



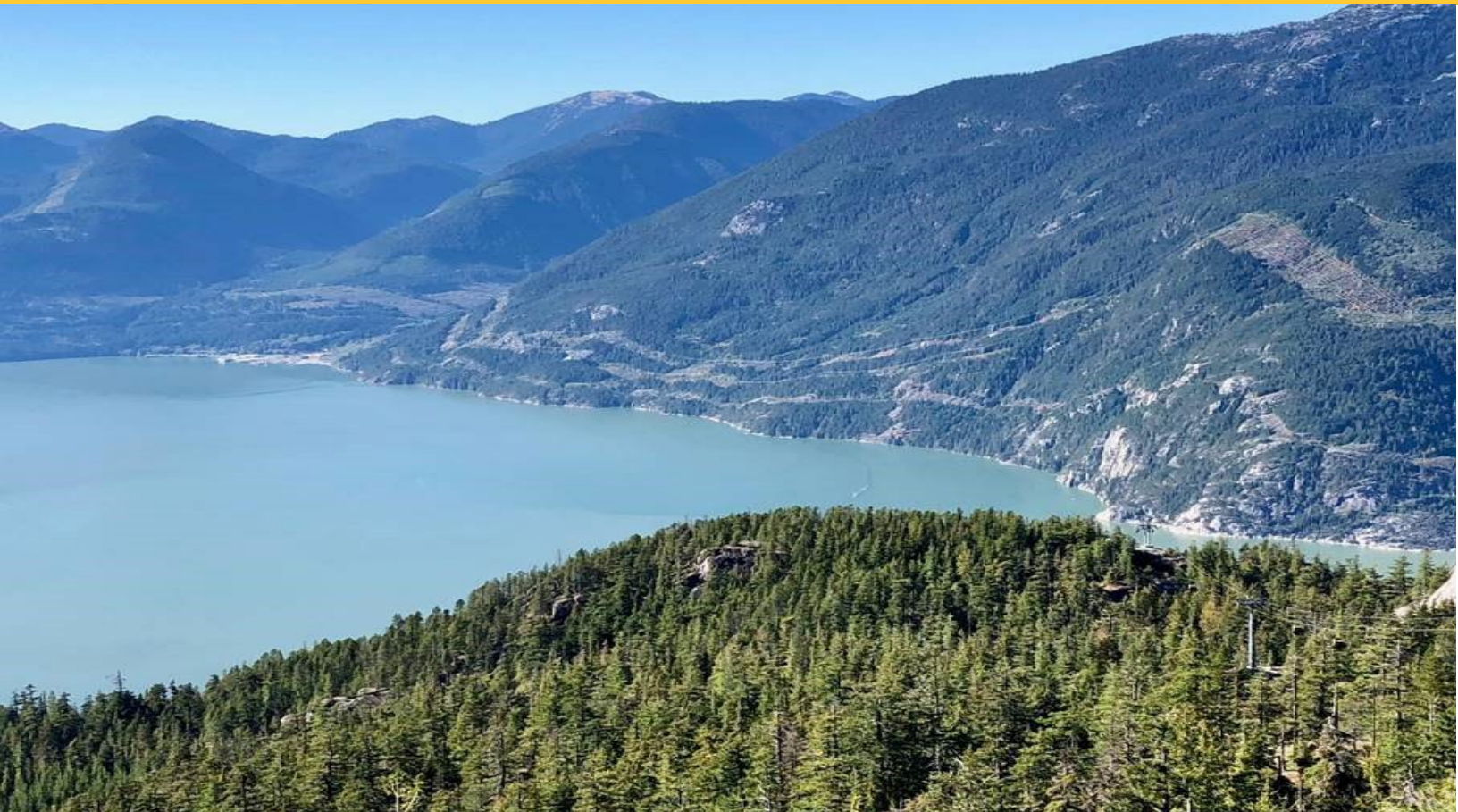
Eagle Mountain - Woodfibre Gas Pipeline Project

