volume, high-speed facility, this project will have an impact on properties and access that could change the function and character of a community or neighbourhood. Reducing the impacts on the community associated with the international traffic facility is a high priority of the study team.	90
Protection of Natural Environment	The study team considered this factor to be of high importance on the basis that the remaining woodlot, prairie and wetland features provide unique habitat for some rare and endangered species. Federal, provincial and local municipal designations have been placed on many of the remaining natural features in the project study area. Local municipalities have incorporated the sensitive natural areas into their local planning to preserve and protect these features for their habitat value, as well as being important community recreational features.	90
Minimize Cost[2]	The study team considered this factor to be of moderate to high importance on the basis that this factor addresses cost and constructability of the new or expanded crossing. This project will be paid for by government funds and/or through tolls paid by users; minimizing the costs of the project will reduce the costs to users and/or taxpayers. In addition, the objectives of this project call for a new or expanded crossing to be in place as quickly as possible to reduce the potential for disruption to the movement of people and goods at this crucial border crossing. Reducing construction impacts and risks is important for the timely completion of this project.	75
Changes to Air Quality	This factor was considered of moderate importance by the study team on the basis that transportation is a minor contributor to ambient pollutants in the Windsor/Essex area; the majority of airborne pollutants and toxics are from industrial sources in the Windsor-Detroit area and external. The study team observed that by giving greater importance to protection of community and neighbourhood characteristics and protection of natural features, impacts to sensitive receivers for air quality will be reduced; it is recognized that this factor was rated as of highest importance by the public and CCG.	70
Protection of Cultural	The study team considered this factor to be of moderate importance on the basis that much of the project area is	70

[2] In the evaluation of illustrative alternatives, this factor was entitled Minimize Cost; for the evaluation of practical alternatives, the title of this factor was revised to Cost and Constructability to more accurately reflect the basis of the assessment.

Factor	Rationale	Rating
Resources	disturbed by development and/or agriculture. As well, the level of importance assigned to this factor reflects that impacts to such features can usually be mitigated to reduce the effects to the resource. MTO has established procedures with First Nations to avoid or minimize impacts to archaeological features. Built features can usually be mitigated by avoidance or relocation of the feature.	
Maintain Consistency with Existing and Planned Land Use	The study team considered this factor to be of moderate importance on the basis that many of the aspects of minimizing impacts to existing land use are addressed in the assessment of impacts to neighbourhoods and communities, and that future land use designations can be changed to reflect provincial and federal land use initiatives and priorities. It is recognized that the local municipalities in the Windsor-Essex County area have Official Plans that identify municipal planning objectives for land use and municipal aspirations for growth.	70

The rating and weights developed by the study team, members of the public and the CCG are presented in Table 4:

TABLE 4 – RATINGS AND WEIGHTS

Factor	Study Team		Public		CCG	
	Rating	Weight (%)	Rating	Weight (%)	Rating	Weight (%)
Changes to Air Quality	70	12.39	85	17.32	91	17.30
Protection of Community & Neighbourhood Characteristics	90	15.93	80	15.49	73	13.88
Maintain Consistency with Existing & Planned Land Use	70	12.39	62	12.89	72	13.69
Protection of Cultural Resources	70	12.39	66	13.14	69	13.12
Protection of Natural Environment	90	15.93	78	16.34	90	17.11
Improve	100	17.70	76	15.28	78	14.83

Factor	Study Team		Public		CCG	
	Rating	Weight (%)	Rating	Weight (%)	Rating	Weight (%)
Regional Mobility						
Minimize Cost[3]	75	13.27	47	9.54	53	10.07
		100		100		100

Scoring

The Canadian study team used a 1 to 7 scoring scale to identify the magnitude of an impact or benefit as follows:

1	2	3	4	5	6	7
High Impact	Moderate Impact	Low Impact	Neutral/ No Impact	Low Benefit	Moderate Benefit	High Benefit

Members of the Canadian study team that led the impact assessment scoring of the practical alternatives included specialists and experts in each of the evaluation factor areas on the Consultant Team. The list of lead participants is as follows:

Factor	Study Team Members	Company
Changes to Air Quality	Chris Marson Sandy Willis	SENES SENES
Protection of Community & Neighbourhood Characteristics	Gwen Brice Fred Bernard Russell Mathews	SENES SENES Hemson Consulting
Maintain Consistency with Existing & Planned Land Use	Irene Hauzar Peter Top	URS Canada URS Canada
Protection of Cultural Resources	Robert Pihl Gwen Brice	Archaeological Services Inc. SENES
Protection of Natural Environment	Grant Kauffman Storer Boone Irene Hauzar	LGL Golder Associates URS Canada
Improve Regional Mobility	Ilya Sher Bruce Mori	URS Canada IBI Group
Cost and Constructability	Murray Thompson George Katic Steve Stroh Storer Boone	URS Canada URS Canada URS Tampa Golder Associates

[3] In the evaluation of illustrative alternatives, this factor was entitled Minimize Cost; for the evaluation of practical alternatives, the title of this factor was revised to Cost and Constructability to more accurately reflect the basis of the assessment.

3.4. Evaluation of Crossing A Corridor Alternatives

The geometric constraints posed by the navigational clearances over the Detroit River, the grade separation at the Ojibway Parkway and Essex Terminal Railway (ETR) corridors, and the maximum design grade of the crossing and approach roadways eliminate the possibility for Crossing A to connect into a plaza in the Plaza B area (i.e. west of ETR). Similarly, a connection from Crossing A to Plaza C was deemed too circuitous and inefficient to be considered a reasonable alternative. Therefore, Crossing A was evaluated solely in combination with Plaza A, and as such, was carried forward in the assessment.

Plaza A is located along the south side of the E.C. Row Expressway between Malden Road and Ojibway Parkway. This alternative falls within Windsor's Malden Planning District, which is largely a residential community integrated with a protected natural area. Some of the residential areas along Matchette Road, Beech Street, Chappus Street and Armanda Street dates back to the 1930's. New residential development is also occurring on lands immediately south of E.C. Row Expressway. Current residents describe the character of the community primarily as having a natural setting, with the feeling of living in the country while enjoying the amenities of the city.

Table 5 provides a summary of the analysis of Crossing A-Plaza A.

TABLE 5 – SUMMARY OF ANALYSIS – CROSSING A - PLAZA A

Evaluation Factor	Measure	Crossing A-Plaza A
Changes to Air Quality	Changes in $PM_{2.5}$ Concentration	Increases in $PM_{2.5}$ within 250 m of crossing and plaza under certain conditions; potential to influence air quality in Armanda Street/Matchette Road area
	Changes in NO_x Concentrations	Increases in NO_x within 250 m of crossing and plaza under certain conditions; potential to influence air quality in Armanda Street/Matchette Road area
Protection of Community and Neighbourhood Characteristics	Effect on Local Access – Number of Roads Crossed / Closed / Connected	7 crossings / 7 closings / 4 connections – Matchette Road realignment; Minor out-of-way travel
	Noise receptors with change in noise levels >5 dBA (2035; with mitigation; compared to future do-nothing)	1
	Potential Acquisitions Households	62
	Potential Acquisitions Businesses/Industries	1
	Social Features (institutional) displaced	1 – Erie Wildlife Rescue
	Overall Effect on Community Character/Cohesion	Negative effect on community character for Armanda Street/Matchette Road neighbourhood due to displacement of homes and proximity of neighbourhood to new plaza
Maintain Consistency with Existing and Planned Land Use	Consistency	Plaza location not consistent with existing land uses of the Malden Planning District; impacts to existing and planned residential uses Crossing and approach are consistent as these are located in industrial area;
	Known Contaminated Sites Impacted – No./Area (ha)	4 sites/1 ha
Protect Cultural Resources	Designated built heritage features potentially displaced	1 Cultural Landscape Unit – Brighton Beach 1 Built Heritage Feature
	Direct impacts to Parks	Ojibway Park (0.7 ha)
	Potential archaeological sites affected	0 – pre-contact habitation site/Euro-Canadian homesteads 6 – pre-contact findspots
Protect the Natural Environment	Feature impacts	Loss of 2.98 ha of provincially rare vegetation communities Loss of 232 specimens/colonies of species at risk Approximately 7.38ha of designated natural areas within the 120m of proposed property limit
Improve Regional Mobility	2035 Average Daily Car and Truck Volume	Canadian plaza and crossing sized to accommodate average daily traffic of 39,000 vehicles (cars and trucks) in 2035.
	Distance from plaza to international border	2.5 km
	Canadian Plaza Operational Considerations	Good accessibility to/from local road network Good access to local utilities for site services Distance from border to plaza > 1.5 km is less desirable; requires on-going security monitoring; 700 m section of at-grade roadway through vacant lands also a security/monitoring concern Plaza provides sufficient size for addressing needs to 2035 and beyond; while there is flexibility to address new/expanded inspection functions within the plaza site, expansion of plaza beyond the identified footprint may be problematic due to existing land uses adjacent to the plaza site.
Cost and Constructability	Is it constructable?	Yes
	Key Issues	Length of main span (approx. 1200 m) means suspension bridge is only practical bridge type; Risk and additional cost associated with project timeframe is high due to magnitude of required construction and longer main-span.
	Construction cost, 2011 CDN $	$830-million (Malden Road to international border, including one-half of crossing construction cost)

3.5. Evaluation of Crossing B Corridor Alternatives

Crossing B can connect to either Plaza A or Plaza B1. Plaza B1 is situated west of Ojibway Parkway on lands acquired by the City of Windsor for the purposes of establishing an industrial park. The Brighton Beach Industrial Park is named after the former Brighton Beach neighbourhood which previously occupied these lands. Over time, most of the residences have been acquired and removed so the area is generally vacant. The industrial area also includes the OPG Brighton Beach and West Windsor power plants, the Nemak Automotive manufacturing plant, Keith Transformer Station, Windsor Salt, and aggregate storage facilities.

Table 6 provides a summary of a comparison of Plaza A and Plaza B1 alternatives with Crossing B based on the results of the analysis.

