

## SURREY RAPID TRANSIT ALTERNATIVES ANALYSIS PHASE 2 EVALUATION

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### FINAL EVALUATION REPORT, EXECUTIVE SUMMARY

AUGUST, 2012

## EXECUTIVE SUMMARY

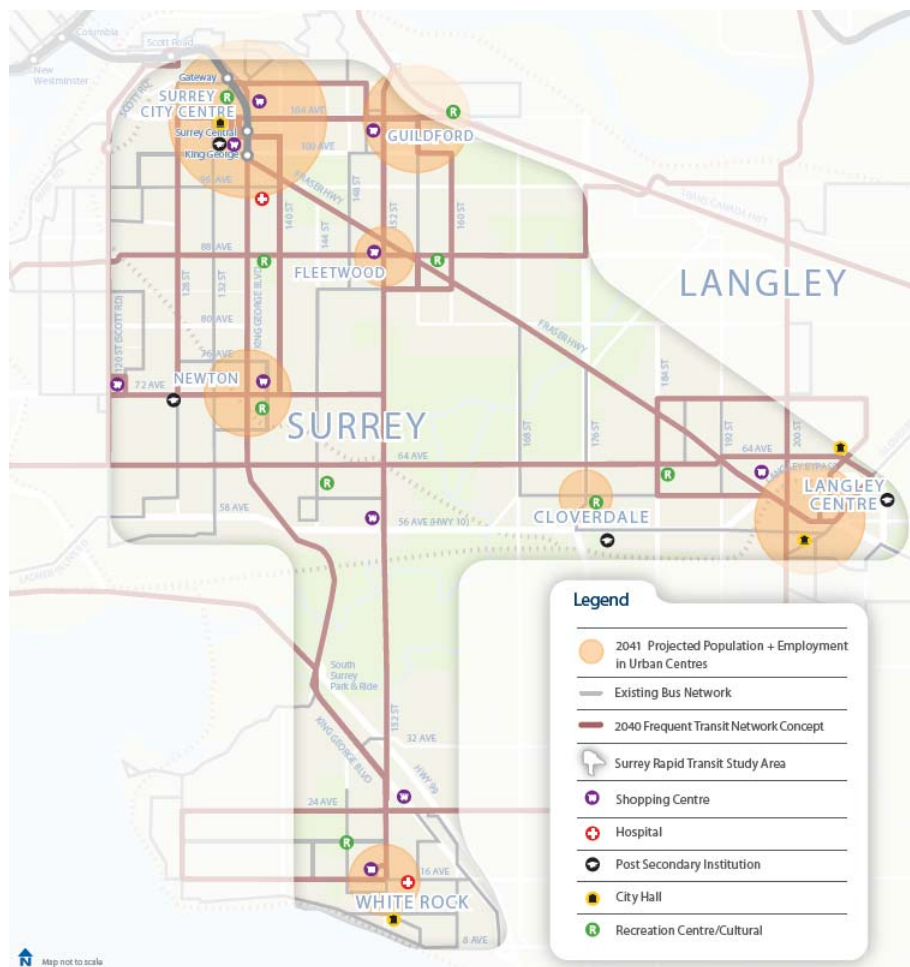
### E1. Introduction

TransLink and the BC Ministry of Transportation and Infrastructure (MoTI) sponsored a multi-phase study to evaluate alternatives for rapid transit in Surrey and surrounding communities. The Cities of Surrey and Langley, and Metro Vancouver were partners in the study. The Corporation of Delta, the City of White Rock, and the Township of Langley were also involved in the process at key milestones.

Since the 1990s regional plans have identified expansion of rapid transit in Surrey as a priority to help shape future travel and growth there. Surrey and the South of the Fraser area are home to an already significant and growing portion of the region's population and employment. Surrey alone is expected to accommodate more than a quarter of Metro Vancouver's residential growth over the next 30 years. Surrey Metro Centre is also poised to become a 'second downtown' for the region, with large scale residential, commercial and institutional growth expected, including SFU Surrey and a relocated Surrey City Hall. Transit usage is increasing across Surrey's communities, but remains well below the regional average at 8% of all trips.

In December 2009, IBI Group was retained to examine a range of rapid transit technology and alignment alternatives to respond to these conditions. The study area, shown in **Exhibit E.1**, extends along King George Boulevard, Fraser Highway and 104 Avenue through most of Surrey. It encompasses the communities of Surrey Centre, Newton, Guildford, Fleetwood, Cloverdale/Clayton, South Surrey/White Rock, and Langley Centre, as well as significant agricultural lands within its almost 300 square kilometres.

