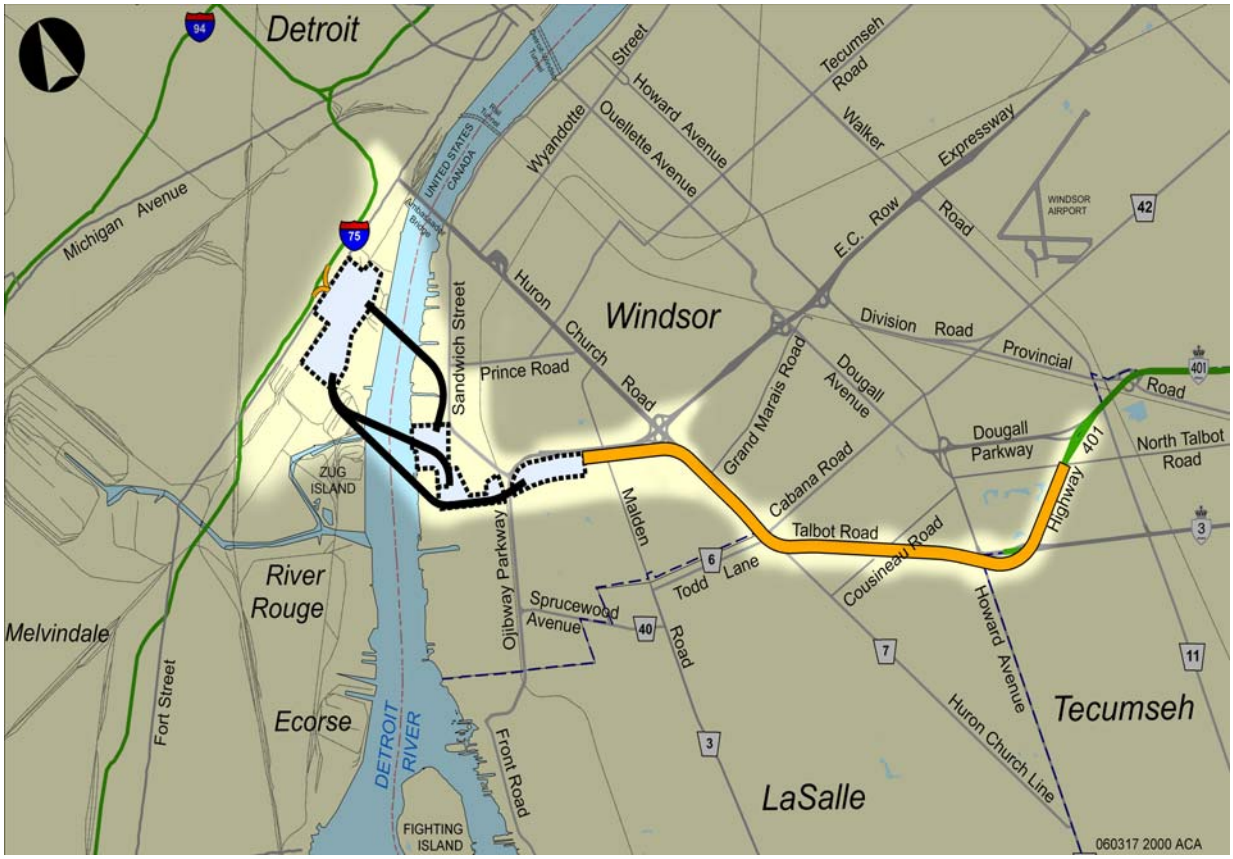
Canada-United States-Ontario-Michigan
Border Transportation Partnership

Detroit River International Crossing Environmental Assessment Study



Draft Structural Planning Report for Practical Alternatives

URS

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Preface

The Detroit River International Crossing (DRIC) Environmental Assessment Study is being conducted by a partnership of the federal, state and provincial governments in Canada and the United States in accordance with the requirements of the Canadian Environmental Assessment Act (CEAA), the Ontario Environmental Assessment Act (OEAA), and the U.S. National Environmental Policy Act (NEPA). In 2006, the Canadian and U.S. Study Teams completed an assessment of illustrative crossing, plaza and access road alternatives. This assessment is documented in two reports: *Generation and Assessment of Illustrative Alternatives Report - Draft November 2006)* (Canadian side) and *Evaluation of Illustrative Alternatives Report (December 2006)* (U.S. side). The results of this assessment led to the identification of an Area of Continued Analysis (ACA) as shown in Exhibit 1.

