

1.0 INTRODUCTION & BACKGROUND

1.1 GENERAL

This brief summary report has been prepared to provide an update of the Walterdale Bridge Replacement Concept Planning Study. The report presents some background data and identifies technical issues and constraints to be addressed during the Study. Initial technical work included development and evaluation of numerous road and bridge options, from which four road options were selected and presented to the public at a recent Open House. Four bridge styles, each appropriate for all the road options, were also presented for consideration. Based on further evaluation and feedback from the Open House, road options and bridge styles have been selected for further evaluation.

1.2 BACKGROUND INFORMATION

Walterdale Bridge, crossing the North Saskatchewan River near Edmonton's downtown, is approaching 100 years of age and the end of its useful life. The bridge is an important link in the City transportation system, carrying two traffic lanes northbound into downtown from Gateway Boulevard and 109 Street via Queen Elizabeth Park Road (two lanes), and Walterdale Hill Road (two lanes and one bus lane). The bridge operates at capacity during peak hours, which results in significant congestion on the south approaches, particularly during the AM Peak.

BPTEC-DNW and Al-Terra Engineering Ltd. were retained in 2008 by the City to complete a Strategic Planning Study for replacement of the Walterdale Bridge, including upgrading of the approach roads. A number of road and bridge options were developed and evaluated, and three were recommended for further consideration and study. It was concluded that vertical (existing +9% grades) and horizontal improvements for Queen Elizabeth Park Road, and additional capacity (three lanes northbound on new bridge) would be highly desirable, but traffic analysis suggested that improved capacity on the south approach roads and bridge may simply relocate congestion north of the river unless roadway improvements north of the river are also completed. Avoiding the north side burial grounds, without first removing the existing bridge, was considered a major challenge for implementation.

The North Bank projects, which included redevelopment of the West Rosedale Urban Area, the Legislative Centre Redevelopment, and Repurposing the Rosedale Generating Station, are complimentary projects at various stages of planning, which require consideration for planning of a replacement bridge and approach roads.

1.3 STUDY PURPOSE AND OBJECTIVES

The Walterdale Bridge and Approach Roads Concept Planning Study was initiated by an April 7, 2009 Council motion, which directed administration to proceed with Option 1 of the Strategic Planning Study. The option required replacement of the existing bridge with a signature structure and demolition of the existing bridge.

The purpose of the Planning Study is to develop concept plans that define the location and alignment of a new Walterdale Bridge, including approach roads north and south of the bridge, and provide the information necessary to commence preliminary design. The Study will follow up on work completed for the Walterdale Bridge Crossing Strategic Planning Concept (BPTEC-DNW/Al-Terra Engineering Ltd., 2008).

Key objectives identified for the Study:

- Review and further evaluate recommended options from the BPTEC-DNW/Al-Terra Engineering Ltd., 2008 report. Develop and evaluate other options.
- Review and evaluate other alternatives, including:
 - Improvements to the adjacent approaches and exits to the bridge structure (Queen Elizabeth Park Road, Walterdale Hill Road, 105 Street, and River Valley Road);
 - Consideration of Saskatchewan Drive intersection/crossing alternatives;
 - Incorporation of an at-grade crossing at Saskatchewan Drive; and
 - Access improvements for affected stakeholders and accommodation of safe pedestrian movements.
- Identify and recommend a bridge replacement option and other associated improvements, with due consideration of functional signature bridge options.
- Develop concept plans and cost estimates for the recommended replacement option; including life cycle cost analysis.
- Complete Study in consideration of development plans currently underway for the West Rosssdale Urban Design Plan and other designs for this area.
- Complete the Concept Planning Study and present to City Council for approval by the spring of 2011.

1.4 KEY ISSUES, CONSTRAINTS AND OPPORTUNITIES

At the outset of the project, a number of key issues and constraints were identified for further consideration during the Study. It will be necessary to address these issues and constraints to ensure that a concept for a replacement bridge and approach roads is developed, which meet the long term needs of the area. Attachment 5 contains a key issues map depicting key features, constraints and relevant issues, along with an exhibit that graphically depicts the land use integration considerations for the study area.

- **Resolution of Competing Interests** – The Walterdale Bridge Replacement project must meet numerous objectives, adapt to many constraints and attempt to satisfy some potentially competing interests. While the bridge's basic role of conveying multi-modal traffic across the river must be met, it is not clear what level of traffic service should be achieved in the future. In particular, the competing interests of vehicular mobility, on an important route into downtown will need to be weighed against interests that are diagrammatically opposed to the facilitation of good traffic flow (heavy traffic through a West Rosssdale Redevelopment as a proposed walkable sustainable community). Resolution of this issue by the Consulting Team and City Staff will be critical to strike an

appropriate balance between the numerous objectives and establish an appropriate degree of flexibility.

