ITEM 4.0 – Interurban Passenger Rail

TO: Joint Regional Transportation Planning Committee
FROM: Geoff Cross, Vice President, Transportation Planning and Policy
DATE: June 6, 2019
SUBJECT: ITEM 4.0 - Interurban Passenger Rail

RECOMMENDATION:
That the Joint Regional Transportation Planning Committee release this report immediately, pending its inclusion in the agenda package for the next meeting of the Mayors’ Council.

APPROVED, June 12, 2019

PURPOSE:
To provide the Mayors’ Council with information on TransLink staff engagement with a group promoting ‘South Fraser Passenger Rail’. The group’s proposal includes the reintroduction of community passenger rail service on what is commonly referred to as the ‘Interurban line’ as an alternative to rapid transit investment. This report provides more information and background on this proposal.

BACKGROUND:
The rail corridor commonly known as the Interurban line is approximately 100 km of existing rail between Surrey, Langley, Abbotsford, and Chilliwack. The line is currently owned and operated by Canadian Pacific (CP) Railway and Southern Railway (SRY) for freight use.

A number of ideas regarding this line have been shared with TransLink through the years, including recently by a group promoting South Fraser Community Rail. The alignment and connections have been studied previously as part of other processes. All previous assessments have resulted in other priorities being advanced, due to challenges around projected demand, cost relative to bus alternatives, potential conflicts with freight movement, and limited alignment with regional land use plans.

The BC Ministry of Transportation and Infrastructure (MoTI) evaluated the corridor as a potential commuter rail service candidate in their Strategic Review of Transit in the Fraser Valley in 2010. The review noted issues around high cost per ride and low projected ridership relative to bus alternatives. It did note that an inter-regional railway service between the Fraser Valley and Metro Vancouver may be part of a longer-term future, and opportunities should be retained for future services.

As part of the 2010-2012 Surrey Rapid Transit Study, TransLink assessed the Interurban section between Scott Road and Langley to explore merits of utilizing the Interurban corridor for fast, frequent, and reliable rapid transit service compared to Fraser Highway or King George Blvd. The 2012 Surrey Rapid Transit Alternatives Analysis Assessment of the Interurban Corridor study is attached as Appendix A. The Interurban corridor was not selected, nor recommended for further consideration because the corridor:
• does not directly connect relevant regional destinations (i.e. Surrey Central and Langley City),
• resulted in less attractive travel times between key destinations, and
• would require significant capital investments to meet safety requirements and reliability objectives, with resulting costs similar or higher than those along Fraser Highway or King George, but without commensurate benefits.

If there was a request to revisit previous assessment that this corridor could not effectively meet the objectives for rapid transit, the above and other challenges would need to be reviewed in the current context to provide an updated assessment of the transportation performance of the line. TransLink staff have not completed an updated assessment of this idea.

A new element of the Interurban proposal includes the potential use of hydrogen fuel cell trains, as being used in Germany for passenger service. This idea has not been evaluated.

The concept of using existing rail corridors and infrastructure in the rapidly-growing Lower Mainland is one that TransLink will be exploring through the update to the long-range strategy, Transport 2050. Transport 2050 will examine the long-term demand for improved inter-regional connections between the Metro Vancouver region and the Fraser Valley and examine what corridors could viably serve that demand. TransLink staff have met with proponents of the idea twice in lengthy meetings to hear the proposal and have shared with the group that management will be recommending that the Interurban concept be considered through the Transport 2050 process.

DISCUSSION:

Land uses connected by Interurban are not as transit-supportive as those along FH, KGB, 104th: The Interurban does not directly connect to the largest regional centre in the South of Fraser – Surrey Metro Centre – which is expected to be the focus of future population and employment growth. While it does connect to other regional centres, including Newton, Cloverdale, and Langley Regional City Centre, the Interurban alignment is indirect and through lower density and diverse areas. Both directness and density are critical factors in the performance of a successful rapid transit corridor. The corridor alignments and projected population and employment densities are presented in the figure below:
The 2012 Assessment study concluded that land use along the Interurban corridor is lower density, including significant amounts of agricultural lands, resulting in lower potential ridership catchment near stations. Cloverdale is projected to be one of the slowest growing urban centres in the South of Fraser. Estimates of potential ridership on the Interurban corridor were one-third that of a Fraser Hwy connecting Langley Centre to Surrey Metro Centre, due to the Fraser Highway route having a higher population and employment density and a more direct routing.

**Interurban estimated travel times are not competitive with rapid transit along Fraser Highway or King George Blvd**

Competitive travel times are important to transit investments, as they are a main factor in successfully attracting ridership. This is particularly important when connecting larger concentrations of people and jobs – such as the Surrey Metro Core and Langley Regional City Centre. When reviewed in the 2012 study, the Interurban was assessed in three segments for comparison with other potential rapid transit connections between urban centres. A summary of estimated travel times, presented below, suggests long travel times between centres along the Interurban corridor due to the less direct route. It was estimated that rapid transit on more direct alignments could achieve in the order of 50% travel time savings depending on segments and technology. Travel time estimates for Langley to Surrey Central from the 2012 studies are presented in the table below:

<table>
<thead>
<tr>
<th>Interurban + Expo Line</th>
<th>Rapid Transit Options along Fraser Hwy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Distance (Km) Travel Time (min)</strong></td>
<td><strong>Distance (Km) Travel Time (min)</strong></td>
</tr>
<tr>
<td>Interurban - Langley to Scott Road</td>
<td>27</td>
</tr>
<tr>
<td>Expo Line - Scott Rd to Surrey Ctr. (Includes transfer time)</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>31</td>
</tr>
</tbody>
</table>

**Freight volumes are expected to increase along the Interurban corridor**

Port of Vancouver is the largest port in Canada and is one of the drivers of a successful economy in the lower mainland. One of the corridors that has experienced growth in freight movements and is expected to grow is the Roberts Bank Rail Corridor (RBRC) that connects Delta Port with the CN heavy rail network and allows the movement of bulk materials and containers between the Vancouver Gateway and the rest of Canada.

The RBRC utilizes a portion of the Interurban between Cloverdale, through Langley City, and to Hwy 1 near Fort Langley as presented in the figure below:
In the 2012 study, it was estimated that freight service on the RBRC would increase from 9 trains per day in each direction (18 total), ranging in length from 1,830 to 2,900 metres each, to up 28-38 trains per day by 2021, with some train lengths up to 3,660 metres. A 2016 Roberts Bank Trade Area Study confirmed this increased volume is occurring, with 12 trains per day noted. The 2012 Interurban study noted that operating passenger rail on the same tracks as freight would require physical and time separation for both regulatory and safety reasons.

Also, for consideration, there is a proposal to increase the Roberts Bank Delta Port, creating a new a new marine terminal that will create 108 hectares of new industrial land and 1,500 on-terminal jobs. The project is undergoing federal environmental approvals and if successful is expected to be fully operational by the late 2020s (next decade), further increasing utilization of rail for freight.

Interurban requires substantial infrastructure investments comparable to building rapid transit along urban arterials

To meet Transport Canada requirements for rail passenger safety, passenger rail vehicles must either be separated from freight train traffic through scheduling, or physically, by constructing separate tracks.

Due to freight traffic throughout the day on the Roberts Bank Rail Corridor, separate rail track would be needed to remove operational conflicts between passenger and freight, to ensure fast, frequent and reliable rapid transit service. While freight operations are less frequent on the SRY Fraser Valley Subdivision, there would still be a need for separate track to ensure reliable and frequent rapid transit service.
The 2012 study identified the following issues associated with construction of new track for passenger operations:

- **Environmental Risks** A long section of the corridor travels along the Agricultural Land Reserve and the floodplains of the Serpentine River. Adding track would create risks to biodiversity, water resources, and farmlands.

- **Constructability Challenges** The corridor has numerous challenges related to constructing new track. These include the constrained existing right-of-way, power lines, industrial lead tracks in Langley, grade crossings, narrow bridges, and poor soil conditions. Maintaining existing freight service would likely result in more complex and slower construction. To separate passenger from freight operations (providing reliability and enhancing safety), one grade separation would be required, and this would be in a section of the corridor constrained by existing and planned arterial bridges.

- **Cost** Constructing additional track and stations, acquiring right of way to add the tracks along the existing Interurban corridor, and overcoming related construction challenges would be costly.

In summary, these findings indicate that operation of passenger rail on this corridor is unlikely to be any easier to implement than on arterial corridors, because providing safe, frequent and reliable service would require construction of separate tracks along the corridor. Given that the construction would likely have similar order-of-magnitude costs to arterial passenger solutions (the range was slightly lower to slightly higher, depending on design), and the lower density land use and ridership potential of the corridor, the benefits of implementing rapid transit on the Interurban corridor were considered insufficient to warrant further consideration as a rapid transit alternative.

*TransLink is committed to delivering the Mayors’ Vision, including rapid transit south of the Fraser*

The current regional priority for transit investment South of the Fraser, as set out in the Mayors’ Vision, is connecting Surrey Metro Centre with other regionally designated centres via 27 km of rapid transit on Fraser Highway, King George Boulevard, and 104th Avenue. These regional priorities are designed to deliver high frequency, high speed and capacity, all-day rapid transit connections between designated town centres within our service region.

Previous assessments have determined that the Interurban line, as a single-track corridor that does not connect to Surrey Metro Centre, does not advance regional objectives as well as other options and as a result, other regional priorities have been advanced. TransLink remains committed to deliver the Mayors’ Vision. The South Fraser Community Rail Interurban proposal is not an alternative or comparable option to rapid transit along Fraser Highway based on the objectives set out in the Vision. The historical alignment of the Interurban corridor within Surrey and Langley does not facilitate, quick, direct connections and as a single-track corridor the capacity is too limited for high frequencies. Further analysis would be required to understand the performance of the proposal in the current context of a new regional rail connection.
Passenger service along the Interurban corridor using hydrogen trains to connect Surrey with Abbotsford and Chilliwack is one of many ideas that will be included as part of Transport 2050

Transport 2050, the Regional Transportation Strategy update, has been initiated and represents an opportunity to review all bold and creative ideas for transportation in the region, including this one. The first phase of public and stakeholder consultation is now underway, intended to receive big ideas from the region. To ensure we’re reaching a range of perspectives, TransLink will be promoting opportunities to get involved through the Lower Mainland, including outside the Metro Vancouver areas. This will include targeted outreach in Abbotsford, Mission, Chilliwack, and Squamish, recognizing the travel patterns outside TransLink’s established service area.

South Fraser Community Rail will be considered through the Transport 2050 process. TransLink staff have met with proponents of the proposal and committed to considering it through the process together with other ideas identified through public consultation and technical evaluation. We agree with the group’s position that the Fraser Valley municipalities and Metro Vancouver, especially the South of Fraser, will be increasingly integrated in the longer term. Staff will be exploring what that demand could look like and the transportation options are to service it. The Interurban proposal, or elements of it, may have merit in serving and shaping that demand and supporting land uses and will be compared to other approaches.

NEXT STEPS

**Mayors’ Council and other stakeholders will be updated during the different phases of Transport 2050**

A review of this and other ideas will be included in the evaluation phase of Transport 2050. TransLink staff will likely provide a more comprehensive review of the South Fraser Community Rail proposal at a future Mayors’ Council meeting as part of the Transport 2050 process.

**Attachment:**  *Surrey Rapid Transit Alternatives Analysis: Assessment Of The Interurban Corridor, TransLink / MoTI, January, 2012*
SURREY RAPID TRANSIT ALTERNATIVES ANALYSIS
ASSESSMENT OF THE INTERURBAN CORRIDOR

REVISED TECHNICAL BRIEFING (ACTIVITY 4)
JANUARY, 2012
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1. INTRODUCTION

This document describes the technical assessment of the interurban railway corridor in the Cities of Surrey and Langley, within the context of the Surrey Rapid Transit Alternatives Analysis (SRTAA). The SRTAA is sponsored by TransLink and the BC Ministry of Transportation and Infrastructure (MoTI). Project partners include the Cities of Surrey and Langley, and Metro Vancouver. The purpose of the SRTAA is to define and evaluate options for extending rapid transit services to provide connections between Surrey Metro Centre and other communities in Surrey and Langley. The study objective is to provide a detailed analysis that supports selection of a preferred rapid transit alternative.

