COUNCIL REPORT

High Level Bridge Lifecycle Strategy

RECOMMENDATION

That the April 13, 2022, Integrated Infrastructure Services report IIS00488, be received for information.

Report Purpose

Information only.

To inform Council of the lifecycle strategy for the High Level Bridge in preparation for upcoming bridge renewal scheduled to begin during the 2023-2026 budget cycle.

Executive Summary

- The High Level Bridge is scheduled for renewal beginning in the 2023-2026 budget cycle.
- This report provides an overview of the lifecycle strategy planned for the High Level Bridge, including a range of strategy options for bridge rehabilitation to meet current and future transportation requirements to varying degrees.
- The scenarios explored accommodate a variety of combinations of uses, including pedestrians, cyclists, general purpose vehicular traffic, goods movement, emergency services, mass transit and the heritage streetcar.
- To optimize the City's investment in the upcoming rehabilitation of the High Level Bridge, while also seeking to advance key policy objectives as articulated in The City Plan, the rehabilitation project will explore strategic enhancements for active transportation to be implemented beginning in the 2023-2026 budget cycle.

REPORT

This report provides an overview of the lifecycle strategy planned for High Level Bridge, including a summary of scenarios explored to accommodate current and future needs for this vital river crossing. The report summarizes the analysis findings, recommended lifecycle renewal approach, and the overall influence on investment in the bridge.

History of the High Level Bridge

The High Level Bridge was constructed by the Canadian Pacific Railway Company between 1910 and 1913. The railway company transferred ownership of the structure to the City of Edmonton in

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1994. The bridge has historical significance from both a transportation and city-building perspective, establishing its importance as a landmark and an icon for Edmonton and Edmontonians. The High Level Bridge is also significant as one of the steel truss bridges constructed by the Canadian Pacific Railway in Canada before World War I. At the time of construction, the bridge was the fourth largest in Canada and the only bridge to carry four modes of transportation: rail, streetcar, automobile and pedestrian. The High Level Bridge was designated as a Municipal Historic Resource and legally protected under the provisions of the Historical Resources Act in 1995.

The iconic structure is large and complex, consisting of an upper deck (where the High Level Bridge Streetcar is located), a lower deck (where vehicles, pedestrians and cyclists travel), and a number of related structures at either end of the bridge for both road, active modes and rail uses.

The bridge accommodates two southbound general traffic lanes with two sidewalks/shared use paths on the lower deck. The upper deck accommodates the High Level Bridge Streetcar, which operates for a portion of the year (between Victoria Day in May and Labour Day in September).

Renewal - History, Upcoming Requirements and Timeline

There have been various repairs and structural modifications to the High Level Bridge in its 109+ years of service life. The last major rehabilitation took place in 1995. At that time, the rehabilitation included repairs to the concrete road deck (lower deck), repairs to the steel structure and other components, protective coating of some bridge components, and a limited number of aesthetic enhancements (e.g., lighting, handrail painting).

Visual inspections of the bridge are routinely completed as part of regular maintenance. When the visual inspection ratings and condition information show deterioration has reached a certain threshold, an extensive condition assessment is carried out to inform when and what type of renewal interventions may be required. These in-depth inspections of the structure were started in 2018 to understand the bridge's current condition. A further review was completed in 2020 to gain insight into the bridge’s capacity to carry existing loads and potential future transportation loads, such as shared use path upgrades and potential for future mass transit across the North Saskatchewan River.

In general, every 25 to 30 years, bridges typically require major rehabilitation to extend service life. The High Level Bridge requires major rehabilitation beginning in the next capital budget cycle (2023-2026) to maintain its structural integrity and safe operation.

