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HATCH

**Surrey Newton - Guildford
Light Rail Transit**

**Environmental and
Socio-Economic Review**

DRAFT Terms of Reference
October 16, 2017



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Abbreviations

A list of the acronyms and abbreviations used in the TOR is below.

BC	British Columbia
BCEAA	<i>British Columbia Environmental Assessment Act</i>
CEA Agency	Canadian Environmental Assessment Agency
CEAA 2012	<i>Canadian Environmental Assessment Act 2012</i>
EAO	British Columbia Environmental Assessment Office
GHG	greenhouse gas
LRT	light rail transit
SNG	Surrey Newton-Guildford Line
OMF	Operations and Maintenance Facility
PPHPD	Passengers per Hour per Direction
TOR	Terms of Reference

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Background to the Terms of References

TransLink and the City of Surrey are proposing to develop the Surrey Newton-Guildford (SNG) Light Rail Transit Project (the Project), which will connect the communities of Newton and Guildford, to Surrey Central and TransLink's existing SkyTrain Expo Line. The Project will run from Guildford Mall west, along 104 Avenue to the King George Boulevard, and then south along the King George Boulevard to Newton Station in Surrey.

This Terms of Reference outlines the methods and content for the SNG Environmental and Socio-economic Review (Environmental Review) of the Project. It has been developed to reflect TransLink's desire to have an environmental review completed for the project. The Environmental Review process, technical data reports and Environmental Review Report will support project planning and the public and Aboriginal engagement processes. The Environmental Review will also provide technical information to the construction procurement process, and is intended to support Project due diligence and transparency.

Proponent

South Coast British Columbia Transportation Authority

The mailing address for TransLink is:

400-287 Nelson's Court
New Westminster, BC V3L 0E7

Website Address: <http://www.translink.ca/>

All communication regarding the Project should be sent to:

Project email: surreylrt@translink.ca

Regulatory Backgrounder

The Project will be a street running light rail project of less than 20 km length and is not considered reviewable under either the *British Columbia Environmental Assessment Act (BCEAA)* or the *Canadian Environmental Assessment Act 2012 (CEAA 2012)*. Both the British Columbia Environmental Assessment Office (EAO) and the Canadian Environmental Assessment Agency (CEA Agency) have confirmed in writing their decisions not to review the SNG project under either BCEAA or CEAA.

Notwithstanding the EAO and CEA Agency's decisions not to review the SNG project, TransLink has decided to undertake an Environmental Review of the proposed Project. The Environmental Review will be used to support development of the SNG Project with engagement and input from the public, Aboriginal groups, stakeholders and government agencies. The SNG Environmental Review will also provide technical information to the construction procurement process with respect to environmental performance requirements. This Terms of Reference document provides the outline of that Environmental Review process.

Project Description

The Project is a light rail transit (LRT) line that will connect Surrey's Newton and Guildford communities to Surrey Central and the existing SkyTrain Expo Line. The Project will run west from 152nd Street in Guildford along 104 Avenue to City Parkway, south along City Parkway to 102 Avenue, west along 102 Avenue to King George Boulevard, and then south along King George Boulevard to the Newton terminus near 71 Avenue and 136b Street. Figure 1 illustrates the alignment of the SNG LRT project, identified as Phase 1. A proposed Phase 2, which would involve an extension of the LRT system from King George Station to Langley City is not considered within this Environmental Review.

Project Components

The principal Project components include LRT alignment and guideways, LRT stops, an operation and maintenance facility (OMF), a power, control and communication system and LRT vehicles.

LRT Alignment and Guideway

LRT guideways will generally be located along the centre of 104 Avenue and King George Boulevard. The guideway will consist of two LRT tracks approximately 7.9 m wide and constructed at grade. Roadway alignments will be widened and/or re-configured to accommodate the LRT guideway, as well as general purpose traffic, (i.e. vehicles), bicycles, and pedestrians. While the LRT guideway will be at grade it will be separated by a curb from general purpose vehicle lanes. Other than at major road crossings, general purpose traffic will not be permitted on the guideway.

104 Avenue

Accommodating the LRT along 104 Avenue between the Guildford terminus and King George Boulevard will require a reduction of the number of general purpose traffic lanes from four to two. The re-configured roadway will include sidewalks for pedestrians.