Technical Assessment Report for Waste Discharge Authorization at the WLNG Site

Rev. 0

September 7, 2022

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ACRONYMS AND ABBREVIATIONS

ARD	Acid Rock Drainage
BC	British Columbia
BC EAO	British Columbia Environmental Assessment Office
BC OGC	British Columbia Oil and Gas Commission
BC Rail	BC Rail Properties Ltd.
CEMP	Construction Environmental Management Plan
CMP	Condition Management Plan
DB	Design Build
DFO	Fisheries and Oceans Canada
EAC	Environmental Assessment Certificate
EGP Project	Eagle Mountain – Woodfibre Gas Pipeline Project
EPMG	Environmental Protection Management Guideline
EPP	Environmental Protection Plan
FortisBC	FortisBC Energy Inc.
Jacobs	Jacobs Consultancy Canada Inc.
km	kilometre(s)
m	metre(s)
m ³ /day	cubic metre(s) per day
MJA	McMillen Jacobs Associates
ML	metal leaching
mm	millimetre(s)
NPS	Nominal Pipe Size
O.D.	outside diameter
PAG	Potentially Acid Generating
QEP	Qualified Environmental Professional
RFP	Request for Proposal
TBM	Tunnel Boring Machine
UPI	Universal Pegasus International
WLNG	Woodfibre Liquefied Natural Gas Ltd.
WLNG Site	Woodfibre Liquefied Natural Gas Ltd. production facility
WTP	Water Treatment Plant
WQG	Water Quality Guidelines

1. INTRODUCTION

The proposed Eagle Mountain – Woodfibre Gas Pipeline Project (EGP Project) involves the construction of approximately 47 kilometres (km) of Nominal Pipe Size (NPS) 24 (610 millimetres outside diameter [O.D.]) pipeline, including an approximately 9 km tunnel (EGP Tunnel) from the BC Rail Properties Ltd. (BC Rail) Site to the proposed Woodfibre Liquefied Natural Gas Ltd. (WLNG) production facility (WLNG Site) in the District of Squamish, British Columbia (BC). Two parallel NPS 24 (610 mm O.D.) natural gas pipelines will be installed for the EGP Tunnel segment, which will be permanently encased within the tunnel.

FortisBC Energy Inc. (FortisBC) received Environmental Assessment Certificate (EAC) No. E16-01 from the BC Environmental Assessment Office (BC EAO) on August 9, 2016, for the EGP Project. A request to extend the duration of the EAC was submitted to the BC EAO on October 30, 2020 and approval was granted August 5, 2021.

FortisBC has initiated the permitting process for the EGP Tunnel and a permit under the *Oil and Gas Activities Act* was granted by the BC Oil and Gas Commission (BC OGC) on August 24, 2020. At the request of the BC OGC, FortisBC submitted an application to the OGC for a Water Licence under the *Water Sustainability Act* for the EGP Tunnel due to the potential impacts to groundwater aquifers and surface streams from construction activities. The Water Licence Application was submitted on July 3, 2020 and included a Water Management Plan with the results of technical studies (such as, a conceptual hydrogeological model and Environmental Flow Needs assessment). The application was approved and a water license was granted on May 17, 2022. FortisBC also submitted a Water Management Plan with the results of technical studies conducted at the BC Rail Site on June 16, 2021.

In addition to the use of water, tunnel construction activities will require the disposal of treated water. On November 27, 2019, FortisBC submitted a preliminary information package to the BC OGC for a Waste Discharge Authorization under the *Environmental Management Act* under permit PE 110163 (Application Number 388398) to discharge treated water from construction activities for the EGP Tunnel. Upon the completion of additional studies, the proposed discharge locations and anticipated discharge rates submitted under PE 110163 were refined. A Technical Assessment Report was submitted with the rest of the permit application deliverables agreed upon between FortisBC and the BC OGC was submitted to the OGC on December 2020. Since the date of submission, FortisBC has conducted additional technical studies and has engaged a Design Build (DB) Contractor for the EGP Tunnel. The Technical Assessment Report presented herein includes additional information on water sources, background conditions of the receiving environment (aquatics, hydrology and water quality) as well as details on water treatment methodologies and mitigations to be implemented during construction.

Refer to Appendices B to H for technical studies and memoranda prepared/signed by qualified professionals.

2. PROJECT OVERVIEW

The EGP Project involves the construction and operation of an approximately 47 km long, NPS 24 sweet natural gas pipeline from an area north of the Coquitlam Watershed, in Metro Vancouver, to Woodfibre, southwest of the District of Squamish, BC. The EGP Project includes approximately 3 km of NPS 24 gas pipeline (Coquitlam Twinning), a 9 km tunnel component (the EGP Tunnel), the installation of additional compression at the existing FortisBC Eagle Mountain Compressor Station in Coquitlam (the Eagle Mountain Compressor Station), and construction of a new compressor station located in Squamish, BC (the Squamish Compressor Station). The EGP Project will require construction logistics, including temporary workspace, temporary infrastructure sites, and the use of ancillary sites to transport people and materials. A Project Overview map is included in Figure 1.