- **Historical Resources Challenges** – Rosssdale Flats generally and the proposed development area specifically have been established as a location of unprecedented cultural resource concern for Aboriginal, Métis, and non-native members of the Edmonton community. In particular, the cultural resource site FjPi-63, which includes a Historic period cemetery, presently referred to as the Fort Edmonton Cemetery and Traditional Aboriginal Burial Ground. Compounded by a history of periodic disturbance as a result of utility and road construction, community concerns regarding this cemetery came to a head in the late 1990's in association with a planned expansion of the EPCOR Rosssdale Power Plant. Issues related to the ongoing management of this resource will continue to play a prominent role in the planning stages of the proposed bridge replacement.
- **Bridge Replacement Opportunities** – Edmonton currently does not have a signature roadway bridge to carry vehicular and pedestrian traffic across the North Saskatchewan River. Most major cities in the world have made major investments in infrastructure projects, and are widely recognized for signature bridge projects. With the redevelopment of the West Rosssdale area, the City of Edmonton has the opportunity to construct a functional signature bridge which will be a source of pride for years to come. If the design is done well, the bridge will serve as a gateway to welcome people to downtown Edmonton for many years to come.
- **Steep Grades on South Approaches** – Improved vertical geometry on Queen Elizabeth Park Road would be desirable and could be achieved (6%) based on Gateway Boulevard grade separation under Saskatchewan Drive (options in Strategic Planning Study). A depressed Gateway Boulevard was, however, not well received by some of the public.
- **Environmental Issues** – The 2008 Strategic Planning Concept Study for the Walterdale Bridge Crossing identified several options for the river crossing that warrant further consideration. The Study also identified the need to examine the existing and future roles of Walterdale Hill Road and Queen Elizabeth Park Road, so the resulting Study Area on the south side of the river is quite large. Importantly, the Study identified the need for approval of the project pursuant to City of Edmonton Bylaw 7188 and also the need to secure approvals pursuant to the federal *Fisheries Act* and *Navigable Waters Protection Act*. These approvals represent some of the environmental permits that will be required.
- **Utilities** – The existing Walterdale Bridge carries a number of utility pipes and other facilities across the river. These include water and gas pipelines, electrical, telecommunication and cable services, and Edmonton Transit trolley and power lines.

These utilities comprise about 21% of the total dead load of the bridge. The trolley lines are expected to be phased out prior to the bridge replacement. Accommodation of all the existing utilities below the deck of the new bridge is expected to be technically feasible. City policy regarding the attachment of gas lines to bridges must be considered to determine whether the existing gas line can be located on the new bridge. The method and sequencing of the construction of the new bridge will be crucial to the cost and methods chosen to relocate the utility lines. If the existing bridge can be kept in service while the new bridge is being built, the utilities could be transferred in an orderly manner before the old bridge is removed from service.

If the existing bridge must be taken out of service before the new bridge can be completed (e.g. in order to stay clear of the burial ground) alternative temporary or permanent locations for the utilities will have to be found. Previous conceptual level cost estimates indicate a premium of \$3.0 M for utility relocation if the existing bridge is taken out of service before the new bridge is completed. Numerous abandoned and active utilities are located within the Study Area, and will impact ultimate design of approach roads. Utility research completed during the Strategic Planning Study was based on the City GBIS, and this work must be expanded to include preparation of a complete contact list as well as initial discussions.

- **Construction Staging and Related Traffic Accommodation** – The Walterdale Bridge acts as a significant central area river crossing. Site constraints may dictate a location for the new bridge that is coincident with the existing structure and thereby force a complete closure of Walterdale Hill Road and Queen Elizabeth Road as access routes. A thorough investigation of construction staging options will be necessary along with related traffic accommodation schemes to minimize impacts of a potential closure of the crossing during construction of the new bridge. Micro-simulation and other traffic analysis will be needed to assess options and define an optimal staging and accommodation plan.

1.5 OTHER PROJECT INFLUENCES

- **Transportation Master Plan, “The Way We Move,” Bylaw 15101** – The City has recently approved a new Transportation Master Plan, “the Way We Move” which outlines the City’s broad policies and approaches to addressing Edmonton’s future transportation needs. The Plan marks a significant shift in Edmonton’s transportation policy direction by designating public transit and active transportation modes as the preferred modes of travel. Improvements to the City’s roadway network are focused primarily on facilitating goods movement and therefore typically located on major highway connector routes outside the “Inner Ring Loop”. This policy direction has implications for the nature and extent of roadway improvements related to the new bridge.

- **Capital City Downtown Plan** - The City of Edmonton is in the final stages of completing a new Downtown Plan. Some of the key policy directions of this plan that are particularly relevant to the Walterdale Bridge replacement include:
 - Focus on reducing reliance on auto access to Downtown in favor of other modes;
 - Focus on improved pedestrian connections to the River Valley; and
 - Focus on urban design excellence and historic preservation.
- **Walterdale Bridge Crossing Strategic Planning Concept Study, 2008** – This Study examined a number of options for replacement of Walterdale Bridge along with related roadway network improvements. The Study recommended three options for consideration ranging in cost from \$61 M to \$185 M with the highest cost options involving a grade separation between Gateway Boulevard and Saskatchewan Drive. Public input received during the Study reflected a high degree of concern over the depression of Gateway Boulevard through Old Strathcona and concern that it would divide the community and that such a scheme was inconsistent with the pedestrian oriented environment as well as the nature and character of the area.
- **West Rosssdale Urban Design Plan** – The West Rosssdale Urban Design Plan sets the direction for neighborhood development and its relation to its immediate surroundings. A key focus of the Plan is the creation of a pedestrian friendly sustainable community and the potential for a gateway to Downtown through the development of a new bridge and associated public realm improvements.

In addition to development of the West Rosssdale area, the Plan proposes to change traffic circulation in the area by converting Rosssdale Road into a two-way artery and eliminating 104 Street as a through artery from 97 Avenue to Rosssdale Road. This change, together with the proposed new southbound access to the Kinsmen Sports Centre, will introduce traffic challenges that will need to be considered.

- **EPCOR Rosssdale Re-purposing Project** – The area south of Rosssdale Road is proposed to have cultural emphasis, utilizing the Low Pressure Power Plant, which is provincially designated. The High Pressure Plant is to be removed through decommissioning.

Limited on-site parking is expected to be provided for the proposed Repurposed EPCOR Power Site, and current temporary parking for Telus Field in the West Rosssdale area will be lost through redevelopment of these lands. Alternate parking at the Kinsman Recreational Facility would create a high pedestrian demand between the south and north sides of the river in this area, which may need to be accommodated on the bridge. A regional parking strategy would need to be explored as part of the repurposing.

