

**Green Line Report to
Green Line Committee
2020 June 01**

**ISC: UNRESTRICTED
GC2020-0583**

Green Line Update Stage 1

EXECUTIVE SUMMARY

Green Line is important to the future of Calgary and benefits all Calgarians. It represents a significant investment in our transportation network, in our communities, and the future of our city. In its entirety, Green Line will deliver high-quality transit service to Calgarians in north central and southeast communities, and strategically connect communities, employment hubs, and key destinations for Calgarians who live and work across the city.

Green Line will not only provide more mobility choice for Calgarians and enhance future community building, moving forward with Green Line today will ready Calgary for tomorrow's recovery. Green Line Stage 1 will be an important part of Calgary's economic recovery. The Stage 1 investment will create an estimated 20,000 jobs and comes at a critical time when it is important to bolster Calgary's economy. Green Line is also a long-term investment in the growth and development of our city, it will be part of Calgary's global competitive advantage and will help attract new businesses and a young, talented workforce to our city.

In July 2019, Administration advised Council of the need to re-evaluate the scope of Stage 1 to bring the Program's cost estimates within budget, manage construction risk and improve the customer experience to best achieve the Green Line vision. Council directed Administration to undertake a review of the Stage 1 alignment and to complete a series of due diligence activities to confirm that Stage 1 has the right alignment, that Stage 1 is the right project for Calgary and that it will be delivered using the right approach.

This report presents a recommended update to the Green Line Stage 1 alignment and confirms:

1. That the updated Stage 1 alignment is the right alignment that can be delivered within budget, manage risk, achieve the Green Line vision and deliver the best value for Calgarians.
2. That the updated Stage 1 alignment is the right project for Calgary and meets the objectives set by Council, and the investment in Stage 1 will have significant mobility and urban development benefits for the City and provide long-term benefits to downtown real estate values and City assessed value.
3. That Administration has set up the right approach to enhance Council and Calgarians trust and confidence in The City's ability to deliver the Green Line Program on time and on budget.

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ADMINISTRATION RECOMMENDATIONS:

The Green Line Committee recommends that Council:

1. Approve Segment 1 of the updated Stage 1 alignment and station locations, as outlined in Attachment 3;
2. Direct Administration to Release the Request for Proposal (RFP) for Segment 1 no later than 2020 July 24, and to start construction of Segment 1 upon execution of the Project Agreement for Segment 1;
3. Direct Administration to advance enabling works construction in Segments 1 and 2;
4. Approve Segment 2 alignment and station locations as outlined in Attachment 3. Direct Administration to undertake the Segment 2 Functional Plan. For the Centre Street N surface-running and Bow River bridge components (16 Avenue N to Eau Claire), direct Administration to continue stakeholder engagement and communications as required when completing the following studies:
 - Mobility Studies Plan;
 - Access Management Plan;
 - Streetscape Plan; and
 - Bow River Bridge Plan.

Direct Administration to report back to the Green Line Committee no later than 2021 July 31 with the results of the above plans and studies. Direct Administration to prepare and release the Segment 2 RFP and start Segment 2 construction provided the Green Line Program cost estimate, including contingency, is estimated at no less than P80 and is within the approved Program funding;

5. Approve the North Central BRT improvement concepts identified in Attachment 7. Direct Administration to conduct the Functional Plan for the North Central BRT Improvements identified in Attachment 7 and report back to the Green Line Committee no later than 2021 July 31 with the delivery plan to construct the approved North Central BRT Improvements identified in Attachment 7;
6. Direct Administration to proceed with real property transactions based on the updated Stage 1 alignment, including the North Central BRT improvements, in accordance with the procedures as outlined in the previously approved Proposed Delegated Authority, Stage 1 Green Line LRT Project [C2018–0333].
7. Direct Administration to advise the Government of Canada and the Government of Alberta of Council's approval of the recommendations in this report, and seek approval to include the North Central BRT Improvements as eligible costs in the funding agreement; and
8. Notwithstanding the approvals above, should significant additional funding become available to extend the line northward prior to construction commencement of Segment 2 (not including enabling works), authorize Administration to redesign the Segment 2 alignment as needed to accommodate the expansion, returning to Council through the Green Line Committee with recommended alignment changes with respect to Segment 2.

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PREVIOUS COUNCIL DIRECTION / POLICY

In 2015 December, Administration presented a report to Council (TT2015-0881) which evaluated the long-term vision for the Green Line LRT Program. Since that time Council has provided Administration with extensive direction on the Program. A summary of key Council decisions relating to the alignment and procurement of the Green Line are outlined in Attachment 1.