TABLE 6 – SUMMARY OF ANALYSIS – CROSSING B ALTERNATIVES

Evaluation Factor	Measure	Crossing B - Plaza A	Crossing B - Plaza B1
Changes to Air Quality	Changes in $PM_{2.5}$ Concentration	Increases in PM2.5 within 250 m of crossing and plaza under certain conditions	
	Changes in NO_x Concentrations	Increases in NOx within 250 m of crossing and plaza under certain conditions	
Protection of Community and Neighbourhood Characteristics	Effect on Local Access – Number of Roads Crossed / Closed / Connected	4 crossings / 9 closings / 4 connections – Minor out-of-way travel; Matchette Road realignment	4 crossings / 12 closings / 4 connections – Minor out-of-way travel
	Noise receptors with change in noise levels >5 dBA (2035; with mitigation; compared to future do-nothing)	2	0
	Potential Acquisitions Households	65	36
	Potential Acquisitions Businesses/Industries	1	1
	Social Features (institutional) displaced	1 (Erie Wildlife Rescue)	
	Overall Effect on Community Character/Cohesion	Negative effect on community character for Armanda Street/Matchette Road neighbourhood due to displacement of homes and proximity of neighbourhood to new plaza	Negative effect on community character for Matchette Road/Chappus Street neighbourhood due to displacement of several homes to accommodate interchange connection at E.C. Row/Ojibway Pkwy
Maintain Consistency with Existing and Planned Land Use	Consistency	Plaza location not consistent with existing land uses and zoning in Malden Planning District Crossing and approach are located in portland industrial area and are considered to be consistent	Plaza located in industrial area; more consistent with existing land uses and zoning Crossing and approaches are located in portland industrial area and are considered to be consistent
	Known Contaminated Sites Impacted – No./Area (ha)	11 sites/5 ha	17 sites/24 ha
Protect Cultural Resources	Designated built heritage features potentially displaced	1 Cultural Landscape Unit - Brighton Beach 2 Built Heritage Features – house	1 Cultural Landscape Unit - Brighton Beach 3 Built Heritage Features – houses
	Direct impacts to Parks	Ojibway Park (0.7 ha)	Ojibway Park (0.7 ha)
	Potential archaeological sites affected	0 – pre-contact habitation site/Euro-Canadian homesteads 6 – pre-contact findspots	2 – pre-contact habitation site/Euro-Canadian homesteads 4 – pre-contact findspots
Protect the Natural Environment	Feature impacts	Loss of 2.70 ha of provincially rare vegetation communities Loss of 223 specimens/colonies of species at risk Approximately 2.38 ha of designated natural areas within 120m of proposed property limit	Loss of 1.09 ha of provincially rare vegetation communities Loss of 185 specimens/colonies of species at risk Approximately 10.96 ha of designated natural areas within 120m of proposed property limit
Improve Regional Mobility	2035 Average Daily Car and Truck Volume	Canadian plaza and crossing sized to accommodate average daily traffic of 39,000 vehicles (cars and trucks) in 2035.	
	Distance from plaza to international border	2.9 km	1.4 km
	Canadian Plaza Operational Considerations	Distance from border to plaza > 1.5 km is less desirable; requires on-going security monitoring; 700 m section of at-grade roadway through vacant lands also a security/ monitoring concern	Distance to plaza < 1.5 km is preferable; good (direct) sight lines between plaza and crossing
Cost and Constructability	Is it constructable?	Yes	
	Key Issues	No issues affecting cost and constructability identified	
	Construction cost, 2011 CDN $	$687-million to $751-million (Malden Road to international border, including one-half of crossing construction cost)	$648-million to $712-million (Malden Road to international border, including one-half of crossing construction cost)

Evaluation Factor	Measure	Crossing B - Plaza A	Crossing B - Plaza B1
Summary of Assessment	Both alternatives have similar effects on air quality and cultural resources and similar cost estimates. The Plaza A alternative displaces more residences and is considered to have a greater negative effect on the residential neighbourhood of Broadway Street/Matchette Road/Armanda Street. These greater effects are due to the proximity of the residential neighbourhood to the plaza. In addition to higher direct effects, the Plaza A alternative is determined to have higher indirect and nuisance effects for residences in proximity to the plaza site. Plaza B1 is located in an industrial park, and is therefore considered to have less community impacts and greater consistency with land use. The Plaza A alternative also results in a greater impact to natural features than the Plaza B1 alternative. Operationally, both plazas will operate well under future peak travel demand. However Plaza B1 is preferred over Plaza A based on the shorter distance to the international border and the direct connection between the crossing and the plaza (less security/monitoring requirements). Based on this assessment, Plaza B1 provides more transportation and mobility benefits and fewer impacts. **Plaza B1 is preferred to Plaza A for connecting to Crossing B.**		

3.5.1. Changes to Air Quality

The results of the air quality modeling of the plaza and Crossing B combinations indicate that the greatest changes to air quality occur around the plaza areas as opposed to the crossings. This is due in part to the more stationary/idling nature of traffic in the plazas as opposed to the more free-flowing movement of traffic on the bridge and the ability of the elevated portions of the crossing to assist in dispersing vehicle emissions. As the plazas and crossings are proposed to be located in an area where there is not a high volume of traffic, all plaza and crossing alternatives result in increases in pollutant concentrations associated with vehicle emissions over the no-build scenario. Both plaza alternatives result in increases in concentrations of particulate matter ($PM_{2.5}$) and gaseous pollutants (NOx) compared to the do-nothing scenario. For both alternatives, the increases can extend approximately 250m from the plazas under certain conditions. The Plaza A alternative would therefore influence $PM_{2.5}$ and NO_x concentrations in the Armanda Street/Matchette Road area under certain conditions. Based on this analysis, both alternatives were considered to have a moderate impact on changes in air quality.

3.5.2. Protection of Community and Neighbourhood Characteristics

The Plaza A alternative has a higher impact to community and neighbourhood features than the Plaza B1 alternative. This assessment is based on there being a higher degree of change in neighbourhood character from park-like residential to industrial with the introduction of the Plaza A site, as well as 29 more homes being displaced by the Plaza A alternative. Changes in noise levels around the plazas can be reduced to acceptable levels (within 5 dB of the no-build scenario), except for some receptors near the E.C. Row Expressway. Additional investigations on cost-effective mitigation will be undertaken as required for the preferred alternative. While berms, barriers and landscaping can be implemented around the perimeter of the plaza to reduce aesthetic impacts and mitigate changes to 24-hr noise levels, approximately 112 residences within 250 m of Plaza A would be exposed to nuisance effects (e.g. light pollution, dust and nuisance noise), impacting the day-to-day use and enjoyment of property. Lighting trespass from the plaza may also disturb adjacent residences between sunset and sunrise, particularly in winter when foliage is off the trees and shrubs that provide some buffering between the Armanda Street neighbourhood and the Plaza A site. Plaza A also requires realignment of Matchette Road around the west end of the plaza. This realignment creates some out-of-way travel for motorists traveling in/out or through the Armanda Street/Matchette Road area.

In terms of impact on existing businesses, none of the alternatives are expected to have any substantive, long-lasting economic impacts for this part of the city. This is due to the nature of the businesses impacted and the ability to relocate elsewhere in the area.

Based on this analysis, the Plaza A alternative was considered to have a high impact to community characteristics and the Plaza B1 alternative was considered to have a moderate impact.

3.5.3. Maintain Consistency with Existing and Planned Land Use

A new inspection plaza in the Matchette Road/Malden Road area is not considered to be consistent with the land uses permitted in the Malden Planning District. The Plaza A site is designated for residential development, while the Plaza B1 site is designated for

industrial uses and is considered to be highly consistent with the local land use. The Plaza A alternative is therefore considered to have a higher impact on land use.

The Plaza B1 alternative impacts a greater number of known contaminated and high risk sites (17 vs. 11); Plaza A alternative was noted as having a lower risk of encountering contamination.

Based on this analysis, the Plaza A alternative was considered to have a moderate impact to land use and the Plaza B1 alternative was considered to have a low impact.

3.5.4. Protect Cultural Resources

Neither plaza alternative impacts any national, provincial or municipally listed built heritage resources. Plaza B1 impacts 6 known small pre-contact habitation sites/Euro-Canadian homestead sites, the same amount as with Plaza A. Overall, there is no notable difference among the two plaza alternatives in terms of impact to cultural resources. Both were considered to have a low impact.

3.5.5. Protect the Natural Environment

Both alternatives result in some loss of provincially rare specimens or colonies, impacts to ecological landscapes and impacts to terrestrial communities and ecosystems of high significance. The Plaza A alternative has a greater impact to natural features than Plaza B1. The Plaza A alternative results in the loss of 2.70 ha of provincially rare vegetation and 223 specimens/colonies of provincially rare plants, compared to 1.09 ha and 185 specimens/colonies respectively with the Plaza B1 alternative.

The Plaza B1 alternative was noted as affecting a greater area of designated natural areas; this is due primarily to the proximity of this plaza to the Black Oak Woods Heritage Park, which is located along the south side of Broadway Street, along the southern edge of the plaza site. Overall, the Plaza A alternative was considered to have a high impact to natural features and the Plaza B1 alternative was considered to have a moderate impact.

3.5.6. Improve Regional Mobility

Both plaza/crossing alternatives are expected to work effectively under future (2035) peak travel demands and add additional border crossing and border processing capacity to the Detroit River border transportation network. The distance from Plaza A to the international border approximately mid-way across Crossing B is 2.9 km. Canada Border Services Agency has identified that keeping this distance from the border to the plaza to less than 1.5 km is desirable from a security/monitoring perspective, as it lessens the requirements for on-going security/monitoring. The Plaza A alternative also has a 700 m section of at-grade roadway in the Brighton Beach industrial park area, which is out of the direct line of sight from the plaza. These characteristics are notable security/monitoring concerns. Plaza B1 connects directly to Crossing B, so there are no similar security/monitoring concerns with this alternative.

Based on this analysis, the Plaza B1 alternative was considered to provide high benefits to regional mobility, and Plaza A was considered to provide moderate benefits.

3.5.7. Cost and Constructability

Both the Plaza A and Plaza B1 alternatives are considered to be constructible. The Crossing B/Plaza B1 alternative has the lowest estimated construction cost of all the

crossing/plaza alternatives. However, the $39 million difference between the costs of the two Crossing B alternatives represents a difference of less than 10% of the total estimated construction cost, and so was not considered a notable cost difference at this stage of the project. Both alternatives were considered to have moderate impacts.

3.5.8. Overall Assessment

Both alternatives have similar effects on air quality and cultural resources and similar cost estimates. The Plaza A alternative displaces more residences and is considered to have a greater negative effect on the residential neighbourhood of Broadway Street/Matchette Road/Armanda Street. These greater effects are due to the proximity of the residential neighbourhood to the plaza. In addition to higher direct effects, the Plaza A alternative is determined to have higher indirect and nuisance effects for residences in proximity to the plaza site. Plaza B1 is located in an industrial park, and is therefore considered to have less community impacts and greater consistency with land use. The Plaza A alternative also results in a greater impact to natural features than the Plaza B1 alternative.

Operationally, both plazas will operate well under future peak travel demand. However Plaza B1 is preferred over Plaza A based on the lower distance to the international border and the direct connection between the crossing and the plaza (less security/monitoring requirements).

Based on this assessment, Plaza B1 provides more transportation and mobility benefits and fewer impacts. Plaza B1 is preferred to Plaza A for connecting to Crossing B.

3.5.9. Arithmetic Method – Crossing B Corridor Alternatives

In accordance with the evaluation process developed for this study, this assessment was also conducted using an arithmetic approach (weighted scoring), based on factor scores assigned by the factor specialists and factor weighting scenarios developed earlier in the study.

The results of this assessment are presented in Table 7. As can be seen in the table, the arithmetic results are consistent with the reasoned argument evaluation considering both the unweighted and weighted scores, as well as across all three weighting scenarios. Plaza B1 is the preferred Canadian plaza for Crossing B.

