

Dufferin Street Bridges Rehabilitation – Class Environmental Assessment Study

Date:	May 11, 2011
To:	Public Works and Infrastructure Committee
From:	Acting General Manager, Transportation Services
Wards:	Ward 14 Parkdale – High Park
Reference Number:	P:\2011\Cluster B\TRA\TIM\pw11001tim

SUMMARY

A structural review of the Dufferin Street bridge over the Lakeshore Rail Corridor (the "Rail Bridge"), located immediately north of Exhibition Place, concluded that the bridge is in need of structural rehabilitation. Given the age of the structure and the extent and associated costs of the required rehabilitation, it was necessary to undertake a Class Environmental Assessment (EA) Study to address the deteriorated condition and develop a range of rehabilitation alternatives.

The structural review also concluded that any significant changes to this Rail Bridge required to bring it up to standard would necessitate modifications to the adjacent Dufferin Street bridge over the Gardiner Expressway (the "Gardiner Bridge") located approximately 10 metres south of the Rail Bridge.

The evaluation of a reasonable range of alternative solutions, which included consultation with the public and review agencies, resulted in the following Recommended Design:

- The replacement of the Rail Bridge with a precast concrete box girder structure along its existing alignment that would comply with Metrolinx/GO Transit's clearance requirements, both vertically (to protect for electrification) and horizontally (to protect for additional tracks); and
- The replacement of the Gardiner Bridge with a welded steel box girder structure.

A Notice of Study Completion must now be issued and the Environmental Study Report (ESR) filed in the public record for a 30-day review period in accordance with the requirements of the Municipal Class Environmental Assessment. In the event that the ESR is not approved or the funding is not in place in the near term to implement the bridge replacement, funds are available to undertake interim rehabilitation measures that might be required prior to the permanent replacement of these structures.

RECOMMENDATION

The Acting General Manager, Transportation Services recommends that City Council:

1. Grant authority to the Acting General Manager, Transportation Services to issue a Notice of Completion and to file the Environmental Study Report for the Dufferin Street Bridges Class Environmental Assessment Study in the public record for 30 days in accordance with the requirements of the Municipal Class Environmental Assessment.

Financial Impact

There is no immediate financial impact resulting from the recommendations contained in this report.

The preliminary construction cost of all elements of the Recommended Design is approximately \$17 million (2011 dollars), although the estimated costs will be refined during the course of securing further required approvals. Additional costs due to inflation or as a result of any design modifications or enhancements are not included in this estimate but will be identified during this process. Currently no funds are provided for these works in the Transportation Services 2011 Capital Budget and 2012-2020 Capital Plan. Funding requirements and schedules for implementation will be included as part of future year Capital Budgets and 10-Year Capital Plans for Transportation Services and Toronto Water within their respective debt affordability targets. Cost-sharing may be sought from Metrolinx and the Toronto Transit Commission.

In the event that funds are not available in the near term for the bridge replacement, funds are available in the Transportation Services 2011 Capital Budget and 2012-2020 Capital Plan to undertake any necessary rehabilitation in the interim.

The Deputy City Manager and Chief Financial Officer has reviewed this report and agrees with the financial impact information.

ISSUE BACKGROUND

The existing Dufferin Street Rail Bridge is located in the south-central part of the City of Toronto immediately north of the Exhibition Place / Canadian National Exhibition (CNE) grounds. This facility and the adjacent Gardiner Bridge connect the south Parkdale

Neighbourhood and Liberty Village Employment District with Exhibition Place. The Study Area and location of the bridges are illustrated in the attached Figure 1: Key Plan.

Dufferin Street is a north/south arterial road which starts north of Saskatchewan Road and continues north of the City's boundary at Steeles Avenue. The route is used as an access point to the Exhibition Place and the waterfront by recreational users, in addition to regular vehicular use on a daily basis. The bridge site is a prominent visual feature as it historically represented the entrance to the Canadian National Exhibition (CNE) and is adjacent to a number of cultural heritage features including the Dufferin Gate (Arch) spanning over Dufferin Street in the immediate vicinity of several heritage buildings with the closest being the Arts & Crafts Building (Medieval Times).

The original Dufferin Gate was removed for the construction of the Gardiner Expressway in 1957. The Arch was later constructed in 1959 to reflect the prominence of the Dufferin Street as an entrance to the CNE.