- **Grade Separated Pedestrian Accommodation** – A desire to provide pedestrian facilities such as a promenade “to touch the water” along each side of the North

Saskatchewan River has been expressed, although no specific study is underway. Accommodation will be considered in the bridge replacement planning to provide opportunity to provide for these facilities in the future.

- **Alberta Legislature Centre Redevelopment Master Plan** – This plan identifies the opportunity for the Legislature Grounds to focus on and front the River Valley, their potential integration with the river and the West Rosedale neighborhood. Vehicular access is contemplated off 96 Avenue and directly off River Valley Road, just west of 105 Street. The position of the new Walterdale Bridge and adjustments to the north side roadway network could affect this access.
- **Bicycle Transportation Plan (BTP) and Cycling** – In 2008 the City of Edmonton developed a new Bicycle Transportation Plan to replace the previous document completed in 1992. The new BTP established a network of bicycle routes throughout the City aimed at providing cyclists with a viable network of routes and to improve the potential for cycling to carry a larger percentage of travelers. The BTP does not identify either Walterdale Hill Road or Queen Elizabeth Park Road as bicycle routes, although there are numerous multi-use trails in and around the Walterdale Bridge.

2.0 ROADWAY / BRIDGE ALIGNMENT OPTIONS

Twenty-six road options involving various bridge locations and orientations were developed by the Project Team for further evaluation. Technical evaluation by the Project Team eliminated sixteen Options considered to have “Fatal Flaws”. Evaluation criteria and weighting was then developed, with input from the Project Team and Workshop attendees to develop a comparison matrix to further reduce the number of viable options. Project Team members and Workshop attendees were asked to complete the comparison matrix which was then used by the Project Team to select four options for further evaluation and subsequently for presentation to the public at an Open House.

The four roadway/bridge realignment options that were developed and exhibited at the Open House are shown in Attachment 1. The main features of each option are summarized below:

2.1 OPTION 1 – BASE OPTION

This option represents bridge replacement with no significant modifications or improvements to the approach roads. This option may or may not have southbound access to the Kinsmen across the bridge, and could therefore provide a three lane bridge (all northbound) or a four lane bridge with three northbound lanes and one southbound lane.

- Minor modifications to the bridge orientation but the north end of the bridge lands at the existing location.

- The south end of the bridge will need to be raised to provide clearance to flood levels. The final elevation of the bridge would depend on the type of bridge (bridge depth), but the south end would likely require a raise of at least 3.5 m, and therefore, significant road reconstruction would be required at the south end of the bridge.
- Minimal vertical adjustment is required at the north end of the bridge; accordingly, minimal widening only would be required. Anticipate road widening generally on the west side of 105 Street to minimize disturbance on the east side.
- No impact on End of Steel Park, as the hairpin curve at Saskatchewan Drive is maintained.

2.2 OPTION 2 – GRADE SEPARATE SASKATCHEWAN DRIVE

This option provides the added attributes of both a southbound connection to Kinsman across a new bridge, but also a southbound connection from Kinsman to Calgary Trail.

Option 2 provides improved horizontal and vertical geometrics for Queen Elizabeth Park Road and Walterdale Hill Road, and provides a four lane bridge (three northbound and one southbound). The option would require the south approaches to the bridge to be raised which creates some challenges and requires reconfiguration of the Kinsman parking lot access. Gateway Boulevard is proposed to be realigned to 102 Street north of 82 Avenue and is proposed to be depressed under Saskatchewan Drive. This option realigns Gateway Boulevard to the east of the Strathcona Farmers' Market parking lot which addresses some concerns regarding pedestrian connectivity.

- Minor modifications to the bridge orientation to develop improved geometrics on the south approaches, but the north end of the bridge lands at the existing location.
- Grade separated, where Gateway Boulevard crosses Saskatchewan Drive, and the preferred approach would have Gateway Boulevard under Saskatchewan Drive, to reduce the vertical distance (longitudinal grades) between Saskatchewan Drive and the south end of the bridge (the existing elevation difference is ≈ 36 m / 120 ft).
- The new road footprint on the south side is quite significant as most of the alignment is off the existing Queen Elizabeth Park Road. Even with a depressed Gateway Boulevard, extensive retaining walls or elevated roadway (structure) will be required for the south approach.
- Major impact on End of Steel Park, and creates depressed roadway or tunnel through the north part of Old Strathcona.

2.3 OPTION 3 – GRADE SEPARATE RIVER VALLEY ROAD

Option 3 provides a four-lane bridge, three lanes northbound and one lane southbound for access to Kinsman. A grade separation is provided at River Valley Road/105 Street.

The intersection at Saskatchewan Drive/Gateway Boulevard is intended to be at-grade, but would require very high fills or elevated road on structure (+13m fills) and tight, horizontal geometry on Gateway Boulevard north of Saskatchewan Drive. Gateway Boulevard would be realigned to 102 Street through End of Steel Park.

- With grade separation at River Valley Road and 105 Street, this option could provide an elevated 105 Street over a significant historical resource, but provides adverse connection to southbound access to Kinsman.
- North departure from the bridge adversely impacts the proposed West Rossdale Redevelopment, and no direct access from 105 Street to River Valley Road.
- Traffic analysis suggests operational concerns on the north side of the river.
- Geotechnical concerns related to high fills on unstable slopes on the south bank.
- Significant impact on End of Steel Park.

2.4 OPTION 4 – REALIGNED BRIDGE CROSSING 280 M EAST

Option 4 provides a bridge location approximately 280 m downstream of the existing bridge, and therefore requires very significant new road construction on both the south and north approaches. The option could accommodate three northbound lanes and one southbound lane (access to Kinsman) on the bridge. This option relocates the major route north of the river off 105 Street to an alignment approximately 250 m east, between EPCOR Water and EPCOR Power sites, and intersects with Rossdale Road at 96 Avenue on the west side of Telus Field.