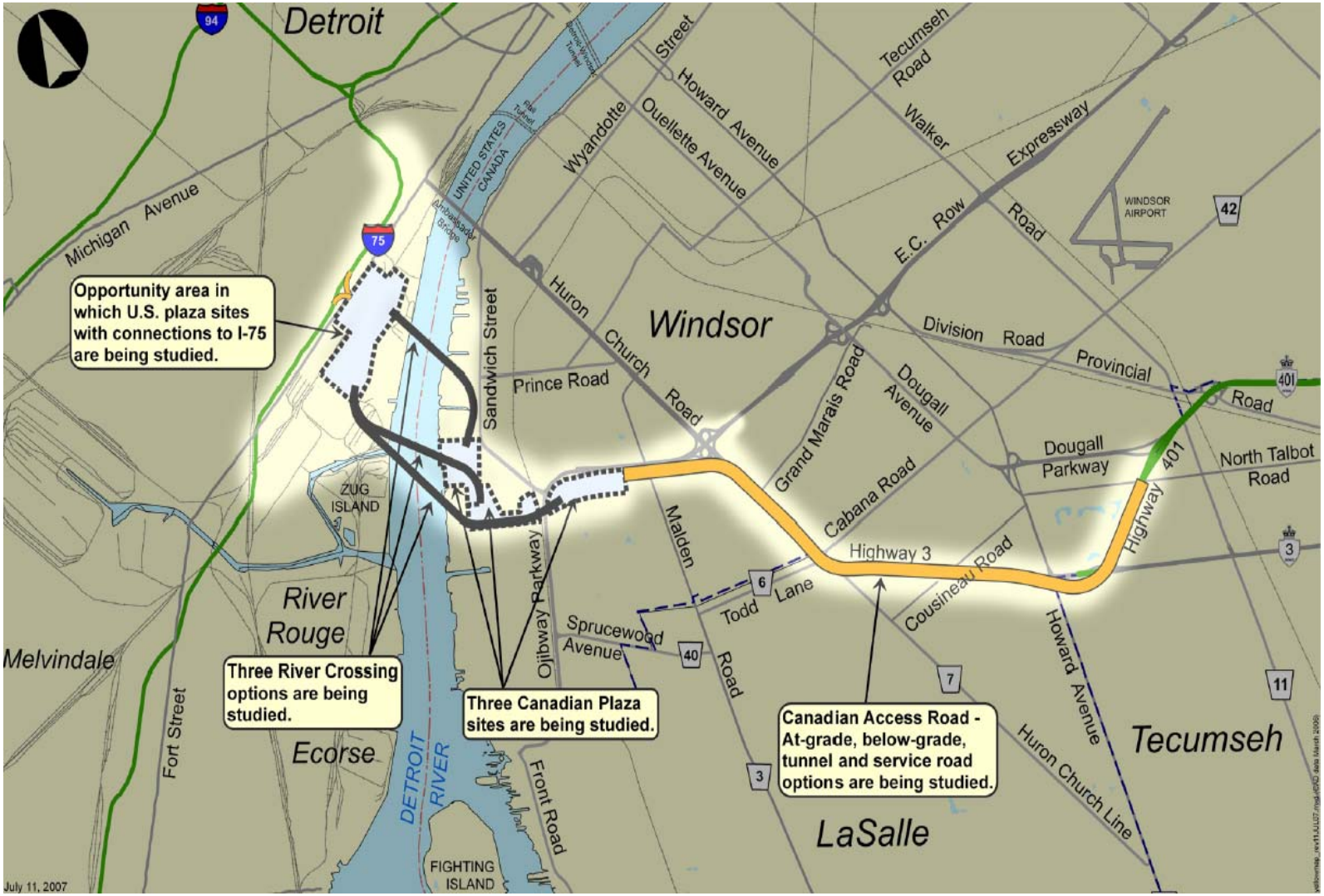
Within the ACA, practical alternatives were developed for the crossings, plazas and access routes alternatives. The evaluation of practical crossing, plaza and access road alternatives is based on the following seven factors:

- Changes to Air Quality
- Protection of Community and Neighbourhood Characteristics
- Consistency with Existing and Planned Land Use
- Protection of Cultural Resources
- Protection of the Natural Environment
- Improvements to Regional Mobility
- Cost and Constructability

This report pertains to the Cost and Constructability factor and is one of several reports that will be used in support of the evaluation of practical alternatives and the selection of the technically and environmentally preferred alternative. This report will form a part of the environmental assessment documentation for this study.