King George Boulevard

King George Boulevard currently has six general purpose traffic lanes between 102 Avenue and 96 Avenue, and four or five general purpose traffic lanes at other segments between 96 Avenue and 72 Avenue. Accommodating the LRT will require reconfiguration of general purpose traffic lanes to four between 104 Avenue and 72 Avenue. The re-configured roadway will include raised bike lanes adjacent to the sidewalk.

LRT Stops and Exchanges

The line will have 11 stops. Seven regular LRT stops and four stops linked to transit exchanges will be constructed at grade and will include side platforms to allow passengers to exit facing traffic, or centre platforms located between tracks. Platforms will initially have a length of 40 m, extendable to 60 m. Side platforms will be 3.6 m to 4.0 m wide, while centre platforms will be 5.0 m to 7.2 m wide. The transit exchanges at Guildford, King George, Surrey Central, and Newton, will connect SNG LRT to SkyTrain and buses.

Figure 1 Project Route Map



Operations and Maintenance Facility

A stand-alone Operations and Maintenance Facility (OMF) will be located in Newton, near the southern terminus of the Project near King George Blvd. It will include a control and administration building, maintenance building, operator’s facility, service pits, traction power substation, and yard track. The OMF will also have perimeter fencing, roadways, and a staff vehicle parking area.

Power, Control, and Communications System

The LRT vehicles will be powered by direct current (DC) motors, supplied by an overhead catenary system supported by poles. DC power will be supplied from eight one-megawatt sub-station units, connected via high voltage power connections to the BC Hydro distribution system.

Light rail transit vehicles will be driver operated, facilitated by radio communications and signalling systems. Signalling systems will include track crossing warning systems, track switching systems, and traffic light control interface. Communications systems include communications cables, telephone and radio systems, as well as a Supervisory, Control, and Data Acquisition system.

LRT Vehicles

The design of the LRT vehicles has yet to be finalized, but are anticipated to be articulated single unit vehicles approximately 30 metres (m) long, each with a capacity of approximately 200 passengers (Figure 2).



Figure 2 Potential Design of LRT Vehicles

Infrastructure Requirements

The LRT system will be powered by electricity supplied by BC Hydro, via existing or new dedicated distribution lines.

Construction Activities

The main construction activities associated with the Project include site preparation and roadwork; construction of guideway, stops and stations, and the OMF; installation of utility and operating systems; and commissioning. Table 1 summarizes the scope of construction work.

Table 1 LRT Construction Activities

Category	Components
Management, Design, and Engineering	Project management; planning; architectural, civil and systems engineering; procurement; systems integration; cost, quality, schedule, and environmental control
Traffic Management	Implementation of traffic measures, including roadway diversions, signage, traffic control, temporary lane closures, temporary access closure, temporary road and lane closure
Utility relocation	Relocation of buried and overhead utilities (e.g., electricity, telecommunications, municipal utilities)
Site preparation	Ground improvement, demolitions, culvert extensions, replacement of Bear Creek Bridge, lowering of guideway under Guildford Mall overhead connector
Environmental Mitigation	Implementation of environmental mitigation measures, which may include but are not limited to: contaminated material removal, fish habitat compensation, installation of noise attenuation measures, landscaping
Roadworks	Widening and alteration of roadways to accommodate transit way, including removal/resurfacing of roads, medians, and sidewalks; instalment of drainage upgrades; replacement of street lights and pedestrian/traffic signalling systems
Transitway/Guideway	Installation of reinforced concrete transitway with embedded trackwork, segregated from vehicle traffic by median curbs, including track switches and crossovers

Category	Components
System structures	Installation of substation buildings, overhead traction power lines, and power distribution/communications ducts
Exchanges and stops	Construction of platform structures, equipment kiosks, platform drainage, lighting, access ramps, traffic calming paving and curbs, safety barriers, service connections. Installation of station facilities, such as bike lockers, signage and furniture, public art, station security and emergency power systems, and flare connection systems
OMF	Construction of OMF buildings, including service pits, yard track, perimeter fencing
Power distribution, signalling, communications, and controls	Installation of overhead power supply catenary system, substations, high voltage connections, and low voltage power distribution systems; instalment of wayside communication and signalling systems, installation of communications and control systems
Testing and commissioning	Testing and commissioning of system

Operations Activities

Once operational, the Project will replace the B-Line bus transit service along 104 Avenue and the King George Boulevard between the Guildford and Newton terminals. Because of the quicker travel time, increased vehicle frequency, and improved rider experience, the Project is expected to increase transit mode share within central Surrey.