- The option appears to have many benefits related to the redevelopment of West Rossdale and EPCOR Power site (moves the main route to the perimeter of the redevelopment area).
- This option will likely require a fairly high bridge due to the shortened south approach, and therefore will likely require extensive use of retaining walls or elevated roadways.
- To reduce grades on the south approach will likely require grade separation at Saskatchewan Drive with Gateway Boulevard under, which has a major impact on End of Steel Park, and creates a depressed road/tunnel through Old Strathcona.
- Traffic analysis indicated that the new intersection of Rossdale Road and River Valley Road would have major operational and congestion concerns during the AM Peak.
- May be feasible to retain the existing bridge for pedestrians, but the bridge would be below flood levels on the south side.

Based on the current status of this Study, we have concluded the following:

2.5 NORTH OF THE RIVER

All options will consider tying into or slightly modifying 105 Street to provide an at-grade

The preferred configuration on the north side of the river is to generally retain the status quo with respect to retaining an at-grade intersection at River Valley Road/Rosssdale Road, and 105 Street. Rosssdale Road will be converted to a two-way operation to meet the requirements of the West Rosssdale re-development plan.

The road options that provided grade separation at River Valley Road and 105 Street, or shifted the bridge east to a new alignment were found to have unacceptable operational concerns, and would require resolution of complex and costly modification to the existing or planned infrastructure. It was concluded that further consideration of these options will not likely be prudent.

2.6 RIVER CROSSING

Three alignment and bridge orientation options are considered feasible technically, and require further study and evaluation, subject to further direction from the City. All options provide a southbound lane across the bridge for access to Kinsman; however, this could be eliminated, if required. The south end of the bridge must be raised to accommodate flood levels and the amount of raise required will be influenced by the bridge type (structure depth). The three alignment options are shown in Attachment 2, and include the following:

- **Base Bridge Replacement Option:** The option requires minimal road improvements on the north side of the river, but reorients the bridge and south approach roads to provide improved traffic flow on both Walterdale Hill Road and Queen Elizabeth Park Road. A traffic signal to meter traffic flows between Queen Elizabeth Park Road and Walterdale Hill Road will be required. This signal would also be expected to provide control for the Kinsman Access. The impact to the Kinsman parking lot may require reconfiguration to minimize loss of parking stalls. This option would likely require the existing Walterdale Bridge to be closed totally through construction of a new bridge.
- **West Bridge Alignment Option:** This option refers to a replacement of the Walterdale Bridge on an alignment west of the existing bridge. This option was developed to facilitate construction of a new Walterdale without the need to close the existing bridge during construction. Our initial development and evaluation of this option indicates that appropriate geometrics, both horizontally and vertically can be achieved on the south approaches. On the north side, significant new road construction would also be required, including reconstruction of the River Valley Road and 105 Street intersection. The resulting intersection would be on skew and may require further study to assure appropriate operations.

The west alignment impacts areas on both the north and south sides of the river, which will require Historical Resource Impact Assessments as limited previous work has been completed. This could impact the schedule somewhat; however, it is the opinion of Turtle Island CRM, our Historical Resources Consultant, that any findings could likely be mitigated.

This option has a slightly greater impact on the Kinsman parking lot, although initial evaluation suggests the impacts can be mitigated through minor reconfiguration of the parking lot to minimize the loss, if any, of parking stalls.

- **East Bridge Alignment Option:** An east side bridge replacement option was developed as a bridge option that could be constructed while the existing bridge remains open to traffic. This option will require relocation of the monument at the north end of the bridge, but will not impact the Fort Edmonton Cemetery. The bridge length required for this option is longer than the other two options.

Road improvements on the south approaches are somewhat more extensive, but appropriate horizontal and vertical geometrics can be achieved. Road improvement costs will be somewhat higher due to the extent of retaining walls and/or elevated structures required on the approaches. The impact to the Kinsman parking lot is minimized as this option moves the south bridge approach roads away from the Kinsman parking lot, and also eliminates left turns across traffic for access to the Kinsman. Further evaluation and design will be required to optimize the south side approach roads. Although the Project Team believes that the east side bridge option can be constructed without closing the existing bridge, additional work is required to validate the preliminary work completed to-date. The bridge type/style selected will also influence the ability to construct the new bridge with the existing bridge open to traffic.

Despite the alignment selected, the elevation of the south end of the bridge, and accordingly, the south approach roads, will require reconfiguration of the access to the Kinsman parking lot. A higher elevation also has a significant impact on the extent of the road reconstruction required on both Walterdale Hill Road and Queen Elizabeth Park Road. However, higher road elevations at the south bridge approaches would be considered more favourable in terms of providing pedestrian and trail accommodation under these roadways. Further study is required to evaluate and determine an appropriate balance.

The north end of the existing bridge is above flood levels, and therefore, a new bridge can be installed at the approximate current road elevations, assuming a typical structure depth. In order to protect for a future grade separated pedestrian crossing (promenade) on the north side of the river, it is suggested that either a pedestrian overpass or underpass would be feasible; however, an underpass would be more desirable and appropriate. A promenade under the bridge (along the water) would require sufficient vertical clearance (+4.0 m), and would therefore likely require the promenade to be located below flood levels, but well above normal water levels. This issue will require further consideration and study.

2.7 SOUTH SIDE OF RIVER – TOP OF BANK

Four options for the south bank roadways require further consideration and evaluation to confirm technical feasibility. All bridge and approach road options have been designed to facilitate staging opportunities and allow the bridge replacement and

approach roads component to be completed prior to, and separate from any south bank road improvements. Each of the bridge options discussed in the previous section can be implemented by connecting to the existing Walterdale Hill Road and Queen Elizabeth Park Road (the exact location of connecting varies between options). The flexibility to ensure stageability has therefore been retained with each bridge option.