The assessment was carried out to investigate the potential of the interurban corridor to support rapid transit. This assessment memo includes the following material:
- Background and Purpose
- Corridor Description;
- Scope of the Study;
- Phase 1 Assessment of the Corridor;
- Expanded Review of Operations and Construction Requirements; and
- Conclusions.

1.1 Background

The interurban rail corridor running diagonally across the Cities of Surrey and Langley is of public interest due to its history as a public transportation corridor several decades ago, when a rail line was operated by BC Hydro as an interurban railway (off-street but similar trains to a streetcar) through what was then a largely rural area. The line was originally built in 1910 as the British Columbia Electric Railway (BCER), an interurban trolley service for passengers (until 1950) as well as for freight such as farm produce.

Several existing community organizations have expressed interest in implementing future passenger rail service along the historic route, and continued to do so in response to a recent MoTI study1, as well as the SRTAA. Given that the western portion of the railway line (Scott Road to Langley) is located within the SRTAA study area, it fell within the scope of this study to evaluate the potential for rapid transit alternatives along this route (along with other routes in the study area).

In 2006, a technical assessment of operating passenger rail on the interurban corridor was conducted by DRL Solutions Inc. for TransLink, in conjunction with the South of Fraser Area Transit Plan (SOFATP). The DRL study provided a detailed analysis of two different types of passenger rail services (commuter rail and light rail) and their associated technical and constructability issues on the segments from Scott Road Station to Langley. This current assessment has drawn upon relevant findings of the 2006 evaluation, including its review of corridor conditions and potential constraints to construction.

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1 MoTI carried out a Strategic Review of Transit for the Fraser Valley (SRTFV), which focused on BC Transit service areas in the Central Fraser Valley, including Abbotsford, Mission and Chilliwack. The SRTFV reviewed a commuter rail concept using the interurban corridor as one potential option to provide a transit connection into Langley and Surrey.
1.2 Purpose

This memo provides a high-level review of the findings from the SRTAA evaluation related to this corridor. This includes analyses carried out against the SRTAA project objectives and a multiple account evaluation framework, using the latest available transportation network and land use information.

The SRTAA focuses on rapid transit that is fast, frequent and reliable. This implies bidirectional services that can operate at approximately 30 km / hour or faster (including time spent at stops), runs approximately every 5 minutes during peak periods, and is not subject to significant and recurring disruptions of service.

The SRTAA evaluation of the interurban corridor does not preclude the corridor from being considered in the future for less frequent types of passenger rail service, such as commuter rail. While the associated requirements are not the focus of this study, implementing lower-frequency passenger service could potentially avoid some of the impacts and costs of rapid transit. A commuter\(^2\) or heritage rail service on the interurban corridor could complement rapid transit, but is not in the scope of this study.

\(^2\) Commuter rail was recently investigated as part of the Strategic Review of Transit in the Fraser Valley, and not recommended due to its higher implementation costs versus highway-based rapid bus services connecting the Central Fraser Valley to Langley and Surrey. For more information, refer to the MoTI study completed in 2010.
2. CORRIDOR DESCRIPTION

Within the SRTAA study area, the interurban corridor is comprised of two sections. BC Hydro owns the right-of-way of both sections of the interurban corridor.

Southern Railway of British Columbia (SRY) owns the track infrastructure and operates the segment northwest of Cloverdale. This is called the SRY Fraser Valley Subdivision. Canadian Pacific Railway (CPR) owns the track infrastructure and operates the Cloverdale to Langley Centre segment (CPR Page Subdivision) as part of the Roberts Bank Rail Corridor (RBRC).

Exhibit 2.1 shows the extent of each section within the study area and their respective levels of current rail usage. The interurban corridor is used for carrying freight and there are currently no regular passenger rail services in the corridor.

**SRY Fraser Valley Subdivision**

The SRY Fraser Valley Subdivision is a single-track railway that joins Vancouver, New Westminster, Surrey and Langley industrial customers with the national rail network of Canada. The railway extends from the New Westminster Rail Bridge in the northwest part of the study area, passes near the Scott Road SkyTrain Station, and runs south to Newton. From there, the rail line extends southeast to Cloverdale, joining the CPR Page Subdivision at Pratt Junction (near 180th Street).

Ownership of the railway infrastructure is with Washington Group (SRY is a subsidiary). The land on which the railway operates is still retained by BC Hydro. In 1988, BC Hydro sold its rail assets to SRY and granted it the right to operate a freight rail system on this section of the corridor. BC Hydro did not specifically reserve rights to operate passenger rail service using SRY facilities, but did retain the ability to grant operating rights to others, including to providers of passenger rail service, that do not materially interfere with SRY’s operations. Operation of passenger service on this subdivision would require an agreement with SRY.

SRY operates an average of two daily trains in each direction on the segment passing through Newton. It dispatches trains by radio system and does not have a signal system to control their movement. Trains typically run between 01:00 and 09:00 Monday to Friday and between 21:00 and 05:00 on Sundays. Days and times are variable and trains can operate at any time between the start and end of each identified window depending on the customers’ requirements. SRY also maintains a window, five days per week, for patrols and periodic / scheduled maintenance. All connecting movements from New Westminster, Fraser Surrey Dock and Burke Road to Cloverdale, Langley, Gloucester, Huntingdon and Chilliwack, must travel through the identified track. Maintenance windows typically are during the day between 09:00 and 15:00 Monday to Friday. Maintenance also may occasionally be required on weekends or outside the specific windows.

**CPR Page Subdivision**

The CPR Page Subdivision continues east of Cloverdale from Pratt Junction through Langley City and beyond. In 1988, BC Hydro sold the track assets of this section to CPR, but retained ownership of the right-of-way. BC Hydro also granted CPR a statutory right-of-way to use this section of the corridor in perpetuity, but put agreements in place to retain partial running rights for passenger service, which were renewed in 2009. Operation of passenger service on this section would require an agreement with CPR.

This section, which CPR shares with Canadian National (CN) Railway and SRY, is part of the RBRC (along with the BC Railway Port Subdivision immediately to the west), serving export coal
and international container traffic going to and from the Roberts Bank port facilities in Delta. It is a busy single-track line that passes through the north side of Langley City, carrying an average of 9 trains of 80-130 cars (1.8 to 2.9 km long trains) in each direction per day, with train movements occurring seven days per week at any hour of the day. CPR train dispatchers use a Centralized Traffic Control (CTC) system to manage trains because of the relatively high frequency of rail traffic.

The RBRC is part of the Asia Pacific Gateway, and the RBRC Improvement Program includes investments from federal, provincial, regional and municipal partners to enhance the safety and efficiency of the corridor. The impetus behind this can be found in the fact that freight trains on this corridor travel to and from a major port facility, the trains are 1.8 km to 2.9 km long and create long wait times at grade crossings.

Associated improvements include the recently completed 204th Street bridge in Langley. Several additional enhancements within the study area have completed the planning stage, and have started construction with an anticipated completion date of 2014. These include:

- The planned 196th / 54th / 192nd “combo” grade separation project in Surrey and Langley, which directly impacts part of the interurban corridor; and

- The planned 152nd Street grade separation (overpass) and closure of grade crossing at 148th Street.

Recent estimates by the RBRC Program indicate that the volume of train traffic is expected to increase to 28-38 trains per day (14 to 19 per direction) by 2021. Therefore the railways are participating in the grade separation projects to increase corridor capacity, and there are longer-term proposals to increase capacity on the RBRC by double-tracking to handle the larger freight volumes.
3. SCOPE OF THE STUDY

The SRTAA is sponsored by TransLink and the BC Ministry of Transportation and Infrastructure (MoTI). Project partners include the Cities of Surrey and Langley, and Metro Vancouver.

The purpose of the SRTAA is to define and evaluate alternatives to provide rapid transit between Surrey Metro Centre and other urban centres in the Cities of Surrey and Langley. The results will be used to support the selection of a preferred rapid transit network alternative for a 2041 horizon. By definition, rapid transit services need to be fast (approximately 30 km/hr or faster), frequent (typically operating approximately every 5 minutes or better during peak periods in each direction) and reliable (not subject to significant and recurring disruptions of service).

This section of the technical memo provides an overview of the study process and objectives as context for the assessment of the interurban corridor.

3.1 Study Overview

Exhibit 3.1 illustrates the Alternatives Analysis process being applied to the SRTAA. The left side of the exhibit represents the situation during Phase 1, where many potential rapid transit alternatives are under consideration and a high-level analysis is carried out to identify a Short List.

**Exhibit 3.1 – TransLink Rapid Transit Alternatives Analysis Process**

The **Phase 2** evaluation focuses on the Short List, carrying out a detailed analysis based on conceptual designs. This includes the development of plans, profiles, cross sections and station prototypes, and a more detailed set of measures applied during the evaluation. After the study is completed, a **preferred alternative** will be selected by the project sponsors.
3.2 Short List Identification Process

The purpose of Phase 1 was to identify and evaluate a range of rapid transit alternatives to meet the project objectives. This process started at the broad conceptual level with the universe of potential alternatives and culminated in identification of a recommended Short List, with the number of alternatives decreasing and the level of evaluation detail increasing after each step. This section outlines the process and relates that to the evaluation of the interurban corridor.

3.2.1 OVERVIEW OF ALTERNATIVES DEVELOPMENT (ACTIVITY 4)

Exhibit 3.2 illustrates the Alternatives Development process.

Exhibit 3.2 – Alternative Development Process

The overall approach was to start with all possible alternatives and step-by-step reduce that set to the ones that best meet the project objectives. The inputs to the process, including the project objectives and Multiple Account Evaluation (MAE) framework were referred to at each step to guide the process of narrowing down the alternatives to a smaller number of better-performing ones. The process started with over 6000 theoretically possible networks connecting the urban centres in the study area. The initial network concepts were filtered down to those that best met the project objectives. These concepts were then combined with the BRT, LRT and SkyTrain technologies in different combinations of specific routes between urban centres.

The initial pre-screening evaluation included three sections of the interurban corridor (Scott Road Station to Newton, Newton to Cloverdale, and Cloverdale to Langley Centre). This compared the corridor as a potential rapid transit route with other connections between the applicable urban centres (e.g. Surrey Metro Centre, Newton, Cloverdale, and Langley Centre).

The pre-screening evaluation applied several high-level measures from the MAE. Based on the results, the central segment of the interurban corridor (Newton to Cloverdale) was included as part
of the Indicative Medium List (the set of representative alternatives from step 4 that includes different extents and technologies) and carried into the screening evaluation process.

The results of the screening evaluation were used to identify the recommended Short List. An assessment of the route segments within the Indicative Medium List led to the conclusion that none of the routes through Cloverdale, including the interurban corridor, would warrant rapid transit by 2041 due to costs (driven by constructability issues and potential environmental concerns) and the relatively low ridership.

Each step in the identification and evaluation of concepts and alternatives drew upon three major inputs:

- Project Objectives;
- Evaluation Framework; and
- Guiding Principles.

These are outlined in the following sections.

3.2.2 PROJECT OBJECTIVES

The purpose of the SRTAA is to define and evaluate options for implementing future rapid transit services connecting Surrey Metro Centre and other communities in the Cities of Surrey and Langley. Based on the Problem Statement developed in Activity 1, which was derived from a detailed review of the project context and issues, the overarching project objectives are to:

- Meet, shift and help shape travel demand through better transit service;
- Shape future land use in keeping with regional and municipal plans;
- Enhance economic competitiveness of the region; and
- Help achieve mode share / emissions targets.

These are elaborated in considerably more detail in the Activity 1 Technical Memorandum.

3.2.3 MULTIPLE ACCOUNT EVALUATION FRAMEWORK

The Evaluation Framework includes qualitative and quantitative measures in seven accounts:

- Economic Development (e.g. goods movement);
- Environment (e.g. air quality, water and land resources);
- Financial (e.g. costs, and cost-effectiveness);
- Social / Community (e.g. safety);
- Transportation (e.g. ridership, travel times);
- Urban Development (e.g. land use); and
- Deliverability (e.g. constructability).

