Fraser River Tunnel Project
Initial Project Description

April 2022

EXECUTIVE SUMMARY

The Ministry of Transportation and Infrastructure (Ministry) proposes to replace the Existing George Massey Tunnel (Existing Tunnel) with a new eight-lane immersed tube tunnel (ITT), replace the existing Deas Island Bridge, and construct connections to Highway 99, collectively referred to as the Fraser River Tunnel Project (the Project). Construction of the Project will be carried out directly upstream of the Existing Tunnel.

This Initial Project Description (IPD) for the Project has been prepared in accordance with the British Columbia *Environmental Assessment Act 2018,* SBC 2018, c. 51 (BCEAA) and associated guidance documents. The purpose of this IPD is to initiate the Early Engagement Phase of the environmental assessment process by presenting information to interested parties so they can develop an understanding of the proposed Project. The IPD is accompanied by an Engagement Plan, which describes engagement conducted to date and planned for in the environmental assessment process. Once the Environmental Assessment Office (EAO) accepts the IPD and Engagement Plan, the Early Engagement Phase of the environmental assessment process formally starts.

The Project is located within the Metro Vancouver Region of southwestern BC and within the municipal boundaries of the City of Richmond and City of Delta (Delta). The Project occurs mainly on provincial Crown land in Richmond and Delta, and under the Fraser River South Arm, designated as the Ministry Highway 99 right of way (Highway 99 ROW).

The Project is also located within Tsawwassen First Nation Territory as defined in the Tsawwassen Final Agreement and within or near the asserted traditional territories of several Indigenous groups. The two closest Indigenous communities to the Project are the Tsawwassen First Nation and Musqueam Indian Band.

The Project's goals are to provide safe, reliable, and accessible transportation options that meet the objectives for sustainable growth for the Metro Vancouver region. Key benefits of the Project include the following:

- providing traffic congestion relief at the Existing Tunnel
- addressing the long-term seismic safety performance of the Existing Tunnel
- improving transit speed and reliability along the Highway 99 corridor
- establishing a dedicated active transportation connection for pedestrians and cyclists across the Fraser River on Highway 99
- maintaining the current clearances for the Fraser River navigational channel

The Project consists of six general-purpose lanes and two dedicated transit lanes through the crossing, which are serviced by extended bus-on-shoulder lanes to the crossing. The Project represents a significant investment in multi-modal transportation improvements and supports provincial and regional strategies, sustainability objectives, and the economic development of the region, the Province, and Canada.

The Project will be designed to modern standards for seismic performance, safety, and vehicle clearances and will include a multi-use path to connect pedestrians and cyclists with active transportation routes on either side of the Fraser River and is planned to be open to traffic in 2030. The Existing Tunnel and ancillary infrastructure will be removed following completion of the Project.

Delivery of the Project will be led by Transportation Investment Corporation (TI Corp), a Crown corporation established under the *Transportation Investment Act,* SBC 2002, c. 65, with a mandate to deliver major infrastructure on behalf of the Ministry. Following announcement of the Project in August 2021, TI Corp was assigned responsibility for the delivery of the Project and will lead technical design, contractor procurement, future oversight, and the environmental assessment process for the Project. If approved, the Ministry would own and maintain the new infrastructure.

Project Components

The Project comprises the following infrastructure, as well as various temporary construction and ancillary facilities:

- new ITT to be installed under the Fraser River connected to Highway 99 by the north and south portals
- new Deas Slough Bridge connecting the new ITT to Highway 99 in Delta; a temporary trestle across Deas Slough would be required to construct the new bridge
- north and south approach roads, tunnel portal structures, and flood protection works
- temporary casting basin to fabricate the tunnel elements in the dry, which can be flooded upon completion of the tunnel elements
- temporary material offloading facilities to accommodate barge unloading of Project equipment and materials during construction
- temporary outfitting jetty to allow access for lifting equipment to prepare the tunnel elements for immersion
- temporary offsite moorage location to stage completed tunnel elements prior to transport for immersion

- construction site access and laydown areas for site offices and staff facilities; material testing facilities; onsite concrete batching plant; material storage; equipment storage; parking for construction staff; site services including power, water, sanitary and communications; and site drainage and water treatment facilities

Following completion of the Project, the Existing Tunnel, existing Deas Island Bridge, CN Railway overpass, and Rice Mill Road overpass across the north portal would be removed.

Project Schedule

The planning, design, and eventual construction of the Project would incorporate mitigation measures to be developed throughout the environmental assessment process in consultation with Indigenous groups, stakeholders, and regulatory agencies. Established Fisheries and Oceans Canada (DFO) least risk windows (July 16 to February 28) for the protection of aquatic and terrestrial ecological receptors would be factored into the development of construction plans and would reflect regulatory requirements and feedback from Indigenous groups, stakeholders, and regulatory agencies during the environmental assessment process. The overall anticipated schedule for the Project is provided in the following table.

Table ES1: Anticipated Project Schedule

Task	Year 20-												
	21	22	23	24	25	26	27	28	29	30	31	32	33
Project announcement	■												
Environmental Assessment process		■	■	■									
Procurement			■	■									
Permitting				■	■								
Detailed design and construction				■	■	■	■	■	■	■			
Operation and maintenance										■	■	■	■
Decommissioning of Existing Tunnel											■	■	

Alternatives to the Project

Consideration of alternatives to the Project builds upon findings and recommendations from the Independent Technical Review commissioned by the Province to review the 2013 decision to replace the Existing Tunnel with a 10-lane bridge. The proposed 10-lane bridge project was the subject of a number of concerns raised by Metro Vancouver communities, specifically that the 10-lane bridge concept and other improvements were too large and complex, had too many lanes, and did not align with Metro Vancouver's regional growth strategy.

Alternative Means of Carrying Out the Project

Alternative means of carrying out the proposed Project has considered technically and economically feasible options for the Project design and siting options, crossing configuration, casting basin, dredging methods, temporary offsite moorage locations, and disposal alternatives.

Design and Siting Constraints

The upstream alignment has been established to minimize potential impacts to utilities, the Existing Tunnel, and properties.

Crossing Configuration

To support selection of the Project's technology choice for the service delivery options, a configuration analysis was completed to determine the recommended number and allocation of lanes, such as a dedicated transit or general-purpose traffic lane. Results of the crossing configuration analysis determined that a symmetrical eight-lane crossing (i.e., four lanes in each direction) would best achieve the Project's goals and objectives. Motorists would benefit from capacity gains due to modern lane widths and geometry, elimination of the counterflow system, and a potential separation of transit from general-purpose lanes, such that buses would not use the general-purpose traffic lanes, thereby improving capacity of the lanes through the new ITT. Transit services would also benefit with dedicated transit lanes providing some additional travel time benefits and incentives for transit or high-occupancy vehicle users.

Dredge Disposal

The Project would generate sediment from the dredging required for the new ITT and soils from excavation of the portals. The options for disposal are based on the guidance of the *Canadian Environmental Protection Act,* SC 1999, c. 33, which provides expectations for the assessment of waste disposal.

Emissions, Discharges, and Waste

Project-related components and activities are anticipated to result in emissions, discharges, and waste from the construction and operations of the Project. Potential sources of emissions, discharges, and waste will be assessed in detail during the environmental assessment process based on refined Project information.

Land and Water Use

Land use in the area is governed by local governments and in collaboration with Indigenous groups. In Richmond, the north tunnel approach component overlaps with lands designated as general urban in the Metro 2040 regional growth strategy (Metro Vancouver 2040), which includes areas intended for residential neighborhoods and centres, services, institutions, recreational facilities and parks. The south tunnel approach and portal ROW traverses through Deas Island Regional Park, which is designated as conservation recreation. The proposed Deas Slough Bridge crosses Deas Slough adjacent to a small portion of conservation- and recreation-designated land along the southern bank in Deas Island Regional Park. The majority of the Project would be located within the existing Highway 99 ROW; however, there may be additional land requirements during construction for the southern portion of Deas Island, as well as additional temporary land requirements for the construction site facilities. The location of the temporary construction site facilities and extent of additional land requirements that may be required outside of the Highway 99 ROW will be determined as the engineering and property requirements for the Project are confirmed and will be reflected in subsequent stages of the environmental assessment process.

Legislative and Regulatory Context

Under the BCEAA, the Reviewable Projects Regulation (BC Reg 67/2020) sets out the criteria for determining which projects require review under the BCEAA. Proposed new projects, modifications of existing projects, and proposed dismantling or abandonment of an existing project that meet certain criteria under the Reviewable Projects Regulation require an environmental assessment.

With construction of the new ITT and removal of the Existing Tunnel, the Project is expected to cause direct physical disturbance of more than 2 ha of foreshore or submerged land, or a combination of foreshore and submerged land, below the natural boundary of the Fraser River. Therefore, the Project triggers environmental review under the BCEAA as a shoreline modification project, according to Part 5, Table 9 of the Reviewable Projects Regulation.

Under the federal *Impact Assessment Act*, S.C. 2019, c.28, s.1, the Physical Activities Regulations (SOR/2019-285) sets out the projects and activities that require an impact assessment under the *Impact Assessment Act*. As the proposed works comprising the Project are not included in the list of physical activities that constitute designated projects that may require an impact assessment, the Project does not trigger a federal review by the Impact Assessment Agency under the *Impact Assessment Act*.

Based on the current location of the Project and the proposed physical activities and components, various federal and provincial permits, approvals, and authorizations may be required, subject to receipt of an Environmental Assessment Certificate (EAC).

Physical, Biological, and Human Environment Conditions

Potential physical, biological, and human environmental conditions and characteristics, including sensitive and vulnerable values to be scoped into the environmental assessment include the following:

- air quality and greenhouse gases, atmospheric and underwater noise, Fraser River hydrology, and water and sediment quality
- vegetation and terrestrial ecosystems, wildlife and wildlife habitat, fish and fish habitat, and marine mammals
- employment and economy, land and marine use, visual quality, services, infrastructure and transportation, cultural heritage, and human health. The human environment assessment for the Project will consider disproportionate effects on distinct human populations, including populations identified by gender.

Cumulative Effects

Environmental and socio-economic impacts and sensitivities from other existing and reasonably foreseeable future projects and activities will be included in the cumulative effects assessment and will be identified in the Project Planning phase during preparation of the Detailed Project Description and the Application Information Requirements. The EAC Application will include a rationale for how the other existing and reasonably foreseeable projects and activities will be identified and a methodology to determine if the potential Project-related residual effects are expected to result in cumulative effects.

Accidents and Malfunctions

Potential accidents and malfunctions that could occur with the proposed Project include the following:

- accidental release of deleterious substances from vessels, vehicles, machinery, equipment, or damage to utilities
- accidental failure of stormwater and/or erosion and sediment control measures resulting in localized flooding, erosion, and/or a release of sediment laden water to the aquatic environment
- transportation incidents during supply/materials delivery and construction equipment mobilization to and from site
- vessel collision or failure resulting in obstruction of navigation and/or navigational safety

Effects of the Environment on the Project

Environmental conditions and natural hazards could adversely affect the Project, which, in turn, could result in potential effects to the environment. Potential effects of the environment on projects are typically a function of design and risks of natural hazards within any given Project area and are typically mitigated through engineering design, regulatory requirements, industry standards, and best management practices.

Elements of the environment that could potentially affect the Project include the following:

- seismic events and tsunamis
- extreme weather conditions, such as wind, heavy precipitation, flooding, and lightning
- sediment and riverbed instability, resulting in erosion and scour
- climate change

Indigenous Engagement and Interests

The Ministry has a legal duty to consult and, where appropriate, accommodate where the Crown has knowledge of an asserted or established Aboriginal or treaty right and where a proposed decision may adversely impact that asserted or established right. Both asserted Indigenous rights and treaty rights overlap the Project area. A Consultative Areas Database search identified 16 Indigenous groups with asserted or established territories that overlap with the Project.

Upholding the commitment of the Province to reconcile with Indigenous groups, the Ministry has developed its Indigenous engagement approach based on the Draft Principles that Guide the Province of British Columbia's Relationship with Indigenous Peoples, the Government Consultation Bulletin on Consulting During the COVID-19 Emergency, and the *Declaration on the Rights of Indigenous Peoples Act,* SBC 2019, c. 44 (2019).

Indigenous engagement on replacing the Existing Tunnel has been ongoing since 2013, during which time many interests and issues were raised by various Indigenous groups. Engagement with Indigenous groups is ongoing, including discussions about interests and issues raised during the environmental assessment of the previous 10-lane bridge project to understand what is relevant to carry forward to the present previous 10-lane bridge project. The Ministry's engagement plans and activities are intended to build upon, and will be informed by, feedback and learnings from the previous 10-lane bridge project. Upon request, the Ministry would be pleased to provide records and a summary of issues and interests raised by identified Indigenous groups during these previous engagements. Discussions with Indigenous groups are ongoing to confirm key issues and interests that will be incorporated into engagement planning and the environmental assessment as the Project progresses. Finally, a detailed list of issues will be produced following comprehensive engagement during the various stages of the environmental assessment process.

The Ministry has engaged with identified Indigenous groups on crossing options, including a tunnel crossing, as part of previous iterations of the Project from February 2019 up to the announcement in August 2021. Engagement with Indigenous groups during previous iterations of the Project included a detailed review of crossing options, development of environmental studies targeted at developing knowledge of some culturally important fish and wildlife species, capacity funding agreements to support Indigenous participation, information sharing, and meetings in-person and virtually.

Since the Project's announcement in August 2021, the Ministry has referred the Project to the following Indigenous groups (listed alphabetically):

- Aitchelitz First Nation (represented by S'ólh Téméxw Stewardship Alliance and the People of the River Referrals Office [PRRO])
- Chawathil First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Cheam First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Cowichan Tribes (represented by the Quw'utsun Nation)
- Halalt First Nation (represented by the Quw'utsun Nation)
- Katzie First Nation
- Kwantlen First Nation
- Kwaw'Kwaw'Apilt First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Kwikwetlem First Nation
- Lyackson First Nation (represented by the Quw'utsun Nation)
- Musqueam Indian Band
- Penelakut Tribe (represented by the Quw'utsun Nation)
- Scowlitz First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Seabird Island Band
- Semiahmoo First Nation
- Shxwhà:y Village (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Shxw'?whámel First Nation
- Skawahlook First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Skowkale First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Skwah First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Snuneymuxw First Nation (no engagement record during previous iteration of the project)
- Soowahlie First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Squiala First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Stz'uminus First Nation (represented by the Quw'utsun Nation)
- Sumas First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Tsawwassen First Nation

- Tsleil-Waututh First Nation
- Ts'uubaa-asatx (formerly Lake Cowichan First Nation)
- Tzeachten First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Yakweakwioose First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Yale First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)

Planned Indigenous Engagement Activities

Based on engagement with Indigenous groups to date, the Ministry plans to conduct the following activities during the Early Engagement phase in collaboration with Indigenous groups that may be further refined through discussions with the EAO:

- seek to establish individual capacity funding agreements with participating Indigenous groups to support their overall capacity and ability to participate in the environmental assessment
- pursue ongoing and regular engagement with all identified Indigenous groups throughout the environmental assessment process and during subsequent phases of the Project
- share Project information through various mediums, including e-mail, secure file transfer, and in-person meetings should COVID-19 protocols allow
- coordinate and conduct monthly engagement meetings where Indigenous groups will be invited to:
    - participate in discussions and learning opportunities related to the Project
    - provide input and views regarding the Project and how it relates to their interests
- coordinate and conduct Project-related workshops, site visits, and community meetings
- identify, discuss, and incorporate relevant agreements (including between Indigenous groups), memoranda of understanding, assessment protocols, treaties, and/or other publicly available information of potentially affected Indigenous groups
- convene regular check-ins with Indigenous groups regarding capacity challenges and potential mitigation measures
- support Indigenous-led studies and assessments related to the Project
- seek feedback from Indigenous groups regarding adapting current and proposed engagement tools and methods to best suit their needs

Current Use of Land and Resources for Traditional Purposes

The Ministry will work with Indigenous groups to identify and conduct traditional use studies to understand traditional and current use of lands and resources surrounding the Project and how the Project may

impact these uses. To the extent possible, the Ministry will build upon the assessments of resources and land use for traditional purposes conducted in the previous 10-lane bridge project to inform these assessments.

Engagement and Consultation with Local Governments, Stakeholders, and the Public

The Ministry recognizes the critical role of members of the public and other stakeholders and their keen interest in learning more about the Project. The Ministry is committed to providing accessible project information that supports the public and stakeholder's participation through engagement. The Ministry held two public open houses in spring 2020 in Delta and Richmond to support public dialogue on the shortlisted crossing options considered at that time. Through the fall of 2021, the Ministry met with several stakeholders and interested parties to re-engage these groups as part of pre-early engagement efforts to understand their preliminary questions and issues.

The focus of the Ministry's engagement activities on the Project is to ensure government and regional authorities, the public, and other interested parties are informed about the Project, have access to information, and are encouraged to provide feedback throughout the environmental assessment process, design, and, subject to receipt of an EAC, the eventual construction process. In addition, the Ministry is planning to establish a community office in the City of Delta in 2022. The office will provide a local connection and meeting point for the Project. The Ministry has developed a draft Early Engagement Plan to ensure open dialogue is maintained with all public and other interested stakeholders to meet the engagement objectives of the environmental assessment process.

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LIST OF ATTACHMENTS

Version History

Version	Revision Date	Authors	Version Description
1.0	Nov 29 2021	D. Paslawski, J. Meyboom, D. Vermeulen, B. Bennett, K. Fennel	Initial Project Description for preliminary review with Indigenous groups, stakeholders, local governments and government agencies.
2.0	Feb 22, 2022	D. Gamble, H. Courteau, R. Scott, J. Quigley, J. Wilkinson, K. Chambers, S. Faulkner D. Paslawski, J. Meyboom, L. Harlley, B. Bennett, K. Fennel	Initial Project Description for issuance to the EAO.
3.0	Mar 28, 2022	D. Gamble, H. Courteau, R. Scott, J. Quigley, J. Wilkinson, K. Chambers, S. Faulkner D. Paslawski, J. Meyboom, L. Harlley, B. Bennett, K. Fennel, C. Klatt, V. Garrett	Final Initial Project Description for issuance to the EAO.
3.1	Apr 6, 2022	D. Gamble, H. Courteau, R. Scott, J. Quigley, J. Wilkinson, K. Chambers, S. Faulkner D. Paslawski, J. Meyboom, L. Harlley, B. Bennett, K. Fennel, C. Klatt, V. Garrett	Final Initial Project Description incorporating EAO feedback reflecting Early Engagement Policy (Initial Project Description Guidelines) – for acceptance by EAO
3.2	Apr 7, 2022	D. Gamble, H. Courteau, R. Scott, J. Quigley, J. Wilkinson, K. Chambers, S. Faulkner D. Paslawski, J. Meyboom, L. Harlley, B. Bennett, K. Fennel, C. Klatt, V. Garrett	Final Initial Project Description incorporating EAO feedback reflecting Early Engagement Policy (Initial Project Description Guidelines) – for acceptance by EAO (minor changes to address EAO comments)

Acronyms and Abbreviations

Acronym	Description
ALR	Agricultural Land Reserve
BCEAA	British Columbia *Environmental Assessment Act,* 2018
CAC	criteria air contaminant
CO_2e	carbon dioxide equivalents
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Fisheries and Oceans Canada
EAO	Environmental Assessment Office
EAC	Environmental Assessment Certificate
Existing Tunnel	Existing George Massey Tunnel
FTE	full-time equivalent
GBA+	Gender-Based Analysis Plus
GHG	greenhouse gas
IPD	Initial Project Description
ITT	immersed tube tunnel
LAA	Local Assessment Area
Metro Vancouver	Metro Vancouver Regional District
MUP	multi-use path
OCP	Official Community Plan
Proponent	Transportation Investment Corporation on behalf of the Ministry of Transportation and Infrastructure
PRRO	People of the River Referrals Office
RAA	Regional Assessment Area
RGS	regional growth strategy
ROW	right of way
SARA	*Species at Risk Act*
the Ministry	Ministry of Transportation and Infrastructure
the Project	Fraser River Tunnel Project
TI Corp	Transportation Investment Corporation
VC	valued component
VFPA	Vancouver Fraser Port Authority
WMA	Wildlife Management Area

1 INTRODUCTION

The intent of the Initial Project Description (IPD) is to provide information to regulatory agencies, Indigenous groups, and stakeholders participating in the environmental assessment process about the proposed Project and to identify preliminary interests and concerns to be considered and assessed by the Project in the Environmental Assessment Application.

This IPD was prepared in accordance with guidance published by the Environmental Assessment Office (EAO) under the BC *Environmental Assessment Act*, SBC 2018, c. 51 (BCEAA). Attachment 1 provides a Table of Concordance that demonstrates how the requirements of Appendix 1 (Initial Project Description) of the Early Engagement Policy (EAO 2019) have been met in this IPD.

1.1 PROJECT INTRODUCTION

The Ministry of Transportation and Infrastructure (Ministry) proposes to replace the Existing George Massey Tunnel (Existing Tunnel) with a new eight-lane immersed tube tunnel (ITT), replace the existing Deas Island Bridge, and construct connections to Highway 99, collectively referred to as the Fraser River Tunnel Project (the Project; Figure 1.1-1). Construction of the Project will be carried out directly upstream of the Existing Tunnel. The Project occurs mainly on provincial Crown land in Richmond and Delta and crosses under the Fraser River South Arm, which is designated as the Ministry Highway 99 right of way (hereafter referred to as the Highway 99 ROW). The Highway 99 ROW is a dedicated arterial highway under the jurisdiction of the Ministry and designated as a numbered highway for transportation. There are no regulatory permits required for the operation and maintenance of the Existing Tunnel and Deas Slough Bridge.

The Project is one of a number of independent upgrades proposed to improve the functionality of the Highway 99 corridor. Collectively, the Highway 99 Tunnel Program, which includes the Project and several corridor improvements, are required to address traffic congestion and safety challenges and to improve transit and cycling connections on Highway 99. Furthermore, and as indicated in Section 2.1, the need for the Project is independent of any planned or proposed upgrades or expansions to other infrastructure components to support the international transportation gateways of the region's marine port, airport facilities, provincial highway network, Tsawwassen ferry terminal, and land border with the United States.

Although most of the Project is within the existing Highway 99 ROW, there may be some additional temporary and permanent land requirements during construction in the southern portion of Deas Island Regional Park, some private lands within the Agricultural Land Reserve (ALR) adjacent to the Highway 99 ROW, and temporary offsite moorage areas within the Fraser River South Arm. The extent of additional land requirements outside of the Highway 99 ROW will be determined as the engineering and property requirements for the Project are further defined and will be reflected in subsequent stages of the environmental assessment process. The Project is located within Tsawwassen Territory as set out in the

Tsawwassen First Nation Final Agreement and Musqueam Indian Band's asserted core traditional territory and recognized fishing rights. The Project also occurs within the asserted traditional territories of several Indigenous groups (Section 9).

The Project includes the removal of the Existing Tunnel and ancillary infrastructure. The Project will be designed to modern standards for seismic performance, safety, and vehicle clearances. The Project includes a multi-use path (MUP) to connect pedestrians and cyclists with active transportation routes on either side of the Fraser River. The Project is planned to be open to traffic in 2030. The Project represents a significant investment in multi-modal transportation improvements and supports provincial and regional strategies, sustainability objectives, and the economic development of the region, the Province, and Canada.

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5430000

Burrard Inlet
English Bay
Coal Harbour
Vancouver Harbour
Second Narrows
False Creek
Fraser River North Arm
Middle Arm
Morey Channel
Salish Sea
Cannery Channel
Strait of Georgia
Canoe Passage
Williamson Slough
Deas Slough
Cohilukthan Slough
Tilbury Slough
Tilbury Island
Annieville Channel
Fraser River South Arm
Mud Bay
Boundary Bay

KITSILANO 6
MUSQUEAM 2
SEA ISLAND 3
MUSQUEAM 4

Pacific Spirit
Pacific Spirit Park
Iona Beach Regional Park
Burnaby Lake Regional Nature Park
Deas Island Regional Park
Burns Bog Ecological Conservancy Area
Delta Nature Reserve
Don & Lion Islands
Poplar Island
Boundary Bay Dyke
Boundary Bay Regional Park

STURGEON BANK WILDLIFE MANAGEMENT AREA
SOUTH ARM MARSHES WILDLIFE MANAGEMENT AREA
ROBERTS BANK WILDLIFE MANAGEMENT AREA
BOUNDARY BAY WILDLIFE MANAGEMENT AREA

Tsawwassen First Nation

City of Vancouver
City of Burnaby
City of New Westminster
City of Coquitlam
City of Port Moody
City of Richmond
City of Delta
City of Surrey

Westbrook Mall
Granville Street
Oak Street
Cambie Street
Main Street
Howe Street
Homer Street
Knight Street
Wanaimo Street
Willingdon Avenue
Inlet Drive
Gaglardi Way
Eighth Avenue
East Columbia Street
Scott Road
Highway 91
Nordel Way
72 Avenue
Kittson Parkway
Garden City Road
Shell Road
No 4 Road
No 1 Road
No 2 Road
Gilbert Road
No 3 Road
No 6 Road
Railway Avenue
Arthur Drive
Highway 17
Highway 17A
66 Street
Ladner Trunk Road
Steveston Highway
Granville Avenue
Blundell Road
Deltaport Way
Grant McConachie Way
Bridgeport Road
River Road
Marine Way
Southwest Marine Drive
Southeast Marine Drive
West 4th Avenue
West King Edward Avenue
West 41st Avenue
East 41st Avenue
East 12th Avenue
East Broadway
East 1st Avenue
East Hastings Street
Hastings Street
Powell Street
Barnet Highway
Lougheed Highway
Trans Canada Highway
Canada Way
Imperial Street

PROJECT FOOTPRINT

LEGEND

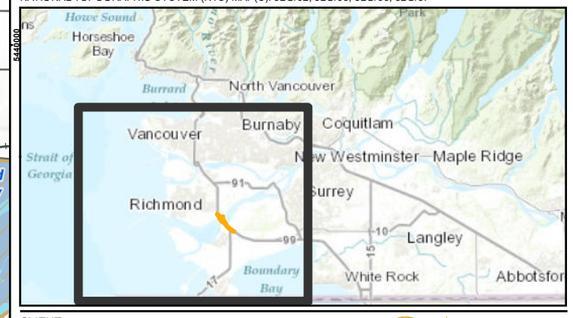
- PROJECT FOOTPRINT
- MUNICIPAL BOUNDARY
- INDIAN RESERVE
- TSAWWASSEN FIRST NATION LAND
- REGIONAL PARK
- INTERNATIONAL SHIPPING LANE
- ACTIVE POTENTIAL DISPOSAL AT SEA (DAS) SITE - POINT GREY
- GEORGE C. REIFEL MIGRATORY BIRD SANCTUARY
- ALAKSEN NATIONAL WILDLIFE AREA
- WILDLIFE MANAGEMENT AREA
- CANADA - U.S.A BORDER
- FRASER RIVER SHIPPING CHANNEL
- POTENTIAL SHIPPING ROUTE TO DISPOSAL AT SEA SITE
- BC FERRIES ROUTE
- HIGHWAY
- ROAD
- RAILWAY
- SAND HEADS LIGHTHOUSE
- FERRY TERMINAL

0 2,500 5,000
1:125,000 METRES

REFERENCE(S)

1. REGIONAL PARKS, MUNICIPAL BOUNDARIES PUBLISHED BY AND OBTAINED FROM THE MINISTRY OF MUNICIPAL AFFAIRS - GOVERNANCE AND STRUCTURE
2. WILDLIFE MANAGEMENT AREAS, CANADA- USA BORDER, FERRY TERMINALS, FERRY ROUTES, SAND HEADS LIGHTOUSE, INDIAN RESERVES PUBLISHED BY AND OBTAINED FROM THE MINISTRY OF FORESTS, LANDS, NATURAL RESOURCE OPERATIONS AND RURAL DEVELOPMENT.
3. TSAWWASSEN FIRST NATION LANDS PUBLISHED BY AND OBTAINED FROM THE MINISTRY OF INDIGENOUS RELATIONS AND RECONCILIATION - INTERGOVERNMENTAL AND COMMUNITY RELATIONS.
4. ROADS AND RAILWAYS OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
5.DISPOSAL AT SEA SITE, INTERNATIONAL SHIPPING LANES, BIRD SANCTUARIES AND NATIONAL WILDLIFE AREAS OBTAINED FROM GOVERNMENT OF CANADA.
6. FRASER RIVER SHIPPING CHANNEL OBTAINED FROM THE VANCOUVER FRASER PORT AUTHORITY.

COORDINATE SYSTEM: NAD 1983 CSRS UTM ZONE 10N
NATIONAL TOPOGRAPHIC SYSTEM (NTS) MAP(S): 92G/02, 92G/03, 92G/06, 92G/07



CLIENT
MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE

BRITISH COLUMBIA
Ministry of Transportation and Infrastructure

PROJECT
FRASER RIVER TUNNEL PROJECT

TITLE
REGIONAL OVERVIEW

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-04-04
DESIGNED	RS
PREPARED	JP
REVIEWED	HC
APPROVED	DG

PROJECT NO.	CONTROL	REV.	FIGURE
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1.2 PREVIOUS ITERATIONS OF THE PROJECT

The EAO issued an Environmental Assessment Certificate (EAC #T17-01) in 2017 for construction of a new 10-lane bridge to replace the Existing Tunnel. The previously proposed 10-lane bridge project was the subject of a number of concerns raised by Metro Vancouver Regional District (Metro Vancouver) communities, specifically that the 10-lane bridge concept and other improvements were too large and complex, had too many lanes, and did not align with Metro Vancouver's regional growth strategy (RGS). In September 2017, the Provincial Government announced that the procurement process for the 10-lane bridge would be cancelled and that the 10-lane bridge project would be subject to an Independent Technical Review.

The Independent Technical Review (Westmar Advisors 2018) concluded that there are options that would reduce the scale, complexity, and cost of the crossing and improvements along the Corridor and better align with regional objectives. Following the release of the Independent Technical Review, through a process of analysis and engagement with the Metro Vancouver Mayors' Task Force and Indigenous groups, two options were shortlisted: a new eight-lane ITT or an eight-lane bridge. In November 2019, the eight-lane ITT option with a MUP, including two transit lanes, was endorsed as the preferred option for the new crossing as the ITT option is more aligned to Metro Vancouver's RGS and addresses a number of concerns raised in the previous 10-lane bridge environmental assessment. Further description of alternatives to the Project is provided in Section 3.5.

The proposed eight-lane ITT, which will include removal of the Existing Tunnel, is substantively different from the previously approved 10-lane bridge project; therefore, a new review under the BCEAA is necessary.

1.3 PROJECT CONTACTS

The Proponent is Transportation Investment Corporation (TI Corp) on behalf of the Ministry. Table 1.3-1 includes key contact information for the Project.

Table 1.3-1: Project Information and Key Contacts

Project Name	Fraser River Tunnel Project
Project industrial sector and type	Water management project Shoreline modification project that entails dredging, filling, or other physical disturbance of the following: ≥1,000 m of linear shoreline; or ≥2 ha of foreshore or submerged land, or a combination of foreshore and submerged land, below the natural boundary of a stream, marine coastline, or estuary
Proponent	Transportation Investment Corporation, on behalf of the Ministry of Transportation and Infrastructure

Proponent corporate address	Transportation Investment Corporation Suite 1750 – 401 West Georgia Street Vancouver, BC, V6B 5A1
Proponent website	https://www.ticorp.ca/
Project website	https://engage.gov.bc.ca/masseytunnel/
Ministry of Transportation and Infrastructure representative	Kevin Volk, Assistant Deputy Minister, Major Projects
Project executive director	Donald Trapp, TI Corp
Primary contact for the Environmental Assessment	Darcy Paslawski, Environment Lead, TI Corp Tel: 236-455-1450, Email: darcy.paslawski@ticorp.ca

1.4 CORPORATE OVERVIEW

Planning for the Project was led by the Ministry, the agency responsible for planning transportation networks in BC, providing transportation services and infrastructure, developing and implementing transportation policies, and administering related acts and regulations including federal–provincial funding programs. Delivery of the Project will be led by TI Corp, a Crown corporation established under the *Transportation Investment Act,* SBC 2002, c. 65, with a mandate to deliver major infrastructure on behalf of the Ministry. Following the announcement of the Project in August 2021, TI Corp was assigned responsibility for the delivery of the Project and will lead the technical design, contractor procurement, future oversight, and environmental assessment process for the Project.

On behalf of the Ministry, TI Corp has a mandate to:

- Provide cost effective and flexible delivery for assigned major projects.
- Establish strong relationships with Indigenous groups who have an interest in the Project through engagement that is guided by provincial government policy and legislation, including the Draft Principles that Guide the Province of British Columbia's Relationship with Indigenous Peoples and the *Declaration on the Rights of Indigenous Peoples Act,* SBC 2019, c. 44 (2019).
- Apply strong and consistent risk management, and Project and financial processes and controls.
- Be accountable and report to the BC Transportation Financing Authority as the owner of the assigned project.

If approved, the Ministry will be responsible for maintenance and operation of the new infrastructure within the broader transportation infrastructure network.

2 PROJECT RATIONALE, GOALS, AND BENEFITS

This section describes the overall rationale and benefits of the Project, as well as the over-arching goals of the Project.

2.1 PROJECT RATIONALE

The Existing Tunnel is an essential link in a transportation corridor of regional, provincial, and national importance. In addition to connecting communities south and north of the Fraser River, the corridor provides a connection to the international transportation gateways of the region's marine port, airport facilities, provincial highway network, Tsawwassen ferry terminal, and land border with the United States. However, the need for the Project is independent of any planned or proposed upgrades or expansions to these networks and facilities and, therefore, not reliant on other infrastructure components.