BACKGROUND

On 2020 January 13, Council reconfirmed the Vision for the Green Line program as:

A city-shaping transit service that improves mobility in communities in north and southeast Calgary, connecting people and places and enhancing the quality of life in the city.

At the same meeting Council approved the following Outcomes for Calgarians for the Green Line Program to deliver a transit service that:

- Improves mobility by providing a frequent, reliable, and affordable service.
- Contributes to an efficient transportation network that promotes transportation choice and reduces congestion, travel times and greenhouse gases.
- Enhances connectivity between people and places including connections to the broader transit network.
- Creates a positive transportation experience – safe, accessible, comfortable and convenient.
- Contributes positively to urban realm, community development and revitalization.
- Contributes to the vitality of business in the community.
- Protects the environment by enhancing the City's environmental stewardship.

Planning for elements of the Green Line LRT started back as far as 1967. In recent years significant planning studies have been completed which have shaped the current alignment, including:

- 2012 Southeast LRT Functional Planning Study 1
- 2012 North Central LRT Corridor Planning Study
- 2015 Green Line SE Alignment and Stations Report
- 2017 Green Line LRT Alignment and Stations 160 Avenue to Seton.

Additional background on the Green Line LRT is outlined in Attachment 2.

In 2017, Council approved the Green Line Stage 1 alignment – 16 Avenue N to 126 Avenue SE (Shepard). Since that time the Green Line Program Team has advanced the planning and design of Stage 1, acquired the required real estate, prepared land for construction through an enabling works construction program and prepared procurement documents for various aspects of the program.

In July 2019, the Green Line Program Team advised Council of the need to re-evaluate the scope of Stage 1 to bring the Program's cost estimates within budget, manage construction risk and improve the customer experience to best achieve the Green Line vision. Council directed

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the Green Line Program Team to undertake a review of the Stage 1 alignment and to complete a series of due diligence activities to confirm that the Stage 1 has the right alignment, that it is the right project for Calgary and that it will be delivered using the right approach.

INVESTIGATION: ALTERNATIVES AND ANALYSIS

The Right Alignment for Stage 1

Administration has re-evaluated the Green Line Stage 1 scope to bring the cost estimates within budget, manage construction risk and improve the customer experience to best achieve the Green Line vision. From the re-evaluation, Administration is recommending an updated Stage 1 alignment and station location plan, as outlined in Attachment 3.

At a glance, the updated Stage 1 alignment includes:

Segment 1 – Shepard (126 Avenue SE) to Elbow River. The alignment and station locations in this segment have not materially changed from the original 2017 Council approved Stage 1 alignment. Value engineering has been undertaken to manage cost and construction risk, as described in the section below.

Segment 2 – Elbow River to 16 Avenue N The alignment and station locations have materially changed from the original 2017 Council approved Stage 1 alignment, as described in the sections below.

North Central BRT Improvements. Customer service and transit priority improvements for the North Central BRT have been added to the Stage 1 scope of work and are described below.

Value engineering of Segment 1

The Green Line Program Team re-evaluated Segment 1 with the objective of reducing construction cost estimates and construction risks. No material changes were made to the alignment and station locations in Segment 1, instead the following opportunities were identified and incorporated into the scope of the updated Stage 1 alignment:

- Replacing a parkade with a surface parking lot at the Shepard LRT station;
- Revising the LRT alignment at Barlow Trail SE and 114 Avenue SE from an underpass concept to an overpass concept;
- Raising the track profile through the Lynnwood Ridge and former Imperial Oil Refinery lands to manage environmental risk during construction;
- Optimizing bus terminal and road layout at South Hill station; and
- Optimizing the size and scale of the LRT maintenance and storage facility.

The Green Line Program Team will continue to seek out additional opportunities to further reduce costs and improve customer service value during the delivery of Segment 1.

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Re-evaluating Segment 2 alignment and station locations

The Green Line Program Team is recommending updates to the alignment and station locations in Segment 2 to bring the cost estimates within budget, manage construction risk and improve the customer experience to best achieve the Green Line vision. The recommended updates include:

- A surface-running LRT on Centre Street N;
- A new LRT bridge over the Bow River;
- 2.5 km of tunnel through the downtown and Beltline;
- Four underground stations; and
- Two surface stations on Centre Street N, including a new station at 9 Avenue N.

The updated Segment 2 alignment, station locations and concept plan are presented in Attachment 4, which outlines:

- A summary of the alignment changes;
- A concept plan, renderings and descriptions to help illustrate what the stations, surface-running LRT and new bridge might look like; and
- The work program to advance the planning of this Segment and ready it for procurement and construction.