TABLE 7 – RESULTS OF ARITHMETIC EVALUATION – CROSSING B ALTERNATIVES

STUDY TEAM WEIGHTING

Factor	Weight	Plaza A		Plaza B1	
		Score	Weighted Score	Score	Weighted Score
Changes in Air Quality	12.39	2	24.78	2	24.78
Protection of Community and Neighbourhood Characteristics	15.93	1	15.93	2	31.86
Maintain Consistency with Existing and Planned Land Use	12.39	2	24.78	3	37.17
Protect Cultural Resources	12.39	3	37.17	3	37.17
Protect the Natural Environment	15.93	1	15.93	2	31.86
Improve Regional Mobility	17.70	5	88.50	6	106.20
Cost and Constructability	13.27	2	26.54	2	26.54
Total	100.00	16	233.63	20	295.58
Rank	Unweighted	2		1	
	Weighted		2		1

PUBLIC WEIGHTING

Factor	Weight	Plaza A		Plaza B1	
		Score	Weighted Score	Score	Weighted Score
Changes in Air Quality	17.32	2	34.64	2	34.64
Protection of Community and Neighbourhood Characteristics	15.49	1	15.49	2	30.98
Maintain Consistency with Existing and Planned Land Use	12.89	2	25.78	3	38.67
Protect Cultural Resources	13.14	3	39.42	3	39.42
Protect the Natural Environment	16.34	1	16.34	2	32.68
Improve Regional Mobility	15.28	5	76.40	6	91.68
Cost and Constructability	9.54	2	19.08	2	19.08
Total	100.00	16	227.15	20	287.15
Rank	Unweighted	2		1	
	Weighted		2		1

COMMUNITY CONSULTATION GROUP WEIGHTING

Factor	Weight	Plaza A		Plaza B1	
		Score	Weighted Score	Score	Weighted Score
Changes in Air Quality	17.30	2	34.60	2	34.60
Protection of Community and Neighbourhood Characteristics	13.88	1	13.88	2	27.76
Maintain Consistency with Existing and Planned Land Use	13.69	2	27.38	3	41.07
Protect Cultural Resources	13.12	3	39.36	3	39.36
Protect the Natural Environment	17.11	1	17.11	2	34.22
Improve Regional Mobility	14.83	5	74.15	6	88.98
Cost and Constructability	10.07	2	20.14	2	20.14
Total	100.00	16	226.62	20	286.13
Rank	Unweighted	2		1	
	Weighted		2		1

3.6. Evaluation of Crossing C Corridor Alternatives

Crossing C can connect to Plazas A, B and C. The connection from Plaza A to Crossing C was assessed assuming two different routes. One route followed the alignment of Ojibway Parkway, passing between the Nemak Plant and the City of Windsor's Lou Romano Water Reclamation Plant. The second route paralleled Broadway Street and Sandwich Street, passing through the Brighton Beach industrial area.

Plaza B is located in the Brighton Beach industrial area west of Ojibway Parkway and north of Broadway Street. Plaza C is located north of the Plaza B site, in the area west of Sandwich Street and south of Prospect Avenue. Residents of Sandwich have indicated to the study team that many consider Prospect Avenue as the southern limit of their community. Portions of the Plaza C site are currently occupied by the OPG Brighton Beach Power Station, the Keith Transformer Station as well as vacant land. A portion of the plaza site is also occupied by Southwestern Sales Corporation, which stores and distributes aggregate and other construction materials.

The results of the geotechnical deep drilling program identified the need to incorporate a cable-stayed or suspension bridge for the approach to Crossing C to mitigate the considerable issues associated with the uncertain bedrock integrity. This would result in a significant cost premium (approximately $325-million) as well as an impact to the construction schedule as compared to the other two crossing alternatives, which would feature more conventional approach structures.

Table 8 provides a summary of a comparison of Plaza A, B and C alternatives with Crossing C based on the results of the analysis.

3.6.1. Changes to Air Quality

As the plazas and crossings are proposed to be located in an area where there is not a high volume of traffic, all four plaza/crossing alternatives result in increases in pollutant concentrations associated with vehicle emissions over the no-build scenario. For all alternatives, under certain conditions, the increases can extend approximately 250m from the crossing and plazas. The crossing would therefore influence $PM_{2.5}$ and NO_x concentrations in portions of Sandwich for all alternatives, while the Plaza A alternatives would influence $PM_{2.5}$ and NO_x concentrations in the Matchette Road/Armanda Street area. The Plaza B and C alternatives would not affect the air quality of the Armanda Street area as these alternatives are sufficiently removed from this area. The layout of Plaza C provides a greater buffer area around the tolling/inspection aprons where vehicles would tend to queue in comparison to the Plaza B option. As a result, concentrations of particulate and gaseous pollutants at 50m and 100m from the property limit of Plaza C would generally be less than those at such distances from the Plaza B property limit.

TABLE 8 – SUMMARY OF ANALYSIS – CROSSING C ALTERNATIVES

Evaluation Factor	Measure	Crossing C-Plaza A (via Ojibway Parkway)	Crossing C – Plaza A (via Brighton Beach)	Crossing C - Plaza B	Crossing C-Plaza C
Changes to Air Quality	Changes in $PM_{2.5}$ Concentration	Slight increases in $PM_{2.5}$ within 250 m of crossing and plaza under certain conditions; potential to influence air quality in Armanda Street area and portion of Sandwich		Slight increases in $PM_{2.5}$ within 250 m of crossing and plaza under certain conditions; potential to influence air quality in portion of Sandwich	
	Changes in NO_x Concentrations	Slight increases in NOx within 250 m of crossing and plaza under certain conditions; potential to influence air quality in Armanda Street area and portion of Sandwich		Slight increases in NOx within 250 m of crossing and plaza under certain conditions; potential to influence air quality in portion of Sandwich	
Protection of Community and Neighbourhood Characteristics	Effect on Local Access – Number of Roads Crossed / Closed / Connected	7 crossings / 4 closings / 4 connections – – minor out-of-way travel; Matchette Road realignment	7 crossings / 3 closings / 4 connections – minor out-of-way travel; Matchette Road realignment	7 crossings / 16 closings / 5 connections – minor out-of-way travel; Relocation of Broadway Street / Sandwich Street connection	5 crossings / 13 closings / 4 connections – minor out-of-way travel
	Noise receptors with change in noise levels >5 dBA (2035; with mitigation; compared to future do-nothing)	3	4	0	0
	Potential Acquisitions Households	64	66	38	35
	Potential Acquisitions Businesses/Industries	6	5	5	5
	Social Features (institutional) displaced	1 (Erie Wildlife Rescue)			
	Overall Effect on Community Character/Cohesion	Negative effect on community character for Armanda Street neighbourhood due to proximity of new plaza; Negative effect on community character for Sandwich Towne due to proximity of new crossing.		Negative effect on community character for Sandwich Towne due to proximity of new crossing.	
Maintain Consistency with Existing and Planned Land Use	Consistency	Plaza location not consistent with existing land uses of the Malden Planning District; impacts to existing and planned residential uses Crossing and approaches located in occupied and vacant industrial areas; consistent	Plaza location not consistent with existing land uses of the Malden Planning District; impacts to existing and planned residential uses Crossing and approaches located in occupied and vacant industrial areas; consistent	Plaza location in occupied and vacant industrial areas; consistent Crossing and approaches located in occupied and vacant industrial areas; consistent	Plaza location in occupied and vacant industrial areas; consistent Crossing and approaches located in occupied and vacant industrial areas; consistent
	Known Contaminated Sites Impacted – No./Area (ha)	22 sites/12 ha	29 sites/24 ha	29 sites/24 ha	30 sites/50 ha
Protect Cultural Resources	Designated built heritage features potentially displaced	2 Cultural Landscape Units – Brighton Beach; unconfirmed tunnel 1 Built Heritage Feature - house	2 Cultural Landscape Units – Brighton Beach; unconfirmed tunnel 2 Build Heritage Features – houses	2 Cultural Landscape Units – Brighton Beach; unconfirmed tunnel 3 Built Heritage Features – houses	2 Cultural Landscape Units – Brighton Beach; unconfirmed tunnel 2 Built Heritage Features – houses
	Direct impacts to Parks	Ojibway Park (0.7 ha)	Ojibway Park (0.7 ha)	Ojibway Park (0.7 ha)	Ojibway Park (0.7 ha)
	Potential archaeological sites affected	0 – pre-contact habitation sites/Euro-Canadian homesteads 5 – pre-contact findspots	0 – pre-contact habitation sites/Euro-Canadian homesteads 6 – pre-contact findspots	3 – pre-contact habitation sites/Euro-Canadian homesteads 4 – pre-contact findspots	1 – pre-contact habitation sites/Euro-Canadian homesteads 3 – pre-contact findspots
Protect the Natural Environment	Feature impacts	loss of 2.70 ha of provincially rare vegetation communities loss of 186 specimens/colonies of species at risk Approximately 1.73 ha of designated natural areas within 120m of proposed property limit	loss of 2.69 ha of provincially rare vegetation communities loss of 231 specimens/colonies of species at risk Approximately 1.48 ha of designated natural areas within 120m of proposed property limit	loss of 2.02 ha of provincially rare vegetation communities loss of 195 specimens/colonies of species at risk Approximately 14.82 ha of designated natural areas within 120m of proposed property limit	loss of 0.89 ha of provincially rare vegetation communities loss of 153 specimens/colonies of species at risk Approximately 7.77 ha of designated natural areas within 120m of proposed property limit

