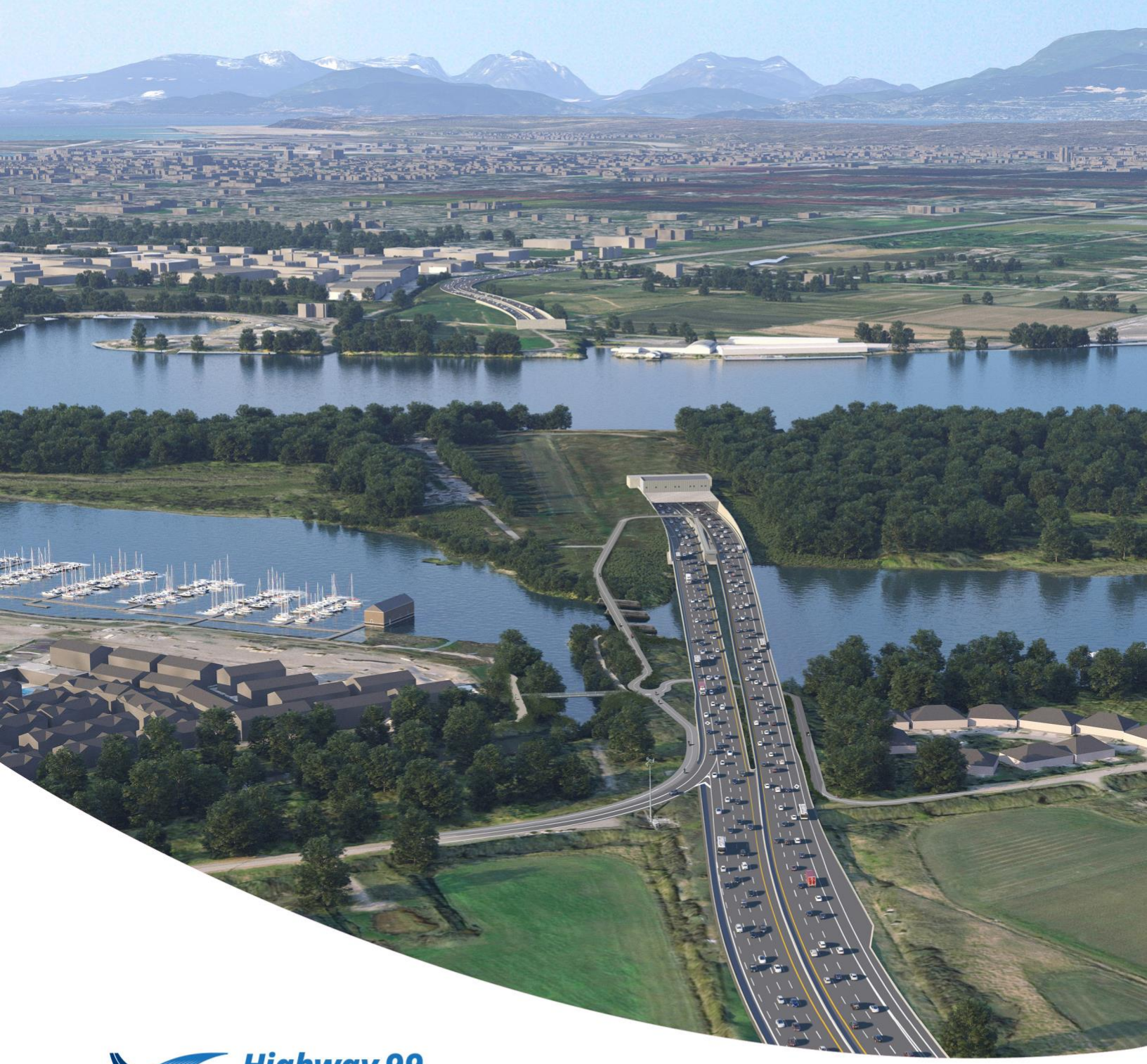


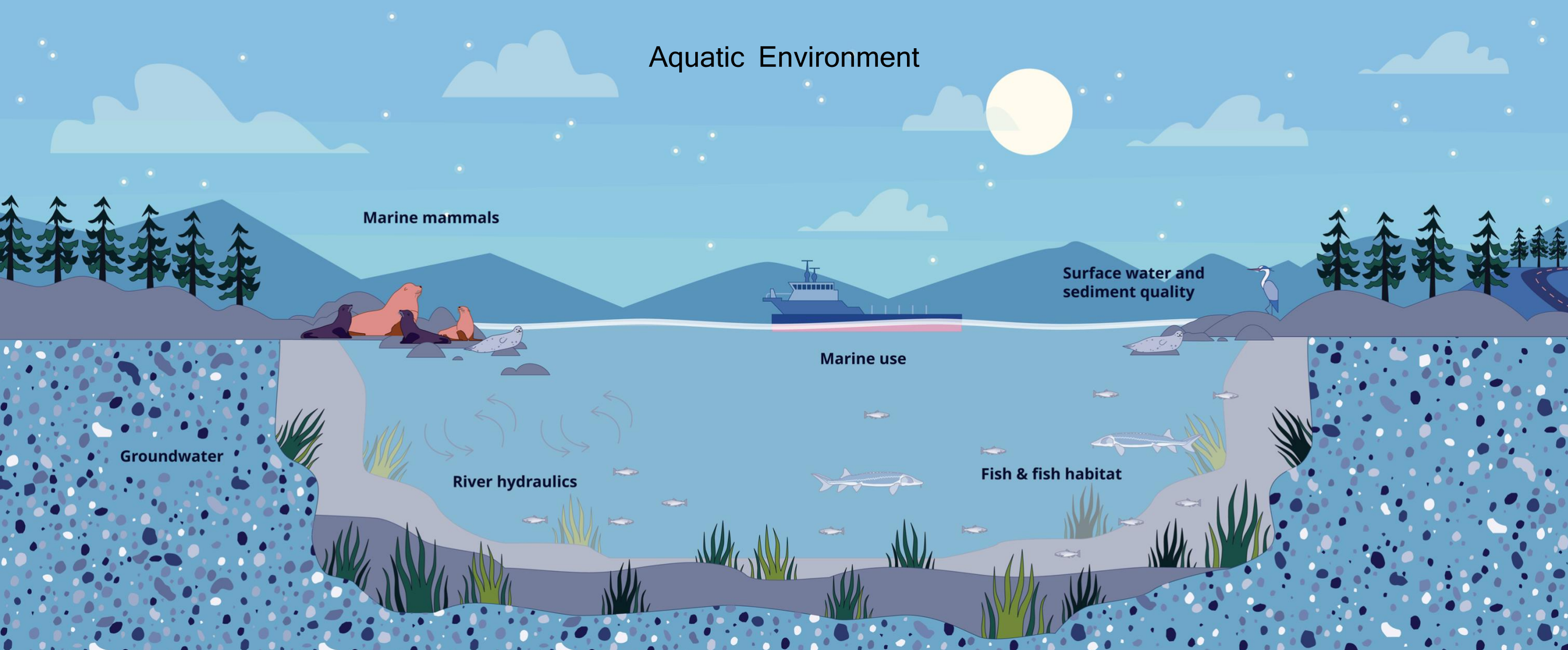
Highway 99 Tunnel Program
FRASER RIVER TUNNEL

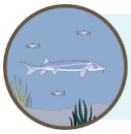
Fraser River Tunnel Project

Valued Components

Contents

Aquatic Environment





Fish and Fish Habitat

Fish and fish habitat play vital roles in aquatic ecosystems. Fish species assessed include salmon, sturgeon, eulachon, trout, char and other culturally important and traditional use fish species.

Anticipated effects from Project activities

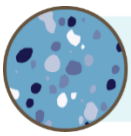
- Dredging, sediment disturbance and underwater noise may affect fish behaviour, mortality or injury
- Fish are anticipated to be resilient to changes in water and sediment quality, as change effects are likely to be periodic and reversible
- Permanent habitat loss in the footprint of new infrastructure

How we will reduce effects

- Conduct in-water work during least-risk timing windows
- Use soft start procedures and daily work stoppages to minimize noise impacts
- Implement vessel speed limits to reduce noise and disturbance
- Conduct fish salvage to safely relocate fish from dewatered areas
- Develop a Fisheries Habitat Offsetting Plan to restore and enhance aquatic and riparian habitat

Future conditions

- Temporary residual effects on fish and fish habitat are expected during tunnel construction and removal of temporary infrastructure
- Restoration efforts will focus on offsetting the effects of the construction and habitat loss
- Cumulative effects on fish health, behaviour and habitat are expected to be of low magnitude, short to medium term and reversible



Groundwater

Groundwater supports plant growth, provides wildlife habitats and stores carbon and nutrients. Groundwater also feeds surface water bodies like ponds, streams and rivers.