Engaging stakeholders on the updated Segment 2 alignment, station locations and concept plan

Engagement on the updated Stage 1 alignment focused on sharing the recommended changes with Calgarians and gathering stakeholder and public feedback to help Council members understand stakeholder and public sentiment towards the proposal when making their decision. Engagement was at the Listen and Learn level: We will listen to stakeholders and learn about their plans, views, issues, concerns and expectations and ideas.

From January 29 until April 30, 2020, stakeholders and public shared over 5,000 comments on the updated Stage 1 alignment at 15 in-person events as well as online. Feedback has been summarized in a What We Heard Report in Attachment 5, together with verbatim comments received during this period. Between March 15 and April 30, when Calgarians and the Green Line Program Team were limited by physical distancing measures imposed as a result of COVID-19, engagement proceeded with feedback provided entirely online.

The What We Heard Report captures a diversity of opinion for the project, including sentiments from Calgarians who are eager for the LRT service, Calgarians who are concerned about the project at this time and Calgarians who have a desire to slow the process to allow for more consultation. A strong preference and support for the original 2017 Council approved alignment as the “right” alignment was heard. Comments on impacts to vehicle movement, the area road network being impacted and increased traffic in the community were heard for Centre Street N. Feedback was received about the potential visual, noise and safety implications of a surface-running alignment in the Eau Claire area and concerns about a bridge over the Bow River, including comments related to construction and long-term impacts on Prince’s Island Park and habitats. A more comprehensive list of key themes can be found in Attachment 5.

The Green Line Program Team has reviewed the What We Heard Report, identified common stakeholder interests and identified ways that many stakeholder interests can be addressed

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through planning and design. A summary of stakeholder interests and potential means to mitigate have been provided in Attachment 6.

North Central BRT improvements

As part of the updated Stage 1 alignment, the Green Line Program Team is recommending that improvements be made to the existing bus rapid transit (BRT) service along the Centre Street N and Harvest Hills Boulevard N corridor in north central Calgary. These improvements will improve customer service and transit priority for Calgary Transit's busiest bus corridor.

The corridor currently carries just under 1,000 busses per day in its highest volume section between Beddington Boulevard N and 64 Avenue N and over 800 busses per day in and out of downtown Calgary. The corridor supports a peak transit ridership of approximately 30,000 customers per day with over 20,000 of those customers traveling in and out of downtown Calgary.

Attachment 7 identifies a series of potential bus operation and infrastructure improvements for the Centre Street N and Harvest Hills Boulevard N corridor. For the purposes of this review, improvements were recommended that will be most beneficial when paired with the updated Stage 1 alignment.

As part of the next steps for this work, the Green Line Program Team is recommending a more detailed study of the potential improvements to prepare a functional plan that will be used to advance the improvements to construction.

Evaluating alternate Stage 1 alignments

To confirm that Administration's recommended updated Stage 1 alignment will provide the best outcome for Calgarians, the Green Line Program Team retained Steer, an international public transit planning and project economics group, to undertake an Alignment Options Review.

Attachment 8 presents the Alignment Options Review Summary. This review evaluated eight different alignment configurations, which included both the 2017 Council approved and updated Stage 1 alignments, as well as other configurations that included a mix of BRT and/or LRT technologies, connecting or disconnecting the line, and the potential use of the existing Red Line tunnel between Stampede Park and City Hall.

The alignment options were evaluated through a Multiple Account Evaluation (MAE) process. This is an established process for comparing options and considers a range of potential factors or criteria to highlight the benefits and impacts of the choices available. The evaluation themes and criteria used were informed and consistent with both the Project Vision and Outcomes for Calgarians.

The MAE evaluation confirmed that the updated Stage 1 alignment, from 16 Avenue N to Shepard, with surface-running LRT on Centre Street N, a new LRT bridge over the Bow River and North Central BRT improvements, is the best performing option across a broad range of criteria and will deliver the best value for Calgarians within the approved budget threshold.

Benefits of updated Stage 1 alignment

The updated Stage 1 alignment can be delivered within budget, manage risk and improve the customer experience to best achieve the Green Line vision. The updated alignment will deliver the best value for Calgarians by:

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- Moving a high number of LRT riders (55,000 – 65,000) on opening day;
- Providing strategic rapid transit network connections, including Red and Blue Line LRTs and MAX Orange BRT;
- Spurring private redevelopment and investment opportunities; and
- Providing the greatest opportunity for incremental LRT expansions to north central and southeast communities in the future.

The Right Project for Stage 1

To confirm that the updated Stage 1 alignment is the right project for Calgary, Administration has developed a Business Case for this stage of the Green Line LRT and undertaken a review to determine how the updated alignment may affect downtown real estate values and City assessed value. Both the updated Business Case and Property Economic Impact Assessment identify long-term benefits which support the investment in the Stage 1 alignment.