**Exhibit E.1 – Surrey Rapid Transit - Study Area**



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The Surrey Rapid Transit Study is being undertaken in three phases and IBI Group has led the technical work of the first two phases.

- Phase 1 - Shortlist Identification: technology and alignment alternatives are identified and screened in order to arrive at a shortlist of alternatives for further development in Phase 2.
- Phase 2 - Alternatives Development and Evaluation: shortlisted alternatives are further developed and evaluated to support a decision on a preferred alternative.
- Phase 3 - Design Development: after selection of a preferred alternative, further design development and costing is undertaken. Phase 3 will establish a budget, timeline and phasing for the project and provide the basis for project definition, securing funding and procurement.

The study has involved stakeholder and public consultation at each step and this has informed the study process and outcomes.

## E2. Evaluation Process and Alternatives Considered

The study undertook a review of the current and expected conditions in the study area, and with stakeholder and public input synthesized project objectives in order to ensure that the rapid transit solutions identified and evaluated address the underlying needs and issues.

### Project Objectives

1. Meet, shift and help shape travel demand through better transit service;
2. Shape future land use in keeping with regional and municipal plans, including the growth of Surrey Metro Centre and other urban centres; and
3. Help achieve ambitious mode share and emissions targets.

An evaluation framework was developed based on these objectives to assess the rapid transit alternatives. The study employed a Multiple Account Evaluation (MAE) approach, which provides a qualitative and quantitative evaluation across a wide range of factors or “accounts” to identify the benefits and impacts of each alternative in a structured format.

The Surrey Rapid Transit Study MAE framework consists of seven accounts: transportation, financial, environment, urban development, economic development, social/community, and deliverability. Within each account more specific objectives and a set of qualitative and quantitative evaluation criteria and measures were developed. **Exhibit E.2** summarizes the accounts, objectives and criteria employed with the evaluation.

Three rapid transit technologies were considered (BRT, LRT and RRT), described in **Exhibit E.3**.

A long list of thousands of possible alternatives was screened to a shortlist according to the evaluation framework above. The shortlist was confirmed through public consultation and thirteen alternatives were advanced for more detailed study (see **Exhibit E.4**). Design concepts and a multiple account evaluation were developed for each alternative and these were brought forward for public consultation. Based on the input received and further technical work, the designs and evaluations were refined and the final results documented in this report.

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All alternatives were evaluated against a Business As Usual (BAU) scenario as a point of reference. The BAU scenario assumes that the study area would continue to be served by buses consistent with TransLink’s South of Fraser Area Transit Plan vision, with service increases consistent with past trends and forecast population and employment growth, but without rapid transit investment. A neutral rating means that an alternative would perform no better or worse than “business as usual”. These assessments have been summarized on a five point scale, represented as follows:






**Exhibit E.2 – Evaluation Framework (Accounts and Criteria)**

Accounts	Account-Level Objectives	Criteria Considered
<b>Transportation</b>	<p><i>Rapid transit is fast, frequent, reliable and attractive to all users, and integrated with the regional transit system and with active modes.</i></p> <p><i>Rapid transit and the supporting transit network meet current and future travel demand efficiently for multiple destinations, increasing transit mode shares and reducing vehicle kilometres travelled (VKT).</i></p>	Transit User Effects, Non-Transit User Effects, Transit Network/ System Access, Reliability, Capacity and Expandability, Integration with Active Modes, Transit Mode Share
<b>Financial</b>	<p><i>Rapid transit and the supporting transit network are cost-effective in meeting travel demands and shaping land use in multiple corridors</i></p>	Capital Cost, Operating Cost, Cost Effectiveness
<b>Environment</b>	<p><i>Rapid transit service contributes towards achieving emission reduction targets by positively affecting travel choices.</i></p> <p><i>Rapid transit is sensitive to natural resources, protected lands, food-producing lands and watercourses.</i></p>	Emissions Reductions, Noise and Vibration, Biodiversity, Water Environment, Effect on Parks and Open Space, Effect on Agricultural Resources
<b>Urban Development</b>	<p><i>Rapid transit is supported by land use planning that promotes density and diversity of uses, integration of the station areas and by high quality urban design.</i></p> <p><i>Rapid transit supports city shaping by encouraging municipalities to focus appropriate levels of development around stations.</i></p>	Land Use Integration, Land Use Intensification Potential, Property Requirements, Urban Design
<b>Economic Development</b>	<p><i>Rapid transit supports economic development.</i></p> <p><i>Rapid transit is compatible with economic needs, including goods movement.</i></p>	Construction Effects, Tax Revenue Effects, Goods Movement
<b>Social and Community</b>	<p><i>Rapid transit is safe, accessible and secure.</i></p> <p><i>Rapid transit and the supporting transit network provide benefits to and do not disproportionately impact disadvantaged groups.</i></p>	Operational Safety, Personal Security, Community Connectivity, Low Income Population Served, Heritage and Archaeology
<b>Deliverability</b>	<p><i>The rapid transit service is constructible and operable, and avoids ‘show-stopper’ constraints.</i></p> <p><i>The rapid transit service allows phasing flexibility and is scalable.</i></p> <p><i>The rapid transit service is affordable, and supported at all levels of government</i></p>	Constructability, Potential for Phasing, Time Required to Deliver, Acceptability, Affordability