Anticipated effects from Project activities

- Removing vegetation, compacting soil or pumping water out of construction areas may cause temporary effects to groundwater levels and flow
- Removing water from a location may also temporarily change groundwater levels and flow during early construction

How we will reduce effects

- Fill excavated areas using clean and similar soil types
- Follow environmental guidelines to restore land and groundwater after construction
- Install underground barriers to prevent groundwater from seeping into work areas and limit impacts to salt wedge
- Develop a groundwater quality monitoring program

Future conditions

- With mitigation in place, no residual effects are anticipated on groundwater during operation of the new tunnel

Marine Mammals

Marine mammals are in the local environment and may interact with areas near the Project footprint. Marine mammals assessed include harbour porpoise, humpback whales, grey whales, California sea lions, Stellar sea lions and harbour seals.

Anticipated effects from Project activities

- Construction may cause temporary behavioural changes and disturbance for seals and sea lions
- Construction vessels in the river may cause temporary disturbance to all marine mammals from additional underwater noise
- Construction may cause temporary changes in the abundance and distribution of prey

How we will reduce effects

- Comply with marine mammal regulations
- Schedule in-river construction activities within the least-risk timing windows
- Develop an underwater noise mitigation strategy, including underwater noise monitoring during construction
- Use speed limits to lower underwater noise and reduce the risk of vessel strikes on marine mammals
- Use “soft starts” – gradual noise increases that offer marine mammals time to leave the area
- Schedule daily work stoppages to minimize impacts on fish
- Implement and follow sediment and waste management procedures

Future conditions

- Residual effects are expected to be mostly short-term and reversible
- Underwater noise from traffic through the new tunnel has the potential to negatively affect sea lions and harbour seals, such as by masking seal vocalizations, however effects are predicted to be negligible; no effects for whales and harbour porpoises are predicted
- Given nearby developments and the impact of existing cumulative effects, the Project may cause short-term effects on Southern Resident Killer Whales, such as underwater noise from vessel traffic, reduced availability of prey and exposure to contaminants

Marine Use

In-river work could potentially affect marine navigation, access and use. Marine use also includes commercial transportation; commercial, recreational and Indigenous fisheries; marine tourism and recreation; and other marine uses by First Nations.

Anticipated effects from Project activities

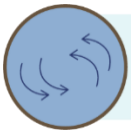
- Temporary, short-term impacts on navigation, requiring vessels to alter course or change speed
- Temporary navigation impacts from river closures required to immerse the tunnel elements; the Project anticipates a minimum of six closures for approximately 48-hour durations
- Potential temporary delays for commercial, Indigenous and recreational fishers due to navigation restrictions
- Temporary disruptions to marine tourism and recreation access

How we will reduce effects

- Implement a Marine Construction Staging Plan, which will outline marine areas used for construction activities, construction schedule and navigation detours to reduce marine disruptions
- Develop marine supply chain logistics and operating procedures to minimize disruptions
- Implement fisheries access management protocols to allow safe, unimpeded access to fish harvesting areas
- Develop a Marine Communications Plan to keep marine users and regulators informed of Project activities

Future conditions

- No anticipated effects on navigation once the new tunnel is in operation
- Improved marine connections to key transportation hubs like the region's ports, airports, highways, Tsawwassen ferry terminal and the United States border
- Changes to the marine setting may affect the area's appearance but will be mitigated through vegetation restoration
- Cumulative effects are anticipated to be mostly low in magnitude and continuous during construction, but short-term and reversible



River Hydraulics and Morphology

River hydraulics and morphology refers to the river depth, speed and direction of flow of the Fraser River, including sediment transport, riverbed levels and bank stability.

Anticipated effects from Project activities

- Minimal changes to flow distribution into Ladner Reach and the Cannery Channel
- Potential minor, localized changes to the riverbed within about 1.2 km upriver and downriver of the Tunnel Corridor Area and the Temporary Moorage Area
- No predicted effects to the dynamics of the salt wedge

How we will reduce effects

- Conduct in-river activities outside of the freshet season (when river flows are high) to minimize erosion (scour) and the buildup of sediment
- Minimize the duration that the immersed tube tunnel trench is open to prevent sediment from building up
- Limit in-river construction to least-risk timing window
- Use underwater separation walls to minimize in-river footprint and disturbance to the river

Future conditions

- Changes to riverbed and river flow near the tunnel and temporary moorage area are anticipated to be minor and partially reversible

Surface Water and Sediment Quality

Project construction activities could affect surface water and sediment quality, including within rivers and streams.