The Rail Bridge was built in 1912 and has experienced deterioration in recent years. This bridge currently has a weight restriction imposed to minimize vibration caused by heavy vehicles. A limited condition bridge survey (structural inspection) for both bridges was completed in February 2008. The survey identified the Rail Bridge as being in need of significant repair or replacement. In addition to these deficiencies, it was noted that the century-old design of the Rail Bridge no longer meets current standards for vertical and horizontal railway clearances.

Although the Gardiner Bridge is, overall, in fair condition, the structural review also noted that if changes are made to the Rail Bridge to bring it up to standard, significant changes would also be required to the adjacent Gardiner Bridge. The most significant of these changes is that the Gardiner Bridge deck would need to be raised to meet the elevation requirements of the Rail Bridge.

Staff considered options for rehabilitation of the Rail Bridge and concluded that the extent of this rehabilitation would require environmental assessment approval since the bridge is more than 40 years old. A Class Environmental Assessment Study was subsequently initiated to evaluate a range of options for addressing the deteriorated condition of the bridge, how to replace the bridge(s) and how to accommodate the users of the bridge.

COMMENTS

Study Process

The Dufferin Street Bridges Class Environmental Assessment Study has been completed in accordance with the requirements for a Schedule 'C' project under the Municipal Class Environmental Assessment (the Class EA). As a requirement of Schedule 'C' projects, if City Council endorses the recommendations of this Study, the Environmental Study Report (ESR) will be filed in the public record for a minimum 30-day review period.

The ESR describes in detail the first three phases of the five-phase environmental planning process set out by the Class EA:

Phase 1 – identification of the problem or opportunity;

Phase 2 – identification and evaluation of alternative solutions; and

Phase 3 – identification and evaluation of alternative design concepts for the preferred solution.

The preparation of the ESR itself and the filing of the document in the public record constitute Phase 4 of the environmental planning process. Phase 5 is the construction and operation or implementation of the project, and monitoring of impacts, in accordance with the terms of the EA approval. The Dufferin Street Bridges Class Environmental Assessment Study is currently at Phase 4 of the process.

This Class EA Study was a joint partnership between the City, the Toronto Transit Commission (TTC) and Metrolinx/GO Transit (GO). The EA Study was carried out with the assistance of technical consultants and supported by a Technical Advisory Committee comprised of staff from the TTC, GO, Transportation Services, Technical Services, Toronto Water, and City Planning.

Public Consultation

Public involvement is an integral and ongoing part of the study process for the Dufferin Bridges Class EA Study. The public consultation requirements of the Class EA were met and surpassed. A Notice of Study Commencement appeared in two issues of the Parkdale Liberty Villager in December 2008 and was also directly mailed to the community stakeholders and relevant review agencies. This notice announced the initiation of the Class EA study and invited interested stakeholders to participate. Two public open houses (POH) were held at key decision points during the study.

The first POH was held on June 21, 2010 to review the problem statement and the evaluation of alternative solutions. Notices were mailed to residents in the area, relevant external agencies, interest groups and members of the public who had requested to be placed on the study mailing list. Also, notices were placed in the Parkdale Liberty-Villager on June 10 and June 17, 2010 and NOW Magazine on June 10, 2010. Canada Post distributed 10,328 notices on June 8, 2010 in the study area. Twenty (20) members of the public signed in at this meeting. Generally, meeting attendees supported the proposed cross-section and had common concerns regarding construction staging/ duration and accessibility during construction. The alignment options had a mix of support however two major stakeholders formally expressed support for keeping the existing alignment.

Following the first POH, Alternative 1 (to replace the Rail Bridge along its current alignment) was selected as the technically preferred option based on the evaluation criteria and the comments received from the public stakeholders. This information, and the evaluation of alternative designs for the preliminary preferred solution, was presented at the second POH, which was held on March 1, 2011. This POH was combined with the POH's for two other City of Toronto Municipal Class Environmental Assessment studies currently underway in the area – the King Liberty Pedestrian/Cyclist Link Class EA and the Liberty Village New Street Class EA.

As a result of the larger distribution area (to cover the three studies) Canada Post distributed 13,529 notices on February 21, 2011 in the study area. In addition, notices were placed in the Parkdale Liberty-Villager on February 10 and February 24, 2011 as well as the Liberty Gleaner (monthly) in February 2011. Notices were also mailed directly to individuals who asked to be placed on the study mailing list. There were 170 members of the public who attended the combined POH. The meeting attendees had overwhelming support for the preferred solution of keeping the bridges on the existing alignment. Support was divided between leaving the Arch in its existing location or moving it between the two bridges. Similar to the first POH, attendees supported the proposed cross-section and had common concerns regarding construction staging/ duration and accessibility during construction.