Additional documentation pertaining to the evaluation of practical alternatives is available for viewing/downloading at the study website (www.partnershipborderstudy.com).

EXHIBIT 1 – AREA OF CONTINUED ANALYSIS – PRACTICAL CROSSING, PLAZA AND ROUTE ALTERNATIVES



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Appendices

1. Introduction

This report has been prepared to document the structures on the proposed Highway 401 along the Highway 3 corridor (Huron Church Road) from Highway 401/Highway 3 interchange to the Plaza. The Detroit River International Crossing (DRIC) Study is an Environmental Assessment Study undertaken by a joint partnership between the Ministry of Transportation Ontario (MTO), Transport Canada (TC), the Michigan Department of Transportation (MDOT) and the U.S. Federal Highway Administration (FHWA).

The project limits for this phase of the study are defined by the Area of Continued Analysis (ACA), which begins near the western terminus of Highway 401, and generally follows the alignments of Highway 3, Huron Church Road and E.C. Row Expressway. Approaching the Detroit River, the ACA includes area for three border plaza sites and three international bridge crossing alternatives. The ACA traverses through the Town of Tecumseh, Town of Lasalle and the City of Windsor. A key plan which identifies the ACA is presented in Exhibit 1.

The proposed Highway 401 will have 3-WB & 3-EB traffic lanes with a central median and shoulders on both sides. The Practical Alternative alignments and profiles considered for this portion of the Highway 401 consist of two at grade options, two below grade options, one tunnel option and The Parkway option.

A one page Structural Planning Sheet for each structure, Site Maps showing the location of each structure along Practical Alternative alignments are appended. Summary Tables giving structure identification number (ID), structure name, structure type, length, width, estimated cost of each structure and total costs of the structures for each alignment are appended. Aerial photographs of each site are appended.

2. Alignments and Profiles

The Alignments (Site Plans) and Profiles used for Practical Alternatives 1A, 1B, 2A, 2B and 3 are as they were in August 2006. The Alignments (Site Plans) and Profiles used for The Parkway are as they were in February 2008.

The profiles of the structures are based on providing a minimum clearance of 5.1 m at overpasses and underpasses and 7.2 m at railway overheads.

2.1. Alternative 1A: Highway 401 at Grade along Highway 3 Corridor (Huron Church Road) with Service Roads on Both Sides

The proposed Highway 401 for this alternative is at grade along the Highway 3 corridor (Huron Church Road). However it is below grade at its crossings with major cross roads. The existing Highway 3 corridor (Huron Church Road) will be replaced by WB and EB Service Roads of two lanes on each side of Highway 401. This alignment with the location of each structure is shown on Site Plan 1, Sheets 1 and 2, Appendix A1. The profile is shown on Profile 1, Sheets 1 to 7, Appendix B1.

2.2. Alternative 1B: Highway 401 Below Grade along Highway 3 Corridor (Huron Church Road) with Service Roads on Both Sides

The proposed Highway 401 for this alternative is below grade along the Highway 3 corridor (Huron Church Road). The existing Highway 3 corridor (Huron Church Road) will be replaced by WB and EB Service Roads of two lanes on each side of Highway 401. The profile of below grade Highway 401, in boat section, is typically 7 m below the existing ground level. This alignment with the location of each structure is shown on Site Plan 2, Sheets 1 and 2, Appendix A2. The profile is shown on Profile 2, Sheets 1 to 7, Appendix B2.

2.3. Alternative 2A: Highway 401 at Grade Parallel to Highway 3 Corridor (Huron Church Road)

The proposed Highway 401 for this alternative is at grade parallel to the existing Highway 3 corridor (Huron Church Road). However it is below grade at its crossings with major cross roads. This alignment with the location of each structure is shown on Site Plan 3,

Sheets 1 and 2, Appendix A3. The profile is shown on Profile 3, Sheets 1 to 5, Appendix B3.