Section 5.2 provides a description of the land and water ownership, designations, and tenures within and adjacent to the Project footprint. Most of the Project would be located within the existing Highway 99 ROW; however, there may be some additional temporary and permanent land requirements during construction for the southern portion of Deas Island, additional temporary land requirements for the construction site facilities on industrial and agricultural lands adjacent to the Highway 99 ROW, and temporary offsite moorage areas within the Fraser River South Arm. The location of temporary construction site facilities, potential and extent of additional land requirements outside of the Highway 99 ROW and associated rezoning requirements and/or changes in land use designations, if required, will be determined as the engineering and property requirements for the Project are advanced and will be reflected in the Detailed Project Description. Section 6.5 provides a listing of anticipated regulatory permits, approvals, and authorizations required for construction of the Project.

Addressing safety and traffic congestion issues associated with the Existing Tunnel are the primary reasons for the Ministry's decision to proceed with the Project. Now more than 60 years old, the Existing Tunnel suffers from congestion and reliability challenges that result in traffic delays and queues, particularly in the non-peak direction. The Existing Tunnel has operated with a retrofitted counterflow system for the past 40 years during peak periods, with three lanes in the peak direction and one lane in the non-peak direction. The counterflow system was implemented to address traffic demand that exceeded the original design volumes. The region has grown significantly, and the current crossing is insufficient to process the level of peak period traffic demand resulting in significant levels of congestion, delay, and travel time variability. When the counterflow is in operation, the off-peak direction in particular sees some of the longest queues and travel time variability due to the vulnerability of the Highway 99 and 91 system to incidents. As such, additional capacity is required on Highway 99 where it crosses the Fraser River South Arm, which would reduce greenhouse gas (GHG) and emissions to the air (i.e., air emissions) by decreasing the time spent idling in queues. The new ITT will not include a counterflow system.

Enhancements to transit service and active transportation[1] options on the Highway 99 corridor are also required to provide sustainable transportation choices for all users. Without improvements to this crossing, economic growth and regional livability will be further constrained by congestion and increased travel times for commuters, commercial users, and other traffic.

The Existing Tunnel was built to the engineering standards of the 1950s. While the Existing Tunnel is operationally safe, it does not meet current seismic and highway clearance standards. The Existing Tunnel lacks road shoulders and there is limited access between the northbound and southbound lanes, which makes it challenging for first responders to access and clear emergencies. Some other deficiencies have been addressed through lighting, ventilation, and structural upgrades.

2.2 PROJECT GOALS

In 2019, as part of planning for the replacement of the Existing Tunnel, the Ministry led engagement and collaborative efforts with 10 municipalities, 12 Indigenous groups, TransLink, and Metro Vancouver to develop a set of shared principles, goals, and objectives to guide the Project:

- Support sustainability of Fraser River communities.
- Facilitate increased share of sustainable modes of transport.
- Enhance regional goods movement and commerce.
- Support a healthy environment.

The Project will provide safe, reliable, and accessible transportation options that meet the objectives for sustainable growth for the Metro Vancouver region. Key benefits of the Project include the following:

- providing congestion relief at the Existing Tunnel
- addressing the long-term seismic safety performance of the Existing Tunnel
- improving transit speed and reliability along the Highway 99 corridor
- establishing a dedicated active transportation connection for pedestrians and cyclists across the Fraser River on Highway 99
- maintaining the current clearances for the Fraser River navigational channel

Furthermore, the Project has the flexibility of being configured with six general-purpose lanes and two dedicated transit lanes through the crossing, which are serviced by extended bus-on-shoulder lanes to the crossing. The Project represents a significant investment in multi-modal transportation improvements and supports provincial and regional growth strategies, sustainability objectives, and the economic

[1] Active transportation refers to all human-powered forms of travel; however, within the context of the Project, active transportation refers to the most common forms: walking and cycling.

development of the region, the Province, and Canada. Specifically, Metro Vancouver has confirmed that an eight-lane crossing with transit priority and provision for active transportation is consistent with its RGS, and the Metro Vancouver Board endorsed a new ITT on the basis of the preliminary technical analysis presented. Similarly, TransLink has advised that the ITT concept is consistent with Transport 2040 – the current Regional Transportation Strategy – and the Southwest Area Transportation Plan, which aims to expand rapid transit across the Fraser River South Arm to serve travel between Richmond and Delta. TransLink has further advised that Transport 2050 (the next Regional Transportation Strategy will assume an eight-lane crossing with transit priority and provision for active transportation.

The Project is compatible with existing government policies and is consistent with the Ministry's mandate of building and maintaining transportation infrastructure to allow for the safe and efficient movement of people and goods.

3 PROJECT COMPONENTS AND ACTIVITIES

This section provides a brief description of the anticipated temporary and permanent physical components of the Project. It also describes the physical activities that are proposed during the Project's construction and operation phases and decommissioning of the Existing Tunnel. Section 3.3 provides the anticipated timing and duration of each phase, and considerations for seasonal timing constraints. A more detailed description of Project components and physical activities will be provided in the Detailed Project Description and the EAC Application.

Anticipated daily and annual maximum production or operational capacity of the project has not been provided as it is not applicable to the Project.

3.1 PROJECT COMPONENTS

The Project is a major transportation and infrastructure project that includes the construction of a new ITT, associated connections to the existing Highway 99 between Steveston Highway and Highway 17, tunnel portals (Figure 3.1-1), and temporary construction facilities. The area overlapped by temporary and permanent construction components and areas associated with removal of the Existing Tunnel are referred to as the Project area. The Project will comprise eight lanes, including six general-purpose lanes, two dedicated transit lanes, and a bi-directional MUP (Figure 3.1-2 to Figure 3.1-4). To the extent possible, the Ministry is proposing to locate Project-components and activities within the Ministry's Highway 99 ROW. The Project will be designed to provide lifeline seismic performance and be equipped with modern fire-life safety, traffic management, ventilation, and drainage equipment.

The Project will be designed and constructed to applicable engineering standards and codes consistent with regulatory requirements and be informed by the environmental assessment process and ongoing engagement with Indigenous groups and stakeholders. The Project comprises the components listed in Table 3.1-1. The components described in Table 3.1-1 are onsite components (within or adjacent to the Highway 99 ROW) except for the temporary offsite moorage location.

Table 3.1-1: Project Components

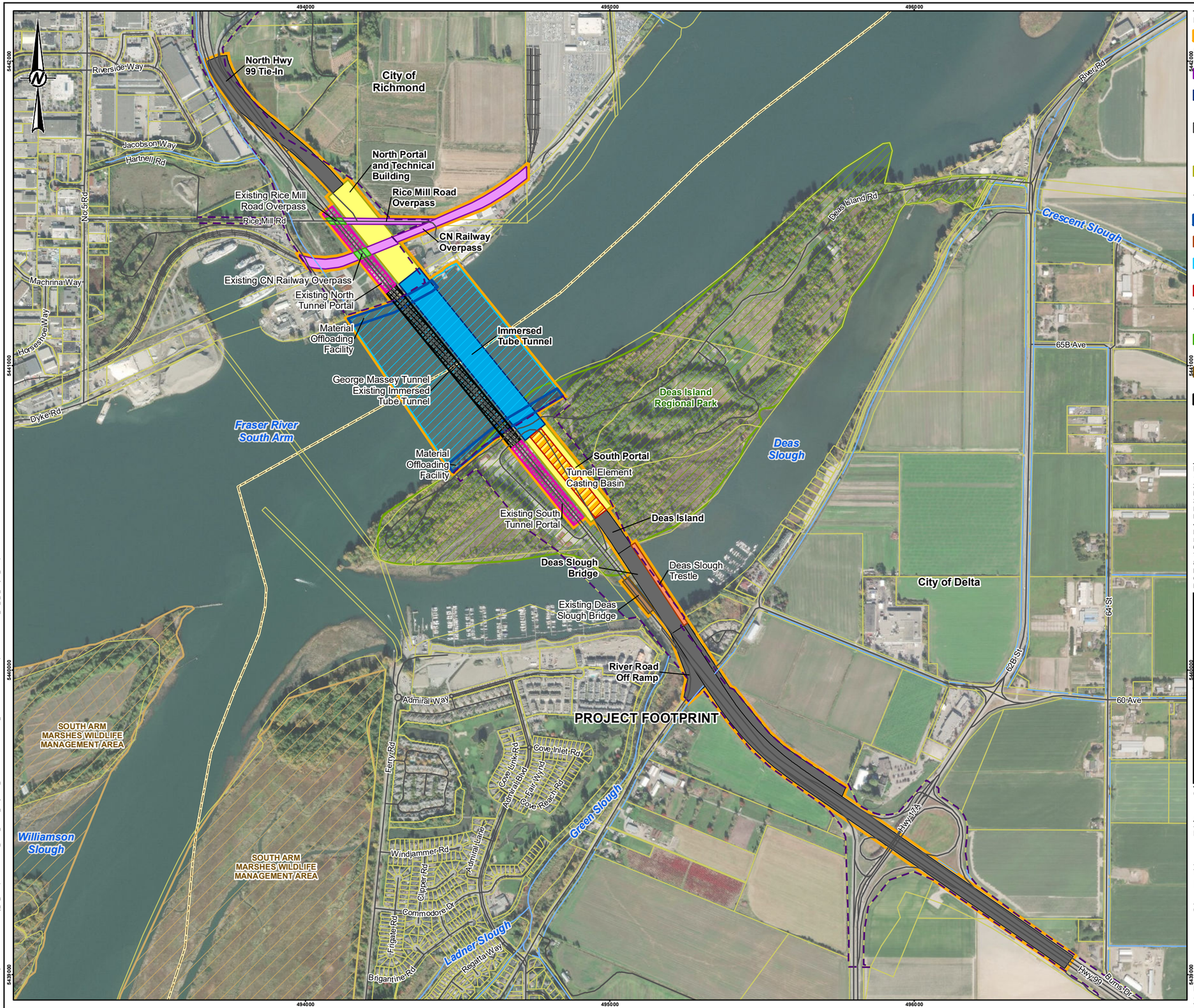
Project Component	Description of Component
Temporary Construction Components	
Construction site facilities	The Project will require temporary space for site offices and staff facilities, material testing facilities, onsite concrete batching plants, material storage, laydown, equipment storage, parking for construction staff, site services including power, water, sanitary and communications, and site drainage and water treatment facilities. Construction site facilities will be located on industrial and agricultural lands adjacent to the Highway 99 ROW within 1 km of the Project Footprint (Figure 3.1-1).

Project Component	Description of Component
Construction site access	During construction, temporary site roads and access roads will be constructed including a temporary trestle across Deas Slough to access Deas Island.
Material offloading facilities	Material offloading facilities will be required with access from the Fraser River. Temporary construction jetties are expected to be constructed and decommissioned as part of the Project to accommodate barge unloading of Project equipment and materials during construction.
Casting basin	The tunnel elements will be fabricated in a temporary casting basin. The casting basin will have a base below sea level and that can be dewatered to allow fabrication of the tunnel elements in the dry. The casting basin would be flooded to allow the completed tunnel elements to be floated out. The Ministry Highway 99 ROW on Deas Island is large enough to accommodate a casting basin suitable to cast tunnel elements.
Temporary outfitting jetty	A temporary outfitting jetty will be required where tunnel elements can be prepared for immersion. The outfitting jetty will be located outside of the navigation channel on the Fraser River South Arm near the new ITT alignment (within the marine construction area shown on Figure 3.1-1). The outfitting jetty will be a piled marine structure with ramps to shore to allow access for lifting equipment and delivery of material. Water depths leading to and from the jetty, as well as depths at the jetty, will need to be deep enough to allow tunnel elements to float at all times.
Temporary offsite moorage	A secure temporary offsite moorage location will be required to stage completed tunnel elements prior to transport for immersion. The temporary offsite moorage location will need to be sufficiently deep to accommodate the water draft of the tunnel elements. Potential locations for temporary offsite moorage are currently under evaluation. The temporary offsite moorage site will be situated outside of navigation channels in the Fraser River South Arm and will be sited in consideration of sensitive habitats and Indigenous fishing locations identified during consultation. Temporary offsite moorage will be located within 11 km downstream of the Existing Tunnel or 6 km upstream of the Existing Tunnel.
Permanent Infrastructure Components	
North approach including roads, tunnel portal structures, and flood protection	The north tunnel approach roads and portal consist of realignment of Highway 99 south of Steveston Highway to accommodate the alignment of the new tunnel, including tie-ins to the existing Highway 99 mainline and ramps, construction of a new Rice Mill Road overpass and a new CN Railway overpass over the new north portal, a tunnel operations building, flood protection infrastructure, and north tunnel portal structures consisting of cast-in-place reinforced concrete structures required for the roadway leading down to the new ITT.

Project Component	Description of Component
South approach including roads, tunnel portal structures, flood protection	The south tunnel approach roads and portal consist of modifications to Highway 99 south of Deas Slough to improve traffic flow and including tie-ins to the existing Highway 99 mainline and ramps, flood protection infrastructure, and south tunnel portal structures consisting of cast-in-place reinforced concrete structures required for the roadway leading down to the new ITT (Figure 3.1-3 - Figure 3.1-4).
New ITT	A new ITT will be installed under the Fraser River connected to Highway 99 by the north and south portals. The tunnel will be designed to provide lifeline seismic performance and be equipped with modern fire-life safety, ventilation, communications, drainage, and illumination systems.
New Deas Slough Bridge	A new Deas Slough Bridge is required. The new Deas Slough Bridge will require in-stream foundations and will be longer than the existing Deas Slough Bridge as the artificial peninsulas used to construct the existing Deas Slough Bridge will not be used. The new Deas Slough Bridge will be designed to maintain the existing navigation clearance. A temporary trestle across Deas Slough would be required to construct the new bridge.
Decommissioning/Removal of Existing Infrastructure	
Existing ITT removal	The Existing Tunnel will be removed. The existing portals will be removed to below grade and backfilled.
Existing Deas Slough Bridge removal	The existing Deas Slough Bridge will be removed.
Existing CN Railway overpass	An existing CN Railway over Highway 99 will be removed.
Existing Rice Mill Road overpass	The existing Rice Mill Road over Highway 99 will be removed.

ROW = right of way; ITT = immersed tube tunnel.

No other components beyond those described in Table 3.1-1 are required for the Project.



LEGEND

- PROJECT FOOTPRINT

PERMANENT WORKS
- CN RAILWAY OVERPASS / RICE MILL ROAD OVERPASS
- IMMERSED TUBE TUNNEL
- NORTH HWY 99 TIE-IN / RIVER ROAD OFF RAMP / DEAS ISLAND / DEAS SLOUGH BRIDGE
- SOUTH PORTAL / NORTH PORTAL AND TECHNICAL BUILDING

TEMPORARY WORKS
- MATERIAL OFFLOADING FACILITY
- DEAS SLOUGH TRESTLE
- MARINE CONSRUCTION AREA
- TUNNEL ELEMENT CASTING BASIN

TO BE REMOVED
- EXISTING CN RAILWAY OVERPASS / EXISTING RICE MILL ROAD OVERPASS
- EXISTING DEAS SLOUGH BRIDGE
- EXISTING IMMERSED TUBE TUNNEL
- EXISTING NORTH TUNNEL PORTAL / EXISTING SOUTH TUNNEL PORTAL
- MUNICIPAL BOUNDARY
- REGIONAL PARK
- WILDLIFE MANAGEMENT AREA
- PARCEL FABRIC
- HIGHWAY 99 RIGHT OF WAY
- FRASER RIVER SHIPPING CHANNEL
- HIGHWAY / ROAD
- RAILWAY
- WATERCOURSE

0 250 500
1:12,500 METRES

REFERENCE(S)

1. PROJECT FOOTPRINTS PROVIDED BY COWI 2022/01/23.
2. REGIONAL PARKS, MUNICIPAL BOUNDARIES PUBLISHED BY AND OBTAINED FROM THE MINISTRY OF MUNICIPAL AFFAIRS - GOVERNANCE AND STRUCTURE
3. RICHMOND WATERCOURSES, WILDLIFE MANAGEMENT AREAS ROADS PUBLISHED BY AND OBTAINED FROM THE MINISTRY OF FORESTS, LANDS, NATURAL RESOURCE OPERATIONS AND RURAL DEVELOPMENT.
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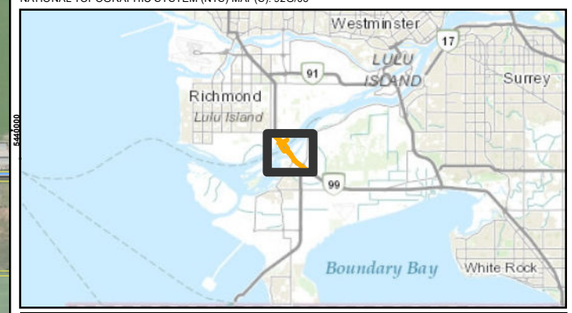
COORDINATE SYSTEM: NAD 1983 CSRS UTM ZONE 10N
NATIONAL TOPOGRAPHIC SYSTEM (NTS) MAP(S): 92G/03



CLIENT
MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE

BRITISH COLUMBIA | Ministry of Transportation and Infrastructure

PROJECT
FRASER RIVER TUNNEL PROJECT

TITLE
PROJECT FOOTPRINT

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-04-04
DESIGNED	JP
PREPARED	JP
REVIEWED	HC
APPROVED	DG

PROJECT NO.	CONTROL	REV.	FIGURE
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Figure 3.1-2: Immersed Tube Tunnel Rendering

Figure 3.1-3: Aerial Rendering

Figure 3.1-4: South Tunnel Entrance Rendering

3.2 CONSTRUCTION, OPERATIONS, AND DECOMMISSIONING PHASE ACTIVITIES

The Project includes site preparation, construction, operation, and decommissioning activities described in Table 3.2-1 and shown in Figure 3.1-1 to complete a new ITT, tunnel portals, temporary construction facilities, a new Deas Island bridge, and removal of the Existing Tunnel and associated infrastructure.

Table 3.2-1: Description of Project Activities

Phase/Component	Description of Activities
Site Preparation	
General site	• Detailed construction planning by site and phase. • Completion of pre-construction utility, geotechnical, hydrotechnical, and environmental surveys. • Mobilization of construction equipment, installation of temporary offices, and delivery of materials to the site by truck or barge. • Clearing, grubbing, filling, placing and grading gravel, in construction areas. • Excavation of site drainage ditches and installation of stormwater management facilities. • Ground preparation, geotechnical and archeological assessments, and work permitted for the site to improve load bearing of the soil (could include pre-loading and geotechnical ground stabilization). • Piling and casting of a grade slab on the north and south sides of the river to provide support for concrete batching plants, if required. • Construction of site circulation roads.
Temporary access trestle	• Installation of a piled temporary access trestle across Deas Slough.
Material offloading facility	• Construction of a materials offloading facility will consist of a jetty on the foreshore of Deas Island and on the Richmond side of the river within the Highway 99 ROW. • Construction activities include in-river and upland pile driving to support a deck. • Installation of a deck on the piles.
Construction	
Casting basin	• Installation of upland pile wall around the perimeter of the casting basin. • Deep excavation of the casting basin. • Dewatering of casting basin and corresponding onsite water management. • Management of excavated material in an approved manner.

Phase/Component	Description of Activities
Tunnel element fabrication	• Inside the casting basin, tunnel elements will be fabricated in the dry. Fabrication will include forming, casting, and curing of concrete. • Tunnel elements will be fabricated of reinforced concrete using cranes, concrete trucks, concrete pumps, and an onsite concrete batching plant. • Once tunnel elements have been fabricated, water will be pumped into the casting basin to flood it, the casting basin will be opened to the Fraser River, and the tunnel elements floated out of the casting basin. • Construction materials required for the fabrication of the tunnel elements will be delivered by a combination of trucks and barges.
Outfitting jetty	• Dredging and installation of piles and decking. • Construction activities include in-river and upland pile driving to support installation of a deck using cranes.
Temporary offsite moorage	• Once constructed, each of the tunnel elements will be towed along the Fraser River from the casting basin to the temporary offsite moorage location. • The proposed temporary offsite moorage location requires sufficient draft to store completed tunnel elements. Maintenance dredging may be required to provide sufficient navigational draft along the length and width of the temporary offsite moorage location. • In-river storage would involve submerging the tunnel elements and temporarily storing them on the riverbed until the dredging and seismic densification activities at the new alignment are complete, and the site is ready for immersion of the tunnel elements. • Each of the tunnel elements would be stored outside of the navigation channel and secured in place with two sets of three-pile mooring dolphins with appropriate safety measures to avoid vessel impact. The storage location would be outside of the navigation channel with appropriate navigation safety measures. Elements would be stored for up to 12 months.
North and south approaches including roads, tunnel portal structures, and flood protection	• Construction of the north and south tunnel approaches will require ground improvements, deep excavation, onsite water management, and foundation preparation. • Installation of a piled wall along the perimeter of the portal excavation. • On the Richmond side of the river the excavation will breach the dike and temporary flood protection will need to be in place prior to excavation. • The excavated material from the portals will be managed in an approved manner. • The portal structures will be cast-in-place concrete and constructed using cranes, concrete trucks, concrete pumps, and an onsite concrete batching plant.

Phase/Component	Description of Activities
New ITT	• Placement of the tunnel elements will require ground improvements, dredging, foundation preparation, tunnel element immersion, and placement of protective fill. • Timing of this work will factor in the established DFO least risk window (July 16 to February 28). In-river construction activities will be carried out 24 hours a day, 7 days a week. • Construction of the ITT trench will progress transversely across the river while maintaining safe navigation. • Temporary closure of the river to navigation will be required during the immersion of each tunnel element. • Communications with VFPA and marine users will be essential to maintaining safe use of the river while the tunnel construction activities occur. • A trench will be excavated in the river bottom prior to installation of the tunnel elements. Dredging of the trench must start the same year that the tunnel elements are immersed. • Once immersion is complete, fill will be placed along the side of the tunnel element to lock the element into the tunnel trench.
Flood protection	• Existing dikes within the Ministry ROW that are affected by the Project will need to be re-constructed to current standards. • A specific flood protection system will be constructed using berms, dikes, and walls to protect the tunnel from flooding.
Final fit out	• The inside of the tunnel will be finished with the final concrete ballast, final roadway paving, and all of the mechanical and electrical equipment needed for modern fire-life safety, ventilation, pumps, lighting, and traffic control will be installed.
New Deas Slough Bridge	• Construction activities will include upland and instream piling, ground improvements, construction of concrete piers and abutments, erection of girders, and construction of the bridge deck. • Bridge superstructure construction would be accomplished using a combination of the temporary access trestle and the spud barges.
Operation	
Operation	• The Project's operations phase begins with the commissioning of the new tunnel crossing and tie-in to Highway 99. • Operations phase activities include paved surface and systems maintenance and stormwater management.
Decommissioning	
Existing ITT	• Decommissioning of the Existing Tunnel as proposed in the Project's Business Case (MOTI 2021) is envisioned as full removal of the in-river portions of the Existing Tunnel and backfilling of the existing onshore elements.
Existing Deas Slough Bridge	• The existing Deas Slough Bridge will be removed.

Phase/Component	Description of Activities
Existing CN Railway overpass	• The existing CN Railway bridge will be removed.
Existing Rice Mill Road overpass	• The existing Rice Mill Road overpass will be removed.

ROW = right of way; ITT = immersed tube tunnel; DFO = Fisheries and Oceans Canada; VFPA = Vancouver Fraser Port Authority.

Potential environmental, social, economic, cultural, and heritage effects associated with each of these components and activities of the Project will be addressed in the EAC Application. The environmental assessment will be used to inform the planning, engineering design, construction sequencing, methodologies, and schedule to minimize potential adverse effects to biophysical and human environment resources and to identify opportunities for offsetting and enhancements.

3.3 PROJECT SCHEDULE

The overall anticipated schedule for the Project is provided in Table 3.3-1.The planning, design, and eventual construction of the Project will incorporate the mitigation measures being developed throughout the environmental assessment process in consultation with Indigenous groups, stakeholders, and regulatory agencies. Least risk windows for the protection of aquatic and terrestrial ecological receptors will be integral to the development of construction plans and will reflect regulatory requirements and feedback from Indigenous groups, stakeholders, and regulatory agencies during the environmental assessment process. Existing environmental conditions will be characterized in 2022 and carried through the environmental assessment with consideration of site-specific environmental, social, economic, and human health resources and will be responsive to the interests of Indigenous groups stakeholders, regulatory agencies, and the public.

Applicable least risk work windows will be considered during schedule planning for construction near any sensitive environmental features such as fish-bearing watercourses and during vegetation removal. In-river construction activities are planned to occur during the Fisheries and Oceans Canada (DFO) least risk window (July 16 to February 28) from the mouth of the Fraser River up to the Existing Tunnel (DFO 2014). No other seasonal timing considerations have been identified at this time. In-river works will require 24/7 operations.

Mitigation measures related to construction activities and least risk windows will be developed in consultation with regulatory agencies, Indigenous groups, and stakeholders through the environmental assessment and applicable permitting processes.

Table 3.3-1: Anticipated Project Schedule

Task	Year 20-												
	21	22	23	24	25	26	27	28	29	30	31	32	33
Project announcement													
Environmental assessment process													
Procurement													
Permitting													
Detailed design and construction													
Operation and maintenance													
Decommissioning of Existing Tunnel													

3.4 INFRASTRUCTURE AND LABOUR REQUIREMENTS

The Project's location, just upstream of the Existing Tunnel, is ideally situated to maximize the use of existing infrastructure. The majority of the necessary utilities and infrastructure are present or readily expandable to support the Project. Access roadways currently being considered to support material transport trucking to the site temporary construction areas predominantly already exist but may require minor upgrades. A temporary access trestle across Deas Slough would be required to construct the new Deas Slough Bridge.

The Project requires construction of a barge ramp for offloading material to upland construction areas from barges on the Fraser River. Material transport would also include marine transportation of vessel/barges along the Fraser River and from the Strait of Georgia.

Construction laydown and storage will be accommodated using the existing Highway 99 ROW and temporary upland construction areas located on industrial and agricultural lands adjacent to the Highway 99 ROW.

The Project will require an estimated 660 full-time equivalents (FTEs) per year during construction, approximately 220 FTEs per year during decommissioning of the Existing Tunnel, and approximately 20 FTEs per year during operation. The majority of the projected workforce is expected to be sourced from the pool of workers residing in Metro Vancouver. Some workers will also be sourced from other regional districts within the BC Economic Region of Mainland/Southwest (including the Fraser Valley, Squamish-Lillooet, and Sunshine Coast), as well as from outside of BC for certain specialized technical positions. Metro Vancouver's labour supply is expected to have capacity to accommodate the project's

construction and decommissioning labour demand due to the relative size of project construction labour requirements compared to Metro Vancouver's trades, equipment operators, and other related occupations labour force size. As the majority of the construction workforce is anticipated to be sourced from within the existing large and skilled local labour force, special workforce accommodations are not anticipated to be required for the Project.

3.5 ALTERNATIVES TO THE PROJECT

Consideration of alternatives to the Project builds upon findings and recommendations from the Independent Technical Review commissioned by the Province to review the 2013 decision to replace the Existing Tunnel with a 10-lane bridge. The proposed 10-lane bridge project was the subject of a number of concerns raised by Metro Vancouver communities, specifically that the 10-lane bridge concept and other improvements were too large and complex, had too many lanes, and did not align with Metro Vancouver's RGS. The Independent Technical Review (Westmar Advisors 2018) concluded that there are options that would reduce the scale, complexity, and cost of the crossing and improvements along the Corridor and better align with regional objectives. In December 2018, the Ministry released the results of the Independent Technical Review and indicated that the Ministry would engage with local governments and Indigenous groups to identify a crossing solution that better aligns with regional interests.

Following the release of the Independent Technical Review, the Ministry identified 18 potential crossing solutions, incorporating either an ITT, a bridge, or a bored-tunnel solution. Consistent with Provincial and regional commitments to transit and active transportation, all options assumed transit infrastructure enhancements and provisions for cycling and walking. The analysis of replacing the Existing Tunnel under the Fraser River with either an ITT, a bridge, or a bored tunnel led to the following conclusions (COWI 2019):

- The relative cost, constructability, and environmental risk of a deep bored tunnel would render it unsuitable for consideration as a long-term solution for the George Massey Crossing.
- While the long- and short-term environmental effects of a long-span bridge and an ITT differ, these effects could be managed through best management practices, environmental offsets, and enhancements.
- Improving transit services and reliability remains a priority for the new crossing. Expanding transit lanes on, and leading to, the new crossing would increase people-carrying capacity across the Fraser River. This, combined with TransLink's potential support to provide rapid transit service and increase transit frequency, should increase ridership and would also align with the region's desired shift to sustainable modes.
- Dedicated pedestrian and cyclist facilities provide an important incentive for active transportation, and users are better served if these facilities are incorporated into the design of the new crossing.

- The benefits of retaining the Existing Tunnel for traffic over the long term are limited. Additionally, the costs associated with seismic upgrades to retain the Existing Tunnel for this purpose would be more expensive than the all-new infrastructure options. The concrete structure of the Existing Tunnel suffers from Alkali-silica reaction and therefore has limited remaining life.

The analysis of these alternative solutions were considered to support the Ministry's ongoing discussions with participating Indigenous groups, TransLink, adjacent Fraser River communities, and key stakeholders and to support its preparation of a business case.

Through a process of analysis and engagement with the Metro Vancouver Mayors' Task Force and Indigenous groups, these options were further shortlisted to either a new eight-lane ITT or eight-lane bridge. In November 2019, and based on the analysis presented, the Metro Vancouver Board endorsed the eight-lane ITT option with an MUP, including two transit lanes, as the preferred option for the Project for the purposes of engagement with Indigenous groups and public stakeholders. At the time, Tsawwassen First Nation, a member of the Metro Vancouver Board, did not endorse the ITT option.

Although Metro Vancouver Board endorsed the new ITT crossing over a bridge, the Ministry is responsible for the final decision of the recommended crossing through its engagement, technical analysis, and business case processes. Since endorsement from the Metro Vancouver Board in November 2019, the Ministry has continued to meet with Indigenous groups and key stakeholders to share information on the Project and to seek feedback on the work to date, including the planning process, service delivery options analysis, and advanced works.

From 2020 to 2021, the Ministry met with Tsawwassen First Nation leadership to address concerns with the eight-lane ITT option. At the Project's announcement in August 2021, Tsawwassen First Nation leadership was represented and spoke in favour of working with the Ministry towards a solution for replacing the Existing Tunnel.

In 2021, the Ministry completed a Business Case which provided an analysis of an eight-lane ITT option and an eight-lane bridge option (MOTI 2021). The Business Case recommended replacement of the Existing Tunnel with a new eight-lane ITT immediately upstream of the Existing Tunnel. The Business Case included a multiple accounts evaluation of both quantitative and qualitative indicators across options in terms of five different accounts including:

- financial
- customer service
- social/community
- economic development
- environmental

Through the multiple accounts evaluation framework, each account was assessed through one or more indicators that represent the important implications of each option against the identified Project goals and objectives and that demonstrate the trade-offs involved in selecting one option in relation to the others. The multiple accounts evaluation analysis considered the costs, benefits, and other impacts of each option in relation to the base case scenario (Base Case) of continued use of the Existing Tunnel under current operating conditions.

3.6 ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT

Alternative means of carrying out the proposed Project have considered technically and economically feasible options for the Project design and siting options, crossing configuration, casting basin, temporary offsite moorage locations, dredging methods, and disposal alternatives. These design alternatives are discussed in Section 3.6.1 to Section 3.6.4.

3.6.1 Design and Siting Constraints

The upstream alignment has been established to minimize utility conflicts, Existing Tunnel impacts, and property impacts and are therefore not flexible. The tunnel cross-section requires eight lanes and a two directional MUP. Shoulders and lane width requirements are prescribed by the Province's Chief Engineer and therefore the width of the tunnel is not flexible. The dredged channel dimensions are a function of the riverbed materials and therefore the width and depth of the tunnel are not flexible. The depth of the tunnel has been established in discussion with the Vancouver Fraser Port Authority (VFPA) to maintain existing navigation clearance.

An upstream alignment for the new crossing option was selected by the Ministry as it would result in the following advantages relative to a downstream option (COWI 2020):

- reduced property impacts
- reduced potential of increasing river scour at an existing downstream Metro Vancouver water supply tunnel

3.6.2 Crossing Configuration

To support selection of the Project’s technology choice for the service delivery options, a configuration analysis was completed to determine the recommended number and allocation of lanes, such as dedicated transit or general-purpose traffic lanes. The analysis assessed configurations from six to eight lanes, including configurations with and without reversible lane (counterflow) systems. Configurations that incorporated the Existing Tunnel were not included based on potential limitations of achieving the required service life. Pursuant to the findings of the Independent Technical Review and input from the consultation and engagement process, a 10-lane configuration was not further considered as a viable solution for the crossing, as this configuration was not aligned with the interests or vision of the region.

Results of the crossing configuration analysis determined that a symmetrical eight-lane crossing (i.e., four lanes in each direction) would best achieve the Project’s goals and objectives.

This configuration provides a flexible approach, which could be used to provide four general-purpose traffic lanes in each direction if vehicular traffic operations are to be optimized to manage congestion or could be configured with three general-purpose lanes and one dedicated transit lane in each direction to encourage transit use.

Drivers will benefit from capacity gains due to modern lane widths and geometry, elimination of the counterflow system, and a potential separation of transit from general-purpose lanes, such that buses will not use the general-purpose traffic lanes, thereby improving capacity of the lanes through the new ITT. Transit services will also benefit with dedicated transit lanes providing some additional travel time benefits for transit users.

3.6.3 Temporary Offsite Moorage

Secure temporary offsite moorage locations will be required to stage the completed tunnel elements prior to immersion. The temporary moorage locations will need to be sufficiently deep to accommodate the tunnel elements.

Temporary offsite moorage would consist of in-river storage of tunnel elements by submerging and securing each tunnel element to a piled dolphin structure. Temporary offsite moorage of tunnel elements would likely require dredging to ensure the draft is deep enough to secure completed tunnel elements outside of navigation channels. Potential locations for temporary offsite moorage are currently under evaluation. The temporary offsite moorage site will be situated outside of navigation channels in the Fraser River South Arm and will be sited in consideration of sensitive habitats and Indigenous fishing locations identified during consultation. Temporary offsite moorage will be located within 11 km downstream of the Existing Tunnel or 6 km upstream of the Existing Tunnel.