<table>
<tr><th>Evaluation Factor</th><th>Measure</th><th>Crossing C-Plaza A
(via Ojibway Parkway)</th><th>Crossing C – Plaza A
(via Brighton Beach)</th><th>Crossing C - Plaza B</th><th>Crossing C-Plaza C</th></tr>
<tr><td rowspan="3">Improve Regional Mobility</td><td>2035 Average Daily Car and Truck Volume</td><td colspan="4">Canadian plaza and crossing sized to accommodate average daily traffic of 39,000 vehicles (cars and trucks) in 2035.</td></tr>
<tr><td>Distance from plaza to international border</td><td>3.0 km</td><td>3.9 km</td><td>2.3 km</td><td>1.6 km</td></tr>
<tr><td>Canadian Plaza Operational Considerations</td><td>Good accessibility to/from local road network
Good access to local utilities for site services
Distance from border to plaza > 1.5 km is less desirable; requires on-going security monitoring; section of at-grade roadway through vacant land use also a security/monitoring concern
Plaza provides sufficient size for addressing needs to 2035 and beyond; while there is flexibility to address new/expanded inspection functions within the plaza site, expansion of plaza beyond the identified footprint may be problematic due to existing land uses adjacent to the plaza site.</td><td>Good accessibility to/from local road network
Good access to local utilities for site services
Distance from border to plaza > 1.5 km is less desirable; requires on-going security monitoring; section of at-grade roadway through vacant land use also a security/monitoring concern
Plaza provides sufficient size for addressing needs to 2035 and beyond; while there is flexibility to address new/expanded inspection functions within the plaza site, expansion of plaza beyond the identified footprint may be problematic due to existing land uses adjacent to the plaza site.</td><td>Good accessibility to/from local road network
Good access to local utilities for site services
Distance from border to plaza > 1.5 km is less desirable; requires on-going security monitoring; section of at-grade roadway through vacant land use also a security/monitoring concern
Plaza provides sufficient size for addressing needs to 2035 and beyond; while there is flexibility to address new/expanded inspection functions within the plaza site, expansion of plaza beyond the identified footprint may be problematic due to existing land uses adjacent to the plaza site.</td><td>Good accessibility to/from local road network
Good access to local utilities for site services
Distance from border >1.5 km, however the road connection is elevated with direct connection to crossing; good (direct) sight lines between plaza and crossing
Plaza provides sufficient size for addressing needs to 2035 and beyond; while there is flexibility to address new/expanded inspection functions within the plaza site, expansion of plaza beyond the identified footprint may be problematic due to existing land uses adjacent to the plaza site.</td></tr>
<tr><td rowspan="3">Cost and Constructability</td><td>Is it constructible?</td><td colspan="4">Yes, but results of geotechnical investigations identified that there is a subsurface cavity caused by salt extraction activities in the vicinity of Sandwich Street and Prospect Avenue. Further settlements due to this cavity represent risks to the design and operation of the approach roadway connecting to Crossing C. It is not certain that further investigation will be successful in reducing or eliminating these risks.</td></tr>
<tr><td>Key Issues</td><td>Costs and risks associated with approach road crossing of brine well area
Direct impact to Sterling Marine Fuels fueling depot</td><td>Costs and risks associated with approach road crossing of brine well area
Direct impact to Sterling Marine Fuels fueling depot</td><td>Costs and risks associated with approach road crossing of brine well area
Direct impact to Sterling Marine Fuels fueling depot</td><td>Costs and risks associated with approach road crossing of brine well area
Costs and risks associated with relocation of Keith Transformer Station
Direct impact to Sterling Marine Fuels fueling depot</td></tr>
<tr><td>Construction cost, 2011 CDN $</td><td>$979-million to $1,049-million
(Malden Road to international border, including one-half of crossing construction cost)</td><td>$985-million to $1,055-million
(Malden Road to international border, including one-half of crossing construction cost)</td><td>$1,015-million to $1,085-million
(Malden Road to international border, including one-half of crossing construction cost)</td><td>$1,142-million to $1,212-million
(Malden Road to internationall border, including one-half of crossing construction cost)</td></tr>
<tr><td colspan="2">Summary of Assessment</td><td colspan="4">The Plaza A alternatives were considered to have higher overall impacts in comparison to the Plaza B and Plaza C alternatives. The Plaza A alternatives result in greater direct and indirect nuisance impacts to the residential and natural areas in the Matchette Road/E.C. Row/Armanda Street area due to the location of this plaza. In addition, the distance between the plaza and the border with the Plaza A alternatives is well beyond the desirable distance identified by Canada Border Services Agency, resulting in greater monitoring/security concerns compared to the other alternatives. Finally, the Plaza A alternatives offered no advantages over the Plaza B and C alternatives with the connection to Crossing C.
The Plaza C alternative is noted as having slightly less impact on local air quality due to the layout of the plaza and greater buffer area provided around the apron area of the plaza in comparison to Plaza B. The Plaza C alternative was also found to have lower impacts to significant natural features than the Plaza B alternative. However, the Plaza C alternative carries substantially higher construction costs, and the potential to add several more years to the construction period than the Plaza B alternative due to the conflict with the Keith Transformer Station.
The differences in air quality impacts between the Plaza B and C alternatives are notable, but of no consequence in this industrial area of west Windsor as no sensitive receivers are located within 250 m of either plaza. The difference in impacts to natural features between the Plaza B and C alternatives is predominately related to terrestrial communities of high significance and provincially rare specimens/colonies. The Plaza B option impacts two additional areas of high significance habitat, resulting in approximately one hectare more area impacted, and 195 specimens/colonies compared to 153 with the Plaza C alternative. In either case, mitigation of impacts through integration, relocation and salvage will be required for the habitat of high significance and provincially rare specimens/colonies with either alternative.
Providing increased capacity, improving border processing capabilities and providing reasonable and secure crossing options in this important trade corridor are the primary objectives of this study and are highly important to the local, regional and national economies on both sides of the river. Approvals and staging for the relocation of the Keith Transformer Station can delay completion of the new crossing several years; in the meantime, increased congestion and delays on the border crossing network, extended disruption to communities due to increased infiltration of international traffic onto local streets, and failure to attract new employment to the region could negatively impact the local communities.
The schedule risks and additional costs associated with the relocation of the Keith Transformer Station associated with the Plaza C alternative were considered to be of greater importance than the increased impacts to natural features. Therefore, the Plaza B alternative was carried forward for further consideration.</td></tr>
</table>

3.6.2. Protection of Community and Neighbourhood Characteristics

Crossing C is the only crossing located in Sandwich Towne, the boundary of which is generally considered to be north of Prospect Avenue. The crossing piers, anchor blocks and approach roadway are situated on industrial lands, but in relative proximity to existing residential areas. Crossing C has the potential to impact approximately 100 homes in the area of Prince Road and Sandwich Street with noise increases greater than 5 dBA. While it has been determined that a noise barrier would be effective in reducing changes in noise levels to below 5 dBA , further investigations of other mitigation measures in this area of Sandwich may be undertaken. The noise impact assessment also determined that changes in noise levels around the plazas can be reduced to acceptable levels (within 5 dB of the no-build scenario), except for some receptors near the E.C. Row Expressway. Additional investigations of appropriate mitigation may be undertaken as required.

The Plaza A alternatives were found to have a higher impact to community and neighbourhood features than the other alternatives. This assessment is based on a higher degree of change in neighbourhood character from park-like residential to industrial with Plaza A, as well as approximately 30 more homes being displaced by the Plaza A alternatives. While berms, barriers and landscaping can be implemented around the perimeter of the plaza to reduce aesthetic impacts and mitigate changes to 24-hr noise levels, approximately 112 residences within 250 m of Plaza A would be exposed to nuisance effects (e.g. light pollution, dust and nuisance noise), impacting the day-to-day use and enjoyment of property. Lighting trespass from the plaza may also disturb adjacent residences between sunset and sunrise, particularly in winter when foliage is off the trees and shrubs that provide some buffering between the Armanda Street neighbourhood and the Plaza A site. Plaza A also requires realignment of Matchette Road around the west end of the plaza. This realignment creates some out-of-way travel for motorists traveling in/out or through the Armanda Street/Matchette Road area.

With plazas B and C being located in the industrial area south of Prospect Avenue, there are fewer impacts to community character and residences with these two alternatives.

In terms of impact on existing businesses, none of the plaza and crossing alternatives are expected to have any substantive, long-lasting economic impacts for this part of the city. The Crossing C alternatives impact approximately four to five businesses, resulting in minimal economic impact due to the possibility of impacted businesses being relocated elsewhere in the area. This is true for all but the Van de Hogen business, which would lose a storage facility and parking area, resulting in a loss of property value and potential revenue and employment. The other alternatives were found to result in few or no economic impacts for businesses in this area.

Based on this analysis, the Plaza A alternatives were considered to have a high impact on community and neighbourhood features, while the Plaza B and C alternatives were considered to have a moderate impact.

3.6.3. Maintain Consistency with Existing and Planned Land Use

A new inspection plaza in the Matchette Road/Malden Road area is not considered to be consistent with the land uses permitted in the Malden Planning District. Plazas B and C are sited on lands designated for industrial uses and are considered to be highly

consistent with the local land use. The Plaza A alternatives are therefore considered to have a higher impact on land use.

Plaza B and C alternatives impact a greater number of potentially contaminated sites than the Plaza A alternatives. Plaza C alternative was noted as having a higher risk of encountering contamination than the other alternatives. Plaza A alternative was identified as having the lowest such risk.

Overall, the Plaza A alternatives were considered to have a moderate impact on land use and the Plaza B and C alternatives were considered to have a low impact.

3.6.4. Protect Cultural Resources

Crossing C is noted as having the highest potential impact on the Sandwich Towne cultural landscape. All alternatives impact between 1 and 3 built heritage features and 2 cultural landscape units. Plaza C alternative impacts the fewest number of known archaeological sites. All known sites affected by any alternative are of similar low significance. All alternatives are therefore considered to have a low impact to cultural resources.

3.6.5. Protect the Natural Environment

All alternatives impact natural features of high significance. The features of highest importance for the DRIC impact assessment are provincially rare specimens or colonies, ecological landscapes of high significance and terrestrial communities/ecosystems of high significance. The Plaza C alternative results in the lowest impacts to all three of these features, as the plaza and the crossing are both located in highly disturbed industrialized areas. The Plaza C alternative impacts less than 0.9 ha of provincially rare vegetation communities and 153 specimens/colonies of species at risk. The Plaza A alternatives displace the undisturbed natural areas within and adjacent to the designated natural areas south of E.C. Row Expressway. As a result, the Plaza A alternatives impact approximately 2.7 ha of sensitive communities each. The Plaza A via Brighton Beach alternative was also noted as having greater impacts to species at risk (over 230 specimens colonies impacted) than the Plaza A via Ojibway Parkway (186 specimens/colonies impacted). The Plaza B alternative impacts 2.02 ha of sensitve communities and 195 specimens/colonies of species at risk. The Plaza C alternative was considered to have the lowest overall impact to natural features; the Plaza A via Brighton Beach alternative resulted in the highest overall impacts of all the Crossing C alternatives due to greater impacts to the sensitive communities and species at risk. The Plaza A via Ojibway Parkway alternative and the Plaza B alternative were considered to have moderate impacts.

3.6.6. Improve Regional Mobility

All four plaza/crossing alternatives with crossing C are expected to work effectively under future (2035) peak travel demands and add additional border crossing and border processing capacity to the Detroit River border transportation network.

The distance from Plaza A to the international border approximately mid-way across Crossing C is 3.0 km via Ojibway Parkway, and 3.9 km via Brighton Beach. The distances to the border with the Plaza B and C alternatives are 2.3 and 1.6 km, respectively. Canada Border Services Agency has identified that keeping this distance from the border to the plaza to less than 1.5 km is desirable from a security/monitoring

perspective, as it lessens the requirements for on-going security/monitoring. The Plaza A alternatives do not provide a direct line of sight between the border and the plaza, and the option via Brighton Beach has a 1600 m section of at-grade roadway that is out of the direct line of sight from the plaza in the Brighton Beach industrial area. These characteristics are notable security/monitoring concerns.

The Plaza B connection to Crossing C consists of 1100 m of elevated roadway and 400 m of at-grade roadway in an industrial area within direct sight of the plaza, which are less of a security/monitoring concern. Plaza C connects directly to Crossing C, so there are no similar security/monitoring concerns with this alternative.

The Plaza C alternative provides a high benefit to regional mobility. The Plaza B alternative is also considered to provide a high benefit. Although the plaza site is outside the desired 1.5 km distance from the border, the approach roadway is less of a security/monitoring concern given the direct line of sight provided and adjacent land uses. The Plaza A alternatives were considered to provide moderate benefits to regional mobility, due to the security/monitoring concerns associated with the distance from the border, the line of sight issues, and length of at-grade roadway in vacant land out-of-sight of the plaza.

3.6.7. Cost and Constructability

Crossing C is the only crossing which traverses an area of known brine well activity, which influences the constructability of all four options.