2.4. Alternative 2B: Highway 401 Below Grade Parallel to Highway 3 Corridor (Huron Church Road)

The proposed Highway 401 for this alternative is below grade parallel to the existing Highway 3 corridor (Huron Church Road). The profile of Highway 401, in boat section, is typically 7 m below the existing ground level. This alignment with the location of each structure is shown on Site Plan 4, Sheets 1 and 2, Appendix A4. The profile is shown on Profile 4, Sheets 1 to 6, Appendix B4.

2.5. Alternative 3: Highway 401 in Tunnel along Highway 3 Corridor (Huron Church Road) with at Grade Service Roads

The proposed Highway 401 for this alternative is underground in a tunnel section along the Highway 3 corridor (Huron Church Road). The existing Highway 3 corridor (Huron Church Road) will be replaced by at grade WB and EB Service Roads above Highway 401 tunnel. The tunnel section will be a twin cell rectangular box. This alignment with the location of each structure is shown on Site Plan 5, Sheets 1 and 2, Appendix A5. The profile is shown on Profile 5, Sheets 1 to 7, Appendix B5.

2.6. Alternative The Parkway: Highway 401 Below Grade along Highway 3 Corridor (Huron Church Road) with Service Roads and Tunnel Sections

The proposed Highway 401 for this alternative is below grade along the Highway 3 corridor (Huron Church Road). The existing Highway 3 corridor (Huron Church Road) will be replaced by WB and EB Service Roads of two lanes each on one side of Highway 401 and pedestrian trails on each side of Highway 401. Also Highway 401 is in tunnel sections as detailed in Section 3. The profile of below grade Highway 401 from east of Howard Avenue to west of Bethlehem Avenue near E.C Row Expressway varies from 7 m to 12 m below the existing ground level. This alignment with the location of each structure is shown on Site Plan 6, Sheets 1 and 2, Appendix A6. The profile is shown on Profile 6, Sheets 1 to 4, Appendix B6.

2.7. Connections from Plazas A, B and C to the International Bridge Crossings X10(A), X10(B) and X11(C)

Practical Alternative approach structures from Plazas A, B, C to the International Bridge crossings X10(A), X10(B) and X11(C) are reported separately.

3. Crossings

The number of traffic lanes at each crossing structure are based on City of Windsor Official Plan (March 2000) and consultations with the stakeholders. The lane widths are based on the Geometric Design Standards for Ontario Highways (GDSOH) and City of Windsor standards.

The Practical Alternatives of the proposed Highway 401 cross the following roads and water courses on structures:

- North Talbot Road
- Highway 3
- Ramps to Highway 3 and Highway 401
- Howard Avenue
- Montgomery Drive
- Cousineau Road / Sandwich Parkway
- St.Clair College Road
- Huron Church Line
- Cabana Road West / Todd Lane
- Turkey Creek
- Pulford Street
- Grand Marais West / Lambton Road
- Labelle Street / Bethlehem Avenue
- Pedestrian Plazas at some of the major road crossings
- Spring Garden Road
- Malden Road
- Malden Ramp
- Matchette Road
- Ojibway Parkway
- Essex Terminal Rail Track
- Cahill Drain
- Secondary Drain
- Lennon Drain

- Marentette Drain
- Basin Drain
- Titcombe Drain

The Parkway alternative of the proposed Highway 401 is located in the following tunnels:

- Tunnel at West of Howard Avenue Underpass (East & West side)
- Tunnel at Hearthwood (East & West side)
- Tunnel at Cousineau Road / Sandwich Parkway (East & West side)
- Tunnel at St. Clair College Road (East, Middle & West side)
- Tunnel at Huron Church Line (East, Middle & West side)
- Tunnel at Cabana Road West (East, Middle & West side)
- Tunnel at Reddock Street
- Tunnel at Pulford Street
- Tunnel at South of Grand Marais Road West (East & West side)
- Tunnel at South of Labelle Street (East, Middle & West side)
- Tunnel near E.C. ROW Expressway

4. Structural Planning Studies

The detailed planning study at each site includes review of structural surroundings, number of traffic lanes required on municipal roads at overpasses and underpasses, geometric alignments and profiles, horizontal and vertical structural clearances, site accessibility, environmental issues, foundation information where available, property requirements, traffic constraints, road detours, and temporary water course diversions. The design of the structures is in accordance with the CAN / CSA S6-06 Canadian Highway Bridge Design Code (CHBDC), MTO Structural Manual, MTO Structural Planning Guidelines and MTO Aesthetic Guidelines for Structures. Preference is given to open spans, low profile structures, short wingwalls and narrow piers. The most cost effective structural arrangement meeting all structural, highway design and environmental requirements is selected for each of the structures. The type of abutment is selected based on the skew angle of the crossing and foundation information available at each of these sites. Consideration is also given to durability of each of the alternatives, including materials and details to improve long-term durability of the structures, reduce maintenance costs and improve safety of the public.

