Prioritization of Future RouteAhead Capital Projects

Executive Summary

The RouteAhead long-term strategic plan guides both operational and capital investments in transit. In the past seven years, Calgary Transit has made strong progress on overall transit network infrastructure development and increased efficiency of service delivery. In 2019, Council approved an updated evaluation framework and list of major transit growth projects. This report provides an updated prioritized project list that sets a clear vision for transit in Calgary. This information will be used by City Council and Administration to make informed decisions regarding customer-centric improvement, and investments in capital projects. The project prioritization will not change the current approved capital projects in One Calgary 2019-2022 as the projects are outside of the four-year anticipated capital funding envelope.

Prioritization Considerations

Business units citywide must establish priorities and decide how to allocate limited resources for public investment. This challenge is particularly pronounced in the case of transit infrastructure development, where funding and financing is often dependent on collaboration with other levels of government. Therefore, Calgary Transit requires a robust prioritization process that considers current and future social, economic, and environmental benefits, capital and long-term operating investments, and impacts to transit ridership. The following principles guided overall development of the prioritization process:

- Providing an objective process that can be applied consistently to all projects;
- Establishing a collaborative and transparent process to evaluate project information;
- Balancing current and longer-term community growth needs;
- Promoting high ridership and overall mobility while improving the customer experience;
- Supporting existing and future land uses; and
- Reducing required future operating funds by evaluating projects that reduce net operating costs.

Prioritization Approach

RouteAhead Project Prioritization used the same methodology as the Green Line to analyze project benefits. Green Line's methodology was based on the original RouteAhead project work. This ensured consistency with past work. A two-dimensional prioritization approach was used to evaluate rapid transit projects by first analyzing project benefits, independent of capital and operating investments. This allowed projects to be first analyzed using the weighted criteria and values approved by Council in the Guiding Framework document (TT2019-0637).

The second dimension used a prioritization matrix to examine benefit analysis results and compared them against the estimated 30-year net operating and capital investments using Net Present Value (NPV). This allowed for the evaluation of relative benefits and financial impacts. The two-dimensional approach produced two key outputs: 1) an overall project ranking based solely on the benefits and 2) a matrix plotting benefits against project investments that highlights readiness. The following section outlines the methodology of the two dimensions of the processes that make up the approach.

<u>Dimension 1: Project Benefits – Criteria and Weighting</u>

Figure 1 below shows the list of key criteria, the metrics for measurement and the weightings used for each criteria. This process allows qualitative data to be meaningfully compared and measured. These criteria were used in the Green Line analysis and based on feedback from Council and other stakeholders. The highest weight was placed on Ridership (30%), followed by Customer Experience (20%), Economic (20%), Social (20%), and Environmental (10%) benefits (Table 1). The criteria weighting signifies a focus on maximizing benefits for the most customers, and highlights associated positive outcomes from rapid transit projects.

Raw data values for each criteria were divided into quintiles then converted into quintile scores to normalize the data. Quintiles divide the data into five equal parts, with each part, or quintile, containing 20% of the values in the total data range. Benefits quintile scores were then weighted based on the assigned weights to each criteria.

Table 1: List of Project Benefits – Criteria and Weighting

	Weighting (%)	Criteria		Metric
Benefits	30	Ridership		Passengers per avg. weekday
	20	Customer Experience	Increases travel time advantage	mins / trip
			Overcomes issues of reliability and delay	on time performance
			Increases passenger capacity	capacity / corridor
	20	Economic	Population Opening Day	# Population in 800m radius
			Population Future	# Population in 800m radius
			Jobs Opening Day	# Jobs in 800m radius
			Jobs Future	# Jobs in 800m radius
	20	Social	Community Services	# of Services in 1,000m radius
			Affordable Housing Units	# of Affordable Housing Units in 600m
			Low Income Population Served	Total # of Low Income Pop in 600m radius
	10	Environmental	GHG Emissions Reductions	Tonne CO2/Year
			Proximity to MDP Activity Centres and Corridors	# Stations within Corridor in 800m