Anticipated effects from Project activities

- Dredging and soil removal are expected to change surface water quality and increase suspended sediment
- Temporary and reversible impacts on water and sediment quality are expected during construction due to sediment disturbance, runoff from construction areas and release of alkaline material from concrete work

How we will reduce effects

- Implement an environmental monitoring program to track water quality throughout all Project phases
- Use erosion and sediment control measures to control water runoff, erosion and sediment movement
- Use water treatment to meet environmental standards before releasing water from the site
- Implement and enforce spill prevention and emergency response procedures
- Dispose waste materials properly to protect the water surface

Future conditions

- Long-term positive effects as a result of new stormwater management systems, drainage infrastructure and improvements to water runoff treatment
- Cumulative effects are expected to be minor, short-term and reversible with mitigations in place

Terrestrial Environment

Air Quality

Air emissions during construction have the potential to affect air quality in the Project area. Air quality is measured by concentration of various pollutants and airborne particles present in the atmosphere. Monitoring and assessing air quality is crucial for human health and environmental protection.

Anticipated effects from Project activities

- Short-term increases in dust and emissions during construction from equipment, unpaved roads and concrete fabrication
- Localized emissions from diesel exhaust and marine vessels, including temporary increase in particulate matter and nitrogen dioxide during construction

How we will reduce effects

- Implement anti-idling policy for construction equipment
- Maintain construction and marine equipment regularly to improve fuel efficiency and reduce fuel use
- Cover haul truck loads to reduce dust and provide tire washing stations during construction
- Water unpaved roads and clean paved surfaces to reduce dust during construction
- Use the new tunnel ventilation system to maintain air quality during operations

Future conditions

- Higher traffic volumes may increase particulate matter, carbon monoxide and other air pollutants; however, they are predicted to be below air quality criteria during the operations phase
- Long-term emission exposure risks are low due to decreased traffic congestion, higher travel speeds through the tunnel and changes in vehicle emission technologies

Archaeological and Heritage Resources

The Project has the potential to affect archaeological and historical heritage resources during construction, including artifacts and heritage sites.

Anticipated effects from Project activities

- No archaeological deposits were found during testing, although some areas could not be assessed because of hard surfaces and sandy fill
- One known heritage shipwreck in the Deas Slough could be affected; it is protected under the Heritage Conservation Act
- Construction activities may uncover undiscovered heritage sites

How we will reduce effects

- Avoid known sites throughout Project design
- Conduct archaeological monitoring, including spot checks, while excavating in areas that could not be assessed previously
- Implement a "chance find" protocol in case new heritage sites or sources are discovered during construction

Future conditions

- No long-term or cumulative negative effects are expected for archaeological or heritage resources
- Known sites will be protected and new discoveries will be carefully managed and monitored

Land and Resource Use

Project activities may affect land and resource use, including access, availability and productivity of Project lands.

Anticipated effects from Project activities

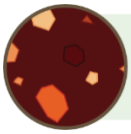
- Temporary disruptions to recreational and tourism spaces such as Deas Island Regional Park and the Millennium Trail during construction
- Potential temporary impacts to First Nations' land use due to limited access and environmental disruption within the Project footprint
- Temporary effects on farmland, like light and noise affecting animals and dust affecting nearby crops
- Potential access disruption to lands designated for agricultural use

How we will reduce effects

- Realign Rice Mill Road and the CN Rail overpasses during construction to help minimize access disruptions
- Provide safe, alternative routes for drivers and cyclists throughout construction
- Relocate and maintain the George Massey Tunnel shuttle stop for cyclists throughout construction
- Implement communications protocols to respond to and address community access concerns

Future conditions

- Improved traffic flow will enhance access to recreational areas, businesses, agricultural sites and First Nations' lands
- Public access to most recreational areas will be restored
- Environmental effects (noise, vibration and air quality) will remain within acceptable limits
- Permanent loss of lands currently designated for parks, recreation and conservation to accommodate the expansion of Highway 99
- Permanent loss of lands designated for agricultural use to accommodate the expansion of Highway 99
- Cumulative effects during construction, such as traffic congestion, are expected to be reversible



Soil

Soils play a vital role in supporting vegetative growth, carbon and nutrient storage and groundwater replenishment. Construction activities such as excavation and ground improvement could affect soil quality and quantity.