A Business Case for the Updated Stage 1 Alignment

A Business Case for the updated Stage 1 alignment of the Green Line LRT Program is presented in Attachment 9. The purpose of this document is to:

- Articulate the case for developing and delivering Stage 1 of the Green Line LRT Program;
- Define the benefits and rationale for Stage 1, as well as the financial and delivery requirements to successfully deliver it; and
- Support evidence-based decision making and ongoing planning and design of Stage 1 in advance of procurement and delivery.

The Business Case has been updated using a revised approach to transportation investment analysis and benefits management. The approach utilized to develop the Business Case draws on robust analysis previously completed by The City and is informed by best practices applied in Canada and internationally that support analysts, planners, decision makers, and stakeholders to understand how a proposed investment performs against four crucial dimensions of performance:

- Strategic Case – Does the investment support the broader policy and planning goals of The City?
- Economic Case – What level of socio-economic benefit is generated by the investment?
- Financial Case – What are the funding and financing requirements to successfully deliver the investment?
- Deliverability and Operations Case – What are the technical and governance requirements to procure, deliver, and operate the investment?

The Business Case for the updated Stage 1 alignment of the Green Line LRT Program draws on over five years of planning, stakeholder engagement, and design to present an optimized investment for the City of Calgary. This investment will have a significant benefit to mobility and urban development for the City of Calgary, including:

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- **Improving mobility choices.** By providing fast, frequent and reliable transit service that strategically connect communities, employment hubs and key destinations, the Green Line LRT will save Calgarians time traveling to work, school and recreational activities.
- **Laying foundations for future expansion.** By delivering the most complex elements of the overall Green Line Program first, Stage 1 enables incremental future expansion to north central and southeast communities.
- **Catalyzing development** The Green Line LRT serves 10 station areas that are identified by Calgary's Municipal Development Plan as an activity centre or corridor. These areas are a priority for investment and development.
- **Integrated and cost-effective transit service.** The Green Line LRT will connect people to where they want to go using a new LRT that can be delivered and operated in a cost-effective manner.
- **Connecting the city.** The Green Line is the next step for completing Calgary's rapid transit network providing seamless connectivity with the existing Red and Blue LRT lines and four MAX transit routes.

Property Economic Impact Assessment

In accordance with Council direction received on 29 July 2019 to undertake a review of risks associated with any potential alignment decisions that affect downtown real estate values and City assessed values; Administration retained Hatch Urban Solutions to complete a Property Economic Impact Assessment for the Green Line, as outlined in Attachment 10.

The report identified the following key findings:

- Properties within 800m of an LRT station will generally see an increase in property value, with the greatest increase within 500m.
- Retail, office and multi-family properties will generally see the largest increase in property value within 20m of an LRT station.
- New LRT may spur development in areas where underutilized land will be converted into higher and better use.
- Additional value will be created from new, higher-density development that is mixed-use and designed with the public realm in mind.
- Uplifts to property values will not be evenly distributed and will vary depending on property type, land use and proximity to stations.
- Retail and single residential uses are more sensitive to station proximity than others and may see their values underperform for their market if not located within a certain distance of the station.
- During construction, there may be impacts in the form of business loss attributed to the loss of tenants due to disruptive construction.
- Station and light rail construction can generate negative impacts to local businesses, but business sustainability is a result of numerous factors, many beyond LRT construction.

While generally, over the long-term positive uplifts to properties within close proximity to the LRT stations can be expected along the proposed Centre City alignment, many other complex factors will need to be considered given Calgary's current economic situation.

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The Right Approach

Administration has setup the right approach to enhance Council and Calgarians trust and confidence in The City's ability to deliver the Green Line Program on time and on budget and in accordance with the Council-approved Program Vision and Outcomes for Calgarians. As part of this right approach, the Green Line Program Team has developed and is implementing enhanced program management, risk management and due diligence.

In February 2020, the General Manager of the Green Line Program presented the Project Readiness Report to the Green Line Committee. The report included information about the project readiness plan developed jointly by the Green Line Program Team, the Green Line Technical and Risk Committee (TRC) and external experts supporting the project. This was in response to the conclusions and recommendations of the TRC in their project deliverability review requested by the General Manager of the Green Line Program and by Council on 2019 July 29. The TRC is comprised of independent, external, professional project advisors possessing expertise in the areas of governance, procurement, commercial matters, stakeholder consultation, design, and tunnel constructability.

Due diligence and risk management: The role of the readiness plan

The readiness plan was developed to:

- Address gaps in program delivery identified by the TRC and required for successful execution over the ongoing alignment planning, procurement and construction stages of the program; and
- Support the successful completion of set-up, planning, procurement, and delivery activities required to be ready to go to market, with minimal impacts to the overall schedule.