Data from the 2048-time horizon was used to analyze benefits to allow for consistent project comparisons. The 2048-time horizon assumes buildout of communities that are currently new and developing, eliminating any bias against transit projects in communities with lower population and job numbers in 2020. Comparable population values are important because the population values were used to scale and calculate other criteria. For example, a low population value translates to lower values for ridership, Greenhouse Gas (GHG) emissions, affordable housing units, and low-income population. The 2048-time horizon was also used for the Green Line prioritization analysis to maintain consistency.

Dimension 2: Prioritization Matrix

A prioritization matrix is an analysis tool that uses specific criteria to objectively compare choices and determine which projects are the best value to the organization depending on the funding available. It is intended to provide an intuitive platform for displaying results and allow for a quick review of information. The RouteAhead Prioritization Matrix used the benefits ranking previously calculated in Dimension 1 and plotted the values against the project investment calculated using Net Present Value (NPV). NPV calculates a single number that considers the time value of money invested into the project in present day. NPV is considered an absolute measure of a project's worth and accounts for operational savings, including revenue. The NPV of a project is calculated using 30-year operating costs, initial capital investment, and a discount rate. A discount rate is the rate of return used to discount future cash flows back to their present value, typically representing. It is commonly the average interest rate central banks charge institutions.

Operating costs used in the calculations represent net annual operating costs in 2018 dollars for the year 2048. The operating costs assume transit service levels for the year 2048 and consider feeder bus service changes and efficiencies realized once a transit capital project is complete, as well as fare

revenue from new ridership along the route. Operating costs were calculated by finding the difference between a 'base' project scenario –the operating cost of transit in 2048 without the capital project, and a 'test' project scenario –the operating cost of transit in 2048 with the capital project complete and fare revenue accounted for. Some projects therefore exhibit a net operating cost savings, due to feeder bus efficiencies, fare revenue, or a combination of both. Other projects result in net operating costs due to less potential for feeder bus efficiencies, the introduction of new routes, and significant increases to route length and/or frequency.

RouteAhead Project List

There are 18 rapid transit network growth programs listed below that include 29 projects. They are divided between LRT Programs (Table 2) and BRT Programs (Table 3). The majority were previously identified in RouteAhead. The following projects were added to the list as they were approved by Council after RouteAhead: Westbrook to MRU Transit Connection, and in-street MAX improvements to Routes 301 and Route 302. Three projects previously identified as beyond the RouteAhead timeframe are now included due to advances in approved development within the project area, they include: 162 Ave Transitway, Shaganappi High-Occupancy Vehicle (HOV) lanes, and 144 Ave North Regional Context Study BRT. See Appendix 1 - Future Rapid Transit Projects on page 13.

The term program is used below to describe a grouping of projects. Projects can indicate separate work segments that can be done to advance a program as funding becomes available. Some programs may contain a single project. Projects have been evaluated both individually and collectively within a program. In the case of Green Line North and South, Blue Line NE and MAX Purple extensions, projects have been divided into discrete segments. This is to allow for incremental expansion based on operational and customer requirements, funding and consistency with the traditional success of Calgary Transit network expansions. This does not preclude multiple projects from being constructed together if funding is available at the time. See Attachment 3- RouteAhead Project Summaries for more information about the individual projects.

Note: The project list below does not include previously approved and funded projects such as Green Line 16 AV N to Sheppard.