Meetings were also held with affected stakeholders including the Liberty Village Business Improvement Association (August 19, 2010), representatives of the Exhibition Place operators and tenants (February 25, 2011), and the Exhibition Place Board of Governors (March 4, 2011). Their comments, issues and input were considered in the development and evaluation of alternatives.

A full description of the public consultation program can be found in Chapter 2 as well as Appendix B of the ESR.

Environmental Assessment Findings

(1) Identification of the Problem or Opportunity

The Study Area, illustrated in Figure 1 attached to this report, extends along Dufferin Street from north of Springhurst Avenue to south of Saskatchewan Road. For the purposes of traffic analysis a wider area of influence was identified from Lake Shore Boulevard to King Street West and from Jameson Avenue to Strachan Avenue.

Based on the structural review of the Dufferin Street bridges, the problem statement for this study is the following:

- A structural review of the bridges has identified that the Dufferin Street bridge over the rail corridor is in need of replacement, while maintenance is required for the bridge over the Gardiner Expressway.

When studying the potential alternatives for the Dufferin Street bridge replacement there are opportunities to:

- Better accommodate vehicles, transit, bicycles and pedestrians;
- Meet the rail clearances and to accommodate the planned expansion of the rail corridor by Metrolinx/GO Transit; and
- Accommodate TTC's Waterfront West Light Rail Transit (WWLRT) plans.

Considering the problem and opportunities for this project, the scope of this study also includes developing alternative plans for the replacement of the Gardiner Bridge. This is due to a number of engineering constraints including:

- The vertical clearance of the Rail Bridge needs to be increased by at least 0.9 metres, which will raise the elevation of the roadway;
- The increase in the span length of the Rail Bridge to protect for the accommodation of two additional future tracks requires a greater structure depth, which has the effect of raising the roadway elevation further;
- The tracks cannot be lowered in this location enough to accommodate the increase in clearance and structure depth, due to drainage requirements, impacts to rail service during construction, and the high cost associated with reconstructing a lower track bed beside in-service tracks; and
- The Rail Bridge and the Gardiner Bridge are located approximately 10 metres apart, making it impossible to match the existing and future grades between the two bridges while protecting for the maximum grades associated with potential future LRT installation.

A full description of the analysis of existing and projected future conditions can be found in Chapter 3 & 4 of the ESR.

(2) Identification and Evaluation of Alternative Solutions

To address the problems described above, four alternatives were generated and evaluated. They are:

- "Do Nothing" Alternative.
- Alternative 1: Replace the Dufferin Street Bridges along the existing alignment.
- Alternative 2: Replace the Dufferin Street Bridges along a Different Alignment (Dufferin Street to Yukon Place).
- Alternative 3: Replace the Dufferin Street Bridges along a Different Alignment (Dufferin Street to Lake Shore Boulevard at British Columbia Drive).

A brief description of these alternatives and the results of the evaluation are provided in Appendix A.

Each of the alternative solutions was subject to a comparative screening. The purpose of this screening was to identify the alternative solution which would provide the best service with the least impacts. In doing so the following factors were considered:

- **Plan and Policy Coordination:** conformance and consistency with relevant planning and policy recommendations. The policies that were reviewed include the *City of Toronto Official Plan (2006)*; *City of Toronto Urban Design Guidelines (2002)*; *Toronto West-Central Area Strategic Transportation Network Review (2006)*; *Waterfront West LRT Environmental Assessment (1993)*; and *Waterfront West LRT EA Modification (2009)*.
- **Built-Cultural Heritage:** anticipated effects on structures and buildings with significant heritage.
- **Urban Design:** maintenance of the existing public view corridors of both Exhibition Place and the waterfront.
- **Socio-Economic:** effects on private and public property, particularly with respect to the need for land acquisition.
- **Transportation:** the effect on existing and future transportation movements and operations, specifically, the effects on TTC operations, vehicle movements and pedestrian/cyclists movements.
- **Construction:** the anticipated costs and construction staging for each proposed alternative solutions.