The following briefly describes the south bank road options (Gateway Boulevard/Saskatchewan Drive/Queen Elizabeth Park Road):

- **Do Nothing Option:** This option retains the status quo, i.e.: the hair pin curve at Saskatchewan Drive/Queen Elizabeth Park Road, and appears to be supported by the neighborhood and business associations south of the river. Although the hairpin curve is considered undesirable to many motorists, it appears to function reasonably well, and has a reasonable collision record. However, we believe that prudent planning requires that an alternative be developed to improve the current situation, now or at some future date.
- **Grade Separation – Queen Elizabeth Park Road under Saskatchewan Drive:** Option 2 realigns Gateway Boulevard to 102 Street north of Whyte Avenue to address concerns related to creating a depressed Gateway Boulevard which severe the parking lot from the market and other venues in Old Strathcona. Gateway Boulevard would be depressed under Saskatchewan Drive, would be a two-way roadway north of 86 Avenue, and provide a southbound access from Kinsmen on Queen Elizabeth Park Road.

Realignment of Gateway Boulevard impacts existing parking for developments along 102 Street, but does not directly impact Ritchie Mill or the Jazz Club. Modification of the Saskatchewan Drive/Gateway Boulevard intersection would be required to facilitate southbound traffic on Queen Elizabeth Park Road, accessing Saskatchewan Drive. This option requires major roadway improvements between 82 Avenue and Saskatchewan Drive.

- **Modified At-Grade Intersection at Gateway Boulevard and Saskatchewan Drive:** Option 3 provides an at-grade intersection for Gateway Boulevard/Saskatchewan Drive, relocated to 102 Street alignment. The option requires substandard horizontal and vertical geometrics to make up the grade difference between Saskatchewan Drive and the bridge. The option also requires lowering a portion of Saskatchewan Drive in the vicinity of 102 Street, which creates some challenges for access to existing developments in the area. This option has significant geotechnical challenges which would likely require significant elevated road structure, approximately 13 m high. Significant additional technical work is required to confirm the feasibility of this option.
- **Grade Separated Gateway Boulevard under Saskatchewan Drive:** This option differs from Option 2 as it retains the one-way northbound operation on Queen Elizabeth Park Road, and only moderately shifts Gateway Boulevard east to provide enhanced geometrics for the grade separation at Saskatchewan Drive.

The option significantly impacts End of Steel Park, but mitigation including a covered depressed Gateway Boulevard could be created to provide enhanced park and pedestrian crossings. **Exhibit 3.10** illustrates this option. This option could be staged with any of the bridge options currently under consideration, and provides a good staging opportunity to meet the long term demand.

3.0 BRIDGE STYLES

3.1 INTRODUCTION

The new Walterdale Bridge will replace the existing three-span structural steel truss bridge that was constructed in 1912 to 1913 to carry two lanes of roadway traffic and a street railway across the North Saskatchewan River in Edmonton, Alberta. The existing bridge currently carries two lanes of northbound traffic, along with pedestrians and bicyclists on sidewalks on both sides, and a number of utilities across the river. The new bridge will be designed to carry three lanes of northbound traffic, possibly one lane of southbound traffic, pedestrians and bicyclists, and utilities across the river.

The terms of reference for the "Walterdale Bridge Replacement and Approach Road Evaluation" indicate that the existing structure should be replaced with a functional signature bridge that will form an attractive entrance to downtown Edmonton. The replacement is to have an innovative urban design complementing the "West Rosedale Urban Design Plan", and respecting the aboriginal burial grounds on the north bank of the river.

In Phase 1 of the "Walterdale Bridge Replacement and Approach Road Evaluation", the Project Team has considered three signature bridge replacement alternatives and compared these to a more conventional girder bridge alternative.

3.2 BRIDGE EVALUATION CRITERIA

Standing the test of time, a signature bridge will become a point of pride for the citizens of Edmonton and will draw people to the river valley. In evaluating the bridge replacement alternatives, the Project Team has made reference to the following selection criteria:

- **User Experience:** Motorists should have a positive impression of the North Saskatchewan River valley and the entrance to downtown Edmonton when travelling across the bridge.

Pedestrians and bicyclists using the trails adjacent to and under the bridge should feel that the bridge complements the river valley trail system, and should not be intimidated by the impersonal nature of a massive structure. Pedestrians and cyclists should feel safe when using the trail system or travelling across the bridge.

As Edmonton matures, there is the desire for people to enjoy the valley by travelling up and down the river in boats, canoes, rafts and other vessels. People on the water should have a positive experience when approaching and travelling under the bridge on the water.

- **Views:** When viewed within the context of the river valley, the bridge should relate to the natural environment, the repurposed EPCOR site and future development on the north bank, and the Kinsmen Sports Centre on the neighboring south bank. The bridge should complement the views of the Legislature Building, the High Level Bridge and other buildings on the tops of the banks.

When crossing the bridge at a leisurely pace, pedestrians and bicyclists should have the opportunity to enjoy the views from the river valley and touch the water.

- **Pedestrian and Bicyclist Movement:** There should be easy access for pedestrians and cyclists to cross the river on the replacement structure or a complementary bridge.
- **Visual Lightness:** Most people find bridges to be more attractive when the decks do not obstruct views and have a light appearance.
- **Towers and Piers:** Many of the signature bridges throughout the world have towers that become design features. Depending on the alternative considered, there is the opportunity to incorporate the towers into the design of the bridge replacement.

To reduce the potential for disturbance to the environment, it may be desirable to construct the new bridge without towers or piers within the river.

- **Utilities:** If the utilities on the existing bridge must be carried across the river, there is no doubt that they will detract from the appearance of the new structure. The replacement alternative selected should accommodate utilities without a negative impact on appearance when the bridge is viewed from the sides or below.