Table 2: LRT Programs

Airport Transit Connector	Blue Line to Airport
	Green Line to Airport
Blue Line NE extension	Saddletowne to 88 AV NE
	88 AV NE to 128 AV NE
	128 AV NE to Stonegate
Blue Line W extension	69 ST SW to 85 ST SW
Green Line N extension	16 AV N to 64 AV N
	64 AV N to Beddington BV N
	Beddington BV N to 96 AV N
	96 AV N to North Pointe
	North Pointe to 160 AV N
Green Line S extension	Shepard to McKenzie Towne
	McKenzie Towne to Auburn Bay/Mahogany
	Auburn Bay/Mahogany to Seton
Red Line S extension	Somerset-Bridlewood to 210 AV S
Westbrook to MRU Transit Connection	Blue Line connection to Mount Royal University and Currie Barracks area
8 AV Subway	Red Line/Blue Line downtown separation

Table 3: BRT Programs

MAX 301 North*	In-street improvements to Route 301 BRT North
MAX 302 Southeast	In-street improvements to Route 302 BRT Southeast
MAX Purple extension	Transitway extension: 52 ST SE to 84 ST SE
	Transitway extension: 84 ST SE to City Limits
	Downtown/Green Line tie-in
MAX Teal extension	In-street extension from Douglas Glen to 68 ST SE
North Regional Context Study/144 AV N BRT	New in-street BRT route: Tuscany Station to Nose Creek
NW-HUB/West Campus Mobility	New in-street routes
Route 305 West	In-street improvements to Route 305 BRT West
Shaganappi HOV	HOV lanes: Bowness RD to Stoney TR
52 ST BRT	In-street BRT route from Saddletowne to Seton
162 AV S Transitway	New transitway BRT route: Somerset-Bridlewood to west Providence

**MAX 301 North (existing route in-street) was approved by Council on June 16, 2020.*

The following projects have been removed from the analysis:

- 8th Avenue Subway (Red Line/Blue Line separation) was removed from project prioritization analysis since the high estimated capital cost at $1.5 billion leads to a significant distortion in the data analysis, especially when calculating NPV, making it difficult to compare projects. Additionally, the need for the 8th Avenue Subway is driven by the need for extra capacity on Red Line South. With the recent approval of Green Line Stage 1, which is expected to create extra capacity on Red Line South, the need for the 8th Avenue Subway diminishes greatly over the 2048 timeframe considered in RouteAhead project prioritization.
- Green Line North and South are not included in the RouteAhead analysis as Administration will be updating the future planning recommendations.
- Note: Regional projects, such as extending service to Chestermere, are not included on the list as they represent distinct projects with varying timelines that are dependent on transit needs in other municipalities as well as the current Calgary Municipal Regional Board regional growth plan work. Regional projects will be considered and evaluated as they are proposed. Regional service extensions are expected to be based on cost recovery model.

Dimension 1 Analysis: Evaluation of Benefits

Table 4 below shows the individual scores for each of the projects. The project scores are solely based on the analysis of the benefits and do not consider capital investments or project readiness for funding or design.

Table 4. Future Rapid Transit Network Growth project benefit scores

Project	Benefits Score
52 Street E BRT	92
MAX 301 North	91
Westbrook to MRU Transit Connection	85
North Regional Context Study/144 Ave N BRT	79
Airport Transit Connector - Blue Line to Airport	75

