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December 15, 2020

British Columbia Utilities Commission Suite 410, 900 Howe Street Vancouver, BC V6Z 2N3

Attention: Ms. Marija Tresoglavic, Acting Commission Secretary

Dear Ms. Tresoglavic:

Re: FortisBC Energy Inc. (FEI)

Application for Approval of a Certificate of Public Convenience and Necessity (CPCN) for the Pattullo Gas Line Replacement (PGR) Project (Application)

Evidentiary Update dated December 15, 2020

On August 31, 2020, FEI filed the above referenced Application seeking approval from the British Columbia Utilities Commission (BCUC), pursuant to sections 45 and 46 of the *Utilities Commission Act* (UCA), for a CPCN for the PGR Project. In accordance with the regulatory timetable established by the BCUC in Order G-253-20, FEI hereby provides its Evidentiary Update to the Application.

In this Evidentiary Update, FEI has amended the Application to reflect the most up to date information on the Project and to complete the Application based on the Sperling Route as the preferred alternative, and includes:

- Updates to Sections 1, 4, and 10 of the original Application;
- A detailed description of the Project, including: project components, final route selection process, basis of design and engineering, construction, project schedule and resourcing requirements, a qualitative risk assessment and risk analysis, and contingency estimate (Section 5 of the Application);
- The cost estimate, the assumptions upon which the financial analysis is based, and the rate impacts (Section 6 of the Application);
- FEI's assessment of the potential environmental and archaeological impacts of the Project and measures to mitigate those potential impacts (Section 7 of the Application); and



• FEI's public consultation and communication efforts regarding the Project and FEI's engagement with Indigenous groups potentially impacted by the Project (Section 8 of the Application).

In addition, this Evidentiary Update reflects the following two changes identified by FEI during the development of the responses to Information Request No.1:

- As explained in the response to BCUC IR1 17.2, an amendment to the year on which the Application and Development Costs non-rate base deferral account will enter rate base from 2021 to 2022 (Sections 1.3.2 and 6.4.3 of the Application); and
- As explained in the response to CEC IR1 3.5,¹ a revised financial analysis period for determining the Project alternative comparisons and rate impact calculations from 73 to 68 years (Section 4.4.2.2 of the Application).

FEI is also clarifying the name of its proposed deferral account to be the PGR Application and *Preliminary Stage* Development Costs deferral account, to make it clear in the name that it is only the preliminary stage development costs that are included in the account.

This Evidentiary Update includes several exhibits to assist participants in referencing the latest information and identifying the amendments made to the Application. This submission includes:

- **Exhibit B-1-1:** The complete Application as amended by this Evidentiary Update;
- *Exhibit B-1-2:* Appendices A to K, including:
 - Appendix A (unchanged);
 - Appendix B;
 - Appendix B-1 (unchanged);
 - Appendix B-2 (amended);
 - Appendix B-3 (new); and
 - Appendices C to K (new).
- Exhibit B-1-3: Confidential Appendices C, D, E, G, and J-19.
- **Exhibit B-1-4:** A blackline comparison of all amendments made in this Evidentiary Update to the original Application.

¹ In response to CEC IR1 3.5, FEI committed to changing the financial analysis period from 73 years to 77 years, which is based on the approved depreciation rate of IP pipeline at 1.35 percent (i.e. 1/0.0135 = 74 years) plus three prior years. However, upon further consideration since filing the IR response, FEI believes it is more appropriate to set the analysis period on the average service life (ASL) of IP pipeline at 65 years as determined in FEI's 2017 Depreciation Study and approved with BCUC Order G-165-20, plus three prior years (i.e. 65 + 3 = 68 years). FEI considers that using ASL is more appropriate for the analysis period since ASL does not include the accumulated gains/losses embedded within the depreciation rates that existed at the time of the depreciation study and that are unrelated to the prospective future life of the assets. FEI notes that the difference between a 68-year analysis period and 77-year analysis period is immaterial in terms of rate impact as the levelized delivery rate changes by only 0.005 percent.



Request for Confidential Treatment of Certain Appendices

FEI is filing the following Appendices on a confidential basis pursuant to Section 18 of the BCUC's Rules of Practice and Procedure regarding confidential documents:

- Appendix C FEED Report Documents
- Appendix D Construction Cost Estimate (FEI)
- Appendix E Risk Analysis Reports
- Appendix G Financial Schedules
- Appendix J-19 Terms of Reference between FEI and the City of Burnaby

FEI respectfully requests that the BCUC hold the above listed documents confidential, and believes that such information should remain confidential even after the regulatory process for this Application is completed. Below, FEI outlines the reasons for keeping the information confidential.

Appendices C, D, and E

Appendices C, D and E are engineering documents and should be kept confidential on the basis that they contain operationally sensitive information pertaining to FEI's assets. In particular, it identifies vulnerable points on the company's gas transmission system and areas of risk to the Project including detailed information that if disclosed, could impede FEI's ability to work safely and reliably operate its gas system assets and could risk the safety of both its workers and the public. These documents also include cost estimates and identify Project risks. They should be kept confidential on the basis that FEI may be going to the market to seek competitive bids for the materials and construction work for the Project. If the estimated costs for the material and construction work are disclosed, FEI reasonably expects that its negotiating position may be prejudiced. For instance, the bidding parties with knowledge about the estimated costs may use the estimate costs as a reference for their bidding.

Appendix G

Appendix G includes financial schedules with sensitive information on the Project costs and related cost of service components that should be kept confidential on the basis that FEI may be going to the market to seek competitive bids for the materials and construction work for the Project. If the estimated costs for the material and construction work are disclosed, FEI reasonably expects that its negotiating position may be prejudiced. For instance, the bidding parties with knowledge about the estimated costs may use the estimated costs as a reference for their bidding.

Appendix J-19

Appendix J-19 is a confidential agreement between FEI and the City of Burnaby that contains commercially sensitive terms related to the construction of the Project along the Sperling



Route. Public disclosure of the terms of the agreement could prejudice FEI's negotiating position with other parties, including with other municipalities in relation to other projects.

Access to Confidential Information for Interveners

Should participants in this proceeding require access to some or all of the information filed confidentially, FEI has provided a proposed Undertaking of Confidentiality in Appendix B-3, to be executed before confidential information may be released to registered parties under the terms of the undertaking. FEI has no objection to providing confidential information to its customary and routine intervener groups representing customer interests. Should any other party seek access to this confidential information, FEI requests that the BCUC provide an opportunity for the company to file comments on the request.

If further information is required, please contact the undersigned.

Sincerely,

FORTISBC ENERGY INC.

Original signed:

Diane Roy

Attachments

cc (email): Registered Interveners



FORTISBC ENERGY INC.

Application for a Certificate of Public Convenience and Necessity for the Pattullo Gas Line Replacement Project

Volume 2 – Amended Application

December 15, 2020



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1 1. APPLICATION

2 **1.1** *INTRODUCTION*

3 FortisBC Energy Inc. (FEI or the Company) applies to the British Columbia Utilities Commission 4 (BCUC), pursuant to sections 45 and 46 of the Utilities Commission Act (UCA), for a Certificate 5 of Public Convenience and Necessity (CPCN) for the Pattullo Gas Line Replacement Project 6 (PGR Project or Project) as described in the application dated August 31, 2020, and as 7 amended by the evidentiary update dated December 15, 2020 (collectively, the Application). 8 FEI also applies for approval of a deferral account, entitled the PGR Application and Preliminary 9 Stage Development Costs", pursuant to sections 59 to 61 of the UCA, to record the costs of 10 preparing the Application, developing the PGR Project prior to approval of this Application, and 11 the regulatory review process.

- 12 The PGR Project is needed to replace the distribution system capacity currently provided by 13 FEI's distribution pressure gas line affixed on the Pattullo Bridge (Pattullo Gas Line), which must
- 14 be decommissioned in 2023 prior to the demolition of the Pattullo Bridge by the Province.
- As will be described in detail in Section 5 of the Application, the PGR Project consists of thefollowing:
- Constructing and installing in the City of Burnaby a 508 mm gas line that will operate at a maximum operating pressure (MOP) of 2,070 kPa;
- Constructing and installing a new district pressure regulating station (PRS);
- Constructing and installing a 508 mm gas line that will operate at a MOP of 700 kPa to connect the PRS to the distribution system;
- Abandoning and removing the existing Pattullo Gate Station in the City of Surrey and approximately 800 m of 508 mm gas line operating at a MOP of 700 kPa affixed to the Pattullo Bridge;
- Abandoning in place approximately 1.2 km of the remaining 508 mm gas line operating
 at a MOP of 700 kPa from the Pattullo Gate Station to the intersection of McBride
 Boulevard and Royal Avenue; and
- Modifying approximately 5.5 km of the Livingston-Pattullo 457 mm transmission gas line
 and associated work due to the removal of the Pattullo Gate Station.
- 30
- For clarity, in requesting a CPCN for the PGR Project, FEI is requesting that the BCUC approve each of the components of the PGR Project set out above as will be described in Section 5 of the Application.

In order to maintain the safe and reliable supply of natural gas to customers in Burnaby, New Westminster and Coquitlam, FEI must complete the PGR Project prior to the demolition of the existing Pattullo Bridge under which the Pattullo Gas Line is affixed. The Ministry of Transportation and Infrastructure (MoTI) has denied multiple requests from FEI for approval to



- 1 install a replacement gas line on the new bridge being constructed to replace the Pattullo Bridge 2 (New Bridge). FEI pursued and examined a number of other alternatives, including trenchless 3 crossings, an aerial crossing of the Fraser River, a peak shaving facility, a virtual pipeline, and 4 various overland gas line routes (i.e., that do not require a crossing of the Fraser River). 5 However, after a comprehensive evaluation of all alternatives. FEI determined that an overland 6 gas line route through the City of Burnaby is the only feasible solution that can be completed in 7 advance of the MoTI's scheduled Pattullo Bridge demolition and meet the main Project objective 8 of replacing the distribution system capacity currently provided by the Pattullo Gas Line.
- 9 FEI began consultation with the City of Burnaby on the Project in February 2020, and has 10 continued to consult and negotiate with the City of Burnaby regarding the route for the Project 11 since that time. On July 20, 2020 City of Burnaby Council passed a recommendation brought forward by the City's Finance Management Committee to "oppose the proposed FortisBC 12 13 Pattullo Gas Line Replacement Project pipeline route through Burnaby".¹ On July 31, 2020, the 14 City requested that FEI investigate a new route on Sperling Avenue (Sperling Route) in the City 15 of Burnaby as an alternative to FEI's previously identified route on Gaglardi Way (Gaglardi 16 Route). FEI investigated the Sperling Route and, based on an analysis of the alternatives using 17 non-financial and financial weighted criteria, FEI has selected the Sperling Route as the 18 preferred alternative for the PGR Project. The City is supportive of the Sperling Route.
- 19 In order to meet the stringent Project schedule requirements driven by the Province's Pattullo 20 Bridge Replacement Project, FEI must initiate the detailed design and procurement of long lead 21 material items in the first quarter of 2021. This will give FEI the necessary time to obtain all the 22 required permits and approvals prior to executing and completing the construction of the new 23 gas line in 2022. This would enable the decommissioning of the Pattullo Gas Line, Project 24 completion and Project close-out activities, including the removal of the Pattullo Gas Line and all 25 equipment in 2023, prior to the demolition of the Pattullo Bridge planned for the third quarter of 26 2023.
- To meet the Province's timelines, FEI is seeking an expedited regulatory review process. In order to commence the regulatory process, FEI filed the Application with a number of components incomplete. FEI has now completed the Application based on the Sperling Route as the preferred alternative.
- In addition, in order to commence the regulatory review process and meet the Project schedule,
 FEI is providing the PGR Project cost estimate at an AACE Class 4 level of project definition.
 While the BCUC's CPCN guidelines prescribe an AACE Class 3 level of estimate, FEI believes
 a Class 4 level of estimate is sufficient in this case, given that:
- FEI will have undertook additional preliminary constructability and other site reviews to
 better define the Project scope than is ordinarily completed for a Class 4 cost estimate.