The following principles guided the development of the plan:

- **Structure:** Defining how the program and the definition of key deliverables (including scope, procurement documents and cost/schedule definition) will mature over time;
- **Focus:** Establishing a sequence and division of work to efficiently allocate resources, prioritize activities, reduce unnecessary change, and eliminate re-work;
- **Accountability:** Establishing transparency and ownership of activities across the Green Line Program Team;
- **Confidence:** Re-establish confidence in the program and the realization of the vision from within the team as well as from within The City organization, Council and other key stakeholders; and
- **Discipline:** Create discipline across the program, reflected in the actions of every team member, to adhere to the plan and proactively support structure, focus, accountability, and confidence within themselves and their peers.

The readiness plan is intended to advance the Green Line program in its state of maturity for successful delivery of a complex mega-project. The readiness plan is currently being implemented and guides the work of the Green Line Program Team as they complete the planning phase of the project and move into the procurement and construction phases.

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Work Streams:

To execute on the readiness plan, four work streams with the following objectives have been identified and staff or external experts assigned to lead each:

- **Governance and Program Set-Up:**
 - Establish a governance framework that allows for effective and efficient delivery; and
 - Establish processes, procedures and onboard personnel with the necessary capabilities and experience required to support effective and efficient delivery of the program;
- **Planning:**
 - Establish a viable scope, technical solution and funding arrangement and develop the supporting business case documentation which demonstrates the need/basis for the successful delivery of the Green Line;
- **Commercial:**
 - Establish the procurement strategy, develop procurement documentation (Request for Quotation, Request for Proposal, Technical Performance Requirements, and Project Agreement) and manage smaller procurements and contract administration processes necessary for successful delivery of the program; and
- **Technical and Delivery:**
 - Deliver the enabling works program and develop the technical deliverables (including the design, estimating, schedule, and risk deliverables) necessary for successful delivery of the program.

2020 Goals:

To ensure focus, The Green Line Program Team is committed to achieve the following three goals for 2020:

- **Goal #1 - Governance and Staffing:**
 - Governance model is finalized, approved by Council and fully operational;
 - Senior leadership positions and required staff requirements are filled by people with the right level of expertise and who excel in the project environment;
 - Clear roles, responsibilities and authorities are defined, documented and embedded into the culture of the team; and
 - Program set-up and systems are in place and all actions identified through TRC reviews have been completed.
- **Goal #1 – Status Update:**
 - Report GC2020-0582 – Green Line Program Governance is being presented at the June 2020 Green Line Committee, the report recommends the establishment of the Green Line Program Governance Board, comprised of the

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City Manager along with individuals with a range of expertise in areas such as governance, leadership, procurement, engineering design, construction, project management, and P3 transactions in respect of projects comparable to the Green Line Program;

- Senior leadership positions are currently filled with permanent or acting leaders. Recruitment is underway to fill acting roles with permanent;
 - Clear roles and responsibilities have been communicated throughout the Program Team; and
 - Program set up is underway with systems being transitioned from pilot to operational.
- **Goal #2 - Planning:**
 - Segment 2 planning is complete and the cost and schedule for the complete Stage 1 is within the approved funding; and
 - An updated Business case is approved by Council.
 - **Goal #2 – Status Update:**
 - Segment 2 Concept planning is complete, this report recommends an updated Segment 2 alignment as part of the overall updated Stage 1 alignment, see Attachment 3. This report also recommends the next steps to complete the Functional Plan for the recommended Segment 2 alignment which if approved will be completed in 2020; and
 - A Business case for the updated Stage 1 alignment has been completed, see Attachment 9.
 - **Goal #3 - Delivery:**
 - RFP for Segment 1 and the LRV's have commenced;
 - Segment 1 enabling works are substantially complete; and
 - Segment 2 construction management utilities contract is issued and underway.
 - **Goal #3 – Status Update:**
 - RFP for Segment 1 will be issued on 2020 July 24;
 - RFP for the LRV's is completed and ready to send to the shortlisted suppliers;
 - Over 100 enabling works construction projects, primarily for Segment 1, have been completed to date with several more significant projects such as the 78 Avenue SE grade separation planned to start this year; and
 - Segment 2 construction management utilities contract will be released in 2020 July.

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Additional External Expertise with Mega-Project Experience:

To provide further due diligence on costing and to enhance risk management around the project, additional external project advisors with mega-project experience have been secured:

- **Steer:** Steer is an international public transit planning and project economics company. They were retained for their transportation planning expertise and for their expertise in writing project business cases;
- **Hanscomb Quantity Surveyors:** This international company has a 60-year history of providing tools needed to control costs and help ensure project success. Their role is to conduct an independent review of The City's cost estimates for the program;
- **SMA Consulting Ltd.:** SMA provides risk management advisory services to the project team. They were retained to assist the project team, the ESC and The City's Integrated risk management team with identifying, documenting, managing, mitigating, monitoring, transferring or avoiding risk. SMA's scope of work includes:
 - project controls program setup and implementation support; and
 - risk management, including quantified cost and schedule risk assessments.