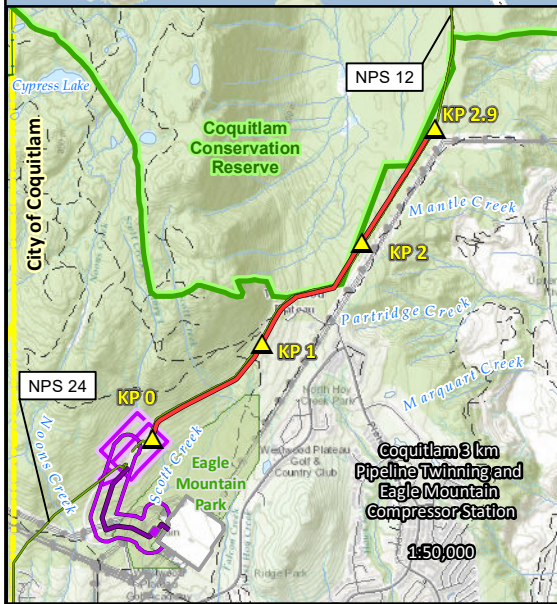
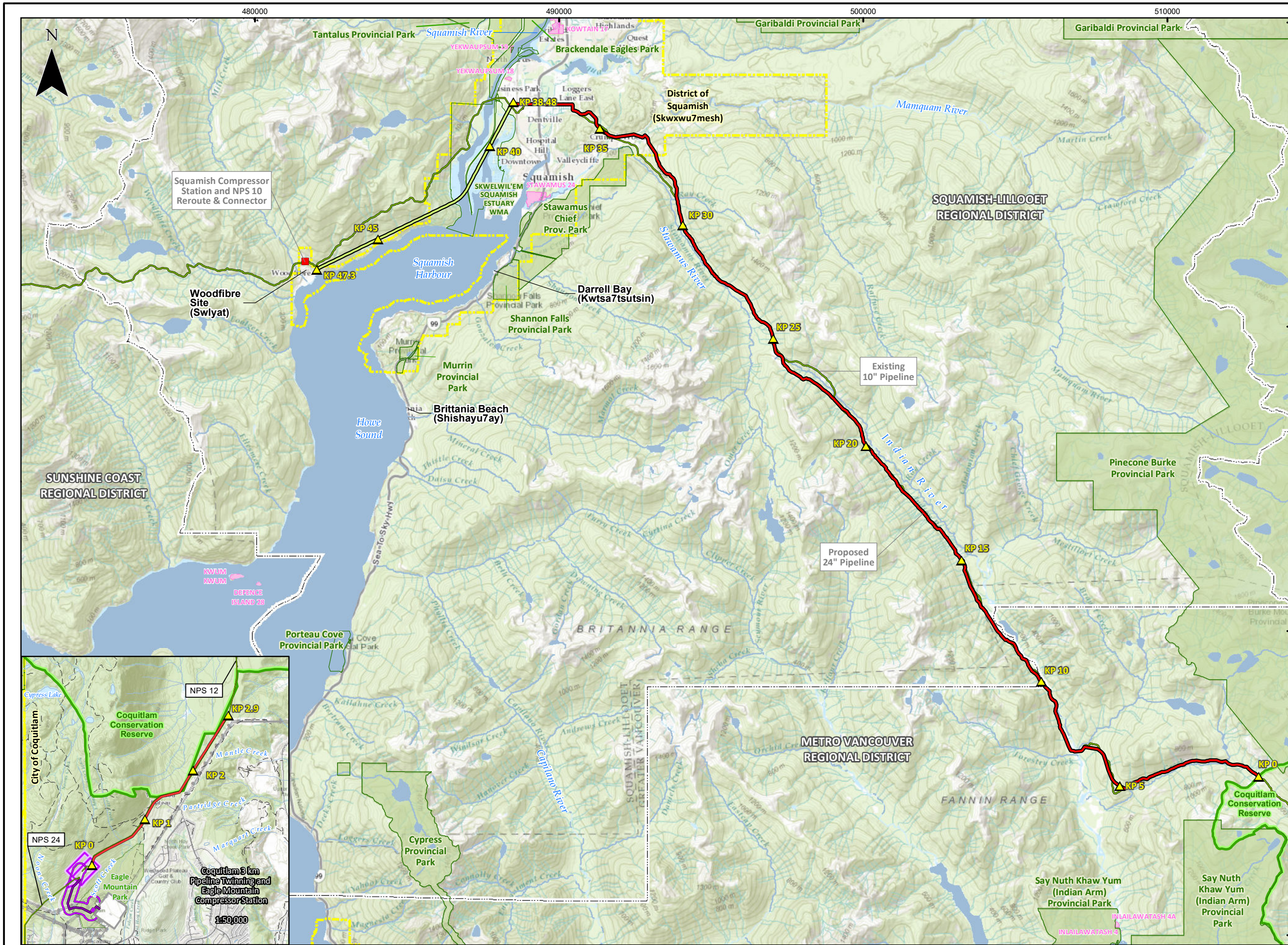
The EGP Tunnel was identified as a solution for the last 9 km of the alignment of the EGP Project to address Indigenous Group and public concerns regarding impacts to the sensitive Skwelwil'em Squamish Estuary Wildlife Management Area, and to avoid steep, difficult terrain in the area of Monmouth Ridge. Two parallel NPS 24 pipelines will be installed for the EGP Tunnel segment, which will be permanently encased within the tunnel. Much like other trenchless construction methods, such as, horizontal directional drilling, tunneling will allow the installation of the pipelines while minimizing surface disturbance.