Based on the results of the analysis and evaluation, Alternative 1, replace the Dufferin Street bridges along the existing alignment, is the preferred solution. This solution not only addresses the identified structural problems while providing the required vertical clearance over the rail corridor along the existing alignment, it also is compatible with the future extension of Dufferin Street south to Lake Shore Boulevard as stipulated in the *City of Toronto Urban Design Guidelines (2002)* and accommodates streetcar operations between Dufferin Street and Exhibition Place as recommended in the approved *WWLRT EA Modification (2009)*. Also, compared to the other alternatives the advantages of *Alternative 1* include:

- minimal impacts on the existing public view corridor of the waterfront for south Parkdale residents;
- minimal re-grading impacts on private property;
- provision for existing and future transit operations;
- no restrictions on traffic movements and operations; and
- the lowest construction and maintenance costs.

Both TTC and Exhibition Place have expressed support for the preferred solution.

A full description of the evaluation of the alternative solutions can be found in Chapter 5 of the ESR.

(3) Identification and Evaluation of Alternative Design Concepts for the Preferred Solution

The technically preferred alternative design was determined based on a comparative evaluation of the various component options. This included decisions regarding each user group, the required right-of-way, and potential structure options. The results of each of these exercises are described below and in greater detail in Chapter 6 of the ESR.

User Groups

In the development and evaluation of alternative designs for the preferred Alternative 1, four distinct user groups were identified as part of the evaluation criteria: pedestrians, cyclists, vehicles and transit.

Various types of cycling infrastructure were considered for implementation across the Dufferin Street bridges. These included a range from providing bike lanes, signed shared curb lanes, and no facility. Options to both include and exclude bicycle facilities were included in the study although Dufferin Street across the rail corridor and Gardiner Expressway are not included in the *City of Toronto Bike Plan*. Since the *City of Toronto Bike Plan* notes bridges as being less bicycle friendly than a typical roadway because of higher cross-winds and traffic speed, bicycle lanes are proposed as part of this bridge design.

In determining the number of traffic lanes crossing the Dufferin Street bridges, two options were considered: one and two lanes in both directions. These options were selected as they match with the Dufferin Street and British Columbia Road cross-sections north and south of the bridges, respectively. Through a review of the future traffic forecast, it was determined that the one-lane in either direction provided sufficient capacity to accommodate the expected demand. As a result, a cross-section with one travel lane in either direction is proposed.

The *Waterfront West LRT EA Modification* specifies a connection of the proposed LRT from the Exhibition Place loop to Dufferin Street. As a result, it was important that LRT operations be accommodated in the proposed design. This requires both the protection of space for a dedicated LRT line on the bridges and the provision of a relatively level grade (maximum 0.5 %) on Dufferin Street in the area of the future LRT crossing / turning area immediately south of the Gardiner Expressway.

Potential Right-of-Way Widths

Both of the existing Dufferin Street bridge structures across the rail corridor and Gardiner Expressway are 21.49 m wide and provide for a 3.4 m wide sidewalk in both directions and a 6.4m pavement width for one lane of traffic per direction.

While considering ROW widths, one option would be to construct a 17 m bridge in the interim until the WWLRT is constructed, at which point the bridge could be widened.

Through a screening process it was determined that, although a 17 m cross-section would be sufficient during the interim period, the bridge would require significant re-construction in order to accommodate a future LRT. The net cost of two-stage construction in this circumstance was found to be in the order of the \$2 million greater than building the bridges in one stage and protecting for future LRT needs. It was therefore concluded that one-stage construction at a 25 m cross-section was appropriate for the Dufferin Street bridges.

Potential Structure Options

The bridge structures must meet both railway vertical clearance standard of 7.01 m (existing being only 6.07 m) and Gardiner Expressway vertical clearance (5.0 m) while minimizing the required grade raise on Dufferin Street, so as to match with existing road grades to the north and south. Five structural options were considered and evaluated in depth. The recommended approach is to use welded steel box girders for the Gardiner Bridge and precast concrete box girders for the Rail Bridge.

To accommodate the increased road elevation with *Alternative 1*, the existing Dufferin Arch structure will have to be raised by approximately 2.5 m. As a result, alternatives of relocating the Arch either to the north or to the south were considered in addition to raising the Arch in its existing location. It was concluded, based on heritage considerations that the Arch should remain in its present location.

A detailed description of the evaluation of alternative designs for the preferred solution is provided in Chapter 6 of the ESR.