These are applied at increasing levels of detail as the set of alternatives is refined and reduced in number, as illustrated by Exhibits 3.1 and 3.2.
3.2.4 GUIDING PRINCIPLES

The alternatives identification process used a set of guiding principles (see Exhibit 3.3) that apply the project objectives, evaluation framework, and planning best practices specifically to the study area. These principles guided the filtering of network concepts to a feasible subset, the pre-screening of the long list of alternatives to an Indicative Medium List, and identification of the recommended Short List drawing on the results of the screening evaluation.

Exhibit 3.3 - Guiding Principles for Alternatives Identification

i. **Provide a better service than today**
   - E.g. Alternatives will provide travel times between key centres that are as good as or better than today.

ii. **Provide enough capacity for future demand**
   - E.g. Alternatives will provide highest capacity solutions where future transit demand is expected to be highest.

iii. **Avoid excessive cost or adverse impact**
    - E.g. Alternatives will use existing rights-of-way, such as arterials roads, rail corridors, or hydro corridors.

iv. **Support Surrey Metro Centre and other key population and job centres**
    - E.g. Alternatives will connect to Surrey Metro Centre, and terminate at urban centres such as Langley Centre or one of Surrey’s five municipal town centres.

v. **Bring forward a range of different alternatives**
   - Extents (focused, intermediate, broad)
   - Geography (e.g. which urban centres are connected)
   - Technologies (SkyTrain [RRT], LRT, BRT, and combinations)
4. PHASE 1 ASSESSMENT OF CORRIDOR

This section describes the investigation of potential rapid transit routes using the interurban railway line. The Phase 1 assessment was part of a comparative evaluation of potential routes and rapid transit technologies. As described in Section 3, the purpose was to determine which alternatives would perform best in meeting the project objectives.

For the purposes of Phase 1, the corridor was evaluated by considering three segments that fall within the study area:

1. SRY Fraser Valley Subdivision from Scott Road Station to Newton;
2. SRY Fraser Valley Subdivision from Newton to Cloverdale; and
3. Roberts Bank Rail Corridor / CPR Page Subdivision, between Cloverdale and Langley.

These three portions of the interurban corridor were considered among the thousands of possible alignments for rapid transit during Phase I of the SRTAA Study. The evaluation assumed LRT or BRT operating every three to five minutes in the peak period on the interurban route, similar to all the other corridors under study.

The first section describes the pre-screening evaluation of all three segments. Section 4.2 describes the screening evaluation of the Newton to Cloverdale segment. The screening evaluation included relative comparisons of a combined interurban / Highway 10 route to other options, including 64th Avenue and Fraser Highway. Section 4.3 summarizes the main findings of this chapter.

4.1 Pre-Screening Evaluation

A pre-screening evaluation was developed that considered the following key MAE measures: travel times to Surrey Metro Centre, number of 2041 residents and jobs within 400 metres of the rapid transit alignment, number of activity centres served, cost, and the presence of likely environmental and constructability constraints or showstoppers.

The pre-screening evaluation was carried out at two levels: connections between urban centres were compared, as well as overall network alternatives. A comparison was made of the three segments of the interurban corridor to other routes connecting the same pair of urban centres, and if the interurban connection performed best or demonstrated tradeoffs requiring further analysis, then it carried forward.

4.1.1 COMPARISON APPROACH AND ASSUMPTIONS

This part of the process included several summary comparisons of the interurban railway route versus nearby arterial street alternatives. The evaluation considered introducing either LRT or BRT into the corridor. The following approach and assumptions were applied:

- The distances were measured between urban centres (or specific SkyTrain stations, as indicated). The distance was used to calculate travel time as well as being an initial proxy for project cost. Because average costs were applied for each technology in pre-screening, the total would depend on length of alignment.
- The estimated population and employment catchments were developed using a 400-metre buffer around the alignment in question. This is approximately a 5-minute walking distance. The 2041 projections derived from the June 2010 update to the Draft Regional Growth

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3 Refined costs that considered the specific requirements of each corridor were developed for the short list – refer to Section 5.1.
Strategy (by Metro Vancouver). The number of people per kilometre is included as an approximation of future density within walking distance of the route.

- Travel times for LRT and BRT assumed a schedule speed of 30 km/hour including running time and stops at stations and crossings. This speed assumes a dedicated running way for the rapid transit system: tracks for LRT or separate bus lanes for BRT. This would be a speed improvement relative to regular transit including B-Lines, which share travel lanes with other traffic.
- For travel time comparisons that extended beyond the route in question, the total travel times included an allowance for SkyTrain travel time and transfers (e.g. Newton to King George using LRT / BRT, plus a transfer, plus SkyTrain time to Scott Road station).
- The economic development and deliverability issues identified in pre-screening are based on the 2006 evaluation\(^4\) of this corridor (which included LRT), and where applicable the analysis was extended to consider the implications for BRT.

4.1.2 SRY FRASER VALLEY SUBDIVISION FROM SCOTT ROAD STATION TO NEWTON

This segment of the interurban corridor between Scott Road SkyTrain Station and Newton was not carried forward for further analysis as a rapid transit option on the basis of the pre-screening evaluation findings.

Exhibit 4.1 compares the interurban corridor with a route along King George Boulevard between King George Station in Surrey Metro Centre and Newton. The two routes are compared because both have the potential to act as major north-south rapid transit linkages between Newton and the existing SkyTrain system.

4.1.2.1 Transportation

Travel times to Surrey Metro Centre (as indicated by Surrey Central Station) would be higher along the rail corridor due to the less direct route. Exhibit 4.1 shows that it is more than 10 minutes faster (14.8 minutes compared to 25.4), or approximately 40%, to reach Surrey Central Station using King George Boulevard. Travel times to Scott Road Station and to points north of the Fraser River would also be slower using the SRY alternative than via King George Boulevard.

4.1.2.2 Urban Development

Future employment along the route is similar to the King George Boulevard option but dispersed over a longer alignment. The future population served is lower than along King George Boulevard. Overall, the number of people served was lower, and the density is considerably lower than the King George option. Areas with higher density are more likely to be transit supportive.

This segment of the interurban corridor only serves one urban centre (Newton), and its other terminus is at Scott Road Station, which is not an urban centre. This does not support the city-shaping objectives of the project and does not help focus future development growth into Surrey Metro Centre.

Exhibit 4.1 – Comparison of Interurban Corridor and King George Boulevard (North of Newton)

<table>
<thead>
<tr>
<th>Route</th>
<th>Interurban/SRY</th>
<th>King George Blvd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segment</td>
<td>Scott Road Stn. to Newton</td>
<td>King George Stn. to Newton</td>
</tr>
<tr>
<td>Distance (km)</td>
<td>10.1</td>
<td>5.8</td>
</tr>
<tr>
<td>People Served</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population, 2041</td>
<td>29,572</td>
<td>36,000</td>
</tr>
<tr>
<td>Employment, 2041</td>
<td>24,300</td>
<td>23,300</td>
</tr>
<tr>
<td>Total People</td>
<td>53,872</td>
<td>59,300</td>
</tr>
<tr>
<td>(400 metre buffer)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>People per km</td>
<td>5,300</td>
<td>10,200</td>
</tr>
<tr>
<td>Travel Times (from Newton)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LRT/BRT on alignment</td>
<td>20.2</td>
<td>11.6</td>
</tr>
<tr>
<td>To Scott Road Stn.</td>
<td>20.2</td>
<td>18.8</td>
</tr>
<tr>
<td>To Surrey Central Stn.</td>
<td>25.4</td>
<td>14.8</td>
</tr>
</tbody>
</table>

4.1.2.3 Economic Development (Goods Movement)

Operating rapid transit (LRT or BRT) along the interurban corridor would have negative impacts on goods movement due to operational and physical conflicts with the existing freight railway.

There are regulatory restrictions in North America that preclude operating LRT and freight trains on the same track without physical and time separation, due to safety requirements related to passengers. If using the same tracks, then the LRT operation would be restricted to times that SRY freight operations are not occupying the tracks. At the very least, this would either mean displacing the freight operation or suspending passenger service for the time window(s) that freight is scheduled.

SRY’s stated position is that their business model is one of service and flexibility that class one railways cannot provide. There will always be a requirement to operate outside the typical service windows (between 01:00 and 09:00 Monday to Friday and between 21:00 and 05:00 on Sundays) due to operational requirements of the customer and operational efficiencies of the railway. It is the position of the SRY to ensure that flexibility is maintained. On-demand freight operations would create additional uncertainty for the operating window(s) available to LRT in this case.

BRT operations would also create conflicts with freight operations, because a bus lane alongside the railway would need to meet requirements for minimum clearance within the right of way. BRT lanes would also cross several industrial tracks (connecting to the main line), which are used to access railway customers.

Since the freight tracks will not be available for rapid transit operations, new construction would be required for either LRT or BRT. At a minimum, this would include a parallel LRT track with passing provisions for LRT, or a bus lane with passing locations for BRT. A new connection would be

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5 Refer to Section 5 for additional details.
needed to fill the gap from the existing railway corridor to Scott Road Station. The implications of this are described below under ‘Deliverability.’

4.1.2.4 Deliverability (Constructability Issues)

There are significant concerns about the constructability of rapid transit along this section of the interurban corridor, including grades at the north end of the alignment, near Scott Road Station.

For LRT, this is particularly true on steep rail gradients through South Westminster where the existing tracks follow the slope of the hill, and adding a second track for LRT would likely require widening of the right of way through property acquisition and the construction of retaining walls along steep cross gradients. In addition, as the track approaches the bottom of the hill, the track geometry is unfavourable for connecting to a new LRT connection towards Scott Road Station.

Construction of a BRT option along the corridor would have similar issues through South Westminster (including right of way and retaining wall requirement), except the connection to Scott Road Station could potentially have more alignment options (including following Scott Road itself near the station). However, the BRT option would also introduce traffic control challenges at the grade crossings of the interurban alignment and Scott Road near the top of the hill. This would increase costs for BRT on this alignment relative to typical arterial-based averages.

For both technologies, electrical transmission pole lines (particularly around the Hydro station near Newton) could constrain and would certainly complicate the construction of a new LRT track or BRT bus lane. There are also several industrial leads northwest of Newton that would have to be crossed by either the additional LRT track(s) or bus lanes for BRT.

4.1.3 SRY FRASER VALLEY SUBDIVISION FROM NEWTON TO CLOVERDALE

The segment of the interurban corridor from Newton to Cloverdale was carried forward for further analysis for the following reasons:

- Arterial street options via portions of King George Boulevard and 64th Avenue or Highway 10 ranged from 10.4 to 11.8 km. The railway route from Newton to Cloverdale measures 9.8 km. This means the best travel time between the two urban centres could be achieved using the rail route.
- The catchment population and employment in 2041 (within 400 m of the route) was estimated as 34,000 people. While this fell at the lower end of the range of 31,000 to 41,000 from the options that were compared, this was over a shorter distance (see point above), so the total density of residents plus jobs was comparable (3500 people per kilometre).

The other routes between Newton and Cloverdale brought forward into the medium list were via 64th Avenue (from King George Boulevard) and Highway 10 (from King George Boulevard). Initial analysis indicated these other routes had higher catchment population and employment than the interurban corridor, but were less direct routes. Keeping all three options allowed for the consideration of tradeoffs in the Medium List options.

4.1.4 RBRC / CPR PAGE SUBDIVISION FROM CLOVERDALE TO LANGLEY

The segment of the interurban corridor from Cloverdale to Langley on the RBRC was not carried forward for further analysis as a rapid transit option on the basis of the pre-screening evaluation findings. Exhibit 4.2 shows a comparison of distance, people served, and approximate travel times on this segment with Highway 10. Both routes follow Fraser Highway within Langley Centre.
Exhibit 4.2 – Comparison of Interurban (RBRC) versus Highway 10 (Cloverdale to Langley)

<table>
<thead>
<tr>
<th>Route</th>
<th>Interurban + Fraser</th>
<th>Hwy 10 + Fraser</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segment</td>
<td>Cloverdale (Hwy 15) to Langley Centre</td>
<td>Cloverdale (Hwy 15) to Langley Centre</td>
</tr>
<tr>
<td>Distance (km)</td>
<td>6.8</td>
<td>6.3</td>
</tr>
<tr>
<td>People Served</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population, 2041</td>
<td>11,800</td>
<td>17,700</td>
</tr>
<tr>
<td>Employment, 2041</td>
<td>17,500</td>
<td>21,000</td>
</tr>
<tr>
<td>Total People</td>
<td>29,300</td>
<td>38,700</td>
</tr>
<tr>
<td>(400 metre buffer)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>People per km</td>
<td>4,300</td>
<td>6,200</td>
</tr>
<tr>
<td>Travel Times (from Cloverdale)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LRT/BRT on alignment</td>
<td>13.5</td>
<td>12.5</td>
</tr>
</tbody>
</table>

4.1.4.1 Transportation

The analysis in Exhibit 4.2, comparing the railway corridor to Highway 10 (56th Avenue), illustrates that Highway 10 could provide more potential transportation and land use benefits as a connection from Cloverdale to Langley, since it is a shorter route and more central to land uses. Travel times along the railway alignment would be slightly higher than if rapid transit were constructed on Highway 10. This is due to the railway corridor having a slightly longer route (6.8 km versus 6.3 km) from Langley Centre Exchange to Cloverdale.