FortisBC will use the Design Build (DB) procurement approach for the EGP Tunnel. Using a request for proposal (RFP) process in 2021, FortisBC selected Frontier-Kemper Michels (FKM) as the DB Contractor. The information presented within this report is based on the DB Contractor's detailed design and plans.

The eastern portion of the tunnel alignment crosses under the Squamish River Estuary. In this portion, the surface generally consists of low-lying, flat ground and braided river channels. The western portion of the tunnel alignment crosses under steep, rugged mountainous terrain. These mountains climb steeply from the estuary valley margin, reaching elevations of over 800 metres (m) above sea level. Geology and groundwater conditions can be analyzed in three distinct reaches:

- Soft Ground Reach, under the estuary (Soft Ground Tunnel)
- Interface Reach (located at the estuary-rock transition)
- Bedrock Reach, which extends from the estuary-rock transition to the Woodfibre Portal (Bedrock Tunnel)

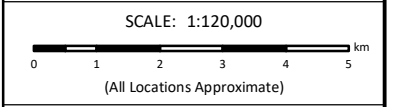
The Bedrock Tunnel is approximately 4.9 km in length and will be constructed from the Woodfibre Portal by a hard rock TBM. The Woodfibre Portal at the WLNG Site will be constructed by excavator in soil overburden and followed by drill and blast in bedrock to provide access for tunnelling operations and pipe installation. The Woodfibre Portal will accommodate all construction activities for the Bedrock Tunnel, including removal of excavated tunnel spoils and the treatment and discharge of all construction affected water. A zone of potentially acid generating (PAG) rock was identified within the planned Bedrock Tunnel. Any excavated PAG rock will be temporarily stored at the WLNG Site until completion of the tunnel excavation, after which the PAG rock will be used as backfill within the tunnel, and any remainders will be removed from the site for disposal at a certified facility. Several of the DB Contractor's key EGP Tunnel design drawings have been included in Appendix A for reference.



**FIGURE 1
PROJECT OVERVIEW**

**EAGLE MOUNTAIN-WOODFIBRE
GAS PIPELINE PROJECT**

- Certified Compressor Station
- ▲ Kilometre Post (KP)
- Proposed NPS 24 FortisBC Pipeline Route
- Proposed Tunnel Route
- Existing FortisBC Pipeline
- Certified 230 kV Transmission Line
- Meridian Substation
- Certified Electrical Transmission Corridor
- Certified Compressor Station Area
- Watercourse
- Waterbody
- Regional District
- Municipality
- First Nation Reserve
- Park and Protected Area
- Coquitlam Conservation Reserve



Jacobs Project Number CE833400

UTM Zone 10 North, NAD 1983.
Proposed Pipeline Route: KP Universal Pegasus International (UPI) 12-14-2021 (Route 1025.1/A003); Proposed Tunnel Route: UPI 10-24-2019 (SSEID 6002); Existing Pipeline: FortisBC 2012; Proposed Squamish Compressor Station: Solaris 06-18-2020; Mount Mulligan CS: FortisBC 08-04-2015; Certified 230kV Transmission Line: Primary Engineering and Construction 01-07-2020; Certified Compressor Station Area: McWhanney Associates Land Surveying Ltd. 10-16-2014; Certified Electrical Transmission Corridor: CH2M 30-07-2014; Conservation Reserve: Metro Vancouver 07-20-2017; Morgan Stewart and Company, 1995 provided by Fortis BC 2015 (modified by Jacobs 05-12-2020); Meridian Substation: DBS Energy Services 03-04-2014; Roads: NRCAN 2014; Railways: BC Gov 2019; Hydrography: NRCAN 2009, BC MFNR 2008; Municipal Boundaries, Regional Districts: BC MFNR 2017; Parks, Wildlife Management Areas: BC MFNR 2008; First Nation Reserves: Government of Canada 2018; Base Map Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NRCAN, Geobase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

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3. SOURCES OF WATER

Water will be produced during construction activities of the EGP Tunnel including water from precipitation, groundwater generated during construction, and industrial water which is water used in construction processes such as drilling, grouting, and TBM operation. Any potential water discharge from the EGP Tunnel will be conducted in accordance with regulatory requirements and Best Management Practices. Prior to discharge, the water will be sampled, tested, and treated (as required) to meet BC Approved Water Quality Guidelines (WQG) (BC ENV 2021), and BC OGC criteria. As part of the EGP Tunnel construction, the need for temporary water discharge has been identified at the WLNG Site. The following sections provide details to support the flow capability, water quality, and aquatic influence at the discharge location.