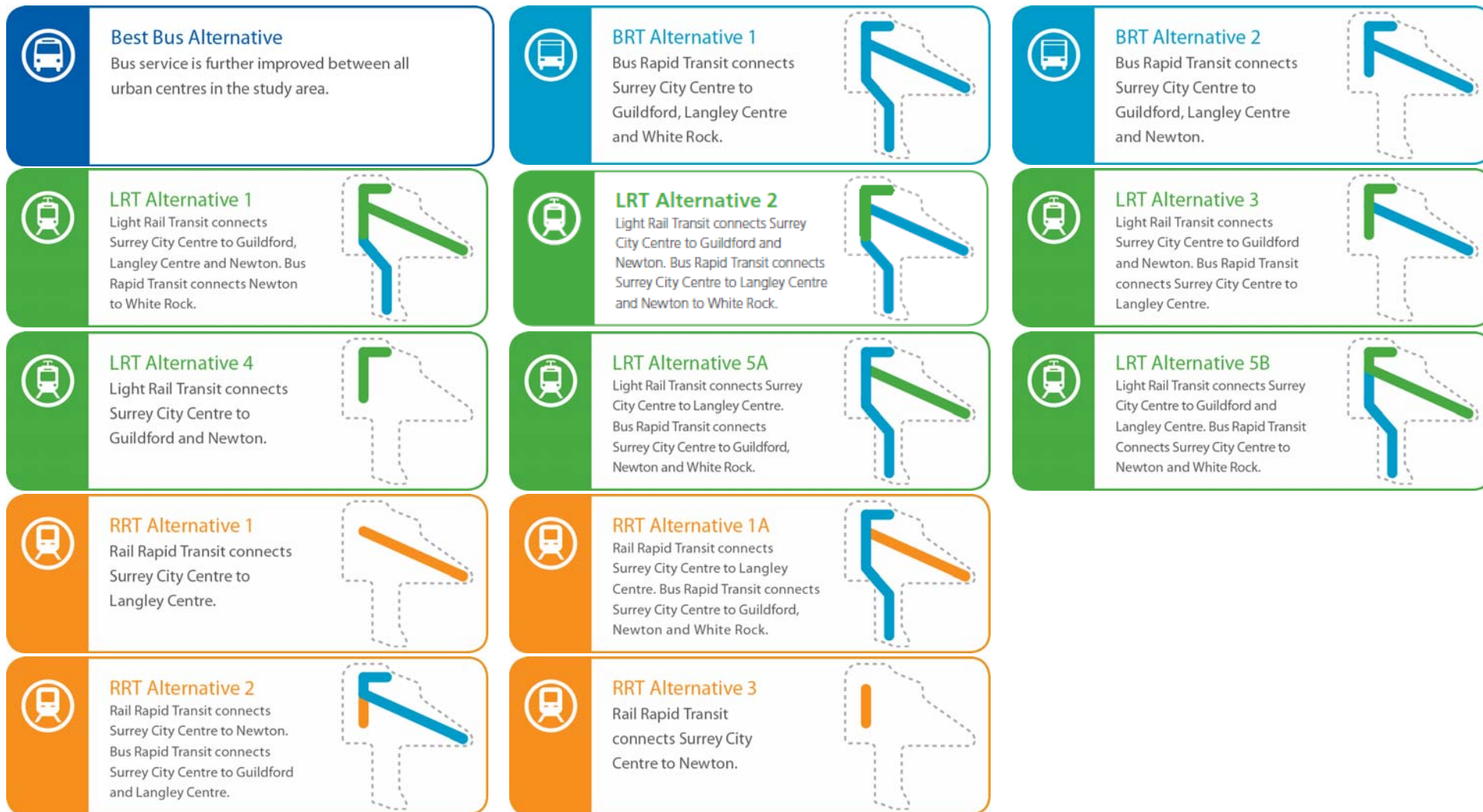
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Exhibit E.3 – Rapid Transit Technologies Considered