The Plaza C alternative would require the complete relocation of the Keith Transformer Station operated by Ontario Power Generation Corporation (OPG). OPG has indicated that, in relocating the transformer station, it would be necessary to find a suitable alternate site for the station and to complete the relocation prior to decommissioning and dismantling the current transformer station. The costs for relocating the 110 and 230 KV breakers are estimated at $180 million (CDN 2011). Although potential relocation sites may be available south of Brighton Beach Power Station, and the 30-40 year old breakers used at the transformer station are programmed for replacement in the near future, the relocation of the transformer station creates additional approval requirements and staging issues that could seriously impact upon the completion of the new crossing.

Plaza B is sited on predominantly vacant land and results in limited impacts to the Keith Transformer Station.

The Plaza A and Plaza B alternatives are generally comparable in cost ($979 million to $1,015 million for cable stay, $1,049 million to $1,085 million for suspension, all costs CDN 2011); the Plaza C alternative is estimated to cost $1,142 million for cable stay and $1,212 million for suspension, or approximately 15 to 17% more than Plaza A via Ojibway Parkway, which has the lowest cost of the four alternatives.

3.6.8. Overall Assessment

The Plaza A alternatives were considered to have higher overall impacts in comparison to the Plaza B and Plaza C alternatives. The Plaza A alternatives result in greater direct and indirect nuisance impacts to the residential and natural areas in the Matchette Road/E.C. Row Expressway/Armanda Street area due to the location of this plaza. In addition, the distance between the plaza and the border with the Plaza A alternatives is well beyond the desirable distance identified by Canada Border Services Agency, resulting in greater monitoring/security concerns compared to the other alternatives. Finally, the Plaza A

alternatives offered no advantages over the Plaza B and C alternatives with the connection to Crossing C.

The Plaza C alternative is noted as having slightly less impact on local air quality due to the layout of the plaza and greater buffer area provided around the apron area of the plaza in comparison to Plaza B. The Plaza C alternative was also found to have lower impacts to significant natural features than the Plaza B alternative. However, the Plaza C alternative carries substantially higher construction costs, and the potential to add several more years to the construction period than the Plaza B alternative due to the conflict with the Keith Transformer Station.

The differences in air quality impacts between the Plaza B and C alternatives are notable, but of no consequence in this industrial area of west Windsor as no sensitive receivers are located within 250 m of either plaza. The difference in impacts to natural features between the Plaza B and C alternatives is predominately related to terrestrial communities of high significance and provincially rare specimens/colonies. The Plaza B option impacts two additional areas of high significance habitat, resulting in approximately one hectare more area impacted, and 195 specimens/colonies compared to 153 with than Plaza C alternative. In either case, mitigation of impacts through integration, relocation and salvage will be required for the habitat of high significance and provincially rare specimens/colonies with either alternative.

Providing increased capacity, improving border processing capabilities and providing reasonable and secure crossing options in this important trade corridor are the primary objectives of this study and are highly important to the local, regional and national economies on both sides of the river. Approvals and staging for the relocation of the Keith Transformer Station can delay completion of the new crossing several years; in the meantime, increased congestion and delays on the border crossing network, extended disruption to communities due to increased infiltration of international traffic onto local streets, and failure to attract new employment to the region could negatively impact the local communities.

The schedule risks and additional costs associated with the relocation of the Keith Transformer Station associated with the Plaza C alternative were considered to be of greater importance than the increased impacts to natural features. Therefore, the Plaza B alternative was carried forward for further consideration.

3.6.9. Arithmetic Method – Crossing C Corridor Alternatives

In accordance with the evaluation process developed for this study, this assessment was also conducted using an arithmetic approach (weighted scoring), based on factor scores assigned by the factor specialists and factor weighting scenarios developed earlier in the study. The results of this assessment are presented in Table 9.

TABLE 9 – RESULTS OF ARITHMETIC EVALUATION – CROSSING C ALTERNATIVES

STUDY TEAM WEIGHTING

Factor	Weight	Plaza A (via Ojibway Parkway)		Plaza A (via Brighton Beach)		Plaza B		Plaza C	
		Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
Changes in Air Quality	12.39	2	24.78	2	24.78	2	24.78	2	24.78
Protection of Community and Neighbourhood Characteristics	15.93	1	15.93	1	15.93	2	31.86	2	31.86
Maintain Consistency with Existing and Planned Land Use	12.39	2	24.78	2	24.78	3	37.17	3	37.17
Protect Cultural Resources	12.39	3	37.17	3	37.17	3	37.17	3	37.17
Protect the Natural Environment	15.93	2	31.86	1	15.93	2	31.86	3	47.79
Improve Regional Mobility	17.70	5	88.50	5	88.50	5	88.50	6	106.20
Cost and Constructability	13.27	2	26.54	2	26.54	2	26.54	1	13.27
Total	100.00	17	249.56	16	233.63	19	277.88	20	298.24
Rank	Unweighted	3		4		1		1	
	Weighted		3		4		2		1

PUBLIC WEIGHTING

Factor	Weight	Plaza A (via Ojibway Parkway)		Plaza A (via Brighton Beach)		Plaza B		Plaza C	
		Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
Changes in Air Quality	17.32	2	34.64	2	34.64	2	34.64	2	34.64
Protection of Community and Neighbourhood Characteristics	15.49	1	15.49	1	15.49	2	30.98	2	30.98
Maintain Consistency with Existing and Planned Land Use	12.89	2	25.78	2	25.78	3	38.67	3	38.67
Protect Cultural Resources	13.14	3	39.42	3	39.42	3	39.42	3	39.42
Protect the Natural Environment	16.34	2	32.68	1	16.34	2	32.68	3	49.02
Improve Regional Mobility	15.28	5	76.4	5	76.4	5	76.40	6	91.68
Cost and Constructability	9.54	2	19.08	2	19.08	2	19.08	1	9.54
Total	100.00	17	243.49	16	227.15	19	271.87	20	293.95
Rank	Unweighted	3		4		1		1	
	Weighted		3		4		2		1

COMMUNITY CONSULTATION GROUP WEIGHTING

Factor	Weight	Plaza A (via Ojibway Parkway)		Plaza A (via Brighton Beach)		Plaza B		Plaza C	
		Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
Changes in Air Quality	17.30	2	34.60	2	34.60	2	34.60	2	34.60
Protection of Community and Neighbourhood Characteristics	13.88	1	13.88	1	13.88	2	27.76	2	27.76

Maintain Consistency with Existing and Planned Land Use	13.69	2	27.38	2	27.38	3	41.07	3	41.07
Protect Cultural Resources	13.12	3	39.36	3	39.36	3	39.36	3	39.36
Protect the Natural Environment	17.11	2	34.22	1	17.11	2	34.22	3	51.33
Improve Regional Mobility	14.83	5	74.15	5	74.15	5	74.15	6	88.98
Cost and Constructability	10.07	2	20.14	2	20.14	2	20.14	1	10.07
Total	100.00	17	243.73	16	226.62	19	271.30	20	293.17
Rank	Unweighted	3		4		1		1	
	Weighted		3		4		2		1

The arithmetic results identify that the Plaza C alternative has the highest weighted score in all three weighting scenarios indicating Plaza C as the preferred alternative, while the Plaza B alternative has the second highest weighted score. As noted in the Terms of Reference for this study, if the reasoned argument evaluation identifies a different result than the arithmetic evaluation, the results of the arithmetic method will be analyzed to determine the key weight-score combinations; similarly, the rationale for the reasoned argument trade-off decisions will also be revisited to determine if the study team decision was appropriate. If the rationale supporting the trade-off decision is valid and appropriate, the preferred alternative identified by the reasoned argument method will stand.

Key Weight Score Combinations

Table 5 identifies that the total weighted-scoring for Plaza B and Plaza C alternatives is relatively close, suggesting there are many similarities between the two alternatives in terms of impacts and benefits. The scoring of the two alternatives differs for two factors:

- Protect the Natural Environment, and
- Cost and Constructability

Protect the Natural Environment

Plaza B alternative is scored as a 2, representing a moderate impact to natural features, while Plaza C alternative is scored as a 3, representing a low impact. This scoring differential reflects primarily the greater area of high significant habitat affected and greater number of specimens/colonies of provincially rare species impacted by the Plaza B alternative. Given the uniqueness of these features in the Windsor-Essex County area and indeed the province, identifying a difference in the impact scoring of one unit is entirely appropriate for this factor, and consistent with the presentation of the issues in the reasoned argument discussion.

Cost and Constructability

Plaza B alternative is scored as a 2, representing a moderate cost and constructability impact, while Plaza C alternative is scored as a 1, representing a high impact. Issues considered in the scoring of this factor include cost estimates, and risks to constructability. These risks can be characterized as schedule risks as well as cost risks. In this case, the costs of the two alternatives (assuming same bridge type) differ by approximately 12%. The costs of the Plaza C alternative include $180 million for relocation of the transformer station. In obtaining this initial estimate, the study team was cautioned that the final costs

of the relocation may be higher, depending on where the transformer station is relocated to. While it is recognized that candidate sites for the transformer station may be found in vicinity of the present site, it would be premature to speculate as to the siting of the new station, which would be an undertaking subject to an assessment of all reasonable options. The cost requirement of this assessment is also unknown and the time to complete this assessment could add several years to the duration of the project. Combining the difference in construction cost estimates with the additional unknown costs associated with siting and connecting the new transformer station increases the risk that the cost differential between these two alternatives may in fact be more substantial.

The schedule risks are those associated with the need to construct and make operable the new transformer station, prior to decommissioning the existing station. Delays to the construction of the new crossing and plaza are not consistent with the Partnership's primary objectives for this study. At the outset of the planning process, the Partnership established year 2013 as the targeted completion date for addressing the stated problems in the Detroit-Windsor transportation corridor. Alternatives that pose serious risks to this completion timeframe are least preferred. A new site would need to be identified and approved, prepared for construction and made operational by 2010 to avoid delays to the construction of the new crossing and plaza. As noted above, the time requirements for the assessment and selection of a suitable transformer site are unknown.

On the basis that the cost and schedule risks associated with the Plaza C alternative are much higher in comparison to those of Plaza B, the study team considered whether a 2-point scoring differential was warranted in this case. However, to provide a 2-point differential, one would have to classify Crossing B alternative as having a low impact (score of 3) to cost and constructability, which was not considered consistent with the scoring of other alternatives. A differential of one unit in the score of cost and constructability was therefore assigned.

Reconciliation of Reasoned Argument and Arithmetic Evaluation Results

In reviewing the results of the two methods, the study team was satisfied that the results of the reasoned argument are valid and appropriate. To some degree, the limitations of the 7-point scoring system utilized for this study underemphasize the difference between the two alternatives in terms of cost and constructability impacts. At the same time, the differences between these two alternatives in terms of their impacts to natural features are adequately reflected in the impact scoring.

The magnitude and significance of the cost and constructability impacts between the alternatives are considered to be greater than the magnitude and significance of the differences in natural features impacts. The Plaza B alternative is therefore preferred over the Plaza C alternative.