See Burnaby Council Minutes, Page 7 Section 4.8. Online: <u>https://pub-burnaby.escribemeetings.com/FileStream.ashx?DocumentId=47967</u>



- The Project budget will include a contingency estimate, determined through a comprehensive risk identification process, detailed qualitative assessment and a risk quantification analysis using the latest revision of AACE International Recommended Practices.
- The need for the PGR Project is driven by the demolition of the Pattullo Bridge, and, as
 such, project cost is not a factor in determining need.
- FEI's alternatives analysis of available overland gas line route options based on "applesto-apples" Class 5 estimates shows that the route through the City of Burnaby has the lowest rate impact, in addition to be being the only option that can be constructed in time to meet the Project schedule. As such, a more defined level of Project cost is not needed for the analysis of project alternatives.
 - While a Class 4 estimate has a wider accuracy range than a Class 3 estimate, only prudently incurred costs may be recovered from customers in rates in any case.
- 13 14

12

For these reasons, FEI requests that the BCUC accept a Class 4 estimate as providing sufficient information on which to make a determination of whether the Project is in the public interest. This will allow the regulatory process to proceed so that FEI can meet the Project schedule driven by the Province's replacement of the Pattullo Bridge.

- 19 All other information presented in the Application is consistent with the CPCN guidelines.
- A draft Procedural Order and draft Final Order are included in Appendices B-1 and amended B 2 respectively.

22 **1.2** EXECUTIVE SUMMARY

23 **1.2.1** Need to Replace the Capacity Provided by the Pattullo Gas Line

FEI needs to undertake the PGR Project due to the Province's Pattullo Bridge Replacement Project, which includes construction of a New Bridge and demolition of the Pattullo Bridge on which FEI's Pattullo Gas Line is affixed. As explained in detail in Section 3.3, FEI's existing Pattullo Gas Line and its location within its natural gas system is integral in providing the following key benefits:

- Distribution system capacity to supply natural gas to customers in the Cities of Burnaby,
 New Westminster and Coquitlam; and
- Resiliency to FEI's larger Metro Vancouver area.
- 32

Specifically, as described in detail in Section 3.5 of the Application, the Pattullo Gas Line currently supplies all or a portion of natural gas to approximately 35,000 customers in Burnaby, New Westminster and Coquitlam. Not replacing the existing system capacity of the Pattullo Gas Line would lead to a loss of gas supply to approximately 10,700 customers during the coldest days of the year when peak demand occurs. This includes approximately 2,100 customers in



- 1 Burnaby, 2,800 customers in New Westminster, and 5,800 customers in Coquitlam. Further,
- 2 based on FEI's 20-year forecast, an additional 14,800 customers (for a total of approximately
- 3 25,500 customers) would be without gas during cold winter periods by 2039.

4 Therefore, FEI must replace the distribution system capacity of the Pattullo Gas Line prior to its 5 decommissioning in 2023 to continue to provide safe and reliable natural gas supply to 6 customers.

7 As explained in Sections 3.3.2 and 3.6 of the Application, in addition to distribution supply 8 capacity, the Pattullo Gas Line provides system resiliency for customers in the Metro Vancouver 9 area. By supporting flexible operation of the Metro Vancouver distribution system, this resiliency allows FEI to maintain safe and reliable supply to all customers during outages or failures of 10 11 other feeds to the Metro Vancouver distribution system. FEI investigated and pursued 12 alternatives that would replace both the distribution capacity and the system resiliency benefits 13 of the Pattullo Gas Line. However, FEI has determined that there is no feasible Project 14 alternative that would replace the system resiliency benefits of the Pattullo Gas Line, while also 15 meeting the schedule constraints of the PGR Project. Therefore, FEI concluded that the 16 resiliency benefits of the Pattullo Gas Line cannot be replaced at this time and another project 17 or system improvement will have to be undertaken at a later date to restore Metro Vancouver's 18 system resiliency.

191.2.2Alternatives Analysis Concluded Overland Gas Line Alternative is only Feasible
Option

FEI conducted a comprehensive evaluation of the alternatives to meet the Project need and that would have the least impact, including consideration of technical design and scope complexity, cost, construction, environmental, archaeological and societal impacts, and impacts to FEI's existing system capacity and resiliency. FEI examined six alternatives and a number of subalternatives as listed below in Table 1-1, and described in further detail in Sections 4.3 and 4.4.

26

Table 1-1: Alternatives and Sub-Alternatives Considered for PGR Project

Alternatives and Sub-Alternatives Considered			
Alternative 1	Alternative 1 Attachment to the New Bridge		
Alternative 2 Trenchless Crossing of the Fraser River 1.Alternative 2A - High Pressure Horizontal Directional Drill (TP/IP H 2.Alternative 2B - Distribution Pressure Horizontal Directional Drill (I 3.Alternative 2C - Alternate High Pressure Horizontal Directional Dried 4.Alternative 2D - Other Trenchless Methodologies (Micro-tunneling			
Alternative 3	 Through Richmond with Fraser River Crossing 5. Alternative 3A - TP Gas Line with 1 Gate Station 6. Alternative 3B - IP Gas Line with 1 Gate Station and 1 District Station 		
Alternative 4	Aerial Gas Line Crossing		



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Alternatives and Sub-Alternatives Considered				
Alternative 5	Alternative 5 Peak Shaving Facility / Virtual Gas Line			
	1. Alternative 5A - Liquefied Natural Gas (LNG)			
	2. Alternative 5B - Compressed Natural Gas (CNG)			
Alternative 6 Overland Gas Line				
	1. Alternative 6A - Broadway and Gaglardi Way Corridor			
	2. Alternative 6B - Cape Horn Gate Corridor			
	3. Alternative 6C - Fraser Gate Corridor			
	4. Alternative 6D – Sperling Avenue Corridor			

1

2 Alternative 1 is effectively a like-for-like replacement with the installation of a gas line on the 3 New Bridge. FEI pursued this option from the time it initially received notice that it would need 4 to decommission the Pattullo Gas Line and continued to pursue the option while simultaneously 5 evaluating other alternatives until January 2020. FEI made multiple requests to MoTI for 6 approval to install the gas line on the New Bridge. However, for the reasons explained in 7 Section 4.3.1.1, MoTI denied FEI's requests. Without approval from MoTI, this alternative is not

8 feasible.

9 The next alternative that FEI evaluated was Alternative 2, a trenchless crossing of the Fraser 10 River. FEI began pursuing this alternative in September 2018 after receiving MoTI's initial 11 response in July 2018 denying FEI's request to install a gas line on the New Bridge. As 12 explained in Section 4.3.2, after conducting preliminary designs, FEI engaged a drilling 13 contractor as part of an early contractor involvement project delivery method to evaluate the 14 constructability and feasibility of this alternative. FEI and the drilling contractor concluded in 15 August 2019 that the drilling options were not feasible due to constructability issues and the low 16 likelihood of successfully completing the drill and pipe installation.

17 After determining that Alternative 2 was not feasible. FEI proceeded to analyze all other 18 alternatives beginning in August 2019. Due to the higher impact of these solutions, significant 19 work on these alternatives was not started until more preferred options were deemed infeasible. 20 Further, these remaining alternatives would not be like-for-like replacements, and would not be 21 able to replace the resiliency benefits currently provided by the Pattullo Gas Line.

22 FEI screened out Alternatives 3, 4 and 5 based on their inability to meet the Project objectives 23 as further explained in Section 4.3.3 through 4.3.5. This left Alternative 6: Overland Gas Line as 24 the only feasible alternative to replace the system capacity provided by the Pattullo Gas Line 25 while meeting Project schedule requirements.

- 26 Within Alternative 6, FEI identified three overland gas line route corridors (prior to the recent 27 addition of 6D - the Sperling Route - as further explained below): 6A - Broadway and Gaglardi 28 Way Corridor: 6B - Cape Horn Gate Corridor, and 6C - Fraser Gate Corridor. FEI compared the 29 three route corridors using the financial and non-financial evaluation criteria in Table 1-2 below
- 30 (specified in detail in Section 4.4.2).

	Weighting	
Non-Fi		
1.	Schedule Impacts	••• •
2.	Community, Indigenous and Stakeholder Impacts	90%
3.	Environmental and Archaeological Impacts	
Financ		
4.	Levelized Delivery Rate Impact	10%

Table 1-2: Alternatives Evaluation Criteria with Weightings

1

2

FEI's evaluation of the three overland route corridors using the financial and non-financial criteria indicated that Alternative 6A (through the City of Burnaby) has the shortest schedule duration, least community impacts, and lowest financial impact based on AACE Class 5 conceptual cost estimates. Further, FEI concluded that Alternative 6A was the only route that could be constructed in time to allow FEI to decommission the Pattullo Gas Line before MoTI's scheduled demolition of the Pattullo Bridge.

9 FEI has been consulting and negotiating with the City of Burnaby regarding the route for the 10 Project since February 2020. On July 31, 2020 the City requested that FEI investigate a new 11 route option – the Sperling Route. FEI considers that it is important to determine if there is a 12 feasible route that is supported by the City of Burnaby. If supported by the City, and other 13 factors are favourable, the Sperling Route could be the most cost effective alternative for the 14 PGR Project. Since July 31, 2020, FEI investigated the Sperling Route.

15 FEI evaluated both the Gaglardi Route and the Sperling Route at an AACE Class 4 level of 16 definition using financial and non-financial weighted criteria. FEI's evaluation of the two routes 17 against the financial and non-financial weighted criteria indicated that Alternative 6D, the 18 Sperling Route, has the best overall weighted score. While the two alternatives are equivalent 19 when compared financially, the Sperling Route was superior from a non-financial perspective, 20 with less schedule impact and fewer community, indigenous and stakeholder impacts. Further, 21 the City of Burnaby supports the route. Accordingly, FEI has selected Alternative 6D, the 22 Sperling Route, as its preferred alternative for the Project.

23 **1.2.3 Project Description**

Section 5 of the Application includes a detailed description of the proposed Project, including project components, final route evaluation and selection process, basis of design and engineering, construction, project schedule and resourcing requirements, as well as a qualitative risk assessment and analysis and contingency estimate.

28 **1.2.4 Project Costs and Rate Impact**

The cost estimate for the PGR Project is \$175.354 million in as-spent dollars and includingAllowance for Funds Used During Construction (AFUDC).

- 1 The Project will result an estimated delivery rate impact of 1.57 percent in 2025 when all
- 2 construction, including abandonment/demolition, is completed and all capital costs have entered
- 3 FEI's rate base. The average annual delivery rate impact over the four years from 2022 to 2025
- 4 is estimated to be 0.39 percent, which equates to an average bill increase of approximately
- 5 \$1.62 per year for a residential customer, or cumulatively \$6.39 over four years.
- 6 The PGR Project costs and rate impacts are further described in Section 6 of the Application.

7 **1.2.5** Environmental and Archaeological Evaluation

8 FEI has assessed the environmental and archaeological impacts of the Project. As described in
9 Section 7 of the Application, FEI expects that the Project will have minimal environmental and
10 archaeological impacts.

Based on environmental overview assessments, the environmental risks of the Project are low and any potential environmental impacts of the Project can be mitigated through the implementation of standard best management practices and mitigation measures.

14 FEI assessed the footprint of the Sperling Route for high-level archaeological constraints in an 15 Archaeological Constraints Report (ACR), which concluded that the majority of the expected 16 footprint is considered to have low archaeological potential within highly developed areas. FEI 17 will be conducting an Archaeological Overview Assessment (AOA) for the Sperling Route in 18 early 2021 to further assess the potential archaeological impacts. The AOA of the 19 decommissioning component concluded that the proposed excavation locations are mostly 20 located in areas of high archaeological potential due to an extensive history of occupation in the 21 surrounding area. FEI will conduct an Archaeological Impact Assessment (AIA) for both the 22 Sperling Route and decommissioning component to further assess potential archaeological and 23 cultural impacts associated within areas of moderate and high archaeological potential identified 24 in the AOAs. The AIA will provide a detailed assessment to allow for development of site 25 specific mitigation strategies to offset any potential impacts associated with the Project.