Recommended Design

The Recommended Design, illustrated in plan and in profile respectively on Exhibit Nos. 7.1 and 7.2 of the ESR (see Figures 2A and 2B), includes the following elements:

- The replacement of the Rail Bridge with a precast concrete box girder structure along its existing alignment that would comply with Metrolinx/GO Transit's clearance requirements, both vertically (to protect for electrification) and horizontally (to protect for additional tracks);
- The replacement of the Gardiner Bridge with a welded steel box girder structure;
- A 25 m width for both bridges with an allowance for a 3.0 m sidewalk, a 2.0 m bike lane and a 3.5 m vehicle lane in both the northbound and southbound directions;
- A 7.4 m-wide raised centre median which acts as space protection to accommodate future exclusive transit lanes in accordance with the Waterfront West Light Rail Transit (WWLRT) plans;

- An increase in pavement elevation of up to 1.0 m to accommodate current rail clearance and structural depth requirements;
- Re-grading of the approaches of the bridge to match the adjacent intersections at Springhurst Avenue and Saskatchewan Road;
- Maintenance of the existing Dufferin loop for TTC operations;
- A 2.5 m raise to the existing Dufferin Gate arch structure to accommodate the proposed road grades; and
- Replacement of the existing 300 mm watermain suspended from the bridges with a 300 mm watermain either attached to the new structures or under the Gardiner Expressway and Metrolinx/GO Transit rail corridor using trenchless technology.

The estimated cost of the recommended design is approximately \$16.3 million:

• Structural:	\$11,000,000
• Dufferin Gate:	\$1,000,000
• Roadworks:	\$4,200,000
• Watermain:	\$75,000
• Total:	\$16,275,000

If trenchless technology is used to replace the watermain across the corridor, it will entail an additional \$700,000, bringing the total project cost to \$17 million.

These costs will be shared by Transportation Services and Toronto Water and funding will be considered in the respective Divisions' future Capital Works Programs. Cost-sharing will also be sought from Metrolinx and the Toronto Transit Commission.

In light of the deteriorated condition of the rail structure, Technical Services' Structures and Expressways Section has a contingency plan to implement a temporary bridge at the site (approximate cost \$3 million) should the bridge replacement project not be funded in the near term.

Property Impacts

There are no requirements to acquire private property for this project. Grading requirements, illustrated by the shaded area in Figure 7.1 of the ESR (also Figure 2A), are mainly confined to the public right-of-way through use of retaining walls but are necessary in the vicinity of Exhibition Place and the TTC yard. Exhibition Place / CNE staff and TTC staff have reviewed the recommendations contained in the ESR and have no objections to the preferred solution. To minimize grading impacts, the recommended design includes the construction of retaining walls north and south of the bridges. Alternative pedestrian access solutions at Exhibition Place will be resolved during the detail design process.

Next Steps

Upon approval of this report by City Council, the ESR will be filed in the public record for a minimum 30-day period.

During this period, members of the public, and any other interested individual, interest group, or government agency, may request that a Part II Order be issued. A Part II Order, if granted by the Minister of Environment, elevates the status of the project from a Class EA Study to an Individual Environmental Assessment. If this occurs, the project cannot proceed until the proponent completes an Individual Environmental Assessment Study and receives approval from the Minister. If a Part II Order is not granted or if no requests or objections are received during the filing period, the project is approved under the Environmental Assessment Act and may proceed.

Once EA approval is received, detailed design can commence any time. However, the timing of construction of the Recommended Design will depend on funding which has not been identified at this time.

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ATTACHMENTS

Figure 1: Key Plan
Figure 2: Recommended Plan
Appendix A: Identification and Evaluation of Alternative Solutions