3.6.4 Dredge Disposal

The Project will generate a substantial volume of sediment from the dredging required for the new ITT and soils from excavation of the portals. The options for disposal are based on the guidance of the *Canadian Environmental Protection Act,* SC 1999, c. 33, which provides expectations for the assessment of waste disposal. Table 3.6-1 provides an overview of potential options for managing dredge materials.

Table 3.6-1: Overview of Potential Dredged Material Management Options

Management Option	Summary
Beneficial use in construction of estuarine marsh and mudflat	A considerable amount of shoreline disturbance has occurred at and near the Project area. Dredged materials will be preferentially re-used within the Project area for shoreline restoration purposes to the extent practicable and dependent on the geotechnical and chemical suitability of the material. Suitable dredge material will be used to build and contour shoreline restoration features. The Ministry will also explore potential options to collaborate to use some of the dredge material as a source of sediments for proposed habitat enhancement and restoration projects.

Management Option	Summary
Beneficial use in upland construction and/or Temporarily stockpiling on site for subsequent re-use and/or re-sale off site	Dredged material from the Lower Fraser River is regularly used for fill and as preload for construction purposes. The ultimate use or disposal method for the dredged material will be influenced by the market demand for dredged material during the time of construction. Efforts will be made to identify beneficial commercial uses for the dredge material near the Project area. Although there would be additional costs associated with transporting material off site, selling or donating the material for use off site reduces the potential for adverse environmental interactions, as well as the complexity of obtaining environmental permits for ocean disposal. Beneficially using dredged material for construction of habitat or onsite construction is preferable to disposal at sea and offsite upland use due to additional handling and potential constraints with the suitability of the material associated with these two disposal options. The ability to use the material off site for commercial purposes will depend on regional projects occurring during the Project construction and operational periods.
Upland disposal at a facility	Material that cannot be sold or otherwise used for beneficial purposes or that contains contaminants or materials not suitable for alternative disposal may be disposed of at a landfill. Receiving facilities have yet to be identified and could vary depending on the volumes and chemical composition of dredge materials. Receiving facilities would be licensed to accept the volume and chemistry of material being sent. Similar to disposing at a commercial location, dredge materials to be disposed of at a landfill would be stored temporarily at a location designated for this purpose along the Fraser River. Materials potentially containing contamination would be separated and isolated from surrounding materials.
Disposal at sea	If beneficial commercial uses for the dredge material cannot be identified, or if disposal at a landfill is not possible, material may need to be disposed of at sea to an applicable location as determined by the Disposal at Sea permitting process, likely the Point Grey disposal site.

Although the beneficial commercial uses and land disposal to a licensed landfill facility are preferred options for dredge disposal, marine disposal of the dredge material cannot be excluded at this time. Given that the potential land-based location(s) and markets for commercial uses of the dredge marine sediments are unknown at this time, the assessment of dredged sediment disposal considers both marine- and land-based alternatives.

4 EMISSIONS, DISCHARGES, AND WASTE

Project-related components and activities are anticipated to result in emissions, discharges, and waste from the construction and operations of the Project. Potential sources of emissions, discharges, and waste will be assessed in detail during advanced stages of the environmental assessment process based on refined Project information. Proposed mitigation measures and/or project design changes to address emissions, including GHGs, will be identified through the emissions, discharge, and waste assessments to be completed for the EAC Application.

4.1 AIR AND DUST EMISSIONS

Primary sources of emissions to the air (i.e., air emissions) related to the Project would occur during construction. Emissions are anticipated from fuel combustion in construction vehicles and equipment such as tugboats, dump barges, cranes, dredges, excavators, and graders. Process fuel used in asphalt and concrete plants would also contribute air emissions. Air emissions are anticipated to occur during the operation phase of the Project. Operation emissions would be related to construction vehicles and equipment used in maintenance. Vehicle emissions in the tunnel would be vented by a longitudinal ventilation system. Dust emissions may be generated by construction activities causing soil or asphalt disturbance.

Criteria air contaminants (CACs), which have the potential to affect human health, would be emitted during the Project. CACs include carbon monoxide (CO), nitrogen oxides (NO_x), sulphur dioxide (SO_2), volatile organic compounds, ammonia (NH_3), particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$).

The scope for air quality dispersion modelling will be determined during the Process Planning Phase as part of the Application Information Requirements. Mitigation practices, which will be implemented to manage dust and air quality during construction, would include the following:

- vehicle and equipment maintained using predefined schedule which may limit air emissions and leaks
- construction environment management plan, which will identify best management dust control practices onsite and contain trigger and response dust control practices

4.2 GREENHOUSE GAS EMISSIONS

Greenhouse gases such as carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) will also be emitted during the Project. Greenhouse gas emissions are expressed as carbon dioxide equivalents (CO_2e) using each GHG's respective 100-year global warming potential.

Sources of direct GHG emissions for the different phases of the Project are summarized in Table 4.2-1.

Table 4.2-1: Preliminary Direct Greenhouse Gas Emission Rates

Phase	Emission Source / Activity	GHG	Duration	Emission Rate (tonnes CO2e/year)
Construction	Fuel combustion from construction equipment (on-land) and marine vessels including general site preparation, temporary access trestle, casting basin, tunnel element fabrication, outfitting jetty, and offsite moorage (Table 3.1-1) Direct process emissions (if any) from the onsite concrete batch plant	CO_2, CH_4, N_2O	2026–2029	• 4,789 tonnes CO_2e/year
Operation	Fuel combustion from on-land maintenance equipment (e.g., sweepers) GHG emissions related to acquired power		2030–project life	• 20.9 tonnes CO_2e/year (direct) • 66.9 tonnes CO_2e/year (acquired power)
Decommissioning Existing Infrastructure	Fuel combustion from decommissioning equipment (on-land) and marine vessels, including the existing ITT, Deas Slough Bridge, CN Railway overpass, and Rice Mill Road overpass (Table 3.1-1)		2031–2032	• 7,183 tonnes CO_2e/year
Decommissioning of Project Infrastructure	Fuel combustion from decommissioning equipment (on-land) and marine vessels		End of project life	• 7,183 tonnes CO_2e/year

GHG = greenhouse gas; CO_2e = carbon dioxide equivalents; ITT = immersed tube tunnel.

GHG emissions estimated in Table 4.2-1 account for direct emissions and acquired GHG emissions (from power consumption) for the project. GHG emissions presented (Table 4.2-1) are preliminary and represent the Ministry's best estimate of GHG emissions for inclusion in the IPD. GHG emissions will be updated throughout the EAC process as activities, schedules, and processes are refined.

Mitigation practices to manage GHG emissions during construction would include vehicles and equipment will be maintained using a predefined schedule which may limit GHG emissions.

4.3 SOLID AND SANITARY WASTE

Solid wastes, such as construction debris and sanitary and food waste, will be generated during the Project. The majority of solid waste will likely be from the demolition and removal of existing infrastructure (e.g., Existing Tunnel) and the construction of new structures (e.g., bridges and overpasses) and site surfaces (e.g., asphalt roads on approaches and lanes). Hazardous wastes, including batteries, hydraulic fluids, lubricants, fuels, used filters, paints, and sanitary wastes from worker amenities, will also be generated. All wastes generated during the Project will be collected and disposed of at appropriate offsite facilities. A waste management plan will be developed prior to Project commencement to identify appropriate disposal facilities that can accommodate projected volumes of waste.

4.4 STORMWATER RUNOFF

Stormwater runoff will occur during and following rainfall events that happen throughout both construction and operation phases of the Project. During the construction phase, exposed soils are likely to be present, which increases the potential for surface erosion and for sediment laden waters to enter ditches and/or watercourses. During the operation phase, soils are expected to be stabilized; however, stormwater runoff from road surfaces will continue to occur. Portals would be provided with ramp pump sumps to prevent stormwater runoff from entering the ITT. A low-point pump sump would remove incoming liquids from the ITT. The discharge of water would be via oil separators or equivalent.

4.5 DREDGED MATERIAL AND EXCAVATED SOILS

Dredging is required to excavate a trench for the ITT in order to meet navigational and technical requirements. Dredging will generate sediments that need to be removed from the Project site. The ITT trench footprint is estimated to require the removal of approximately 750,000 m^3 of river sediment during DFO least risk windows (July 16 to February 28). As described in Section 3.6.5, disposal options of dredged material will be assessed in accordance with the guidance of the *Canadian Environmental Protection Act.* Given that the potential land-based location(s) and markets for commercial uses of the dredge marine sediments are unknown at this time, the assessment of dredged sediment disposal considers both marine- and land-based alternatives. Although the beneficial commercial uses and land disposal to a licensed landfill facility are preferred options for dredge disposal, marine disposal of the dredge material cannot be excluded at this time.

Disposal at sea, therefore, will be considered for disposing of river sediments that are dredged to create a trench for the ITT and meet rigorous disposal at sea sediment quality criteria. A Disposal at Sea permit from Environment and Climate Change Canada may be required for any sediment disposal at sea. Alternative options for beneficial use of dredged sediments are outlined in Section 3.6 as part of the Alternative Means of Carrying Out the Project and will be described in more detail in the Detailed Project Description.

Overburden and excavation spoils will also be generated on upland portions of the Project. These materials will be tested for contaminants of concern prior to or concurrent with dredging and excavation programs. Materials will be removed by barge and/or trucks to the appropriate locations. It is expected that suitable uses for the excavated soils will be explored prior to construction. If re-use of overburden and excavated soils is not a viable option, permitted disposal facilities will be considered. All general construction waste would be disposed of at an approved upland facility.

5 LAND AND WATER USE

This section describes land and water aspects pertaining to the Project including a description of the Project location, Project footprint, land and water ownership, designations (including agricultural lands), and tenures that overlap with and are immediately adjacent to the Project footprint. Past and current land uses pertaining to the Project footprint and adjacent areas are also described along with Project water requirements and relevant land and water use and resource management plans. Further information on land and marine use characteristics in the broader vicinity of the Project is included in Section 8.5.

5.1 PROJECT LOCATION, FOOTPRINT, AND AREA OF DISTURBANCE

The Project is located within the municipal boundaries of Richmond and Delta, with both municipalities located within Metro Vancouver. The Project straddles the lower reaches of the Fraser River South Arm (Figure 1.1-1). As described in Section 3.0 and illustrated in Figure 3.1-1, the Project footprint comprises temporary construction components, permanent infrastructure components, and equipment and activities associated with decommissioning/removal of the existing ITT, Deas Slough Bridge, CN Railway overpass, and Rice Mill Road overpass. The majority of the Project would be located within the existing Highway 99 ROW; however, there may be some additional land requirements during construction for the southern portion of Deas Island, additional temporary land requirements for the construction site facilities on industrial and agricultural lands adjacent to the Highway 99 ROW, and temporary offsite moorage areas within the Fraser River South Arm.

The permanent footprint for the Project as illustrated in Figure 3.1-1 is 37 ha. Temporary footprints are composed of 60 ha for the temporary construction components and 6 ha for decommissioned removed infrastructure (Table 5.1-1).

Table 5.1-1: Estimated Size of Disturbed Area

Project Component	Area (ha)
Temporary construction components	60.0
Permanent infrastructure components	37.0
Decommissioning/removal of existing infrastructure	6.0

5.2 LAND AND WATER OWNERSHIP, DESIGNATION, AND TENURES

Ownership of land and water within and adjacent to the Project footprint are shown in Figure 5.2-1. The majority of the Project footprint is located on provincial Crown land within the existing Highway 99 ROW, which is Crown land owned by the Ministry and designated as arterial highway for transportation. The Highway 99 ROW includes the submerged land underwater within the Project alignment and the existing Highway 99 and associated road infrastructure including the existing Rice Mill Road overpass, the Existing Tunnel, the north and south highway approaches into the Existing Tunnel, and the Existing Deas Slough Bridge. In Richmond, just south of Rice Mill Road, the Highway 99 ROW

crosses the CN Railway line, with a portion of Highway 99 accessing and crossing lands owned by Burlington Northern and Santa Fe Railway, BC Rail, and Canadian National Railway (i.e., private land). The Highway 99 ROW for the Project runs through Deas Island Regional Park (located on Deas Island), which is owned by Metro Vancouver. Support structures for the new ITT on Deas Island will be located within the Highway 99 ROW, outside of Deas Island Regional Park. The transmission line currently located within the Existing Tunnel (which will be relocated as determined by BC Hydro's capital projects approval process) is owned and operated by BC Hydro.

Land immediately adjacent to the Project footprint in Delta is mainly private land composed of agricultural land within the ALR. The ALR is a provincial designation in which agriculture is recognized as the priority use. The Project footprint is also adjacent to a small section of provincial Crown land within Delta, as well as small sections of provincial Crown agency land within Delta and Richmond and municipal land within Richmond (Figure 5.2-1). Within Deas Island Regional Park, land adjacent to the Highway 99 ROW is owned by Metro Vancouver and is designated as parks and recreation. In Richmond, land immediately adjacent to the Project footprint is mainly private agricultural lands within the ALR and privately-owned industrial lands. Descriptive and spatial land tenure information by individual land parcel interest type and interest holders will be specified, as the locations of temporary construction site facilities, site roads and access roads are confirmed and delineated in the Detailed Project Description.

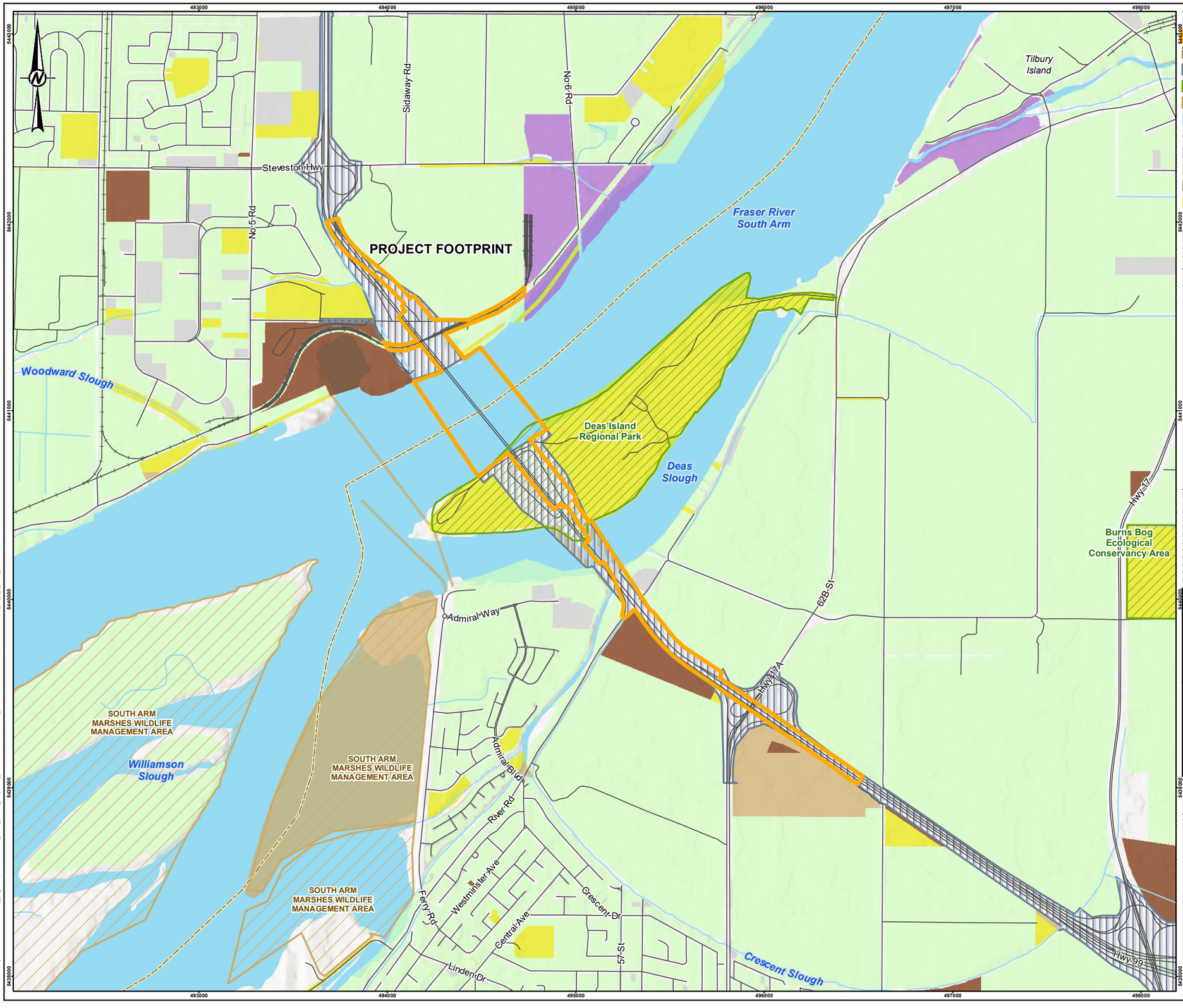
The submerged land under the Fraser River within the Project alignment is Provincial Crown land. VFPA maintains navigational jurisdiction in the Fraser River South Arm in the vicinity of the Project; however, submerged lands are under provincial jurisdiction and not managed by VFPA. VFPA also manages designated federal lands at Fraser Wharves located in Richmond to the northeast close to the Project footprint, as well as several other properties along the Fraser River upstream of the Project.

The Project footprint does not overlap with any Indian Reserve Lands. However, it is located within Tsawwassen Territory as set out in the Tsawwassen First Nation Final Agreement and Musqueam Indian Band's asserted core traditional territory and recognized fishing rights. As described in Section 9 (and illustrated in Figure 1.1-1), there are three Indian Reserves within Richmond and Delta: Musqueam IR No. 2, Sea Island IR No. 3, and Musqueam IR No. 4. The Tsawwassen First Nation Lands are located 6 km southwest of the Project between the Fraser River and Boundary Bay. Musqueam Indian Band asserts that the Project occurs within its area of recognized fishing rights. The Project occurs within the Traditional Territory of other Indigenous groups as further detailed in Section 9.0.

Figure 5.2-2 summarizes land use designations for lands within and immediately adjacent to the Project footprint. Land use in the area is governed by local governments and in collaboration with Indigenous communities. In Richmond, the north tunnel approach Project component overlaps with lands designated as general urban (which is inclusive of areas intended for residential neighborhoods and centres, services, institutions, recreational facilities, and parks; Metro Vancouver 2022). Land adjacent to and west of the north tunnel approach roads and portal is designated as agricultural, while land adjacent to and east of the north tunnel approach is designated as mixed employment (which is inclusive of industrial,

commercial, and other employment-related uses) and industrial. Land located along the northern bank of the Fraser River South Arm in Richmond is primarily designated as industrial. The south tunnel approach and portal traverses through Deas Island Regional Park, which is designated as conservation and recreation. The new Deas Slough Bridge would cross Deas Slough adjacent to a small portion of conservation- and recreation-designated land along the southern portion of Deas Island Regional Park.

Provincial Crown land tenures exist along the foreshore areas within vicinity of the Project. These generally include transportation, utility rights of way, industrial, and commercial tenures. Further information on land and foreshore tenured areas will be provided in the Detailed Project Description.



LEGEND

- PROJECT FOOTPRINT
- MUNICIPAL BOUNDARY
- HIGHWAY 99 RIGHT-OF-WAY
- REGIONAL PARK
- WILDLIFE MANAGEMENT AREA
- WATERBODY

OWNERSHIP TYPE

- CROWN FEDERAL
- CROWN PROVINCIAL
- CROWN AGENCY
- MUNICIPAL
- PRIVATE
- UNKNOWN
- FRASER RIVER SHIPPING CHANNEL
- HIGHWAY / ROAD
- RAILWAY
- WATERCOURSE

0 400 800

1:20,000 METRES

REFERENCE(S)

1. REGIONAL PARKS, MUNICIPAL BOUNDARIES PUBLISHED BY AND OBTAINED FROM THE MINISTRY OF MUNICIPAL AFFAIRS - GOVERNANCE AND STRUCTURE
2. WILDLIFE MANAGEMENT AREAS, HIGHWAYS, ROADS, WATER FEATURES PUBLISHED BY AND OBTAINED FROM THE MINISTRY OF FORESTS, LANDS, NATURAL RESOURCE OPERATIONS AND RURAL DEVELOPMENT.
3. LAND OWNERSHIP PUBLISHED BY AND OBTAINED FROM THE MINISTRY OF CITIZENS SERVICES.
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5. FRASER RIVER SHIPPING CHANNEL OBTAINED FROM THE VANCOUVER FRASER PORT AUTHORITY.

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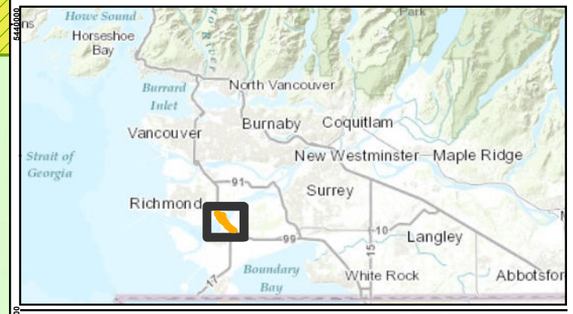
NATIONAL TOPOGRAPHIC SYSTEM (NTS) MAP(S): 92G/03



CLIENT
MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE

BRITISH COLUMBIA — Ministry of Transportation and Infrastructure

PROJECT
FRASER RIVER TUNNEL PROJECT

TITLE
LAND OWNERSHIP

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-04-04
DESIGNED	RS
PREPARED	JP
REVIEWED	HC
APPROVED	DG

PROJECT NO.	CONTROL	REV.	FIGURE
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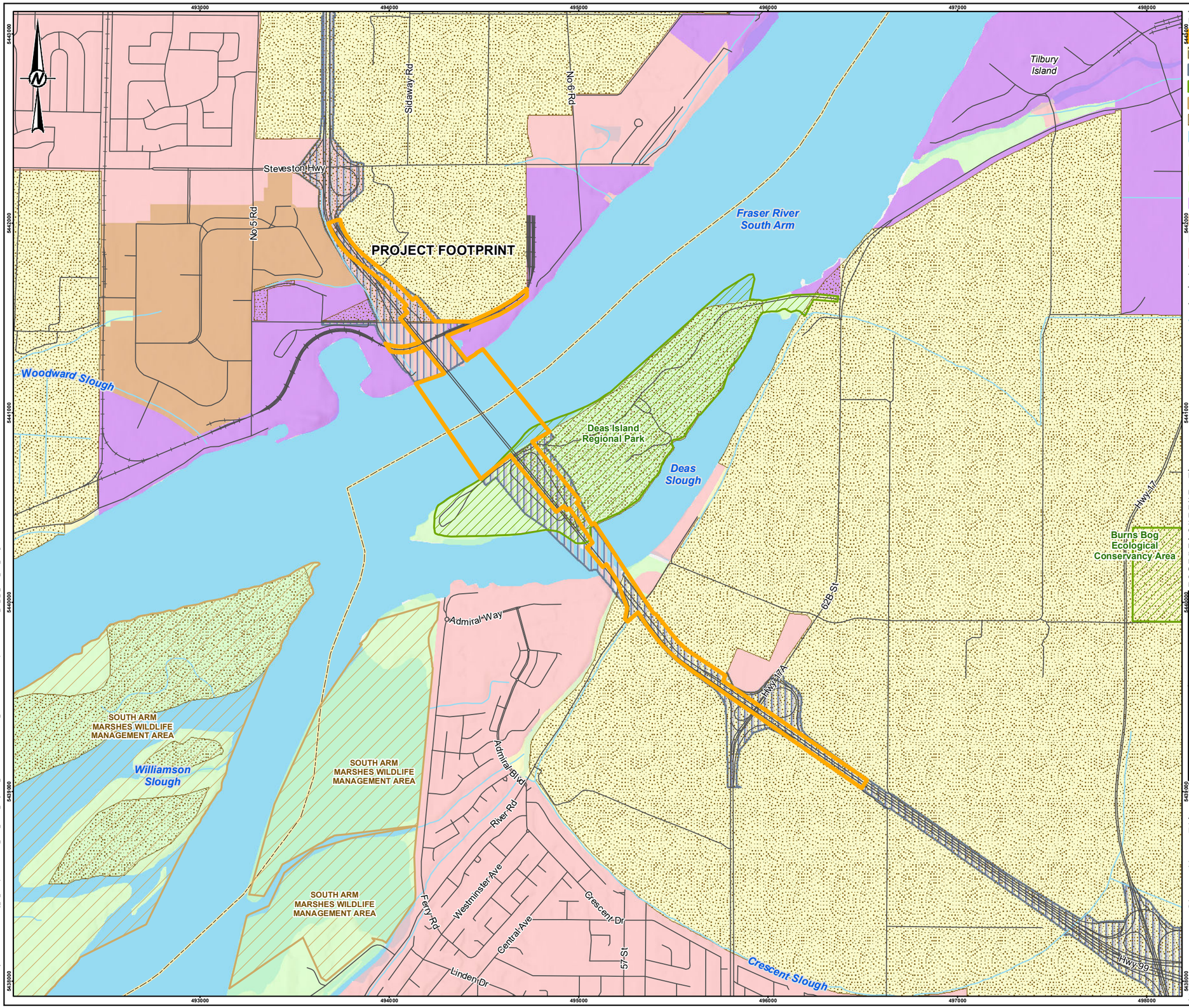

LEGEND

- PROJECT FOOTPRINT
- MUNICIPAL BOUNDARY
- HIGHWAY 99 RIGHT-OF-WAY
- REGIONAL PARK
- WILDLIFE MANAGEMENT AREA
- AGRICULTURAL LAND RESERVE
- WATERBODY

METRO VANCOUVER LAND USE DESIGNATIONS

- AGRICULTURAL
- CONSERVATION_RECREATION
- INDUSTRIAL
- MIXED EMP
- RURAL
- URBAN
- FRASER RIVER SHIPPING CHANNEL
- HIGHWAY / ROAD
- RAILWAY
- WATERCOURSE

0 400 800

1:20,000 METRES

REFERENCE(S)

1. REGIONAL AND LOCAL PARKS, MUNICIPAL BOUNDARIES PUBLISHED BY AND OBTAINED FROM THE MINISTRY OF MUNICIPAL AFFAIRS - GOVERNANCE AND STRUCTURE
2. WILDLIFE MANAGEMENT AREAS, HIGHWAYS, ROADS, WATER FEATURES PUBLISHED BY AND OBTAINED FROM THE MINISTRY OF FORESTS, LANDS, NATURAL RESOURCE OPERATIONS AND RURAL DEVELOPMENT.
3. METRO VANCOUVER LAND USE DESIGNATIONS (2040) OBTAINED FROM METRO VANCOUVER OPEN DATA CATALOG.
4. AGRICULTURAL LAND RESERVE PUBLISHED BY AND OBTAINED FROM THE BC AGENCY - AGRICULTURAL LAND COMMISSION.
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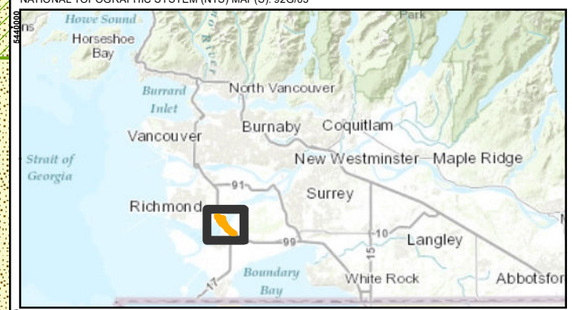
COORDINATE SYSTEM: NAD 1983 CSRS UTM ZONE 10N
NATIONAL TOPOGRAPHIC SYSTEM (NTS) MAP(S): 92G/03



CLIENT
MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE

Ministry of Transportation and Infrastructure

PROJECT
FRASER RIVER TUNNEL PROJECT

TITLE
LAND USE DESIGNATIONS

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-04-04
DESIGNED	RS
PREPARED	JP
REVIEWED	HC
APPROVED	DG

PROJECT NO.	CONTROL	REV.	FIGURE
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5.3 PAST AND PRESENT LAND AND WATER USE

During the past 20 years, growth and the associated land and water use along the lower reaches of the Fraser River South Arm and surrounding nearby lands have focused on industrial use, urban and rural residential development, and transportation infrastructure development. Water and road transportation infrastructure has grown in response to the expansion of trade and urban development, resulting in a network of major transportation routes that both parallel and cross the lower reaches, connecting municipalities and port warehousing and distribution facilities. International and inter-regional transportation hubs, including the Vancouver International Airport, have also contributed to development and activity on the Fraser River South Arm.

As described in Section 5.2, land within and adjacent to the Project footprint has been previously developed and is currently used for road and rail transportation, agriculture, public utilities, industrial and commercial activities, recreation and mixed urban uses. Waters within and immediately adjacent to the Project footprint are currently used for navigation by commercial and recreational marine vessels transiting the Project area, marina moorage, and for Indigenous, commercial, and recreational fishing at various times during the year.

Portions of the Project footprint and adjacent land and water areas have historical and current importance in supporting Indigenous Interests including harvesting, transportation, trade, recreation, fishing, hunting/trapping, and gathering, as well as language and culture, cultural sites, habitation sites, sacred or spiritual sites, transportation routes, and cultural landscapes. Asserted and defined Indigenous Rights including title and treaty rights known to overlap with or lie in the vicinity of the Project area are discussed further in Section 9.

5.4 PROJECT WATER REQUIREMENTS

The Project will require potable water to prepare batched concrete on site, as well as for onsite office, staff, and worker facilities. Potable water will be sourced from nearby municipalities through a water service agreement. Freshwater sourced from the Lower Fraser will be used for riverbank excavation, ballast water for immersion of the ITT elements, flooding of the casting basin, and decommissioning of the Existing Tunnel. All river water used for the Project will be treated on site before pumping it back into the Fraser River. Further detail on Project water requirements will be provided in the Detailed Project Description.

5.5 LAND AND WATER USE MANAGEMENT PLANS

Table 5.5-1 describes land use, water use, and resource management plans that apply to the immediate Project footprint and nearby land and water areas. Currently, no rezoning is required for the Project. Project conformance with these and other identified plans will be assessed in the Project's EAC Application.

Table 5.5-1: Land and Water Use Management Plans

Responsible Agency	Plan	Rationale
Federal		
VFPA	Land Use Plan (VFPA 2014)	Project is located with VFPA Planning Area 7, which extends from North Arm Jetty and Sturgeon Bank to the north end of Boundary Road (New Westminster) and from Sands Head to just east of Tilbury Island. Includes goals to ensure safe and efficient movement of port-related cargo, traffic, and passengers.
Department of Fisheries and Oceans	Pacific Fisheries Integrated Management Plan 2021/2022 (DFO 2022) Integrated Management Plan: Fraser River Eulachon, Pacific Region (DFO 2021)	Project is located within the PFIMA Pacific Salmon Southern Coast spatial area, which delineates stewardship, management, and co-management objectives and plans of the Pacific Salmon fishery. The Project is located within the region covered by the Fraser River Eulachon Integrated Management Plan, which delineates objectives, requirements, and management measures for the eulachon fishery in the Fraser River.
Regional		
TransLink	Southwest Area Transportation Plan (TransLink 2018)	Strategy and recommendations for improving transit services and infrastructure in Richmond, South Delta, and the Tsawwassen First Nation, including aspects of cycling, walking, driving, and goods movement.
	Regional Transportation Strategy (TransLink 2013a); 2014 Base Plan and Outlook (TransLink 2013b)	Goals and strategy to maintain and grow the existing transportation system, including major road networks.
	Regional Transportation Investments. A Vision for Metro Vancouver (Mayors' Council on Regional Transportation (2016)	Transportation vision for Metro Vancouver, which supports the region's land use vision as outlined in the RGS.
Metro Vancouver	Metro Vancouver RGS (Metro Vancouver 2015)	The Project is located with in Metro Vancouver, and the area covered by the RGS. The RGS sets out goals, strategies, and policies to guide regional growth and a land use framework for transportation planning.
	Metro Vancouver Regional Parks Plan (Metro Vancouver 2016)	Plan that sets out goals and strategies for future development, delivery, and management of regional parks.
	Metro Vancouver Regional Food System Strategy (Metro Vancouver 2011)	A framework with goas to support sustainable, resilient, and healthy food systems in the region.

Responsible Agency	Plan	Rationale
Municipal		
City of Delta	Delta OCP (City of Delta 2014)	Project is located within the Municipality of Delta. Delta's OCP includes polices and objectives to guide land use and development, including those pertaining to transportation infrastructure and systems. OCP is guided by Metro Vancouver's RGS.
	Delta Agricultural Plan (Zbeetnoff and Quadra 2011, currently undergoing updates)	Current plan undergoing updates, to address goal of ensuring the long-term viability of agriculture.
City of Richmond	Richmond OCP (City of Richmond 2012)	Project is located within the Municipality of Richmond. Richmond's OCP includes polices and objectives supporting transportation mobility and access, including for areas and sub-areas in proximity to the Project. OCP is guided by Metro Vancouver's RGS.
	Richmond Agricultural Viability Strategy (City of Richmond 1999); Richmond's Farming First Strategy (Forthcoming)	Policies and plans to support the farming industry in Richmond including maintaining the agricultural land base, environmental protection, agricultural infrastructure, and economic viability.
	City of Richmond's Ecological Network Management Strategy (City of Richmond 2015)	The roadside drainage areas adjacent to the north section of Hwy 99 (between the mouth of the Existing Tunnel and Westminster Hwy) are designated with the City of Richmond's Riparian Management Areas network and are corridor components in the City's Ecological Network Management Strategy.
Indigenous Groups		
Lower Fraser Fisheries Alliance	Blueprint for Restoring Ecological Governance to the Lower Fraser River (Lower Fraser Fisheries Alliance 2020)	Guidance document from the Lower Fraser Working Group, proposing principles and commitments for research, communication, and dialogue to support a coordinated and strategic approach to restoration efforts in the Lower Fraser.
TFN	TFN Land Use Plan (TFN 2009)	Tsawwassen First Nations Land is adjacent to the Municipality of Delta. Tsawwassen First Nations Land Use Plan outlines principles, policies, and objectives pertaining to development of Tsawwassen First Nation treaty lands.
	TFN Agricultural Plan (TFN 2013)	Plan outlines a framework, vision, and objectives for management of Tsawwassen First Nation's agricultural land resources.
Other Indigenous management plans relevant to the Project and communities will be further identified through engagement with Indigenous groups.		