26 **1.2.6** Consultation and Engagement

As detailed in Section 8 of the Application, the consultation and engagement activities to the time of filing have been sufficient, appropriate and reasonable to meet the requirements of the BCUC CPCN Guidelines.

- 30 FEI considers consultation, engagement, and communication with the public, local government,
- 31 Indigenous communities, and other stakeholders to be critical components of the PGR Project.
- 32 FEI created a Consultation and Engagement Plan² that sets out the general approach to
- 33 engagement, consultation and communications activities with respect to the PGR Project. Due

² Filed as Appendix J-5, Consultation and Engagement plan includes Community Engagement, Indigenous Relations, and Communications Plan with respect to the Sperling Route.



to the COVID-19 pandemic, FEI has continued to assess and adjust its consultation andengagement approach and activities as necessary.

3 FEI has consulted and engaged extensively on the Project to date. FEI has used multiple 4 communication and consultation methods to ensure that local stakeholders, including federal 5 and provincial elected officials, local government, customers, residents, businesses, stakeholder groups, schools, places of worship, places of community gathering and permitting 6 7 agencies have had the opportunity to become informed about the Project and provide their 8 feedback. FEI has also engaged early with potentially impacted Indigenous groups in a 9 thorough, timely and meaningful manner. FEI values the comments and feedback received, and has incorporated this feedback into its Project planning. Throughout its consultation and 10 11 engagement, FEI has tracked issues and concerns that have been raised and will continue to 12 address any outstanding items with respect to the Project.

Further consultation and engagement activities will continue prior to and throughout construction help inform the public, customers, residents, businesses, local government, other stakeholders and Indigenous groups about construction activities in their area in an effort to minimize impacts.

17 1.2.7 British Columbia's Energy Objectives and FEI's Long-Term Resource Plan

In alignment with considerations for the issuance of a CPCN, FEI confirms that the Project was identified within FEI's most recent 2017 Long Term Gas Resource Plan (2017 LTGRP), and will support British Columbia's energy objective of encouraging economic development and the creation and retention of jobs. The Project is anticipated to have positive employment impacts and will contribute to the local economy of British Columbia.

23 **1.2.8 Conclusion**

FEI submits that the Project is necessary and in the public interest. FEI requests that the BCUC grant a CPCN for the PGR Project as described in this Application.

26 **1.3** APPROVALS SOUGHT

27 1.3.1 CPCN for PGR Project

Pursuant to sections 45 to 46 of the UCA, FEI requests that the BCUC grant a CPCN for the
construction and operation of the PGR Project as described in the Application. In granting a
CPCN for the PGR Project, FEI requests that the BCUC approve the components of the PGR
Project as described in detail in Section 5 of the Application.

32 1.3.2 Application and Preliminary Stage Development Costs Deferral Account

Pursuant to sections 59 to 61 of the UCA, FEI requests approval of a deferral account, entitled
 the PGR Application and Preliminary Stage Development Costs", to capture the costs of the



Application and regulatory review process, and certain costs of developing the PGR Project. The Application costs will include expenses incurred by FEI for the development of the Application for filing, and the regulatory review process such as legal fees, BCUC costs, hearing costs and BCUC-approved intervener costs, a forecast of which is provided in the Application. The Preliminary Stage Development costs include expenses for Project management, engineering, and consultants for assessing the potential design and alternatives.

7 For the Application costs, FEI has estimated \$350 thousand related to expenses incurred by FEI for the preparation and regulatory review process for the Application. For the Preliminary Stage 8 9 Development costs, FEI is proposing to record \$2.507 million, which are the actual costs to 10 January 31, 2020, less the tax deduction available for certain capitalized development costs 11 incurred by FEI after January 31, 2020. The Application and Preliminary Stage Development 12 costs are recorded in the proposed non-rate base deferral account on a net-of-tax basis, 13 attracting FEI's weighted average cost of capital (WACC) until transfer to rate base. FEI 14 proposes to transfer the balance in the deferral account to rate base on January 1, 2022 and 15 commence amortization over a three-year period.

16 This request is set out in more detail in Section 6.4.3 of the Application.

17 **1.4** *PROPOSED REGULATORY PROCESS*

As per the amended regulatory timetable established in BCUC Order G-253-20, FEI will provide
a written submission on further process for the regulatory review of the Application by
December 23, 2020.

FEI respectfully requests a Decision from the BCUC as soon as practicable. FEI plans to initiate the detailed design and procurement for the first phases of the Project in the first quarter of 2021. FEI plans to begin construction of the new gas line in the second quarter of 2022 and is expecting to have all construction complete by the fourth quarter of 2022. Based on this timeline, the removal of the Pattullo Gas Line is expected to be complete by the third quarter of 2023.

27 **1.5** ORGANIZATION OF THE APPLICATION

The Application provides detailed information in support of the approvals sought. The remainder of the Application is organized into the following sections:

- Section 2 provides an overview of the Applicant, and provides information on FEI's
 financial and technical capabilities to undertake the Project;
- Section 3 describes the need and justification for the Project;
- Section 4 describes the alternatives considered, the criteria for evaluating potentially
 feasible alternatives, and details the technical and financial evaluation of each of the
 these alternatives;



- Section 5 provides a detailed description of the Project, including project components,
 final route evaluation and selection process, basis of design and engineering,
 construction, project schedule and resourcing requirements, a qualitative risk
 assessment and analysis, and contingency estimate;
- Section 6 provides the Project cost estimate, the assumptions upon which the financial analysis is based, and the rate impacts;
- Section 7 provides an overview of the Project environment, including a discussion of the environmental and archaeological impacts the Project may have, and FEI's plans to mitigate those impacts;
- Section 8 discusses FEI's public consultation and communication efforts regarding the
 Project and FEI's engagement with Indigenous communities potentially impacted by the
 Project;
- Section 9 describes how the Project supports BC's energy objectives and its inclusion within FEI's most recent long-term resource plan; and
- Section 10 concludes this Application.



1 **2. APPLICANT**

2 2.1 NAME, ADDRESS AND NATURE OF BUSINESS

FEI is a company incorporated under the laws of the Province of British Columbia and is a
wholly-owned subsidiary of FortisBC Holdings Inc., which in turn is a wholly-owned subsidiary of
Fortis Inc. FEI maintains an office and place of business at 16705 Fraser Highway, Surrey,
British Columbia, V4N 0E8.

FEI is the largest natural gas distribution utility in British Columbia, providing sales and
transportation services to residential, commercial, and industrial customers in more than 100
communities throughout British Columbia, with more than 1 million customers served throughout
British Columbia. FEI's distribution network provides more than 95 percent of the natural gas

11 energy delivered to customers in British Columbia.

12 2.2 FINANCIAL CAPACITY

FEI is regulated by the BCUC and is capable of financing the Project. FEI has credit ratings for
senior unsecured debentures from Dominion Bond Rating Service Morningstar and Moody's
Investors Service of A and A3, respectively.

16 2.3 TECHNICAL CAPACITY

17 FEI has designed and constructed a system of integrated high, intermediate and low-pressure

pipelines, and operates approximately 50,000 kilometres of natural gas transmission and natural gas distribution mains and service lines in British Columbia. FEI has completed other large

20 natural gas projects, and has the technical capacity to complete the Project.

21 **2.4** *COMPANY CONTACT*

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- 23 Vice President, Regulatory Affairs
- 24 FortisBC Energy Inc.
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- 31



1 2.5 LEGAL COUNSEL

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9



1 3. PROJECT JUSTIFICATION

2 **3.1** *INTRODUCTION*

3 The need to undertake the PGR Project arises from the Province's Pattullo Bridge Replacement 4 Project, which includes the demolition of the Pattullo Bridge on which FEI's Pattullo Gas Line is 5 affixed. The Pattullo Gas Line, which has been in operation since 1956, is integral to FEI's 6 ability to supply natural gas to customers in Burnaby, New Westminster, and Coquitlam, and 7 also provides resiliency benefits to FEI's Metro Vancouver natural gas system. FEI must, 8 however, decommission the Pattullo Gas Line by the end of 2023 in advance of the scheduled demolition of the Pattullo Bridge. Therefore, in order to continue to deliver natural gas to existing 9 10 customers in the cities of Burnaby, New Westminster and Coquitlam, the PGR Project is needed 11 to replace the system capacity currently provided by the Pattullo Gas Line prior to its 12 decommissioning.

- 13 The remainder of this section will provide details of the Project need and justification, as follows:
- Section 3.2 describes the Pattullo Gas Line and its location in relation to FEI's Metro Vancouver natural gas system;
- Section 3.3 describes the capacity and resiliency benefits of the Pattullo Gas Line;
- Section 3.4 describes the Province's Pattullo Bridge Replacement Project, including the timing of the demolition of the existing Pattullo Bridge which drives the need and required in-service date of the Project;
- Section 3.5 explains the need to replace the system capacity of the Pattullo Gas Line to continue to provide safe and reliable service to its customers; and
- Section 3.6 explains the need to replace the system resiliency benefits of the Pattullo
 Gas Line, which FEI has determined cannot be achieved by this Project.

24 3.2 DESCRIPTION AND LOCATION OF THE PATTULLO GAS LINE

The Pattullo Gas Line is a nominal pipe size (NPS) 20 (508 mm outside diameter) distribution pressure (DP)³ gas line affixed to the underside of the Pattullo Bridge, which spans the Fraser River from the City of Surrey to the City of New Westminster. FEI has operated the Pattullo Gas Line safely since its installation in 1956.

Figure 3-1 shows the Pattullo Gas Line (in green) in relation to FEI's Coastal Transmission System (CTS) and adjoining distribution system. The gas lines operating at transmission pressure (TP), which are shown in red, constitute the CTS.

³ Distribution Pressure (\leq 700 kPa).





Figure 3-1: Overview of FEI's CTS and Distribution System

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3 Source: FEI data overlaid on Google Earth mapping

- TP gas lines operating at greater than 2069 kPa
- ---- IP gas lines operating between 701 kPa and 2069 kPa
- DP gas lines operating at less than or equal to 700 kPa
 - Pattullo gas line operating at less than or equal to 700 kPa
- 4

5 The TP gas lines transport gas from the FEI Huntingdon Station near Abbotsford into the Fraser

6 Valley and Metro Vancouver areas to feed gate stations⁴ located within various communities in

7 the Lower Mainland. The IP gas lines transport the natural gas supply from the gate stations in a

8 bi-directional corridor to numerous district stations, which in turn feed the DP system that serves

9 customers in Metro Vancouver. Within this system, the Pattullo Gas Line is an integral

10 component of FEI's Metro Vancouver IP and DP distribution system due to the system capacity

11 and resiliency benefits it provides, as described in the following section.

⁴ A gate station is a station that regulates the pressure of the gas stream prior to it entering a distribution system operating at a lower pressure and the gas usually requires preheating.



1 **3.3** SIGNIFICANCE OF THE PATTULLO GAS LINE TO THE METRO VANCOUVER 2 DISTRIBUTION SYSTEM

3 Although it is relatively short in length (as shown in Figure 3-1), the Pattullo Gas Line is a critical

- 4 link in the gas supply to thousands of downstream customers. Specifically, it provides two key
 5 benefits:
- Distribution system capacity to supply natural gas to customers in Burnaby, New
 Westminster and Coquitlam; and
- 8 2. Resiliency to FEI's larger Metro Vancouver area.

9 3.3.1 Capacity to Serve Customers in Burnaby, New Westminster and Coquitlam

Today, the Pattullo Gas Line supplies all or a portion of natural gas to approximately 35,000customers in Burnaby, New Westminster and Coquitlam.