Stakeholder Engagement, Research and Communication

Consultation for the updated Stage 1 alignment has focused on gathering stakeholder and public feedback to help Council members understand stakeholder and public sentiment towards the recommended alignment when making their decision. Council's decision is needed to maintain project timelines, allow the team to confirm project scope, advance key dialogues with stakeholders and complete additional planning, studies, and design.

For the engagement following the January 2020 release of the recommended updated Stage 1 alignment the Green Line Program Team hosted four open houses with approximately 780 people in attendance, six pop-up events with approximately 400 people in attendance, and five drop-in events with approximately 115 people in attendance – receiving over 2,300 pieces of feedback. A Citizen Perception Survey was conducted between February 20 and March 1. The survey was sent out to 2,818 panelists and was completed by 1,131 panelists.

Online participation was also strong. Over the same period of engagement, there were nearly 17,000 views of the engage portal, 7,500 visitors and 2,850 contributions. Feedback from stakeholders has been summarized in a What We Heard Report in Attachment 5, together with verbatim comments received during this period, and will be considered as planning for Segment 2 advances.

The City communicated with Calgarians about the updated Stage 1 alignment from June 2019 through May 2020, through a variety of City of Calgary channels including social media, The City of Calgary Newsroom, stakeholder e-newsletters, letter mail, roadside signage, and Calgary.ca/GreenLine. The focus of communications efforts was ensuring key stakeholders and the public had the latest, accurate information needed to understand the status of the project, why changes to Stage 1 were required, what the changes were and next steps. Since the

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conclusion of active engagement on the updated Stage 1 alignment, communications efforts have focused on changes to the project report back schedule for Green Line Committee due to COVID-19, public presentations online to report back on engagement and providing information to Calgarians on how they can participate in Committee and Council meetings.

Future Engagement

The Green Line LRT is a large and complex program. While stakeholder engagement will continue to support the planning work for Segment 2, and stakeholders will be engaged to inform the development of a program to support businesses and communities during construction, the nature of stakeholder engagement will evolve with the project. For the Green Line program, valuable input that has been gathered from Calgarians for more than four years has been used to define the contract requirements for Segment 1, and will be used to define the contract requirements for Segment 2 using a Design Build Finance (DBF) model for procurement.

In a DBF model, the responsibility for developing the detailed design for the project is part of the successful proponent's (Project Co's) scope of work. This means that under a DBF model, Project Co will use these requirements to develop detailed designs for the project, and it is the Green Line Program Team's responsibility to ensure the design complies with these requirements.

This process will take time, and Calgarians will be informed of progress as the designs evolve. While stakeholder engagement for planning input will continue for Segment 2, there will not be further opportunities for planning input for Segment 1. Instead, the focus for stakeholder engagement in Segment 1 will shift to implementation and supporting communities and businesses to prepare for and manage the impacts of construction.

Community and Business Support

Construction of the Green Line LRT will be disruptive, and the impact on businesses is top of mind for the Green Line Program Team. In preparation for LRT construction, the Program Team continues to build relationships with stakeholders and consult with the impacted business community to develop a Community and Business Support Program as directed by Council in 2015 (Taking Care of Business During the Construction of the Green Line NM2015-32).

The development of the Community and Business Support Program will begin in earnest upon confirmation of the Stage 1 Green Line alignment. As part of this program development an engagement process with impacted businesses will be undertaken. The purpose of this engagement is to learn from impacted businesses and to understand the potential impacts that Green Line LRT construction may have on their business operations. This input will allow for the Green Line Program Team to better plan for and help manage the potential disruption to area businesses. It will also provide opportunities for the business communities along the Green Line LRT to work together to inform the priorities for this program.

The Community and Business Support Program will be developed with consideration of input from impacted businesses and communities and will be in place prior to the start of construction of the Green Line LRT. As per NM2015-32, the Administration will report back to the Green Line Committee before construction begins.

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Strategic Alignment

The Green Line LRT is aligned with the future vision of our city as articulated in imagineCALGARY and is identified as part of the City's RouteAhead 30-year Strategic Plan for Transit in Calgary. The RouteAhead plan is aligned with the policy direction and strategic goals of the Municipal Development Plan (MDP) and Calgary Transportation Plan (CTP), the 2020 Sustainability Direction and Council's priorities.