Water is expected to be produced from the following sources during the construction of the Woodfibre Portal and the Bedrock Tunnel:

- Precipitation and runoff affected by construction activities at Woodfibre Portal;
- Groundwater inflow within the Bedrock Tunnel;
- TBM industrial water including water for drilling, probing, and cleaning of equipment; and
- Precipitation and runoff at the PAG rock temporary storage site.

The groundwater inflow at the excavation face and the TBM industrial water are expected to become mixed at the working face of the tunnel excavation, due to the slight downward slope on which the TBM will advance toward the Interface Reach. Other groundwater inflows along the tunnel excavation will accumulate in a sump at the end of the TBM trailing gear and be pumped back up to the Woodfibre Portal for storage, treatment, and discharge. A bulkhead will be installed between the Bedrock Tunnel and the Soft Ground Tunnel to prevent flow of water between the two reaches in the final operating configuration.

4. QUANTITY AND QUALITY OF WATER DURING CONSTRUCTION

Construction is currently scheduled to start in early-2023, operating 24 hours/day from Q3 2023 for the duration of construction (approximately 3 years). Hydrostatic testing for the pipeline inside the tunnel will be completed in mid-to late-2025 and will take approximately 3 to 4 months to complete. The estimated quantity and duration of water production from each water source at the WLNG Site are summarized in Table 1.

Source	Estimated Rate		Duration and Description
	L/min	m ³ /day	
Portal construction	0	0	<ul style="list-style-type: none"> • 3 Months
Groundwater inflows	1,040	1,500	<ul style="list-style-type: none"> • 3-year duration • Largest anticipated volume for full 4.9 km length of tunnel and assumes grouting is undertaken during construction in select zones producing high water inflows • Natural groundwater quality is good, but quality degrades when mixed with TBM industrial water.
Hard rock TBM industrial water	100	70	<ul style="list-style-type: none"> • 2-year duration • Period of TBM operation • High total suspended solids and pH from contact with cementitious material, oil, and grease and additive chemicals.
Portal precipitation and runoff	Negligible	Negligible	<ul style="list-style-type: none"> • 3-year duration • Volume to be minimized through ditching and diversion • May come in contact with contaminated fill, oil, and grease and other chemicals at the portal site and will be treated accordingly
PAG rock temporary storage site	Negligible	Negligible	<ul style="list-style-type: none"> • Volume for discharge is expected to be negligible as the PAG storage area will be covered with geomembrane liners to minimize infiltration. Any discharge will be routed to the water treatment plant (WTP) at Woodfibre Portal. • The time from excavation to backfill is estimated to be less than 18 months.

At the excavation face, groundwater inflow is expected to dominate the system and result in dilution of contaminant concentrations from the TBM industrial water. It is not technically feasible to segregate the groundwater and TBM industrial water at the excavation face as they will be collected in the same low point and pumped back to treatment plant to be located at the Woodfibre Portal via a water pipeline.

Water at the Woodfibre Portal will be managed such that precipitation and runoff will not come in contact with contaminated fill in this area. These quantities will be diverted into the existing courses. The remainder of the water at the Woodfibre Portal will be collected and pumped into the water treatment plant.

The WLNG Site was issued a Risk Based Certificate of Compliance (CofC) in 2014. The CofC indicated that pre-existing groundwater impacts have been discharging to the Mill Creek and other drainages and subsequently to Howe Sound, but these have been either remediated and/or assessed to have an acceptable risk. Multiple surface water quality sampling programs have been conducted in the area indicating exceedances of the BC WQG. A Sampling and Analysis Plan has been developed by a Jacobs Consultancy Canada Inc. (Jacobs) Qualified Environmental Professional (QEP) which outlines the existing groundwater quality and previous sampling programs – refer to Appendix C.

5. PROPOSED DISCHARGE LOCATION

Treated water is proposed to be discharged to the non-fish bearing stream immediately adjacent to the south of the Woodfibre Portal where it will infiltrate into the ground and/or flow downhill to Howe Sound, approximately 150 m south. The proposed discharge point is presented in Appendix E.