3.3 BRIDGE TECHNICAL DESIGN CRITERIA

- **Hydrotechnical Considerations:** The new bridge will be designed so that the underside of the bridge is at or above geodetic elevation 624.7 m to accommodate a 100 year flood.
- **Bridge Piers:** River piers (if applicable based on bridge style) must be aligned with the direction of flow to minimize ice forces and reduce hydrotechnical effects such as scour. Bridge alternatives that have piers in the river and are aligned on an angle other than 90 degrees to the river are therefore designed "on a skew",

which introduces design and construction challenges. The bridge structures that can cross the river without in-stream piers work better in skew situations, since abutments can be rotated to be square to the bridge instead of the river.

- **Geotechnical Considerations:** The stratigraphy in the south uplands consists of layers of fill, clay, sand and clay till overlying clay shale at depths of about 10 m. The south slope material is made up of clay, sand and gravel overlying bedrock. There is evidence of ancient landside activities on the south slope.
- **Existing Pedestrian and Bicycle Circulation:** The Project Team will design the bridge replacement to be convenient and attractive for pedestrians and bicyclists to cross the river. Considerations may include lookouts or similar features on the bridge that will allow pedestrians and bicyclists to stop and enjoy the views of the valley as they cross the river. The configuration of the new bridge should allow the multi-use trail on the north side to pass underneath the structure.
- **Roadway Geometry and Related Issues:** The replacement bridge will be on a skew for the Base and East Side Road Options. The skew of a bridge refers to the angle between the roadway and the river being crossed. A zero-skew bridge crosses the river at a right (90 degree) angle, and is the simplest to design and construct. Depending on the roadway option, the skew of the bridge replacement could be up to thirty degrees.

3.4 BRIDGE ALTERNATIVES

The Bridge Team members of the Project Team (Dialog and Buckland Taylor) have expended significant effort to develop and evaluate bridge types (styles) considered appropriate signature bridges for this location. A half day Design Charette was held in Dialog's office which resulted in the following four bridge types being selected for further consideration and evaluation:

- Girder
- Cable Stayed
- Extradosed
- Arch

Each bridge type / style was determined to be appropriate for the four road options presented at the Open House, and accordingly all four bridge types were also exhibited as potential bridge styles for consideration.

The four road/bridge alignment options were presented at the Open House as three separate elements: north side of the river, bridge crossing, and south side of the river. The focus of the technical work since the Open House has been to complete further evaluation of the options and to delve further into the details of each option. As a result of this further work, we have concluded the following for each element of the project.

There are a variety of types of bridges that have been constructed throughout the world to carry vehicles, pedestrians and bicyclists across rivers. If designed with sensitivity to the surroundings, it is the Project Team's opinion that either a girder, extradosed, arch or cable stayed alternative has the potential to become a signature bridge at the Walterdale site. As part of the planning study, the Project Team has collected precedent photographs from around the world that illustrate the characteristics of signature bridges. These precedents are illustrated in Appendix 3, in addition to renderings of each bridge style shown in a section of Edmonton's River Valley. These images and renderings provide an idea of how each bridge style could be incorporated into the bridge replacement, while achieving the signature quality desired for this bridge replacement.

3.5 GIRDER ALTERNATIVE DESIGN AND CONSTRUCTION CONSIDERATIONS

Girder bridges are a commonly used structural system in Alberta. Variable-depth girder bridges are less common than constant-depth girders, but contractors will likely be comfortable bidding on and constructing this type of bridge.

A girder bridge will require piers in the water, which will have an impact on the river during construction and over the life of the structure.

The bridge will carry utilities across the river. The utilities can be placed between girder lines so that they are hidden except when viewed from directly below the bridge.

3.6 EXTRADOSED ALTERNATIVE DESIGN AND CONSTRUCTION CONSIDERATIONS

Extradosed bridges are a relatively new structural system. Two notable extradosed bridges were built in the Vancouver area within the last few years (North Arm and Golden Ears bridges). Since the bridge is a cable/girder hybrid, contractors will be less comfortable bidding on and constructing this alternative than a girder alternative.

An extradosed bridge will require piers in the water, which will have an impact on the river during construction and over the life of the structure.

The bridge will carry utilities across the river. The utilities can be placed between girder lines so that they are hidden except when viewed from directly below the bridge.

3.7 ARCH ALTERNATIVE DESIGN AND CONSTRUCTION CONSIDERATIONS

This bridge alternative is used around the world, but is less commonly built due to increased construction costs. The alternative will be a new structural system for most local contractors and fabricators, but good detailing and communication will streamline the construction process.

A single-span arch bridge will not require piers in the water, which will reduce the impact on the river during construction and over the life of the structure.

The bridge will carry utilities across the river. The utilities can be placed between girder lines so that they are hidden except when viewed from directly below the bridge.

3.8 CABLE STAYED ALTERNATIVE DESIGN AND CONSTRUCTION CONSIDERATIONS

This bridge alternative is used around the world, but is less commonly built due to increased construction costs. This alternative will be a new structural system for some local contractors, but good detailing and communication will streamline the construction process.

A single-span cable stayed bridge will not require piers in the water, which will reduce the impact on the river during construction and over the life of the structure.

The bridge will carry utilities across the river. The utilities can be placed between girder lines so that they are hidden except when viewed from directly below the bridge.

4.0 PUBLIC INVOLVEMENT

The public involvement component of the Walterdale Bridge concept planning study is summarized in Attachment 7. Public input is included in Attachment 8, including open house comments, public inquiries and responses from the Project Team.