Technology	Typical Characteristics	Assumptions in this Study
<p><b>Bus Rapid Transit</b></p> 	<ul style="list-style-type: none"> <li>• High-frequency, medium-capacity service;</li> <li>• High-quality stop infrastructure, with off-vehicle ticketing facilities and multiple-door, level boarding;</li> <li>• Uses rubber-tire, low-floor articulated buses that can run on diesel, compressed natural gas or electricity;</li> <li>• Operates in the street in reserved lanes or on street-level dedicated rights-of-way separated from other traffic;</li> <li>• Runs on the surface, but can also be underground or elevated;</li> <li>• Uses signal priority at intersections and serves moderately-spaced stations at key destinations to improve journey times; and</li> <li>• Can typically move 2,000 to 3,000 people per hour in each direction.</li> </ul>	<ul style="list-style-type: none"> <li>• Low-floor articulated bus using modern, clean diesel propulsion, carries up to 100 people;</li> <li>• Driver operated;</li> <li>• Frequency in peak: 2 to 5 minutes, carrying up to 3,000 per hour in each direction;</li> <li>• Alignment: mostly in segregated median lanes, with sections of side running, operation in mixed traffic, and one new bridge;</li> <li>• Signal priority at intersections; and</li> <li>• Street-level stations every 800 to 1600 metres, with shelters, seating, ticket vending, security cameras, real time information and wayfinding.</li> </ul>
<p><b>Light Rail Transit</b></p> 	<ul style="list-style-type: none"> <li>• High-frequency, high-capacity service;</li> <li>• High-quality stop infrastructure, with off-vehicle ticketing facilities and multiple-door, level boarding;</li> <li>• Uses driver-operated, electrically-powered rail vehicles;</li> <li>• Operates in the street in reserved lanes or on street-level dedicated rights of way separated from other traffic</li> <li>• Runs on the surface, but can also be underground or elevated;</li> <li>• Has variants that include diesel light rail and tram-train; and</li> <li>• Can typically move up to 6,000 to 10,000 people per hour in each direction.</li> </ul>	<ul style="list-style-type: none"> <li>• Low-floor electrically powered rail, carries up to 240 people in two-car sets;</li> <li>• Driver operated;</li> <li>• Frequency in peak: 3 to 5 minutes, carrying up to 4,800 per hour in each direction;</li> <li>• Alignment: mostly in segregated median lanes, with sections of side running, and one new bridge;</li> <li>• Signal priority at intersections; and</li> <li>• Street-level stations every 800 to 1600 metres, with shelters, seating, ticket vending, security cameras, real time information and wayfinding.</li> </ul>
<p><b>Rail Rapid Transit</b></p> 	<ul style="list-style-type: none"> <li>• High-frequency, high-capacity service;</li> <li>• High-quality stop infrastructure with off-vehicle ticketing facilities and multiple-door, level boarding;</li> <li>• Comes in a variety of types, for example, the region's SkyTrain systems are automated, driverless systems powered by electricity, while Toronto and New York subways and London Underground systems typically use drivers;</li> <li>• Typically operates completely separated from traffic, usually in a tunnel / trench, elevated structure, or fenced off at surface level; and</li> <li>• Can typically move 10,000 to 25,000 people per hour in each direction.</li> </ul>	<ul style="list-style-type: none"> <li>• Electrically powered SkyTrain technology, carries up to 650 people in five-car sets;</li> <li>• Automated operation, centrally controlled;</li> <li>• Frequency in peak: 2.3 or 4.6 minutes, carrying up to 17,000 per hour in each direction;</li> <li>• Alignment: elevated above street; and</li> <li>• Elevated stations every 800 to 1600 metres, with station building accessed by stairs / elevators / escalators; includes seating, ticket vending, security cameras, real time information and wayfinding.</li> </ul>

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Exhibit E.4 – Surrey Rapid Transit Study Alternatives – Schematic Maps