VFPA = Vancouver Fraser Port Authority; PFMA = Pacific Fisheries Management Area; RGS = regional growth strategy; OCP = Official Community Plan; TFN = Tsawwassen First Nation.

6 LEGISLATIVE AND REGULATORY CONTEXT

6.1 ENVIRONMENTAL IMPACTS ON FEDERAL LANDS AND RESERVE LANDS IN A PROVINCE OTHER THAN BC OR OUTSIDE CANADA

The Project Site is located on predominantly on provincial Crown land managed by the Ministry within the municipal boundaries of Delta and Richmond and within Provincial jurisdiction on the Fraser River. Project-related components and activities are not anticipated to interact with or impact Federal lands, a Province other than BC, or lands outside of Canada.

6.2 ENVIRONMENTAL ASSESSMENT ACT 2018

Under the provincial *Environmental Assessment Act 2018,* SBC 2018, c. 51, the Reviewable Projects Regulation (BC Reg 67/2020) sets out the criteria for determining which projects require review. Proposed new projects, modifications of existing projects, and proposed dismantling or abandonment of an existing project that meet certain criteria under the Reviewable Projects Regulation require an environmental assessment.

Combining construction of the new ITT and the removal of the Existing Tunnel, the Project is expected to cause direct physical disturbance of more than 2 ha of foreshore or submerged land, or a combination of foreshore and submerged land, below the natural boundary of the Fraser River. Therefore, the Project triggers environmental review under BCEAA as a shoreline modification project according to Part 5, Table 9 of the Reviewable Projects Regulation.

6.3 FEDERAL *IMPACT ASSESSMENT ACT*

Under the federal *Impact Assessment Act*, S.C. 2019, c.28, s.1, the Physical Activities Regulations (SOR/2019-285) sets out the projects and activities that require an impact assessment under the Impact Assessment Act. As the proposed works comprising the Project are not included in the list of physical activities that constitute designated projects that may require an impact assessment, the Project does not trigger a federal review by the Impact Assessment Agency under the Impact Assessment Act.

6.4 FEDERAL LANDS AND LEGISLATIVE REQUIREMENTS

The Project is predominantly located on provincial Crown land (including submerged land under the Fraser River). Under the *Canada Marine Act,* SC 1998, c. 10, VFPA is responsible for the administration, management and control of lands and waters within its jurisdiction, including parts of the Fraser River. While the Project is not located on lands and waters managed by VFPA specifically, the Project is located within VFPA's navigational jurisdiction on the Fraser River. Therefore, Project-related vessel activity and Project-related in-river components must comply with VFPA navigational requirements for Fraser River South Arm Traffic Control Zone 4 (TCZ-4; VFPA 2021).

6.5 ANTICIPATED AUTHORIZATIONS AND PERMITS

Key authorizations and permits that are anticipated to be required for construction and/or operation of the Project are listed in Table 6.5-1. Uncertainty remains as to whether or not all listed authorizations and permits will be needed and/or if additional authorizations may be required (e.g., depending on design and method refinement, as well as changes in law that could occur between submission of this IPD and construction of the Project). Authorizations and permits that may be required based on the current location of the Project and the proposed physical activities and components are summarized in Table 6.5-1.

Table 6.5-1: Anticipated Authorizations and Permits

Permit	Statute	Authorizing Agency	Reason Required
Provincial			
EAC	*Environmental Assessment Act SBC 2018 c. 51*	EAO	Project triggers an environmental assessment under water management project threshold in the Reviewable Projects Regulation.
Regulatory requirement for all soil relocated from a site that has had Schedule 2 activities and/or Independent Remediation and/or Certificate of Compliance	*Environmental Management Act, SBC 2003, c. 53* Contaminated Sites Regulation, B.C. Reg 375/96, including amendments up to B.C. Reg. 161/2020, February 1, 2021.	Ministry of Environment and Climate Change Strategy	Soils and sediments may be removed and disposed of off site.
Change Approval or Notification for works in and about a stream	*Water Sustainability Act, SBC 2014, c. 15, Section 11* Water Sustainability Regulation, BC Reg. 36/2016, Parts 2 and 3	Ministry of Forests, Lands, Natural Resource Operations and Rural Development	Project activities will be conducted in or about a watercourse (e.g., bridge piers, dredging, and tunnel installation).
Permission for non-agricultural use	*Agricultural Land Commission Act, SBC 2002, c. 36* Agricultural Land Reserve Use, Subdivision and Procedure Regulation, B.C. Reg. 171/2002 Section 6	Agricultural Land Commission	Project activities (e.g., highway alignment) located within the ALR.

Permit	Statute	Authorizing Agency	Reason Required
Heritage Inspection Permit / Alteration Permit	*Heritage Conservation Act, RSBC 1996, c. 187, s. 12.2 and s.12.4*	Ministry of Forests, Lands, Natural Resource Operations and Rural Development, Archaeology Branch	Ground disturbance may lead to the discovery of previously unknown archaeological sites which would require an Archaeological Impact Assessment (s. 12.2). An Alteration permit (s. 12.4) is required to alter an archaeological site.
Dike Maintenance Act Approval	*Dike Maintenance Act RSBC 1996, c. 95*	Ministry of Forests, Lands, Natural Resource Operations and Rural Development	Project activities interacting with existing flood protection infrastructure (e.g., portal construction, dredging, and highway construction installation).
Wildlife Act General *Wildlife* Permit and Fish Collection Permit	*Wildlife Act, RSBC 1996, c. 488*	Ministry of Forests, Lands, Natural Resource Operations and Rural Development	Wildlife, bird nests, or other wildlife features may require relocation. A Fish Collection Permit will be required for fish inventories.
Federal			
Section 7(6) Permit or Approval	*Canadian Navigable Waters Act, RSC 1985, c. N-22*	Transport Canada	Activities that "construct, place, alter, rebuild, remove or decommission works that are in, on, over, under, through or across any navigable water may be required to apply for an approval." Project activities will occur in the Fraser River, which is a navigable water.
Section 35(2) Authorization	*Fisheries Act, RSC 1985, c. F-14 S. 35(2)(b)*	DFO	Project activities may result in the death of fish or the Harmful Alteration, Disruption or Destruction of fish habitat.
Licence to Fish for Scientific, Experimental, or Educational Purposes	*Fisheries Act, RSC 1985, c. F-14; Fishery (General) Regulations SOR/93-53, S.52*	DFO	A Licence to Fish for Scientific, Experimental, or Educational Purposes will be required for fish inventories.
Disposal at Sea Permit	*Canadian Environmental Protection Act, SC 1999, c. 33*	Environment and Climate Change Canada	Dredge material may be disposed of at sea.

Permit	Statute	Authorizing Agency	Reason Required
Indigenous			
First Nation Heritage Permits	-	-	For Indigenous groups that have heritage permitting processes, such permits will be applied for.

EAC = Environmental Assessment Certificate; EAO = Environmental Assessment Office; ALR = Agricultural Land Reserve; DFO = Fisheries and Oceans Canada.

6.6 OTHER AGREEMENTS

Agreements that will facilitate engagement between the Province and Indigenous groups include the following:

- S'ólh Téméxw Stewardship Alliance Strategic Engagement Agreement Amendment 4 – Spring 2019, Appendix D regarding Engagement Framework for Major Projects
- *Tsawwassen First Nation Final Agreement Act,* SC 2008, c. 32
- Cowichan Nation British Columbia Government to Government Agreement, whose purpose includes "to create processes and mechanisms to assist in the co-operative resolution of disputes between the Parties." (p. 3)

Agreements that will facilitate meaningful Project engagement between the Government of British Columbia and other governments include the following:

- Environmental Cooperation Agreement between The Province of British Columbia and The State of Washington (May 7, 1992) (Government of BC and State of Washington 1992)

7 SPATIAL BOUNDARIES

The Project's environmental assessment will consider Project-related interactions with physical, biological, and human environment valued components (VCs) within appropriate spatial boundaries. The spatial boundaries for the Project will encompass the spatial areas within which the Project is expected to have interactions with the VCs. Boundaries for each VC will consider the spatial and temporal characteristics of the respective VCs. These spatial boundaries may be limited to the Project footprint or extend beyond the physical boundaries of the Project. The preliminary spatial boundaries for assessing Project effects on VCs will be VC specific and as such will be developed following Indigenous Engagement, VC selection, and further scoping exercises.

The environmental assessment will include three spatial boundaries to characterize Project-related interactions with selected VCs:

- **Project Footprint**—consists of the spatial area directly disturbed by the Project construction activities, including Project-related physical works and activities.
- **Local Assessment Area (LAA)**—includes the area in which the selected VC is most likely to interact with Project-related physical works and activities.
- **Regional Assessment Area (RAA)**—encompasses the LAA and the area beyond the LAA where residual effects from Project-related interactions may result from a combination of interactions with other existing and reasonably foreseeable projects and activities to cause cumulative effects.

8 PHYSICAL, BIOLOGICAL, AND HUMAN ENVIRONMENT CONDITIONS

This section provides a summary of the potential physical, biological, and human environmental conditions and characteristics, including sensitive and vulnerable values, and their interaction with Project-related activities and components. This section also summarizes how the Project may potentially affect these values. Key values proposed for study as part of the environmental assessment include the following:

- physical values, such as air quality and GHG emissions, atmospheric and underwater noise, hydrology, water and sediment quality, and disturbed areas
- biological values such as vegetation and terrestrial ecosystems, wildlife and wildlife habitat, fish and fish habitat, and marine mammals
- human values such as employment and economy, land use, marine use, visual quality, services, infrastructure and transportation, cultural heritage, and human health

The identification of VCs and potential Project-related interactions and effects will be further refined through engagement with Indigenous groups, local governments, stakeholders, and regulators and development of Project-specific and regional existing conditions studies. Studies of these values will assist in identifying potential Project-related effects, as well as opportunities to avoid or mitigate such effects. The EAC Application will include an assessment of potential Project-related and cumulative effects, identification of mitigation measures, and characterization of any residual effects.

8.1 PHYSICAL ENVIRONMENT CONDITIONS

Key biophysical environmental values proposed for study as part of the environmental assessment include vegetation and ecosystems, wildlife and wildlife habitat, fish and fish habitat, and marine mammals. The following subsections describe the natural setting characteristics, including coastal, foreshore, riparian, mountainous, watersheds, and agricultural land; disturbed area characteristics, including brown field; contaminated site(s) and any history of development; and sensitive or vulnerable species, ecosystems, and/or habitats in the Project area. A list of existing data, including monitoring reports, previous environmental assessments, regional studies, and/or other sources of information that support the understanding of the existing biophysical conditions, is provided in Attachment 2.

Key physical environmental values proposed for study, described in Section 8.1.1 to 8.1.7 as part of the environmental assessment include air quality and GHG emissions, atmospheric and underwater noise, Fraser River Hydrology, and water and sediment quality. Key biological environmental values are provided in Section 8.2.

8.1.1 Air Quality

Air quality along Highway 99 is largely determined by local and regional atmospheric conditions and local human activities. Traffic congestion at the Existing Tunnel has increased emissions and reduced air quality around the Fraser River crossing. Vehicle idling and slower movements during periods of traffic congestion produces greater per-vehicle emissions of air contaminants such as fine particulate matter, nitrogen oxides (NO_X), and sulfur dioxide (SO_2) when compared to uncongested conditions.

The Project is expected to result in an improvement in air quality in the long term, especially in the vicinity of the Existing Tunnel, as a result of improved traffic flow, since vehicles driving at highway speeds consume less fuel and generate lower emissions. However, air emissions during construction are likely to result in localized temporary changes in air quality. Long-term improvements in air quality are likely to be driven by ongoing improvements in vehicle emission reduction technology and increased transit.

Metro Vancouver operates a large network of air quality stations in the Lower Mainland, each of which monitoring a specific set of pollutants focused on CACs. The National Air Pollution Surveillance network in turn collects data on non-CACs. The Ministry will collect data from these sources and other sources, as applicable, to characterize existing conditions for the pollutants in the area surrounding the Project.

8.1.2 Greenhouse Gas Emissions

Traffic congestion at the Existing Tunnel has increased GHG emissions around the Fraser River crossing. Vehicle idling and slower movements during periods of traffic congestion produces greater per-vehicle GHG emissions when compared to uncongested conditions. Vehicle idling and slower movements during periods of traffic congestion produces greater per-vehicle GHG emissions when compared to uncongested conditions.

The Project is expected to result in an improvement in GHG emissions in the long term, as a result of improved traffic flow, since vehicles driving at highway speeds consume less fuel and thus generate less GHG emissions. Additionally, long-term improvements in GHG emissions are likely to be driven by ongoing improvements in vehicle emission reduction technology and increased transit use.

The Project construction, operation, and decommissioning phases will result in direct and indirect GHG emissions (e.g., CO_2, CH_4, and N_2O). Preliminary direct emissions for the Project construction, Project operation, decommissioning of the Existing Tunnel, and Project decommissioning are summarized below.

- **Project Construction**—4,789 tonnes CO_2e/year
- **Project Operation**—20.9 tonnes CO_2e/year
- **Decommissioning of Existing Infrastructure**—7,183 tonnes CO_2e/year
- **Decommissioning of Project Infrastructure**—7,183 tonnes CO_2e/year

8.1.3 Atmospheric Noise

Atmospheric noise in the Project area is primarily the result of traffic on Highway 99 and connecting roadways. Changes in the noise environment in this area in recent decades are associated with growth in local and regional traffic volumes. Activity on adjacent industrial sites, trains, aircraft, marine traffic, and agricultural activities also contribute to ambient noise in and around the Project area. In addition to these anthropogenic noises, natural sounds from wind, rain, waves, and wildlife can contribute to atmospheric noise.

The Project will temporarily increase atmospheric noise during the construction phase because of heavy equipment operation during construction activities. Noise-sensitive land uses in the vicinity of the Project alignment may experience an increase in noise over time during Project operations if vehicle speeds, traffic volumes, and the proportion of heavy trucks increase.

The Ministry will study the existing atmospheric noise conditions at locations representative of noise-sensitive land uses (e.g., residential, institutional, and recreational) where Project-related changes in atmospheric noise are likely to occur.

8.1.4 Underwater Noise

Underwater Noise in the main channel of the Fraser River South Arm is largely the result of commercial and industrial vessel shipping traffic, such as tugs and large ships transiting the river to upstream terminals and industrial sites. Construction works in the Fraser River such as dredging and pile driving are also underwater noise contributors. Ambient noise levels in Deas Slough are substantially lower than in the main channel, because vessel traffic in the slough consists primarily of smaller, slow-moving recreational vessels transiting to and from the marinas.

Project-related activities that will generate underwater noise and have the potential to result in injury or disturbance to fish and marine mammals include vibratory and impact pile driving during the construction of the casting facility, outfitting jetty, temporary element moorage, and new Deas Slough Bridge, as well as ground improvements (e.g., in-river ground densification), dredging during riverbank excavation and tunnel trench preparation, decommissioning of the Existing Tunnel, operation of vessels supporting construction works, and increases in vehicle traffic in the tunnel during Project operations.

Ambient underwater noise levels near the Existing Tunnel were recorded in 2014 and are considered sufficient to characterize the existing underwater noise levels in the Fraser River. Underwater acoustic modelling will be used to predict potential areas of disturbance and injury for fish and marine mammals expected to be generated by noise-producing Project activities. The results of the modelling will be used to support the assessment of fish and fish habitat and marine mammals.

8.1.5 Fraser River Hydrology

The Fraser River South Arm is a single, meandering, sand-bed channel. Dunes, characteristic features of a sand-bed channel, occur on the riverbed within a 1.2 km stretch centred over the Existing Tunnel and vary in height from 0.5 m to 2.0 m, although individual dunes can be considerably larger. Fraser River flows are dominated by snowmelt, with discharge typically rising in April, peaking between May and July during freshet, and receding during autumn and winter.

Salinity in the Lower Fraser River is influenced by the presence of a salt wedge, the location of which moves in response to daily tidal variations and seasonally in response to variations in freshwater river discharge. During winter low flows, the salt wedge can travel as much as 30 km upstream from the mouth of Fraser River. During freshet high flows, the maximum extent of saltwater intrusion is less than 15 km. The location of this salt wedge in relation to irrigation intakes in the river influences salinity of water available for agricultural use in the adjacent communities of Delta and Richmond.

Project-related changes in river hydraulics are expected to be limited to in-river construction activities including dredging, immersion of new tunnel elements, and decommissioning of the Existing Tunnel. These activities may temporarily affect water levels, river velocity, sediment transport, and turbidity, as well as erosion and deposition patterns, and result in changes to flow patterns and scour. These potential changes are expected to be limited to the location of the new ITT and Existing Tunnel.

The Ministry will study river hydraulics and morphology in the Fraser River and Deas Slough to understand potential changes in river velocity, water levels, and flow patterns and their influence on sedimentation and erosion in the Fraser River and potential impacts to flood protection and utility infrastructure and Deas Island Regional Park. The study will consider permanent infrastructure components (e.g., new ITT), as well as proposed in-stream temporary construction components (e.g., outfitting jetty and temporary element moorage; Table 8.7-1). Results of the river hydraulics and morphology studies will be used to support the assessment of potential effects of the Project on fish and fish habitat, marine mammals, agricultural use, and marine use VCs.

8.1.6 Water and Sediment Quality

In addition to the Fraser River South Arm and Deas and Green Sloughs, the Project alignment also crosses several roadside drainage and irrigation ditches (Figure 8.2-1), most of which support ecological values in addition to agriculture and stormwater management purposes. The quality of water and sediment in these water courses determine their ability to support ecological and land use values. Water quality in the Lower Fraser River is influenced by mixing of silt-laden freshwater and tidal saltwater with water quality characteristics changing due to tidal and seasonal factors.

Potential Project-related changes in surface water and sediment quality are expected to include land-based construction activities, which may result in erosion or spills, and in-river construction activities, which may result in temporary redistribution of riverbed sediments.

The impervious surface area created by the ITT and associated approaches will generate additional stormwater runoff, which may affect water quality in the receiving environment. Stormwater management infrastructure or catchment areas will be incorporated in the Project design and will minimize the potential for stormwater to directly enter watercourses.

The Ministry will study the quality of water and sediment in the Fraser River and Deas Slough in and around the Project alignment. The results of these studies will be used to support the assessment of environmental values such as fish and fish habitat, marine mammals, and land and resource use.

8.1.7 Disturbed Areas

The contaminated sites study completed for the previous 10-lane bridge project identified multiple areas of developed or disturbed land and/or brownfields including a major highway (Highway 99), manufacturing operations on No.4 Road, various industrial development on Vanguard Road, transportation infrastructure on Steveston Highway and the Highway 99 overpass, an electrical substation, a railway, and two maintenance works yards. Notwithstanding the commercial and industrial development in the area, the study did not identify any properties where the risk of contamination is high (MOTI 2015). Five properties were assessed as having moderate risk of potential contaminants, and the remaining properties had low risk of potential contaminants.

8.2 BIOLOGICAL ENVIRONMENT CONDITIONS

Key biological environmental values proposed for study as part of the environmental assessment, described in Sections 8.2.1 to 8.2.4, include vegetation and terrestrial ecosystems, wildlife and wildlife habitat, fish and fish habitat, and marine mammals.

8.2.1 Vegetation and Terrestrial Ecosystems

The Project is situated in the Coastal Douglas-fir biogeoclimatic zone, moist maritime (mm) subzone, and the Lower Mainland Ecoregion. Since the 1870s urbanization and industrialization of the Lower Fraser, including diking, armouring, farming, road construction, and construction of the George Massey Tunnel, have altered historical shorelines and ecosystems in and near the Project.

Remaining forested areas in and near the Project are largely restricted to Deas Island. Deas Island harbours several ecological communities at risk including the red-listed Lyngbye's sedge (*Carex lyngbyei*) herbaceous vegetation estuarine marsh ecosystem, large-headed sedge (*Carex macrocephala*) herbaceous vegetation beach ecosystem, and Sitka willow - Pacific willow / skunk cabbage (*Salix sitchensis* - *Salix lasiandra* var. *lasiandra* / *Lysichiton americanus*) swamp. The former two red-listed ecological communities likely overlap with temporary laydown offices, parking, storage, and fabrication footprints, while the latter ecological community at risk does not. The blue-listed western redcedar / sword fern - skunk cabbage (*Thuja plicata* / *Polystichum munitum* - *Lysichiton americanus*) swamp and common cattail (*Typha latifolia*) marsh also occur on Deas Island but are not known to overlap with Project footprints; however, common cattail marshes are known to occur in drainage ditches

alongside Highway 99. Metro Vancouver Sensitive Ecosystem Inventory mapping identifies primarily estuarine and riparian habitat, with a small wetland at the northeast end of Deas Island, old-field habitat on the north shore of the Fraser River, and several small intertidal areas along the banks of the Fraser River (Metro Vancouver 2014; Figure 8.2-1).

Two plant species at risk are known to occur on Deas Island. A Vancouver Island beggarticks (*Bidens amplissima*) population, a blue-listed species in BC and federally listed on Schedule I of the *Species at Risk Act,* SC 2002, c. 29 (SARA) as a species of special concern, occurs east of the Project footprints on Deas Island. Streambank lupine (*Lupinus rivularis*), which is red-listed in BC and listed as endangered on Schedule I of SARA, has been successfully introduced to Deas Island and incorporated into a critical habitat polygon. No plant species at risk are known to overlap with the Project footprint.

During construction, the Ministry will implement the BC mitigation hierarchy of avoidance, minimizing, and restoring on site. Where permanent loss of vegetation and wetland habitat will result from increased road surface or construction of other Project components, opportunities for onsite restoration in other areas of the corridor will be explored to mitigate effects on values including fish and aquatic habitat and wildlife and wildlife habitat. The Ministry will characterize vegetation along the Project alignment to better understand its aquatic habitat and wildlife habitat value and to determine the presence of at-risk plant species and ecological communities.

LEGEND

- PROJECT FOOTPRINT
- MUNICIPAL BOUNDARY
- REGIONAL PARK
- WILDLIFE MANAGEMENT AREA

SENSITIVE ECOSYSTEM INVENTORY FOR METRO VANCOUVER (2014)

- WETLAND
- RIPARIAN
- ESTUARINE
- INTERTIDAL
- OLD FIELD
- FRASER RIVER SHIPPING CHANNEL
- HIGHWAY / ROAD
- RAILWAY
- WATERCOURSE

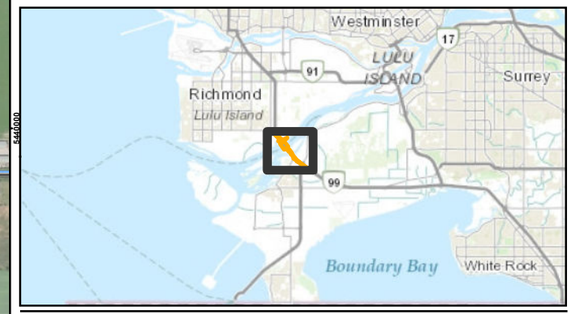
0 250 500

1:12,500 METRES

REFERENCE(S)

1. PROJECT FOOTPRINTS PROVIDED BY COWI 2022/01/23.
2. REGIONAL PARKS, MUNICIPAL BOUNDARIES PUBLISHED BY AND OBTAINED FROM THE MINISTRY OF MUNICIPAL AFFAIRS - GOVERNANCE AND STRUCTURE
3. RICHMOND WATERCOURSES, WILDLIFE MANAGEMENT AREAS ROADS PUBLISHED BY AND OBTAINED FROM THE MINISTRY OF FORESTS, LANDS, NATURAL RESOURCE OPERATIONS AND RURAL DEVELOPMENT.
4. RAILWAYS OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
5. FRASER RIVER SHIPPING CHANNEL OBTAINED FROM THE VANCOUVER FRASER PORT AUTHORITY.
6. DELLTA WATERCOURSES OBTAINED FROM THE CITY OF DELTA.
7. SENSITIVE ECOSYSTEM INVENTORY MAPPING FOR METRO VANCOUVER (2014) PUBLISHED AND OBTAINED FROM METRO VANCOUVER
8. IMAGERY COPYRIGHT © 20200315 ESRI AND ITS LICENSORS. SOURCE: MAXAR GE01. USED UNDER LICENSE, ALL RIGHTS RESERVED.

COORDINATE SYSTEM: NAD 1983 CSRS UTM ZONE 10N
NATIONAL TOPOGRAPHIC SYSTEM (NTS) MAP(S): 92G/03



CLIENT
MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE

BRITISH COLUMBIA | Ministry of Transportation and Infrastructure

PROJECT
FRASER RIVER TUNNEL PROJECT

TITLE
SENSITIVE ECOSYSTEM INVENTORY AND DRAINAGES

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-04-04
DESIGNED	JP
PREPARED	JP
REVIEWED	HC
APPROVED	DG

PROJECT NO.	CONTROL	REV.	FIGURE
21490984	2	0	8.2-1

8.2.2 Wildlife and Wildlife Habitat

Habitat available to wildlife species along the Project alignment generally consists of roadside verge and ditches near the existing roadway, agricultural fields, forested areas, riparian habitat, and industrial/developed areas. Terrestrial wildlife along Highway 99 (i.e., within 1 km of the Project alignment) consists primarily of common species of raptors, songbirds, amphibians, and small mammals that are adapted to anthropogenic disturbances. Grassy areas adjacent to Highway 99 provide habitat for small mammals, such as voles, and foraging habitat for raptors and other birds that prey on small mammals. Additionally, grassy areas, roadside verge, and patches of shrubs provide some habitat for songbirds. Roadside and agricultural ditches may support amphibian species. Large mammals, specifically black-tailed deer may live in areas adjacent to the highway; however, monitoring of the existing collision impacts of Highway 99 by the Ministry indicates limited impacts along the portion of the Highway 99 comprising the Project. Suitable habitats for several species at-risk have been identified along vegetated sections of Highway 99, including barn owl (*Tyto alba*; provincially red-listed and listed as Threatened under Schedule 1 of SARA), Pacific water shrew (*Sorex bendirii*; provincially red-listed and listed as Endangered under Schedule 1 of SARA), and barn swallow (*Hirundo rustica*; provincially blue-listed and listed as Threatened under Schedule 1 of SARA) (BC CDC 2022). The Project is located within the Boundary Bay – Roberts Bank – Sturgeon Bank (Fraser River Estuary) Important Bird Area (IBA BC107) (Birds Canada 2022). The Lower Fraser River downstream of the ITT supports a variety of aquatic birds such as shorebirds, waterfowl, loons, grebes, cormorants, and gulls, especially during the winter. Further, a bat maternity colony that is used by Yuma myotis (*Myotis yumanensis;* provincially yellow-listed) and little brown myotis (*M. lucifugus;* provincially yellow-listed and listed as Endangered under Schedule 1 of SARA) occurs at the east end of Deas Island, approximately 1.1 km from the Project.

Terrestrial habitat may be lost during vegetation clearing and grubbing. Habitat connectivity and access may be affected by noise levels, and by the temporary presence and movement of crews, machinery and equipment. In-stream works within the Fraser River may result in sedimentation of downstream nearshore habitat, sensory disturbance, and temporary displacement of aquatic birds from the vicinity of the new ITT. Wildlife mortality may occur during vegetation clearing and grubbing, soil stripping, and excavation. Following construction and decommissioning of the Existing Tunnel, additional areas will be available to re-establish wildlife connectivity on Deas Island. It is not anticipated that a SARA or *Migratory Bird Convention Act,* SC 1994, c. 22*,* permit will be required because the Project footprint does not overlap with existing approved critical habitat for wildlife species, and it is expected that barn swallow nests that may be removed during replacement of the Deas Slough Bridge would be removed outside the specified nesting period in accordance with guidance from Environment and Climate Change Canada (ECCC 2019). Potential Project interactions with wildlife and wildlife habitat and their effects will be considered in more detail during the Process Planning Phase as part of the Application Information Requirements and subsequently in the EAC Application.

Existing information on the occurrence of wildlife along Highway 99 is available from the 2017 EAC Application for the previous 10-lane bridge project, information prepared for other projects in the vicinity (e.g., Tilbury Marine Jetty Project), government databases (e.g., iMapBC [Government of BC 2022]), and ongoing Indigenous-led advanced environmental studies for migratory birds of the Fraser River (TFN and LGL 2021a, 2021b, 2021c, 2022). The Ministry will conduct additional studies of terrestrial wildlife and habitats along the Project alignment to document the presence of wildlife species and use of terrestrial habitats in areas proposed for clearing, construction, or related disturbance; assess the occurrence of aquatic birds in the Fraser River in the vicinity of the new ITT; assess bat summer habitat use near the proposed areas of clearing and construction; assess amphibian presence in adjacent waterbodies; and determine how suitable the habitat along Highway 99 is for small mammals. Information from stakeholder comments provided during the EAC Application for the previous 10-lane bridge project, such as those from ECCC related to species at risk, will be considered for the current Project.

8.2.3 Fish and Fish Habitat

The Fraser River, Deas Slough, and Green Slough support fish communities that include five species of Pacific salmon – Chinook Salmon (*Oncorhynchus tshawytscha*), Chum Salmon (*O. keta*), Coho Salmon (*O. kisutch*), Pink Salmon (*O. gorbuscha*), and Sockeye Salmon (*O. nerka)*, as well as Rainbow Trout (*O. mykiss),* Coastal Cutthroat Trout (*O. clarkii clarkii*), Bull Trout (*Salvelinus confluentus*), Dolly Varden (*S. malma*), White Sturgeon (*Acipenser transmontanus*), Green Sturgeon (*A. medirostris*), and Eulachon (*Thaleichthys pacificus*). In total, there are 58 documented species of fish in the Fraser River, plus one crayfish species and one mollusc species (ENV 2021). The Fraser River is a significant salmonid-bearing system and migration route. Anadromous fish use the Fraser River South Arm for adult migration throughout much of the year and for downstream juvenile migration and rearing in the spring to midsummer. Where accessible, upland tributaries with higher quality habitat values may also provide juvenile salmonid rearing habitat. Upland tributaries potentially impacted by the Project are primarily man-made ditches. These are typically located upland of flood-control infrastructure, limiting access to the Fraser River and therefore have lower fish and aquatic habitat values. A list of key fish species in the Project area and their conservation status is provided in Table 8.2-1.

Potential Project-related effects on fish in the Fraser River, Deas Slough, and Green Slough include exposure to underwater noise and elevated suspended sediment levels during in-water construction activities, physical habitat alteration, and direct mortality. Potential Project-related effects on fish in upland tributaries are similar, although underwater noise exposure is not expected. The Project may result in temporary and permanent loss of fish habitat within the Fraser River, Deas Slough, and upland tributaries in areas that overlap with the Project footprint. Project-related effects will be assessed, mitigated, and offset as required in accordance with regulatory requirements and in consultation with Indigenous Groups. Potential Project interactions with Fish and Fish Habitat and their effects will be considered in more detail during the Process Planning Phase and in the EAC Application.

There are ongoing Indigenous-led advanced environmental studies collecting data to assess juvenile salmonid habitat use during outmigration, sturgeon presence and use, and Eulachon spawning within the Project area (Hemmera 2021; Hemmera and Musqueam Indian Band 2021; LGL 2021). The Ministry will conduct additional studies to assess fish habitat values and fish use of watercourses, assess the quality and quantity of fish habitat within the Project alignment, and consider effects to fish and fish habitat including species of conservation concern, species listed under SARA, or species identified as at-risk by the Committee on the Status of Endangered Wildlife in Canada.

Table 8.2-1: Key Fish Species and their Conservation Status in the Project Area

Species	BC CDC	COSEWIC	SARA Schedule 1
Eulachon (Fraser River population)	–	Endangered	–
Green Sturgeon	Blue	Special Concern	Special Concern
White Sturgeon (Lower Fraser population)	Red	Threatened	–
Chinook Salmon (multiple populations)	–	Endangered/Threatened/Special Concern	Currently under consideration for addition
Chum Salmon	–	-	–
Coho Salmon (multiple populations)	–	Threatened	–
Pink Salmon	–	–	–
Sockeye Salmon (multiple populations)	–	Endangered/Threatened/Special Concern	–
Coastal Cutthroat Trout	Blue	–	–
Steelhead (Rainbow) Trout (multiple populations)	Red	Endangered	–
Bull Trout (South Coast population)	Blue	Special Concern	Special Concern
Dolly Varden (Southern lineage)	–	–	–

Note: Conservation status includes species listed under Schedule 1 of the federal Species at Risk Act (SARA), assessed as Endangered, Threatened, or Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and/or assigned by the BC Conservation Data Centre (BC CDC) as red-listed (Extirpated, Endangered, or Threatened) or blue-listed (Special Concern).

- = not applicable.

8.2.4 Marine Mammals

Pinnipeds (seals and sea lions) are the marine mammal most likely to be present near the Project footprint. Harbour seals (*Phoca vitulina*) are present year-round in the Strait of Georgia and are common in the Lower Fraser River (WesPac 2018; MOTI 2016). Harbour seals are anticipated to exhibit higher abundance between spring and fall when eulachon and salmon are migrating upriver to spawn (DFO 2010a; Hume 2010). There are no known harbour seal haul-out sites near the Project footprint; however, haul-out sites have been documented at the mouth of the river near Gary Point Park, Westham Island, and Brunswick Point (Jeffries et al. 2000; WesPac 2018). Sea lions – both Steller (*Eumetopias jubatus*) and California (*Zalophus californicanus*) – also have the potential to be affected by Project activities and may occur near the Project footprint. Both species have been documented hauling out near Sand Heads (along the Steveston jetty) at the mouth of the Fraser River, approximately 18 km downstream of the Project site (Bigg 1985; Jeffries et al. 2000; DFO 2010b). While both Steller sea lions and California sea lions likely follow prey species up the Fraser River (Bigg 1985), they are not anticipated to be present near the Project footprint in large numbers.