Anticipated effects from Project activities

- Soil will be disturbed, lost or removed during construction and closure of temporary infrastructure
- Soil quality may decline from compaction, erosion or movement of soil throughout construction
- Anticipated loss of soil volume due to erosion changes or stockpile loss

How we will reduce effects

- Limit ground disturbances to previously disturbed areas
- Save ecologically valuable soils and use them to restore sites, reducing the risk of importing and exporting incompatible soils
- Separate and manage contaminated soils
- Plan soil handling activities during suitable weather conditions and suspend work during excessively wet or windy conditions

Future conditions

- Soil reclamation efforts will help return soil to original conditions
- No long-term effects on soil quality are anticipated during operations

Vegetation

Vegetation plays a fundamental role in the ecosystem. A variety of plant species and types are present in the Project area.

Anticipated effects from Project activities

- The Project may result in the loss or disturbance of native plants, including species at risk and culturally important plants
- Expected loss or disturbance of 12.4 ha of ecological communities at risk, 8.7 ha of riparian ecosystems, 3.2 ha of terrestrial ecosystems and 1.6 ha of wetlands during construction
- Expected loss or disturbance of 12.5 ha of culturally important and traditional use plants due to construction

How we will reduce effects

- Limit soil and vegetation disturbances to designated areas
- Develop species-specific management measures, such as transplanting and propagating at-risk plants or managing invasive plants
- Avoid marine staging areas where culturally significant plants are located
- Implement a site restoration plan to restore habitat vegetation and wildlife features

Future conditions

- Anticipated increase in available habitat for culturally important and traditional use plants through restoration of areas previously disturbed and used for the existing tunnel
- During construction, management will be required to reduce the spread of invasive plants, adaptively manage established plant communities and maintain cultural value of vegetation to First Nations
- Once construction is complete, restoration is expected to increase the total area of habitat available to re-establish native plant communities
- Cumulative effects from the Project and other nearby projects may affect vegetation, but mitigation measures will help reduce effects

Wildlife and Wildlife Habitat

Wildlife in the Project area can include a variety of bird species, bats, small mammals, river otters and reptiles.

Anticipated effects from Project activities

- Potential temporary and permanent loss of wildlife habitat during construction and closure of temporary infrastructure
- Increased wildlife mortality risks for raptors, small mammals and bats due to traffic
- Temporary habitat loss will be addressed through restoration after construction, while permanent loss may require extra mitigations to reduce long-term effects
- Short-term and minor effects on habitat from construction noise and lighting