12 The Pattullo Gas Line provides capacity to serve customers through the 700 kPa trunk 13 distribution system, depicted in orange in Figure 3-2 below. This trunk distribution system is a 14 subset of Metro Vancouver's distribution system spanning from the south east portion of 15 Vancouver, from Elliott Street and South East Marine Drive (near Fraser Gate) to Como Lake 16 Avenue and Westwood Street in Coquitlam (near Coquitlam Gate). The 700 kPa trunk 17 distribution system supplies 14 regulating district stations, represented by the green stars in 18 Figure 3-2, which feed gas into the 420 kPa distribution system that directly supplies residential, 19 commercial and industrial customers.



Figure 3-2: Stations Supplying the Metro Vancouver 700 kPa Trunk Distribution System



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- 3 As seen in the figure above, the trunk distribution system is fed at four points:
- 4 1. Pattullo Gate Station (via the Pattullo Gas Line);
- 5 2. Como Lake Avenue and Westwood Street District Station (fed by Coquitlam Gate);
- 6 3. Elliott Street and South East Marine Drive District Station (fed by Fraser Gate); and
- 7 4. 29th Avenue and Slocan Street District Station.

8

9 The length of the yellow arrows in the figure above represent the proportion of gas supplied 10 from each station. As shown, the Pattullo Gas Line represents the largest and most significant 11 feed into the 700 kPa trunk distribution system. In cold winter weather, the Pattullo Gas Line 12 supplies over half of the gas entering the 700 kPa trunk distribution system.

13 The capacity benefits of the Pattullo Gas Line are discussed further in Section 3.3.

14 3.3.2 Resiliency for Metro Vancouver Distribution System

- 15 The Pattullo Gas Line also provides resiliency benefits to FEI's Metro Vancouver distribution
- 16 system. As shown in Figure 3-3 below, the CTS supplies natural gas to the Metro Vancouver
- 17 distribution system primarily through three gate stations:



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- 1 1. Fraser Gate, located on East Kent Ave South near Kerr Street in Vancouver;
 - 2. Coquitlam Gate, located on Spuraway Avenue near Mariner Way in Coquitlam; and
 - 3. Pattullo Gate, located on 120th Street near Old Yale Road in Surrey.
- 4

2

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Figure 3-3: Gate Stations Feeding FEI's Metro Vancouver Distribution System



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6 The three gate stations shown in the figure above are independent feeds into the interconnected 7 distribution system. Coquitlam Gate supplies the majority of gas required to serve customers in 8 FEI's larger Metro Vancouver area, with Fraser Gate and Pattullo Gate (via the Pattullo Gas 9 Line) contributing the remainder of the gas supply. Together, the three gate stations provide the 10 capacity to support the vast majority of customers served by the Metro Vancouver distribution 11 system.

With the recent system improvements completed as part of the Lower Mainland IP System Upgrade (LMIPSU) Project⁵, the Metro Vancouver distribution system is fully supported under peak day conditions if either Coquitlam Gate or Fraser Gate is out of service due to an unanticipated station failure or the failure of an upstream gas line supplying the station. However, the resiliency of the Metro Vancouver distribution system relies on the independent third feed from the Pattullo Gate station (through the Pattullo Gas Line) to support the 700 kPa trunk distribution system. The third feed from the existing Pattullo Gas Line leaves capability in

⁵ BCUC Decision and Order C-11-15, dated October 16, 2015. Online: https://www.bcuc.com/Documents/Proceedings/2015/DOC_44883_10-16-2015_FEI-LMIPSU-CPCN-Decision.pdf



1 the Coquitlam and Fraser gate stations to compensate if supply from either is lost. This

- 2 resiliency allows for flexibility in the operation of the distribution system and allows FEI to
- maintain reliable supply to its customers. The resiliency benefits of the Pattullo Gas Line and
 the impacts of PGR Project on FEI's system resiliency are discussed further in Section 3.6 and
- 5 Section 4.4.2 of the Application.

6 3.4 PATTULLO BRIDGE REPLACEMENT PROJECT

7 FEI will lose the Pattullo Gas Line, and the benefits it provides, due to the Province's Pattullo Bridge Replacement Project, which includes the demolition of the Pattullo Bridge on which FEI's 8 9 Pattullo Gas Line is affixed. The Pattullo Bridge Replacement Project has received an 10 Environmental Assessment Certificate from the B.C. Environmental Assessment Office (EAO) 11 under British Columbia's Environmental Assessment Act, as well as a Project and Environmental Review Project Permit from the Vancouver Fraser Port Authority. At the time of 12 13 filing this Application, the Pattullo Bridge Replacement Project is in the design and construction 14 phase.

15 The New Bridge is scheduled to open in fall 2023. The existing bridge will remain in use until the

16 New Bridge is open to traffic. Once the New Bridge is open, the existing bridge will be 17 removed.⁶

Based on the current Project schedule, demolition of the Pattullo Bridge is scheduled to proceed by the end of 2023 after the New Bridge opens. However, MoTI has indicated that it could occur earlier than this target date due to the nature of the performance based, design-buildfinance contract it has entered into with its contractor who will be performing the construction and demolition work.

Prior to the demolition of the existing Pattullo Bridge, FEI will need to degasify and purge the existing Pattullo Gas Line to make it safe for removal, and abandon and/or remove all associated infrastructure, as well as complete any required modifications to the existing infrastructure upstream and downstream of the Pattullo Gas Line.

27 3.5 FEI MUST REPLACE THE DISTRIBUTION SYSTEM CAPACITY PROVIDED BY 28 THE PATTULLO GAS LINE

29 Prior to the decommissioning of the Pattullo Gas Line, FEI must replace the distribution system

- 30 capacity currently provided by the Pattullo Gas Line in order to continue to supply natural gas
- 31 safely and reliably to customers in Burnaby, New Westminster and Coquitlam. The Pattullo Gas

⁶ The Government of B.C.'s website for the Pattullo Bridge Replacement Project (https://engage.gov.bc.ca/pattullobridge/) provides details on the project. Transportation Investment Corporation, a provincial Crown corporation, is delivering and overseeing the project, and Fraser Crossing Partners has been awarded the contract to design and build the New Bridge. The Province will own and maintain the New Bridge when complete.



- Line currently supplies all or a portion of natural gas to approximately 35,000 customers in these
 cities. The area where these customers are located is outlined in yellow in Figure 3-4 below.
- 2 cilles. The area where these customers are located is outlined in yellow in Figure 5-4 below.



Figure 3-4: 10,700 Customers Impacted by Loss of Pattullo Gas Line Feed in 2020

4

3

Without the Pattullo Gas Line, the area shaded in red in Figure 3-4 would have inadequate gas 5 supply. This represents the distribution area supplied by one regulating district station in 6 7 southwest Coquitlam and two regulating district stations in New Westminster, all of which are 8 fed from the 700 kPa trunk distribution system. Based on FEI's 2020 peak demand projection⁷, 9 during the coldest days of the year when peak demand occurs, and without support from the 10 Pattullo Gas Line, these district stations would have inadequate inlet pressure leading to a loss 11 of gas supply. This includes approximately 2,100 customers in Burnaby, 2,800 customers in 12 New Westminster, and 5,800 customers in Coguitlam. This represents a disruption in service to 13 approximately 10,700 residential, commercial, and industrial customers who rely on natural gas 14 to provide necessary heat and hot water for their homes and businesses.

Based on 2020 customer peak demand projections, the customers in the area shaded in yellow (and outside the red region) in Figure 3-4 above could continue to receive service without the Pattullo Gas Line. This is because of the relative proximity of the customers in the yellow-

⁷ Peak demand conditions occur in cold winter when consumer space heating demands are highest. To design reliable distribution systems FEI projects system peak demand based on coldest weather conditions likely to occur 1 in 20 years.



- 1 shaded area to either Fraser Gate or Coquitlam Gate and the capacity of these Gate stations to
- 2 accept some of the load currently provided by the Pattullo Gas Line. This illustrates the
- 3 resiliency of the current system.
- 4 However, without replacement of the Pattullo Gas Line, the impacted area in red would expand
- 5 as customer load grows over time. Based on FEI's 20-year forecast, by 2039 an additional
- 6 14,800 customers (for a total of approximately 25,500 customers) would be without gas during
- 7 cold winter periods. This is illustrated in Figure 3-5 below.
- 8

Figure 3-5: 25,500 Customers Impacted by Loss of Pattullo Gas Line Feed in 2039



9

10 In summary, FEI must replace the distribution system capacity of the Pattullo Gas Line prior to 11 its decommissioning in 2023 to continue safe and reliable natural gas supply to existing 12 customers. While the number of customers that would be left without safe and reliable service 13 would grow over time, the need to replace the distribution system capacity of the Pattullo Gas Line is not driven by load growth or an increase in customers' peak demand. Rather, even 14 15 based on current (2020) customer loads, 10,700 customers would be left without safe and 16 reliable service. Thus, any variation from FEI's load forecast in the area, including any sustained 17 impacts of the COVID-19 pandemic, would not impact the need for the Project. In short, in 18 order to continue providing natural gas service safely and reliably to customers in Burnaby, New 19 Westminster and Coquitlam, FEI must replace the distribution system capacity currently 20 provided by the Pattullo Gas Line prior to its decommissioning in 2023.



1**3.6**Impacts of the PGR Project on FEI's Metro Vancouver2Distribution System Resiliency

3 As discussed in Section 3.3.2, the resiliency benefits of the Pattullo Gas Line allow for the full 4 capacity of the Metro Vancouver distribution system to be maintained should Coquitlam Gate or 5 Fraser Gate station be unable to supply gas into the distribution system. If the Pattullo Gas Line 6 is removed without replacement, and if the gas supply from either Coguitlam Gate or Fraser 7 Gate station is lost, the sole remaining gate station would need to compensate for both the loss 8 of the Pattullo Gas Line supply and the failed gate station. Under this scenario, the resiliency of 9 the system is eroded and there is insufficient capacity to support the lost station. This 10 represents a loss of resiliency, as the remaining gate station could only support customers in 11 warmer weather when system demand is lower.

As explained in detail in Section 4, FEI examined a number of alternatives for the PGR Project that would replace both the capacity and resiliency benefits currently provided by the Pattullo Gas Line. However, FEI determined that there is no feasible project alternative that would replace the system resiliency currently provided by the Pattullo Gas Line and meet the schedule requirements of the Project. This is further discussed in Section 4.4.2.

17 **3.7** CONCLUSION ON PROJECT NEED AND JUSTIFICATION

FEI must undertake the PGR Project due to the Province's Pattullo Bridge Replacement Project, which requires FEI to decommission the Pattullo Gas Line in 2023. The Pattullo Gas Line provides vital capacity and system resiliency benefits to the Metro Vancouver distribution system. If the Pattullo Gas Line is not replaced, it will result in the loss of safe and reliable gas supply to thousands of customers in Burnaby, New Westminster and Coquitlam.

- 23 Therefore, the PGR Project is required and needs to meet following objectives:
- Replace the distribution system capacity currently provided by the Pattullo Gas Line to
 maintain the safe and reliable supply of natural gas to customers; and
- Complete the PGR Project in advance of the scheduled Pattullo Bridge demolition to
 ensure continued gas supply to its customers.
- 28

A desirable secondary objective would be to also replace the resiliency benefits provided by the existing Pattullo Gas Line. However, as discussed above, FEI has determined that it cannot replace the distribution system resiliency benefits of the Pattullo Gas Line at this time. Therefore, another project or system improvements will be undertaken to restore the Metro Vancouver system resiliency at a later date.



PATTULLO GAS LINE REPLACEMENT CPCN APPLICATION (EVIDENTIARY UPDATE DECEMBER 15, 2020)

1 4. ALTERNATIVES EVALUATION

2 **4.1** *INTRODUCTION*

FORTISBC ENERGY INC.