Cetaceans (whales and dolphins) rarely occur within the Fraser River and are unlikely to occur as far upstream as Deas Island, though cetacean sightings have been documented (BCCSN 2018; COSEWIC 2016; Dunphy 2015). Cetacean sightings reported by the British Columbia Cetacean Sightings Network between 1990 and 2018 included two Grey whales (*Eschrichtius robustus*), one near Deas Island and a second immediately upstream of Tilbury Island, as well as multiple killer whale (*Orcinus orca*) sightings at the mouth of the river near Westham Island. Harbour porpoises (*Phocoena vomerina*) have also been documented in the Fraser River (COSEWIC 2016) and have potential to occur near the Project footprint. A list of key marine mammal species that may be affected by Project activities is provided in Table 8.2-2.

Critical habitat for southern resident killer whales is established at the mouth of the Fraser River and extends into the Strait of Georgia and the Strait of Juan de Fuca (DFO 2011). This critical habitat was established because of its importance to southern resident killer whales for foraging, especially during salmon migration and spawning (DFO 2011).

Potential Project-related effects on marine mammals include injury and behavioural disturbance effects from underwater noise, injury and mortality from vessel strikes, potential contaminant exposure from dredging and disposal at sea, and effects to prey items (Section 8.2.3).

Table 8.2-2: Marine Mammal Species with Potential to Interact with the Project

Common Name (Scientific Name)	SARA	COSEWIC
Harbour porpoise (*Phocoena phocoena vomerina*) – Pacific Ocean population	Special Concern/Schedule 1	Special Concern
Southern Resident Killer Whales (*Orcinus orca*)	Endangered/ Schedule 1	Endangered
Grey whale (*Eschrichtius robustus*)	Varies with population[a, b, c]	Varies with population[a, b, c]
Humpback whale (*Megaptera novaeangliae*) – North Pacific population	Concern/Schedule 1	Special Concern
Steller sea lion (*Eumetopias jubatus*)	Concern/Schedule 1	Special Concern
California sea lion (*Zalophus californicanus*)	No Status/No Schedule	Not at Risk
Harbour seal (*Phoca vitulina richardsi*) Pacific subspecies	No Status/No Schedule	Not at Risk

(a) Northern Pacific migratory population = Not at risk (COSEWIC status), No status (SARA status).
(b) Pacific coast feeding group population = Endangered (COSEWIC status), Under consideration for addition (SARA status).
(c) Western Pacific population - Endangered (COSEWIC status), Under consideration for addition (SARA status).
COSEWIC = Committee on the Status of Endangered Wildlife in Canada;

8.3 HUMAN ENVIRONMENT CONDITIONS

Key human environment values proposed for study as part of the environmental assessment include employment and economy, land use, marine use, visual quality, services, infrastructure and transportation, cultural heritage, and human health. The following sections describe the Project's proximity to communities, general characteristics of the human environment setting, sensitive or vulnerable human environment values in the Project area, potential Project interactions, and key areas for study. Gender-Based Analysis Plus (GBA+) analysis will be applied to characterize differential economic, social, cultural and health existing conditions and identify potential disproportionate effects of the Project on distinct human populations, including populations identified by gender. A list of existing data, including monitoring reports, previous environmental assessments, regional studies, and/or other sources of information that support the understanding of existing human environment conditions is provided in Attachment 2.

8.3.1 Proximity to Communities

As indicated in Section 5.1 and illustrated in Figure 1.1-1, the Project is within the Metro Vancouver Region of southwestern BC and within the municipal boundaries of the City of Richmond and City of Delta. The City of Richmond comprises a series of islands nested within the mouth of the Fraser River, between the Fraser River South Arm and North Arm. The City of Delta is located south of Richmond and is bounded by the Fraser River to the north, the Salish Sea (Strait of Georgia) to the west, the City of Surrey to the east, and Boundary Bay and the international border with the United States (Point Roberts) to the south. The current population of Metro Vancouver is 2,642,825. Richmond's population is 209,937 and Delta's population is 108,455. The Metro Vancouver draft RGS (Metro 2050) projects that the region is expected to grow by about 35,000 residents per year (Metro Vancouver 2021).

As illustrated in Figure 1.1-1, the Tsawwassen First Nation Lands are located 6 km southwest of the Project between the Fraser River and Boundary Bay. Tsawwassen First Nation is an Indigenous community of 491 members, with 215 of these members living on Tsawwassen Lands (as of March 2019; TFN 2021). Musqueam is an Indigenous community of approximately 1,284 members (Musqueam First Nation 2018). Musqueam has three registered reserves: Musqueam IR2 (at 204 ha), which is the Musqueam's main reserve and population centre located south of Marine Drive at the mouth of the Fraser River with approximately 672 members; Musqueam IR4 (at 57.2 ha), which is surrounded by the City of Delta, and located in the provincial ALR; and Sea Island IR3 (at 6.5 ha) located on the northwest corner of Sea Island, adjacent to the City of Richmond (Musqueam Indian Band 2018).

8.3.2 Employment and Economy

The Project is expected to interact with Metro Vancouver's labour market, employment and contracting, economic development, and business activity. Metro Vancouver has the largest labour market in the Province and the third largest in the country. As of December 2020, there were over 1.5 million workers in Metro Vancouver, comprising approximately 55% of the Province's labour force. Metro Vancouver had an Indigenous labour force of 31,840 in 2016 with 3,055 Indigenous persons identified as being unemployed (Statistics Canada 2018). The labour market participation rate in Metro Vancouver was 65.8%, which was above the provincial average of 64.8%, while Metro Vancouver's unemployment rate of 7.4% is slightly higher than the provincial average of 7.2% (Statistics Canada 2021a).

Trades, transport, equipment operators, and related occupations- comprise approximately 13% of Metro Vancouvers' labour force or 207,800 workers (Statistics Canada 2021b). In 2016, 5,740 Indigenous workers, or approximately 19% of the Indigenous labour force in Metro Vancouver were employed in the trades, transport, and equipment operators and related occupational categories. In 2020, there were 112,584 registered businesses in the Vancouver census metropolitan area. Approximately 12.5% of businesses in BC (or approximately 25,784 companies) belonged to the construction industry, with almost half of these businesses (12,385) located in the Vancouver census metropolitan area (Statistics Canada 2021c). According to the BC Indigenous Business Listings, 187 Indigenous businesses are located in Metro Vancouver, of which 22 are construction related (BC Indigenous Business Listings 2021). Project construction is anticipated to require a labour force of between 300 and

500 persons, with jobs in project management, design, and engineering- and construction-related professions. The majority of construction jobs are expected to be filled by the labour force within Metro Vancouver and from within BC. The Project could affect the Metro Vancouver labour market balance depending on parallel timing of other major projects in the Lower Mainland, as well as temporary business activities and revenues for businesses operating in proximity to the Project.

The Ministry will consider Project capital and operational expenditures, as well as labour and supplier requirements to understand project effects on employment supply, direct and indirect employment opportunities, labour market balance, local and regional supplier revenues, and government tax revenues. The Ministry will also consider Project services and infrastructure usage and requirements and the potential effects on local government expenditures, as well as effects of the Project on nearby business operations (e.g., commercial fisheries) and the associated economic impacts.

8.3.3 Land and Marine Use

Section 5 provides a description of land and water use ownership, designations, zoning, and uses that overlap with and are immediately adjacent to the Project footprint. This section provides further information on general land and marine use characteristics, including those pertaining to the City of Richmond and Delta more broadly and within 1 km of either side of the Project footprint.

The City of Richmond encompasses an area of approximately 129.27 km^2 (City of Richmond 2021). Land use in Richmond is approximately 60% urban and 40% agricultural, with a mix of residential and commercial property, agricultural lands, industrial parks, waterways, and natural areas. The City of Delta encompasses an area of approximately 180.20 km^2 (City of Delta 2021). Delta is a largely agricultural community, with most of Delta's farmland located in the ALR.

With land use in the general Project area being predominantly agricultural, agricultural activities and transportation of farming inputs, supplies, and products to market are prominent activities surrounding the Project. These agricultural and supporting activities contribute significantly to the local and BC economy and cultural identity of the region.

As described in Section 5.0, industrial uses are located along the northern bank of the Fraser River South Arm in Richmond (Figure 8.3-1). Commercial and residential areas are located along the northern portion of Highway 99 in Richmond, including near the Steveston Highway interchange. In Delta, residential areas are located on the foreshore of Deas Slough west and east of the Tunnel and in proximity to River Road South, east of Highway 99. Tilbury Island and adjacent areas are primarily zoned and used for industrial purposes.

Several parks and protected areas are located upland of the Project, which are used for walking, biking, and other outdoor recreational activities. These include Deas Island Regional Park, Burns Bog, Ladner Harbour Park, Richmond Nature Park, Model Airplane Park, and Woodward's Landing, as well as a number of smaller neighbourhood parks and playgrounds (Figure 8.3-1). Various trails and a golf course flank the lower reaches of the Fraser River South Arm near the Project.

The Alaksen National Wildlife Area and the George C. Reifel Migratory Bird Sanctuary are located west of the Project at the south end of mouth of the Fraser River South Arm, while the South Arm Marshes Wildlife Management Area (WMA) is located in the Fraser River South Arm, directly downstream of the Project (Figure 3.1-1). Designated under section 4(2) of the *Wildlife Act,* RSBC 1996, c. 488, the South Arm Marshes WMA provides protection to 937 ha of regionally and internationally significant areas of wildlife habitat and is an important nesting, feeding, staging, and wintering habitat for waterfowl and other wetland-dependent species, as well as important nearshore habitat for many freshwater and anadromous fish species including pacific salmon, eulachon, and white sturgeon (Province of BC 2021).

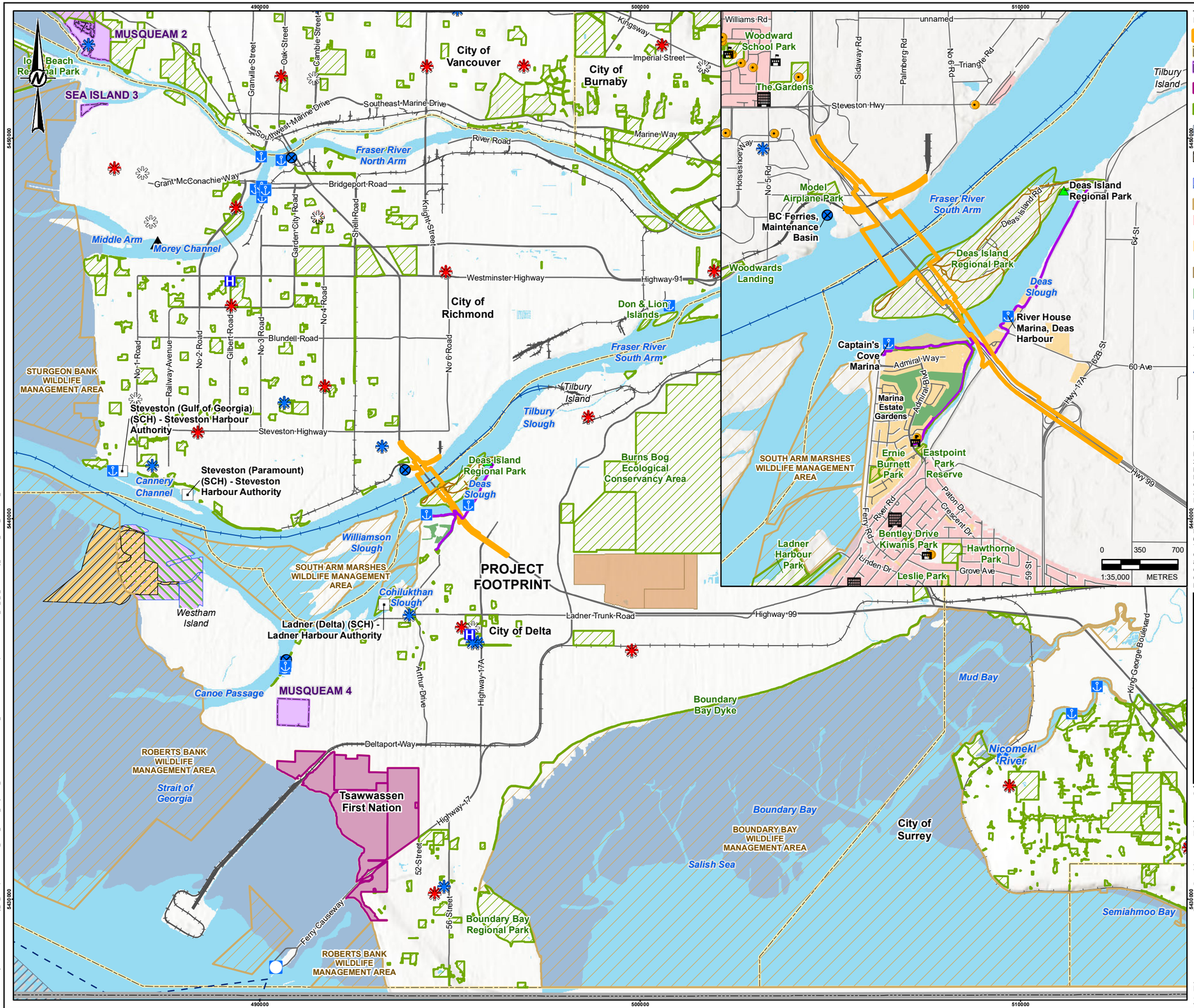
The Fraser River South Arm is heavily used for navigation, with thousands of vessels transiting annually. International and domestic deep-sea shipping vessels, tugs, and barges transit through and access shore-based terminals along the Lower Fraser River South Arm for shipment of goods and bulk commodities domestically and internationally. Commercial salmon fisheries are focused in-river and at the mouth of the South Arm at various times of the year, with commercial fisheries being of high economic importance in the region. The tidal waters of the South Arm within and proximate to the Project are also popular for recreational boating (including canoeing, motor-boating, sailing, windsurfing, river rafting, kayaking), fishing, and water-based tourism, with numerous shore-fishing locations, boat access points, and marinas and docks scattered along the shoreline. Boat moorage facilities are located at various points downstream and upstream in proximity to the Project.

The Fraser River South Arm is used extensively by Indigenous fishers to fish and access other Indigenous fishing areas, are Indigenous Interests pertaining to fish harvesting overlap with or are in the vicinity of the Project. The Lower Fraser River and surrounding lands also support a range of other important historical and current Indigenous, economic, and recreational resources, uses, cultural activities, and practices. A number of Indigenous groups have established or asserted traditional territories where the Project is located, with the river providing transportation, cultural identity, and values connections.

Land-based construction activities could potentially affect land availability, access and area use, the presence of land-based resources for recreational purposes (e.g., birds for recreational viewing), and the land-based recreational setting. Site preparation, in-river construction activities, temporary 48-hour closure of the marine shipping channel during tunnel element immersion, temporary shifting of navigation channels during tunnel construction, and removal of the Existing Tunnel and Deas Slough Bridge could potentially affect marine access and area use, the presence and availability of marine resources (e.g., fish for harvesting purposes), and the marine recreational environmental setting. Land- and marine-based construction could also potentially affect other Indigenous Interests. Project interactions with agricultural land availability, irrigation and drainage systems, and farm utilities services could affect agriculture land use. Once operational, the Project is not expected to adversely affect land and marine uses and will provide benefits such as improved reliability for the agricultural community in getting goods to market.

The Ministry will study land and marine designations, management plans, tenures, area and resource uses, and activities within the existing Project footprint and nearby potentially impacted areas. The land and marine recreational environmental setting in proximity to the Project will be characterized by drawing upon noise and vibration, air quality, and visual quality study results. With respect to agriculture, the Ministry will study irrigation and drainage systems, ALR land by capability class, and farm infrastructure and operations, with a focus on the agricultural land base potentially affected by the Project.

The marine use environment including marine traffic frequency and volume, navigational aids and regulations pertaining to the Fraser River South Arm, existing navigation conditions, commercial marine transportation, and recreational marine uses, as well as commercial and Indigenous fish harvesting and other Indigenous Interests will also be studied.



LEGEND

- PROJECT FOOTPRINT
- MUNICIPAL BOUNDARY
- INDIAN RESERVE
- TSAWWASSEN FIRST NATION LAND
- LOCAL/REGIONAL PARK
- INTERNATIONAL SHIPPING LANE
- GEORGE C. REIFEL MIGRATORY BIRD SANCTUARY
- ALAKSEN NATIONAL WILDLIFE AREA
- WILDLIFE MANAGEMENT AREA
- RESIDENTIAL ZONING (INSET)
- COMPREHENSIVE DEVELOPEMNT ZONING (INSET)
- VANCOUVER LANDFILL
- LINKS AT HAMPTON'S COVE GOLF COURSE
- INTERTIDAL AREA
- CANADA - U.S.A BORDER
- FRASER RIVER SHIPPING CHANNEL
- BC FERRIES ROUTE
- HIGHWAY / ROAD
- MILLENIUM TRAIL
- DEAS ISLAND REGIONAL PARK TRAILS
- RAILWAY
- FERRY - RAILWAY
- FERRY TERMINAL
- HOSPITAL
- AMBULANCE STATION
- COASTGUARD
- FIRE HALL/STATION
- POLICE DETACHMENT/STATION
- RESIDENTIAL CARE HOME (INSET)
- SCHOOL (K-12) (INSET)
- CHILD CARE PROVIDER (INSET)
- HARBOUR AUTHORITY
- MARINA
- MARINE REPAIR FACILITY
- PUBLIC WHARF

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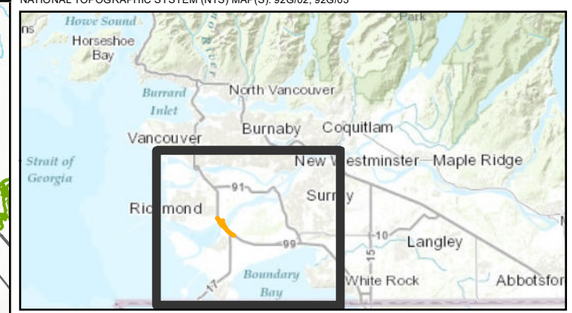
REFERENCE(S)

1. LOCAL AND REGIONAL PARKS, MUNICIPAL BOUNDARIES PUBLISHED BY AND OBTAINED FROM THE MINISTRY OF MUNICIPAL AFFAIRS - GOVERNANCE AND STRUCTURE
2. MARINAS, HARBOUR FACILITIES, FIRST RESPONDERS LOCATIONS, HOSPITALS, WILDLIFE MANAGEMENT AREAS, CANADA- USA BORDER, FERRY TERMINALS, FERRY ROUTES, INDIAN RESERVES PUBLISHED BY AND OBTAINED FROM THE MINISTRY OF FORESTS, LANDS, NATURAL RESOURCE OPERATIONS AND RURAL DEVELOPMENT.
3. TSAWWASSEN FIRST NATION LANDS PUBLISHED BY AND OBTAINED FROM THE MINISTRY OF INDIGENOUS RELATIONS AND RECONCILIATION - INTERGOVERNMENTAL AND COMMUNITY RELATIONS.
4. RAILWAYS OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
5. INTERNATIONAL SHIPPING LANES, BIRD SANCUTARIES AND NATIONAL WILDLIFE AREAS OBTAINED FROM GOVERNMENT OF CANADA.
6. FRASER RIVER SHIPPING CHANNEL OBTAINED FROM THE VANCOUVER FRASER PORT AUTHORITY.
7. DELTA ZONING/LANDUSE OBTAINED FROM DELTA MAP. RICHMOND ZONING OBTAINED FROMT EH CITY OF RICHMOND.
8. LINKS AT HAMPTON'S COVE GOLF COURSE, DEAS ISLAND REGIONAL PARK TRAILS, MELLENIUM TRAIL OBTAINED FROM DELTA MAP.

COORDINATE SYSTEM: NAD 1983 CSRS UTM ZONE 10N
NATIONAL TOPOGRAPHIC SYSTEM (NTS) MAP(S): 92G/02, 92G/03



CLIENT
MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE

Ministry of Transportation and Infrastructure

PROJECT
FRASER RIVER TUNNEL PROJECT

TITLE
COMMUNITY FEATURES, PARKS AND PROTECTED AREAS

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-04-04
DESIGNED	RS
PREPARED	JP
REVIEWED	HC
APPROVED	DG

PROJECT NO.	CONTROL	REV.	FIGURE
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8.3.4 Visual Quality

The Project is located within an urban transportation corridor that traverses the Fraser River. In the general vicinity and up to 500 m on either side of the Project footprint, views of the river are available upstream and downstream of the Existing Tunnel. Adjacent to Highway 99, the north and south shores of the Fraser River are characterized by extensive industrial development. On the south shore there are recreational, residential, and commercial developments, including the River House Marina and Captain's Cove Marina.

The Project is expected to result in visual changes during construction due to the presence of disturbed areas and construction-related equipment and materials. Following completion, visual aesthetics are not expected to be adversely changed from existing conditions. To better understand the visual effects of the Project, the Ministry will study the existing visual conditions from sensitive locations, such as residences and recreational areas, and Indigenous cultural sites and placenames in the vicinity of the new ITT.

8.3.5 Services, Infrastructure, and Transportation

Figure 8.3-1 shows the proximity of key services and infrastructure to the Project within the City of Richmond and City of Delta, including schools; hospitals; police, fire, and ambulance stations; roads; railways; and landfills. Hospitals are located in both Richmond and Delta; Richmond Hospital is operated by Vancouver Coastal Health and Delta Hospital is operated by Fraser Health Authority. Delta Police provide policing services in Delta while the Royal Canadian Mounted Police provide policing services in Richmond. Fire services are provided in Richmond by Richmond Fire Rescue and in Delta by Delta Fire and Emergency Services. Ambulance services are provided by BC Ambulance.

Metro Vancouver is responsible for sourcing, treating, and delivering potable water to and from municipalities, while municipalities are responsible for piping water to residents and businesses. Metro Vancouver is also responsible for the collection and treatment of the region's wastewater. Five wastewater treatment plants service the region including the Lulu Island and Iona Wastewater Treatment Plants, which treat wastewater from municipalities including Richmond. The Annacis Island Water Treatment Plant treats water from 14 municipalities, including Delta. Metro Vancouver is also responsible for solid waste management planning and recycling and for waste disposal. The Vancouver Landfill, located in Delta, is used by Vancouver, Delta, Richmond, White Rock, the University Endowment Lands, and portions of Surrey.

A number of utilities including those owned by BC Hydro, Fortis BC, Kinder Morgan, Shaw Communications Inc., TELUS Communications Company, and municipalities are located within proximity of the Highway 99 ROW. Metro Vancouver's Lulu Island-Delta water main, which crosses the Fraser River South Arm, is located directly downstream of the Tunnel. The location of utilities will be further mapped and described in the Detailed Project Description.

As part of BC's Highway 99 system, the Existing Tunnel connects the City of Richmond to the City of Delta and the Tsawwassen First Nation, while also providing links to the region's major airport, marine ports, land border, and passenger ferry networks. Cyclists and pedestrians are not permitted to use the

Existing Tunnel, but a free shuttle service provides safe transportation for cyclists and their bikes through the tunnel. TransLink, the regional transit operator, has several bus routes through the tunnel, including routes linking South Surrey and the BC Ferries terminal in Tsawwassen to major transit hubs in Richmond.

Project-related direct employment and supplier requirements, along with local and regional labour force and business supplier data, will be analyzed to understand potential for temporary in-migration for Project employment and business opportunities and the associated effects on housing and accommodation, services, and infrastructure. This analysis, along with Project direct use of water, waste, and emergency services, as well as any physical disturbance to utilities, transportation, and other infrastructure, will be analyzed to understand potential Project effects on services and infrastructure capacity, delivery, and supply.

A traffic impact assessment will be completed for the Project EAC Application. Traffic volumes, patterns, and forecasts will be used to assess potential Project construction impacts to vehicle, bike, and pedestrian transportation safety, travel times, and reliability, as well as changes to vehicle, transit, cycling, and pedestrian transportation under Project operations. Potential impacts to rail transportation as a result of removal of the CN Railway overpass will also be assessed.

8.3.6 Cultural Heritage

Under Section 12.1(2) of the *Heritage Conservation Act,* RSBC 1996, c. 187, heritage resources that receive automatic protection include the following:

- sites with physical evidence of human use or occupation prior to 1846
- burial places with archaeological or historical value
- rock art of Indigenous origin
- heritage wrecks (i.e., vessels or aircraft)

In addition, other heritage sites and objects that may be protected or recognized under the *Heritage Conservation Act* include the following:

- heritage sites protected under an agreement between the Province and a First Nation (Section 4)
- Sections 9 and 11.1 designated (protected) heritage places, including:
    - cultural or spiritual sites designated for their heritage value
    - Provincial heritage properties (e.g., Barkerville Historic Town and Emily Carr House)
    - paleontological sites designated for their heritage value (e.g., McAbee Fossil Beds)
- Section 18 formally recognized (not protected) heritage places (e.g., Tashme Internment Camp, Todd Inlet, and Vancouver Chinatown)

The existing Highway 99 corridor has been substantially altered by past development and while sites that contain physical evidence of past human activities are known to exist in the vicinity of the Project alignment, no recorded heritage sites are currently identified within the Project alignment.

Considering the nature of the Project, any adverse effect on heritage resources would be limited to the construction phase. Through consultation with Indigenous communities and background data review, the Ministry will identify areas of archaeological potential within the Project alignment and those areas will be assessed through field investigations. If present, heritage sites will be documented and evaluated in a manner consistent the requirements of the Archaeology Branch and Indigenous communities.

8.3.7 Human Health

8.3.7.1 Human Health Risk

Human health considerations for the Project are primarily associated with changes in air quality. The current conditions within the Project alignment, with respect to air quality, are consistent with the current use of this area as an active transportation corridor. Congestion-related idling associated with current traffic conditions has led to elevated concentrations of air contaminants relative to areas farther away from the highway.

Other human health considerations include potential changes to atmospheric noise and environmental quality (e.g., soil, sediment, surface water, and country foods). Noise conditions along the Project alignment are heavily influenced by the high volumes of vehicle traffic along the highway and feeder routes. Atmospheric deposition may influence soil and country food quality, while sediment and surface water quality may be impacted by dredging activities.

8.3.7.2 Community Health and Wellbeing

Project construction could potentially result in temporary nuisance effects to nearby receptors during construction such as schools, childcare centres, and residential care centres near Steveston Highway, and residences near Deas Island may experience temporary noise, dust, or visual changes during the construction and decommissioning phases of the Project (Figure 8.3-1). Potential sensitive receptors will be further identified and mapped as part of the EAC Application. Potential changes (both positive and adverse) to social determinants of health (including, for example, employment and working conditions, access to health services, and culture among others) could also occur during construction and operations of the Project.

The Ministry will study human health conditions in and around the Project, as well as key health indicators and data available from regional, community, and Indigenous health studies, to understand existing human health conditions in local, regional, and Indigenous populations. Community health and wellbeing can be affected by a wide range of social influences and can be experienced differently by diverse groups within society, such as Indigenous people, women, or people with disabilities.

Potential effects on community health and wellbeing during Project operations as a result of increased road infrastructure connectivity, increased opportunity for active and public transportation, improved safety, and decrease in congestion and travel times will also be analyzed.

8.4 CUMULATIVE EFFECTS

Urbanization and development have resulted in various cumulative environmental and socio-economic impacts and sensitivities throughout the Lower Mainland, including within the Project area. Pollutants generated from domestic and industrial wastes, agricultural practices, and stormwater runoff enter the Fraser River from neighbouring lands, which have impacted the health of a highly sensitive aquatic ecosystem. Indigenous groups have expressed increasing concerns with the cumulative effects of existing and proposed future development on fish and wildlife resources, on the health and integrity of the Lower Fraser River, and on their ability to access those resources for traditional uses and activities and the economic factors associated with a reduced ability to fish. There are also concerns that cumulative development and in-river activities interfere with fishing, affecting the ability for Indigenous groups to sustain their culture.

Expanding water and road transportation infrastructure to support trade and urban development have resulted in local road and marine transportation congestion. Planned port, land, and infrastructure development continue to place competing demands on the extensively developed Lower Fraser River waterway, as well as adjacent lands for Indigenous, industrial, residential, and agricultural uses. Farmers and municipalities have expressed challenges with drainage and irrigation, flooding, and saltwater intrusion affecting the maintenance of agricultural capability and resources. Maintaining safety and navigation of the shipping channel and balancing competing needs for industrial and agricultural lands have all been identified as priority objectives through coordinating planned development with municipalities, Indigenous groups, and community stakeholders. Indigenous groups have expressed the importance of a coordinated approach to the management of existing cumulative effects from past and current developments.

Planned commercial development of commercial land adjacent to the Lower Fraser River and in-river infrastructure include, among other activities, changes to the approved loading infrastructure at the Fraser Surrey Docks Direct Transfer Coal facility, the WesPac Tilbury Marine Jetty Project, The Fortis BC Phase 2 LNG Expansion, the Genstar Grinding Facility, and the Pattullo Bridge Replacement Project. Projected population growth in Metro Vancouver and associated residential development, including along the Lower Fraser River, will further contribute to land and marine uses and activity.

The Project may interact with the above projects, other projects, and existing cumulative effects in the region. Existing and reasonably foreseeable future projects and activities will be identified as the Project Planning phase progresses during preparation of the Detailed Project Description and the Application Information Requirements. These projects and activities will be included in the cumulative effects

assessment for the EAC Application to assess the potential Project-related residual physical, biological, and/or human environment effects in combination with the anticipated effects resulting from other existing or reasonably foreseeable future projects and activities within identified RAAs.

The EAC Application will include a rationale for how existing and reasonably foreseeable projects and activities will be identified and methodologies to determine if the potential Project-related residual effects are expected to result in cumulative effects.

The cumulative effects assessment will be informed by the following:

- engagement with Indigenous groups
- traditional use information provided by Indigenous groups
- Feedback from regulatory agencies, stakeholders, and the public
- approved land use plans surrounding the Project
- the Project's existing conditions studies and other historical and publicly available data that describe the effects of past developments and characterize existing conditions
- effects assessments for other existing and reasonably foreseeable future projects that have recently undergone or that are currently undergoing a formal environmental assessment process
- review of potential overlapping effects due to present and reasonably foreseeable future developments that did not trigger formal assessment

8.5 ACCIDENTS AND MALFUNCTIONS

This section of the IPD describes the potential accidents and malfunctions that could occur with the proposed Project, considering industry experience with similar infrastructure and the specific components and activities of the Project. An accident is defined as an unexpected occurrence, unplanned event, or unintended action that could result in an adverse effect on the environment or public safety, while a malfunction is the failure of a piece of equipment, device, or system that could result in an adverse effect on the environment or public safety.

The potential Project-related accidents and malfunctions are described below for the Project construction and decommissioning of existing infrastructure, as well as for the Project operation and how the potential accidents and malfunctions will be managed to reduce the likelihood of occurrence and the consequence severity if an accident or malfunction occurs.

During Project construction and decommissioning of existing infrastructure, Project-related accidents and malfunctions with reasonable potential to occur include the following:

- accidental release of deleterious substances (e.g., hydrocarbon fuels, lubricants, and concrete) from vessels, vehicles, machinery, equipment, or damage to utilities (e.g., buried gas lines) that impact the terrestrial and/or aquatic environment

- accidental failure of stormwater and/or erosion and sediment control measures (e.g., silt fencing, detention ponds, ditches, and swales) resulting in localized flooding, erosion, and/or a release of sediment laden water to the aquatic environment
- transportation incidents (e.g., collisions and spills) during supply/materials delivery and construction equipment mobilization to and from site, resulting in injury and/or release to the environment along the roads
- vessel collision or failure resulting in obstruction of navigation and/or navigational safety

The potential accidents and malfunctions during Project construction and decommissioning of existing infrastructure would be managed through design, construction planning, and good management practices, such as contractor selection and review of the contractor's management plans (e.g., construction management plan, traffic management plan, and spill prevention and response plan) and their implementation in accordance with the Ministry's standards and other applicable provincial and federal requirements and guidelines. These management plans will be developed, reviewed, and implemented prior to the commencement of construction and decommissioning activities.

The potential accidents and malfunctions during Project operation will be managed through design according to the Ministry's and other applicable standards, including design for natural hazards and the potential effects of climate change (Section 8.6), as well through the implementation of quality assurance/quality control, maintenance plan, spill prevention and response plan, emergency response plan, and other operational procedures in accordance with applicable provincial and federal requirements and guidelines.

Implementation of effective Project design and management specifications and mitigation measures is expected to minimize the likelihood and avoid or reduce the consequence of potential accidents and malfunctions. With the implementation of risk mitigation, the potential risks associated with potential Project-related accidents or malfunctions are expected to be low, which will be confirmed during the Project's Application Development phase. The accident and malfunction assessment in the EAC Application will identify specific Project-related accident and malfunction scenarios along with their associated mitigation (including prevention and contingency response plan requirements).
The assessment will evaluate the risks associated with each potential accident or malfunction scenario by examining the likelihood of an incident and the consequences of the incident to each relevant VC and Indigenous Interests. The results of the risk-based assessment of potential accidents and malfunctions will be used, as applicable, to inform the Project's detailed engineering design and development of relevant management plans and procedures.

The following issues were raised during the Project's pre-Early Engagement program on the potential Project-related accidents and malfunctions and their potential effects on public and environmental safety:

- would like to see the MUP in the centre of the tunnel for fire-life safety purposes (feedback received from Delta Emergency Services)
- would like the Project to consider how first responders will deal with hazardous materials spills in the future tunnel (feedback received from Delta Emergency Services)

The feedback received have been considered in the identification of potential Project-related accidents and malfunctions in this section of the IPD. Engagement on the potential accidents and malfunctions will continue through the Project's Early Engagement phase, as described in the Project's Engagement Plan. Information on the potential Project-related accidents and malfunctions and overview of the risk mitigation will be included as part of the sharing of Project information through Early Engagement. The Proponent expects that any additional issue related to the potential accidents and malfunctions identified through Early Engagement, along with the path for potential resolution, will be considered, as applicable, in the Readiness Decision and the development of the Application Information Requirements for the Project.