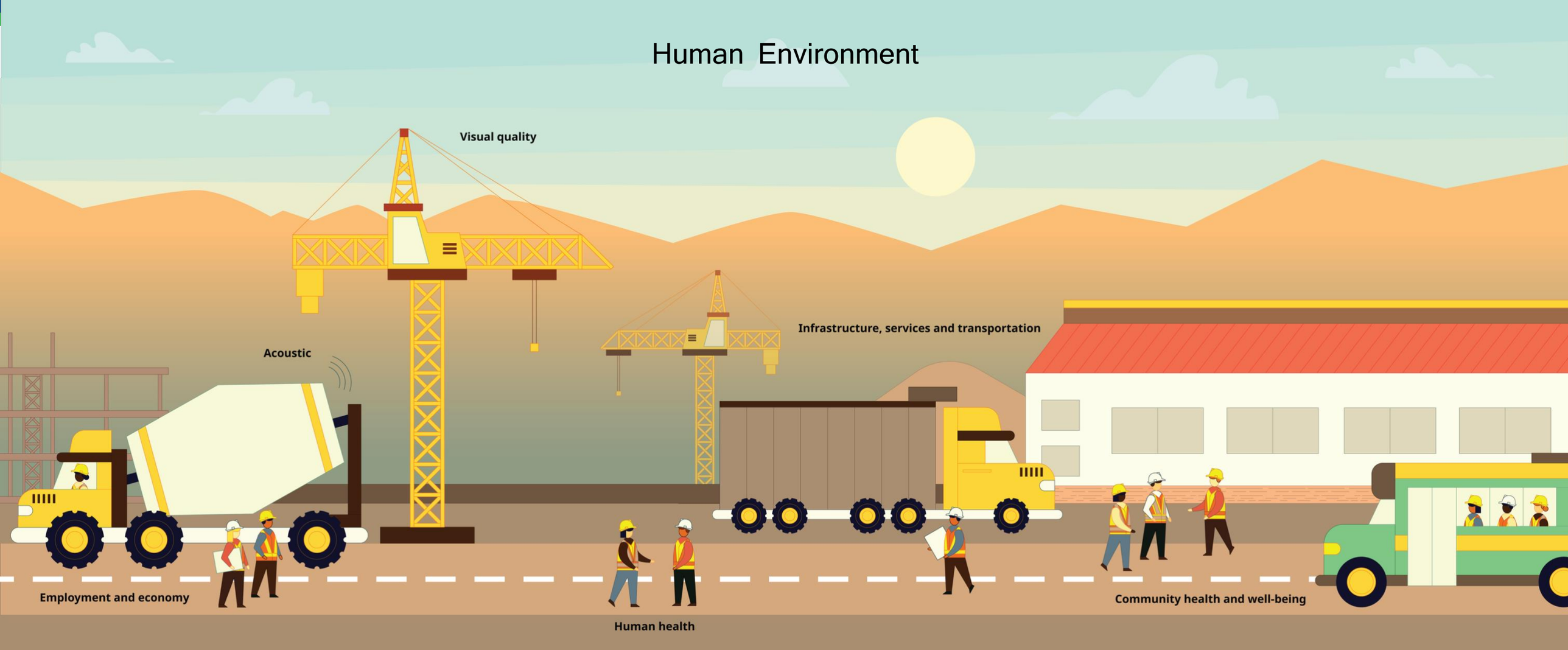
How we will reduce effects

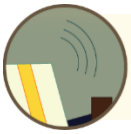
- Limit vegetation clearing and avoid construction in sensitive habitats and during critical periods for amphibians, reptiles, birds, bats and barn swallows
- Reduce light pollution and noise disturbance near sensitive habitats
- Establish and maintain lower speed limits for Project traffic and install wildlife collision barriers
- Conduct pre-construction surveys to document and protect unique wildlife features
- Develop habitat offsetting measures where potential effects are unavoidable
- Implement restoration plans to reinstate ecosystems and wetlands

Future conditions

- Most wildlife habitat loss or disturbance is expected to be temporary, with most areas restored after construction
- The Project is in a highly developed area of Metro Vancouver – while the Project may cause habitat loss and disturbance, wildlife are expected to be resilient as the Project area has minimal high-quality habitat

Human Environment





Acoustic

The Project has the potential to increase noise and vibration levels during construction, which can have adverse effects on human and animal health.

Anticipated effects from Project activities

- Temporary increases in noise and vibration are expected during construction
- Temporary and variable noise increases at locations close to the construction areas
- Temporary and localized elevated vibration levels expected during pile driving activities; levels are expected to remain below applicable thresholds during construction
- No noticeable noise exceedances are predicted from construction by year four

How we will reduce effects

- Prioritize quieter construction methods like vibratory pile driving over use of impact hammers
- Schedule noise-generating work, like pile driving, during daytime hours
- Implement noise mitigation measures during construction, including noise muffling or silencers on certain equipment
- Monitor noise-generating activities and implement anti-idling rules for construction equipment
- Establish a communication protocol to respond to community concerns about noisy or vibration-generating activities
- Install noise barriers during the operations phase where needed

Future conditions

- No significant long-term noise or vibration impacts are expected after construction
- Noise levels during operations range from negligible to low depending on noise receptor locations
- No additional mitigation is required for cumulative effects from other nearby projects

Community Health and Well-being

Construction activities may temporarily affect the health and well-being of nearby communities due to dust and noise from construction and impacts to the use of recreational and Indigenous traditional lands.