4.1.4.2 Urban Development

Overall, future employment along the railway route is lower than the Highway 10 option. A significant amount of the railway segment runs alongside the Agricultural Land Reserve while Highway 10 is located closer to the commercial and residential activity. The density of people per km is significantly higher along Highway 10 and the ALR along the railway will not change in the future.

4.1.4.3 Economic Development (Goods Movement)

Freight train service on the RBRC / CPR Page Subdivision is operated by CPR, CN and SRY. Currently, there are 9 trains per day in each direction (18 trains total) to and from the Roberts Bank port facility. The trains range in length from 1,830 to 2,900 metres in length. The volume of train traffic is expected to increase to 28 – 38 trains per day by 2021, and some train lengths are expected to increase up to 3,660 m. Operating LRT on the same tracks as freight (mostly double-stack container trains and unit coal trains) would require physical and time separation, for the same regulatory and safety reasons as noted in Section 4.1.2 and described further in Section 5.

Given that the freight operations are of national importance (this is part of the Asia-Pacific Gateway), it would not be reasonable to assume that LRT would have the single railway track in this segment dedicated to passenger operations in lieu of freight. Even if the LRT could operate on the track between the passings of freight trains, the rapid transit service would be interrupted several times per day, resulting in unpredictable headways and schedule disruption, and these would not be attractive to potential transit passengers. Operating BRT would require a parallel roadway alongside the tracks, and this would be problematic where the proposed roadway crosses other active railway tracks, such as industrial spur lines.

Along Highway 10, construction of BRT or LRT is assumed to require widening of the street, but also closure of some left turns and mid-block crossings to create a transit median. This approach...
would have less impact on goods carrying capacity although local access times could increase for deliveries that currently use minor streets or cross between intersections. This is a much lower impact than on the RBRC.

The next section outlines construction issues for LRT and BRT along this segment, assuming that new tracks or a new roadway would be required, given the potential fatal flaw with operating rapid transit on the main freight track.

4.1.4.4 Deliverability (Constructability Issues)

As noted above, in this context freight and LRT cannot operate at the same time which could seriously constrain transit operations and service reliability. Previous technical assessments have concluded that construction of LRT tracks parallel to the CPR Page Subdivision would also be highly challenged due to space limitations within the corridor. The remaining space alongside the existing mainline track is under long-term consideration by the railways for double-tracking to accommodate growing freight traffic to Roberts Bank.

Even if it were feasible to construct rapid transit adjacent to the existing track, the LRT or BRT service would have to cross the freight corridor to access Langley Centre. Due to safety requirements and to provide service reliability this crossing would require grade separation. Without grade separation, rapid transit operations would be disrupted in both directions each time that a freight train passed, since LRT could not cross the tracks while they were occupied by a freight train. The freight trains can take up to 15 minutes or more to pass, which exceeds the defined rapid transit frequency. Construction would be complicated by finding a suitable location for a bridge clear of obstructions. In addition to the railway itself, there is a major hydro corridor crossing the railway corridor near 192 Street. As part of the RBRC program, there is an east-west roadway grade separation planned between the Cities of Surrey and Langley at 54th Avenue, which would be accessed from Highway 10 and then 56th Avenue – suggesting another reason why Highway 10 would be a better option for a Cloverdale to Langley connection.

4.1.5 RECOMMENDATIONS FROM PRE-SCREENING ANALYSIS

Based on factors that included length of alignment, number of people served, and travel time, the Newton to Cloverdale segment was retained for further consideration as described in the following sections. The other two segments of the interurban (Scott Road Station to Newton, and Cloverdale to Langley) were not carried forward, because they compared unfavourably to alternate connections along arterial roadways between the same urban centres.

4.2 Screening Evaluation

Based on the results of the pre-screening evaluation described above, the central segment of the interurban corridor (Newton to Cloverdale) was included as part of the Indicative Medium List and carried into the screening evaluation process. Consistent with the guiding principles, it was assumed that either LRT or BRT would operate along this route. This section documents this more detailed screening evaluation.

4.2.1 INCLUSION IN THE INDICATIVE MEDIUM LIST

Exhibit 4.3 illustrates two medium list alternatives which incorporated sections of the interurban corridor (1) an east-west route between Newton and Langley City that used the corridor from King George Boulevard until the tracks cross Highway 10 west of Cloverdale and (2) an overlapping route from Newton to White Rock via the interurban until 152nd Street. The portion of the alternative

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DRL Solutions, 2006.
connecting to White Rock is not the focus of this memo. The discussion in the rest of this section is of the more extensive Newton to Langley route, which is composed of a number of segments, including the interurban corridor and portions of Highway 10 and Fraser Highway.

4.2.2 ALIGNMENT AND CROSS SECTION ASSUMPTIONS

The 2006 evaluation of the corridor indicated that there would be operational constraints with providing rapid transit along all segments of the corridor due to existing freight traffic operations. The section from Newton to Cloverdale forms part of the SRY Fraser Valley Subdivision, and an average of two trains per day are operated on these tracks at various times of day. Given that SRY owns the track assets and has rights to operate freight service on this section of the corridor, it is unlikely that the freight traffic could be temporally separated from any proposed rapid transit operation on the same tracks.

Exhibit 4.3 – Map: Indicative Medium List Alternative Incorporating Interurban Segment
For the purpose of the following analysis, it was assumed that LRT operation would require one or two separate tracks so that it could operate frequently and with minimal interference from freight operations. Since the corridor right of way is fairly narrow, a conceptual cross-section was developed (for analysis purposes) with a new LRT track running parallel to the existing freight track. It was assumed that passing tracks would be constructed at stations so that LRT trains could operate in both directions without requiring the use of the freight track. The overall width to accommodate the LRT system plus the existing freight track would range from approximately 12 m (single parallel track) to 20 m (at stations, with passing tracks), including clear distance outside the tracks. This assumption was assessed as a compromise between two other options: no new track (which would have freight conflict issues); and building two complete end-to-end tracks (with higher costs and more construction impacts). With a single track and passing track configuration, there would be reliability constraints because bi-directional BRT or LRT service would require vehicles proceeding in opposite directions to “meet” at the passing locations. If a vehicle was delayed, it could delay other vehicles waiting for the passing to take place.

In the case of a Bus Rapid Transit (BRT) option, it was assumed the existing freight track would remain and a parallel dedicated bus roadway would have to be constructed. At a minimum, this roadway would have to include passing provisions at rapid transit stations so that bi-directional operation could take place within the narrow right-of-way. The overall width to accommodate the BRT system plus the existing freight track would range from approximately 14 m (single parallel bus lane) to 22 m (at stations, with passing lanes).

Appendix A includes conceptual cross sections, as described above, for a typical LRT and BRT alignment adjacent to the existing freight tracks. These were considered to be the minimum cross section required to be able to operate rapid transit along the interurban corridor. (Other LRT options are evaluated in Section 5).

4.2.3 SCREENING EVALUATION FINDINGS

Highlights of the Phase 1 evaluation, as they pertain to the interurban segment, are outlined on the following pages. Where appropriate, comparisons are made to other alternatives from the Indicative Medium List, including the other routes (e.g. 64th Avenue, Highway 10) evaluated between Newton, Cloverdale and Langley, and with Fraser Highway, which connects Langley to Fleetwood and Surrey Metro Centre.

4.2.3.1 Economic Development (Goods Movement)

The Economic Development Account includes ‘Compatibility with Goods Movement’ as a criterion. This was assessed by considering goods movement routes including railways and truck routes.

The interurban route is potentially the least compatible with goods movement because building an LRT or BRT system alongside the existing freight railway would result in crossings of industrial lead tracks along the route from Newton to Cloverdale. Lead tracks are used to take rail cars from sidings on the property of railway customers onto the main railway.

The east-west route options along 64th Avenue would have least conflicts with goods movement traffic, and the Highway 10 option, because it is a busy trucking corridor, would potentially see intermediate impacts (e.g. access to certain customers could be limited where the LRT / BRT system prohibits turns across the median). Fraser Highway would experience impacts to goods movement somewhere between the Highway 10 and 64th Avenue options, and less than the interurban.
4.2.3.2 Environmental

The Environmental Account can be summarized in terms of areas with the greatest potential impact from the construction and operation of rapid transit, synthesizing the findings from several individual criteria (habitat, watercourses, natural resources, agricultural resources).

The areas of greatest potential environmental impacts in the SRTAA study area include the flood plains and the Agricultural Land Reserve (ALR). The interurban corridor crosses through the Agricultural Land Reserve between 152nd Street and just west of Highway 15. The corridor also runs adjacent to the Serpentine River for nearly 300 metres and crosses it (on a narrow trestle bridge) approximately 150 metres northwest of Highway 10.

The impacts of widening or adding new structures to accommodate LRT or BRT system along this alignment would potentially be much higher than either the 64th Avenue or Highway 10 options. The interurban alignment passes through the ALR for a distance of 4.6 km, versus 3.5 km if purely on Highway 10, and only 2.4 km for the route along 64th Avenue. In addition to the longer distance, the closer proximity to the Serpentine River suggests there could be impacts to the watercourse, especially if LRT or BRT were constructed between the existing railway and the river. The path of Fraser Highway through the ALR is the most direct, 2.3 km, and therefore potential impacts may be lowest along Fraser Highway.

4.2.3.3 Financial

The Financial Account includes order of magnitude capital costs (in current dollars) and cost effectiveness on the basis of transportation benefits (costs per rapid transit boarding). The preliminary order-of-magnitude estimates take the corridor conditions into account, grouped broadly by two types of issues.

The first set of issues that drive costs relates to the crossing of the Serpentine River floodplain. This includes soil conditions, grades, and structures over the Serpentine River. The 64th Avenue and Highway 10 routes would also experience this issue, although along a shorter distance. The Deliverability discussion (see 4.2.3.7) elaborates on this further.

The second set of issues are unique to the interurban railway corridor, and examples include freight track crossings, grade crossings of city streets, highly constrained right of way, and presence of hydro transmission poles along the railway. One of the perceived advantages of the interurban corridor was that one track is already constructed, but since it is not feasible to use that existing track for frequent rapid transit operations, its presence actually complicates some of the construction requirements for rapid transit. These issues have the effect of increasing average costs and offsetting the perceived savings.

Other costs typical to LRT, including the tracks, power distribution, communications, stations and vehicles, would be common to alternatives on the interurban corridor or arterial streets. These are included in the LRT cost estimates.

The cost-effectiveness of this route would be below average, given that construction costs per kilometre would be higher than average relative to other routes in the study area (due to the significant constructability issues), while ridership on the Newton-Cloverdale-Langley connections is significantly lower, particularly compared to the Fraser Highway.

4.2.3.4 Social / Community

No significant impacts or benefits to the Social / Community Account (cohesion, visual) are anticipated for the interurban corridor. Since the corridor already exists and acts as a ‘barrier’ of sorts where the local street pattern is interrupted by the railway, introducing a new transit route would not have any significant community impacts. In addition, the alignment is urban west of...
152nd Street, but most of the segment is rural. LRT would have somewhat more visual impact than BRT because of overhead power distribution, but by following the railway, the exposure of this to the public would be limited to grade crossing locations and along Highway 10 near Cloverdale.