5.1 AQUATICS

The unnamed tributary to Howe Sound (Stream X) is a non-fish bearing stream that has been classified as S6 at the proposed point of discharge per the Environmental Protection Management Guideline (EPMG) (BC OGC 2018). Channel width varied between 1 and 3 m near the proposed discharge location. Howe Sound is located approximately 150 m downstream and is expected to be the closest fish habitat to the discharge site. Howe Sound has documented fish species including provincially Blue-listed, Committee on the Status of Endangered Wildlife in Canada-listed, and *Species at Risk Act*-listed. An aquatic assessment conducted by a Jacobs Consultancy Canada Inc. (Jacobs) Qualified Environmental Professional (QEP) in April 2019 identified barriers to fish access in the lower reaches of the watercourse near the intertidal zone of Howe Sound.

The unnamed Tributary to Howe Sound is heavily disturbed, lacks perennial flow and has many barriers to fish passage. A Jacobs QEP has prepared a Fish and Fish Habitat Technical Memorandum detailing the aquatic environment, including fish and fish habitat near the Project attached as Appendix D. The Provincial reduced risk window does not apply at the proposed discharge location on the Tributary since it is non-fish bearing. However, the federally recognized timing window of least risk will apply to Howe Sound, located downstream of the proposed discharge location. There are erosion and sediment concerns identified along the unnamed tributary to Howe Sound including:

- Stream banks partially eroded, indicating current discharge is likely exceeding stream capacity.
- Erosion and unstable banks, resulting in higher risk for sediment mobilization during instream work.
- Stream would likely require bed and bank stabilization, armouring such as rip rap, and sediment fencing to handle an increase in discharge.

To avoid risk to fish and fish habitat downstream of the discharge location in Howe Sound, erosion control measures need to be adequate in keeping turbidity below BC Approved WQG. Erosion and sediment control measures are discussed in Section 7.3. Further recommendations and mitigation measures are outlined in Appendix D.

5.2 HYDROLOGY

The unnamed Tributary to Howe Sound flows south from the proposed discharge location, down a steep slope (~40 percent) and waterfall before being directed into a road ditch and through a twin culvert before reaching Howe Sound, approximately 150 m downstream of the discharge site. Several small tributaries enter the stream which accounted for a considerable proportion of flow during the April 2019 assessment. Flow measured near the proposed discharge site was 0.027 cubic metres per second during the assessment. The stream has been observed to run nearly dry in the summer but likely contains some flow most of the time. Details of the stream hydrology are in Appendix E.

The conditions of the non-fish bearing unnamed Tributary to Howe Sound were further assessed in August of 2020 by a Jacobs QEP, a Jacobs Water Resource Engineer and an MJA Engineer. It was observed that the stream banks were generally over-steepened with undercutting along both banks and some areas of active erosion. The stream was assessed to be unsuitable to receive additional flows without causing additional erosion and potential bank failure. Mitigation is in development to ensure there will be no risk to fish or fish habitat.

5.3 WATER QUALITY

In August 2021 and November 2021, Tetra Tech Canada Inc, (Tetra Tech) conducted water sampling and analyses on Mill Creek, Stream X, and for the groundwater along the Bedrock Tunnel alignment, to determine baseline water quality in varying seasons. The results of the analyses were compared to the BC Approved WQG. At the time of sampling in August 2021, the majority of watercourses sampled were found to have exceedances for temperature, pH, alkalinity and dissolved copper. In November 2021, the majority of watercourses sampled were found to have exceedances for pH, dissolved aluminum and dissolved copper. Refer to Appendix F for additional details on methodology and for a complete list of parameters evaluated.

6. WATER SAMPLING AND ANALYSIS

During construction, water quality sampling, both manual and automated, will be conducted within the DB Contractor's WTP prior to discharge at the WLNG Site. The purpose of the sampling is to monitor the effectiveness of water treatment, compliance with the Waste Discharge Authorization, and to verify that the treated water meets BC Approved WQG and BC OGC criteria. This includes water from all sources indicated in Section 3 above. If the water does not meet the discharge criteria, it will be continuously recirculated through the WTP until the criteria are met. Discrete water quality monitoring (field samples and visual observations) will be conducted prior to, during, and after discharge. All water quality sampling will be conducted in accordance with the BC Field Sampling Manual.

A Sampling and Analysis Plan has been developed by a Jacobs QEP and includes testing parameters and sampling frequency for the proposed points of discharge at the BC Rail Site. The Sampling and Analysis Plan is included in Appendix C and has been provided to the DB Contractor for implementation.

7. MITIGATION MEASURES

A Construction Environmental Management Plan (CEMP) has been developed by FortisBC and approved by the BC EAO for the EGP Project. In addition, Condition Management Plans (CMPs) are being developed as part of compliance with the Project's EAC. The CMPs will ensure that the commitments made in the CEMP communicate environmental procedures and mitigation relevant to the scope of the EGP Tunnel.