FEI evaluated numerous alternatives for the PGR Project to identify a solution that meets the
Project objectives and has the least impact in terms of technical design, scope, complexity, cost,
construction, environmental, archaeological and societal impacts, along with consideration of
impacts to FEI's existing system capacity and resiliency.

7 FEI initially pursued alternatives that would have the least impact and would replace both the capacity and resiliency benefits of the Pattullo Gas Line. The obvious least overall impact 8 9 solution would be to attach a replacement gas line to the New Bridge. FEI pursued the 10 installation of a gas line on the New Bridge, which MoTI would not approve, and investigated a 11 trenchless crossing of the Fraser River, which was found to be not feasible. FEI then 12 considered various other alternatives to meet the project need, including through Richmond and 13 across the Fraser River, an aerial crossing near the site of the Pattullo Bridge, a peak shaving facility or virtual pipeline, and overland gas line routes. Ultimately, FEI determined that an 14 overland gas line routed through the City of Burnaby had the least impact, and would be the 15 16 only solution available that can be implemented prior to the time when FEI must decommission 17 the Pattullo Gas Line. FEI's consultation and negotiations with the City of Burnaby regarding 18 the route for the Project have been ongoing and resulted in the identification of two feasible 19 alternatives, referred to as the Gaglardi Route and the Sperling Route. Based on an analysis of 20 these two alternatives using financial and non-financial weighted criteria, FEI chose the Sperling 21 Route as its preferred alternative for the Project, which is supported by the City of Burnaby.

The remainder of this section will provide details of the Project alternatives analysis and organized as follows:

- Section 4.2 provides an overview of the alternatives analysis, including the timeline of FEI's analysis.
- Section 4.3 describes FEI's analysis of the alternatives that were determined to be not feasible.
- Section 4.4 describes the overland gas line route options for the Project, and FEI's analysis of the route options based on financial and non-financial criteria. This section also describes FEI's ongoing consultation and negotiations with the City of Burnaby regarding a route for the Project.

32 4.2 OVERVIEW OF ALTERNATIVES ANALYSIS

The alternatives and sub-alternatives FEI identified and evaluated are listed in Table 4-1 below,
 and described in detail in Sections 4.3 and 4.4.


Table 4-1: Alternatives and Sub-Alternatives Considered for PGR Project

Alternatives and Sub-Alternatives Considered			
Alternative 1	Attachment to the New Bridge		
Alternative 2	 Trenchless Crossing of the Fraser River Alternative 2A - High Pressure Horizontal Directional Drill (TP/IP HDD) Alternative 2B - Distribution Pressure Horizontal Directional Drill (DP HDD) Alternative 2C - Alternate High Pressure Horizontal Directional Drill (TP/IP) Alternative 2D - Other Trenchless Methodologies (Micro-tunneling) 		
Alternative 3	 Through Richmond with Fraser River Crossing Alternative 3A - TP Gas Line with 1 Gate Station Alternative 3B - IP Gas Line with 1 Gate Station and 1 District Station 		
Alternative 4	Aerial Gas Line Crossing		
Alternative 5	 Peak Shaving Facility / Virtual Gas Line Alternative 5A - Liquefied Natural Gas (LNG) Alternative 5B - Compressed Natural Gas (CNG) 		
Alternative 6	 Overland Gas Line Alternative 6A - Broadway and Gaglardi Way Corridor Alternative 6B - Cape Horn Gate Corridor Alternative 6C - Fraser Gate Corridor Alternative 6D – Sperling Avenue Corridor 		

2 3

1

3 These alternatives are shown in Figure 4-1 below. Alternative 5 is not shown as locations for a

4 peak shaving facility and injection sites associated with a virtual gas line were never identified.





Figure 4-1: Map of PGR Project Alternatives



- 1 FEI conducted a comprehensive evaluation of these alternatives with a focus and priority on the
- 2 solutions with the least impact.

3 Given that it would be the most straightforward and overall least impact solution, FEI first 4 pursued a like-for-like replacement with Alternative 1 via an installation of the replacement 5 Pattullo Gas Line on the New Bridge. FEI diligently pursued this alternative with multiple requests to MoTI, complete with supporting documentation, from the time it first received written 6 7 notice in June 2017 to move the Pattullo Gas Line or cease transmission of gas. FEI pursued 8 this alternative while simultaneously evaluating other alternatives until it received final verbal 9 confirmation from MoTI in January 2020 that the installation of FEI's gas line on the New Bridge 10 would not be allowed. Section 4.3.1 below explains the reasons why MoTI denied FEI's 11 requests. While FEI considered that the new replacement gas line could be designed for safe 12 and reliable long-term operations with no material safety impacts to the New Bridge or its users, 13 without agreement from MOTI's chief engineer to allow the attachment, this alternative is not 14 feasible.

15 The next alternative evaluated was Alternative 2, a trenchless crossing of the Fraser River. FEI 16 began to pursue this alternative in September 2018 after receipt of MoTI's initial response in July 2018 denying FEI's request to install a gas line on the New Bridge. As explained in Section 17 18 4.3.2, after conducting preliminary designs, FEI engaged a drilling contractor using an early 19 contractor involvement project delivery method to evaluate the constructability and feasibility of 20 this alternative. However, FEI and the drilling contractor concluded in August 2019 that the drill 21 options were not feasible due to constructability issues and the high likelihood of hydraulic 22 failures that could lead to a frac-out⁸ in the Fraser River.

After determining that Alternative 2 was not feasible, FEI proceeded to analyse all other alternatives beginning in August 2019. These remaining alternatives would not be like-for-like replacements, and would not be able to replace the resiliency benefits currently provided by the Pattullo Gas Line.

FEI screened out Alternatives 3, 4 and 5 as they could not meet the Project objectives as further explained in Sections 4.3.3 through 4.3.5.

29 The only remaining potentially feasible alternative was Alternative 6: Overland Gas Line. FEI 30 analysed and evaluated the route options for this alternative based on the evaluation criteria 31 specified in Section 4.4.2, which included choosing a cost effective feasible solution that 32 minimizes impacts to the project schedule, environment and the public and Indigenous 33 communities. Out of the three Overland Gas Line alternatives originally evaluated (i.e 34 Alternatives 6A, 6B and 6C), Alternative 6A - Broadway & Gaglardi Way Corridor has the shortest schedule duration, least community impacts, and lowest financial impact based on 35 36 AACE Class 5 conceptual cost estimates. FEI began consulting with the City of Burnaby on the

⁸ Frac-out is defined as the uncontrolled release of drilling fluid through fractured bedrock or flows into the rock and sand that surrounds the bedrock and travels toward the surface.



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- 1 route for the Project in February 2020 and its consultation and negotiations continue at the time
- 2 of filing this Application, including investigation of an alternative route in the City of Burnaby
- 3 (Sperling Route). Details regarding the evaluation of the Overland Gas Line alternatives are
- 4 provided in Section 4.4.
- 5 The remainder of Section 4 describes in further detail FEI's analysis of alternatives determined
- 6 to be not feasible, and the analysis of the Overland Gas Line alternative based on financial and
- 7 non-financial evaluation criteria, as well as FEI's ongoing consultation and negotiations with the
- 8 City of Burnaby.

9 4.3 ALTERNATIVES INVESTIGATED BUT DEEMED NOT FEASIBLE

10 FEI evaluated a number of alternatives to meet the Project's objectives and requirements that

11 were ultimately determined to be not feasible. A summary of the assessment for each of the

12 alternatives considered is provided in Table 4-2 below, with the reasons described in detail in

- 13 the sections below.
- 14

Table 4-2: Assessment Summary of PGR Project Alternatives

Alternatives Considered	Feasibility
1. Attachment to the New Bridge	Not Feasible
2. Trenchless Crossing of the Fraser River (Alternatives 2A, 2B, 2C and 2D)	Not Feasible
3. Through Richmond with Fraser River Crossing (Alternatives 3A, 3B and 3C)	Not Feasible
4. Aerial Gas Line Crossing	Not Feasible
5. Peak Shaving / Virtual Gas Line (Alternatives 5A and 5B)	Not Feasible
6. Overland Gas Line (Alternatives 6A, 6B, 6C and 6D)	Potentially Feasible

15

4.3.1 Alternative 1 - Attachment to the New Bridge Not Feasible Based on MoTI's Refusal to Permit

This alternative involves the installation of an NPS 20 (508 mm OD) DP gas line on the underside of the New Bridge similar to the current gas line on the Pattullo Bridge. As shown in Figure 4-2 below, on the south side of the bridge, the gas line would tie into the NPS 20 DP gas line near Highway 17 (South Fraser Perimeter Road) in the City of Surrey. On the north side of the Bridge, the gas line would tie into the NPS 20 DP gas line on McBride Boulevard in the City of New Westminster.



1





2

3 4.3.1.1 Analysis of Alternative 1

4 FEI pursued Alternative 1 - Attachment to the New Bridge, through multiple submissions to 5 TransLink and MoTI in an effort to obtain approval to install a natural gas line on the New 6 Bridge.

In a letter dated July 3, 2018 MoTI communicated its decision to not allow FEI to install a
 replacement natural gas line on the New Bridge. The rationale provided was as follows:⁹

- MoTI's Utility Policy Manual notes that while DP and IP natural pipelines can sometimes
 be accommodated on provincial bridges, such pipelines are only considered when other
 crossing alternates are not feasible or if the alternate approaches result in environmental
 risk or other sensitivities. Fortis has developed potential alternate solutions.
- MoTI's policies of restricting natural gas pipelines on bridges are in line with other North
 American jurisdictions, where such installations are highly discouraged and only allowed
 as a last resort when no other feasible crossing alternative exists.
- The New Bridge will be designed as a lifeline structure with the highest standard of seismic design, requiring the New Bridge to be usable by traffic after a seismic event for both emergency response and economic recovery. The bridge is a key link between communities. The presence of a natural gas pipeline represents a significant risk to the reliability of the structure post a major seismic event that impacts the Greater Vancouver region.
- 22

⁹ The letter from MoTI to FEI, dated July 3, 2018 is attached as Appendix A-1 to the Application.



- In a letter dated September 28, 2018 (see Appendix A-2), FEI responded to MoTI to emphasize
 the following:
- The gas line on the New Bridge will be designed to the same seismic design
 requirements as that of the bridge (1:2475);
- FortisBC will be responsible for all the costs related to the installation and subsequent
 maintenance of the gas line on the New Bridge; and
- 7 3. Remote controlled valves, similar to ones installed on a number of gas lines in the Lower mainland, will be installed in the line at both ends of the New Bridge. These valves could be closed when an event that could affect the integrity of the lines is detected to ensure gas does not flow through it.
- 11

In a subsequent letter from MoTI to FEI dated October 30, 2018 (see Appendix A-3), MoTI
 reaffirmed its initial position, stating:

The New Bridge will be designed as a lifeline structure and will be a vital link between communities should there be a significant seismic event. The ongoing integrity of the bridge will be key to facilitating an effective response and recovery plan after such an event. Given this context, and the fact that there are other options open to Fortis, MoTI does not intend to revisit the decision taken on this matter.¹⁰

FEI believes that installing a replacement gas line on the New Bridge would have the least impact, and therefore it continued to pursue this alternative with multiple attempts to meet with MoTI's chief engineer to discuss the reasons as provided and to discuss any design modifications to meet the new lifeline design criteria. MoTI verbally confirmed that its decision was final in January 2020. Having exhausted all possibilities for approval by MoTI, FEI concluded that this alternative was not feasible.

264.3.2Alternative 2 – Trenchless Crossing of the Fraser River Not Feasible Based on27Significant Construction Challenges

FEI evaluated several options for a trenchless crossing of the Fraser River near the Pattullo Bridge, including three horizontal directional drill (HDD) alignments and other trenchless crossing methods. FEI engaged a drilling contractor as part of an early contractor involvement project delivery method to further assess these alternatives. All of the proposed subalternatives were identified as not being constructible and had other technical issues and risks which could not be adequately addressed or cost effectively mitigated using risk mitigation techniques. As a result, FEI determined that these alternatives were not feasible.