Operating Route

The SNG LRT is 10.5 km in length and runs along King George Boulevard from the Newton Transit Exchange to Surrey City Centre, and along 104 Ave from Surrey City Centre to the Guildford Transit Exchange. The system has a predicted average runtime of approximately 24.5 minutes end to end with 2.5 minutes of total dwell time at stops for a total of approximately 27 minutes.

Operating Parameters

The LRT will operate “right hand running” to match the typical street operation, and in exceptional cases the system may operate with Light Rail Vehicles (LRVs) on a single track where the other track is impassable.

Table 2 shows a summary of the operating parameters for the LRT system for both the initial and ultimate (expanded SNG LRT service) configurations.

Table 2 SNG LRT Operating Parameters

	Initial (Phase 1)	Ultimate ⁽¹⁾ (Phase 2)
Total Fleet	16 vehicles	32 vehicles
System Capacity ⁽²⁾	2,040 pphpd ⁽³⁾	4,080 pphpd
Load Standard Average	4 pass/m ²	4 pass/m ²
LRV Length	30 m	30 m x 2 (60 m) – SNG
Minimum Headway	5 minutes	
Stop Dwell Time	14 to 24 seconds	

	Initial (Phase 1)	Ultimate ⁽¹⁾ (Phase 2)
Total Stop Dwell Time	2.5 minutes	
Travel Time	27 minutes	27 minutes
Average Operational Speed	25-35 km/hr	26 km/hr – SNG
Maximum Line Speed	50 km/hr (generally based on traffic speed limit)	
Power Pickup	Overhead Catenary	
Gauge	1,435 mm	
⁽¹⁾ Ultimate assumes doubling of 30 m SNG vehicles to 2 vehicles per train (60 m total)		
⁽²⁾ For system capacity, TransLink Planning uses a factor of 0.85 relative to vehicle capacity (based on 4 pass/m ²)		
⁽³⁾ Calculation for 30 m LRV system capacity = 200 pass/trip x 0.85 x 12 trips per hour per direction = 2,040 passengers per hour per direction (pphpd)		

Line Capacity and Ridership

The ridership analysis indicates that on opening day in 2023, it is estimated there will be 3,300 boardings on the SNG Line during the AM Peak hour (or 36,000 daily boardings) based on the AM peak hour forecast model. This daily ridership is predicted to reach between 51,000 and 55,000 by 2030 and to increase to between 71,000 and 77,000 by 2045. Newton, King George, Surrey Central and Guildford stops show the highest boardings/alightings as these stops serve as key transit exchanges. Table 3 shows the forecasted ridership summary from opening day in 2023 up to 2045. The PM peak load has been scaled based on existing 96-B Line observed data.

Table 3 Surrey-Newton-Guildford LRT Line Ridership Summary

	2023	2030	2045
AM Peak Boardings	3,270	3,900	5,470
Daily Boardings	36,200	53,000 (51,000-55,000)	74,000 (71,000-77,000)
AM Peak Load (pphpd)	900	1,080	1,450
PM Peak Load (pphpd)	1,250	1,500	2,030

Compared to the 96 B-Line, the SNG LRT provides a faster service with higher frequency. Though the 96 B-Line has an end to end run time of approximately 30 minutes today, it is forecasted to slow down significantly in the future due to growing traffic congestion. In 2045, the LRT is forecasted to triple the route ridership when compared to the 2045 96 B-Line ridership

Maintenance and Renewal

Ongoing maintenance of the Project will occur at regular time intervals and as-needed throughout operation. These activities include servicing LRT vehicles and tracks, and maintaining stops, station buildings, and the OMF.

Connection with Other Modes of Transport

Once operational, the Project will replace existing B-Line bus service that currently operates between Guildford Mall and Newton along 104 Avenue and King George Highway. Terminal stations at Guildford and Newton will provide bus connections to destinations in Fraser Heights, Langley, South Surrey, and White Rock. The Project will connect to the SkyTrain at King George Station and Surrey Central Station.

The Project will be expandable to include an LRT line running between King George Station and Langley City, along Fraser Highway (Phase 2).

The Project alignment will be designed to enhance pedestrian experience by maintaining and improving sidewalks along alignment routes; providing safe access to LRT stops, through the use of signage, crossings, and lighting; providing shelters and street furniture at LRT stops; and increasing the frequency of transit service. The Project will maintain and enhance current bicycle lanes along King George Boulevard.