Strategy Considerations

The High Level Bridge is a key mobility corridor today and it plays an important part in the future mobility system outlined in The City Plan. With this in mind, strategic considerations were an essential part of the analysis of lifecycle options for the High Level Bridge. Administration has evaluated a number of scenarios for the upcoming rehabilitation, taking into consideration the following:

- Accommodation of multiple modes of transportation

- Financial Impacts (capital investment, maintenance and lifecycle costs, enhancement costs)
- Business, Community and Social Impacts
- Sustainable Urban Integration
- Environment
- Feasibility
- Heritage Considerations

Attachment 1 outlines additional details related to the strategic considerations taken into account as part of the analysis of rehabilitation options.

Scenario Generation

Rehabilitation of the High Level Bridge is anticipated to begin during the 2023-2026 budget cycle. The City has also identified the need for an additional or enhanced dedicated mass transit connection between Downtown and south-central Edmonton. It was important to consider how to best support (or not preclude) a future multimodal transportation crossing of the North Saskatchewan River based on these needs. Several types of scenarios were evaluated, including:

- Scenarios A1, A2, A3 - Critical Rehabilitation (the minimum);
- Scenarios B1, B2, and B3 - Rehabilitation (to varying degrees); and
- Scenarios C1 and C2 - Replacement / New Bridge.

A detailed evaluation was conducted taking into consideration the benefits and trade-offs with each scenario, including how each scenario accommodates current and future mobility needs.

The Province of Alberta has a long term vision of using the High Level Bridge to run regional rail connecting Edmonton and Calgary, which is documented in an agreement between the City of Edmonton and the Province of Alberta. However, the current High Level Bridge does not have the structural integrity to accommodate the load capacity required for regional rail. Administration reviewed the High Level Bridge's capacity to accommodate regional rail and noted that, even with rehabilitation, the enhancements needed are cost prohibitive, carry significant risk, have high potential to detract from the heritage nature of the iconic bridge and are not within the scope of the City's Infrastructure Asset Management Policy (C598) and renewal objectives. Thus, this option was not further pursued.

Scenarios A - Critical Rehabilitation

The critical rehabilitation scenarios identify the minimum work required (including maintenance requirements) to extend the service life of the High Level Bridge for another 15 years, thus deferring major rehabilitation. Three different approaches to critical rehabilitation were further examined to better understand the costs and trade-offs while considering a range of uses.

- Scenario A1: Current usage, Critical Rehabilitation
- Scenario A2: Active modes only, Critical Rehabilitation
- Scenario A3: Active modes and transit use, Critical Rehabilitation

Due to the impacts of several closures of the High Level Bridge, high cost and nominal benefits, none of the Critical Rehabilitation approaches were carried forward for further analysis.

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Scenarios B - Rehabilitation

The rehabilitation scenarios examine the primary improvements needed to enable the High Level Bridge to serve current transportation uses for a period of approximately 25 years. The necessary rehabilitation includes:

- Rehabilitation of the roadway deck (lower deck);
- Re-establishing a protective coating on the steel;
- Repairs to concrete foundations; and
- Replacement of components not repaired during the 1995 rehabilitation.

Three different approaches to rehabilitation were also further examined to better understand the costs and trade-offs while considering a range of uses.

- Scenario B1: Rehabilitation
- Scenario B2: Rehabilitation + Strategic Considerations
- Scenario B3: Rehabilitation + Mass Transit + Shared Use Path Upgrades

Scenario B1: This scenario provides for a rehabilitation of the bridge based on current uses and with the purpose of expanding its lifecycle for approximately 25 years. No enhancements or upgrades were considered.

Scenario B2: This scenario optimizes the value of the rehabilitation work on the High Level Bridge by also advancing improvements to the bridge that align with key policy direction, including enhancements to active transportation. This scenario specifically considers rehabilitation combined with active mode enhancements on the upper deck, which align with the vision of the High Level Line between Downtown Edmonton and the Strathcona neighbourhood. Beyond renewal, the key enhancements considered in this scenario include:

- Shared use paths on the upper deck;
- Widening of the lower east deck sidewalk;
- Rehabilitation of the north and south approaches of the upper deck; and
- Maintenance of the streetcar track and provision of safety barriers.