FortisBC has initiated consultation with Indigenous Groups and other specified agencies for the development of the CMPs. Mitigation measures described in the CMPs will be implemented during construction of the EGP Tunnel to avoid or reduce potential adverse effects on the environment.

The DB Contractor for the EGP Tunnel will adhere to the directions provided in the CMPs and will provide an EGP Tunnel-specific Environmental Protection Plan (EPP), for FortisBC's review and acceptance, which shall meet or exceed the standards outlined in the CMPs. The EGP Tunnel-specific EPP developed by the DB Contractor will be prepared in advance of construction and will be submitted to the BC OGC.

7.1 WATER TREATMENT

Water treatment at the BC Rail Site is expected to consist of sedimentation/storage ponds, flocculant and carbon dioxide addition, sand filtration, and/or oil water separation at a minimum. If required, additional treatment in the modular form of activated carbon media can be added to the existing system to treat hydrocarbons and metals. This process is consistent with other recent underground construction and major excavation projects in British Columbia.

The DB Contractor must submit a Water Treatment Plan for collecting, handling, treating, measuring, and disposing of groundwater and other wastewater generated from construction activities (see Appendix G). The Water Treatment Plan includes drawings and designs, treatment goals, and detailed process descriptions with a corresponding flowchart. All treatment measures to be implemented must not exceed the applicable BC Approved WQG for discharge of treated water to the environment. The Water Treatment Plan includes details on the means and methods of treatment, frequencies of monitoring water quality to check compliance with regulatory requirements prior to discharge, a water quality monitoring program, and contingency plans, amongst others.

The DB Contractor will also be required to prepare a Groundwater Management Work Plan for each dewatering system utilized, if any.

The WTP at the WLNG Site will be established after excavation of the Portal and prior to excavation of the Bedrock Tunnel. It will remain operational until the Bedrock Tunnel is permanently backfilled and flooded. Refer to the Design Basis Memorandum in Appendix G for additional details on water treatment and discharge mitigations.

7.2 GROUTING OF FRACTURE ZONES IN HARD ROCK TUNNEL

A series of fracture zones (lineaments) occurring in the granitic bedrock intersect the Bedrock Tunnel and are anticipated to be the largest contributors of groundwater inflow during construction activities. To reduce groundwater inflows, grouting of fracture zones will be carried out during construction. This will be beneficial from two standpoints:

- limit the impacts of water flows on construction activities including reducing pumping and treating requirements, and
- limit the impacts to the natural hydrogeological regime.

Continual monitoring of inflows and water quality will be conducted by taking flow measurements and collecting and analyzing water samples from observed seepage sources within the Bedrock Tunnel. These measurements and analysis will help determine if additional grouting is required to impede groundwater inflows, as well as conform with water quality and treatment requirements. Should a high groundwater inflow occur from a particular fracture zone, the DB Contractor will grout the feature to reduce groundwater ingress. It is considered that by grouting the five to ten critical water-bearing features expected in the Bedrock Tunnel, the actual inflow to the tunnel will be substantially reduced.

The grouting program will consist of drilling a series of advance boreholes (percussion drilled probe holes) and injecting cementitious grout at high pressure into the zone or lineament that is hydraulically conductive. Once the grout has solidified, measurement of water inflows will be repeated to confirm that flows are at an acceptable level. If the anticipated inflows are not at an acceptable level, additional drilling and grouting will be performed, with the sequence repeated as necessary. If the anticipated inflows are at an acceptable level, the TBM will advance through the grouted lineament, pausing ahead of the next lineament to repeat the process.

The results of predicted inflows to the Bedrock Tunnel during construction activities indicate that the implementation of remedial grouting of the fracture zones would approximately halve the groundwater inflow into the Bedrock Tunnel.

7.3 EROSION AND SEDIMENT CONTROL

The EPP to be prepared by the DB Contractor will include measures for erosion and sediment control during construction and dewatering activities. Erosion and sediment control measures included in the CEMP approved by the BC EAO for the EGP Project include the following requirements that have been included in the Groundwater Management Specification for dewatering activities.

- The DB Contractor must accomplish dewatering in a way that prevents the loss of fines from excavation sidewalls, will maintain stability of excavated slopes and bottom of excavations, and will result in construction operations being conducted in the dry to the extent required to complete the work.