4.2.3.5 Transportation

Under the Transportation Account, the number (range) of new rapid transit riders and the number of people in the station area catchments were evaluated. The estimated ridership range comes from the Metro Vancouver travel demand Model (MVM) for 2041, refined for Phase 1 of the SRTAA evaluation and using the most recent (June 2010) land use forecasts. The station area catchment is based on a 400 metre radius around nominal station locations at major intersections, transit exchanges and other significant activity centres along the study alignments.

**Ridership.** Total ridership is a function of the entire transit network, so a supplementary comparison was made of the peak passenger loads and the ridership productivity on the full set of SkyTrain extensions and LRT / BRT routes that had been included in the Indicative Medium List.

The highest boardings for LRT / BRT and LRT were on routes through Surrey Metro Centre, Guildford, Fleetwood and Newton. Intermediate demand levels were estimated for the routes from Fleetwood to Langley Centre, and from Newton to White Rock. The lowest boardings and passenger loads were on routes through Cloverdale, which demonstrated only half the productivity (passengers boarding per kilometre travelled) compared to the Fleetwood-Langley or Newton-White Rock connections. Compared to the routes through Surrey Metro Centre, ridership through Cloverdale was approximately one-third. Riders that could be attracted to the interurban line would be going to or from Newton, a lower-demand connection.

**People in Station Area Catchments.** Exhibit 4.4 compares the station-area catchments of population and employment for 2041 on the combined interurban / Highway 10 route versus the comparable distance on the Fraser Highway. In 2041 the Fraser Highway route would serve 35% more residents and 30% more jobs in stations areas than the interurban / Highway 10 route.

<table>
<thead>
<tr>
<th>Station Area</th>
<th>2041 Population</th>
<th>2041 Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>72nd &amp; King George</td>
<td>4,100</td>
<td>3,850</td>
</tr>
<tr>
<td>144th &amp; Railway</td>
<td>1,000</td>
<td>2,050</td>
</tr>
<tr>
<td>152nd &amp; 64th</td>
<td>1,750</td>
<td>700</td>
</tr>
<tr>
<td>Hwy. 10/168th</td>
<td>1,250</td>
<td>250</td>
</tr>
<tr>
<td>Hwy. 10/176th</td>
<td>1,600</td>
<td>550</td>
</tr>
<tr>
<td>Hwy. 10/180th - Kwantlen</td>
<td>1,050</td>
<td>600</td>
</tr>
<tr>
<td>Hwy. 10 &amp; 184th</td>
<td>1,100</td>
<td>450</td>
</tr>
<tr>
<td>Langley Center</td>
<td>3,200</td>
<td>2,200</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15,050</strong></td>
<td><strong>10,650</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Station Area</th>
<th>2041 Population</th>
<th>2041 Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fraser &amp; 140th</td>
<td>2,800</td>
<td>2,150</td>
</tr>
<tr>
<td>Fraser &amp; 152nd</td>
<td>2,550</td>
<td>650</td>
</tr>
<tr>
<td>Fleetwood</td>
<td>3,100</td>
<td>1,300</td>
</tr>
<tr>
<td>Fraser &amp; 168th St</td>
<td>2,300</td>
<td>1,000</td>
</tr>
<tr>
<td>Fraser &amp; 184th St</td>
<td>2,800</td>
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<td>Fraser &amp; 192nd</td>
<td>4,150</td>
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</tr>
<tr>
<td>Fraser/196th</td>
<td>2,400</td>
<td>4,900</td>
</tr>
<tr>
<td>Langley Center</td>
<td>3,200</td>
<td>2,200</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>23,300</strong></td>
<td><strong>13,800</strong></td>
</tr>
</tbody>
</table>

**Difference**                        | **8,250**       | **3,150**       |

Fraser Highway performs better
4.2.3.6 Urban Development

The biggest differentiator of the Urban Development Account was the Land Use Potential criterion, which qualitatively assesses the ability of the rapid transit alternatives to concentrate and shape future development by delivering outcomes of re-zoning, additional density and Transit Oriented Development (TOD) at stop locations and along the alignment. The areas within the SRTAA study area deemed to have greatest potential were Surrey Metro Centre and Guildford (office and mixed use), followed by Langley Centre and Newton (residential and commercial).

Land use potential was assessed as lower for the Cloverdale urban centre in comparison with the other urban centres in the SRTAA study area. Exhibit 4.5 illustrates the entire corridor against a density map of forecast population and employment in 2041. While the urban centres in Newton and Langley Centre are both projected to be relatively dense urban nodes, Cloverdale is a much smaller and less significant concentration. In fact, Cloverdale is projected to have much a lower population density than the Clayton community along Fraser Highway, which supports the recommendation that Langley Centre be served via Fraser Highway rather than through Cloverdale.

4.2.3.7 Deliverability

The Deliverability Account considers the main issues that could affect the construction of a rapid transit alternative. At this stage of analysis, these relate to grades, right of way constraints, and physical constraints along the proposed route, such as existing bridges. The interurban corridor includes several challenging issues related to passing through the Serpentine River floodplain, as well as specific ones related to building a proposed LRT or BRT along an operating freight railway.

To construct LRT or BRT alongside the existing freight track, the challenges on this corridor that differentiate it from a street-running LRT or BRT system include:

- In order to operate LRT or BRT in parallel with a freight train, safety improvements such as signals and switches would be required where the new LRT track(s) or BRT bus lanes cross any active industrial lead tracks.
- Existing public grade crossings would need to be reconfigured so that both the existing track and proposed LRT track(s) or BRT lane(s) have traffic signals with transit priority, and are coordinated and compatible with the grade crossing protection in place for the existing railway track. Alternatively, new grade crossing protection or grade separation may be required.
- The downward gradient of the existing track from 152nd towards Highway 10 is somewhat steep but not as significant as on the arterial streets (e.g. 64th, Hwy. 10) in the area, which enter the floodplain more abruptly. The interurban grade is sufficient to accommodate existing freight operations. However, building new LRT track(s) or BRT lane(s) next to the existing track may require excavation (cut and fill) in areas of poor soils to maintain a similar operable grade.
- The soils through the floodplain require stabilization before construction could take place, and this alignment (as noted above) passes through the floodplain in close proximity to the Serpentine River.
- A new bridge would have to be constructed for the LRT or BRT system over the Serpentine River, parallel to the existing trestle. Widening of arterial bridges on other routes may also be required, but the interurban route has the longest crossing of the Serpentine due to the angle of approach, and therefore potentially higher costs and greater impacts.

(Continues on Page 22)
Exhibit 4.5 – Map: 2041 Land Use and the Interurban Right of Way
• Some of the hydro transmission poles along one side of the existing tracks would need relocation to accommodate the new LRT tracks or BRT lanes.

• Additional right of way would be needed.

Construction of LRT or BRT on arterial routes (such as 64th Avenue, Highway 10 or Fraser Highway) would also have challenges related to integrating rapid transit with traffic, and obtaining right of way. However, constructing median LRT or BRT takes advantage of existing public rights of way already established for the streets, and the traffic signals along those streets can be reconfigured to manage LRT / BRT and other traffic operations.

4.2.3.8 Recommendation from the Screening Evaluation

In conjunction with the deliverability, potential environmental and financial (cost) issues, the relatively poor ridership potential and urban development results lead to the conclusion that rapid transit investment through Cloverdale is not justified by 2041, and rapid transit to Langley Centre could be better served from Fleetwood via Fraser Hwy. Connecting frequent bus service from Cloverdale to Newton, Fleetwood and Langley Centre is recommended instead.

4.3 Phase 1 Conclusions

4.3.1 PHASE 1 RECOMMENDATIONS

Based on the Phase 1 assessment, the study team recommended that rapid transit (namely SkyTrain, LRT or BRT) options on the interurban railway corridor not be carried into the Short List of alternatives for more detailed Phase 2 evaluation.

The segment of the corridor from Scott Road Station to Newton (portion of SRY Fraser Valley Subdivision) does not meet the project objective of serving the urban centres. This segment of the interurban corridor bypasses Surrey Metro Centre and serves a longer, lower density industrial section of the study area with lower ridership potential than routes along King George Boulevard. Because the railway bypasses Surrey Metro Centre, it would actually undermine the project’s land use shaping objectives. In addition to not meeting project objectives, construction along this segment would be complicated by the need to construct a new connection to Scott Road Station over difficult terrain.

The segment of the corridor between Cloverdale and Langley (CPR Page Subdivision / RBRC) is part of the RBRC and is a primary freight connection between the port and the rest of Canada. The railway will continue to be heavily used by freight service and this would preclude rapid transit from using the same tracks. It was also found that a rapid transit route next to the existing railway would be inferior to the nearby parallel route on Highway 10, which more directly connects to adjacent land uses and would potentially have a faster travel time to Langley. The lands on one side of the railway corridor in this segment are agricultural and therefore ridership potential would be lower.

The central segment from Newton to Cloverdale was not recommended for the Short List because none of the rapid transit options through Cloverdale, including those using the interurban railway route, demonstrated sufficient ridership to warrant a high level of capital investment. This is in part due to the rural nature of the alignment as it crosses through the Agricultural Land Reserve and Serpentine floodplain: costs are higher because of constructability and environmental issues; and the rural nature of that part of the alignment contributes few additional riders.
4.3.2 PUBLIC RESPONSE DURING PHASE 1 CONSULTATION

The preliminary Short List included several alternatives serving Langley Centre and northern Cloverdale via the Fraser Highway. This Short List was approved by the project sponsors and agreed on by the project partners to be brought forward for public consultation. The Phase 1 consultation program was undertaken in October 2010. This program had the objectives of explaining the study process, Problem Statement and project objectives to the public, and gathering public input on the proposed set of alternatives. The process included four public workshops across the study area, online materials, a webinar, a survey questionnaire, as well as media and blogger events. Advance notice was provided through the media, email, and distribution of information cards.

The survey results provided the broadest cross-section of responses to the study, including:

- 84% of the respondents were in agreement with the Problem Statement, the foundation for developing alternatives. Only 4% disagreed.
- 73% agreed that the Preliminary Short List was complete. 16% of the respondents suggested additional alternatives.

The suggestions of additional alternatives included rapid transit alternatives that had not passed the Phase 1 evaluation, future bus service improvements, corridors and communities outside the study area, and comments emphasizing support for parts of the Short List alternatives. None of the rapid transit alternatives suggested were new; all had been set aside during the pre-screening and screening evaluations.

Through the consultation, participants advocating for LRT on the Newton – Cloverdale – Langley connection (4% of participants) expressed the perception that using the interurban corridor could be relatively inexpensive and easy to implement. In response, TransLink confirmed that additional technical work would be carried out to verify the requirements and associated costs related to operating LRT on that railway corridor. It was agreed by the project sponsors and partners that LRT operation on the interurban corridor would not be carried into Phase 2 as a full alternative, pending the results of the technical update, which is included in the next chapters of this report.

\[7\] Commuter rail was recently investigated by MOTI as part of the Strategic Review of Transit in the Fraser Valley.
5. EXPANDED REVIEW OF OPERATIONS AND CONSTRUCTION REQUIREMENTS

This chapter describes the supplementary review of the interurban corridor for potential LRT construction and operations.

The Phase 1 assessment did not recommend carrying the interurban corridor forward to Phase 2 for further evaluation. However, due to the expressed interest from some members of the public to include LRT on the interurban corridor as a potential Phase 2 alternative, it was recommended that further technical analysis be carried out. This assessment has been carried out for the Newton to Langley segments of the corridor. The first section describes the supplementary assessment of LRT operation options in the corridor, and the associated construction requirements. The second section is a brief discussion of other rail transit technologies including tram-trains, Diesel Multiple Units (DMUs), and Electric Multiple Units (EMUs).

5.1 LRT Operations and Construction Options

Additional technical analysis included further identifying the regulatory requirements, the existing corridor conditions, and analyzing the issues regarding constructing and operating LRT as rapid transit in the corridor between Newton and Langley Centre.

This additional analysis differentiates between the segments from Newton to Cloverdale, and Cloverdale to Langley, given the different existing conditions. Three different design approaches have been identified and analyzed at a pre-conceptual level. These include:

- Operating LRT on the existing track in the interurban corridor,
- Adding a single LRT track adjacent to the freight track, or
- Adding two LRT tracks adjacent to the freight track.