The proposed Project scope does not include park and ride facilities although it will be connected to the Scott Road Park and Ride facility via SkyTrain.

Project Schedule

A summary of the anticipated Project schedule is provided in Table 4. The Project is currently in the procurement readiness stage. During this phase, a number of engineering and planning activities are underway to support preparation of a detailed business case for the Project. If funding from federal, provincial, and regional governments is secured as planned in 2018, construction could begin as early as mid-2019. Construction and commissioning are expected to take three to five years.

Environmental baseline studies began in February 2016, and will continue through the Fall of 2017.

The Project is anticipated to be in operation for 30+ years, with major maintenance and upgrading after approximately 20 years. Electric tram and streetcar systems in Europe have been operating continually for well over 100 years, indicating that with periodic maintenance an LRT system can be operated indefinitely. As such, there are currently no plans for Project decommissioning.

Table 4 Project Schedule for the Newton-Guildford Line

Key Project Activities	2017	2018	2019	2020	2021	2022	2023	2024
Aboriginal Group Engagement	█	█	█	█	█	█	█	█
Stakeholder, Agency and Public Engagement	█	█	█	█	█	█	█	█
Environmental Baseline Studies	█							
Environmental and Socioeconomic Review	█	█						
Permitting and Environmental Management Plans		█						
Engineering Studies	█	█	█					
Construction			█	█	█	█	█	
Commissioning							█	
Operation							█	█

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1 Executive Summary

The Executive Summary will summarize the results of engagement with Aboriginal groups, the public, stakeholders and government agencies; summarize the results of the analysis of project-related effects; and provide conclusions on the overall effects of the Project on the natural and human environment.

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2 Project Description

This section of the Environmental Review Report will:

- Identify and provide Project contact information
- Describe the purpose of the Project, and identify how the objectives of the proposed SNG Project are related to broader private or public sector policies, plans, or programs
- Discuss the relevant history of the proposed Project, including exploratory or investigative studies, and Project alternatives
- Describe the location of the Project and include maps showing regional context
- Identify and describe Project components
- Describe all phases of the proposed Project, including the duration and proposed schedule for construction and operation. Project decommissioning and reclamation will not be discussed since the project has no fixed end of operation
- Describe the activities associated with all components and phases of the Project.

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3 Project Benefits

This section of the Environmental Review Report will describe the anticipated benefits of the proposed Project, including transportation, community, economic, and environmental benefits.

3.1 Transportation Benefits

Description of transportation benefits anticipated to result from the Project, including:

- Improved accessibility
- Travel time savings
- Increased transit ridership
- Improved regional connectivity

3.2 Community Benefits

Description of community benefits anticipated to result from the Project including:

- Complete communities
- Community connectivity
- Urban design features

3.3 Economic Benefits

Description of the economic benefits that will result from the Project, including:

- Enhanced economic output
- Direct, indirect, and induced employment
- Government revenue

3.4 Environmental Benefits

Description of environmental benefits that will result from the Project, including:

- Air quality improvement
- GHG reduction

4 Aboriginal Engagement

The Environmental Review Report will describe the approach taken by the Proponent to:

- Provide Project-related and Environmental Review information to potentially affected Aboriginal groups
- Provide opportunities for Aboriginal groups to review and comment on key environmental review documents
- Obtain the views of Aboriginal groups regarding the Project and the environmental review process
- Identify and respond to issues raised by Aboriginal groups in a respectful manner, including discussions regarding proposed mitigation measures
- Discuss possible Project-related benefits and opportunities for Aboriginal communities

The Environmental Review Report will summarize the Proponent's engagement activities with Aboriginal groups by:

- Summarizing Proponent's past and planned engagement activities with Aboriginal groups in support of the Environmental Review
- Providing a summary of key issues raised by Aboriginal groups regarding the Project and the environmental review process along with the Proponent's responses to those issues, and the status of resolution of the issue (i.e., whether it has been resolved)
- Summarizing how feedback from Aboriginal groups influenced the environmental/socio-economic review, identification of proposed mitigation measures, and the design, construction and operation of the Project

The proponent will also prepare a supporting Aboriginal Engagement Report to provide additional information regarding the Aboriginal engagement program. The report will be attached as an Appendix to the Environmental Review Report.