Figure 1: Key Plan

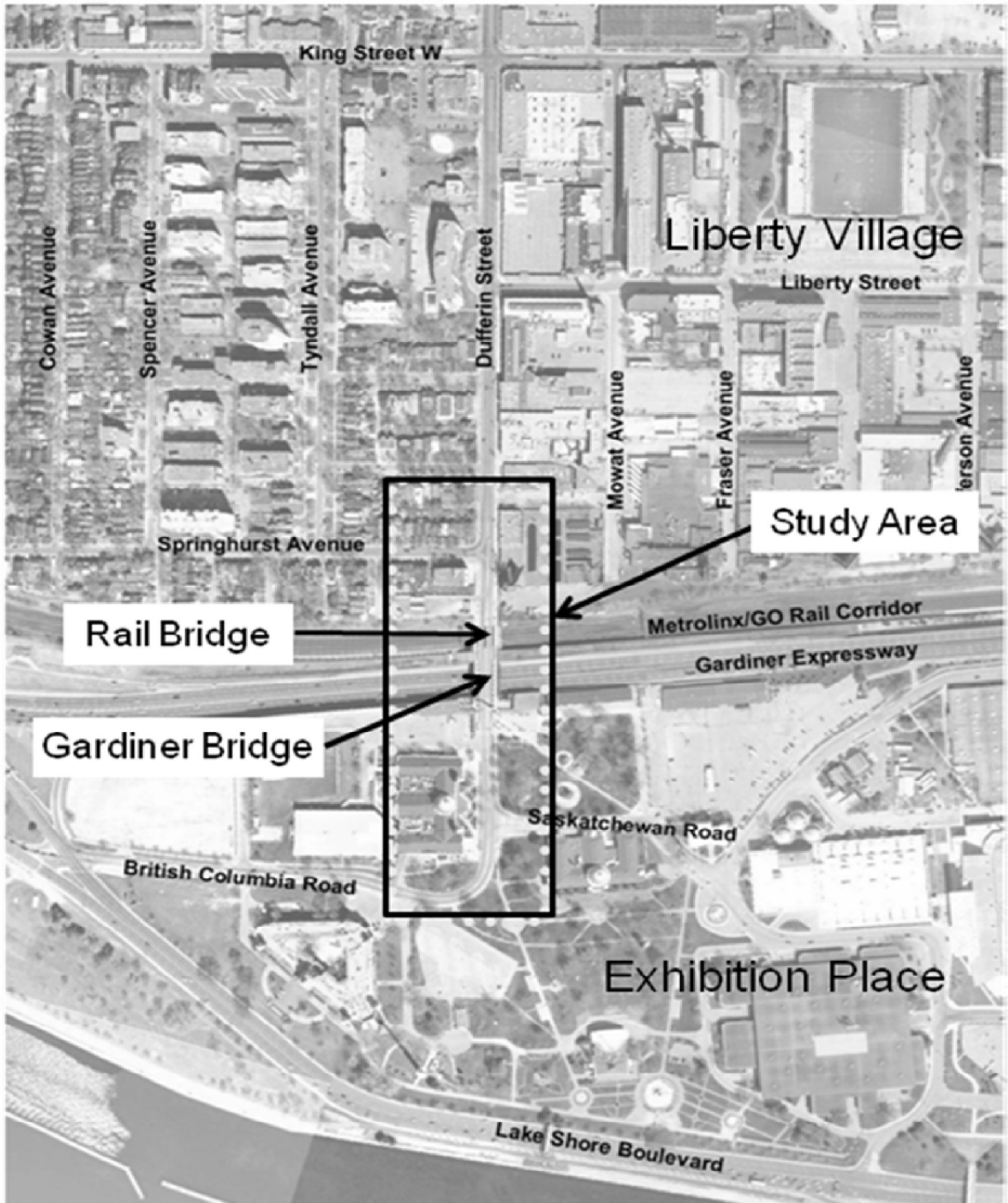


Figure 2A: Recommended Plan – Interim