Anticipated effects from Project activities

- Temporary effects to noise and dust and changes to visual landscape during construction are expected to impact users of Deas Island Regional Park and residents living near construction areas
- New temporary routes and detours may temporarily disrupt drivers and people using active transportation
- Local marine and land businesses may experience minor, short-term disruptions
- Construction and closure phases will increase employment and business opportunities
- Additional construction vehicles, road closures and detours on roads in Delta and Richmond from other nearby projects could cause more congestion if they coincide with the tunnel construction

How we will reduce effects

- Use one-way navigation channels during construction to reduce impacts on marine businesses
- Manage vehicle emissions to minimize impacts to air quality
- Reduce noise by putting in place mitigation measures, such as noise walls
- Design lighting to address safety, while minimizing disturbance to wildlife and local residents
- Establish a communication protocol to respond to community concerns about noise, dust and visual landscape changes

Future conditions

- Improvements to traffic flow and walking and cycling options will shorten commutes, cut congestion and in turn, decrease stress and annoyance
- Improvements to public safety for drivers, cyclists, transit users and pedestrians
- Potential cumulative negative effects on community health and well-being if other projects affect recreational areas like Deas Island and Iona Beach Regional Park

Employment and Economy

The Project is expected to contribute to economic output and regional economic development.

Anticipated effects from Project activities

- Positive effects on job creation, economic development, workforce training and labour income through Project spending on goods and services
- Increased business and contracting opportunities in Metro Vancouver
- Improved transportation connectivity supporting long-term business activity
- Enhanced work opportunities for under-represented groups, including Indigenous people and women
- Short-term disruptions to nearby businesses during construction due to access impacts
- Temporary negative effects from changes in business activity due to temporary navigation impacts

How we will reduce effects

- Implement a strategy to promote equitable hiring of staff
- Establish Indigenous workforce requirements, including equitable contracting, cultural awareness training and engagement with First Nations
- Support economic activity by developing plans to enhance communications and minimize disruptions
- Realign Rice Mill Road and construct a temporary rail trestle to maintain access and avoid rail disruptions

Future conditions

- Positive long-term economic effects; boost economic output, tax revenues and employment
- Strengthened infrastructure and traffic flow supports economic development and health
- No anticipated negative residual effects on employment and the economy

Human Health

Project activities may result in changes to air, sediment, surface water, soil and food quality, which may affect human health.

Anticipated effects from Project activities

- Negligible to low potential human health risks
- Changes to air quality during construction may affect human health due to a low, temporary exposure to particulate matter and moderate, temporary exposure to Diesel Particulate Matter

How we will reduce effects

- Implement a Diesel Particulate Matter Monitoring Plan to track levels against thresholds set by Health Canada air quality criteria for Diesel Particulate Matter
- Additional mitigations in Air Quality and Wildlife and Wildlife Habitat will help reduce effects

Future conditions

- No long-term health impacts are expected after construction is complete
- No additional mitigations or follow-up programs are proposed

Infrastructure, Services and Transportation

The Project may affect existing infrastructure, as well as regional services to support the Project workforce.

Anticipated effects from Project activities

- Anticipated changes to existing flood protection infrastructure in Richmond
- Potential effect on landfill capacity and waste transfer stations due to disposal of excavated materials
- No changes anticipated to service capacity for emergency services or housing demand during construction

How we will reduce effects

- Implement temporary flood protection infrastructure throughout construction
- Separate hazardous and non-hazardous construction waste and materials
- Develop a Traffic Management Plan to mitigate congestion and disruptions during construction
- Maintain bike access via the George Massey Tunnel shuttle throughout construction
- Develop alternative routes during temporary closures of Millennium Trail

Future conditions

- Improved vehicle capacity, reduced congestion and enhanced travel times
- Improved transit speed and reliability because of dedicated bus lane and reduced congestion
- No long-term negative effects on rail transportation, emergency services or utilities
- Cumulative effects on traffic may occur from nearby construction projects like BC Ferries Fleet Maintenance, BC Hydro tunnel transmission work or other nearby municipal road projects

Visual Quality

Project construction may temporarily affect the visual appeal and visual experience of the landscape.

Anticipated effects from Project activities

- Temporary visual changes during construction from using cranes, vessel activity and clearing trees on Deas Island
- There may be temporary and localized changes in nighttime light from transporting materials and equipment to the site at night
- Permanent visual changes will occur during operations from new infrastructure like the Deas Slough Bridge, technical buildings and highway alignment

How we will reduce effects

- Design measures to reduce reflection and glare and integrate with the natural surroundings
- Restore natural habitats and reintroduce colours, forms and textures associated with the natural environment
- Design lighting to keep the construction site safe while reducing changes to natural light levels

Future conditions

- Long-term visual changes will be minor and light levels will remain similar to the existing highway alignment
- Vegetation, wetlands and riparian forests will be restored to help integrate the Project and recover visual conditions