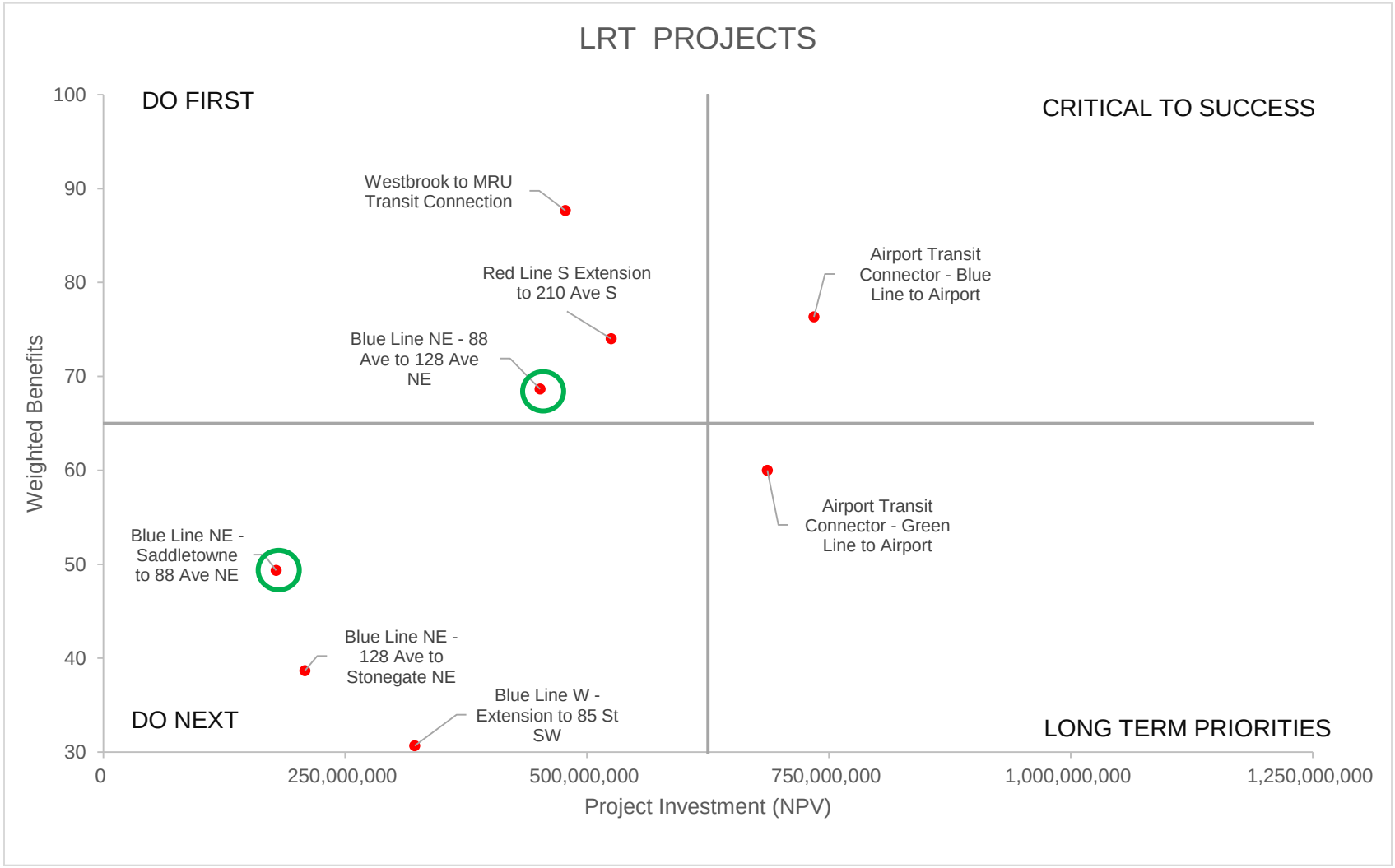
Shaganappi HOV: Bowness Road to Stoney Trail	73
Route 305 West - existing route, in-street	72
Red Line S Extension to 210 Ave S	72
Blue Line NE - 88 Ave to 128 Ave NE	68
MAX 302 South, existing route, in-street	67
NW-HUB / West Campus Mobility	67
162 Ave Transitway/BRT	64
Airport Transit Connector - Green Line to Airport	59
Blue Line NE - Saddletowne to 88 Ave NE	48
MAX Purple/17 Ave SE - Blackfoot Truck Stop to Downtown	44
MAX Purple/17 Ave SE - 52 St E to 84 St SE	43
Blue Line NE - 128 Ave to Stonegate NE	39
MAX Purple/17 Ave SE - 84 St E to City Limits	38
Blue Line W to 85 St SW	31
Max Teal/South Crosstown BRT to 68 St E	28