3.7. Bi-national Evaluation of Practical Crossing and Plaza Alternatives

As discussed in the previous sections, Crossing A-Plaza A, Crossing B-Plaza B1 and Crossing C-Plaza B are the plaza-crossing alternatives to be considered on the Canadian side. The three crossing-plaza combinations were carried forward for consideration by

the Canadian and U.S. study teams. The complete plaza-crossing-plaza combinations that were considered were:

- Crossing X-10A, with U.S. Plaza P-a and Canadian Plaza A
- Crossing X-10B, with U.S. Plaza P-a and Canadian Plaza B1
- Crossing X-11C, with U.S. Plaza P-c and Canadian Plaza B

The analysis and evaluation of alternatives was based on the seven factor areas noted earlier in this previous section. Table 10 provides a summary of a comparison of Crossing A-Plaza A, Crossing B-Plaza B1 and Crossing C-Plaza B based on the results of the analysis. As noted in the "Introduction" to this report, the information presented in Table 10 is based on the U.S. study team's Draft Environmental Impact Statement (DEIS) published in February 2008. The U.S. team announced their final decision through their Final Environmental Impact Statement (FEIS) on December 5, 2008.

TABLE 10 – EVALUATION OF CROSSING A, CROSSING B AND CROSSING C ALTERNATIVES – CANADIAN SIDE

Evaluation Factor	Measure	Crossing A – Plaza A	Crossing B – Plaza B1	Crossing C - Plaza B
Changes to Air Quality	Changes in $PM_{2.5}$ Concentration	Increases in $PM_{2.5}$ within 250 m of crossing and plaza under certain conditions; potential to influence air quality in Armanda Street/Matchette Road area	Increases in $PM_{2.5}$ within 250 m of crossing and plaza under certain conditions;	Increases in $PM_{2.5}$ within 250 m of crossing and plaza under certain conditions; potential to influence air quality in portion of Sandwich
	Changes in NO_x Concentrations	Increases in NOx within 250 m of crossing and plaza under certain conditions; potential to influence air quality in Armanda Street/Matchette Road area	Increases in NOx within 250 m of crossing and plaza under certain conditions;	Increases in NOx within 250 m of crossing and plaza under certain conditions; potential to influence air quality in portion of Sandwich
Protection of Community and Neighbourhood Characteristics	Effect on Local Access – Number of Roads Crossed / Closed / Connected	7 crossings / 7 closings / 4 connections – Matchette Road realignment; Minor out-of-way travel	4 crossings / 12 closings / 4 connections – Minor out-of-way travel	7 crossings / 16 closings / 5 connections – minor out-of-way travel; Relocation of Broadway Street / Sandwich Street connection
	Noise receptors with change in noise levels >5 dBA (2035; with mitigation; compared to future do-nothing)	1	0	0
	Potential Acquisitions Households	62	36	38
	Potential Acquisitions Businesses/Industries	1	1	5
	Social Features (institutional) displaced	1 (Erie Wildlife Rescue)		
	Overall Effect on Community Character/Cohesion	Greater impact on community character for Armanda Street/Matchette Road neighbourhood compared to other alternatives due to proximity of new plaza to this residential area;	Less impact on community character compared to other alternatives; both plaza and crossing are situated in industrial area	Greater impact on community character of Sandwich compared to other alternatives due to proximity of new crossing to this residential area.
Maintain Consistency with Existing and Planned Land Use	Consistency	Plaza location not consistent with existing land uses of the Malden planning district; impacts to existing and planned residential uses Crossing and approach are consistent as these are located in industrial area;	Crossing and plaza are consistent as these are located in industrial area;	Crossing and plaza are consistent as these are located in industrial area;
	Known Contaminated Sites Impacted – No./Area (ha)	4 sites/1 ha	17 sites/24 ha	29 sites/24 ha
Protect Cultural Resources	Designated built heritage features potentially displaced	1 Cultural Landscape Unit 1 Built Heritage Feature (low significance)	1 Cultural Landscape Unit 3 Built Heritage Features (low significance)	2 Cultural Landscape Units 3 Built Heritage Features (low significance)
	Direct impacts to Parks	Ojibway Park (0.7 ha)	Ojibway Park (0.7 ha)	Ojibway Park (0.7 ha)
	Potential archaeological sites affected	0 pre-contact habitation sites/ Euro-Canadian homesteads 6 pre-contact findspots	2 pre-contact habitation sites/ Euro-Canadian homesteads 4 pre-contact findspots	3 pre-contact habitation sites/ Euro-Canadian homesteads 4 pre-contact findspots
Protect the Natural Environment	Feature impacts	Loss of 2.98 ha of provincially rare vegetation communities Loss of 232 specimens/colonies of species at risk Approximately 7.38 ha of designated natural areas within 120m of proposed property limit	Loss of 1.09 ha of provincially rare vegetation communities Loss of 185 specimens/colonies of species at risk Approximately 10.96 ha of designated natural areas within 120m of proposed property limit	Loss of 2.02 ha of provincially rare vegetation communities Loss of 195 specimens/colonies of species at risk Approximately 14.82 ha of designated natural areas within 120m of proposed property limit

Evaluation Factor	Measure	Crossing A – Plaza A	Crossing B – Plaza B1	Crossing C - Plaza B
Improve Regional Mobility	2035 Average Daily Car and Truck Volume	Canadian plaza and crossing sized to accommodate average daily traffic of 39,000 vehicles (cars and trucks) in 2035.		
	Distance from plaza to international border	2.5 km	1.4 km	2.3 km
	Canadian Plaza Operational Considerations	Good accessibility to/from local road network Good access to local utilities for site services Distance from border to plaza > 1.5 km is less desirable; requires on-going security monitoring; 700 m section of at-grade roadway through vacant lands also a security/monitoring concern Plaza provides sufficient size for addressing needs to 2035 and beyond; while there is flexibility to address new/expanded inspection functions within the plaza site, expansion of plaza beyond the identified footprint may be problematic due to existing land uses adjacent to the plaza site.	Good accessibility to/from local road network Good access to local utilities for site services Distance to plaza < 1.5 km is preferable; good (direct) sight lines between plaza and crossing Plaza provides sufficient size for addressing needs to 2035 and beyond; while there is flexibility to address new/expanded inspection functions within the plaza site, expansion of plaza beyond the identified footprint may be problematic due to existing land uses adjacent to the plaza site. It was also noted that this plaza is in reasonable proximity to the waterfront, offering an opportunity to incorporate marine inspection functions at the plaza, if required.	Good accessibility to/from local road network Good access to local utilities for site services Distance from border to plaza > 1.5 km is less desirable; requires on-going security monitoring; 400 m section of at-grade roadway through vacant lands also a security/monitoring concern Plaza provides sufficient size for addressing needs to 2035 and beyond; while there is flexibility to address new/expanded inspection functions within the plaza site, expansion of plaza beyond the identified footprint may be problematic due to existing land uses adjacent to the plaza site. It was also noted that these plaza is in reasonable proximity to the waterfront, offering an opportunity to incorporate marine inspection functions at the plaza, if required.
Cost and Constructability	Is it constructible?	Yes	Yes	Yes, but results of geotechnical investigations identified that there is a subsurface cavity caused by salt extraction activities in the vicinity of Sandwich Street and Prospect Avenue. Further uncontrolled settlements due to this cavity represent risks to the design and operation of the approach roadway connecting to Crossing C. It is not certain that further investigation will be successful in reducing or eliminating these risks
	Key Issues	Length of crossing (approximately 1200 metres) leads to cost and constructability risks	None identified	Costs and risks associated with approach road crossing of brine well area Direct impact to Sterling Marine Fuels fueling depot
	Construction cost, 2011 CDN $	$830-million (Malden Road to int'l border, including one-half of crossing construction cost)	$648-million to $712-million (Malden Road to int'l border, including one-half of crossing construction cost)	$1015-million to $1085-million (Malden Road to int'l border, including one-half of crossing construction cost)
Summary of Assessment		Overall, the Crossing A-Plaza A was found to have many disadvantages and few advantages over the other alternatives. This alternative was found to have higher impacts to community and neighbourhood features, land use and natural features than the other alternatives. In addition, this alternative was found to provide lower benefits to regional mobility compared to the other alternatives. This alternative has lower cost and constructability impacts than Crossing C-Plaza B. The cost and constructability issues with the Crossing C-Plaza B alternative are a serious disadvantage of this alternative. This alternative was also found to have greater community and cultural feature impacts to Sandwich. Overall, Crossing C-Plaza B was found to have many disadvantages, and no advantages, over Crossing B-Plaza B1 alternative. Crossing B-Plaza B1 offers more advantages and has no notable disadvantages when compared to the Crossing A and Crossing C alternatives. The crossing and plaza are situated away from residential areas and sufficiently close to the international border. This alternative has the lowest impacts to natural and community features, and is comparable to the other alternatives in terms of its impacts to air quality, land use and cultural features. No alternative provides greater benefits to regional mobility and this alternative has the lowest cost.		

3.7.1. Changes to Air Quality

In Canada, the plazas and crossings are located in areas where no major transportation facilities presently exist; all plaza and crossing alternatives therefore result in increases in concentrations of pollutants over the "Do Nothing" alternative. The results of the air quality modelling of the plaza and crossing combinations indicate that the greatest changes to air quality occur around the plaza areas as opposed to the crossings. This is due in part to the more stationary nature of traffic in the plazas as opposed to the more free-flowing movement of traffic on the bridge and the ability of the elevated portions of the crossing to assist in dispersing vehicle emissions.

The plazas connected to the Crossing X-10B and X-11C alternatives are located in industrial areas away from sensitive receptors. With Crossing X-10A, Plaza A has a greater buffer area around the tolling/inspection plazas, where vehicles stopping/queuing/starting up will occur. Nonetheless, impacts to adjacent residences may occur under certain conditions.

All three crossing-plaza alternatives were found to have moderate impacts. In 2015 and 2025, this distance which the effects of the plaza can be significant in terms of the $PM_{2.5}$ concentrations under certain conditions is approximately 100 m from the property boundary, but increases to 250 m from the boundary in 2035 for Plazas B and B1. Plaza A impacts less of an area around its perimeter as this plaza has a greater buffer area around the tolling/inspection plazas, where vehicles stopping/queuing/starting up will occur. Nonetheless, impacts to adjacent residences may occur under certain conditions.

The modeling of NO_x concentrations indicated that Plazas A and B tend to have the highest increases in concentrations due to the combined effects of the plaza and local roads (i.e. E.C. Row Expressway). Under certain conditions, NO_x concentrations within 250 m are higher with all alternatives relative to the no-build scenario. Plaza B1, which is more removed from other NO_x sources such as the E.C. Row Expressway, is found to have slightly lower increases in concentrations in comparison to the other alternatives. The impact of the crossings themselves is limited to within 250 m of the bridge or roadway. Amongst the crossing alternatives, Crossing C was shown to have some influence on NO_x concentrations in Sandwich.