Social, Environmental, Economic (External)

The Green Line LRT will result in outcomes which include social, environmental, and economic benefits for generations to come.

Social

The Green Line LRT supports mixed-use and mixed income communities to reach community aspirations for vitality, sustainability and affordability. Mixed-use neighbourhoods are the places where people live, work, play, shop and learn. Mixed income communities are financially accessible to all Calgarians. A major benefit of increasing access to rapid transit is the overall lowering of transportation costs, and the fundamental link between cost and affordability of housing, especially lower income households. Consideration for multi-generational communities and the places where residents can transition through all stages of life ensure a long-term, sustainable and resilient plan.

Environmental

The Green Line is expected to save 30,000 tonnes of greenhouse gas (GHG) emissions, equivalent to 6,100 vehicles. Investment in transit provides environmental benefits that extend beyond the reduction of GHG. Improved, higher quality transit service and complete communities attract higher levels of ridership, decreasing the environmental impacts associated with urban travel but also support compact growth which in turn provides health benefits. The Canadian Urban Transit Association (CUTA) has outlined the public health benefits of public transit to include improved urban air quality and increased physical activity, which can lower the risk for many diseases. Reduction in greenhouse gases and social health benefits are therefore realized by maximizing the transit investment. The City of Calgary has committed to reducing GHG from its corporate operations, through energy efficiency and conservation programs and a shift to using lower carbon and renewable energy sources.

Economic

Recommendations in this report were strategically conceived by integrating transit and planning. Leveraging the transit investment maximizes the economic return through land use with the intent of providing new and redevelopment opportunities along the corridor. This reduces the fiscal impact of growth and promotes integrated and sustainable development. The investment in transit provides the opportunity to attract global corporations in innovative industries to promote a diversified economy in Calgary. As a result, more population and activity generates sustained ridership and economic growth thereby creating a multiplier effect of the infrastructure investment.

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Investing in Calgary's future also results in economic resiliency through job creation, Gross Domestic Product (GDP) growth, with direct benefits resulting from construction, operations and maintenance, increased property values, savings for households, and productivity gains.

The Green Line project is putting Calgarians to work with over 100 Enabling Works projects completed to prepare for Stage 1 construction. Construction of Stage 1 is expected to create 20,000 direct and indirect jobs.

On opening day, Stage 1 of Green Line will provide Calgarians direct access to 190,000 jobs, with access to 225,000 jobs anticipated by 2048.

Financial Capacity

Financial analysis of the program including recommendations for capital budget appropriation approval and a proposed borrowing bylaw are included in GC2020-0616 (Green Line Budget and Financing Approval) and are not repeated in this report.

Current and Future Operating Budget:

Incremental operating and maintenance costs of approximately \$40 million per year (in 2016 dollars) have been estimated for the Project. Approximately half of the incremental operating and maintenance costs are associated with the Green Line LRT and the other half are required for the supporting bus network. Bus operating hours are required with or without the Green line in the southeast to meet population growth and to ensure coverage and adequate service levels.

With approval of the updated Stage 1 alignment the operating costs will be refined. Operating costs are dependent on a number of factors including: additional operating investments prior to LRT, LRV vehicle characteristics, operating speeds and actual ridership.

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Current and Future Capital Budget:

This report does not result in any changes to either the current or future capital budget requirements for this project.

The updated Stage 1 cost estimate for the Program is:

Cost Category	Updated Stage 1 Alignment (millions)
Program	\$805
Enabling Works	\$225
Real Estate	
Segment 1	\$218
Segment 2	\$171
Infrastructure (Rail, Utilities, Structures, Contingency)	
Segment 1	\$1,567
Segment 2	\$1,918
TOTAL	\$4,903

The program cost estimate contains the cost estimates for all projects in the program, many of which are at different levels of maturity. The complete Program Cost Estimate for Green Line has 2 components: a base cost estimate and contingency.

To review the base cost estimate work completed by the Green Line Program Team, Hanscomb has conducted two independent reviews of the capital cost estimate. The reviews provided a realistic analysis of the project development cost and a comparison with fair market values.

Findings from the initial review indicated that the base cost estimate, in general, provided by the City of Calgary appears to be in line compared with other major LRT projects across Canada as reviewed on a high level. The second review which was more detailed in nature identified a number of areas where the Program Team cost estimates could likely be reduced.

The reviews were positive and confirmed the quality of the cost estimating work which the Program Team is conducting. The reviews also identified a number of risks which need to be captured in the contingency estimating for the Program and recommended that the Program continue to diligently reduce project risk and improve project certainty.