35 The description and analysis of these alternatives are provided below.

¹⁰ The letter from MoTI to FEI, dated October 30, 2018 is attached as Appendix A-3 to the Application.



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1 4.3.2.1 Alternative 2A – High Pressure HDD (TP/IP HDD)

This alternative involves the installation of an NPS 12 (323 mm) TP or IP gas line across the Fraser River via an HDD (#1) near the Pattullo Bridge. The drill entry point would be located in a grassed clearing immediately east of Dufferin Street in the City of New Westminster and would exit in a rail storage yard on the south side of the Fraser River in the City of Surrey. The new pipe would be strung and welded together along Highway 17 as shown in blue in Figure 4-3 below. The length of the HDD would be approximately 1,063 meters. The drill path would cross under the existing Pattullo Bridge.

9 On the south end, the gas line would require additional onshore piping to connect to the existing 10 Pattullo Gate Station via a shorter HDD (#2) approximately 391 meters under Highway 17 and

11 the Burlington Northern Santa Fe (BNSF) Railway. On the north end, a new pressure regulating

12 station would be required to reduce the gas pressure to 700 kPa and a new DP gas line would

13 be required to tie into the NPS 20 DP gas line on McBride Boulevard, as shown in purple in

14 Figure 4-3.

15

Figure 4-3: Map of High Pressure Horizontal Directional Drill (TP/IP HDD) Alternative



16

17 4.3.2.1.1 ANALYSIS OF ALTERNATIVE 2A

18 FEI determined this alternative with the TP/IP HDD alignment shown in Figure 4-3 above was 19 not feasible due to the compounding impacts of the following challenges:

• The HDD alignment crosses below or beside piers of the Pattullo Bridge, which would likely destabilize the existing structure. Considering that the bridge structure must remain operational during the construction of the New Bridge, there is no cost effective risk mitigation that FEI could identify to safely address this issue;



- There is an increased likelihood of a significant environmental event due to increased
 risk of frac-out causing an uncontrolled release of drilling fluid under the Fraser River
 due to:
 - elevation differences between entry and river bottom; and
 - soft soil conditions which cannot resist the drilling pressure;
- Limited workspace resulting in the likelihood of overstressing the pipe or damaging the pipe coating during construction and pullback; and
- Conflicts with Highway 17, SkyTrain tunnel and railroad crossings, creating potential for significant transportation system closures.

10 *4.3.2.2* Alternative 2B – Distribution Pressure HDD (DP HDD)

This alternative involves the installation of an NPS 20 (508 mm) DP gas line across the Fraser River via an HDD near the Pattullo Bridge. The drill entry point would be located in a rail storage yard on the south side of the Fraser River in the City of Surrey and would exit on the east side of McBride Boulevard in the City of New Westminster. The new pipe would be strung and welded together along McBride Boulevard as shown in blue in Figure 4-4. The length of the HDD would be approximately 1,293 meters. The drill path (shown in green) would cross under the Pattullo Bridge, the New Bridge, and the Canadian National (CN) Rail bridge.

- 18 On the south end, the gas line would require additional onshore piping and would tie into the 19 existing NPS 20 DP gas line near Highway 17, as shown in purple in Figure 4-4 below. On the 20 north end, the gas line would tie into the existing NPS 20 DP gas line on McBride Boulevard
- 21 between two existing block valves.

22 Figure 4-4: Map of Distribution Pressure Horizontal Directional Drill (DP HDD) Alternative



23

4



1 4.3.2.2.1 ANALYSIS OF ALTERNATIVE 2B

- FEI determined the DP HDD alignment shown in Figure 4-4 above was not feasible due to thecompounding impacts of the following issues and risks:
- The HDD alignment crosses below and beside piers of the CN Rail bridge which has the potential to destabilize the structure. There is no cost effective risk mitigation strategy that FEI could identify to safely address this issue and keep the bridge operational. CN Rail will not grant a crossing permit to FEI, which is required for execution of this alternative;
- Increased likelihood of a significant environmental event due to increased risk of frac-out causing an uncontrolled release of drilling fluid under the Fraser River;
- Significant traffic disruption during pipeline string out construction and testing on
 McBride Boulevard, precipitating lane closures for several months; and
- The proposed HDD entry location is in conflict with the future development plans by the property owner. There is no feasible alternate location.

15 4.3.2.3 Alternative 2C – Alternate High Pressure HDD (TP/IP HDD) Alignment

16 This alternative involves the installation of an NPS 12 (323 mm) gas line across the Fraser River 17 near the New Bridge, as shown below in Figure 4-5. There would be drill entry points on each 18 side of the Fraser River that would meet in the middle. The new pipe would be strung and 19 welded together along McBride Boulevard. The length of the HDD would be approximately 1,340 meters. The drill path would run parallel and approximately 16 metres upstream (on the 21 North side) of the alignment of the New Bridge.

On the south end, the gas line would require additional onshore piping to connect to the Pattullo
Gate Station via a short HDD under Highway 17 and SFR Railway, shown in red in Figure 4-5.
On the north end, a new pressure regulating station would be required where the gas pressure
would be reduced to 700 kPa and a new DP gas line would be tied into the NPS 20 DP gas line
on McBride Boulevard, as shown in purple in Figure 4-5.





1

3 4.3.2.3.1 ANALYSIS OF ALTERNATIVE 2C

The footprint of this alternative is fully contained within the Pattullo Bridge Replacement Project 4 5 footprint (refer to bolded and yellow areas in Figure 4-5), and therefore would have required 6 coordination between FEI and the design build contractor for the Pattullo Bridge Replacement 7 Project. However, as this alternative was identified during MoTI's competitive bidding process, FEI's requirements could not have been incorporated in the scope of the Pattullo Bridge 8 9 Replacement Project without change orders being put to MoTI, for which MoTI indicated they would not be responsible. FEI determined this alternative was not feasible due to the 10 compounding impacts of the following challenges: 11

- Added complexity with project coordination for workspace requirements and access points for both FEI's project and the Pattullo Bridge Replacement Project;
- The MoTI Design Build Finance (DBF) contract limits FEI's ability to negotiate coordination with the Pattullo Bridge Replacement Project, as FEI's project requirements were not incorporated in their original scope;
- The close proximity of the crossing to the New Bridge alignment creates design and construction risks as location and size of bridge pier foundations would not be available prior to detailed design of the HDD;
- Impact on a known archaeological site the indigenous village site in the City of Surrey;

¹¹ Image taken from MoTI Pattullo Bridge Replacement Project Business Case Scope Sketches, May 2018.

- Significant traffic disruption during pipeline stringing, construction, and testing on
 McBride Boulevard, resulting in road lane closures for several months;
 - Permitting challenges due to multiple railway crossings; and
- Compounding schedule effects to both FEI and the Pattullo Bridge Replacement Project should the HDD fail on the first attempt due to uncertain geological profile.

6 *4.3.2.4* Alternative 2D – Other Trenchless Methodologies

7 Given that the HDD alternatives were not feasible, FEI requested that the drilling contractor perform an analysis of alternate trenchless methodologies to cross the Fraser River within 8 9 proximity to the Pattullo Bridge. The other methodologies reviewed by the construction 10 contractor included micro-tunnelling and direct pipe. The construction contractor found that the 11 most promising technology would be micro-tunnelling, which is a method of constructing a 12 tunnel that involves underground installation of a casing pipe, without removal of the ground above the pipe and without requiring entry by personnel. However, the construction contractor 13 14 concluded that none of the trenchless technologies would be successful at crossing the Fraser 15 River in this area, for the following reasons:

- A crossing length in excess of 750 meters and a depth of at least 70 metres to avoid liquefaction induced flow would make it the longest and deepest attempted micro-tunnel in North America, as of the date of the study. Typical lengths and depths are 600 metres and 35 metres, respectively;
- The required hydrostatic pressure to accommodate the depth would be twice what current technologies are capable of withstanding;
- Geotechnical data indicated that mixed ground (till, cobble and bedrock) would be encountered, which would cause cutter head selection challenges and/or replacements (based upon similar infrastructure projects in the vicinity); cutter head replacements at this depth would require an airlock system, increasing the diameter of the boring machine to at least 2.0 m; and
- Limited availability of experienced contractors in North America to meet the Project schedule.

4.3.3 Alternative 3 – Through Richmond with Fraser River Crossing Screened Out Based on Inability to Meet Schedule Requirements

- This alternative involves gas line installations in the Cities of Richmond and Burnaby and a trenchless crossing of the Fraser River. There are two configurations to achieve this alternative:
- Alternative 3A TP Gas Line with one Gate Station; and
- Alternative 3B IP Gas Line with one Gate Station and one District Station.
- 35

3

36 Both of these configurations were screened out based on their inability to meet the Project 37 schedule objective. The description and analysis of these two configurations are provided in 38 sections below.



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1 *4.3.3.1* Alternative 3A – TP Gas Line with 1 Gate Station

2 This alternative involves the installation of an NPS 12 (323 mm) TP gas line for approximately 3 4,000 metres in the City of Richmond which would tie into the TIL FRA 508¹² and NIC FRA 4 610¹³ gas lines, near Cambie Road and No. 7 Road (see blue line in Figure 4-6). A trenchless 5 crossing (either HDD or micro-tunnel) of the north arm of the Fraser River would be required 6 between the Cities of Richmond and Burnaby. The gas would be fed to a new TP/DP gate 7 station (shown in purple) at Byrne Road and Mountbatten Street in the City of Burnaby, where the gas pressure would be reduced to 700 kPa. Approximately 4,000 metres of NPS 20 (508 8 9 mm) 700 kPa DP gas line would be installed along Byrne Road, continuing north onto Gilley Avenue to tie-in to the DP 700 kPa system at Gilley Avenue and Beresford Street (see green 10 11 line in Figure 4-6).

12

Figure 4-6: Map of Richmond – TP to DP Alternative



13

14 *4.3.3.2* Alternative 3B – IP Gas Line with 1 Gate Station and 1 District Station

This alternative would tie into the TIL FRA 508¹³ and NIC FRA 610¹⁴ gas lines at the same location as Alternative 3A described above, which would be fed directly into a new TP/IP gate station (shown in yellow in Figure 4-7 below). The gas pressure would be reduced to 1,200 kPa (i.e., intermediate pressure) and approximately 8,000 metres of NPS 20 (508 mm) IP gas line would be installed along the same route as above to Gilley Avenue and Beresford Street (see light blue line), including a trenchless crossing of the Fraser River. At Gilley Avenue and

¹² Tilbury to Fraser Gate 508mm Outer Diameter (OD) operating at 4020 kPa.

¹³ Nichol to Fraser Gate 610mm OD operating at 4020 kPa.



- 1 Beresford Street, a new IP/DP district station (shown in purple) would reduce the gas pressure
- 2 to 700 kPa and tie into the existing DP 700 system.
- 3

Figure 4-7: Map of Richmond – TP to IP to DP Alternative



4

5 4.3.3.3 Analysis of Alternatives 3A and 3B

6 FEI determined that the Through Richmond with Fraser River Crossing Alternatives 3A and 3B7 were not feasible for the following reasons:

- 1. A significant portion of the Richmond section of this alternative includes acquiring new 8 9 Statutory Right-of-Way (SRW) across private farmland which has a significant public 10 impact. The SRW is required to be 18 metres wide for the TP alternative and 10 metres wide for the IP alternative. Further, the IP alternative would require the acquisition of 11 12 land in Richmond for a new TP/IP gate station. Approximately 30 individual properties 13 identified along the proposed route in Richmond are in the Agricultural Land Reserve, 14 requiring approval from the Agricultural Land Commission for a gas line corridor. The 15 time required for negotiations with landowners, in addition to a subsequent application to 16 the Agricultural Land Commission, would exceed the Project schedule requirements.
- There is a lack of existing geotechnical information to depths sufficient to adequately characterize the geotechnical risks at the crossing location for the trenchless Fraser River crossing in this location. Therefore, to assess the feasibility of this alternative, an extensive borehole drilling program in the Fraser River would be required and would involve several lengthy permit applications. FEI has recent experience with an HDD



- crossing project¹⁴ approximately 3,700 metres downstream of this location that required
 substantial geotechnical information. Even with the comprehensive geotechnical data,
 the project experienced several challenges in successfully completing the HDD causing
 significant delay from the original schedule.
- 5

For the reasons outlined above, FEI concluded that these alternatives pose a significant project
schedule risk and cannot be constructed prior to the Pattullo Bridge demolition and
decommissioning. As a result, FEI determined that this alternative is not feasible.