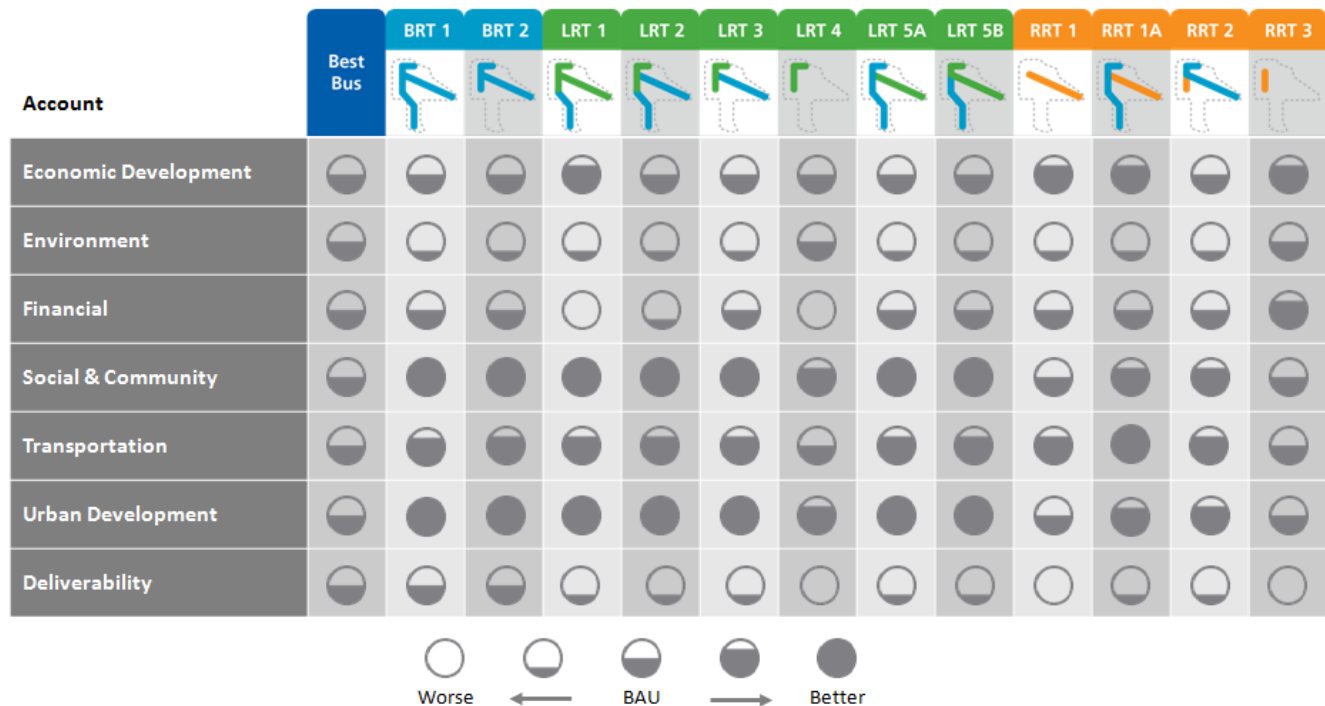


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### E3. Evaluation Results

The performance of each alternative within each account is summarized in **Exhibit E.5** followed by an account by account description of the findings for each account.

**Exhibit E.5 – Multiple Account Evaluation Summary for Phase 2 Alternatives**



#### Transportation

The Transportation account measures the benefits and impacts to transportation network users. All alternatives would provide transportation benefits, with RRT 1A having the greatest transit user benefits due to fast, transfer-free travel times to Fraser Highway. Best Bus, LRT 4 and RRT 3 do not provide rapid transit on Fraser Highway and generate the least transit user benefits. Alternatives without rapid transit on Fraser Hwy or King George Blvd would not meet long term demand. BRT (combined with local bus service) would provide sufficient capacity on all three corridors, but would be nearing the limits by 2041 on Fraser Highway. Alternatives with LRT or RRT on Fraser Highway would provide expandability on this busy corridor. BRT and LRT alternatives require some reductions in travel lanes which somewhat increase congestion levels and travel times for non-transit users. All alternatives increase transit mode share, but at a regional scale the impact would be small.

#### Financial

The Financial account considers capital and operating costs, as well as cost-effectiveness. Capital costs for rapid transit alternatives range from \$770 million (BRT 2) to \$2.2 billion (RRT 1A), with the Best Bus capital cost at \$290 million. With the exception of Best Bus, over the lifecycle, operating costs for all alternatives are small in relation to capital costs. Operating costs range from an

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additional \$9 million per year (RRT 3) to \$58 million (Best Bus). Generally the alternatives with the greatest extent have the highest operating costs as they require more vehicles and drivers. The BRT and RRT-based alternatives were most cost-effective overall in achieving the project objectives due to greater relative benefits (RRT) or lower costs (BRT). LRT 1 and LRT 4 performed the worst in this account, due to higher costs and minimal benefits, respectively.