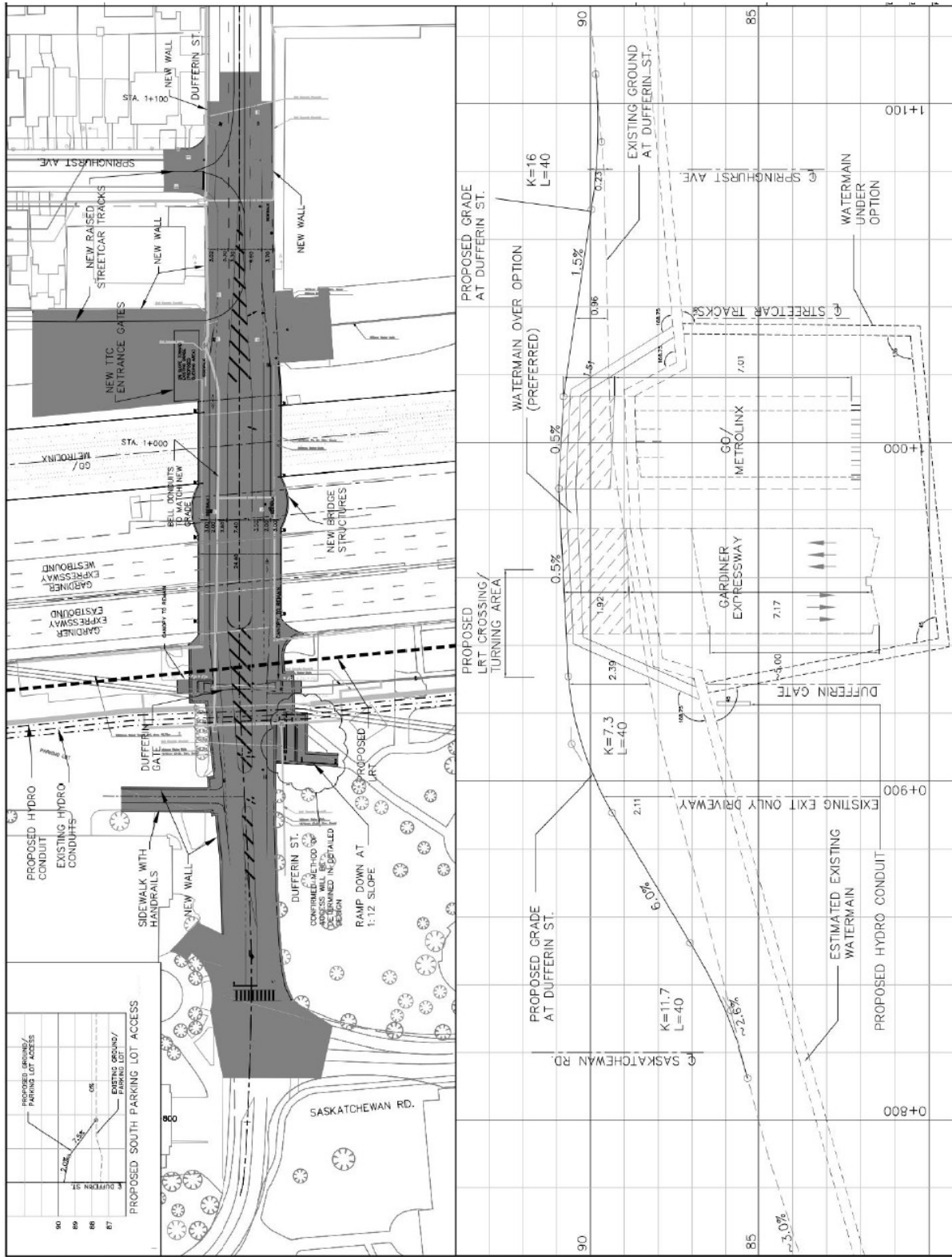
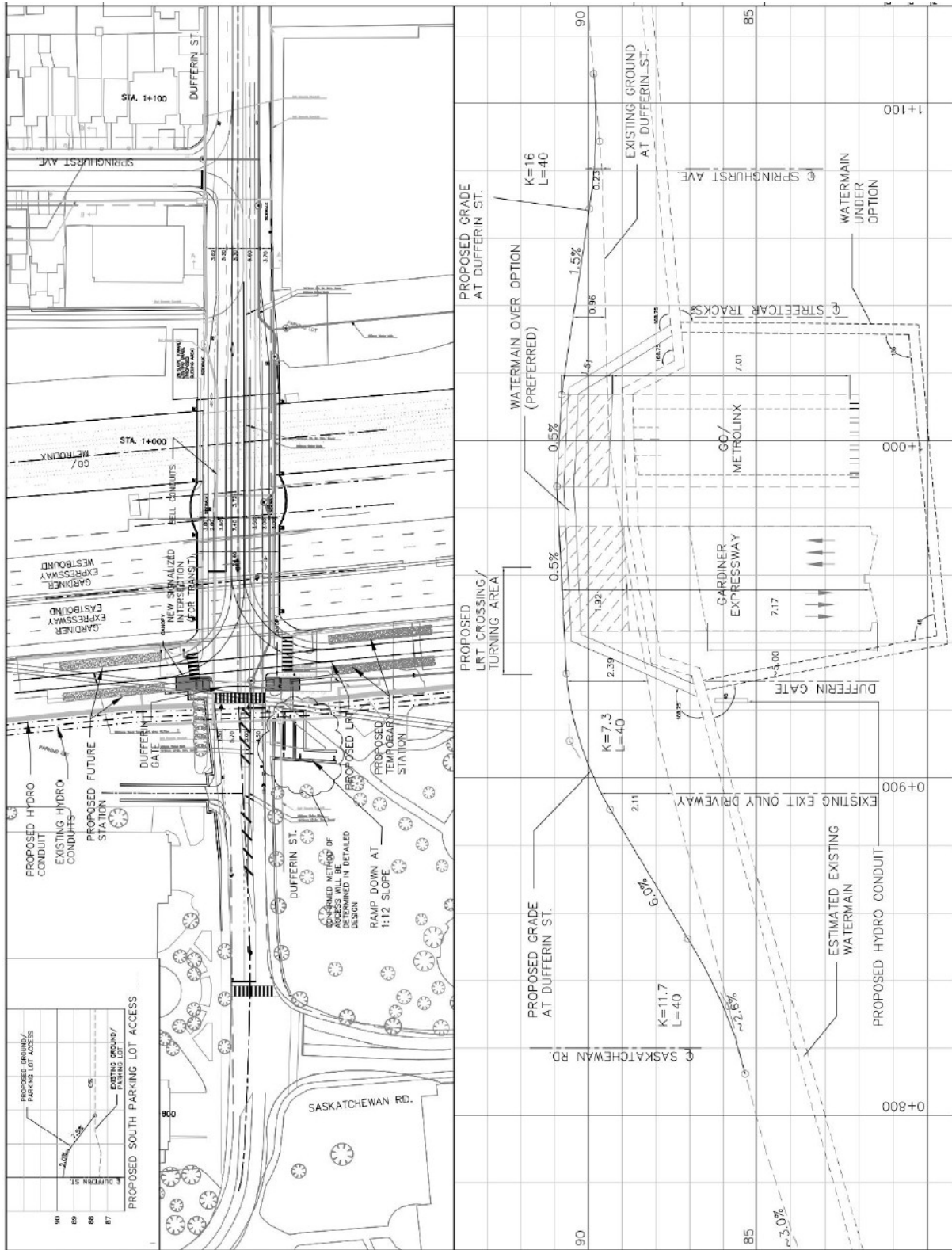