94.3.4Alternative 4 – Aerial Gas Line Crossing Screened Out Based on Inability to Meet10Schedule Requirements

11 This alternative involves the construction of an aerial gas line support structure across the Fraser River near the Pattullo Bridge. The structure would support an NPS 20 (508 mm) 700 12 13 kPa DP gas line which would tie-in to the existing Pattullo Gate Station in the City of Surrey and 14 the NPS 20 DP gas line near McBride Boulevard in the City of New Westminster as shown in 15 Figure 4-8 below. In addition to the evaluation of FEI building its own support structure, FEI reviewed the feasibility of using the existing Pattullo Bridge piers upon decommissioning of the 16 17 bridge for the aerial crossing. However, it was determined that this option would not allow FEI to 18 meet the Project schedule requirements.

19

Figure 4-8: Map of Aerial Gas Line Crossing



¹⁴ BCUC Decision and Order C-02-09, dated March 12, 2009. Online: <u>https://www.bcuc.com/Documents/Proceedings/2009/DOC_21279_TGI%20Fraser%20River%20Crossing%20Decision.pdf</u>



1 4.3.4.1 Analysis of Alternative 4

FEI determined that the Aerial Gas Line Crossing alternative was not feasible because it could
not meet the Project's objective to be completed in advance of the scheduled Pattullo Bridge
demolition, for the following reasons:

Due to the high impact structural requirements of an aerial crossing of the Fraser River,
 there are several long lead-time permits required for in-river geotechnical investigations
 and for the construction phase. Several of the identified permits must be filed
 sequentially with approval prior to design activities followed by construction start. This
 long lead-time permitting process prevents this alternative from meeting the project
 schedule timelines. The permits required include but are not limited to:

a)	Environmental Assessment Certificate (EAC)	2 to 2.5 years
b)	MoTI Approvals	6 to 12 months
c)	Section 11 Water Sustainability Act Approval	1 to 1.5 years
d)	Fisheries Act Authorization	4 to 6+ months
e)	Vancouver Fraser Port Authority Project and Environmental Review	6 to 8 months

- 11
- The proximity in both time and location to MoTI's Pattullo Bridge Replacement Project would result in challenges associated with cumulative effects of the two projects. It is likely that the Cities of Surrey and New Westminster, Indigenous communities and the public would take an increased interest in an aerial gas line crossing due to the visual impact, and perceived fisheries or watercourse impacts. As a result, FEI does not expect that it could complete the stakeholder engagement and consultation process in time to meet Project schedule requirements.

19 4.3.5 Alternative 5 – Peak Shaving Facility / Virtual Gas Line

This alternative involves supplementing the City of New Westminster DP system using a peak shaving facility or virtual gas line. A virtual gas line consists of compressing and transporting natural gas via trucks from a supply location to a pressure reduction station without the need for permanent transmission gas line infrastructure. Without the existing Pattullo Gas Line or replacement, there would be a need for a virtual gas line or peak shaving facility to meet customer demand through the winter.

A peak shaving facility or virtual gas line would be required when temperatures drop below minus 1°C. Within the New Westminster area, it is normal for temperatures to drop to minus 1°C or below in late fall and winter, sometimes for extended periods.

Under peak demand conditions (approximately minus 12°C), the peak shaving facility or virtual
 gas line would need to deliver approximately 100,500 standard cubic metres per hour (Sm³/hr)



- of gas into the system. For comparison, FEI's legacy Tilbury LNG peak shaving facility has a
 send-out capability of approximately 172,000 Sm³/hr of gas.
- There are two delivery alternatives (LNG and CNG) described below, by which the required demand or load could be supplied using a peak shaving facility or virtual gas line. Both of these sub-alternatives were determined to be not feasible for the reasons outlined below.

6 *4.3.5.1* Alternative 5A – LNG

7 To meet the capacity shortfall at peak demand and generate 100,500 Sm³/hr of gas, 8 approximately 167 m³ of LNG would be required (LNG has an volumetric energy density 9 approximately 600 times greater than that of atmospheric pressure natural gas). If this load 10 were supplied via a virtual gas line, approximately 4 LNG trailers per hour would be required. If 11 this load were supplied by a peak shaving facility, approximately 28,000 m³ of LNG would need 12 to be stored to provide a one-week supply during peak demand conditions. A tank similar to the 13 size of the legacy Tilbury LNG storage tank (26,000 m³) would be need to be constructed in 14 Burnaby, New Westminster or Coquitlam.

15 4.3.5.1.1 ANALYSIS OF ALTERNATIVE 5A

During peak demand, four LNG trailers per hour would be required to supply the required load via a virtual gas line. Any interruption in the delivery and injection of LNG, such as traffic disruption between Tilbury LNG and the injection point in New Westminster, could result in the loss of pressure in the system and significant customer outages. Therefore, this solution is not feasible.

To supply the above demand during peak periods, a peak shaving facility with an LNG storage tank comparable to the legacy Tilbury LNG storage tank (0.6 BCF) would be required. A large area of land would need to be acquired and rezoned in order to build an LNG storage facility with setbacks sufficient to meet the requirements of CSA Z276-18 Liquefied Natural Gas (LNG) – Production, storage and handling. Finding an appropriate site for a tank of this size within New Westminster, Burnaby or Coquitlam would be challenging, and the timeline to complete this alternative would exceed the Project schedule requirements.

28 4.3.5.2 Alternative 5B – CNG

CNG provides a much lower energy density when compared to LNG and is therefore limited in its ability to meet demand. The energy density differential means that significantly more trailers and / or a larger storage tank would be required to deliver equivalent quantities of gas.

32 4.3.5.2.1 ANALYSIS OF ALTERNATIVE 5B

33 Since LNG is not able to meet the large capacity requirement, CNG is also not feasible since it 34 has a smaller volumetric ratio (LNG has an energy density many times greater than that of 35 compressed natural gas). For comparison, during peak demand approximately 12 CNG trucks per hour would be required to supply the required load via virtual gas line. This would not be
 feasible.

3 4.4 EVALUATION OF OVERLAND GAS LINE ALTERNATIVE

4 This section describes FEI's evaluation of Alternative 6 and its sub-alternatives (route corridors)

5 to replace the system capacity provided by the Pattullo Gas Line while meeting project schedule 6 requirements.

7 4.4.1 Alternative 6 – Overland Gas Line

8 The Overland Gas Line alternative includes gas line installations in the Cities of Burnaby,
9 Coquitlam, New Westminster and / or Vancouver.

10 Potential route corridors were identified by completing a search over a broad area between 11 available start and end points to interface with existing infrastructure. An ideal 'straight line' 12 route of interest between these points is identified so that key issues and constraints affecting 13 the selection of the route can be plotted and assessed. Through this process, three potential 14 route corridors were identified and evaluated. Also, as mentioned above in Section 4.1 of the 15 Application, FEI's consultation and negotiations with the City of Burnaby regarding the route for 16 the Project resulted in the identification of the fourth route option (Sperling Route). The 17 description and evaluation of all four route corridors are provided in the sections below.

18 *4.4.1.1* Alternative 6A – Broadway and Gaglardi Way Corridor

19 As shown in Figure 4-9 below, the Broadway and Gaglardi Way Corridor option involves the 20 installation of approximately 5 km of NPS 20 (508 mm) IP gas line in the City of Burnaby (see 21 green line). The gas line would tie into the newly constructed NPS 30 (762 mm) Coguitlam to Vancouver IP gas line¹⁵ at Broadway and Gaglardi Way. The IP gas line would then continue 22 23 south towards the City of New Westminster and feed a new district station (shown in purple) to be located near the intersection of McBride Boulevard and 10th Avenue in the City of New 24 25 Westminster. A short connection would be required between the district station outlet and the 26 existing DP 700 kPa system. Refer to Figure 4-9 for a map of the corridor.

¹⁵ BCUC Order C-11-15, dated October 16, 2015.





Figure 4-9: Map of Broadway and Gaglardi Way Route Corridor

2 3

1

4 4.4.1.2 Alternative 6B – Cape Horn Gate Corridor

As shown in Figure 4-10 below, the Cape Horn Gate Corridor option involves the installation of approximately 8 km of NPS 20 IP gas line in the Cities of Coquitlam and Burnaby (see light blue line). A new TP/IP gate station (shown in yellow) would tie-in to the NPS 20 (508 mm) TP gas line within the Cape Horn Gate Station in the City of Coquitlam. The NPS 20 IP gas line would continue west to a new IP/DP district station (shown in purple) located near the intersection of McBride Boulevard and 10th Avenue in the City of New Westminster. A short connection would



- 1 be required between the IP/DP district station outlet and the DP 700 kPa system. Refer to
- 2 Figure 4-10 for a map of the corridor.
- 3

Figure 4-10: Map of Cape Horn Gate Route Corridor



4

5 4.4.1.3 Alternative 6C – Fraser Gate Corridor

6 The Fraser Gate Corridor option involves the installation of approximately 7 km of NPS 20 (508 7 mm) IP gas line starting at Fraser Gate Station in the City of Vancouver (see yellow line) and 8 continuing east to a new IP/DP district station (shown in purple) located near the intersection of 9 Beresford Street and Buller Avenue in the City of Burnaby. A short connection would be 10 required between the district station outlet and the DP 700 kPa system. Refer to Figure 4-11 for 11 route map of the corridor.



1

Figure 4-11: Map of Fraser Gate Route Corridor



2

3 4.4.1.4 Alternative 6D – Sperling Avenue Corridor

4 As part of FEI's ongoing consultation and negotiation with the City of Burnaby, on July 31, 2020,

5 City of Burnaby staff requested that FEI investigate Alternative 6D. FEI has now completed its 6 investigation and analysis for Alternative 6D (the Sperling Route). The detailed route description

7 and analysis is provided below in Section 4.4.4.2.