In the U.S., air quality will improve even under the "Do Nothing" alternative because of U.S. Environmental Protection Agency rules and regulations under the Clean Air Act and the National Ambient Air Quality Standards. Regional air quality will also improve because of the closings of old manufacturing plants due to the decline in the economy and a shift to more service-oriented industries. Local air quality conditions in the Mexicantown area at the Ambassador Bridge are expected to improve with opening of the Ambassador Bridge Gateway Project in 2009. All of the new crossing/plaza alternatives will aid in improving air quality by spreading the automotive traffic in Southwest Detroit and reducing the number of heavy-duty diesel trucks within the neighborhoods. The Ambassador Bridge has Mexicantown as its neighbor to the east. The Delray neighborhood is located to the west of the new plaza. Mexicantown is an expanding, neighborhood. Splitting traffic between two bridges/plazas will reduce the pollution now concentrated in one area.

Overall, there was no preference for a particular Crossing/Plaza alternative based on the air quality factor.

3.7.2. Protection of Community and Neighbourhood Characteristics

In Canada, the Crossing X-10A impact to the Armanda Street/Matchette Road neighbourhood is considered of greater effect than the other alternatives. This assessment is based on there being a higher degree of change in neighbourhood character from park-like residential to industrial with the introduction of the Plaza A site.

The results of community consultation on the crossing alternatives indicate concern that the Crossing X11-C alternative would have a notable impact to community character in Sandwich Towne. These concerns are related to potential increases in traffic and nuisance impacts (noise, dust) and the relative proximity of the new crossing to the Ambassador Bridge. In addition, the Crossing X-11C alternative also has the potential to impact approximately 100 homes in Sandwich Towne with noise increases greater than 5 decibels (dB) – a level of increased noise which requires mitigation be considered. A noise barrier to reduce changes in noise levels to below 5 dB is estimated to cost approximately $CAD 20-million.

Crossing X10-B, with the plaza and crossing located in the industrial lands west of Sandwich Street is not expected to have a substantial impact to the community and neighbourhood features in this part of the city.

In the U.S., the X-11C Crossing would have a greater number of impacts to active residential and business units; albeit relatively few in comparison to the plaza and interchange.

The Crossing X-10A alternative displaces 62 homes, whereas the other alternatives displace less than 40 homes each. In terms of disruption to the residential areas, the Crossing X-10A alternative is expected to generate more nuisance effects (e.g. noise, dust, light trespass) in the nearby Armanda Street/Matchette Road area, which would have residences generally within 200 m of the new plaza. In addition, Crossing C and the approach road between the plaza and crossing is within 200 m of the residential area of Sandwich Towne. This may result in nuisance impacts for residents in this area which were noted as concerns during the community consultations.

There is no notable difference in noise levels after mitigation with all the plaza and crossing alternatives. Changes in noise levels around the plazas can be reduced to acceptable levels (within 5 dB of the no-build scenario), except for some receptors near the E.C. Row Expressway. While berms, barriers and landscaping can be implemented around the perimeter of the plaza to reduce aesthetic impacts and mitigate changes to 24-hr noise levels, approximately 110 residences within 250 m of Plaza A, would be exposed to nuisance effects (e.g. light pollution, dust and nuisance noise), impacting the day-to-day use and enjoyment of property.

It should be noted that there is a different level of mitigation of noise impacts required with each crossing option. The X-11C Crossing alternative in particular has the potential to impact approximately 100 homes in Sandwich Towne with noise increases greater than 5 dBA. A noise barrier to reduce changes in noise levels to below 5 dBA is estimated at a cost of approximately $20-million. Further investigations of mitigation measures in this area of Sandwich would be undertaken as appropriate.

Lighting trespass from the plaza may also disturb adjacent residences between sunset and sunrise, particularly in winter when foliage is off the trees and shrubs that provide some buffering between the Armanda Street neighbourhood and the Plaza A site. Plaza A also requires realignment of Matchette Road around the west end of the plaza. This

realignment creates some out-of-way travel for motorists traveling in/out or through the Armanda Street/Matchette Road area.

None of the plaza and crossing alternatives are expected to have any substantive, long-lasting economic impacts for this part of the city. The Crossing X-11C alternative impacts five businesses, resulting in minimal economic impact due to the possibility of impacted businesses being relocated elsewhere in the area. This is true for all but the Van de Hogen business, which would lose a storage facility and parking area, resulting in a loss of property value and potential revenue and employment. The other alternatives were found to result in few or no economic impacts for businesses in this area.

Overall, from the perspective of protecting community and neighbourhood characteristics, the Crossing X11-C alternative was least preferred. Between the X-10 alternatives, X-10B is preferred based on lower residential impacts. The X10-A and X11-B alternatives were found to have high impacts, while the Crossing X10-B alternative has moderate impacts.

3.7.3. Maintain Consistency with Existing and Planned Land Use

In Canada, the Crossing X-10A Alternative was considered to have higher impacts to land use in comparison to the other alternatives. This is reflective of the existing land use in the Malden Planning District, which is primarily residential, integrated with natural features. This land use would be heavily disrupted by Plaza A, which would be located on generally undeveloped lands south of E.C. Row between Malden Road and Ojibway Parkway. The other crossing alternatives are located generally within industrial lands in the Windsor port area and carry less impact to land use.

In the U.S., with the "Do Nothing" alternative, trends indicate continued industrialization of the Delray area will occur at the cost of the residential area that now exists. Existing land use patterns are expected to continue with little change in the remainder of the ACA. However, forecasts by Southeast Michigan Council of Governments (SEMCOG) indicate losses in population and jobs in the region that could lead to abandonment of some currently active land uses.

If the proposed crossing is built, positive land use changes are possible in the U.S. The vision is to create a better place to live, with a new crossing system as its neighbor. The 150-plus-acre plaza associated with Crossing X-10 or X-11 could be the separator of neighborhood uses to the west and logistics/industrial uses to the east. A number of households and businesses will be displaced if the project is constructed. If any of them choose to relocate in the Delray area that would help move the vision closer to reality. MDOT, in partnership with FHWA is exploring a number of concepts by which enhancements may be made to the Delray area if it becomes the "host community" for the project. These concepts are applicable with either an X-10 or X-11 Crossing.

With regard to contaminated sites, several known or high potential sites were identified on both sides of the river. Recommendations in both the U.S. and Canadian studies include preliminary site investigations (PSI) for most of the medium- and high-rated sites. Further assessment of the regulatory status and site conditions of other sites is also recommended. The PSIs will be completed for the preferred alternative and access can be obtained by provisions in applicable federal/state/provincial law.

Overall, from the perspective of maintaining consistency with existing and planned lane use, the X-10A crossing was considered to have moderate impacts and was identified as

least preferred based on greater impacts associated with the Canadian plaza. The X-10B and X-11C alternatives were considered to have low impacts.

3.7.4. Protect Cultural Resources

In Canada, the alternatives impact six to seven archaeological sites which are either pre-contact habitation sites/ Euro-Canadian homesteads or pre-contact findspots, which are generally considered of low/medium significance. The Crossing X-11C alternative was noted as having a higher impact to the cultural landscape of the historic town of Sandwich. Although no significant portion of the historic town of Sandwich is directly affected, this crossing may impact the heritage sensitive area through introduction of physical, visual, audible or atmospheric elements that are not in keeping with the resources and/or their setting.

All of the alternatives have the same impact to Ojibway Park; a corner of the park (0.7 ha) is impacted near Ojibway Parkway/Broadway Street.

In the U.S., numerous areas were examined during the archaeological field study. Most locations produced little or nothing of archaeological value, because of the heavy degree of prior disturbance. No evidence of prehistoric or historic Native American land use was observed. It was determined that no prehistoric archaeological resources are affected by any of the practical alternatives. Three aboveground (built) heritage features are in, or partially in, the footprint of all practical alternatives and will require removal, resulting in an adverse effect to be mitigated.

In terms of parks and playgrounds in the U.S., South Rademacher Playground, South Rademacher Community Recreation Center and the Post-Jefferson Playlot are each located in the plaza area of every practical alternative and would be removed (used) by the plaza.

Overall, the Crossing X-11C alternative was least preferred. All alternatives were found to have moderate impacts to cultural resource features, with Crossing X-10A and Crossing X-10B having slightly lower impacts than Crossing X-11C.

3.7.5. Protect the Natural Environment

In Canada, all alternatives result in some loss of provincially rare specimens or colonies, impacts to ecological landscapes and impacts to terrestrial communities and ecosystems of high significance. The Crossing X-10A alternative has the greatest impact on provincially rare vegetation communities (2.98 ha (7.4 acres) impacted) and species at risk (232 specimens/colonies impacted). Given the regional importance of these natural features, the Crossing X-10A alternative was considered to be least preferred in terms of protecting the natural environment. Overall, the Crossing X-10B alternative was considered to have slightly lower impacts to natural features than Crossing X-11C.

Both the Crossing X-10B and Crossing X-11C alternatives were noted as affecting a greater area of designated natural areas than the other alternatives; this is due primarily to the proximity of the plazas to the Black Oak Woods Heritage Park, which is located along the south side of Broadway Street, along the southern edge of both plaza sites. With Crossing X-10B, 10.96 ha of designated lands are adjacent to the plaza, while 14.82 ha are adjacent to Crossing X-11C.

In the U.S., Crossing X-11 would impact a total of 0.01 acre (0.004 ha) of low quality wetland at the edge of the Detroit River. Loss of this wetland will result in minimal impacts to wetland function and value.

Overall, Crossing X-10A was least preferred.

3.7.6. Improve Regional Mobility

All three plaza/crossing alternatives are expected to work effectively under future (2035) peak travel demands and add additional border crossing and border processing capacity to the Detroit River border transportation network. Based on the *Draft Level 2 Traffic Operations Analysis of Practical Alternatives (December 2008)*, without a new crossing, Huron Church Road connection to Ambassador Bridge would operate poorly during extended periods of the day, resulting in congestion and delays on this roadway and infiltration of international traffic onto other local streets. The new crossing is expected to carry 2,300 vehicles in the PM peak hour from the U.S. into Canada (the peak direction of travel) in 2035, which would provide substantial relief to Huron Church Road and reduce the likelihood of congestion on this arterial roadway. Further analysis undertaken by the U.S. study team pertaining to travel time comparisons between Crossing X-11 and Crossing X-10 alternatives suggests the volume of traffic using the X-10 crossings could be as much as 50% more than the traffic using the X-11 crossing. This variance is reflective of differences in access and circulation between the U.S. plaza layouts serving crossings X-10 and X-11. This variance also suggests, however, the X-11 alternative could result in greater traffic volumes on Huron Church Road during peak travel periods to the point that intersections along Huron Church Road will remain congested as in the "Do-Nothing" alternative, lowering the level of service on this key roadway link in the border transportation network. Huron Church Road also serves as a primary arterial road for local access in west Windsor. Reducing access and mobility along the Huron Church Road corridor during peak travel periods reduces the benefits of the new crossing on the local transportation network. By comparison, the X-10 crossing alternatives are more likely to result in improved transportation levels of service on Huron Church Road over the "Do-Nothing" alternative as well as the X-11 Alternative, thereby providing greater benefits to regional and local mobility.