8.6 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

Potential effects of the environment on projects are typically a function of design and risks of natural hazards within any given Project area and are typically mitigated through engineering design, regulatory requirements, industry standards, and best management practices.

Potential effects of the environment on the Project could result in increased structural loading on infrastructure, construction delays, loss of infrastructure use, and increased cost to maintain/repair infrastructure. Effects of the environment on the Project may be considerable or minor. Considerable effects of the environment result in substantial delays, long-term interruptions in service, damage to infrastructure that poses a public health or environmental risk, or damage that is not technically or economically feasible to repair. Minor effects of the environment typically result in short-term delays to construction or service and marginal increases to costs.

Environmental factors that could lead to environmental effects to the new ITT and associated infrastructure include the following:

- climate change
    - more frequent extreme weather conditions and overall higher precipitation and temperatures
    - extended heavy rain events and rain on snow events could lead to higher river flows and flooding and increases in debris
    - earlier peak spring flow and other potential hydrological changes, which could change riverbed sediment and affect stability
    - sea level rise

- natural hazards
    - seismic events and tsunamis
    - fire
    - extreme weather events
- sediment/riverbed stability (e.g., erosion and scour)

The Project will be designed and constructed in accordance with federal and provincial standards to minimize potential effects of the environment during construction and on the infrastructure. In anticipation of climate change, including the effects of extreme weather conditions, the Project will include design parameters that reflect the predicted increases in the severity and variability of weather conditions and the resultant alterations in terrestrial and marine dynamics. Increased temperatures and rising sea levels are the most likely climate change parameters to potentially affect the Project.

8.7 SUMMARY OF PROJECT INTERACTIONS

Table 8.7-1 summarizes potential project interactions with physical, environmental, and human environment values. The Ministry has received preliminary feedback and information on these potential project–environment interactions through engagement with Indigenous groups and regulatory agencies prior to submitting this IPD.

Potential VCs will be identified in collaboration with Indigenous groups, regulators, local and regional government agencies, and stakeholders. Effects of the Project, including those pertaining to Indigenous Interests, will be further identified through engagement with Indigenous groups. Effects will be included in the Detailed Project Description where identified, and assessed as part of the EAC Application.
The assessment of potential effects to VCs will include identification of mitigation measures and plans to avoid, minimize, rehabilitate, or offset impact, residual incremental, and cumulative effects associated with the Project and reasonably foreseeable developments.

Table 8.7-1: Preliminary Identification of Project Interactions

Project Activities	Physical Environment				Biological Environment				Human Environment						
	Air Quality and Greenhouse Gases	Atmospheric Noise	Fraser River Hydrology	Water and Sediment Quality	Vegetation and Ecosystems	Wildlife and Wildlife Habitat	Fish and Fish Habitat	Marine Mammals	Employment and Economy	Land and Marine Use	Visual Quality	Services, Infrastructure and Transportation	Cultural Heritage	Human Health Risk	Community Health and Wellbeing
Site Preparation															
Procurement of labour, goods, and services	–	–	–	–	–	–	–	–	✓	–	–	✓	–	–	✓
Transport of construction materials and workers using existing roads and aquatic transportation routes	✓	✓	–	✓	✓	✓	✓	✓	–	✓	✓	✓	–	✓	✓
General site preparation (clearing, grubbing)	✓	✓	–	✓	✓	✓	✓	–	–	✓	✓	✓	✓	✓	✓
Construction site access (piled temporary access trestle across Deas Slough)	✓	✓	–	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓
Material offloading area (materials offloading pier on the foreshore of Deas Island)	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓

Civil Construction															
Procurement of labour, goods, and services	–	–	–	–	–	–	–	–	✓	–	–	✓	–	–	✓
Transport of construction materials and workers using existing roads and aquatic transportation routes	✓	✓	–	✓	✓	✓	✓	✓	–	✓	✓	✓	–	✓	✓
Casting basin	✓	✓	–	✓	✓	✓	✓	–	–	✓	✓	✓	✓	✓	✓
Tunnel element fabrication	✓	✓	✓	✓	✓	✓	✓	–	–	✓	✓	✓	✓	✓	✓
Outfitting jetty	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓
Temporary element moorage	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓
Tunnel element tow channel	✓	✓	✓	✓	✓	✓	✓	✓	–	✓		✓	✓	✓	✓
North and south approaches including roads, tunnel portal structures, flood protection	✓	✓	–	✓	✓	✓	✓	–	–	✓	✓	✓	✓	✓	✓
New ITT	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓
Installation of a separation wall between the new and existing tunnels	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓
Ground improvements	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓
River bank excavation	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓
Tunnel trench preparation	✓	✓	✓	✓	✓	✓	✓	✓	–	✓		✓	✓	✓	✓
Tunnel element fit out	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓
Tunnel element immersion	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓
Flood protection	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓
Final fit out of the tunnel	✓	✓	–	✓	–	–	✓	✓	–	✓	-	✓	–	✓	✓
New Deas Slough Bridge	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓

Operation															
Procurement of labour, goods, and services	–	–	–	–	–	–	–	–	✓	–	–	✓	–	–	✓
Operation	✓	✓	–	✓	✓	✓	✓	–	–	–	✓	✓	–	✓	✓
Decommissioning/Removal of Existing Infrastructure															
Procurement of labour, goods, and services	–	–	–	–	–	–	–	–	✓	–	–	✓	–	–	✓
Transport of construction materials and workers using existing roads and aquatic transportation routes	✓	✓	–	✓	✓	✓	✓	–	–	✓	✓	✓	–	✓	✓
Existing ITT	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓
Existing Deas Slough Bridge	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓
Existing CN Railway overpass	✓	✓	–	✓	✓	✓	✓	–	–	✓	✓	✓	✓	✓	✓
Existing Rice Mill Road overpass	✓	✓	–	✓	✓	✓	✓	–	–	✓	✓	✓	✓	✓	✓

✓ = potential interaction; – = no interaction; ITT = immersed tube tunnel.

9 INDIGENOUS GROUPS INTERESTS

The Ministry has a duty to consult and, where appropriate, accommodate in situations where the Crown has knowledge of an asserted or established Aboriginal or treaty right and where a proposed decision may adversely impact that asserted or established right. Both asserted and defined Indigenous rights, including treaty rights and fishing rights, are known to overlap with or lie in the vicinity of the Project area. A new Consultative Areas Database (CAD) search was conducted in 2021 using the Project's updated consultative area boundaries, which identified 16 Indigenous groups with asserted or established territories that overlap with the Project. Table 9-1: provides a list of the Indigenous groups identified for engagement during the CAD search and lists the location of their core community(ies), as well as other key information.

As indicated in Section 5.2, the Project does not directly overlap with any treaty settlement lands or reserves (Figure 1.1-1); however, it does overlap with the defined Treaty rights area of the Tsawwassen First Nation. Also, Musqueam asserts that the Project occurs within its area of recognized fishing rights as per *Sparrow, 1992.* The Project also occurs within the Traditional Territories of the Indigenous Groups listed in Table 9-1.

Table 9-1: List of Indigenous Groups and Location Details (organized alphabetically)

Indigenous Group	Location Details	Approximate Distance Between Main Community and Project
Aitchelitz First Nation	**Main community:** Aitchelitch 9, located in Chilliwack, BC **Reserves:** Four reserves (Aitchelitch 9, Grass 15, Pekw'ex:yles, Skumalasph 16)	80 km
Chawathil First Nation	**Main community:** Chawathil 4, located near Hope, BC **Reserves:** Six reserves (Chawathil 4, Greenwood Island 3, Hope No. 1, Pekw'xe;yles, Schkam 2, Tunnel 6)	120 km
Cheam First Nation	**Main community:** Cheam 1, located near Chilliwack, BC **Reserves:** Three reserves (Cheam 1, Pekw'xe:yles, Tseath 2)	95 km
Cowichan Tribes	**Main community:** Cowichan 1, located in Duncan, BC **Reserves:** Nine reserves (Cowichan 1, Cowichan 9, Est-Patrolas 4, Kakalatza 6, Kil-Pah-Las 3, Skutz 7, Skutz 8, Theik 2, and Tzart-Lam 5)	61 km
Halalt First Nation	**Main community:** Halalt 2, located in Chemainus, BC **Reserves:** Two reserves (Halalt Island 1 and Halalt 2)	53 km
Katzie First Nation	**Main community:** Barnston Island 3, located in the Fraser River, near Pitt Meadows, BC **Reserves:** Five reserves (Barnston Island 3, Graveyard 5, Katzie 1, Katzie 2, and Pitt Lake)	28 km

Indigenous Group	Location Details	Approximate Distance Between Main Community and Project
Kwantlen First Nation	**Main community:** McMillan Island, located in the Fraser River, north of Fort Langley, BC **Reserves:** Seven reserves (Langley 2, Langley 3, Langley 4, Langley 5, McMillan Island 6, Pekw'xe:yles and Whonnock 1)	37 km
Kwaw'Kwaw'Apilt First Nation	**Main community**: Kwaw'Kwaw'Apilt 6, located in Chilliwack, BC **Reserves:** Four reserves (Grass 15, Kwaw'Kwaw'Apilt 6, Pekw'xe:yles, Skumalasph 16)	80 km
Kwikwetlem First Nation	**Main community:** Coquitlam 1, located in Coquitlam BC **Reserves:** Two reserves (Coquitlam 1 and Coquitlam 2)	22 km
Lyackson First Nation	**Main community:** Shingle Point 4, located on Valdes Island, BC **Reserves:** Three reserves (Lyacksun 3, Porlier Pass 5, and Shingle Point 4), all located on Valdes Island, BC	53 km
Musqueam Indian Band	**Main community:** Musqueam 2, located on the North Arm of the Fraser River, in Vancouver, BC **Reserves:** Three reserves (Musqueam 2, Musqueam 4, and Sea Island 3), located in Vancouver, Richmond, and Delta, BC	14 km
Penelakut Tribe	**Main community:** Penelakut Island 7, on Penelakut Island, BC **Reserves:** Four reserves (Galiano Island 9, Penelakut Island 7, Tent Island 8, and Tsussie 6)	46 km
Scowlitz First Nation	**Main community:** Squawkum Creek 3, located near Chilliwack, BC **Reserves:** Three reserves (Grass 15, Pekw'xe:yles, Squawkum Creek 3)	80 km
Seabird Island Band	**Main community:** Seabird Island, located east of Agassiz, BC **Reserves:** Two reserves (Pekw'xe:yles and Seabird Island)	98 km
Semiahmoo First Nation	**Main community:** Semiahmoo, located southeast of White Rock, BC **Reserves:** One reserve (Semiahmoo)	25 km
Shxwhà:y Village	**Main community:** Skway 5 Reserve, located near Chilliwack Landing **Reserves:** Four reserves (Grass 15, Pekw'xe:yles, Skumalasph 16, Skway 5)	79 km
Shxw'?whámel First Nation	**Main community:** Ohamil 1, located on the left bank of the Fraser River, north of Laidlaw, BC **Reserves:** Four reserves (Kuthlath 3, Ohamil 1, Pekw'xe:yles, and Wahleach Island 2)	109 km

Indigenous Group	Location Details	Approximate Distance Between Main Community and Project
Skawahlook First Nation	**Main community:** Ruby Creek 2 located next to the District of Kent **Reserves:** three reserves (Pekw'xe:yles, Ruby Creek 2, and Skawahlook 1)	109 km
Skowkale First Nation	**Main community:** Skowkale 11, located in Chilliwack, BC **Reserves:** Four reserves (Grass 15, Pekw'xe:yles, Snowkale 10, Snowkale 11)	83 km
Skwah First Nation	**Main community:** Skway 5 Reserve, located near Chilliwack Landing **Reserves:** Seven reserves (Grass 15, Pekw'xe:yles, Schelowat 1, Skumalasph 16, Skwah 4, Skwahla 2, Skwali 3)	79 km
Snuneymuxw First Nation	**Main community:** Nanaimo Town 1, located in Nanaimo, BC **Reserves:** Six reserves (Gabriola Island 5, Ma-guala 6, Nanaimo River 2, Nanaimo River 3, Nanaimo River 4, Nanaimo Town 1)	62 km
Soowahlie First Nation	**Main community:** Soowahlie 14, located south of Chilliwack, BC **Reserves:** Three reserves (Grass 15, Pekw'xe:yles, and Soowahlie 14)	80 km
Squiala First Nation	**Main community:** Squiala 8, located in Chilliwack, BC **Reserves:** Five reserves (Grass 15, Pekw'xe:yles, Skumalasph 16, Squiaala 7, Squiaala 8)	80 km
Stz'uminus First Nation	**Main community:** Chemainus 13, located near Ladysmith, BC **Reserves:** Four reserves (Chemainus 13, Oyster Bay 12, Say-la-quas 10, and Squaw-hay-one 11)	57 km
Sumas First Nation	**Main community:** Upper Sumas 6, located in Abbotsford, BC **Reserves:** Two reserves (Pekw'xe:yles and Upper Sumas 6)	65 km
Tsawwassen First Nation	**Main community:** Located to the west of Boundary Bay and north of Tsawwassen, BC, on the shores of the Salish Sea **Treaty Lands:** 725 ha between the Tsawwassen ferry terminal and the container port at Roberts Bank and 62 ha of fee simple land near Boundary Bay and on the Fraser River along Canoe Pass	9 km
Tsleil-Waututh First Nation	**Main community:** Burrard Inlet 3, located in North Vancouver, BC **Reserves:** Three reserves (Burrard Inlet 3, Inlailawatash 4, and Inlailawatash 4A)	22 km

Indigenous Group	Location Details	Approximate Distance Between Main Community and Project
Ts'uubaa-asatx	**Main community:** Ts'uubaa-asatx, east of the Town of Lake Cowichan, BC **Reserves:** One reserve (Ts'uubaa-asatx)	80 km
Tzeachten First Nation	**Main community:** Tzeachten 13, located in Chilliwack, BC **Reserves:** Three reserves (Grass 15, Pekw'xe:yles, Tzeachten 13)	83 km
Yakweakwioose First Nation	**Main community:** Yakweakwioose 12, located near Chilliwack, BC **Reserves:** Three reserves (Grass 15, Pekw'xe:yles, Yakweakwioose 12)	83 km
Yale First Nation	**Main community:** Yale Town 1, located in Hope, BC **Reserves:** Sixteen reserves (4 ½ Mile 2, Albert Flat 5, Kaykaip 7, Lukseetsissum 9, Qualark 4, Squeah 6, Stullawheets 8, Yale 18, Yale 19, Yale 20, Yale 21, Yale 22, Yale 23, Yale 24, Yale 25, Yale Town 1)	130 km

PRRO = Peoples of the Rivers Referrals Office.

9.1 INDIGENOUS ENGAGEMENT TO DATE

Upholding the commitment of the Province to reconcile with Indigenous groups, the Ministry has developed its Indigenous engagement approach based on the Draft Principles that Guide the Province of British Columbia's Relationship with Indigenous Peoples (Government of BC n.d.), the Government Consultation Bulletin on Consulting During the COVID-19 Emergency (Government of BC 2020), and the *Declaration on the Rights of Indigenous Peoples Act* (2019).

In addition to the COVID-19 Emergency, Indigenous groups were impacted by several catastrophic events in 2021. In the summer, there were revelations from a number of Indigenous communities in BC related to residential school investigations and discoveries, including Tk'emlúps te Secwépemc regarding the Kamloops Indian residential school and Penelakut Tribe regarding the Kuper Island Residential School. In November, severe flooding impacted parts of southern BC. The Ministry strives to take the impacts of these events into account when conducting engagement and outreach. The Ministry follows the Ministry of Indigenous Relations and Reconciliation's guidance on Consulting First Nations Following Revelations About the Kamloops Indian Residential School and otherwise makes accommodations to schedules and timelines when consulting with First Nations in recognition of the depth and breadth of the impacts these events have in Indigenous communities.
Since the Project's announcement in August 2021, the Ministry has referred the Project to the following Indigenous groups (listed alphabetically):

- Aitchelitz First Nation (represented by S'ólh Téméxw Stewardship Alliance and the People of the River Referrals Office [PRRO])

- Chawathil First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Cheam First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Cowichan Tribes (represented by the Quw'utsun Nation)
- Halalt First Nation (represented by the Quw'utsun Nation)
- Katzie First Nation
- Kwantlen First Nation
- Kwaw'Kwaw'Apilt First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Kwikwetlem First Nation
- Lyackson First Nation (represented by the Quw'utsun Nation)
- Musqueam Indian Band
- Penelakut Tribe (represented by the Quw'utsun Nation)
- Scowlitz First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Seabird Island Band
- Semiahmoo First Nation
- Shxwhà:y Village (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Shxw'?whámel First Nation
- Skawahlook First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Skowkale First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Skwah First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Snuneymuxw First Nation (no engagement record during previous iteration of the project)
- Soowahlie First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Squiala First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Stz'uminus First Nation (represented by the Quw'utsun Nation)
- Sumas First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Tsawwassen First Nation
- Tsleil-Waututh First Nation
- Ts'uubaa-asatx (formerly Lake Cowichan First Nation)
- Tzeachten First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)

- Yakweakwioose First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)
- Yale First Nation (represented by S'ólh Téméxw Stewardship Alliance and the PRRO)

As of November 2021, the Ministry has met directly or scheduled meetings with the following Indigenous groups (listed alphabetically):

- Cowichan Tribes
- Halalt First Nation
- Katzie First Nation
- Kwantlen First Nation
- Lyackson First Nation
- Musqueam
- Penelakut First Nation
- Snuneymuxw First Nation
- Stz'uminus First Nation
- Ts'uubaa-asatx
- Tsawwassen First Nation

9.2 SUMMARY OF PRELIMINARY INDIGENOUS ENGAGEMENT ACTIVITIES

The Ministry has engaged with identified Indigenous groups on crossing options, including a tunnel crossing, as part of previous iterations of the Project from February 2019 up to the announcement in August 2021. Engagement with Indigenous groups during previous iterations of the Project included a detailed review of crossing options, development of environmental studies targeted at developing knowledge of some culturally important fish and wildlife species, capacity funding agreements to support Indigenous goals and objectives, information sharing, and meetings in person and virtually.
The communities that engaged with the Ministry during previous iterations of the Project include the following (listed alphabetically):

- Cowichan Tribes
- Halalt First Nation
- Katzie First Nation
- Kwantlen First Nation
- Lyackson First Nation
- Musqueam Indian Band
- Penelakut First Nation

- Snuneymuxw First Nation
- Stz'uminus First Nation
- Ts'uubaa-asatx
- Tsawwassen First Nation
- Tsleil-Waututh Nation

Since the Project announcement in August 2021, the Ministry has been conducting engagement activities with the identified Indigenous groups listed above. In September 2021, the above Indigenous groups were sent email invitations to attend an introductory engagement meeting to discuss the project and explore their initial interests. From September to November 2021 the Ministry met with 11 Indigenous groups and made efforts to engage with those who did not respond to invitations. On November 15, 2021, project introduction referral packages were sent to those Nations represented by the PRRO, Seabird Island, and Shxw'?whámel First Nation. In November and early December 2021, the Ministry shared the draft Engagement Plan and draft IPD with all Indigenous groups and requested feedback on the draft Engagement Plan by January 15, 2022 and on the draft IPD by February 3, 2022. Reminders of the opportunity to provide feedback on the draft Engagement Plan and draft IPD were sent to all Indigenous groups in mid-January 2022.

The preliminary engagement and outreach activities included email notifications, email invitations, preliminary virtual engagement meetings, follow-up engagement virtual meetings, and the establishment and coordination of access to a file-sharing site (SharePoint) specific to each participating Indigenous group to facilitate information sharing and records management. The following is a summary of these engagement and outreach activities:

- **Email notifications**—Written notification to advise of an upcoming Project milestone.
- **Email invitations**—Written notification inviting the recipient to meet with the Ministry regarding the Project.
- **Letters**—Letters introducing the Project, providing Project-related information, and inviting the recipients to meet to discuss the Project were sent to those Nations represented by the PRRO, Seabird Island Band, and Shxw'?whámel First Nation.
- **Preliminary engagement virtual meeting**—Virtual meetings between the Ministry and Indigenous groups that included a project introduction, overview of the environmental assessment process and associated existing conditions studies, and concluded with a discussion on capacity funding, engagement planning including file sharing via SharePoint, and next steps.
- **Follow-up engagement virtual meeting**—Virtual meetings between the Ministry and Indigenous groups to continue general engagement on the Project. Topics varied by Indigenous group and covered one or more of the following: capacity funding agreements, existing conditions studies update, technical updates, review of the Engagement Plan and/or IPD, and/or general discussion on

the Project. Where appropriate the Ministry brought TI Corp team members with technical expertise to meetings to lead discussions on areas of interest to Indigenous groups.

- **Establishment and coordination of access to a file sharing (SharePoint) site**—The Ministry has established a SharePoint intended for use by Indigenous groups and the Ministry. Indigenous groups who have expressed interest in using SharePoint as a venue for file sharing and collaboration have access via the SharePoint to a general folder with project documents, as well as a controlled-access folder that is unique to their group and contains confidential documents such as capacity funding agreements. Use of the file sharing site is optional; Indigenous groups may opt to continue receiving documents via other means, such as email or regular mail.

9.2.1 Interests and Issues Identified by Indigenous Groups

Indigenous engagement on replacing the Existing Tunnel has been ongoing since 2013, during which time many interests and issues were raised by various Indigenous groups. Engagement with Indigenous groups is ongoing, including discussions about interests and issues raised during the environmental assessment of the previous 10-lane bridge project to understand what is relevant to carry forward to the present project. The Ministry's engagement plans and activities are intended to build upon, and will be informed by, feedback and learnings from the previous 10-lane bridge project. Upon request, the Ministry would be pleased to provide records and a summary of issues and interests raised by identified Indigenous groups during these previous engagements.

Table 9.2-1 summarizes the key issues raised by Indigenous groups during preliminary engagements to date but is not exhaustive and does not include any issues or interests raised during Indigenous group engagement on the previous iteration of the Project. Discussions with Indigenous groups are ongoing to confirm key issues and interests that will be incorporated into engagement planning as the Project progresses. Finally, a detailed list of issues will be produced following comprehensive engagement during the various stages of the environmental assessment process.

Table 9.2-1: Key Issues Raised by Indigenous Groups to Date

Indigenous Group	Issues Raised	Proponent Response
Musqueam Indian Band	Musqueam notes that the Project is located in core Musqueam territory and that Musqueam Indian Band is the only Nation with a constitutionally recognized right to fish in the Lower Fraser, where Project activity will take place. Musqueam Indian Band notes the importance of the Project area for knowledge transmission tied to visual qualities, which may be disturbed or lost due to Project activities.	The Ministry has noted Musqueam Indian Band's comments. The "Introduction" of the Engagement Plan has been revised to note Musqueam Indian Band's asserted core traditional territory and defined fishing rights.
Musqueam Indian Band	Musqueam Indian Band has experienced significant issues with the consultation process for other major infrastructure projects such as over-consultation, rushed timelines, and lack of consideration for cumulative effects and would like to avoid those consultation challenges with this Project.	The Ministry recognizes Musqueam Indian Band's consultation experience on other major infrastructure projects and shares the goals of achieving an effective and purposeful engagement on the Project.
Musqueam Indian Band	Musqueam Indian Band does not agree with the use of the CAD in determining consulted Nations for the Project. The CAD does not distinguish between core and secondary use areas or adequately differentiate between level of impact on different Nations at a given location. Musqueam Indian Band emphasizes the importance of consultation that is consistent with Musqueam Indian Band culture and governance and proportionate with the seriousness of impact on a Nation's Aboriginal rights.	The Ministry has noted the Musqueam Indian Band's views on the CAD. The Ministry's consultation will be guided by applicable provincial policy and by the EAO's December 16, 2019 Early Engagement Policy, Section 4, which states: "...the EAO will work with participating Indigenous groups to establish effective consensus-seeking processes for the environmental assessment of the proposed Project that respect and seek to align where possible, with their own governance frameworks, jurisdictions, and authorities. Part of this collaborative engagement is building a shared and comprehensive understanding of the Nation's culture and unique connection to the lands and resources that are subject to a proposed Project, including situating the Project proposal within the Nation's priorities and visions into the future."

Indigenous Group	Issues Raised	Proponent Response
Musqueam Indian Band	The impacts of this Project, particularly on fish and fish habitat, will be extensive. The sturgeon population is already at critical lows and the decommissioning and removal of the Existing Tunnel will greatly disturb sturgeon habitat and migratory areas, which have acclimatized to the tunnel's current position. Musqueam Indian Band seeks assurance that all possible mitigation and offsetting options will be employed to address these impacts.	The Ministry recognizes the importance of fish and fish habitat to Musqueam Indian Band. Developing methods to mitigate potential Project impacts on fish and fish habitat will be at the forefront of the environmental assessment process. Since early 2021, the Ministry has been working with Indigenous groups on studies related to sturgeon and other species. In addition, the Ministry has shared a Preliminary Draft List of Existing Conditions Studies, which identified fish and fish habitat as an area to be studied. Musqueam Indian Band's feedback will inform the Existing Conditions Studies. The Ministry looks forward to collaborating with Musqueam Indian Band to proactively explore mitigation and offsetting possibilities.
Musqueam Indian Band	Cumulative effects are of utmost concern to Musqueam Indian Band for this Project. Musqueam Indian Band notes that a reliance on proponent and EAO-driven existing conditions studies is not necessarily an adequate existing condition in Musqueam Indian Band's consideration of project effects, and requests the acknowledgement of study limitations and further work with Musqueam Indian Band to ensure robust impact standards.	Musqueam Indian Band's comments are noted. Along with existing conditions studies, the IPD Section 8.8 states that: "The EAC Application and the cumulative effects assessment will be informed by: • Engagement with Indigenous groups • Traditional use information provided by Indigenous groups • Approved land use plans surrounding the Project • The Project's existing conditions studies and other historical and publicly available data that describe the effects of past developments and characterize existing conditions • Effects assessments for other existing and reasonably foreseeable future projects • Review of potential overlapping impacts due to present and reasonably foreseeable future developments which did not trigger formal assessment."

Indigenous Group	Issues Raised	Proponent Response
Musqueam Indian Band	Musqueam Indian Band requests that conversations around offsetting and restoration begin at a very early project stage, with a focus on the Deas Slough and Deas Island area. Musqueam requests that builders are chosen based on their offsetting experience and plans, and that conversations around offsetting are limited to closely impacted Nations.	The Ministry is prepared to engage in conversation related to offsetting and restoration at an early stage in the environmental assessment process.
Musqueam Indian Band	In the past, the EAO process has been guided exclusively by the proponent's timelines, with no option to pause the process in order to address Musqueam concerns. Musqueam Indian Band requests further conversation about the consultation process and timeline to ensure this concern is addressed appropriately to ensure adequate and meaningful consultation. Additionally, Musqueam Indian Band requests to be updated as soon as timelines and deadlines are established to ensure adequate time is provided to address concerns.	The Ministry will engage with Musqueam Indian Band on Project timelines to further an informative and meaningful consultation process in coordination with the EAO.
Musqueam Indian Band	Musqueam Indian Band 's location at the mouth of the Fraser River is deeply connected with Musqueam Indian Band oral histories, cultural identity and continuity, access for other communities, and trading relationships. Musqueam Indian Band, or xʷməθkʷəy̓əm, translates to "Place of məθkʷəy̓", signifying the mθkʷ"y̓ plant, which grew in the Fraser River delta and tidal flats.	Thank you for the comment. We look forward to working with Musqueam Indian Band to learn and understand Musqueam Indian Band's traditional uses and cultural protocols, and we will work to incorporate these where possible into the Project and environmental assessment.
Musqueam Indian Band	Musqueam Indian Band is interested in close participation in environmental studies, including their design, methodology, and application.	The Ministry looks forward to Musqueam Indian Band's participation and is interested in understanding Musqueam Indian Band's availability to participate in the environmental study programs.

Indigenous Group	Issues Raised	Proponent Response
Tsawwassen First Nation	The Engagement Plan provides for the flexibility to address the concerns of Indigenous communities (e.g., holding community meetings), should they be requested. The ability to hold such meetings may be in doubt for at least the near future due to concerns with COVID-19. This could pose challenges that require novel solutions.	The Ministry acknowledges that the ongoing COVID-19 pandemic can present challenges to the forms of engagement—such as community meetings—used to address the concerns of Indigenous communities. The Ministry is willing to discuss this issue further and collaborate with Tsawwassen First Nation to find novel solutions to the engagement challenges posed by the COVID-19 pandemic.
Tsawwassen First Nation	Tsawwassen First Nation recommends that the Engagement Plan allow for Indigenous Groups to provide feedback on how well engagement, such as that at the community level, is proceeding in light of any barriers that may be imposed by considerations such as (i) the COVID-19 pandemic, (ii) time availability and "consultation fatigue" resulting from the numerous project proponents currently seeking to engage Tsawwassen First Nation Government and its citizens (including, but not limited to, during a pandemic), or (iii) other matters that may arise.	The Ministry has noted Tsawwassen First Nation's recommendation that the Engagement Plan allow for Indigenous groups to provide feedback on how well engagement is proceeding. The Project team welcomes feedback from Indigenous groups on the Project engagement and will work to address any opportunities for improvement identified by Indigenous groups. The Ministry has noted the importance of Indigenous group evaluation of engagement and will seek to provide avenues through which Indigenous groups can evaluate and/or comment on engagement processes.
Tsawwassen First Nation	Tsawwassen First Nation notes that it would be prudent to anticipate that not every element of engagement (e.g., in the traditional sense of community meetings) can be replaced fully by alternate (e.g., virtual) means. In this regard, it will be important to ensure that Tsawwassen First Nation Government staff are not put in the position of receiving criticism from community members insofar as engagement in the Project's environmental assessment process or associated decisions are concerned. Beyond that, creative solutions may be required to ensure that sufficient engagement can and does occur and that decisions are communicated. It may be appropriate to explicitly address this matter in the Engagement Plan.	The Ministry will continue to meet with Tsawwassen First Nation regularly to ensure they are kept informed of the status of the environmental assessment process and associated decisions. The Ministry is willing to discuss alternatives to virtual engagements and collaborate with Tsawwassen First Nation on finding creative solutions. The Ministry is committed to working collaboratively with Indigenous groups toward forms of engagement that meet their needs.

Indigenous Group	Issues Raised	Proponent Response
Tsleil-Waututh Nation	Tsleil-Waututh Nation notes that its resources are stretched thin and thus it has a limited capacity to engage at this time.	The Ministry is committed to providing capacity funding to support Tsleil-Waututh Nation's participation in the environmental assessment process.
Tsleil-Waututh Nation	Tsleil-Waututh Nation's limited capacity to engage in no way diminishes the constitutional and statutory duties of the Crown owed to Tsleil-Waututh Nation, and Tsleil-Waututh Nation still expects that it be adequately consulted. Tsleil-Waututh Nation does not consider any communications or actions taken by the Ministry without participation or input from Tsleil-Waututh Nation to constitute consultation.	The Ministry is committed to providing capacity funding to support Tsleil-Waututh Nation's participation in the environmental assessment process. Indigenous groups' participation is a critically important and valuable component of the planning, development and execution of the Project. The Project team is committed to establishing strong relationships with Indigenous groups who have an interest in the Project, and engagement will be guided by provincial government policy and legislation, including the Draft Principles that Guide the Province of British Columbia's Relationship with Indigenous Peoples, the *Declaration on the Rights of Indigenous Peoples Act* (2019), and the Government Consultation Bulletin on Consulting During the COVID-19 Emergency.
Tsleil-Waututh Nation	Tsleil-Waututh Nation notes that meaningful consultation requires that affected Indigenous groups have the time and resources to meaningfully participate in the consultation process.	The Ministry is committed to providing capacity funding to support Tsleil-Waututh Nation's participation in the environmental assessment process.
Tsleil-Waututh Nation	Tsleil-Waututh Nation requires that it continue to receive all information related to the Project.	The Ministry will continue to share Project-related information with Tsleil-Waututh Nation as these materials become available.
Tsleil-Waututh Nation	The Tsleil-Waututh Nation issues and interests to date should and must also include everything Tsleil-Waututh Nation has worked on and submitted for the George Massey Tunnel Replacement Project from start to finish, as many of Tsleil-Waututh Nation's comments will be identical and/or similar in nature; this will help to decrease the burden and double work on Tsleil-Waututh Nation.	The Ministry will review and compile the Tsleil-Waututh Nation's issues and interests submitted for the previous 10-lane bridge project and ensure they are reflected and addressed in future stages of the environmental assessment process.

CAD = Consultative Areas Database; EAO = Environmental Assessment Office; IPD = Initial Project Description; EAC = Environmental Assessment Certificate

9.3 PLANNED INDIGENOUS ENGAGEMENT ACTIVITIES

Based on engagement with Indigenous groups to date, the Ministry plans to conduct the following engagement activities during the Early Engagement phase:

- seek to establish individual capacity funding agreements with participating Indigenous groups in order to support their overall capacity and ability to collaborate on the Project
- engage on an ongoing and regular basis with all identified Indigenous groups throughout the environmental assessment process and during all subsequent phases of the Project
    - For example, Early Engagement will focus on the development of the Initial Project Description, Engagement Plan and Detailed Project Description. Feedback received on the Detailed Project Description will help to establish expectations and identify any issues or Project-related effects on participating Indigenous groups' interests.
- share Project information through various mediums, including e-mail, secure file transfer, and in-person, should COVID-19 protocols allow
- coordinate and conduct monthly engagement meetings where Indigenous groups will be invited to:
    - participate in discussions and learning opportunities related to the Project
    - provide input and views regarding the Project and how it relates to their interests
- coordinate and conduct Project-related workshops, site visits and community meetings, when and where requested
- support access to independent experts and resources to support Indigenous review of project materials
- support Indigenous participation in the delivery of Project work, data collection, and assessments, where possible
- identify, discuss, and where appropriate incorporate relevant agreements (including between Indigenous groups), memoranda of understanding, assessment protocols, treaties, or other publicly available information of potentially affected Indigenous groups
- convene regular check-ins with Indigenous groups regarding capacity challenges and potential mitigation measures
- support Indigenous led studies and assessments related to the Project
- seek feedback from Indigenous groups regarding adapting current and proposed engagement tools and methods to best suit their needs

9.4 CURRENT USE OF LANDS AND RESOURCES FOR TRADITIONAL PURPOSES

The Fraser River South Arm and upland areas along the Fraser River sustains a variety of Indigenous traditional uses including Indigenous fishing, hunting, gathering, transportation, and cultural practices.