5.0 OTHER CONSIDERATIONS

5.1 HISTORICAL RESOURCES

As noted, the area in the vicinity of the Walterdale Bridge has been established as a location of unprecedented cultural resource potential. To identify and mitigate the potential impact of historical resources on this project, Gareth Spicer, MA, with Turtle Island Cultural Resource Management, who has considerable experience in the area, commenced initial work and community engagement prior to preparing and submitting a Statement of Justification for Historical Resources Act Requirements. The Statement of Justification summarized a review of the Project Area and provided recommendation for a proactive cultural resource management program to facilitate moving forward with the project options. Written response from Alberta Culture and Community Spirit (ACCS) had not been received at the time of writing; however, the report has been referred for possible paleontological concerns, which may further delay a response from ACCS.

A review of the current road and bridge replacement options suggests that the historical resource impacts can be mitigated and/or managed to facilitate construction completion of a replacement bridge by 2014, provided a Historical Resources Impact Assessment is initiated immediately upon the development of the recommended alignment.

5.2 ENVIRONMENTAL REVIEW

Spencer Environmental conducted a comprehensive desktop inventory of available environmental information sources for the entire project area encompassing the initial

ten options identified in the evaluation matrix exercise conducted in August 2010. Sources of information included the City of Edmonton's Planning and Development and Transportation Libraries as well as Alberta Environment's Environmental Site Assessment Registry (ESAR). All reports were reviewed for environmental information including: geology and soils, surface and groundwater, vegetation (including rare plants), wildlife (including wildlife movement corridors), fish and recreational land use and access.

Based on the results of that analysis, sufficient baseline environmental information is available for the bridge replacement Project Area in general. Information gaps do exist for site specific information including avifauna, vegetation and rare plants and fish and fish habitat information. Avifauna and vegetation/rare plant surveys will be required in June 2011 once the final bridge alignment and road network option is chosen.

Pisces Environmental Consulting Services Ltd. conducted a fish and fish habitat assessment in October 2010. Their assessment included the North Saskatchewan River (NSR) Project Area encompassing the previously selected ten bridge crossing options. Preliminary results indicate that spring and fall spawning fish species (specifically lake sturgeon, walleye and mountain whitefish) were present in the river and habitat characteristics in the study sections appeared to be suitable for spawning. As a result, project sequencing and timing of instream work to avoid sensitive periods will be of principle importance in reducing impacts to fish and fish habitat. Specifically, the NSR is a mapped Class C water body under the *Code of Practice for Watercourse Crossings*. This means the restricted activity period is September 16 to July 31, and no instream construction activities may occur in that period. Instream activities (i.e. instream isolation of the construction site) may occur between August 1 and September 16. In addition, construction site isolation and implementation of sediment control will be instrumental in protecting potentially sensitive habitat areas identified during the assessment. Further, deep water habitat areas potentially used by lake sturgeon (ranked as endangered by COSEWIC) were found within the project area during the assessment.

5.2.1 Environmental Permitting and Approvals

Members of the Project Team and the City of Edmonton met with federal permitting agencies [Department of Fisheries and Oceans Canada (DFO) (*Fisheries Act*), Transport Canada (*Navigable Waters Protection Act*) and Canadian Environmental Assessment Agency (CEAA) (*Canadian Environmental Assessment Act (CEA Act)*)] on December 6, 2010. That meeting was held to confirm environmental permitting and approval requirements and the required project scope for the environmental review.

Considering the conceptual information available to-date, DFO indicated they likely will be the lead Responsible Authority for CEAA review of the project and anticipate that it could take up to six months to get a *Fisheries Act* Authorization for the project once detailed designs are available. Application for approval pursuant to the *Navigable Waters Protection Act* and CEAA review would occur concurrently.

Although the North Saskatchewan River is well-studied in terms of available fish and fish habitat information, DFO indicated there is the possibility that they may ask for additional fisheries fieldwork (i.e. spring 2011 and summer 2011). This will be confirmed once the final alignment and bridge crossing are chosen and the project proceeds to detailed design.

It was determined that one Environmental Impact Assessment (EIA) document that satisfies the requirements of the federal regulatory agencies as well as the City of Edmonton's *Bylaw 7188* (North Saskatchewan River Valley Area Redevelopment Plan) will be required. City of Edmonton *Bylaw 7188* review usually takes approximately three weeks once a draft EIA is submitted to Planning and Development. The timeline for resubmitting a final EIA will depend on the nature and extent of comments received from the City's review and whether another City review is required prior to Council approval.

5.3 TRAFFIC ANALYSIS

5.3.1 Analysis of Road / Bridge Alignment Options:

The Walterdale Bridge replacement project, while focused on the need to replace the existing bridge by 2014, could also involve some significant changes to the adjacent roadway network that could affect the operation of the broader roadway network, or specific elements of that network. As part of the process of arriving at an optimal bridge replacement, a number of bridge and roadway options were generated and analyzed. An initial screening of the alternatives resulted in a shortlist of four options being identified for further consideration. In order to further distinguish between these four options, the City of Edmonton carried out traffic modeling of the four options to identify their relative performances. Using Roadway link characteristics: location, length, no. of lanes, posted speed and capacity.

Given that the new Walterdale Bridge is needed by 2014, the traffic analysis was carried out for the 2016 planning horizon, which is the closest available set of traffic projections in the RTM. The 2016 planning horizon assumes the following major network changes from the current situation:

- Light Rail Transit: City-wide extensions to west, northwest and southeast.
- Anthony Henday Drive: Completed around entire city.
- Rosedale Road: Converted to 2-way operation.
- Bellamy Hill Southbound: Connected to Rosedale Road, instead of 104 Street.

At a broad level, there are no material differences between the various bridge replacement options in the overall performance of the central area network. Across almost all metrics, the bridge replacement options provide similar levels of traffic performance. A noteworthy difference between the options however is the amount of traffic crossing the central area river bridges in the AM Peak Hour. It is observed that the total amount of traffic crossing into the central area in Options 3 and 4 is noticeably lower than in Options 1 and 2.