Appendix A includes cross sections relevant to the second and third design options. All of the other LRT alternatives evaluated in the SRTAA feature double LRT tracks, generally in the median of the arterial roadways.

5.1.1 OPERATIONAL CONSIDERATIONS

The main operational considerations for rapid transit on the interurban corridor include safety and performance. In the SRTAA, rapid transit is defined as fast, frequent and reliable.

5.1.1.1 Transport Canada Regulations for Operational Safety

As previously noted, there are regulatory restrictions in North America that preclude operating LRT and freight trains on the same track without physical and time separation, due to safety requirements related to passengers. There are examples in parts of Europe where non-crash compliant LRT vehicles (referred to as tram-trains) operate on mainline railways alongside heavier freight and passenger trains. This difference in operations is due to extensive signalling, power and control systems (Positive Train Control\footnote{Positive Train Control (PTC) is the North American term for an advanced train control system that monitors train positions and signals, and also provides this information on-board the trains (this aspect is referred to as cab signals). The system grants authority for train movements along the tracks, and applies speed restrictions and braking to prevent trains from entering track segments occupied by other trains or maintenance crews. This type of system has not been standardized, and may use track circuits, wayside or wireless tracking.}) implemented in Europe. These provisions are expensive...
and not present within the SRTAA study area. Additional information on this topic is found in Section 5.2.

Given the nature of the existing freight operations in the interurban corridor, and the ownership of the track segments by SRY and CPR, rapid transit services would have to operate concurrently with freight operations, particularly on the RBRC / CPR Page Subdivision.

This has different implications for the three design options for LRT:

**Design 1: Use existing freight track for LRT.** LRT vehicles may not share the freight track without physical or temporal separation. If no tracks were constructed, then LRT operations would have to be coordinated with freight operations. On the SRY Fraser Valley Subdivision conflicts with existing freight operations would occur in the peak morning hours. On the RBRC/CPR Page Subdivision, many time windows throughout the day would have LRT service interrupted, since the corridor lacks the track, signal and power infrastructure necessary to permit LRT and freight vehicles to operate close together (as is done in some circumstances in Germany and France). Due to this disruption, the resulting level of LRT services would not meet the definition of “rapid transit”.

**Design 2: Add single LRT track adjacent to freight railroad.** Sufficient physical separation would be required between the LRT and freight tracks to operate during the same time periods. In order to operate alongside the entire interurban from Newton to Langley, the LRT tracks would have to cross the freight tracks at least once to access Langley Centre which is east of the corridor. Assuming that concurrent freight and transit operations are to be accommodated, Transport Canada and/or the BC Safety Authority could likely require a grade separation of the LRT tracks from the freight tracks, because of the high frequency of LRT operations and concerns over heavy freight trains crossing the passenger route. This grade separation would in any case be advisable for an owner of the LRT system to implement for operational reasons – to maintain the frequency and reliability of LRT -- notwithstanding any safety requirements that would arise during BCSA/TC review of the operating plan for any proposed service. Otherwise, the delays caused by longer freight trains would exceed the headway between LRT services, resulting in 'bunching' of transit vehicles and downstream delays. Maintaining existing freight service would likely result in more complex and slower construction.

In order to provide reliable and frequent LRT service, the LRT vehicles would need to pass in several locations along the route. Due to safety regulations, this requires separate passing sidings since using the freight tracks would not be feasible for this function.

**Design 3: Add double LRT track adjacent to freight railroad.** This would allow for safe operations of LRT, provided there is sufficient clearance between the LRT and freight tracks. As noted above, there would likely be a rail-rail grade separation required for the LRT service to head east and access Langley Centre, in a reliable and safe operation.

**5.1.1.2 Rapid Transit Operations**

The rapid transit alternatives being evaluated in Phase 2 of the SRTAA have assumed headways between vehicles of 3 to 5 minutes during the peak period. If the same typical LRT speeds of 30-35 km/hour were achievable on the rail corridor, then the 16-km route could be traversed in approximately 27 minutes. In order to maintain 5-minute headways, 12 LRT vehicles would be in service. On a typical one-way trip, each LRT would have to pass 5 or 6 others heading in the opposite direction while en route. This implies 5 or 6 regularly spaced passing locations over a 16 km route, as a minimum, and these would require a passing section of sufficient length to limit

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9 In Ottawa the freight and LRT had to be completely time-separated when the O-Train first went into service, to meet the requirements of the safety review.
potential disruption of service in one direction by variations in operations in the other direction. Some of these passing locations may be at stations and along their approaches, but this depends on their location and vehicle travel times and relying solely on stations to pass limits reliability. The number of passing locations would need to be higher than the minimum of 5 or 6 to consistently provide a frequent and reliable rapid transit service. Ideally, continuous passing would be provided for by an end-to-end second LRT track.

The corridor is already used by freight services, as described in Section 2. The requirement for fast, frequent and reliable service is evaluated against each of the design options below.

**Design 1: Use existing freight track for LRT:** Regular and reliable service would be difficult to provide due to freight operations occupying the single track at various times of day. During the day, even the off-peak headway for LRT would be too short to operate freight trains. Accounting for bi-directional service, 10 minute LRT service would operate in one direction or the other every 5 minutes. On the segment from Cloverdale to Langley, rapid transit service would not be feasible due to very high levels of freight train traffic throughout the day. Even if time separation were possible, rapid transit operations would still be highly constrained by the single track, since several locations are needed for the passing of LRT vehicles running in opposite directions.

**Design 2: Add single LRT track adjacent to freight railroad.** Reliability and flexibility of operations could be negatively affected by single track LRT, since several sections of passing tracks would be needed to provide frequent operations. Whenever delays occurred in one direction, LRT vehicles heading in the other direction could be held waiting at passing locations, and thus also be delayed. (The level of reliability still represents an improvement over Design 1).

**Design 3: Add double LRT track adjacent to freight railroad.** This option provides sufficient reliability and flexibility to LRT operations because continuous LRT operations would be possible in both directions, with no freight conflicts.

### 5.1.2 CONSTRUCTION REQUIREMENTS

This section identifies some of the challenges and impacts that the three levels of LRT design have within this corridor, and where necessary identifies tradeoffs between operational and construction impacts.

#### 5.1.2.1 Environment

The corridor travels through residential, rural, and then light industrial areas on its path from Newton to Langley. Each of these has its own environmental issues for rail construction and operations.

The residential areas, from King George Boulevard to 152nd Street, are adjacent to the railway corridor and include multi-family and single-family homes. From 152nd Street until Cloverdale, the corridor passes through the Agricultural Land Reserve (ALR), and also through the floodplain. Just north of Highway 10, the corridor crosses the Serpentine River. East of Pratt Junction, the corridor has agricultural land on the south side, and light industrial, commercial (highway-oriented business) and institutional uses (Kwantlen College Campus) to the north. As the corridor enters Langley, the uses are predominantly light industrial. Several of these key features are indicated on Exhibit 5.1, a map of corridor constraints.
Exhibit 5.1 – Constraints to Construction along the Interurban Corridor

Legend

- Interurban Rail Corridor
- Roberts Bank Rail Corridor
- Hydro Corridor
- Existing Grade Crossings
- Agricultural Land Reserve (ALR)
- Rivers
- Surrey Rapid Transit Study Area

Map not to scale
These have varied environmental implications for the three representative LRT designs.

*Design 1: Use existing freight track for LRT.* If negotiable, temporal separation of LRT and freight uses would require freight traffic to operate at night causing more noise and vibration impacts to nearby communities, particularly the residential areas of Newton alongside the tracks.

*Design 2: Add single LRT track adjacent to freight railroad.* Construction of new track would have potential biodiversity and water resource impacts in the ALR and the Serpentine floodplain, particularly where the existing trestle bridge would have to be twinned or replaced to carry the new track. If the corridor needed to be widened along the SRY Fraser Valley Subdivision, or on the south side of the RBRC / CPR Page Subdivision, there could be potential impacts to the ALR.

*Design 3: Add double LRT track adjacent to freight railroad.* Impacts would be of a similar type as design #2, but of potentially greater magnitude if two tracks were constructed alongside the existing freight line.

### 5.1.2.2 Constructability

Exhibit 5.1 highlights several of the constraints along the interurban corridor, many of which could influence the ease of implementation and have a direct influence on the potential capital costs to construct LRT in this corridor. These issues include:

- **Constrained right of way.** The BC Hydro right-of-way includes the railway and a hydro distribution corridor, and is adjacent to residential, light industrial and environmentally sensitive areas. Placing stations within the corridor would create some need for right of way, and track construction would require even more space. Railways have indicated an interest to eventually double-track the RBRC / CPR Page Subdivision in the future, which would reduce the space available for new LRT tracks even further (on that segment).

- **Existing Freight operations.** The continuation of freight operations on the existing tracks during construction would complicate the process and likely result in slower construction. Lastly, the power supply system for LRT (typically overhead) would need to be designed at a safe clearance from anticipated double-stack freight cars.

- **Power Lines.** There are BC Hydro power distribution lines alongside the existing tracks of the entire SRY Fraser Valley Subdivision, and along the RBRC / CPR Page Subdivision west of 196th Street. These would potentially need to be relocated. There may also be issues with interference between these power lines and the power and communications / signalling systems for the LRT.

- **Industrial Lead Tracks.** Near Langley, there are several industrial lead tracks that connect to the main line. These would be in conflict with any LRT tracks located alongside, unless their use was restricted temporally, or they were physically separated.

- **Grade Crossings.** The requirements at grade crossings differ from LRT in the middle of arterial streets, where traffic signals are coordinated with the transit operation. Where railways cross streets at grade, the level of protection (e.g. stop sign, flashing lights, lights and gates, grade separation) is a function of local conditions, including traffic and train volumes. At a minimum, it is likely that all grade crossings would require a review and potentially an upgrade to accommodate the high-frequency LRT operation. In several cases, for example at Highway 10, grade separation may be warranted by the high peak vehicle volumes, frequent LRT traffic and the oblique approach angle of trains to the highway crossing. (Other potential locations include 64th Avenue/152nd Street). Some of the existing grade crossings are farm access roads, and these would likely require flashing lights, bells and gates to ensure safe crossing by farm traffic.
**Bridges.** There are several bridges used by the SRY Fraser Valley Subdivision to cross local creeks, ditches, and the Serpentine River. Twinning or replacement would be necessary where tracks are added. Any bridge construction is likely to trigger environmental reviews.

**Poor Soils.** The soils in the floodplain are of poor strength and usually require pre-treatment before construction can take place. This can add years to construction timelines through this area.

**Railway Grade Separation.** For operational and safety reasons, one rail-rail grade separation would be necessary if LRT and freight were operating during the same time period, to allow frequent LRT service to connect Newton to downtown Langley, which are on opposite sides of the RBRC (see description in 5.1.1.1). This crossing would have to take place somewhere between Pratt Junction and Langley. There would be limited options to achieve this, given the plans to grade separate RBRC / CPR Page Subdivision and 192nd Street, and the presence of high-voltage power lines crossing over the railway. Both of these place limits on locations for the LRT line to cross over the freight tracks. Based on initial review, the most promising location is between 180th Street and 192nd Street. (Depending on the angle of the grade separation, it could require this entire distance.)

The net impacts of these issues on the different designs are summarized here:

- **Design 1: Use existing freight track for LRT.** In the segment between Cloverdale and Newton, at a minimum, LRT would need an additional passing track with related impacts on grade crossings, hydro facilities, structures, and property requirements. Operation from Cloverdale to Langley would be infeasible.

- **Design 2: Add single LRT track adjacent to freight railroad.** Challenges include hydro lines, substations, poor soils, industrial lead tracks, grade crossings, wider or new bridge structures, access to Langley Centre, and property requirements. Traffic impacts of at-grade crossings may require grade separation of one or more arterial crossings. There is very constrained right of way in places between Cloverdale and Langley, in particular if a second freight track were implemented in the future.

- **Design 3: Add double LRT track adjacent to freight railroad.** Challenges are of the same type as design #2, but more pronounced issues with the constrained right-of-way and potential need for adjacent property.