The typical bridge deck consists of CPCI girders supporting a reinforced concrete deck slab with asphalt and waterproofing. Some of the bridge decks consist of voided slabs. The abutments will be either integral or semi-integral supported on HP piles.

Temporary supports of excavation (SOE) for the typical boat section comprises of HP piles and lagging or 1050mm diameter reinforced concrete caisson retaining walls. These SOEs with 500mm thick concrete facia on the exterior side will act as permanent walls of the boat sections. The types of SOEs depend of soil conditions, water table, bedrock level etc. They could also be either concrete diaphragm walls or temporary slurry walls. The base of these boat sections will have pavement road surface.

For Practical Alternative 3 the proposed Highway 401 tunnel will be a twin cell box section constructed by cut and cover (top down or bottom up) method in two stages, one for each cell. Temporary supports of excavation (SOE) will be HP piles and lagging or 1200mm diameter concrete caisson walls, depending on the depth of excavation. The types of SOEs depend of soil conditions, water table, bedrock level etc. They could also be either concrete diaphragm walls or temporary slurry walls. Each rectangular cell of reinforced concrete box section will be constructed after removing the soil between the support of excavations.

Foundation information considered for Practical Alternatives 1A, 1B, 2A, 2B and 3 is based on the Interim Foundations and Geotechnical Engineering Report, March 2005 by Golder Associates.

Foundation information considered for the Practical Alternative The Parkway is based on

Preliminary Foundations Investigation and Design Report, June 2006 by Golder Associates. In this report, Golder Associates advised that the depth of excavation should be limited to 7m with excavation being in open cut with 3:1 side-slopes. This advice refers to The Parkway section from east end to Todd Lane / Cabana Road. The depth of excavation should be limited to 5m with excavation being in open cut with 3:1 side-slopes for The Parkway section from Todd Lane / Cabana Road to E.C. Row Expressway. These Golder recommendations relate to "The Parkway" sections with enough room, within the proposed right-of-way, for maximum open cut permissible from geotechnical considerations as above. For the excavations deeper than such limits, there should be a combination of open cut and support of excavation walls placed on both sides. For other sections with more restricted right-of-way, there will be a need for shallower open cut with deeper support of excavation walls (Crossing Outlet Mall area). Preliminary construction cost estimate for The Parkway is based on the assumptions given above. There will be an opportunity during the Preliminary Design stage to further refine heights and lengths of support of excavation walls in order to optimize cost and efficiency. This could result in deeper sections of open cut with flatter side-slopes and shorter height of support of excavation walls.

4.1. Structural Planning Sheets

The Structure Planning Sheet for each structure contains the following information:

- Corridor and Route Identification
- Structure Identification Number (ID)
- Location
- Structure Description
- Bridge / Structure Type
- Elevation showing the span arrangement and length of bridge or depths for boat ramps and tunnel structures
- Cross section showing structure type, overall width, lane widths, shoulder widths, barriers and abutment types
- Skew angle
- Structural depth
- Span/Depth Ratio
- Vertical Clearance
- Overall length
- Overall width
- Unit price used for estimating structure cost

- Estimated cost of structure
- Comments summarizing special construction and design features

The Structural Planning Sheets for the Practical Alternatives are given in Appendix C.1 to C.6:

Appendix C.1: Structural Planning Sheets for Alternative 1A

Appendix C.2: Structural Planning Sheets for Alternative 1B

Appendix C.3: Structural Planning Sheets for Alternative 2A

Appendix C.4: Structural Planning Sheets for Alternative 2B

Appendix C.5: Structural Planning Sheets for Alternative 3

Appendix C.6: Structural Planning Sheets for The Parkway

4.2. Unit Costs

Unit costs considered in this report for Practical Alternatives are as follows:

a) "Boat" Sections of Highway 401 (Alternatives 1A,1B,2A,2B and 3)