Figure 2B: Recommended Plan – Ultimate



Appendix A Identification and Evaluation of Alternative Solutions

“Do Nothing” Alternative

The “Do Nothing” alternative was considered as a benchmark for the assessment of the proposed planning alternatives but was screened out as not being feasible. Under the “Do Nothing” alternative, the Rail Bridge would continue to deteriorate from its existing condition. While maintenance efforts could extend the operating life of the structures, since the design of the Rail Bridge exposes the structure to corrosion from de-icing salts and poses challenges for regular inspections of the floor beam connections, this option has significant on-going maintenance costs and risk associated with it. As a result, the expected on-going deterioration will ultimately require the decommissioning of the bridge, and closure of this crossing of the rail corridor and Gardiner Expressway. Given the significant role that Dufferin Street plays in the transportation network, its permanent closure at the rail crossing is unacceptable to the City.

Alternative 1: Replace the Dufferin Street Bridges along its existing alignment

As illustrated in Figure 5.1 of the ESR, the Dufferin Street bridges would be replaced along the existing alignment of Dufferin Street. This alternative would consist of two structures: one over the rail corridor and one over the Gardiner Expressway. The watermain could either be attached to the new structures or be placed under the Gardiner Expressway and Metrolinx/GO Transit rail corridor using trenchless technology. Note that two structures are preferred over a single long-span structure for structural, cost, and geometric reasons. This is the least cost new bridge alternative, and is supported by both TTC and Exhibition Place.

Alternative 2: Replace the Dufferin Street Bridges along a Different Alignment (Dufferin Street to Yukon Place)

As illustrated in Figure 5.3 of the ESR, the Dufferin Street bridges could be replaced along a different alignment connecting Dufferin Street with Yukon Place. With this alternative the route of Dufferin Street would shift to the west, run along the top of the embankment of the rail corridor before turning south to align with the intersection of British Columbia Road and Yukon Place. This alternative would provide a pedestrian bridge along the existing alignment of Dufferin Street. This plan is, however, inconsistent with the WWLRT and Exhibition Place plans, and due to longer bridge spans, would entail greater structural cost than Alternative 1.

Alternative 3: Replace the Dufferin Street Bridges along a Different Alignment (Dufferin Street to Lake Shore Boulevard at British Columbia Drive)

As illustrated in Figure 5.4 of the ESR, the Dufferin Street bridges could be replaced along a different alignment connecting Dufferin Street and Lake Shore Boulevard West at British Columbia Road. This alternative would also provide a pedestrian bridge along the existing alignment of Dufferin Street. With this alternative the route of Dufferin Street would shift to the west, run along the embankment of the rail corridor before turning southwest to align with the intersection of British Columbia Road and Lake Shore Boulevard. This alternative involves private property impact and long-span structures that are avoided with Alternative 1, and is inconsistent with WWLRT and Exhibition Place Plans.