Dimension 2 Analysis: Prioritization Matrix

Tables 5 and 6 show the results of the prioritization matrix divided between LRT and BRT projects, due to the comparative costs between the two modes. The matrices show benefits plotted against project investment, calcuated using the NPV of each project. Each matrix is broken into four quadrants. The quandrants indicate where projects fall on the specturm of low to high benefit and low to high investment. Projects located in the upper left hand corner indicate high benefit and lower relative cost, and have been labelled – Do First. The projects in the upper right hand side indicate high benefit and high relative cost, and have been labelled – Critical to Success. The projects in the lower left side indicate lower relative benefit and low relative cost, and have been labelled – Do Next. The projects in the bottom right corner indicate lower relative benefit and higher relative cost, and have been labelled – Long Term Priorities.

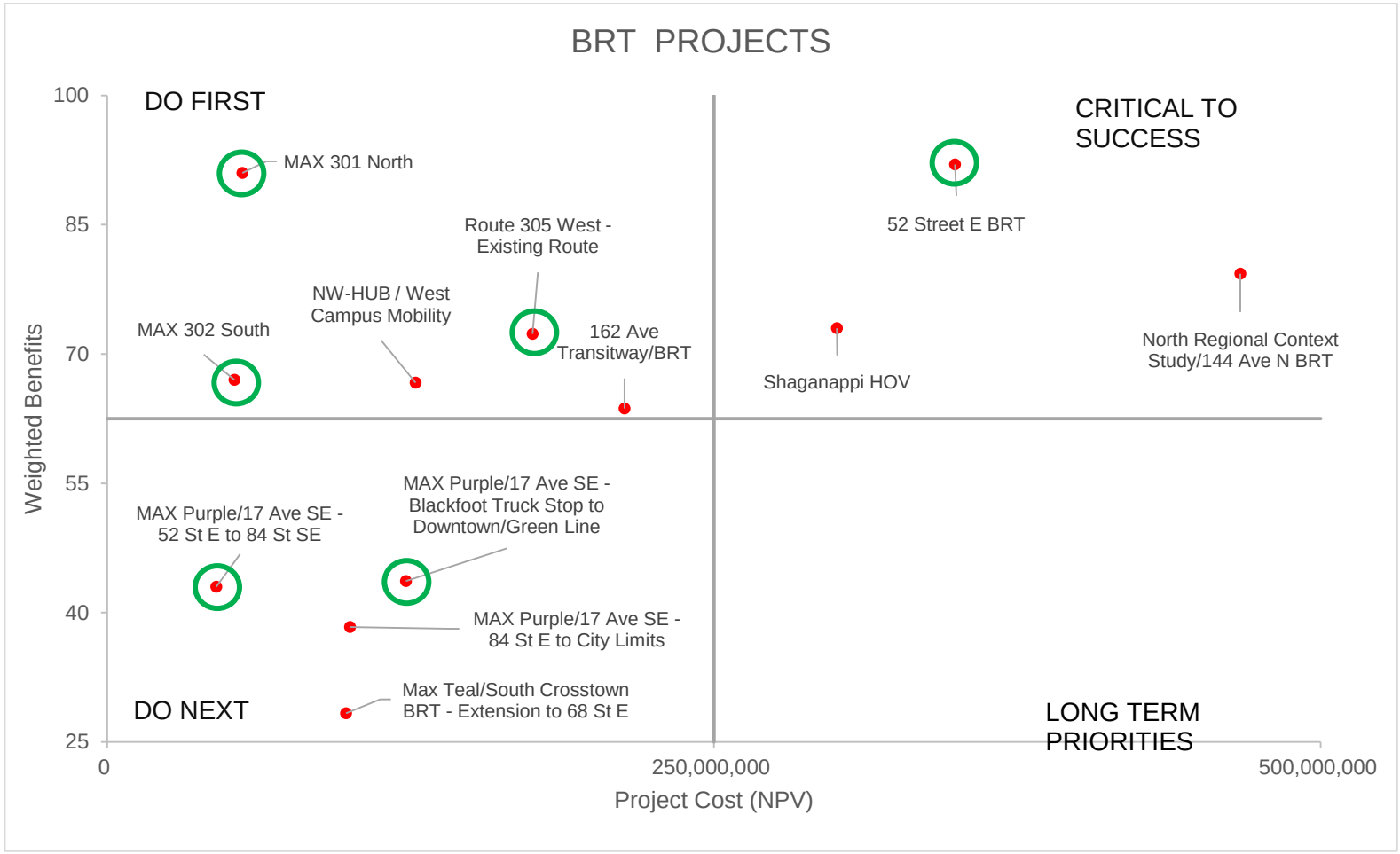
Projects circled in green indicate a high degree of readiness in the next 5 -10 years based on function planning, system capacity, and/or surrounding development. The green circle considers additional project characteristics such as ridership capacity and strategic alignment. Additional considerations such as high ridership corridors, Transit Oriented Development and Coordination with other City Departments and key City strategies were incorporated from a qualitative perspective to account for project readiness and corporate coordination. See Attachment 3- RouteAhead Project Summaries. City of Calgary COVID-19 recovery scenarios were also taken into account and are outlined in Attachment 5 – Risks.