Other Observations:

- A review of V/C plots for Options 1 and 2 indicates very similar performance levels. In both cases, the approach to River Valley Road operates at a V/C of under 0.9 in the critical AM Peak Hour. In both cases the new, wider bridge, will result in less interference from the River Valley Road intersection on the Walterdale Road / Queen Elizabeth Park Road (QEPR) intersection.
- A review of the northbound approaches to the Walterdale Hill Road / Queen Elizabeth Park Road intersection for Options 1 and 2 indicates that all the approaches will operate poorly, as they will be at capacity. The QEPR approach is particularly congested in both options.
- The provision of a grade separation on Gateway Boulevard at Saskatchewan Drive (as shown in Options 2 and 4 in Appendix 1) relieves the congestion on Gateway Boulevard between Whyte Avenue and Saskatchewan Drive. The improvement on this link appears to draw some additional traffic to this corridor and results in a slightly higher degree of congestion on QEPR.
- The provision of a fly-over from the new Walterdale Bridge across River Valley Road (RVR) as shown in Option 3 (Appendix 1) has a significant impact on traffic volumes and network performance on both sides of the new bridge. The flyover eliminates turns from Walterdale Road onto either RVR or Rosssdale Road. As a result, there is a significant reduction in traffic choosing to use the new Walterdale Bridge, there will also be less traffic on the approach roads, and correspondingly better levels of service. However, the removal of turns at RVR will result in all bridge traffic being fed directly north on 105 Street towards 97 Avenue. This will result in 105 Street operating poorly, with extremely long queues. This is likely to result in a significant amount of shortcutting through the West Rosssdale Plan area, along 96 Avenue.
- The provision of a new Walterdale Bridge located significantly to the east of the existing bridge (as shown in Option 4 in Appendix 1) results in a reduction in traffic using this bridge. Traffic on and immediately north of the bridge on Rosssdale Road will be highly congested and experience long delays. This option generates significant northbound to westbound left turns from Rosssdale Road onto River Valley Road, followed by high right turns from RVR onto 105 Street. These two heavy movements are caused by the desire of traffic to access the west side of Downtown via 97 Ave/109 Street. As with Option 3, the difficulty of executing the left turn from Rosssdale Road to RVR is most likely to result in significant shortcutting through West Rosssdale via 96 Avenue.

5.3.2 Analysis of Bridge Closure during Construction:

In addition to testing the four road / bridge alignment options, two additional scenarios were tested to evaluate the implications of complete bridge closure. Although yet to be determined, it may be necessary to completely close the existing Walterdale Bridge and

south approaches for a significant length of time to accommodate the construction of the replacement bridge. Two possible closure scenarios were examined, including:

- Walterdale Bridge closure without any other changes in the roadway network; and
- Walterdale Bridge closure, with High Level Bridge being converted to two-way operation.

Analysis of the bridge closure options indicates a dramatic decrease in cross-river traffic on central area bridges. Simple closure of the Walterdale Bridge with no changes to the surrounding road network, results in a 17% decline in cross-river traffic. On the other hand, closure of the bridge with conversion of the High Level Bridge to two-way operation results in a 21% decline. The decline in cross-river traffic is also accompanied by a degradation of average speed in the central area network; this means that there are fewer vehicles in the network, but that each vehicle is encountering more delay.

The decline in cross-river traffic is judged to occur as a result of the removal of significant river crossing capacity and the inability of alternative routes to absorb the displaced traffic. As a consequence, the displaced traffic is either choosing to avoid the congested peak hour, travelling outside the peak hour, or being diverted to public transit, or a combination of both.

Closure of the existing Walterdale Bridge during construction of the new bridge will cause a significant disruption to the central area roadway network. The modeling of two scenarios for such closure indicates that conversion of the High Level Bridge to two-way operation will not provide any relief but will actually result to further degradation, as compared to a simple closure of Walterdale.

5.4 GEOTECHNICAL

A review of existing geotechnical information, coupled with air photo interpretation and site reconnaissance, was completed as part of the initial phases of this study for use in comparing geotechnical implication of each alignment option. No geotechnical investigation was completed for this assessment, and the preliminary evaluations provided herein need to be verified by further investigation and stability analysis. This work is a continuation of the preliminary assessment completed by Thurber in 2008 for selected route options at that time.

The main geotechnical feature of the south slope alignments is the presence of deep seated ancient and presently dormant landslides that extend from the north edge of Saskatchewan Drive down to the toe of the slopes at the low level river terrace. While these landslide areas are presently inactive, there is the potential to reactivate these failures by unfavorable construction activities on these slopes that could reduce the overall stability. Activities that could negatively impact the current state of slope stability include; placement of fill on the upper portion of the slopes; cuts into the middle or lower portions of the slopes; and activities that cause a rise in the groundwater table. Positive impact on stability would include placement of fills at the toe of the slope.

5.5 PERCENT FOR ART POLICY

The Project Team in conjunction with the Edmonton Arts Council, completed selection of an Artist, through a Request for Proposal selection process. The artist will be assigned to work with the Project Team throughout the Concept Planning Study and continue through preliminary and detailed design. The intent is that the Artist would work and collaborate with Project Team to develop the Public Art, not a separate commission, but rather as an integral part of the design and implementation process. This is a unique approach to Public Art and is expected to result in enhanced value for the art component of the project.

6.0 COSTS

Conceptual cost estimates for the signature bridge styles and required minimal road improvements range from \$100 to \$200 Million. Several factors impact the cost of the bridge replacement, including bridge style and bridge alignment.

Conceptual cost estimates for the associated ultimate road network improvement options on the south bank range from \$33M to \$43 Million. This is dependent upon the option selected, extent of structures required, and numerous other factors.