The distance from Plaza A to the international border approximately mid-way across Crossing A is 2.5 km. The distances to the border with the Crossing B-Plaza B1 and Crossing C-Plaza B alternatives are 1.4 km and 2.3 km, respectively. Canada Border Services Agency has identified that keeping this distance from the border to the plaza to less than 1.5 km is desirable from a security/monitoring perspective, as it lessens the requirements for on-going security/monitoring. The Crossing A-Plaza A (X-10A) alternative does not provide a direct line of sight between the border and the plaza, and has a 700 m section of at-grade roadway that is out of the direct line of sight from the plaza in the vacant portion of the Brighton Beach industrial park area. These characteristics are notable security/monitoring concerns.

The Crossing C-Plaza B (X-11C) alternative consists of 1100 m of elevated roadway and 400 m of at-grade roadway in an industrial area within direct sight of the plaza, which are less of a security/monitoring concern.

Plaza B1 connects directly to Crossing B, so there are no similar security/monitoring concerns with this alternative.

Plazas B and B1 were also noted as being within reasonable proximity to the waterfront to potentially enable marine inspection operations to be incorporated in these plazas, if required.

Crossing B-Plaza B1 was considered to have high benefits to regional mobility while Crossing A-Plaza A was considered to have moderate benefits. Overall, Crossing X-10B is preferred.

3.7.7. Cost and Constructability

Two factors influencing the cost and constructability of the new international crossing are: soundness of the bedrock and length of the crossing itself. The section of the Detroit River shoreline under consideration for the new international crossing has a history of salt mining activities. The study teams on both sides of the Detroit River undertook extensive geotechnical testing of the bedrock conditions to a depth of approximately 500 m, i.e. below the salt producing layers. The purpose of this detailed geotechnical work was to determine whether there are any unknown brine wells in the area under consideration for future crossings, and to verify the limits of any subsurface influence of past salt mining activities.

Detailed geotechnical investigations in the area of Sandwich Street north of Prospect Avenue confirmed that there are underground anomalies in this area, which could pose a risk to any roadway built in this vicinity. It is believed that the underground caverns left behind from previous brinewell activity in the area of Sandwich Street are interconnected with other caverns further west. These interconnected caverns are also believed to have caused a sinkhole to form immediately west of Sandwich Street. In February 1954, the ground on the Windsor Salt property collapsed into a sinkhole about 8m deep at the center, 150m in diameter. Several buildings and railroad facilities were irreparably damaged during this incident.

The proposed approach roadway to Crossing X-11C passes over the eastern end of the former solution mining well field and a subsurface anomaly that is suspected to be a brine-filled cavity, rubble zone and disturbed rock mass. Initial estimates suggest that the rock mass above this anomaly might experience subsidence ranging up to values on the order of 3m. The proportion of such subsidence that has already occurred or may occur in the future cannot be quantified at this time because of uncertainties associated with the nature and position of the identified anomaly. Should this crossing alignment be considered further, additional study will be required to refine the range of risks and orders of magnitude of future settlement that should be accommodated by design. The field exploration and testing program and historical data are not sufficient to clearly assess the three-dimensional extent, specific location, or potential limits of influence of this subsurface anomaly. The level of effort (investigation, testing, and analysis) that may be required to further refine these issues relative to the Crossing X-11C approach alignment is extensive and, if undertaken, may still be insufficient to consider supporting structures on the rock within and adjacent to the identified limits of solution mining influence within an acceptable degree of risk.

The Canadian study team has considered a 660 metre long-span structure extending over the zone of influence of this brinewell area between Prospect Avenue and John B. Street. There still remains some risk as to the acceptability of this solution and the continual operation of this crossing, even with this mitigation. The constructability and maintenance risks associated with the approach roadway to Crossing X-11C, were noted as significant

disadvantages of the Crossing X-11C alternatives. This long-span structure will also have its own impacts on the community in terms of impacts to the character of the community, as well as noise and aesthetic impacts. In addition, having two long-span structures on the Crossing X-11C alignment increases the construction and maintenance costs of this alternative.

A second factor influencing the cost and constructability of the new crossing is the length of the main span. Crossing X-10A is on a skew angle that results in a total crossing length bank-to-bank of in excess of 1100 m. By comparison, Crossings X-10B and X-11C have a total span requirement (bank-to-bank) of 800 m and 700 m respectively. This substantial additional length of Crossing A translates into higher additional costs and greater risk to the construction schedule due to the complexities of construction of such long span bridges.

In the U.S., the difference in impacts between Crossings X-10A and X-10B were indistinguishable except in how each can be built. The X-10A Crossing was developed to avoid the area around known historical brine mining in Canada. The alignment of the X-10A Crossing would start near the location of X-10B in the U.S. and land in Canada southwest of the Brighton Beach Power Station. Analyses determined that the only feasible structure type for Crossing X-10A is a suspension bridge with an unsuspended back span. The X-10A bridge is the longest of the alternatives with a main span of 1200 metres (3937 feet). Although suspension bridges with main spans exceeding that length do exist, this would become the longest bridge of its type in the Americas. The bridge analyses conducted by the U.S. and Canadian study teams evaluated eight constructability factors. Of those, cost, risk to controlling cost, schedule duration, and risk to controlling the schedule were considered to be differentiating among the crossings. The estimated construction cost of the X-10A Crossing at $920-million is significantly greater than the other suspension bridges at Crossings X-10B and X-11 (X-10B @ $550-million and X-11 @ $600-million). The construction duration of 62 months for Crossing X-10A is over one year more than the other alignments.

On the basis of cost and constructability, Crossing X-10B has slightly less cost and constructability impacts than Crossing X-10A, and both are considered to have a moderate impact. Crossing X-11C is considered to be a high impact alternative. Overall, Crossing X-10B is preferred.

3.7.8. Overall Assessment

The overall assessment of crossing alternatives based on the seven major factor areas are summarized in Table 11.

TABLE 11 – OVERALL ASSESSMENT OF CROSSING AND PLAZA ALTERNATIVES

Factor	Crossing Alternative (including plazas)		
	X-10A	X-10B	X-11C
Air Quality	No preference		
Community & Neighbourhood Characteristics		Preferred	Least Preferred
Existing & Planned Land Use	Least Preferred		

Factor	Crossing Alternative (including plazas)		
	X-10A	X-10B	X-11C
Cultural Resources			Least Preferred
Natural Environment	Least Preferred		
Regional Mobility		Preferred	
Constructability		Preferred	

Overall, Crossing X-10B was identified as the preferred alternative in three of the six factor areas in which a preference could be expressed. Both the X-10A and X-11C alternatives were identified as least preferred in two factor areas. Crossing X-10B was not identified as the least preferred in any factor area.

The constructability issues with the Crossing X-11C alternative are a serious disadvantage of this alternative. Overall, Crossing X-11C was found to have many disadvantages, and no advantages, over Crossing X-10B alternative.

Similarly, The Crossing X-10A alternative was noted as having higher community and natural impacts on the Canadian side and greater cost and constructability risks with no advantages on the U.S. side.

In contrast, the Crossing X-10B alternative was found to have notable advantages on both sides of the river and no disadvantages in comparison to the other alternatives. Both the Canadian and U.S. study teams identified Improve Regional Mobility as the most important factor area. It is also worth noting that the ownership model (based on public agency control) and contractual arrangements for construction and operation of the new crossing and plazas has not been finalized by the partner governments undertaking this study. Joint agreement on the preferred alternative from a constructability perspective is an equally significant conclusion of this evaluation.

For the purposes of the environmental studies in both countries, both a suspension bridge and a cable stay bridge are being carried forward. There are no substantive differences among these options. The final bridge type selection will be completed during subsequent stages of the project. Schematic illustrations of the two options are illustrated in Exhibit 7.

3.7.9. Arithmetic Method

As additional input to the bi-national decision-making process, a numeric ranking of the Canadian alternatives was conducted using the weighting scenarios developed earlier in the study and scores assigned by the factor specialists to identify the relative ranking of the Crossing-Plaza alternatives. The results are presented in Table 12 on the following page.

The results of the arithmetic method indicate that Crossing B-Plaza B1 is the highest ranking alternative, followed by the Crossing A-Plaza A alternative, and the Crossing C-Plaza C alternative, respectively. These results are consistent with those of the reasoned arguments presented in this section.

EXHIBIT 7 – CONCEPTUAL ILLUSTRATIONS OF ALTERNATIVE BRIDGE TYPES

CABLE-STAYED BRIDGE

SUSPENSION BRIDGE

TABLE 12 – RESULTS OF ARITHMETIC EVALUATION–CROSSING A, CROSSING B AND CROSSING C ALTERNATIVES–CANADIAN SIDE

STUDY TEAM WEIGHTING

Factor	Weight	Crossing A – Plaza A		Crossing B – Plaza B1		Crossing C - Plaza B	
		Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
Changes in Air Quality	12.39	2	24.78	2	24.78	2	24.78
Protection of Community and Neighbourhood Characteristics	15.93	1	15.93	3	47.79	2	31.86
Maintain Consistency with Existing and Planned Land Use	12.39	2	24.78	3	37.17	3	37.17
Protect Cultural Resources	12.39	3	37.17	3	37.17	3	37.17
Protect the Natural Environment	15.93	1	15.93	2	31.86	2	31.86
Improve Regional Mobility	17.70	6	106.20	7	123.90	7	123.90
Cost and Constructability	13.27	2	26.54	2	26.54	1	13.27
Total	100.00	17	251.33	22	329.21	20	300.01
Rank	Un-weighted	3		1		2	
	Weighted		3		1		2

PUBLIC WEIGHTING

Factor	Weight	Crossing A – Plaza A		Crossing B – Plaza B1		Crossing C - Plaza B	
		Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
Changes in Air Quality	17.32	2	34.64	2	34.64	2	34.64
Protection of Community and Neighbourhood Characteristics	15.49	1	15.49	3	46.47	2	30.98
Maintain Consistency with Existing and Planned Land Use	12.89	2	25.78	3	38.67	3	38.67

Protect Cultural Resources	13.14	3	39.42	3	39.42	3	39.42
Protect the Natural Environment	16.34	1	16.34	2	32.68	2	32.68
Improve Regional Mobility	15.28	6	91.68	7	106.96	7	106.96
Cost and Constructability	9.54	2	19.08	2	19.08	1	9.54
Total	100.00	17	242.43	22	317.92	20	292.89
Rank	Un-weighted	3		1		2	
	Weighted		3		1		2
	COMMUNITY CONSULTATION GROUP WEIGHTING						
Factor	Weight	Crossing A – Plaza A		Crossing B – Plaza B1		Crossing C - Plaza B	
		Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
Changes in Air Quality	17.30	2	34.60	2	34.60	2	34.60
Protection of Community and Neighbourhood Characteristics	13.88	1	13.88	3	41.64	2	27.76
Maintain Consistency with Existing and Planned Land Use	13.69	2	27.38	3	41.07	3	41.07
Protect Cultural Resources	13.12	3	39.36	3	39.36	3	39.36
Protect the Natural Environment	17.11	1	17.11	2	34.22	2	34.22
Improve Regional Mobility	14.83	6	88.98	7	103.81	7	103.81
Cost and Constructability	10.07	2	20.14	2	20.14	1	10.07
Total	100.00	17	241.45	22	314.84	20	290.89
Rank	Un-weighted	3		1		2	
	Weighted		3		1		2