- $30,000 / m: variable depth from 0 to 7 m
- $45,000 / m: uniform depth of 7 m
- $45,000 / m: variable depth from 0 to 12 m
- $65,000 / m: uniform depth of 12 m
- $65,000 / m: variable depth from 0 to 16 m and from 7 m to 12 m
- $75,000 / m: variable depth from 12 m to 16 m

b) Tunnel Sections of Highway 401 (Alternative 3)

Tunnel with Highway 401 profile control at approximately 12 m below ground

- $75,000 / m: one lane ramp tunnel
- $90,000 / m: two lanes ramp tunnel
- $215,000 / m: Highway 401 with 3+3 Lanes tunnel
- $255,000 / m: Highway 401 with 4+4 Lanes tunnel (with SCL on both sides)

Tunnel with Highway 401 profile control at approximately 16 m below ground

- $135,000 / m: one lane ramp tunnel

- $265,000 / m: Highway 401 with 3+3 Lanes tunnel

c) Bridge Structures (All Alternatives)

- $2000 / m²: with integral abutments
- $2100 / m²: with integral abutments and RSS walls
- $2100 / m²: with semi-integral abutments
- $2200 / m²: with semi-integral abutments and RSS walls
- $2300 / m²: post-tensioned bridge with semi-integral abutments
- $2400 / m²: prestressed box girders with semi-integral abutments and RSS walls
- $2500 / m²: with semi-integral abutments above ETR tracks

d) The Parkway

d1) Full Height Retaining Walls

- $15,000 / m: variable depth from 0 to 8 m (type 'BS1')
- $32,500 / m: variable depth from 9 to 10 m (type 'BS3')

d2) Retaining Walls with Open Cut and Caisson Walls

- $31,000/ m: variable depth from 7 to 12 m with 7 m open cut (type 'A')
- $29,500/ m: variable depth from 7 to 10 m with 5 m open cut (type 'B')
- $32,500/ m: variable depth from 7 to 12 m with 4 m open cut (type 'C')
- $27,000/ m: variable depth from 8 to 9 m with 7 m open cut (type 'D')
- $18,000/ m: variable depth from 0 to 10 m with 4 m open cut (type 'E')

d3) Tunnel Sections

- $400 / m²: additional cost due to high embankment fills above the tunnel sections

4.3. Summary Tables

The summary table for each alignment alternative contains the structure ID, structure name, structure type, length, width and estimated cost of each structure and a total cost of all the structures for each alignment.

The summary tables are given in Appendix D.1 to D.6:

Appendix D.1: Table 1A for Alternative 1A

Appendix D.2: Table 1B for Alternative 1B

Appendix D.3: Table 2A for Alternative 2A

Appendix D.4: Table 2B for Alternative 2B

Appendix D.5: Table 3 for Alternative 3

Appendix D.6: Table for The Parkway

4.4. Photographs

The photographs at each structure location for the five Practical Alternatives are given in Appendix E.1 to E.6:

Appendix E.1: Photographs for Alternative 1A

Appendix E.2: Photographs for Alternative 1B

Appendix E.3: Photographs for Alternative 2A

Appendix E.4: Photographs for Alternative 2B

Appendix E.5: Photographs for Alternative 3

Appendix E.6: Photographs for The Parkway

5. Utilities Crossing Highway 3 Corridor (Huron Church Road)

A number of utilities are located along the existing Highway 3 corridor (Huron Church Road) or cross it at Howard Avenue, Cousineau Road, Todd Lane / Cabana Road, Pulford Avenue, Lambton Avenue and Labelle Street. These utilities are:

- Bell Canada cables
- Gas pipelines
- Water mains
- Essex power cables
- Storm sewer
- Sanitary sewer
- MAXess fiber optics cables

These utilities are identified in the table in Appendix F.

According to Ontario Ministry of Transportation Structural Manual, fluid carrying pipe lines are not normally allowed to be carried through or under bridges, unless specifically approved by MTO. This includes oil and gas pipelines, sanitary and storm sewers and water mains. Electrical power lines may be carried through, under or over structures, provided the voltage does not exceeds 44 KV. Utilities are not allowed in sidewalks or to be directly supported from the deck slabs. They must not be placed in a location which prohibits routine inspection of structural components of the bridge. MTO Structural Manual gives approved details for the accommodation of non-MTO utilities on bridges.

Utilities crossings will be reviewed during the preliminary design stage by initiating negotiations with the utility companies. Suitable methods of carrying the utilities through or under the structures will be negotiated with the utility companies during detailed design stage.