### 5.1.2.3 Order of Magnitude Costs

For the purpose of comparison, order-of-magnitude estimates for the three design options were prepared. These are based on typical planning-level costs and are applied to the 14.5-km length of corridor from Newton to crossing of the RBRC / CPR Page Subdivision and Fraser Highway. These costs exclude any LRT construction on arterial streets, such as Fraser Highway into Langley Centre. The following assumptions were made to prepare these estimates:

- **Design 1: Use existing freight track for LRT.** Vehicles and supporting power supply, signals and communications are necessary for even a rudimentary LRT operation. For the purpose of preparing the estimate, the RBRC / CPR Page Subdivision segment is included. However, this type of operation would be infeasible on the RBRC segment, and very highly constrained on the SRY Fraser Valley Subdivision. Due to excessive costs, the design does not include Positive Train Control (PTC) for the transit vehicles, freight trains or the related corridor infrastructure. (Such upgrades would be needed across the rail network, and well beyond this study area.)
• **Design 2: Add single LRT track adjacent to freight railroad.** Construction of a new track, passing sidings, and a rail-rail grade separation are additional costs over the bare-bones system in design #1. Other (arterial) grade separations are identified as a potential range of costs.

• **Design 3: Add double LRT track adjacent to freight railroad.** Cost elements are of the same type as design #2, but costs will be higher with the additional track, additional bridge construction, and greater need for right of way. Again, grade separations are identified as a potential range of costs.

The order-of-magnitude costs are presented as a typical range in **Exhibit 5.2**, based on sketch planning of a potential design for this corridor. The resulting average costs are compared to the typical cost of arterial LRT with two tracks in the street median. These costs are based on preliminary Phase 2 cost estimates for the LRT arterial alternatives. Based on this, the two-track option (Design 3) for the interurban corridor has costs of a similar or higher magnitude than the arterial LRT costs ($70-85 M and $60-80 M respectively) while the costs for the single track option (Design 2) are similar or slightly lower.

### Exhibit 5.2 – Order of Magnitude Costs for LRT Design Options

<table>
<thead>
<tr>
<th>Category</th>
<th>Design 1*</th>
<th>Design 2</th>
<th>Design 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicles**</td>
<td>$100 M</td>
<td>$100 M</td>
<td>$100 M</td>
</tr>
<tr>
<td>Stations</td>
<td>$30 M</td>
<td>$30 M</td>
<td>$30 M</td>
</tr>
<tr>
<td>LRT Power, Systems</td>
<td>$20 M</td>
<td>$20 M</td>
<td>$20 M</td>
</tr>
<tr>
<td>New Track(s), Civil Works and</td>
<td>$10 M</td>
<td>$460 to</td>
<td>$750 to $780 M</td>
</tr>
<tr>
<td>Property</td>
<td></td>
<td>$480 M</td>
<td></td>
</tr>
<tr>
<td>Grade Separations</td>
<td>$120 M</td>
<td>$120 to 330 M</td>
<td>$120 to 330 M</td>
</tr>
<tr>
<td>Total***</td>
<td>$160 M</td>
<td>$730 to 970 M</td>
<td>$1,000 to $1,250 M</td>
</tr>
<tr>
<td>Approx. Average per Km</td>
<td>$10 M</td>
<td>$50 to 65 M</td>
<td>$70 to 85 M</td>
</tr>
</tbody>
</table>

**Typical range for arterial LRT (based on LRT 1 through LRT 4)**

$60 to 80 M per Km

**Notes:**

*Design 1 does not produce a feasible operation. The costs shown do not include PTC.*

**Vehicles and spares to serve corridor every 5 minutes. Excludes OMC allocated costs.**

***Estimates include implementation costs and contingencies**

### 5.1.3 BENEFITS

The relative benefits of the interurban corridor were compared to the Fraser Highway options at the conclusion of Phase 1, and it was found that the travel demands in the corridor were lower due to lower population and employment forecasts, and the less direct path to Surrey Metro Centre.

### Cost- Effectiveness

The rationale for re-evaluating LRT in this corridor was the perception by some members of the public that implementation costs would be low relative to other corridors. However, the lowest-cost option does not meet the requirements for rapid transit.
Design 1: Use existing freight track for LRT. This option would have several adverse impacts and costs to operate the passenger service. Temporal separation requirements would mean rescheduling freight service on the SRY Fraser Valley Subdivision (with potentially adverse costs and economic impacts). The segment from Cloverdale to Langley is not feasible for rapid transit service given the frequency and timing of freight operations. Therefore, the option would have low benefits and adverse impacts and costs.

Design 2: Add single LRT track adjacent to freight railroad. This option would have moderate adverse impacts (environmental) and medium-high costs (for new construction and modifications to the railway corridor), for low ridership and travel time benefits.

Design 3: Add double LRT track adjacent to freight railroad. With its larger footprint, this option would have greater adverse environmental (and property) impacts and costs (for new construction and modifications to the corridor), for lower ridership and travel time benefits. These benefits would be highest of the three interurban design options because the two tracks provide the greatest flexibility for operations, but construction impacts would be greatest.

5.1.4 SUMMARY

An overview of the main findings from this additional analysis is summarized in Exhibit 5.3.

Exhibit 5.3 – LRT Operation and Construction Issues on the Interurban Corridor

<table>
<thead>
<tr>
<th>Issue area</th>
<th>Design 1: Use existing freight track for LRT</th>
<th>Design 2: Add single LRT track adjacent to freight railroad</th>
<th>Design 3: Add double LRT track adjacent to freight railroad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport Canada Regulations for Operational Safety</td>
<td>Not safe for LRT vehicles to share freight track Regulations require physical or temporal separation between the LRT track and freight tracks.</td>
<td>Not safe unless additional passing tracks also added for LRT since LRT cannot share freight track Sufficient physical separation required between LRT and freight tracks.</td>
<td>Safe operation if sufficient physical separation between LRT and freight tracks</td>
</tr>
<tr>
<td>Rapid Transit Operations</td>
<td>Not reliable service due to freight train operations. Rapid transit operations constrained with little flexibility. Requires temporal separation.</td>
<td>Reliability and flexibility of operations negatively affected by single track LRT Requires additional LRT passing tracks, but operations still somewhat constrained.</td>
<td>Good reliability and flexibility</td>
</tr>
<tr>
<td>Environment</td>
<td>Temporal separation of LRT and freight uses would require freight traffic to operate at night (outside of assumed LRT operating hours) causing more noise and vibration impacts to</td>
<td>Biodiversity and water resource impacts in the ALR and Serpentine floodplain.</td>
<td>Biodiversity and water resource impacts in the ALR and Serpentine floodplain.</td>
</tr>
<tr>
<td>Issue area</td>
<td>Design 1: Use existing freight track for LRT</td>
<td>Design 2: Add single LRT track adjacent to freight railroad</td>
<td>Design 3: Add double LRT track adjacent to freight railroad</td>
</tr>
<tr>
<td>------------</td>
<td>--------------------------------------------</td>
<td>-------------------------------------------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>Constructability</td>
<td>At a minimum, need additional track for passing with related impacts on grade crossings, hydro facilities, structures, and property requirements.</td>
<td>Challenges include hydro lines, substations, poor soils, industrial lead tracks, grade crossings, wider or new structures, access to Langley Centre, and property requirements. Impacts of at-grade crossings might require that some crossings be grade-separated. Very constrained ROW in places between Cloverdale and Langley</td>
<td>Challenges include hydro lines, substations, poor soils, industrial leads, grade crossings, wider or new structures, access to Langley Centre, and significant property requirements. Impacts of at-grade crossings might require that some crossings be grade-separated. Very constrained ROW in places between Cloverdale and Langley</td>
</tr>
<tr>
<td>Cost-Effectiveness</td>
<td>Some adverse impacts and costs, for low ridership and travel time benefits</td>
<td>Moderate adverse impacts and costs, for low ridership and travel time benefits</td>
<td>High adverse impacts and costs, for low ridership and travel time benefits</td>
</tr>
</tbody>
</table>

(5.2 Other Technologies and Operational Approaches)

Current Canadian regulations for passenger safety require that passenger vehicles operating within physical and time proximity to freight traffic meet minimum strength criteria for buff and draft loads, as a safeguard against the possible consequences of accidental collision. Transport Canada (TC) applies much the same regulations as the United States Federal Railroad Administration (FRA) to railway operations. The United States and Canada set higher strength standards than Europe, which limits most DMU/EMU vehicles available on the North American market from sharing tracks with freight trains.

This section outlines alternative approaches from elsewhere in North America and Europe where transit passenger service is provided on the same tracks used by freight railroads, either through the use of vehicles that would comply with the TC/FRA regulatory requirements, or through shared transit/freight operations using non-compliant vehicles in cases where specific infrastructure investments and/or operating modifications have been made. These approaches are assessed for applicability with respect to the interurban corridor and the scope of the SRTAA.

10 Buff loads are compression loads between railway cars, and draft loads are in tension. (Under normal operations, these loads are experienced between coupled rail cars being pushed or pulled.)

11 The FRA is part of the United States Department of Transportation (USDOT), and Transport Canada generally uses identical or similar regulations (several major North American railways operate in both countries)
5.2.1 ALTERNATIVE APPROACHES TO SHARING TRACK – COMPLIANT VEHICLES

Passenger rail vehicles that may meet TC/FRA regulatory requirements for strength in North America tend to be the types used for commuter rail, including push-pull trains with locomotives and passenger cars, heavier Diesel Multiple Units (DMUs), essentially self-contained passenger rail cars with a control cab and powered by a diesel engine on-board the train, and heavier Electric Multiple Units (EMUs), similar to DMUs but powered by electricity. A DMU/EMU can consist of one or multiple carriages, and are typically used on commuter and lower capacity intercity passenger services. Some newer versions of DMUs are considered to meet the strength specifications to withstand collisions with freight trains, and would potentially be considered TC/FRA-compliant. For example, the Portland Westside Express Service operates with FRA compliant vehicles constructed several years ago by the now defunct Colorado Railcar company.

Assuming the strength specifications could be met, a compliant DMU/EMU rapid transit alternative would still have limitations operating in the interurban corridor, including the following:

- If running on the existing freight track, the service would not meet the frequency and reliability needs of rapid transit, due to freight traffic. This would be especially problematic between Cloverdale and Langley Centre due to the very high levels of existing and projected freight traffic in that segment.
- For a DMU/EMU rapid transit alternative, additional track would still be required to allow for trains to pass, since the intended operation is approximately every 5 minutes in the peak period. In this case, most of the construction challenges and costs outlined above for the LRT alternatives would apply, and the order of magnitude costs would be similar to LRT alternatives running on arterial streets. In addition, a separate Operations and Maintenance Centre (OMC) would be required to store and maintain the DMU/EMU fleet.
- On the environmental side, along with the issues identified earlier for additional LRT track, DMU/EMU technology generally has higher noise, vibration and air emissions impacts (for DMU) than LRT technology.
- A DMU/EMU alternative would require a transfer at Newton to connect to Surrey Metro Centre from Langley and Cloverdale, causing additional travel time impacts and corresponding lower ridership. Also, a DMU/EMU alternative would be limited in terms of Langley Centre stop locations, since Willowbrook Mall is off the interurban corridor to the northwest and the traditional downtown area with the transit exchange is east of the corridor. These transfer and service issues would be addressed in part if a “tram-train” operation were feasible. This topic is discussed in section 5.2.2 below.

As outlined above, with respect to operating DMU/EMU service in the interurban corridor, even a compliant vehicle that met the regulatory requirements to share track with freight trains would still encounter operational issues related to the lack of track capacity to accommodate frequent transit operations without disruption from freight trains.

5.2.2 ALTERNATIVE APPROACHES TO SHARING TRACK – NON-COMPLIANT VEHICLES WITH TEMPORAL OR PHYSICAL SEPARATION

Another lighter type of DMU/EMU operation is more similar to typical LRT than commuter rail. However, the currently available lighter-weight DMU/EMU vehicles do not meet the TC/FRA strength specifications. These non-compliant DMU/EMU operations therefore require temporal or physical separation.
physical separation from freight operations. They tend to follow more lightly used rail corridors, or former freight corridors owned/controlled by the public transportation authority and therefore disposed to prioritize transit operations.