- Keep all water entering excavations sufficiently controlled to develop a workable subgrade and control groundwater levels as specified to facilitate construction.
- Provide and construct all necessary intercepting ditches, barriers, sedimentation basins, holding ponds, or other acceptable means, as necessary, to prevent muddy water, eroded materials, and other undesirable constituents from being discharged.
- Mechanized equipment, except equipment associated with water handling and treatment, must not be operated in flowing surface water. The DB Contractor's methods of dewatering, excavating, and stockpiling excavated materials (to the extent allowed) must include preventative measures to control silting and erosion.
- Water from excavations, drilling, grouting, or similar construction operations must not enter flowing or dry watercourses without the use of water treatment to achieve compliance with regulatory requirements.
- Dewatering system construction, operation, and monitoring must be performed in the presence of a FortisBC representative, who must be allowed unrestricted access.
- Observe and record the flow rate and time of the operation of each dewatering system used daily and in accordance with any additional requirements.
- Monitor and record groundwater levels surrounding all excavations to ensure groundwater levels are maintained in accordance with applicable regulatory requirements and seasonal fluctuations.
- Repair all damage to adjacent properties, structures, or utilities and restore surfaces and finishes to the original ground state or better.
- Remove and dispose of all excavated material and other construction debris in compliance with applicable regulatory requirements.
- Keep the site clean and do not obstruct access to equipment.

Other erosion and sediment control measures included in Section 6.3 of the CEMP, such as the use of energy dissipaters for dewatering activities, will also be implemented.

7.4 POTENTIALLY ACID GENERATING ROCK

Testing of rock samples has been undertaken across the Bedrock Tunnel alignment from outcrops and investigative boreholes. The results of the investigations completed to-date indicate that PAG rock could be encountered in a short section of the Bedrock Tunnel, approximately 1.5 km in length – refer to Appendix H.

Monitoring and management plans will be updated and developed, including the Construction Environmental Management Plan (CEMP) and a detailed Acid Rock Drainage/Metal Leachate (ARD/ML) Construction Response Plan in accordance with the Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (Price 2009). In addition to the CEMP and ARD/ML Construction Response Plan, the EPP prepared by the DB Contractor will detail their approach to identification, excavation, storage and monitoring ARD/ML during tunnel construction. These plans will ensure that commitment and mitigation measures will be implemented during construction of the EGP Tunnel to avoid or reduce the potential adverse effects on the environment specific to ARD/ML.

As per the CEMP, FortisBC will actively monitor construction activities to verify that regulatory requirements are being met and the ARD/ML Construction Response Plan is being successfully implemented. The DB Contractor will

also have a full-time team of dedicated qualified professionals to control, manage, and inspect the works continually. Active monitoring will be conducted to ensure the excavated rock is constantly monitored for signs or traces of sulphide mineralization and staining, as well as to conduct mapping of the tunnel sidewalls to assess ARD/ML potential. At locations where ARD/ML rock is suspected to occur, samples will be taken as required and sent for testing to an approved laboratory to accurately determine the ARD/ML classification.

Rock handling, storage, re-use and disposal will be undertaken following the best practices outlined in Price (2009), the CEMP, and the ARD/ML Construction Response Plan. Previous testing has shown that the PAG rock starts to generate acidic water after a period of between 20 to 70 weeks, in the presence of oxygen and water depending on the particular mineralogy of the rock sample. Excavated PAG rock will be temporarily stored at the WLNG Site and be contained in a geomembrane liner. The temporary stockpile site will also be covered with geomembrane liners to prevent infiltration by surface water runoff and rainfall to delay the onset of ARD/ML conditions. Water that does percolate through will be drawn off at a specific point, which will be tested to monitor the onset of ARD/ML conditions, then treated to meet BC Approved WQG prior to discharge.

All temporarily stockpiled PAG rock will be brought back and be used as backfill material within the Bedrock Tunnel. The Bedrock Tunnel will be flooded by water after construction. It is noted that the mechanisms that would cause long-term ARD/ML issues are dependent on exposure of the PAG rock to oxygen, which will not be present when the Bedrock Tunnel is completed, backfilled, and flooded. As such, acidic groundwater drainage will not be an issue following construction.

8. REFERENCES

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Appendix A

EGP Tunnel Design Drawings

Appendix B

Water Management Plan

Appendix C

Waste Discharge Authorization Sampling and Analysis for the WLNG Site

Appendix D

Fish and Fish Habitat Technical Memorandum

Appendix E

Summary of Stream Hydrology for Stream X

Appendix F

Surface Water Quality Sampling along the Bedrock Tunnel Alignment

Attachment 1 Doc #: P-00763-ENV-MEM-2005
Surface Water Quality Sampling along the Bedrock Tunnel Alignment – Revision 1

Attachment 2 Doc #: P-00763-ENV-MEM-2006
Surface Water Quality Sampling along the Bedrock Tunnel Alignment November 2021 Sampling Event

Appendix G
Eagle Mountain – Woodfibre Gas Pipeline Project
Construction Water Treatment Design Basis
Memorandum

Appendix H

Overview of ARD / PAG Issues for the OGC