5 Public Engagement and Information Distribution

The Environmental Review Report will describe the results of the Public Engagement Plan including:

- Background Information:
 - Identification of local governments, residents, property owners, and other rights holders who are potentially impacted by the proposed Project.
 - Maps of local government boundaries, private land, tenures/authorizations, or residences with respect to the proposed Project.
 - Background information about potentially affected municipality and/or stakeholder group.
- Engagement:
 - A summary of past and planned engagement activities.
 - A summary of proposed changes to the approved Public Engagement Plan because of feedback from local governments, stakeholders or individuals, or experience from engagement to date.
 - A description of the key issues raised by the public that are relevant to the Environmental Review, the responses to those issues, and the status of their resolution.

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6 Environmental and Socio-economic Review Scope and Methods

This section of the Environmental Review Report will describe the methods used to assess the potential adverse environmental and socio-economic effects of the Project.

6.1 Issues Scoping and Selection of Review Elements

The Environmental Review Report will describe the process for selecting the various environmental and socio-economic aspects addressed in the review (referred to as “Review Elements”), the metrics used for measuring or describing Project-related changes to the Review Elements, as well as the spatial and temporal boundaries of the review.

6.1.1 Selection of Review Elements

The Environmental Review Report will describe how Review Elements were selected. Proposed Review Elements, identified in Table 6-1 were selected based on:

- What was assessed in similar projects (e.g., Evergreen Line).
- Potential for effects based on the project description for SNG.
- Issues and concerns identified by Aboriginal Groups, government agencies, stakeholders, and the public.
- Relevant environmental policies, regulations, or guidance.

6.1.2 Selection of Potential Effects and Review Criteria

The Environmental Review Report will provide a table identifying the potential effects during Project construction and operations, and review criteria for each Review Element. Potential effects will be identified in consideration of information and concerns identified in Section 4 (Aboriginal Engagement) and Section 5 (Public Engagement). The review criteria will include, as appropriate, quantitative, and qualitative aspects. Where Project-related effects to a Review Element can be measured quantitatively, measurable criteria are used.

Table 6-1 Summary of the Review Elements identified for the SNG project

Review Element (RE)	Rationale for Selection	Spatial Boundaries
Socio-economics	<p>Project construction will disrupt traffic flows.</p> <p>The project may affect housing availability, and access to residential properties</p> <p>LRT construction may affect some commercial operations along the corridor due to change in access.</p> <p>Project may affect mobility of emergency service providers</p> <p>Concerns over safety and security</p>	City of Surrey communities and travel routes near the Project
Archaeological and Heritage Resources	Project construction may adversely affect archaeological and heritage resources.	100 m buffer centred on Project alignment
Fisheries and Aquatics	The project will directly affect freshwater fisheries and aquatic resources during one or more phases of the project.	Watercourses located within 100 m buffer of Project alignment
Vegetation and Wildlife Resources	<p>Interaction with Project activities may impact the viability of plant species of interest, and may alter species-level diversity at the local and regional levels.</p> <p>Project activities could result in the direct loss, alteration and fragmentation of wildlife habitat, and indirect loss of habitat due to sensory disturbance.</p> <p>Vegetation clearing, increased traffic, attraction to facilities and other human activities, and encounters with equipment or Project components may increase wildlife mortality risk.</p>	All green space in a semi-natural or natural state that is encompassed within a 100 m buffer (vegetation) and 200 m buffer (wildlife) centred on the Project alignment
Noise and Vibration	<p>Noise and vibration from construction fleets and other equipment will be emitted during construction and may affect sensitive receptors.</p> <p>Noise and vibration from train operation and stop operation may affect sensitive receptors.</p>	300 m buffer centred on Project alignment
Air Quality and GHGs	<p>Pollutants from equipment, vehicles, and other sources, will be emitted during construction and may adversely affect air quality and subsequently other receptors.</p> <p>Increased GHG emissions from mobile equipment during Project construction.</p>	Urban areas within City of Surrey near Project alignment
Contaminated Sites	Potential for encountering contaminated material during construction.	100 m buffer centred on Project alignment
Electric and Magnetic Fields	Public concern over effects of potential EMF emissions from electrified transit lines.	100 m buffer centred on Project alignment and power sub-stations

The Environmental Review Report will provide justification for why Review Elements suggested by government agencies, Aboriginal groups, stakeholders or the public during engagement were excluded from the review. Generally, Review Elements are excluded because of limited presence within the study area or limited potential for Project interactions.