The rehabilitation works combined with active mode enhancements on the upper deck would keep the bridge operational for up to 25 years until the next rehabilitation is required, while also providing immediate improvements to active mode connections between Downtown and Whyte Avenue.

Scenario B3: This scenario considers rehabilitation of the High Level Bridge combined with upgrades for mass transit and active modes. Due to the weight loading requirements for this type of use, the feasibility to achieve this scenario may be limited and the cost significant. The key enhancements considered as part of this scenario include:

- Shared use paths on the upper deck;
- Inclusion of a dedicated mass transit LRT corridor;
- Rehabilitation of the north and south approaches of the upper deck; and
- Removal of the High Level Bridge Streetcar to accommodate active modes and Mass Transit (specifically LRT).

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Strengthening the structure for mass transit presents increased risk (construction impacts, disruption to the river valley, natural areas and sacred ground), in addition to a heavy capital cost investment for future requirements that are not yet fully understood or defined. Further, the enhancements presented by this scenario will alter the bridge's historical appearance and require amendments to Bylaw 11114 - Designate the High Level Bridge as a Municipal Historic Resource.

This option was excluded from further evaluation based on these complexities, associated risks and high costs. Additionally, recently completed mass transit planning work does not identify a new mass transit connection as a priority for the 1.25 million population horizon.

Scenarios C - Replacement / New Bridge

As an alternative to the rehabilitation of the High Level Bridge, the construction of a new bridge was evaluated. Two different approaches noted below and summarized in more detail to follow were considered:

- Scenario C1: Build a new bridge for vehicles and mass transit. Retain the High Level Bridge for active modes only.
- Scenario C2: Replacement of the High Level Bridge for all uses.

Scenario C1: This scenario includes the construction of a new bridge that takes on a simpler form, such as a girder structure, that integrates well with its surroundings. The design of the new bridge would aim to minimize visual competition with the High Level Bridge and would be located between the High Level Bridge and the Dudley B. Menzies Bridge (LRT Bridge) to the west. This new bridge would be completed in combination with minor rehabilitation of the High Level Bridge to accommodate active modes.

The new bridge could accommodate both vehicles and mass transit and would not accommodate active mode connections or the High Level Bridge Streetcar. In this scenario, general traffic would be relocated from the High Level Bridge to the new bridge, while the High Level Bridge would be repurposed solely for active transportation uses.

This strategy presents potential conflicts with the High Level Bridge Streetcar at both the north and south connections due to the alignment of a new bridge and roadway.

Scenario C2: This scenario includes demolition of the existing High Level Bridge and construction of a new bridge at the same location that would accommodate mass transit, two general traffic southbound lanes, in addition to shared use paths for active uses.

Option Evaluation Process

The options were evaluated using a Multiple Account Evaluation Framework - an evidence-based approach to decision-making. The Multiple Account Evaluation Framework consisted of a set of accounts (Figure 1 below) and criteria aligned with the available information and appropriate level of detail for the stage of the study.

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Figure 1 - City of Edmonton Multiple Account Evaluation Framework: Accounts

Each account has several criteria, both qualitative and quantitative considerations that align with project priorities. This exercise maximizes value and supports decision-making aligned with City and project objectives.

Evaluation Findings

The Critical Rehabilitation Scenarios (Scenarios A) were considered the base case outlining the absolute “do minimum” against which the other scenarios were evaluated. Each scenario has benefits and trade-offs which can be evaluated to help identify the best value for the upcoming investment and the ability to meet current and future needs of Central Edmonton. A summary of the analysis is presented in Attachment 2.

Cost

Both capital and lifecycle costs form criteria within the Financial account evaluated as part of the option evaluation process. The total cumulative lifecycle costs were calculated over a 75-year evaluation period. The Net Present Value for each option was calculated to take into account the time value of money and express the future monetary quantities in terms of their worth today. Attachment 3 provides a relative comparison of the total cumulative rehabilitation costs for each option.