### Environment

The Environment account considers a range of criteria including regional vehicle emissions, noise and emissions, and potential for impact on biodiversity, fish bearing watercourses, parks and open space, and agricultural resources. All alternatives reduce air emissions from automobiles, but also increase emissions due to construction and/or increases in bus service. At a regional scale, emissions impacts are small relative to regional totals. Construction of rapid transit alternatives carries some risk of environmental impacts that would require mitigation. All alternatives travel through urban areas and on road rights-of-way; potential impacts on ecological resources are modest. The alternatives passing through the Agricultural Land Reserve and over Nicomekl and Serpentine rivers are viewed as having greater potential for impacts. All rapid transit alternatives produce noise and vibration, with RRT having the most potential impact.

### Urban Development

The urban development account considers the benefits and impacts on local land uses and the urban environment. All rapid transit alternatives generate improvements in urban development, though for RRT alternatives those benefits are balanced by negative urban design impacts. All rapid transit alternatives have the potential to intensify land use around stations with the greater extent alternatives accessing the most development capacity. All alternatives attract similar amounts of development demand (14 to 19 million square feet of high density development through 2041) with most of this development forecast around existing stations in Surrey Centre and expected to occur under the BAU scenario. The BRT and LRT alternatives will improve urban design through widening of sidewalks and/or increases to boulevards. Elevated RRT alternatives have negative visual impacts due to their large guideway structures. All rapid transit alternatives require property to construct; LRT 4 and RRT 3 are shortest and require fewest properties.

### Economic Development

The economic development account addresses the economic benefits generated by construction activity, impact on tax revenues as well as goods movement. All alternatives generate positive impacts associated with construction and tax revenue effects, however for most alternatives these are balanced by negative goods movement impacts. The construction of rapid transit is expected to generate benefits associated with employment and increases in GDP. The capital intensive alternatives have the greatest construction and tax revenue benefits (LRT 1, RRT 1, RRT 1A). There are some impacts to goods movement for the street level alternatives due to localized lane reductions and mid-block turn restrictions; similar mid-block restrictions would apply to the RRT alternatives due to guideway columns and sightlines.

### Social / Community

The social and community account addresses a wide range of social and community benefits and impacts, including operational safety, personal security, community connectivity, service to low-income households, and heritage and archaeological impacts. All rapid transit alternatives would improve operational safety and perceived security and they all would increase access for low-income populations. Alternatives with the greatest extent would provide the greatest safety and access benefits. Street-level stations and driver-operated vehicles are perceived as most secure, and therefore BRT and LRT alternatives rated higher than RRT alternatives on perceived security. All alternatives would remove some minor vehicular crossings, having a negative impact on



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community connectivity, though they do maintain pedestrian and cyclist crossings and increase pedestrian refuges. No impacts to heritage or archaeological sites have been identified.

### Deliverability

The deliverability account considers potential issues associated with implementing the alternative, including the ease and speed with which it can be constructed, potential for phasing, public acceptability, and affordability. All alternatives are deliverable subject to funding, based on analysis to date. Larger LRT and RRT alternatives are more complex to construct, with greater utility conflicts. All alternatives require a similar length of time to deliver (4 to 7 years). Best Bus and BRT have the most potential for phasing, while single-route rail alternatives have the least potential. Market research indicates that the most significant factor in public acceptability is the extent of coverage, with rapid transit alternatives that would serve all three corridors being deemed most acceptable relative to Business as Usual. There is a wide range in capital and lifecycle costs; affordability of alternatives cannot be assessed through this study as the sources and other uses of funds at a regional scale have not been identified.

### Sensitivity Tests

A range of sensitivity tests were undertaken to assess the robustness of the above evaluation results to variations in land use, transportation model assumptions, emissions assumptions and financial inputs. While the specific results from the sensitivity tests varied from the base evaluation, the relative performance of the alternatives remained generally consistent. The tests identified the following risks and opportunities for further consideration in a later phase:

- BRT on Fraser Hwy would not have the capacity to meet forecast 2041 peak demand on that corridor in the event of : (1) accelerated population and employment growth in the study area over that forecast in the Regional Growth Strategy; and/or (2) lower levels of connecting bus service growth than called for in the South of Fraser Area Transit Plan;
- Emerging bus propulsion technologies have potential to reduce GHG emissions at low lifecycle costs for alternatives containing BRT.
- Optimization of connecting local bus service, through development of a detailed transit integration plan, has potential to achieve operating cost savings for all of the alternatives.

## E4. Key Findings and Conclusions

Based on this evaluation and considering the primary project objectives identified for the study area, the following conclusions can be drawn:

### Capacity to Meet Demand

By 2041, rapid transit will be required to serve demand on Fraser Hwy and King George Blvd. Conventional bus service can continue to meet demand on 104 Ave through 2041. BRT and local bus service combined provide sufficient capacity to meet forecast demand (2041) on all three corridors. On Fraser Hwy, BRT is forecast to be at capacity in 2041, with uncertain ability to expand further<sup>1</sup>. LRT and RRT meet forecast demand on Fraser Hwy (2041) and provide the opportunity for expansion.