6.1.3 Boundaries

The Environmental Review Report will describe the methods used in identifying applicable review boundaries, and will describe technical or administrative factors that may affect the assessment of Project-related effects. Information on boundaries of assessment of Review Elements will be included in the appropriate sections of the Environmental Review Report and will encompass relevant project phases, components, and activities.

Table 6-1 provides proposed spatial boundaries by Review Element.

6.2 Existing Conditions

For each Review Element section, the Environmental Review Report will include a description of existing (or baseline) conditions within the study area in sufficient detail to enable review of the potential project-related interactions that are identified and assessed.

The Environmental Review Report will contain technical appendices for Review Elements with field components as appropriate. Key findings contained in these technical reports will be summarized directly in the Environmental Review Report.

6.3 Potential Effects

The Environmental Review Report will summarize the overall process and methods used to identify and assess the potential effects of the proposed Project during construction and operations on the identified Review Elements. This includes a description of potential interactions between the Project and Review elements, and pathways of consequent effects. Interactions between project activities and potential effects will be identified in a matrix for each Review Element section.

6.4 Mitigation Measures

For each Review Element, the Environmental Review Report will describe mitigation measures that will be incorporated into project design and planning, including site and route selection, project scheduling, and construction and operation (e.g., equipment selection, placement, emissions abatement measures) to avoid/reduce Project-related adverse effects.

6.5 Discussion of Project Effects

The Environmental Review Report will discuss project effects for each Review Element, in consideration of the local environmental and socio-economic context, potential project interactions, and proposed mitigation measures. Relevant criteria such as magnitude, geographical extent, and duration will be used to describe/characterize the effects. Where effects cannot be characterized quantitatively, they will be discussed qualitatively.

6.6 Conclusions

The Environmental Review Report will present conclusions on potential Project effects on each Review Element, and implications of such effects in the context of sensitivity and resilience of the Review Element to Project-induced changes.

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7 Assessment of Potential Effects

The Environmental Review Report will include an assessment of environmental and socio-economic effects based on selected REs identified herein. The assessment will be conducted consistent with the methodology presented in Section 6.

7.1 Environmental and Socio-Economic Setting

The Environmental Review Report will provide an overview of the environmental and socio-economic setting of the review area, including an overview of geographical and biophysical features, built environment, and land use.

7.2 Socio-economics

The Environmental Review Report will provide an overview of the socio-economic assessment and the rationale for its selection as a Review Element. The Environmental Review Report will also describe how the results of the assessment of socio-economics will be integrated with the analysis of other Review Elements. Table 7-1 identifies potential adverse effects and review criteria used to review effects related to change in socio-economics.

Table 7-1 Potential Effects and Review Criteria for Socio-economics

Topics Included in Assessment	Potential Effects	Review Criteria
Traffic/Congestion Transportation Infrastructure Housing Infrastructure and Services Commercial Businesses	Change in traffic and transportation	<ul style="list-style-type: none"> Roadway description (e.g., # of lanes) Change in parking Change in vehicle volume (vehicles/day, vehicles-km travelled) Passenger vehicle travel time (selected Origin/Destinations) Transit (travel time, ridership) Pedestrian/cyclist information
	Change in residential property and commercial business	<ul style="list-style-type: none"> Property access change Population change Number and type of residential properties affected by the Project Housing availability and cost metrics Number of businesses affected by the Project
	Change in emergency health care services and public safety	<ul style="list-style-type: none"> Access to emergency health care and trauma services (qualitative) Emergency medical (EMS), fire rescue, and police response routes (qualitative) Crime Rates Community infrastructure and services

7.3 Archaeological and Heritage Resources

The Environmental Review Report will provide an overview of Archeological and Heritage Resources assessment, and the rationale for its selection as a Review Element. The Environmental Review Report will also describe how the results of the Archeological and Heritage Resources assessment will be integrated with the analysis of other Review Elements. Table 7-2 identifies the potential adverse effects and review criteria for archaeological and heritage resources.

Table 7-2 Potential Effects and Review Criteria for Archaeological and Heritage Resources

Topics Included in Assessment	Potential Effects	Review Criteria
Archaeological sites	Alterations to archaeological site contents or context	<ul style="list-style-type: none"> Number and description of archaeological sites altered as a result of Project activities
Heritage sites	Alterations to heritage buildings, landscapes, or other sites of heritage value	<ul style="list-style-type: none"> Number and description of heritage sites altered as a result of Project activities

7.4 Fisheries and Aquatic Resources

The Environmental Review Report will provide an overview of the Fisheries and Aquatic Resources assessment, and the rationale for its selection as a Review Element. The Environmental Review Report will also describe how the results of the review of Fisheries and Aquatic Resources will be integrated with the analysis of other Review Elements. Table 7-3 identifies potential adverse effects and review criteria used to assess effects on fisheries and aquatic resources.