Contingency is the second major component of the Program cost estimate. It is held within the Program budget to cover uncertainty in the estimate and schedule, as well as known Program

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risks. Contingency is calculated using foundational inputs from the base estimate, base schedule, and risk register. These inputs are evaluated by discipline experts and input into a Monte Carlo simulation. The resulting output is a range of possible Program outcomes, some of which are more likely than others.

Bent Flyvbjerg, University of Oxford (a leading voice of mega-project planning, governance and delivery) in a guidance document to the British Department for Transport “Procedures for Dealing with Optimism Bias in Transport Planning” June 2004, indicated the following regarding the use of probability in contingency estimating for mega-projects:

“The upper percentiles (80-90%) should be used when Investors want a high degree of certainty that cost overrun will not occur, for instance in stand-alone projects with no access to additional funds beyond the approved budget. Other percentiles may be employed to reflect other degrees of willingness to accept risk and the associated uplifts can be found in the Guidance Document.”

The most recent interim contingency estimate identified the Program budget including all contingencies is at approximately the 81st percentile (the P81) of potential Program outcomes. The Green Line Program Team is committed to keeping the contingency estimate in the range of P80-90 as recommended by leading experts.

Risk Assessment

SMA is assisting with due diligence of risk management activities and leading the management of risk on the Green Line in alignment with the Project Readiness Plan. Earlier this year, SMA commenced a review and update of the Green Line Program’s current risk practices and associated risk management tools.

Understanding risk and developing measures to either accept or mitigate risk involves the development and continuous improvement of three primary risk management components:

- A Risk Management Plan: a clear plan for identifying, assessing, and managing risks as well as communicating status and potential implications.
- A Risk Register: a comprehensive register of risks and thorough analysis of their impacts, and a repository for response strategies.
- Ongoing Risk Management: identifying and responding to risk through a proactive and empowered risk-aware culture.

Based upon the work completed to date, SMA’s risk assessment results indicate that the Green Line Program risk exposure is at the high end of the typical range of other major LRT projects at this stage. The program holds risk in all of the typical categories of an LRT mega-project, but higher risk than is typical has been identified in the following risk areas:

- Scope additions and uncertainty
- Governance and decision making
- Procurement and market conditions
- Contract interfaces (i.e. due to the use of multiple Design-Build-Finance contracts plus a separate LRV procurement)
- Canadian National/Canadian Pacific coordination

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- Scope and technical risks associated with Segment 2 (from north of Inglewood Station to 16 Avenue N)
- Current impacts of COVID-19

The Green Line team is acutely aware of the need to continue to prioritize effort on proactively mitigating these risks. There are significant actions the Green Line Program Team has and is taking to respond to these risks, including:

- Finalizing Segment 2 planning and freezing scope
- Streamlined, risk informed decision making
- Meeting established procurement timelines
- Retaining experienced project resourcing
- Continually looking to implement cost savings throughout the program

Monitoring and updating risks and risk response strategies will continue as the Program progresses. With team effort directed toward managing and controlling risk on the Green Line, the risk profile should continue to reduce over time. The risk assessment will be refined and updated to accurately reflect the evolution in affordability, schedule, and program risks as key milestones are reached.

For additional detail on risk assessment and risk management refer to Attachment 11.

REASON(S) FOR RECOMMENDATION(S):

The updated Stage 1 alignment achieves Council's Vision for the Green Line "*A city-shaping transit service that improves mobility in communities in north and southeast Calgary, connecting people and places, and enhancing the quality of life in the city.*" The updated Stage 1 alignment will support Calgary's long-term economic recovery. As the City's largest job creation project starting construction of Green Line Stage 1 will be a critical component of The City's COVID-19 recovery effort, creating approximately 20,000 direct and supporting jobs.

The updated Stage 1 alignment provides the foundation for future investments in extensions when the time is right, and provides the opportunity to leverage this unprecedented investment to shape the growth of Calgary. These recommendations were developed after significant consultation, the evaluation of multiple options, and the validation through risk assessments and additional due diligence.

ATTACHMENTS

1. Attachment 1 – Previous Council Direction
2. Attachment 2 – Green Line Background
3. Attachment 3 – Green Line Updated Stage 1 Alignment and Station Locations
4. Attachment 4 – Updated Segment 2 Alignment, Station Location and Concept Plan
5. Attachment 5 – What We Heard Report
6. Attachment 6 – Common Stakeholder Interests and Mitigation
7. Attachment 7 – North Central Bus BRT Improvement Concepts

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8. Attachment 8 – Alignment Options Review Summary
9. Attachment 9 – Calgary Green Line LRT Stage 1 Business Case
10. Attachment 10 – Property Economic Impact Assessment
11. Attachment 11 – Risk Update
12. Attachment 12 – Public Submissions
13. **Attachment 13 – Additional Public Submissions**
14. **Attachment 14 – Additional Public Submissions**