Potential effects to current use of lands and resources for traditional purposes may result from in-river and upland construction activities and subsequent decommissioning of the Existing Tunnel. However, once operational, it is anticipated that use of lands and resources will return to existing levels along the Highway 99 corridor.

The Ministry will work with Indigenous groups to identify and augment existing information and conduct additional studies as necessary to understand the traditional and current use of the lands and resources surrounding the Project and how the Project may impact these uses. To the extent possible, the Ministry will build upon the assessments of resources and land use for traditional purposes conducted in the previous 10-lane bridge project to inform these assessments.

10 ENGAGEMENT AND CONSULTATION WITH LOCAL GOVERNMENTS, REGIONAL AUTHORITIES, STAKEHOLDERS, AND THE PUBLIC

10.1 SUMMARY OF PRELIMINARY ENGAGEMENT ACTIVITIES

With the cancellation of the previously proposed 10-lane bridge project in 2017, and the completion of an Independent Technical Review in 2018, the Ministry undertook a three-phase engagement program to support planning for a new crossing:

1. **Phase 1 – Principles, Goals, and Objectives (January to April 2019)—**The Ministry worked with Indigenous groups, regional and local governments, and select external stakeholders to develop and achieve regional consensus on project principles, goals, and objectives.

2. **Phase 2 – Options Analysis (spring 2019 to spring 2020)—**The Ministry worked with Phase 1 audiences to identify and shortlist crossing options and conduct a Multiple Account Evaluation of the shortlisted options. Public engagement was conducted on the shortlisted options.

3. **Phase 3 – Business Case (fall 2020 to spring 2021)—**The Ministry completed and updated the Business Case for the recommended crossing option (MOTI 2021).

10.1.1 Federal, Provincial, and Local Governments

The Ministry has been regularly communicating and engaging with local governments, Metro Vancouver, and federal and provincial agencies on Project planning since 2019. Following the Business Case public release in August 2021, the Ministry has re-engaged these groups as part of pre-early engagement efforts to understand their preliminary questions and issues. Engagement meetings included both staff and elected officials with stakeholder organizations. Meetings included overviews of the Project scope to support a shared understanding and meaningful engagement. Through fall 2021, the Ministry met with the cities of Richmond and Delta, Metro Vancouver, the VFPA, TransLink, DFO, Environment and Climate Change Canada, the Agricultural Land Commission, the Ministry of Environment and Climate Change Strategy, the EAO, and the Ministry of Forests, Lands, Natural Resource Operations and Rural Development.

10.1.2 Public Stakeholders and Other Interested Parties

The Ministry recognizes the critical role of members of the public and other stakeholders and their keen interest in learning more about the Project. The Ministry is committed to providing accessible project information that supports the public and stakeholders' participation through engagement. The Ministry held two public open houses in spring 2020 in Delta and Richmond to support public dialogue on the shortlisted crossing options considered at that time, and in fall 2020 the Ministry held meetings with emergency service providers in Delta and Richmond, the Fraser River Pilots Association, BC Coastal

Pilots, BC Ferries, HUB Cycling, the BC Cycling Coalition, the BC Trucking Association, Vancouver International Airport, and other public stakeholders to provide an update on the Project and discuss areas of interest.

The Ministry will continue to maintain and strengthen relationships during subsequent phases of engagement. The Ministry uses a number of communication channels to share information with the public and stakeholders, including in-person open houses and virtual information sessions, social media, Project update emails, and a Project website (https://www2.gov.bc.ca/gov/content/transportation-projects/highway-99-tunnel-program). The Ministry is also developing a new Project website to support the environmental assessment process.

10.2 PROPOSED ENGAGEMENT ACTIVITIES

The focus of the Ministry's engagement activities is to ensure government and regional authorities, the public, and other interested parties are informed about the Project, have access to information, and are encouraged to provide feedback throughout the environmental assessment, Project planning and design, and eventual construction process.

10.2.1 Federal, Provincial, and Local Governments and Indigenous Groups

The Ministry will continue to meet regularly with the cities of Delta and Richmond, Metro Vancouver, and federal and provincial government agencies, as well as Indigenous groups to keep them informed about the Project and seek their input to identify and mitigate project issues. The Ministry will also work with regulatory agencies and regional authorities regarding permitting requirements associated with the Project.

10.2.2 The Public and Other Interested Parties

Early Engagement will initiate the next stage in public engagement on the Project. Early Engagement activities will include the launch of the EAO's public comment period and virtual open houses. Project information sessions, stakeholder meetings, and working groups will be organized and delivered by the Ministry to support public understanding and awareness. A re-launch of the Project website will outline details from this IPD.

Advertisements, social media, and news releases will enable public awareness of opportunities to participate in the engagement process. Email updates will be provided to all identified stakeholders and/or other interested parties, who have been contacted through early engagement efforts, to keep them informed of upcoming opportunities for input.

In addition, the Ministry will establish a community office in the City of Delta in fall 2022. The office will provide a local connection and meeting point for the Project.

Further information about the Ministry's approach to engagement during the environmental assessment process and subsequent stages of Project planning is provided in the Ministry's environmental assessment Engagement Plan.

11 REFERENCES

BC CDC (BC Conservation Data Centre). 2022. Species and ecosystem explorer. Available at: http://a100.gov.bc.ca/pub/eswp/. [Accessed February 2022].

BC Indigenous Business Listings. 2021. BC Indigenous Business Listings. Available at: https://open.canada.ca/data/en/dataset/bdc81d33-1ab5-4882-9764-8701e8971bb7. [Accessed February 2022].

BCCSN (British Columbia Cetacean Sighting Network). 2018. South Georgia Strait Marine Mammal Sighting Data. Letter from Vancouver Aquarium Marine Science Centre to Golder, letter dated January 23, 2018.

Bigg MA. 1985. Status of the Steller Sea Lion (*Eumetopias jubatus*) and California Sea Lion (*Zalophus californianus*) in British Columbia. Can. Spec. Publ. Fish. Aquat. Sci. 77: 20 p.

Birds Canada. 2022. IBA Canada Important Bird Areas. Available at: https://www.ibacanada.ca/site.jsp?siteID=BC017. [Accessed February 2022].

City of Delta. 2014. Delta Official Community Plan (OCP). Available at: https://delta.civicweb.net/filepro/documents/37999. [Accessed February 2022].

City of Delta. 2021. About Delta. Available at: http://www.delta.ca/discover-delta/about-delta. [Accessed February 2022].

City of Richmond. 1999. Richmond Agricultural Viability Strategy. Available at: https://www.richmond.ca/plandev/planning2/agriculture/viability.htm#:~:text=Richmond%27s%20Agricultural%20Viability%20Strategy%20%28AVS%29%20was%20adopted%20by,Agricultural%20Decision%20Making%20Strategy%3B%20Services%20and%20Infrastructure%20Strategy%3B. [Accessed February 2022].

City of Richmond. 2012. Richmond Official Community Plan (OCP). Available at: https://www.richmond.ca/cityhall/bylaws/ocp/sched1.htm. [Accessed February 2022].

City of Richmond. 2015. City of Richmond's Ecological Network Management Strategy. Available at: https://www.richmond.ca/__shared/assets/2018enmsupdatereport52187.pdf#:~:text=Richmond%20City%20Council%20adopted%20the%20Ecological%20Network%20Management,livable%20and%20healthy%20places%20in%20which%20residents%20thrive.%E2%80%9D. [Accessed February 2022].

City of Richmond. 2021. Discover Richmond. Available at: https://www.richmond.ca/home.htm. [Accessed February 2022].

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2016. COSEWIC Assessment and Status Report on the Harbour Porpoise *Phocoena phocoena vomerina*, Pacific Ocean Population, in Canada. Ottawa. xi + 51 pp. Available at: https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/cosewic/sr_Harbour%20Porpoise_2016_e.pdf. [Accessed February 2022].

COWI (COWI North America Ltd.). 2019. George Massey Crossing Immersed Tube Tunnel Technical Summary. Approach to Design Basis.

COWI. 2020. George Massey Crossing – Choice of Horizonal Alignment.

DFO (Fisheries and Oceans Canada). 2010a. Population assessment Pacific harbour seal (*Phoca vitulina richardsi).* Science Advisory Report 2009/011, Canadian Science Advisory Secretariat, Fisheries and Oceans Canada, Nanaimo, BC. Available at: https://waves-vagues.dfo-mpo.gc.ca/Library/338997.pdf. [Accessed February 2022].

DFO. 2010b. Management plan for the Steller sea lion (*Eumetopias jubatus*) in Canada. Species at Risk Act Management Plan Series, Fisheries and Oceans Canada, Ottawa, ON. Available at: http://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/mp_steller_sea_lion_012011_final-eng.pdf. [Accessed February 2022].

DFO. 2011. Recovery Strategy for the Northern and Southern Resident Killer Whale (*Orcinus orca*) in Canada. *Species at Risk Act* Recovery Strategy Series, Fisheries and Oceans Canada, Ottawa, ix + 80 pp.

DFO. 2014. British Columbia Marine/Estuarine Timing Windows for the Protection of Fish and Fish Habitat - South Coast and Lower Fraser Areas Available at: Projects Near Water - British Columbia Marine/Estuarine Timing Windows for the Protection of Fish and Fish Habitat - South Coast and Lower Fraser Area (dfo-mpo.gc.ca). [Accessed February 2022].

DFO. 2021. Fraser River Eulachon (*Thaleichthys pacificus*) Pacific Region 2021. Integrated Fisheries Management Plan Summary. Available at: https://www.pac.dfo-mpo.gc.ca/fm-gp/mplans/eulachon-eulakane-ifmp-pgip-sm-eng.pdf. [Accessed February 2022].

DFO. 2022. Southern Pacific Salmon Integrated Fisheries Management Plan Summary. Genus Oncorhynchus. 2021/2022. Available at: https://www.pac.dfo-mpo.gc.ca/fm-gp/mplans/smon-sc-cs-ifmp-pgip-sm-eng.pdf. [Accessed February 2022].

Dunphy M. 2015. Are Vancouver's Recent Gray Whale Sightings the Start of Regular Seasonal Visits? In The Georgia Strait. Available at: https://www.straight.com/news/547461/are-vancouvers-recentgray- whale-sightings-start-regular-seasonal-visits. [Accessed February 2022].

EAO (Environmental Assessment Office). 2019. Early Engagement Policy, Version 1.0. December 16, 2019. Available at: https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/environmental-assessments/guidance-documents/2018-act-guidance-materials. [Accessed February 2022].

ECCC (Environment and Climate Change Canada). 2019. Barn Swallow (*Hirundo rustica*): Residence Description. Available at: https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/residence-descriptions/barn-swallow.html. [Accessed February 2022].

ENV (BC Ministry of Environment and Climate Change Strategy). 2021. Fish Inventories Data Query, Single Waterbody Query. [accessed February 2022]. Available at: http://a100.gov.bc.ca/pub/fidq/viewSingleWaterbody.do. [Accessed February 2022].

Government of BC. 2022. iMapBC 2.0. Available at: https://maps.gov.bc.ca/ess/hm/imap4m/. [Accessed February 2022].

Government of BC. 2020. Government Consultation Bulletin on Consulting During the COVID-19 Emergency. Available at: https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/consulting-with-first-nations. [Accessed February 2022].

Government of BC. N.d. Draft Principles that Guide the Province of British Columbia's Relationship with Indigenous Peoples. Available at: https://www2.gov.bc.ca/assets/gov/careers/about-the-bc-public-service/diversity-inclusion-respect/draft_principles_intro_faq.pdf.

Government of BC and State of Washington. 1992. Environmental Cooperation Agreement Between the Province of British Columbia and the State of Washington. Available at: https://www2.gov.bc.ca/assets/gov/environment/natural-resource-policy-legislation/environmental-policy/bcwaccord.pdf

Hemmera. 2021: George Massey Tunnel Crossing (GMC) – Juvenile Salmonid Advanced Studies 2021. Prepared for BC Ministry of Transportation and Infrastructure.

Hemmera and Musqueam Indian Band. 2021: George Massey Tunnel Crossing (GMC) – Sturgeon Advanced Studies 2021. Prepared for BC Ministry of Transportation and Infrastructure.

Hume M. 2010. Seals, sea lions devastating West Coast salmon runs. The Globe and Mail.

Jeffries SJ, Gearin PJ, Huber HR, Saul SL, Pruett DA. 2000. Atlas of seal and sea lion haulout sites in Washington. Washington Department of Fish and Wildlife, Wildlife Science Division, Olympia, WA.

LGL (LGL Limited). 2021. George Massey Tunnel Replacement–An Assessment of Eulachon (Thaleichthys pacificus) Spawning Activity in the Lower Fraser River at Deas Island. Final Report for Tsawwassen First Nation, Tsawwassen, BC.

Lower Fraser Fisheries Alliance. 2020. Blueprint for Restoring Ecological Governance to the Lower Fraser River. [accessed February 2022]. Available at: https://wcel.org/sites/default/files/publications/blueprint-restoring-ecological-governance-lower-fraser-river.pdf

Mayors Council on Regional Transportation (2015). Regional Transportation Investments. A Vision for Metro Vancouver. [Accessed February 2022]. Available at: https://www.translink.ca/-/media/translink/documents/about-translink/governance-and-board/council-minutes-and-reports/2015/march/mayors_council_vision_mar_2015.pdf

Metro Vancouver. 2011. Metro Vancouver Regional Food System Strategy. [accessed February 2022]. Available at: http://www.metrovancouver.org/services/regional-planning/PlanningPublications/RegionalFoodSystemActionPlan.pdf

Metro Vancouver. 2014. Sensitive Ecosystem Inventory for Metro Vancouver. Available at: http://www.metrovancouver.org/services/regional-planning/PlanningPublications/SEITechnicalReport.pdf. [Accessed February 2022].

Metro Vancouver. 2015. Regional Growth Strategy. [accessed February 2022]. Available at: https://92ancouver.ca/docs/eastern-core/regional-growth-strategy.pdf

Metro Vancouver. 2016. Metro Vancouver Regional Parks Plan. [accessed February 2022]. Available at: http://www.metrovancouver.org/services/parks/ParksPublications/RegionalParksPlan.pdf

Metro Vancouver. 2021. Metro Vancouver 2050 Regional Growth Strategy. [accessed February 2022].Available at: http://www.metrovancouver.org/services/regional-planning/PlanningPublications/DraftMetro2050.pdf

Metro Vancouver. 2022. Metro2040 Dashboard; Regional Land Use Designations. Available at: Regional Land Use Designation (metrovancouver.org). [Accessed February 2022].

MOTI (BC Ministry of Transportation and Infrastructure). 2015. George Massey Tunnel Replacement Project. Contaminated Sites Study. April 2015.

MOTI. 2016. George Massey Tunnel Replacement Project Application for an Environmental Assessment Certificate: Section 4.6 Marina Mammals Assessment. Prepared by Hemmera Envirochem (Hemmera) for MOTI.

MOTI. 2021. Business Case. George Massey Crossing Project. April 2021

Musqueam First Nation. 2018. Musqueam First Nation a Comprehensive Sustainable Community Development Plan Update Available at: https://www.musqueam.bc.ca/wp-content/uploads/2018/10/Musqueam-CCP-Update_FINAL_Oct2018_lowres.pdf. [Accessed February 2022].

Province of British Columbia. 2021. South Arm Marshes Wildlife Management Area. Available at: https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/wildlife/wildlife-habitats/conservation-lands/wma/wmas-list/south-arm-marshes. [Accessed February 2022].

Statistics Canada, 2018. Greater Vancouver, RD [Census division], British Columbia (table). Aboriginal Population Profile. 2016 Census. Statistics Canada Catalogue no. 98-510-X2016001. Available at: https://www150.statcan.gc.ca/n1/en/catalogue/98-510-X2016001. [Accessed February 2022].

Statistics Canada. 2021a. Table 14-10-0294-02. Labour force characteristics by census metropolitan area, three month moving average, seasonally adjusted, inactive (x 1,000). Available at: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1410029402&pickMembers%5B0%5D=2.2&cubeTimeFrame.startMonth=12&cubeTimeFrame.startYear=2020&referencePeriods=20201201%2C20201201. [Accessed February 2022].

Statistics Canada. 2021b. Table 14-10-0098-01 Employment by industry, annual, census metropolitan areas, inactive (x 1,000). Available at: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1410009801&pickMembers%5B0%5D=1.34&cubeTimeFrame.startYear=2020&cubeTimeFrame.endYear=2020&referencePeriods=20200101%2C20200101. [Accessed February 2022].

Statistics Canada. 2021c. Table 33-10-0304-01 Canadian Business Counts, with employees, December 2020. Available at: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3310030401&pickMembers%5B0%5D=2.1&pickMem bers%5B1%5D=3.1. [Accessed February 2022].

TFN (Tsawwassen First Nation). 2009. Tsawwassen First Nation Land Use Plan. [Available at: http://www.tsawwassenfirstnation.com/pdfs/TFN-About/Information-Centre/Strategic-Planning/TFN_Land_Use_Plan.pdf#:~:text=The%20Tsawwassen%20First%20Nation%20Final%20Agreement%20%28Treaty%29%20provides,Treaty%2C%20TFN%E2%80%99s%20land%20base%20will%20total%20724%20hectares. [Accessed February 2022].

TFN. 2013. Tsawwassen First Nation Agricultural Plan. Available at: http://tsawwassenfirstnation.com/wp-content/uploads/2019/07/TFN-Agricultural-Plan-2013.pdf. [Accessed February 2022].

TFN. 2021. Official website. Our Nation. http://tsawwassenfirstnation.com/about-tfn/our-nation/ [Accessed November 2021].

TFN and LGL (Tsawwassen First Nation and LGL Limited Environmental Research Associates). 2021a. George Massey Crossing: Migratory Birds. Progress Report – February 2021. Prepared for the Ministry of Transportation and Infrastructure. 3 pp.

TFN and LGL. 2021b. George Massey Crossing: Migratory Birds. Progress Report – October 2021. Prepared for the Ministry of Transportation and Infrastructure. 3 pp.

TFN and LGL. 2021c. George Massey Crossing: Migratory Birds. Progress Report – November 2021. Prepared for the Ministry of Transportation and Infrastructure. 3 pp.

TFN and LGL. 2022. George Massey Crossing: Migratory Birds. Progress Report – January 2022. Prepared for the Ministry of Transportation and Infrastructure. 3 pp.

TransLink. 2013a. Regional Transportation Strategy. Strategy Framework. July 2013. Available at: https://www.translink.ca/-/media/translink/documents/plans-and-projects/regional-transportation-strategy/rts_strategic_framework_07_31_2013.pdf. [Accessed February 2022].

TransLink. 2013b. 2014 Base Plan and Outlook. 2014 Strategic Plan. Available at: http://www.translink.ca/~/media/documents/plans_and_projects/10_year_plan/2014_base_plan/2014%20base%20plan%20draft%20for%20consultation.ashx. [Accessed February 2022].

TransLink. 2018. Southwest Area Transport Plan. Available at: https://www.translink.ca/-/media/translink/documents/plans-and-projects/area-planning/southwest-area/final_plan/southwest_area_transport_plan-april_2018.pdf. [Accessed February 2022].

VFPA (Vancouver Fraser Port Authority). 2014. Land Use Plan. Port Metro Vancouver. Available at: http://www.portmetrovancouver.com/wp-content/uploads/2015/06/port-metro-vancouverland-use-plan-english.pdf. [Accessed February 2022].

VFPA. 2021. Port Information Guide. Port of Vancouver. July 2021. Available at: https://www.portvancouver.com/wp-content/uploads/2021/07/2021-07-06-PORT-INFORMATION-GUIDE-Final.pdf. [Accessed February 2022].

WesPac Midstream-Vancouver LLC. 2018. Marine Mammal Baseline Report. Report submitted by Golder Associates (Golder) to WesPac in support of the WesPac Tilbury Marine Jetty Project Environmental Assessment Certificate Application. Report No. 1314220049-133-R-Rev0. [Accessed February 2022].

Westmar Advisors. 2018. Independent Technical Review of the George Massey Crossing. Final Report. Prepared for Ministry of Transportation and Infrastructure. Available at: https://www2.gov.bc.ca/assets/gov/transportation-infrastructure-projects/highway-99-tunnel-project/technical-services-report-december-2019/george-massey-crossing_independent-technical-review_final_corr.pdf. [Accessed February 2022].

Zbeetnoff (Zbeetnoff Agro-Environmental Consulting) and Quadra (Quadra Planning Consultants). 2011. Delta Agricultural Plan. Phase 3 Report: Agricultural Plan. Prepared for the Corporation of Delta.

ATTACHMENT 1: CONCORDANCE TABLE

Early Engagement Policy Requirement	Addressed	Section No.
Executive Summary		
A plain language summary of the IPD that is clear and concise	Yes	1.1 (Project Introduction)
General Information and Contacts		
Project Name	Yes	1.3 (Table 1.3-1)
Project Location	Yes	1.1 (Project Introduction)
Project industrial sector and type (e.g., open pit metal mine)	Yes	1.3 (Table 1.3-1)
Proponent name, mailing address, phone numbers, email address and website URL •Include the name and contact information of the primary representative for the EA	Yes	1.3 (Table 1.3-1)
Purpose and Rationale		
A general rationale for why the project has been proposed	Yes	2.1 (Project Rationale and Benefits)
Potential project benefits	Yes	2.1 (Project Rationale and Benefits)
Legislative and Regulatory Context		
The type and size of the project, with specific reference to EA Regulatory Triggers [e.g., the EAO Reviewable Project Regulations and Impact Assessment Act (Canada) thresholds]	Yes	6.2 (Reviewable Project Regulation) 6.3 (Impact Assessment Act)
A list of anticipated authorizations and permits	Yes	6.5 (Table 6.5-1)
Consider the requirements of any applicable agreements between the Province and Indigenous nations, including treaties	Yes	6.6 (Agreements)
Consider the requirements of any applicable international agreements between the Province and state or federal governments	Yes	6.6 (Agreements)
A description of relevant government policies that the project may not be compatible with	No relevant government policies that the Project may not be compatible with have been identified at this time - stated at the end of Section 2.2	2.2 (Project Goals)
Proposed timing for conducting the provincial EA and federal EA, if applicable	Yes	3.3 (Project Schedule) and Table 3.3-1

Early Engagement Policy Requirement	Addressed	Section No.
Project Status and History		
Project history, including past ownership	Yes	1.2 (Previous Iterations of the Project)
State if it is a new project or a modification to an existing project	Yes	1.2 (Previous Iterations of the Project)
A list of any existing permits or tenure in place	Yes - there are no regulatory permits required for the operation and maintenance of the existing George Massey Tunnel and Deas Slough Bridge - stated in Section 1.1. The Project is located predominantly within Ministry Highway 99 ROW. Additional land requirements are described in Section 5.2.	1.1 (Project Introduction) 5.2 (Land and Water Ownership, Designation and Tenures)
A description of any previous proposal(s) for the project or a similar proposal and the outcomes and history of the proposal(s), if applicable	Yes	1.2 (Previous Iterations of the Project)
If the project was previously declined or terminated, a description of how this proposal differs and how the issues for which the previous proposal was declined or terminated have been addressed	Yes	1.2 (Previous Iterations of the Project)
Project Timing		
A list of proposed project phases (e.g. construction, operation, decommissioning, and reclamation) and the anticipated timing and duration of each phase	Yes	3.2 (Phases) 3.3 (Timing and Duration)
Include any known seasonal timing constraints	Yes	3.3 (Figure 3.3-1)
Project Location, Activities and Components		
A description of the proposed project's location in a local and regional context, including proximity to communities or locations of interest to the public, government, or Indigenous nations, and key designated or protected areas such as parks or Wildlife Habitat Areas	Yes	Addressed in various subsections in Section 5 (Land and Water Use) and 8 (Physical, Biological and Human Environment Conditions) and Figure 1.1-1 (Project Overview Figure) and 8.3-1 (Services, Infrastructure and Transportation)
Proposed project activities and components	Yes	3.1 (Project Components) 3.2 (Construction, Operation and Decommissioning Activities)
Proposed on and off-site facilities and equipment	Yes	3.1 (Facilities described in Project Components) 3.2 (Equipment described in Construction, Operation and Decommissioning Activities)
A brief description of proposed activities related to processing, transportation and/or shipping of materials to/from the site	Yes	3.2 (described in Construction, Operation and Decommissioning Activities)
A description of any other project(s) that are needed for the proposed project to proceed and be feasible (e.g. a pipeline would be needed for an oil and gas facility to proceed)	Yes	1.2 (Previous Iterations of the Project)
A description of the work that has been conducted to arrive at the proposed project as described in the IPD	Yes	1.2 (Previous Iterations of the Project) and 3.6 (Alternative Means of Carrying Out the Project
A list of design or siting constraints that are flexible and those that are not flexible	Yes	3.6.1 (Design and Siting Constraints)
A list of other design or siting options that may be considered	Yes	3.6 (Alternative Means of Carrying out the Project)
Anticipated daily and annual maximum production or operational capacity of the project (if applicable)	Yes - text added to indicate this is not applicable	3.0 (Project Components and Activities)

Early Engagement Policy Requirement	Addressed	Section No.
Maps and Shapefiles		
Local and regional scale maps of the project showing its location and known off-site components	Yes	1.1 (Figure 1.1-1 - Regional) 3.1 (Figure 3.1-1 - Local)
Shapefiles of the proposed project footprint and the footprint of known offsite components: • Shapefiles must be in ESRI format and include four file types: .shp, .shx, .dbf, and .prj • Please also provide .KMZ files • Shapefiles must be in BC Albers (NAD83) projection • Shapefile polygons and their corresponding polygons on all maps must be identical in shape, size, and location • Spatial features (.shp and .shx) must be represented as polygons, not as points or line features • Shapefiles must be named in a way that clearly describes the contents • To avoid having ArcGIS generate random errors, follow these best practices: avoid starting names by number, add an underscore instead of a space or dash, and do not include a symbol outside of the underscore • Provide shapefiles demonstrating the overlap of known project components with any identified communities or locations of interest to the public. This may include information regarding specific sites of importance to an Indigenous nation or their territory, if this information is not confidential in nature and an Indigenous nation has agreed to allow the information to be shared	Yes	This information is provided in a .zip folder with GIS files. As noted in Section 5.3 (Past and Present Land and Water Use), specific sites of importance to Indigenous groups or their territories that are known to overlap the Project will be further identified through early and ongoing engagement with Indigenous nations groups and Indigenous- led studies.
Maps must be presented in the required standard format with legible grids and suitable scaling (typically 1:100,000 to 1:150,000 for centralized projects such as a mine, and up to 1:1,500,000 or 1:1,250,000 scale for linear projects such as a pipeline or transmission line)	Yes	Added Figures: Figure 1.1-1 (Project Overview Figure) Figure 3.1 1 (Project Footprint) Figure 5.2-1 (Land Ownership) Figure 5.2-2 (Metro Vancouver Land Use Designations Figure 8.2-1 (Sensitive Ecosystem Inventory and Drainages) Figure 8.3-1 (Services, Infrastructure and Transportation)
Maps must also include a national Topographic System (NTS) Map number, latitude and longitude references, titles, a north arrow, and relevant legends	Yes	Addressed on figures
Indigenous Nation Interests		
A description of the proximity of the proposed project to Indigenous nations' territory, communities, locations of interest, Indian Act reserve lands, lands subject to a Treaty, or other relevant agreements	Yes	1.1 (Figure 1.1-1) 5.2 (Figure 5.2-2)
A description of potential project interactions with any identified Indigenous interests	Yes	9.3 (Planned Indigenous Engagement)
A description of alignment of the IPD with Indigenous nation laws, customs and policies	Consideration of applicable Indigenous laws, customs, and policies is currently underway as part of the Ministry's consultation program with Indigenous groups. Further delineation of applicable Indigenous laws will be included in the Detailed Project Description.	9 (Indigenous Groups Interests)
A list of any issues, concerns, or questions raised by Indigenous nations during engagement on the draft IPD or other information shared in relation to the proposed project	Yes	9.2 (Table 9.2-1)

Early Engagement Policy Requirement	Addressed	Section No.
Biophysical Environment		
A description of the natural setting characteristics, including coastal, foreshore, riparian, mountainous, watersheds, and agricultural land	Yes	8.1 (Physical Environment Conditions)
A description of disturbed area characteristics, including: brown field; contaminated site(s), and any history of development	Yes	8.1.7 (Disturbed Areas)
Identification of sensitive or vulnerable species, ecosystems, and/or habitats in the project area	Yes	8.2 (Biological Environment Conditions)
A list of existing data, including monitoring reports, previous EAs, regional studies, and/or other sources of information that support the understanding of the existing biophysical conditions	Yes	8.1 (Physical Environment Conditions) 8.2 (Biological Environment Conditions)
Human and Community Wellbeing		
A description of the proposed project's proximity to local communities, including seasonal or temporary residences	Yes	8.3.5 (Services, Infrastructure, and Transportation)
Identification of the local governments within which the proposed project is located or where effects may occur	Yes	10.1.1 (Federal, Provincial, and Local Governments)
A description of the proposed project's proximity to important or sensitive community and natural places such as: municipal boundaries, parks, schools, hospitals, housing, water supplies, roads, railways, and protected and recreational areas	Yes	8.3.5 (Services, Infrastructure, and Transportation)
A list of existing data, including monitoring reports, previous EAs, regional studies, and/or other sources of information that support the understanding of the existing human environment conditions	Yes	8.3 (Human Environment Conditions)
Identification of any sensitive or vulnerable economic, social, heritage, or health values that may be affected by the project	Yes	8.3 (Human Environment Conditions) 8.3.5 (Cultural Heritage)
A preliminary understanding of the anticipated size of the workforce for each project phase, where the workforce will be drawn from, and where the workforce will be housed. Refer to the Human and Community Wellbeing Guidelines for further information.	Yes	3.4 (Infrastructure and Labour Requirements)
Emissions, Discharges, and Waste		
A high-level outline of anticipated direct project waste and emissions to land, air, and water, including estimated greenhouse gas (GHG) emissions. • This information would include direct emissions that are expected to be above provincial or national standards and emissions that have the potential to interact with Indigenous interests, the biophysical environment, and/or the human environment.	Yes - added additional text to Air and Dust Emissions and added new Greenhouse Gas Emissions Section	4.1 (Air and Dust Emissions) 4.2 (Greenhouse Gas Emissions)
A description of proposed mitigation measures and/or project design changes to address emissions, including GHGs	Yes	4.1 (Air and Dust Emissions) 4.2 (Greenhouse Gas Emissions)
Public and Environmental Safety		
A description of potential malfunctions or accidents associated with the industry or specific to the proposed project and how they will be managed. • Include any proposed outreach to help Indigenous nations, governments and the public better understand the risks and mitigations • Include any issues raised about public and environmental safety during engagement with Indigenous nations, the public, provincial and federal government agencies, and stakeholders and how issues were considered in developing any mitigation measures or design changes.	Yes	8.5 (Accidents and Malfunctions).

Early Engagement Policy Requirement	Addressed	Section No.
Alternative Means of Carrying out the Project		
A high-level description of the alternative options for the proposed project, including a rationale for the preferred option that demonstrates how positive and negative effects and/or issues raised during engagement have been considered	Yes	3.5 (Alternatives to the Project) 3.6 (Alternative Means of Carrying out the Project)
The alternative means of undertaking the proposed project may include information related to: • the use of best available technologies • the technical and economic feasibility • the potential effects, risks and uncertainties of those alternatives • the preferred option and a rationale for this preference • the different options for the project location, project routing, technologies, mitigation, or design	Yes	3.6 (Alternative Means of Carrying out the Project)
Effects of the Environment on the Project		
An overview of potential effects of natural hazards or processes and climate change on the proposed project	Yes	8.6 (Effects of the Environment on the Project)
Land and Water Use		
An outline of the anticipated project footprint and proposed area of disturbance	Yes	3.1 (Figure 3.1-1)
A description of the land required for the proposed project, including whether the project is located on private lands, provincial or federal Crown lands, or Indian Reserve lands	Yes	5.1 (Table 5.1-1) 7 (Spatial Boundaries)
Include the applicable zoning, Agriculture Land Reserve designation, land and resource management plans, and other land use designations (e.g. parks and protected areas) and the legal land descriptions and/or tenure numbers of those lands, if known	Yes	5.1 (Project Location, Footprint and Area of Disturbance) 5.2 (Land and Water Ownership, Designation, and Tenures) 5.5 (Table 5.5-1) 8.3.3 (Land and Marine Use)
A description of past uses of the land required for the proposed project, including whether the site has been previously developed	Yes	5.3 (Past and Present Land and Water Use)
A description of water requirements for the proposed project, if applicable, and the proposed source of water	Yes	5.4 (Project Water Requirements)
Land Use Plans		
A list of all relevant land use plans, including provincial land use plans, Indigenous land use plans, and relevant municipal or local government plans	Yes	5.5 (Land and Water Use Management Plans)
An identification of any rezoning or changes in land designations that would be required for the proposed project	Yes	As noted in Section 5.2 (Land and Water Ownership, Designation and Tenures), any associated rezoning requirements and/or changes in land use designations, if required, will be determined as the engineering and property requirements for the Project are advanced.
Project Interactions		
A description of potential interactions between the proposed project and the biophysical and human environments, including Indigenous interests. It may be helpful to present this information in a table format, refer to the Effects Assessment Policy for examples of interaction tables	Yes	8.7 (Summary of Project Interactions) and Table 8.7-1 (Preliminary Identification of Project Interactions)
A summary of any biophysical feasibility studies undertaken that may be pertinent to understanding potential interactions, if applicable	Yes	8.1 (Physical Environment Conditions) and 8.2 (Biological Environment Conditions)
A list of any activities proposed to be undertaken during the Early Engagement period to inform the development of the DPD or the Application, should the project proceed to an EA	Yes	10.1 (Summary of Preliminary Engagement Activities)
An identification of existing cumulative effects in the region that the project may interact with. Refer to the Effects Assessment Policy for more information	Yes	8.4 (Cumulative Effects)

ATTACHMENT 2: LIST OF EXISTING DATA

This attachment is a list of existing data, including monitoring reports, previous environmental assessments, regional studies, and other sources of information that support the understanding of the existing biophysical and human environment conditions for the Fraser River Tunnel Project (the Project). These are preliminary lists identified through scoping and early engagement. Searches for more information and studies will be re-run and will be updated in concert with existing conditions data collected in the field, as well as through collaboration and engagement with stakeholders and regulators, as the Project progresses (for example, for valued component selection, the detailed project description, assessment).