Bridge Rehabilitation Strategy

The analysis provides a clear indication that if the emphasis is on the initial capital expenditure, there is merit in investing in the Rehabilitation + Strategic Considerations scenario (Scenario B2), which has lower capital costs than a new bridge. This option would meet the City's goals of maintaining current vehicular services and enhancing the active mode connections for the next 25 years for Edmontonians. In addition, this scenario allows for the alignment of the next High Level Bridge rehabilitation with the anticipated timeline for any required future mass transit connection across the North Saskatchewan River.

On that basis, Administration is proceeding with the planning and design phase of the project for Scenario B2, rehabilitation of the High Level Bridge with consideration for strategic enhancements for active modes.

Next Steps

The next step for the upcoming bridge rehabilitation is the commencement of planning, which will include public consultation, clarifying assumptions, reviewing opportunities and risks, and identifying capital and operational costs associated with the rehabilitation. This work will define

not only the condition-based renewal requirements, but also the base level enhancements for active uses (with consideration of the vision of the High Level Line) and other factors such as noise, conditions for active mode users, vandalism and suicide prevention. A robust engagement plan will be developed to support this work.

While the rehabilitation will include the base requirements to enhance active modes, making the bridge accessible and useful for active mode users, the rehabilitation planning will be completed with the understanding that further enhancements could be added. Further work could also then be done by the High Level Line Society to provide further enhancements over and above those provided with the rehabilitation, in addition to programming and animation of the space.

Budget/Financial Implications

Planning for the High Level Bridge is now in the early stages in preparation for construction to begin during the 2023-2026 budget cycle. High Level Bridge rehabilitation planning work is funded from the Transportation: Bridges & Auxiliary Structures - Renewal Capital Profile (CM-24-0000). Funding for the next stages of design and construction will be discussed as part of the 2023-2026 Capital Budget deliberations in late 2022.

At a strategy level, the High Level Bridge rehabilitation project is anticipated to cost in the range of $135 to $270 million from planning through delivery.

COMMUNITY INSIGHT

The High Level Bridge is one of Edmonton's most iconic and historic structures. Rehabilitation of the much loved, high profile bridge will require meaningful, inclusive, thoughtful engagement and communications with Edmontonians. A comprehensive public and stakeholder engagement will be developed and implemented as part of the rehabilitation planning process. The feedback gathered through the engagement process will help Administration adjust designs, where possible, to reflect the community's current needs.

Feedback from community members can influence the enhancements for all modes of travel, tree and vegetation impacts, history and art. Community feedback will help Administration understand and mitigate construction related issues such as access restrictions or detour requirements, pedestrian safety, and displacement and safety of vulnerable populations.

Administration has been working with the High Level Line Society to define their role in the upcoming planning for the High Level Bridge renewal. The High Level Line Society will play a key role in supporting the development of the vision and plan for active mode enhancements associated with the upcoming rehabilitation.

GBA+

Detailed Gender Based Analysis Plus (GBA+) analysis for the High Level Bridge Renewal will form an important aspect of the initial planning phase and will be ongoing through the following stages of design and construction. The analysis will support identification of stakeholders, development of meaningful ways of connecting with stakeholders, and gathering of meaningful input that will shape the path forward for the High Level Bridge rehabilitation. The process will support

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Administration in identifying any stakeholders who may be interested or impacted by the project, in addition to those who may be less likely to participate in traditional engagement methods. This effort will aid in developing means of reaching the diverse voices needed for the success of this project.

Further, the input gathered from Edmontonians is anticipated to lead to the incorporation of equity measures that will enhance the accessibility and usability of the High Level Bridge. Such measures include universal accessibility enhancements, widening of active mode infrastructure, and the addition of accessibility ramps to enhance mobility for all users.

ATTACHMENTS

1. Strategic Considerations
2. Key Trade-Offs and Benefits
3. High Level Bridge Scenarios Cost Comparison