<sup>1</sup> The use of high capacity bi-articulated buses for BRT has not been evaluated in this phase of the study. Further analysis will take place in a later study phase to identify the specific vehicle requirements for the preferred alternative.

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### Shape Land Use

All of the rapid transit alternatives support additional development demand in rapid transit station areas, consistent with the regional growth strategy and local plans. The rapid transit alternatives with the greatest extent provide connectivity between the six largest of the seven urban centres in the study area, and are expected to attract the most station area development. Over the next thirty years 47 million square feet of multifamily and office development is forecast for the entire study area, of which 14.2 million square feet is anticipated to take place around the existing SkyTrain stations in Surrey. The additional station area development attracted by rapid transit ranges from 1 to 5.2 million square feet by 2041. Additional land use and demand management measures may increase the share of development drawn to station areas, but these were not evaluated in the study.

### Shift Trips and Achieve Mode Share and Emissions Targets

All alternatives increase transit trips and mode share, and do so in similar amounts when considered at the scale of the region. Within the study area, alternatives with RRT increase transit trips and mode share the most. On King George Boulevard, alternatives with transfer-free service between Surrey Centre and South Surrey attract more new transit trips than those with a transfer at Newton. For all the alternatives, the number of new transit trips is small relative to the number of trips shifted from bus to rapid transit, and to the total number of transit trips in the region. Therefore, at a regional scale, and when considered in isolation, they all have a similar and limited impact on regional and sub-regional mode share and greenhouse gas emissions. None of these supply-side interventions would achieve mode share or emission targets, consistent with findings elsewhere in the region. Demand-side measures, such as road pricing, tolling, higher parking rates or gas prices, may complement rapid transit expansion to further increase transit mode share, but were not evaluated in depth in the study.

**Exhibit E.6** summarizes selective quantitative measures for the Phase 2 alternatives, relative to the original project objectives. The “Business as Usual” case is presented for comparison. It also indicates the capital cost for construction and the net present value of costs (capital and operating costs and fare revenue, discounted at 6% to 2010).

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Exhibit E.6 – Summary of Selected Measures

Measure		Business As Usual	Best Bus	BRT 1	BRT 2	LRT 1	LRT 2	LRT 3	LRT 4	LRT 5a	LRT 5b	RRT 1	RRT 1a	RRT 2	RRT 3
<b>Capacity to Meet Demand</b>															
2041 Forecast Peak Load (passengers per hour per direction)	Fraser Hwy	1,700*	3,000	4,300	4,350	4,300	4,300	4,350	1,700*	4,250	4,350	6,800	6,600	4,300	1,700*
	KGB	1,700*	3,350	3,900	3,300	3,450	3,450	3,300	3,450	3,900	3,900	1,700*	3,650	5,250	5,250
	104 Ave	1,150	1,250	2,000	2,000	1,800	1,800	1,800	1,850	2,000	1,800	1,000	1,850	1,950	1,100
Assumed Capacity ** (passengers per hour per direction)	Fraser Hwy	1,700	4,000	4,700	4,700	6,500	4,700	4,700	1,700	6,500	6,500	10,200	10,200	4,700	1,700
	KGB	1,700	4,000	4,700	4,700	6,500	6,500	6,500	6,500	4,700	4,700	1,700	4,700	18,700	18,700
	104 Ave	1,700	4,000	4,700	4,700	6,500	6,500	6,500	6,500	4,700	6,500	1,700	4,700	4,700	1,700
<b>Transit Trips and Mode Share</b>															
Surrey Rapid Transit Daily Ridership (2041)		-	-	180,000	149,000	166,000	169,000	152,000	65,000	178,000	180,000	115,000	202,000	200,000	81,000
New Regional Daily Transit Trips (Weekday Average, 2020-2049)		-	11,500	13,500	11,500	12,000	12,500	12,000	4,000	12,500	13,500	17,000	24,500	17,500	8,000
Reduction in Vehicle Kilometres Travelled (millions km, to 2041) ***		-	1,200	1,500	1,200	1,300	1,400	1,300	500	1,400	1,500	1,500	2,400	1,700	800
2041 Transit Peak Hour Mode Share	(Regional / Study Area, %)	16.4 / 14.5	16.5 / 14.9	16.5 / 15.1	16.5 / 15.0	16.5 / 15.0	16.5 / 15.0	16.5 / 15.0	16.4 / 14.7	16.5 / 15.1	16.5 / 15.1	16.5 / 15.2	16.6 / 15.5	16.5 / 15.3	16.4 / 14.2
<b>Air Emissions</b>															
CO2 Net Reduction, Life Cycle (tonnes)			-524,000	-250,000	-141,000	-38,000	-174,000	-68,000	30,000	-114,000	-102,000	66,000	-50,000	-56,000	54,000
<b>Land Use</b>															
Station Area Redevelopment Demand (square feet millions, to 2041) ****		14.2	14.2	19.4	18.2	19.4	19.4	18.2	16.0	19.4	19.4	17.0	19.4	18.5	15.4
<b>Costs</b>															
Capital Costs (\$ millions)		-	290	900	770	2,180	1,510	1,370	910	1,680	1,930	1,800	2,220	1,540	920
Net Present Value of Lifecycle Costs (\$ millions)		-	530	820	640	1,630	1,180	1,030	640	1,280	1,460	1,260	1,670	1,150	630