1. Physical Environment

BC ENV (British Columbia Ministry of Environment and Climate Change Strategy). 2013. BC Field Sampling Manual. Victoria, BC. https://www2.gov.bc.ca/assets/gov/environment/research-monitoring-and-reporting/monitoring/emre/bc_field_sampling_manual_complete.pdf. [Accessed January 2019].

BC ENV. 2017. Guidance on Application of Provincial Air Quality Objectives for SO2

BC ENV. 2021a. British Columbia Air Quality Dispersion Modelling Guideline. Version November 2021.

BC ENV. 2021b. Guidance for NO2 Dispersion Modelling in BC. Version November 2021.

BC ENV. 2021c. BC Ambient Air Quality Objectives. https://www2.gov.bc.ca/assets/gov/environment/air-land-water/air/reports-pub/prov_air_qual_objectives_fact_sheet.pdf. [Accessed February 2022].

BC ENV 2021d. Guidance on Application of Provincial Air Quality Objectives for NO2.

CCME (Canadian Council Ministers of Environment). N.d. (No date). Canadian Ambient Air Quality Standards. https://ccme.ca/en/air-quality-report#slide-7. [Accessed February 2022].

Cora Hallsworth Consulting and Sustainability Managers. 2021. Metro Vancouver Regional Consumption-Based Emission Inventory. Prepared for Metro Vancouver

ECCC (Environment Canada and Climate Change). 2021. National Inventory Report (NIR) 1990-2019: Greenhouse Gas Sources and Sinks in Canada: Canada's Submission to the United Nations Framework Convention on Climate Change

Government of BC. 2022. Traffic Data Program. https://www.th.gov.bc.ca/trafficData/index.html. [Accessed February 2022].

Greater Vancouver Regional District. 2008. Air Quality Management Bylaw No. 1082, 2008.

Google LLC. 2022. Google Earth Pro.

Metro Vancouver. 2012. Station Information: Lower Fraser Valley Air Quality Monitoring Network.

Metro Vancouver. 2018. 2015 Lower Fraser Valley Air Emissions Inventory and Forecast: Final Report and Summarized Results.

Metro Vancouver. 2020a. Metro Vancouver Ambient Air Quality Objectives Version January 2020. http://www.metrovancouver.org/services/air-quality/AirQualityPublications/CurrentAmbientAirQualityObjectives.pdf. [Accessed February 2022].

Metro Vancouver. 2020b. Metro Vancouver Near-Road Air Quality Monitoring Study.

Metro Vancouver. 2021a. Caring for the Air. http://www.metrovancouver.org/services/air-quality/about/caring-for-the-air/. [Accessed February 2022].

Metro Vancouver. 2021b. 2017 Lower Fraser Valley Air Quality Monitoring Report

MOTI (BC Ministry of Transportation and Infrastructure). 2015a. George Massey Tunnel Replacement Project. Contaminated Sites Study. April 2015.

MOTI. 2016a. George Massey Tunnel Replacement Project Application for an Environmental Assessment Certificate: Section 16.3 Underwater Noise Modelling Study. Technical Volume.

MOTI. 2016b. George Massey Tunnel Replacement Project Application for an Environmental Assessment Certificate: Section 16.6 Atmospheric Noise Study. Technical Volume.

WesPac Midstream-Vancouver LLC. 2018. Appendix 4.4.1-2: Air Quality and Meteorology Existing Condition Report. Report submitted by Golder Associates (Golder) to WesPac in Support of the EAC Application.

2. Biological Environment

BC CDC (BC Conservation Data Centre). 2022. BC Conservation Data Centre (CDC) Species and Ecosystems Explorer. https://a100.gov.bc.ca/pub/eswp/. [Accessed February 2022].

BCCSN (British Columbia Cetacean Sighting Network). 2022. South Georgia Strait Marine Mammal Sighting Data. [Accessed February 2022].

BEC Program. 2021. Biogeoclimatic Ecosystem Master ecosystem plot Biogeoclimatic Ecosystem Classification Program of BC 2021. [Accessed February 2022].

BHP (BHP Billiton Canada Inc). 2018. Aquatic Resources Assessment Report BHP Potash Export Facility at Fraser Surrey Docks. Report prepared by Hemmera Envirochem Inc. (Hemmera) for BHP. File No. 1856-001.01. [Accessed February 2022].

Birds Canada. 2022. IBA Canada Important Bird Areas. [Accessed February 2022]. https://www.ibacanada.ca/site.jsp?siteID=BC017

California Academy of Sciences and National Geographic Society. 2022 iNaturalist. https://www.inaturalist.org/. [Accessed February 2022].

City of Delta. 2022. DeltaMap Online Mapping System. Database provided by the City of Delta: https://maps.delta.ca/Html5Viewer/index.html?viewer=DeltaMapExternal.viewer/. [Accessed February 2022].

City of Richmond. 2022. City of Richmond Interactive Map. Database provided by the City of Richmond: https://maps.richmond.ca/rim/. [Accessed February 2022].

Clark J, Meidinger D. 2020. Update of the Metro Vancouver Sensitive Ecosystem Inventory (2009 -2014).

CNABH (Consortium of North American Bryophyte Herbaria). 2022. CNABH Portal. https://bryophyteportal.org/portal/. [Accessed February 2022].

CNALH (Consortium of North American Lichen Herbaria). 2022. Lichen Portal. https://lichenportal.org/cnalh/. [Accessed February 2022].

Consortium of Pacific Northwest Herbaria. 2022. Consortium of Pacific Northwest Herbaria (pnwherbaria.org). [Accessed February 2022].

ENV (BC Ministry of Environment and Climate Change Strategy). 2020. Terrestrial Ecosystem Information (TEI): Coding Updates for Non-Vegetated, Sparsely

Environment Canada. 2015. Management plan for Vancouver Island beggarticks (*Bidens amplissima*) in Canada. https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/management-plans/vancouver-island-beggarticks-2015.html. [Accessed February 2022].

Environment Canada. 2016. Recovery Strategy for the streambank lupine (*Lupinus rivularis*) in Canada. https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/streambank-lupine-2016-proposed.html. [Accessed February 2022].

FLNRO (Ministry of Forests, Lands, Natural Resource Operations and Rural Development). 2017. Biogeoclimatic Ecosystem Classification Codes and Names BECdb, Version 10. MS Access Database Updated 2017. [Accessed February 2022].

FLNRO. 2021a. BC Invasive Alien Plant Site Online Database. [Accessed February 2022].

FLNRO. 2021b. Provincial Biogeoclimatic Subzone/Variant/Phase Mapping Version 12. [Accessed February 2022].

FLNRO. 2021. Old Growth Technical Advisory Panel spatial data. Provincial Stewardship Strategies and Planning. https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/old-growth-forests/old-growth-maps. [Accessed February 2022].

FREMP - BIEAP (Fraser River Estuary Management Program – Burrard Inlet Environmental Action Program Habitat Atlas). 2014. Vancouver, B.C. https://cmnmaps.ca/dfo_fremp/. [Accessed February 2022].

GBIF (Global Biodiversity Information Framework). 2022. Global Biodiversity Information Framework. https://www.gbif.org/. [Accessed February 2022].

Golder (Golder Associates Ltd.). 2019. Lower Fraser River Adult White Sturgeon Acoustic Telemetry Data Analysis. Prepared for BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development. [Accessed February 2022].

Golder. 2022. Golder VPro and Plant Species Master Databases. [Accessed February 2022].

Government of BC. 2022a. Fish Inventories Data Queries (FIDQ). Database provided by the BC Government. https://cadi.data.gov.bc.ca/dataset/fish-information-data-query#:~:text=Fish%20Information%20Data%20Query%20%28FIDQ%29%20FIDQ%20provides%20easy,from%20the%20provincial%20BC%20Geographic%20Data%20Warehouse%20%28BCGW%29 [Accessed February 2022].

Government of BC. 2022b. Habitat Wizard. Database provided by the BC Government. https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/ecosystems/habitatwizard. [Accessed February 2022].

Government of BC. 2022c. iMapBC 2.0. https://maps.gov.bc.ca/ess/hm/imap4m/. [Accessed January 2022].

Government of Canada. 2022. Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Database provided by the BC Government. https://www.cosewic.ca/index.php/en-ca/. [Accessed February 2022].

Hatfield Consultants. 2018. Pattullo Bridge Replacement Project: Fish and Fish Habitat Report. Prepared for: South Coast British Columbia Transportation Authority (TransLink) New Westminster, British Columbia.

Hemmara. 2015. George Massey Tunnel Replacement Project – Part B Vegetation Assessment.

Hemmera. 2016. Environmental Assessment Application for the George Massey Tunnel Replacement Project. Terrestrial Wildlife Assessment. Prepared for BC Ministry of Transportation and Infrastructure.

Hemmera. 2017. George Massey Tunnel Replacement Project Environmental Assessment Application – Section 16.4 Fish and Fish Habitat Study Technical Volume . Prepared for the B.C. Ministry of Transportation, Vancouver, B.C. https://projects.eao.gov.bc.ca/p/588511ffaaecd9001b8291b7. [Accessed January 2022].

Hemmera. 2020. Review of GMTRP Technical Studies - Gap Analysis for Phase 2. Prepared for BC Ministry of Transportation and Infrastructure.

Hemmera. 2021a: George Massey Tunnel Crossing (GMC) – Juvenile Salmonid Advanced Studies 2021. Prepared for BC Ministry of Transportation and Infrastructure.

Hemmera. 2021b. Habitat Mapping in Support of Advance Studies - Methodology for the Lower Fraser River. Prepared for BC Ministry of Transportation and Infrastructure.

Hemmera & Musqueam Indian Band. 2021: George Massey Tunnel Crossing (GMC) – Sturgeon Advanced Studies 2021. Prepared for BC Ministry of Transportation and Infrastructure.

Hitchcock and Cronquist. 2018. Flora of the Pacific Northwest an Illustrated Manual, Second Edition. https://heritage.nv.gov/documents/flora-of-the-pacific-northwest-an-illustrated-manual-2nd-edition. [Accessed February 2022].

ISCMV (Invasive Species Council of Metro Vancouver). 2020. Invasive Species Council of Metro Vancouver Invasive Plant Prioritization Ranking. https://www.bing.com/search?q=Invasive+Species+Council+of+Metro+Vancouver+Invasive+Plant+Prioritization+Ranking&cvid=89e4186fc2a14245b5e6a9fdc35ec5ec&aqs=edge..69i57.387j0j9&FORM=ANAB01&PC=U531. [Accessed February 2022].

LGL (LGL Limited). 2021. George Massey Tunnel Replacement–An Assessment of Eulachon (Thaleichthys pacificus) Spawning Activity in the Lower Fraser River at Deas Island. Final Report for Tsawwassen First Nation, Tsawwassen, BC.

LGL & TFN (Tsawwassen First Nation). 2021. Eulachon (*Thaleichthys pacificus*) Migration in the Lower Fraser River and Estuary Revealed through Acoustic Telemetry: Years 1 and 2. Final Report for Tsawwassen First Nation, Tsawwassen, BC. December 2021.

Meidinger D, Clark J, Adamoski D. 2014. Sensitive Ecosystem Inventory for Metro Vancouver and Abbotsford 2010 to 2012.

North and Teversham. 1984. The vegetation of the floodplains of the Lower Fraser, Serpentine and Nicomekl Rivers, 1859 to 1890.

PMV (Port Metro Vancouver). 2015. Roberts Bank Terminal 2 Environmental Impact Statement: Marine Mammal Effects Assessment. Prepared by Hemmera Envirochem (Hemmera) for PMV.

Randall Sharp and Associates and Larry Diamond. 1988. Deas Island Regional Plan Master Plan a Long Rage Development, Enhancement and Conservation Plan.

TFN and LGL. 2021a. George Massey Crossing: Migratory Birds. Progress Report – February 2021. Prepared for the Ministry of Transportation and Infrastructure. 3 pp.

TFN and LGL. 2021b. George Massey Crossing: Migratory Birds. Progress Report – October 2021. Prepared for the Ministry of Transportation and Infrastructure. 3 pp.

TFN and LGL. 2021c. George Massey Crossing: Migratory Birds. Progress Report – November 2021. Prepared for the Ministry of Transportation and Infrastructure. 3 pp.

TFN and LGL. 2022. George Massey Crossing: Migratory Birds. Progress Report – January 2022. Prepared for the Ministry of Transportation and Infrastructure. 3 pp.

UBC (University of British Columbia). 2022. University of British Columbia Specimen Label Information.

WesPac Midstream-Vancouver LLC. 2018. Marine Mammal Baseline Report. Report submitted by Golder Associates (Golder) to WesPac in support of the WesPac Tilbury Marine Jetty Project Environmental Assessment Certificate Application. Report No. 1314220049-133-R-Rev0.

WesPac Midstream-Vancouver LLC. 2019a. Environmental Assessment Certificate Application: WesPac Tilbury Marine Jetty Project. Section 4.2: Fish and Fish Habitat. Vancouver, British Columbia.

WesPac Midstream-Vancouver LLC. 2019b. Environmental assessment certification application WesPac Tilbury Marine Jetty Project, section 4.7 Vegetation. Vancouver, British Columbia

3. Human Environment

ALC (Agricultural Land Commission). 2014. Permitted Uses in the ALR. http://www.alc.gov.bc.ca/alc/content.page?id=A2BE9E6859EC45A0977515C398C138FA. [Accessed February 2022].

ALC. 2021. Annual Reports. https://www.alc.gov.bc.ca/alc/content/library/annual-reports. [Accessed February 2022].

BC Assessment. n.d. Crown Land Leases, Licenses and Permits. http://www.bcassessment.ca/public/Fact%20Sheets/Crown%20Land%20Leases,%20Licenses%20and%20Permits.aspx. [Accessed February 2022].

BC Stats. n.d. Statistics (online database). https://www2.gov.bc.ca/gov/content/data/statistics. [Accessed February 2022].

BC MOE (Ministry of Environment). 2021a. Protocol 1 for Contaminated Sites: Detailed Risk Assessment. https://www.bing.com/search?q=Protocol+1+for+Contaminated+Sites%3A+Detailed+Risk+Assessment&cvid=d0701a7b218847e991c2d8e244c39e65&aqs=edge..69i57.622j0j9&FORM=ANAB01&PC=U531. [Accessed February 2022].

BC MOE. 2021b. Protocol 28 for Contaminated Sites; 2016 Standards Derivation Methods, version 2.0. Protocol 28 For Contaminated Sites, 2016 Standards Derivation Methods (Version 2.0). Updated 1 February 2021. https://www2.gov.bc.ca/assets/gov/environment/air-land-water/site-remediation/docs/protocols/p28__jan_2021_revisions_final_signed.pdf. [Accessed February 2022].

BC MOE. 2021c. Protocol 1 for Contaminated Sites: Detailed Risk Assessment (version 2.0). Updated 1 February 2021. https://www2.gov.bc.ca/assets/gov/environment/air-land-water/site-remediation/docs/protocols/p1_jan_2021_revisions_final_signed.pdf. [Accessed February 2022].

BC MOH (Ministry of Health). 2021a. BC Guidance for Prospective Human Health Risk Assessment. https://www.bing.com/search?q=BC+Guidance+for+Prospective+Human+Health+Risk+Assessment%5C&cvid=0dd3f84a6566477892ea0a9d28590000&aqs=edge..69i57.2581j0j9&FORM=ANAB01&PC=U531. [Accessed February 2022].

BC MOH. 2021b. BC Guidance for Prospective Human Health Risk Assessment. Version 1.0. April 2021. Health Protection Branch, Population and Public Health Division. https://www.bing.com/search?q=BC+Guidance+for+Prospective+Human+Health+Risk+Assessment&cvid=468ff964c3c34caea1e3f33d07551e77&aqs=edge..69i57j69i59.655j0j9&FORM=ANAB01&PC=U531. [Accessed February 2022].

Canada et al. 2010. Tsawwassen First Nation Final Agreement. [Accessed February 2022]. http://www.tsawwassenfirstnation.com/pdfs/TFN-About/Treaty/1_Tsawwassen_First_Nation_Final_Agreement.PDF. [Accessed February 2022].

City of Delta. n.d. Official Community Plan Land Use Designations. https://maps.delta.ca/Html5Viewer/index.html?. [Accessed February 2022].

City of Delta. 2011. Official Community Plan. Schedule D.1 Tsawwassen Area Plan. https://delta.civicweb.net/filepro/documents/?preview=39379. [Accessed February 2022].

City of Delta. 2015. Official Community Plan. Schedule A. https://delta.civicweb.net/filepro/documents/?preview=39377. [Accessed February 2022].

City of Delta. 2021. Delta Police. https://deltapolice.ca/. [Accessed February 2022].

City of Delta. 2022a. Delta Fire and Emergency Services. https://www.delta.ca/services/public-safety/delta-fire-emergency-services. [Accessed February 2022].

City of Delta. 2022b. DeltaMap Online Mapping System. Database provided by the City of Delta: https://maps.delta.ca/Html5Viewer/index.html?viewer=DeltaMapExternal.viewer/. [Accessed February 2022].

City of Delta. 2022c. Open Data Catalogue. Water mains, drainage sanitary utilities. https://www.delta.ca/city-hall/municipal-information/open-data-catalogue. [Accessed February 2022].

City of Richmond. 2012a. Main 2041 Official Community Plan - Bylaw 9000 - Schedule 1. 6.0 Resilient Economy. https://www.richmond.ca/__shared/assets/OCP_9000_economy34170.pdf. [Accessed February 2022].

City of Richmond. 2012b. Main 2041 Official Community Plan - Bylaw 9000 - Schedule 1. 12.0 Sustainable Infrastructure and Resources. https://www.richmond.ca/__shared/assets/OCP_9000_infrastructure34176.pdf. [Accessed February 2022].

City of Richmond. 2022a. Agriculture in Richmond. https://www.richmond.ca/plandev/planning2/agriculture/about.htm?PageMode=HTML. [Accessed February 2022].

City of Richmond. 2022b. About Richmond RCMP. https://www.richmond.ca/safety/police/aboutus.htm?PageMode=HTML. [Accessed February 2022].

City of Richmond. 2022c. Fishing Piers & Boating. City of Richmond. http://www.richmond.ca/parks/waterfront2/fishingpiers.htm. [Accessed February 2022].

City of Richmond. 2022d. Official Community Plan Land Use Designations. http://maps.richmond.ca/rim/. [Accessed February 2022].

City of Richmond. 2022e. Richmond Fire-Rescue. https://firerescue.richmond.ca/. [Accessed February 2022].

Corporation of Delta. 2011. Delta Agricultural Plan. https://www.delta.ca/sites/default/files/2021-06/Agricultural%20Plan.pdf. [Accessed February 2022].

City of Vancouver. 2020. Annual Report for the Vancouver Landfill. https://vancouver.ca/files/cov/2020-vancouver-landfill-annual-report.pdf. [Accessed February 2022].

Crown-Indigenous Relations and Northern Affairs Canada. n.d. First Nations Profiles Interactive Map. https://geo.aadnc-aandc.gc.ca/cippn-fnpim/index-eng.html. [Accessed February 2022].

Department of Natural Resources Canada. 2022. Canvec. Water, roads and railways. https://open.canada.ca/data/en/dataset/2dac78ba-8543-48a6-8f07-faeef56f9895. [Accessed February 2022].

DFO (Fisheries and Oceans Canada). 2016. Recreational Catch Statistics. Fraser River. https://www.dfo-mpo.gc.ca/stats/rec/pac/index-eng.html. [Accessed February 2022].

DFO. 2021a. Commercial Catch Statistics Pacific Region. https://www.pac.dfo-mpo.gc.ca/fm-gp/comm-eng.html. [Accessed February 2022].

DFO. 2021b. Fraser River Indigenous Fisheries Data and Information. https://www.pac.dfo-mpo.gc.ca/fm-gp/fraser/abor-autoc-eng.html. [Accessed February 2022].

DFO. 2021c. South Pacific Salmon Integrated Fisheries Management Plan. https://www.pac.dfo-mpo.gc.ca/fm-gp/mplans/smon-sc-cs-ifmp-pgip-sm-eng.html. [Accessed February 2022].

DFO. 2022a. Commercial License Reports, Salmon Gillnet, Salmon Troll and Salmon Seine, Pacific Region. https://www.pac.dfo-mpo.gc.ca/fm-gp/licence-permis/comm-smon-eng.html. [Accessed February 2022].

DFO. 2022b. Fisheries Opening and Closures, Pacific Region. https://www-ops2.pac.dfo-mpo.gc.ca/fns-sap/index-eng.cfm. [Accessed February 2022].

EAO (Environmental Assessment Office). 2020a. EAO User Guide: Introduction to Environmental Assessment under the Provincial Environmental Assessment Act. [https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/environmental-assessments/guidance-documents/2018-act/eao_user_guide_v101_march_2020.pdf. [Accessed February 2022].

EAO. 2020b. Human and Community Well-Being: Guidelines for Assessing Social, economic, Cultural and Health Effects in Environmental Assessments in B.C. Version 1.0. https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/environmental-assessments/guidance-documents/2018-act-guidance-materials. [Accessed February 2022].

FLNRO. n.d. South Arms Marshes Wildlife Management Area. https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/wildlife/wildlife-habitats/conservation-lands/wma/wmas-list/south-arm-marshes. [Accessed February 2022].

FLNRO. 2014. Ministry of Forests, Lands, Natural Resource Operations and Rural Development-TANTALIS - Crown Tenures. https://catalogue.data.gov.bc.ca/dataset/3544ad91-0cf2-4926-a08a-bfe42d9a031d. [Accessed February 2022].

FLNRO. 2021. Natural Resources Fraser River Transition Area - Crown Tenures. First responders locations, hospitals, Indian reserves. [Accessed February 2022].

FLNRO. 2022a. Data Catalogue. Regional parks, roads, and railways. [Accessed February 2022].

FLNRO. 2022b. Data Catalogue. Residential care homes, schools, childcare providers, fire hall/station and police detachment/station, waterbodies, roads and railways. [Accessed February 2022].

FLNRO. 2022c. Data Catalogue. Waterbodies, roads and railways. [Accessed February 2022].

Fraser Health. 2021. Delta Hospital. https://www.fraserhealth.ca/Service-Directory/Service-At-Location/B/E/delta-hospital#.YgrkQN_MJPY. [Accessed February 2022].

GMTRP (George Massey Tunnel Replacement Project). 2017. Environmental Assessment Certificate Documents. OCP Land Use Designations.

Golder. 2019. Tilbury Environmental Assessment Certificate Application. 5.1 Economy. Human Environment.

Golder. 2019. Tilbury Environmental Assessment Certificate Application. 6.1 Socio-community. Human Environment.

Golder. 2019. Tilbury Environmental Assessment Certificate Application. 5.1 Land and Marine Use. Human Environment.

Government of BC. 2021. Crown Land Use Operational Policy, Reserves, Withdrawals, Notations and Prohibitions. https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/natural-resource-use/land-water-use/crown-land/reserves.pdf. [Accessed February 2022].

Government of BC. 2022. Visual Landscape Inventory. https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/visual-resource-management/visual-landscape-inventory. [Accessed February 2022].

Government of BC. 2022. iMapBC 2.0. https://maps.gov.bc.ca/ess/hm/imap4m. [Accessed January 2022].

Health Canada. 2005. It's Your Health: Community Noise Annoyance. http://hc-sc.gc.ca/hl-vs/alt_formats/pacrb-dgapcr/pdf/iyh-vsv/life-vie/community-urbain-eng.pdf. [Accessed February 2022].

Health Canada. 2010a. Federal Contaminated Site Risk Assessment in Canada, Part V: Guidance on Human Health Detailed Quantitative Risk Assessment for Chemicals (DQRAChem). Contaminated Sites Division, Safe Environments Programme, Health Canada. Ottawa, ON, Canada.

Health Canada. 2010b. Federal Contaminated Site Risk Assessment in Canada, Part V: Guidance on Human Health Detailed Quantitative Risk Assessment for Chemicals.

Health Canada. 2016a. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Drinking and Recreational Water Quality.

Health Canada. 2016b. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Air Quality.

Health Canada. 2016c. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Drinking and Recreational Water Quality. Ottawa, ON: Healthy Environments and Consumer Safety Branch, Health Canada.

Health Canada. 2016d. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Air Quality. December 2016. Ottawa, ON: Healthy Environments and Consumer Safety Branch, Health Canada.

Health Canada. 2017a. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Water Quality. Ottawa, ON: Healthy Environments and Consumer Safety Branch, Health Canada.

Health Canada. 2017b. Federal Contaminated Site Risk Assessment in Canada, Supplemental Guidance on Human Health Risk Assessment of Contaminated Sediments: Direct Contact Pathway. Contaminated Sites Division, Safe Environments Directorate. Ottawa, ON, Canada.

Health Canada. 2017c. Federal Contaminated Site Risk Assessment in Canada, Supplemental Guidance on Human Health Risk Assessment for Oral Bioavailability of Substances in Soil and Soil-like Media. Contaminated Sites Division, Safe Environments Programme, Health Canada. Ottawa, ON, Canada.

Health Canada. 2017d. Federal Contaminated Site Risk Assessment in Canada, Supplemental Guidance on Human Health Risk Assessment of Contaminated Sediments: Direct Contact Pathway.

Health Canada. 2017e. Federal Contaminated Site Risk Assessment in Canada, Supplemental Guidance on Human Health Risk Assessment for Oral Bioavailability of Substances in Soil and Soil-like Media.

Health Canada. 2017f. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Water Quality.

Health Canada. 2018a. Federal Contaminated Sites Risk Assessment in Canada: Interim Guidance on Human Health Risk Assessment for Short-Term Exposure to Carcinogens at Contaminated Sites.

Health Canada. 2018b. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Country Foods.

Health Canada. 2018c. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Country Foods. Ottawa, ON: Healthy Environments and Consumer Safety Branch, Health Canada.

Health Canada. 2018d. Federal Contaminated Sites Risk Assessment in Canada: Interim Guidance on Human Health Risk Assessment for Short-Term Exposure to Carcinogens at Contaminated Sites.

Health Canada. 2019a. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Human Health Risk Assessment.

Health Canada. 2019b. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Human Health Risk Assessment.

Health Canada. 2021a. Federal Contaminated Site Risk Assessment in Canada: Guidance on Human Health Preliminary Quantitative Risk Assessment.

Health Canada. 2021b. Federal Contaminated Site Risk Assessment in Canada, Part II: Toxicological Reference Values (TRVs).

Health Canada. 2021c. Federal Contaminated Site Risk Assessment in Canada: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA). Health Canada, Ottawa, Ontario. Version 3.0.

Health Canada. 2021d. Federal Contaminated Site Risk Assessment in Canada: Toxicological Reference Values (TRV). Version 3.0. Health Canada, Ottawa Ontario.

Hemmara. 2016a. Environmental Assessment Application for the George Massey Tunnel Replacement Project. 5.1 Traffic.

Hemmara. 2016b. Environmental Assessment Application for the George Massey Tunnel Replacement Project. 5.2 Marine Use.

Hemmara. 2016c. Environmental Assessment Application for the George Massey Tunnel Replacement Project. 5.3 Land Use.

Hemmara. 2016d. Environmental Assessment Application for the George Massey Tunnel Replacement Project. 5.4 Agriculture.

Hemmara. 2016e. Environmental Assessment Application for the George Massey Tunnel Replacement Project. 5.5 Visual Quality.

Hemmara. 2016f. Environmental Assessment Application for the George Massey Tunnel Replacement Project. 7.0 Human Health.

Hemmara. 2016g. Environmental Assessment Application for the George Massey Tunnel Replacement Project. 10.0 Indigenous Consultation.

ICBC (Insurance Corporation of BC). 2021. Lower Mainland Crashes 2016-2020. https://public.tableau.com/app/profile/icbc/viz/LowerMainlandCrashes/LMDashboard. [Accessed February 2022].

IHS Markit Canada. 2022. ULC GDM Pipelines. High pressure pipelines obtained. [Accessed February 2022].

Integrated Land and Resource Registry. 2022. ILRR Database. https://www2.gov.bc.ca/gov/content/data/geographic-data-services/land-use/integrated-land-resource-registry. [Accessed February 2022].

Metro Vancouver. n.d. Health Impact Assessment (HIA) of Transportation and Land Use Activities: Toolkit. http://www.metrovancouver.org/services/regional-planning/PlanningPublications/HIA-Toolkit.pdf. [Accessed February 2022].

Metro Vancouver. n.d. Health Impact Assessment (HIA) of Transportation and Land Use Activities: Guidebook. http://www.metrovancouver.org/services/regional-planning/PlanningPublications/HIA-Guidebook.pdf. [Accessed February 2022].

Metro Vancouver. n.d. Deas Slough Recreational Use Schedule. http://www.metrovancouver.org/services/parks/ParksPublications/Deas_Slough_schedule.pdf. [Accessed February 2022].

Metro Vancouver. 2010. Regional Growth Strategy. https://vancouver.ca/docs/eastern-core/regional-growth-strategy.pdf. [Accessed February 2022].

Metro Vancouver. 2019. Regional Agricultural Land Use Inventory (data forthcoming). [http://www.metrovancouver.org/metro2040/sustainable-economy/agricultural-land/land-use/Pages/default.aspx. [Accessed February 2022].

Metro Vancouver. 2022a. Water and Liquid Waste System Facilities. Proximal Work Requirements. http://www.metrovancouver.org/services/liquid-waste/Pages/default.aspx. [Accessed February 2022].

Metro Vancouver. 2022b. Metro Vancouver Land use designations (2040). [Accessed February 2022].

Michaud, D. S., Bly, S. H. P., & Keith, S. E. 2008. Using a change in percentage highly annoyed with noise as a potential health effect measure for projects under the Canadian Environmental Assessment Act. Canadian Acoustics, 36, 13–30.

Ministry of Children and Family Development. 2017. Child Care Map Data. https://catalogue.data.gov.bc.ca/dataset/child-care-map-data. [Accessed February 2022].

Ministry of Indigenous Relations and Reconciliation. 2022. Intergovernmental and Community Relations. Tsawwassen First Nation Lands. [Accessed February 2022].

Ministry of Municipal Affairs. 2022a. Governance and Structure. Municipal boundaries. [Accessed February 2022].

Ministry of Municipal Affairs. 2022b. Governance and Structure. Regional parks, municipal boundaries. [Accessed February 2022].

MOTI. n.d. Traffic Data Program Database. https://www.th.gov.bc.ca/trafficdata/. [Accessed February 2022].

Office of the Provincial Health Officer. 2009. Pathways to Health and Healing: 2nd Report on the Health and Well-being of Aboriginal People in British Columbia (Provincial Health Officer's Annual Report 2007). [Accessed February 2022].

Port of Vancouver. 2021. Port Information Guide. https://www.portvancouver.com/wp-content/uploads/2020/06/2020-06-12-PORT-INFORMATION-GUIDE-FINAL.pdf. [Accessed February 2022].

Public Health Agency of Canada. 2013. What Makes Canadians Healthy or Unhealthy? - Population Health Approach. http://www.phac-aspc.gc.ca/ph-sp/determinants/determinants-eng.php#income. [Accessed February 2022].

Site Economics. 2016 (June). Land Use Study. George Massey Tunnel Replacement Project. Prepared for B.C. Ministry of Transportation and Infrastructure.

Statistics Canada. 2017. Focus on Geography Series, 2016 Census. Statistics Canada Catalogue no. 98-404-X2016001. Ottawa, Ontario. Data products, 2016 Census. https://www12.statcan.gc.ca/census-recensement/2016/as-sa/fogs-spg/Facts-csd-eng.cfm?LANG=Eng&GK=CSD&GC=5915011. [Accessed February 2022].

Statistics Canada. 2017. Focus on Geography Series, 2016 Census. Statistics Canada Catalogue no. 98-404-X2016001. Ottawa, Ontario. Data products, 2016 Census. https://www12.statcan.gc.ca/census-recensement/2016/as-sa/fogs-spg/Facts-csd-eng.cfm?LANG=Eng&GK=CSD&GC=5915015. [Accessed February 2022].

The Firelight Group. 2017. Musqueam Indian Band Knowledge and Use Study: Translink's Pattullo Bridge Replacement Project.

Tsimshian Environmental Stewardship Authority. 2018. A Guideline for Conducting Health Impact Assessment for First Nations in British Columbia. Draft. Document on file at Golder Associates Ltd. [Accessed February 2022].

Transportation Safety Board. 2021. Marine Investigation Reports. http://www.bst-tsb.gc.ca/eng/rapports-reports/marine/index.asp. [Accessed February 2022].

Tsawwassen First Nations. 2021. Tsawwassen First Nation Post-season Fisheries Report, April 2020. http://tsawwassenfirstnation.com/wp-content/uploads/2021/07/TFN-Annual-Post-Season-Fisheries-Report-2020_FINAL-8-April-2021_with-Appendices_WebCopy.pdf. [Accessed February 2022].

Vancouver Coastal Health. 2020. Richmond Hospital. http://www.vch.ca/locations-services/result?res_id=1. [Accessed February 2022].

Vancouver Fraser Port Authority. 2022. Fraser River Maintenance. https://www.portvancouver.com/marine-operations/fraser-river-maintenance/. [Accessed February 2022].

Vancouver Fraser Port Authority. 2022. Dredging. https://www.portvancouver.com/about-us/topics-of-interest/dredging/. [Accessed February 2022].

WHO (World Health Organisation). 1948. WHO Definition of Health. http://www.who.int/about/definition/en/print.html. [Accessed February 2022].