Table 7-3 Potential Effects and Review Criteria and Spatial Boundaries for Fisheries and Aquatic Resources

Topics Included in Assessment	Potential Effects	Review Criteria
Fish Habitat Fish Mortality or Health	Change in fish habitat Change in fish mortality or health	<ul style="list-style-type: none"> Total area (m²) of instream habitat permanently altered or destroyed Total area (m²) of riparian habitat permanently altered or destroyed Qualitative estimate of mortality risk (all life stages) due to extent, duration, or timing of instream works; changes in water quality (including changes in Total Suspended Solids)

7.5 Vegetation and Wildlife Resources

The Environmental Review Report will provide an overview of the Vegetation and Wildlife Resources assessment, and the rationale for its selection as a Review Element. The Environmental Review Report will also describe how the results of the Vegetation and Wildlife Resources assessment will be integrated with the analysis of other Review Elements.

Table 7-4 identifies potential adverse effects and review criteria used to assess effects on vegetation and wildlife resources.

Table 7-4 Potential Effects and Review Criteria for Vegetation and Wildlife Resources

Topics Included in Assessment	Potential Effects	Measurable Parameters
Species and Ecosystems of Management Concern	Change in abundance of species or communities of interest	<ul style="list-style-type: none"> • Presence and abundance of species at risk • Presence and abundance of invasive species • Areal extent of provincially-listed ecological communities at risk and wetlands
	Change in abundance or quality of ecological communities and wildlife habitat	<ul style="list-style-type: none"> • Areal extent of change in habitat for focal species of management concern • Change in the availability of wildlife habitat features
Green Space	Change in quantity, quality, or connectivity of green space	<ul style="list-style-type: none"> • Areal extent of forest canopy cover • Areal extent of Green Infrastructure Network elements
Mortality Risk	Change in injury, or mortality of wildlife	<ul style="list-style-type: none"> • Changes in mortality risk

7.6 Noise and Vibration

The Environmental Review Report will provide an overview of the Noise and Vibration assessment, and the rationale for its selection as a Review Element. The Environmental Review Report will also describe how the results of the Noise and Vibration assessment will be integrated with the analysis of other Review Elements. Table 7-5 identifies potential adverse effects and review criteria for noise and vibration.

Table 7-5 Potential Effects and Review Criteria and Spatial Boundaries for Noise and Vibration

Topics Included in Assessment	Potential Effects	Review Criteria
Construction noise Operational noise	Change in Noise Levels	Predicted noise level during construction and operation phases quantified using the following parameters: <ul style="list-style-type: none"> • Daytime and night time equivalent sound level (Ld and Ln) in dBA • Hourly equivalent sound level (Leq [1 hour]) in dBA • Day-Night sound level (Ldn) in dBA • 24-hour equivalent sound level (Leq [24 hours]) in dBA
Construction vibration Operational vibration	Change in Vibration Levels	Predicted ground vibration levels during construction and operation phases quantified using the following parameters: <ul style="list-style-type: none"> • Peak particle velocity (PPV) in mm/s • Room mean square (RMS) velocity in mm/s • PPV or RMS level in VdB

7.7 Air Quality and Greenhouse Gases

The SNG Project will replace diesel powered busses that operate between Newton Station on King George Boulevard and on 104 Avenue to Guildford Centre. Thus, once operational, the Project will have a net beneficial effect on local criteria air contaminate emissions and provincial GHG emissions both from the reduction of diesel bus emissions and from the reduction in vehicle emissions due to riders switching from personal vehicle use. As a result, the air quality assessment

will focus on the effects of the emission of criteria air contaminants (CACs) during construction activities, namely SO₂, NO₂, CO, PM₁₀, PM_{2.5}, as well as dust, and greenhouse gases.

The Environmental Review Report will provide an overview of the Air Quality and Greenhouse Gases assessment, and the rationale for its selection as a Review Element. The Environmental Review Report will also describe how the results of the Air Quality and Greenhouse Gases assessment will be integrated with the analysis of other Review Elements. Table 7-6 identifies potential adverse effects and review criteria for the air quality and greenhouse gases.