Examples of services using non-compliant DMU commuter-rail style railcars include the Ottawa O-Train, North San Diego Sprinter, and many suburban commuter rail services in Europe. Another example of non-compliant DMU operation is the O-Train in Ottawa, which uses former CP freight tracks. Originally, authorization to operate LRT sharing the freight tracks was based on temporal separation, obtained by scheduling the infrequent CP freight movements to night-time hours, when the LRT was not in service. Freight service later ceased on that line, for economic reasons, and the LRT now exclusively uses the tracks.

Exhibit 5.4 illustrates the types of non-compliant DMU vehicles used for urban service (examples are the O-Train and San Diego Sprinter, manufactured by Bombardier Talent and Siemens, respectively).

Exhibit 5.4 – Examples of Alternative Rail Transit Vehicles Sharing Track with Freight Trains

Other DMU examples include the River Line in New Jersey, connecting Camden to Trenton, which has temporal separation from freight traffic. The Sprinter in North San Diego County uses DMU vehicles on an agency-owned corridor between Oceanside and Escondido. For a short stretch in Oceanside, the transit service runs on dedicated tracks parallel to and physically segregated from the mainline commuter rail/freight tracks used by the Coaster and Amtrak trains. This application is another example of physical separation.

In an EMU example, Caltrain, the regional commuter rail system in the San Francisco Bay Area, plans to use EMU vehicles on its mainline tracks. Caltrain was recently granted a waiver to use passenger vehicles alongside freight trains between San Francisco and Gilroy, CA. These EMU trains, while constructed to European safety standards that feature Crash Energy Management (CEM) capabilities, are non-compliant with US FRA regulations. Caltrain was granted permission to implement the EMU trains by limiting freight movements to exclusive freight period hours of 24:00 – 05:00 (temporal separation). To implement the EMU system, Caltrain has also had to install a new signal system, electrify its mainline tracks, and replace the vehicle fleet. These enhancements were required to allow Caltrain to expand service, enhance safety and reduce costs. On the basis of this precedent, implementing an EMU system in the interurban corridor would result in the need for temporal separation, in addition to signal upgrades along the interurban corridor, electrification of the corridor to provide power to the trains, and investment in a fleet of EMU vehicles and a maintenance facility. The signal upgrades and electric power distribution costs would be similar to those for LRT in section 5.1.

As outlined, non-compliant vehicles like lighter-weight DMU/EMUs require temporal or physical separation to meet the regulatory requirements for rail safety in North America. For physical separation, the capital costs for this alternative approach would be expected to be approximately the same order-of-magnitude as the Design 2 or Design 3 costs for LRT noted in Section 5.1, or fairly comparable to arterial-running LRT.
5.2.3 ALTERNATIVE APPROACHES TO SHARING TRACK – NON-COMPLIANT VEHICLES WITH SHARED OPERATIONS (TRAM TRAINS)

There are several examples around the world of shared passenger/freight operations on regional rail lines, where the vehicles also operate along city streets. Tram-train systems feature rail transit vehicles that operate on a mix of rights of way, including city streets, dedicated tracks, and mainline railways shared with heavier freight and passenger trains. Tram-train vehicles are often Electric Multiple Units (EMU) or DMUs, and several examples feature dual power mode vehicles (e.g. AC and DC electric power, or diesel/DC) that can operate on three different types of right of way, including using the existing freight tracks. The advantage is both flexibility in alignments and ability to through-route passengers between mainline railways and urban streets, avoiding transfers.

Tram-trains are an innovative solution to regional passenger rail transportation challenges. However, the number of successful cases is limited and even in Germany and France, with supportive regulatory and political structures in place, progress has been slow. Examples of tram-train operation include the Karlsruhe system in Germany where the modern concept was pioneered, and several other mid-size and smaller cities in Germany and France. The Karlsruhe system uses an Automatic Train Protection signaling system that applies brakes to any train if it passes a signal without authority to proceed.

A North American example that includes elements of tram-train application is the Austin, Texas Metrorail, which began operating in 2010. It uses non-compliant DMUs and operates for a short segment along city streets, and otherwise runs on a freight railway line owned by Capital Metro (the public transit system). Service frequency (30 minutes peak, intermittent mid-day) meets the definition of commuter rail, and is time separated from the evening and night-time freight movements on the corridor.

A successful tram-train application requires significant master planning to create a final system that integrates both mainline railway requirements and operations on city streets. The United Kingdom and North America do not yet run rail transit vehicles in time-shared mode on mainline railways, and do not have the same standards as Germany and France to facilitate it. This difference in operations is due to safety standards and extensive signaling and control systems (the European equivalent to Positive Train Control (PTC)) on German and French train lines to minimize accidents. These PTC provisions are expensive in that they require the entire corridor and network, and all passenger and freight trains that are likely to serve it to be technologically compatible. These conditions are not present within the SRTAA study area.

In the case of the interurban corridor, tram-trains could feature either DMU or EMU vehicles operating on the interurban freight track and then along urban arterial streets (e.g., Fraser Highway in Langley and/or King George Boulevard in Newton) without requiring a transfer to reach the destination. However, a tram-train rapid transit alternative would still have to overcome most of the limitations discussed in the previous section regarding sharing of track, meeting frequency and reliability needs of rapid transit, environmental impacts, etc. In addition, for tram-train operation, there are significant dependencies on the political and operational structures of the freight railway landowners and operators, which can severely impact the quality of public transportation service that can be delivered. Finally, there would be additional environmental air quality issues if DMU vehicles from the interurban corridor were also to operate on city streets.

Tram-train operation could help resolve the DMU/EMU transfer issue (see section 5.2.1) but the other limitations of using alternative DMU/EMU approaches in the interurban corridor would still remain, plus a couple of new issues regarding governance and the environment.

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13 Vehicles used in Austin are Stadler GTW diesel-electric railcars, similar to those employed on the New Jersey River Line. The vehicles are articulated and 65% of the car space is low-floor, which meets accessibility requirements for urban transit.
5.2.4 CONCLUSIONS REGARDING ALTERNATIVE PASSENGER RAIL APPROACHES

Other types of passenger rail vehicles besides traditional LRT could be deployed to provide service on the interurban corridor, based on precedents from other jurisdictions. However, these other technologies, whether deployed strictly on the interurban corridor or in tram-train formation, would carry with them most or all of the same limitations and costs in this corridor as LRT (as defined in the options in 5.1) in order to provide fast, frequent and reliable rapid transit service. This is due to the constrained nature of the existing interurban corridor (e.g., single track, no overhead power, freight operations throughout the day, no PTC, and long trains that take significant time to clear the track).

As a consequence of these limitations, neither a DMU or EMU-style vehicle nor a tram-train approach was assumed for the analysis in Section 5.1, and instead, traditional LRT which operates on arterial streets and separate tracks alongside the freight corridor was assumed.
6. CONCLUSIONS

The initial assessment of the interurban corridor in Phase 1 of the study identified the relative benefits and the potential challenges of implementing rapid transit (either LRT or BRT) in the interurban corridor.

Along the corridor, land use is most commonly farmland, resulting in a fairly low overall density of population and employment. Cloverdale is projected to be the slowest growing and smallest urban centre of the seven centres in the study area. Initial estimates of potential ridership on the interurban corridor were one-third that of a Fraser Highway route connecting Langley Centre to Surrey Metro Centre, due to the Fraser Highway route having a higher population and employment density and a more direct routing (as noted in section 4.2.3.5 Transportation). Riders that could be attracted to a rapid transit interurban line would be going to or from Newton, a lower-demand connection. For these reasons, the Phase 2 alternatives connecting to Langley Centre all include Fraser Highway rather than the interurban corridor.

The possibility of introducing either LRT or BRT service within the interurban corridor was assessed in Phase 1 based on the current freight operations and the physical characteristics of the corridor. Due to the nature of the existing corridor, there would be significant construction challenges due to obstacles adjacent to the existing track, including hydro lines, grade crossings, poor soils through the floodplains, and potential complications with maintaining freight service during construction. The existing right of way is also a constraint to new construction for LRT or BRT.

Due to its having lower projected benefits than other routes, including Fraser Highway, the interurban corridor was not recommended to be carried into Phase 2.

During the Phase 1 public consultation events, several members of the public expressed the perception that using the interurban corridor could be less expensive and easier to implement than the alternatives on Fraser Highway that were recommended to be carried forward to Phase 2.

In response to these public comments, additional investigation was carried out on the requirements to operate LRT in the interurban corridor, with the following main findings:

- **Safety Regulations.** To meet Transport Canada requirements for rail passenger safety, LRT vehicles must either be separated from freight train traffic through scheduling, or physically, by constructing separate tracks.

- **Reliability and Service Frequency.** Due to moderately heavy freight traffic throughout the day on the RBRC, separate track would be needed to remove operational conflicts between LRT and freight, in order to ensure fast, frequent and reliable rapid transit service. While freight operations are less frequent on the SRY Fraser Valley Subdivision, there would still be a need for separate track to ensure reliable and frequent rapid transit service.

- **Construction and costs.** Given the need for construction of new track for LRT operations, the following issues arise:
  - **Environmental Risks.** A long section of the corridor travels along the Agricultural Land Reserve and the floodplains of the Serpentine River. Adding track would create risks to biodiversity, water resources and farmlands.
  - **Constructability Challenges.** The corridor has numerous challenges related to constructing new track. These include the constrained existing right-of-way, power lines, industrial lead tracks in Langley, grade crossings, narrow bridges, and poor soil conditions. Maintaining existing freight service would likely result in more
complex and slower construction. To separate LRT from freight operations (providing reliability and enhancing safety), one grade separation would be required, and this would be in a section of the corridor constrained by existing and planned arterial bridges and overhead high-voltage power lines.

- **Costs.** Constructing additional track and stations, acquiring right of way to add the tracks along the existing interurban corridor, and overcoming related construction challenges would be costly.

- **Benefits.** Compared to other alternatives, the interurban corridor has lower population and employment densities along it. It also provides a less direct connection to Surrey Metro Centre. Although it would serve Newton, this is a much smaller travel market. The corridor would provide fewer transportation benefits than other alternatives connecting the urban centres.

In summary, these findings indicate that operation of LRT on this corridor is unlikely to be any easier to implement than on arterial corridors, because providing safe, frequent and reliable service would require construction of separate tracks along the corridor. Given that the construction would likely have similar order-of-magnitude costs to arterial LRT solutions (the range was slightly lower to slightly higher, depending on design), and the lower density land use and ridership potential of the corridor, the benefits of implementing rapid transit on the interurban corridor are insufficient to warrant further consideration as a rapid transit alternative in the SRTAA.

Additional investigation was also carried out on alternative approaches for rail transit vehicles (DMU or EMU) to share track with freight trains in this corridor. This included a review of FRA/TC regulatory compliant and non-compliant vehicles in use in North American applications, and resulted in the identification of significant limitations to implementing such a service in the interurban corridor.

These findings do not preclude the interurban corridor from being considered for other types of passenger rail service. While the associated requirements are not the focus of this study, implementing lower-frequency passenger service could potentially avoid some of the adverse impacts and costs. A commuter or heritage rail service on the interurban corridor could complement rapid transit, but is not in the scope of this study.

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14 Commuter rail was recently investigated as part of the Strategic Review of Transit in the Fraser Valley, and not recommended due to its higher implementation costs versus highway-based rapid bus services connecting the Central Fraser Valley to Langley and Surrey. For more information, refer to the MoTI study completed in 2010.
APPENDIX A – CROSS SECTION EXAMPLES FOR LRT AND BRT IN THE CORRIDOR

Exhibits A.1 and A.2 show conceptual cross sections for LRT and for BRT within the interurban corridor. These cross sections feature a single additional track with passing track sections as needed. They were prepared to support the Phase 1 evaluation of the corridor. The LRT concept was also applied in the expanded review of LRT operations and construction in Section 5.

These sections do not show the hydro poles, or other constraints present along one or both sides of the current track. Some utility relocation would be required if either of these rapid transit cross sections were to be constructed.

Exhibit A.3 shows a typical cross section for a double-tracked LRT in the interurban corridor.

Exhibits A.1, A.2, and A.3 were used to guide the evaluation in Section 5.
Exhibit A-1 – LRT Cross Section for Interurban Corridor – Single Track Example, with Passing
Exhibit A-2 – BRT Cross Section for Interurban Corridor – Single Lane Example, with Passing
Exhibit A-3 -- LRT Cross Section for Interurban Corridor – Double Track Example