Table 5: LRT Projects - Weighted Benefits, Project Investment and Project Readiness



The green circles indicate project readiness in the next 5-10 years.

Table 6: BRT Projects - Weighted Benefits, Project Investment and Project Readiness



The green circles indicate project readiness in the next 5-10 years.

Summary of Prioritization Results

Tables 7 and 8 provide a ranking of projects into two categories: short-term, defined as projects with readiness in 5-10 years, and long-term, defined as projects that exceed 10 years. Within these categories, projects are ranked based on the higest benefits compared to project investment. Projects have been organzied according to logical sequencing for build out.

Ongoing capital investment programs in assets such as bus and train procurement, infrastructure maintenance, and station refurbishments have not been prioritized against the rapid transit network expansion projects through this process but will need to be identified and accounted for as further capital funding streams are identified. Appropriate funding is needed for ongoing maintenance of these critical assets to remain in a state of good repair and support safe and reliable transit service.

Table 7: Short-term future rapid transit projects ranked according to benefit and investment.

Short-term Projects	Rank
52 Street E BRT	1
MAX 301 North	2
Route 305 West	3
Blue Line NE*	4
MAX 302 South	5
MAX Purple/17 Ave SE - Blackfoot Truck Stop to Downtown	6
MAX Purple/17 Ave SE - 52 St E to 84 St SE	7
Max Teal/South Crosstown BRT - Extension	8

**Includes both Blue Line NE - Saddletowne to 88 Ave NE & 88 Ave to 128 Ave NE Projects*

Table 8: Long-term future rapid transit projects ranked according to benefit and investment.

Long-term Projects	Rank
Westbrook to MRU Transit Connection	1
North Regional Context Study	2
Airport Transit Connector - Blue Line to Airport	3
Shaganappi HOV: Bowness Road to Stoney Trail	4
Red Line S Extension to 210 Ave S	5
NW-HUB / West Campus Mobility	6
162 Ave Transitway/BRT	7
Airport Transit Connector - Green Line to Airport	8
Blue Line NE - 128 Ave to Stonegate NE	9
MAX Purple/17 Ave SE - 84 St E to City Limits	10
Blue Line W to 85 St SW	11

In summary, Calgary Transit is in a positive position to continue to advance the long-term 30-year rapid transit network growth strategy. The evaluation found that BRT Projects rank as beneficial to LRT projects and that the agile delivery of capital projects will be needed as funding becomes available so that individual projects can be funded to advance high priority rapid transit programs. It is important to note that the benefit rankings tended to favour longer projects, as they result in more benefits. For example,

the longer the physical length of the project, generally the more population, jobs, services, and affordable housing that are captured in the analysis.

Appendix 1: Future Rapid Transit Network