Table 7-6 Potential Effects and Review Criteria for Air Quality and Greenhouse Gases

Topics Included in Assessment	Potential Effects	Review Criteria
Ambient concentrations of CACs	Change in the ambient concentration of CACs	<ul style="list-style-type: none"> Concentrations of CACs (SO₂, NO₂, CO, PM₁₀, PM_{2.5},)
Greenhouse gas emissions	Emissions of GHGs	<ul style="list-style-type: none"> Release GHGs (CO₂, CH₄, N₂O, reported as CO_{2e})

Project benefits with respect to provincial GHG emissions are discussed in Section 3.4. Construction related GHG emissions and mitigation measures will be addressed qualitatively.

7.8 Contaminated Sites and Excavated Materials

The Environmental Review Report will provide an overview of the Contaminated Sites assessment and the rationale for its selection as a Review Element. The Environmental Review will also address disposal options for excavated materials. The Environmental Review Report will also describe how the results of the Contaminated Sites assessment will be integrated with the analysis of other Review Elements.

The contaminated sites assessment will focus on the effects of disturbance to contaminated sites during Project construction. Table 7-7 identifies potential adverse effects and review criteria used to assess effects associated with contaminated sites.

Table 7-7 Potential Effects and Review Criteria for Contaminated Sites and Excavated Materials

Topics included in Assessment	Potential Effects	Review Criteria
Contaminated soils	Release of contaminants from contaminated soils or water encountered during construction	<ul style="list-style-type: none"> Existence and location of contaminated sites Nature of contaminated materials

7.9 Electric and Magnetic Fields

The Environmental Review Report will provide an overview of the Electric and Magnetic Fields assessment and the rationale for its selection as a Review Element. The Environmental Review Report will also describe how the results of the assessment of Electric and Magnetic Fields will be integrated with the analysis of other Review Elements. Table 7-8 identifies potential adverse effects and review criteria for the review of electric and magnetic fields.

Table 7-8 Potential Effects and Review Criteria for Electric and Magnetic Fields

Topics included in Assessment	Potential Adverse Effects	Review Criteria
EMF Effects	Change in EMF levels	<ul style="list-style-type: none">• Electric field (V/m)• Magnetic field (mG)• Stray Current

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8 Accidents, Malfunctions, and Natural Hazards

The Environmental Review Report will include:

- Identification of potential accidents and malfunctions, such as:
 - Fire
 - Fuel leak or spill
 - Power outage
 - Train derailment
- The methodology for assessing the potential risk of an event (likelihood and consequence)
- Identification of proposed measures to reduce the likelihood of the event
- Conclusions on the potential risk of the accident or malfunction to Review Elements.

The Environmental Review Report will include:

- The environmental factors deemed to have possible consequences on the proposed project, including, but not necessarily limited to, consideration of natural hazards such as:
 - Seismic events
 - Extreme weather (wind storms; heavy rain and/or snow)
- A description of any changes or effects on the proposed Project that may be caused by the above-mentioned environmental factors
- The likelihood and consequence of the changes or effects to relevant Review Elements
- Practical mitigation measures, including design strategies and environmental contingency plans, to avoid or minimize the likelihood and consequence of natural hazards
- A conclusion about the potential risk of natural hazards to Review Elements

9 Environmental Management Plans

The Environmental Review Report will include:

- A list of Management Plans for the construction and operation phases of the proposed Project.
- A description of the contents of each Management Plan, including the identification of any mitigation measures described in previous sections.
- A list of all applicable licenses, permits and/or approvals that are already received or required for the phases of the proposed Project, and the associated responsible regulatory body.

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10 Summary and Conclusion

The Environmental Review Report will:

- Summarize potential project effects in a table format that depicts the potential effect, project phases, project activity or physical work linked to the effect
- Summarize mitigation measures and environmental management plans that will be implemented to avoid and limit potential adverse project effects on environmental and socio-economic values.
- Provide conclusions on overall environmental and socio-economic effects of the Project.

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11 References

The Proponent will provide a list of reference material used in developing the Environmental Review Report. Below is a list of materials used to develop the TOR.

British Columbia Environmental Assessment Office. 2013. Guideline for the Selection of Valued Components and Assessment of Potential Effects. Available at:
http://www.eao.gov.bc.ca/VC_Guidelines.htm.

British Columbia Environmental Assessment Office. August 2015. Application Information Requirements Template. Available at: <http://www.eao.gov.bc.ca/guidance.html>.

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