\* Peak Load for "Business as Usual" (and alternatives with the same level of service as BAU) is forecast to be above capacity and therefore is shown here at capacity.

\*\* The assumed capacity is the level of capacity used for the purposes of evaluation and costing, and the numbers here include supporting bus service and rapid transit. The capacity of LRT is assumed to be 4,800 passengers per hour per direction (pphpd) and can be expanded to 10,000 pphpd or more subject to further analysis. RRT capacity is assumed to be 8,500 pphpd can be expanded to 26,000 pphpd.

\*\*\* For context, without Surrey Rapid Transit there are projected to be 800 Billion Vehicle Kilometres Travelled in the region over the same 30-year period.

\*\*\*\* For context, over the same 30-year period, 47 million square ft of total office and high density multifamily residential development demand is expected in the entire study area.

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### E5. Tradeoffs between Alternatives

It is worth highlighting the following tradeoffs and considerations further to those identified relative to the project objectives.

#### Speed, Reliability, and Frequency

BRT and LRT provide similar improvements in speed and reliability, particularly on Fraser Hwy. RRT on Fraser Hwy provides the greatest speed and reliability improvements for those travelling on that corridor, associated with grade segregation of the Expo Line SkyTrain extension and avoiding the requirement to transfer at Surrey Central / King George for those travelling to or from the existing SkyTrain system.

On King George Boulevard, improvements in speed and reliability depend on whether or not there is a transfer required to reach White Rock. Direct BRT service between Surrey Central and White Rock (included in BRT 1, LRT 5A, LRT 5B and RRT 1A) provides the greatest overall speed improvements over local bus. LRT/BRT combinations with a transfer in Newton (LRT 1 and LRT 2) also have speed improvements over local bus, but overall are slower than the single BRT service over the length of the corridor.

All alternatives provide high frequencies of service. For example, on Fraser Hwy during the 2041 peak hour, RRT provides service every 4-5 minutes, LRT every 3 minutes, and BRT every 2 minutes to provide sufficient capacity to meet forecasted demand. These frequencies would be higher than needed if the population and employment growth in the study area was less than the forecast in the RGS.

#### Urban Design

BRT and LRT provide the greatest potential to improve urban design. RRT on Fraser Hwy or King George Blvd would introduce an elevated guideway and stations, and have a negative visual impact on the corridor.

#### Timing and Phasing

All alternatives can be constructed in phases, with differences based on technology and extent, which would spread out the capital requirements over a longer period of time. Best Bus and BRT alternatives have the greatest potential for phasing, including the ability to begin operating service and generating benefits independent from the construction of the rapid transit guideway. BRT infrastructure can be planned and designed for future conversion to LRT or RRT, at increased costs and with impacts to users during the conversion. Phasing plans have not been developed or evaluated through this study.

#### Affordability

There is a large range in capital and lifecycle costs for the alternatives. The capital costs of the alternatives range from \$290 million for Best Bus to over \$2.2 billion for RRT 1A. An assessment of affordability can only be made by considering regional investment needs relative to available funding. Such an assessment cannot be done within an alternatives analysis focused on the assessment of an individual subregion.

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### E6. Next Steps

The results of this evaluation will help to inform the selection of a preferred alternative. The selection of an alternative will take place within a regional context, to allow the consideration of funding availability for this project and other regional transportation investment needs.

Once a preferred alternative has been identified, Phase 3 will advance the planning and design of that alternative, and carry out further public consultation to aid in design development. The technical scope would include more detailed design of the alignments and intersection layouts, station locations, station area planning and urban design, transit service integration, and environmental study and identification of any mitigation measures.