8 4.4.2 Evaluation Of Alternatives 6A, 6B and 6C

9 Prior to the identification of Alternative 6D, FEI evaluated Alternatives 6A, 6B and 6C using nonfinancial and financial criteria. 10

11 The non-financial and financial evaluation criteria that FEI used to compare the three Overland

- 12 Gas Line route corridors are listed below and discussed in detail in Sections 4.4.2.1 and 4.4.2.2 13 below.
- 14 1. Non-Financial Criteria:
- 15 Schedule Impacts
- 16 Community, Indigenous and Stakeholder Impacts
- 17 Environmental and Archaeological Impacts •
- 18 2. Financial Criterion:
- 19
- 20
- Levelized Delivery Rate Impact

21 The replacement of FEI's distribution system resiliency was not included as a criterion in the 22 Overland Gas Line alternatives evaluation as all three route corridors would erode the existing



- system resiliency by requiring other major gate stations in the system to provide the capacity previously provided by the Pattullo Gas Line. Alternatives 6A and 6C will shift the Pattullo Gas Line load onto Coquitlam Gate and Fraser Gate, respectively, consuming a portion of the available capacity in the Transmission pressure gas lines feeding these stations and the IP gas lines leaving these stations. Similarly, Alternative 6B erodes resiliency by either:
- Consuming a portion of the transmission gas lines' capacity feeding Coquitlam Gate,
 thereby effectively limiting the available supply from Coquitlam Gate station should
 Fraser Gate fail; or
- Consuming a portion of the available capacity at the gas lines into or out of Fraser Gate
 should the Port Mann crossing supplying Cape Horn and Coquitlam Gate stations fail.
- 11
- 12 As described in Section 3.6, this results in Coquitlam Gate and Fraser Gate being unable to 13 support customers on cold winter days should either one of the stations be lost.
- 14 *4.4.2.1* Non-Financial
- 15 The following non-financial evaluation criteria were used to evaluate the three route corridors:
- 16 1. **Schedule Impacts:** the ability to ensure the new system will be in-service to meet the 17 MoTI schedule, impacted by several factors including:
- Estimated timelines for meaningful engagement to obtain the necessary permit
 approvals required for project execution; and
- Estimated timelines for construction with regard to municipal bylaws which restrict
 working hours, traffic management staging as required by the City, working in and
 around existing third party utilities and construction methodologies.
- Community, Indigenous and Stakeholder Impacts: each route corridor would have
 varying challenges that would affect the project from a cost and feasibility perspective
 including:
- Community infrastructure along the route corridor directly impacted during construction such as schools, hospitals, recreation centres, etc.;
- Private properties and businesses along the route corridors directly impacted during construction; and
- Indigenous communities directly impacted by Project.
- 31 3. Environmental and Archaeological Impacts: each route corridor would have varying
 32 challenges that would affect construction and the continued long term operation of each
 33 route corridor including:
- Presence of federally and/or provincially at-risk species, critical habitat, fish-bearing watercourses, or fish habitat;



- Presence of unique habitats or greenspaces (e.g., wetlands, parks or forested areas); and
 - Presence of known archaeological and/or heritage sites and relative importance to Indigenous groups (if known).
- 5 **4.4.2.2 Financial**

3

4

6 The following financial criterion was used to evaluate three route corridors:

 Levelized Delivery Rate Impact: Ability for an alternative to be completed with the lowest possible delivery rate impact over the approximate financial life of the asset (i.e., 68-year analysis period) for the PGR Project. Alternatives that minimize the levelized delivery rate impact to FEI's non-bypass customers score the highest.

11 FEI considered the long-term rate impact to FEI's non-bypass customers by financially 12 comparing the present value (PV) of the incremental revenue requirement as well as the 13 levelized delivery rate impact over the 68-year analysis period¹⁶ for the three Overland Gas Line 14 alternatives based on the estimated capital cost and operating cost. These cost estimates were based on information available in March 2020,¹⁷ and are considered to be AACE Class 5 15 16 estimates. The cost estimates were benchmarked against the LMIPSU Project. The LMIPSU 17 Project is a particularly relevant benchmark, as it was recently completed and faced similar urban construction challenges that would be expected for the three overland routes considered 18 19 for the PGR Project. For a fair comparison, future replacement costs in terms of sustainment 20 capital over the 68-year analysis period for each Overland Gas Line alternatives are included.

21 *4.4.2.3* Scoring and Weighting

22 Table 4-3 below shows the weighting applied for the PGR Project between non-financial and 23 financial criteria, and also shows the weightings within the non-financial and financial criteria as 24 described in Section 4.4.2 above. The weightings were determined through collaborative 25 discussions with FEI's subject matter experts. In order to meet the stringent PGR Project 26 schedule requirements driven by the Pattullo Bridge Replacement Project, FEI weighted 27 schedule impacts highest. For non-financial evaluation criteria, each overland alternative was 28 scored by subject matter leads based on system analysis and experience of similar projects 29 using a scale from 1 to 3 as defined in Table 4-4 below. For financial criteria, the Overland Gas 30 Line alternatives (6A, 6B and 6C) were evaluated from the lowest levelized delivery rate impact 31 to the highest using a scale from 1 to 3.

¹⁶ The 68-year analysis period is based on 65 years of post-project analysis period plus three prior years for the estimated construction schedule of the Project from 2020 to 2023 (when all new assets are in-service by 2023). The 65-year post-project analysis period is chosen based on the average service life (ASL) for the distribution main pool asset account (which includes the intermediate pressure pipelines) as shown in FEI's 2017 Depreciation Study, approved by BCUC Order G-165-20 as part of FEI's 2020-2024 Multi-Year Rate Plan (MRP) Application.

¹⁷ FEI's Class 5 cost estimate in this section for Alternative 6A does not take into account recent information gained from FEI's consultation and negotiations with the City of Burnaby over the course of 2020. Refer to Section 4.4.4.

	4	
1	1	

Table 4-3: Weightings within Non-Financial and Financial Criteria

Evaluation Criteria	Weighting
 <u>Non-Financial</u> Schedule Impacts Community, Indigenous and Stakeholder Impacts Environmental and Archaeological Impacts 	90% (54%) (22.5%) (13.5%)
Financial Levelized Delivery Rate Impact	10%

2

3

Table 4-4: Non-Financial Evaluation Scoring Definitions

Score	Impact Evaluation
3	Good Choice: Minimal concerns or risks with some positive impact
2	Acceptable Choice: Moderate concerns and risks; or medium positive impact
1	Poor Choice: Significant concerns or risks; no positive impact

4

5 4.4.2.4 Non-Financial Evaluation Summary

6 Table 4-5 below provides a summary of the weighted scores and a rationale for this scoring 7 against the non-financial evaluation criteria of Schedule Impacts, Community, Indigenous and 8 Stakeholder Impacts, and Environmental and Archaeological Impacts. For reasons outlined in 9 Table 4-5 below, Alternative 6A - Broadway and Gaglardi Way Route Corridor was found to be 10 superior to Alternatives 6B and 6C based on the highest weighted score using all non-financial 11 criteria. Furthermore, based on the significant schedule impacts (see reasons in Table 4-5 12 below), it was determined that Alternatives 6B and 6C would not meet Project schedule requirements and were therefore considered to be not feasible. 13

Table 4-5: Non-Financial Evaluation Summary of	Overland Gas Line Route Corridors
--	--

Criterion	Alternative 6A: Broadway & Gaglardi Way Corridor	Alternative 6B: Cape Horn Gate Corridor	Alternative 6C: Fraser Gate Corridor
	3	1	1
Schedule Impacts (Weighting – 60%)	 Project does not cross private land so no private land SRW negotiations are required Permitting required from one 	 Requires negotiations with private landowners for RoW access and is expected to be a lengthy process 	 Requires negotiations with private landowners for RoW access and is expected to be a lengthy process



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Criterion	Alternative 6A: Broadway & Gaglardi Way Corridor	Alternative 6B: Cape Horn Gate Corridor	Alternative 6C: Fraser Gate Corridor
	 Overall less congestion of third party utilities in route corridor compared to other alternatives 	 Increased complexity and coordination required due to permitting from two municipalities High congestion of third party utilities along/near United Boulevard leading to increased complexity for construction 	 Increased complexity and coordination required due to permitting from two municipalities High congestion of third party utilities along Buller Ave leads to increased complexity for construction
	3	1	1
Community, Indigenous and Stakeholder Impacts (Weighting – 25%)	 Less than 10 businesses potentially impacted Minimal impact to private lands 	 More than 100 businesses potentially impacted Some impacts to private lands 	 More than 50 businesses potentially impacted Significant impacts to private lands Impacts City of Vancouver without any system benefit to constituents
	1	1	3
Environmental and Archaeological Impacts (Weighting – 15%)	 Critical habitat for several at-risk species; however mitigation available through re-routing Several fish-bearing watercourses, including the Brunette River Crosses, or is located within close proximity to wetlands and riparian areas Known archaeological site; however, mitigation 	 Intersects with Critical Habitat in surrounding multiple watercourse, within the Brunette River Several watercourses are red-coded (fish- bearing) creeks Potential for encountering contaminated soil, or water Does not interact directly with any 	 Low environmental interactions Low likelihood of impacting fish or fish habitat No known archaeological or heritage sites



PATTULLO GAS LINE REPLACEMENT CPCN APPLICATION (EVIDENTIARY UPDATE DECEMBER 15, 2020)

Criterion	Alternative 6A: Broadway & Gaglardi Way Corridor	Alternative 6B: Cape Horn Gate Corridor	Alternative 6C: Fraser Gate Corridor
	available through micro-routing ¹⁸ , • Known heritage site	 known archaeological or heritage sites Close proximity to known sites in New Westminster and proximity to Fraser River increases likelihood of chance finds 	
Weighted Total ¹	2.7	1.3	1.3

<u>Note:</u>

¹ Weighted total is calculated for each alternative by multiplying the score for each criterion with its associated weighting and then summing the scores. The maximum possible weighted total is 3.

1 *4.4.2.5* Financial Evaluation Summary

2 Table 4-6 below shows the financial comparison between the three overland gas line route 3 corridors in terms of levelized delivery rate impact over a 68-year analysis period to FEI's non-4 bypass customers. As discussed in Section 4.4.2.3, the Overland Gas Line alternatives 5 (Alternatives 6A, 6B and 6C) were evaluated financially from the highest levelized delivery rate 6 impact to the lowest using a scale from 1 to 3 (i.e., a score of 3 for the lowest levelized rate 7 impact), which is also shown in Table 4-6 below. Based on their financial evaluation, Alternative 8 6A: Broadway and Gaglardi Way Corridor has the lowest levelized delivery rate impact to FEI's 9 non-bypass customers.

Table 4-6: Financial Evaluation Summary

	Alternative 6A: Broadway and Gaglardi Way Corridor	Alternative 6B: Cape Horn Gate Corridor	Alternative 6C: Fraser Gate Corridor
Total Capital Costs, AACE Class 5, 2019 (\$ millions)	122.2	184.3	167.3
PV of Incremental Revenue Requirement ¹⁹ over 68 years (\$ millions)	125.6	189.6	171.2

¹⁸ Micro-routing analysis will be conducted during the detailed design phase of the Project.

¹⁰

¹⁹ The incremental revenue requirements have been discounted at the after tax cost of capital based on FEI's capital structure, rate of return, and income tax rate for 2021 as approved under BCUC Order G-319-20.



PATTULLO GAS LINE REPLACEMENT CPCN APPLICATION (Evidentiary Update December 15, 2020)

	Alternative 6A: Broadway and Gaglardi Way Corridor	Alternative 6B: Cape Horn Gate Corridor	Alternative 6C: Fraser Gate Corridor
Levelized Delivery Rate Impact over 68 years (in \$/GJ)	0.036	0.055	0.049
Average Residential UPC (in GJ/yr)	90	90	90
Average Residential Bill Impact per year over 68 years (in \$)	3.2	5.0	4.4
Financial Evaluation Score	3	1	2

1 *4.4.2.6* Summary of Assessment of Alternatives 6A, 6B and 6C

- 2 The following Table 4-7 provides a summary of FEI's assessment of the three route corridors
- 3 against all evaluation criteria.

Table 4-7: Overall Alternative Evaluation Summary

Criterion	Weighting	Alternative 6A: Score	Alternative 6B: Score	Alternative 6C: Score
Schedule Impacts	54%	3	1	1
Community, Indigenous and Stakeholder Impacts	22.5%	3	1	1
Environmental and Archaeological Impacts	13.5%	1	1	3
Rate Impact	10%	3	1	2
Weighted Score: ¹	100%	2.73	1	1.37

- 5 <u>Note:</u>
- Weighted total is calculated for each alternative by multiplying the weighted score for each criterion
 with its associated overall weighting, and then summing these scores. The maximum possible
 weighted total is 3.

9 FEI's evaluation of the three Overland Gas Line route corridors against the financial and non10 financial weighted criteria (as shown in table above), the Broadway and Gaglardi Way Corridor
11 had the overall least schedule, community, and financial impact based on AACE Class 5 capital
12 cost estimates.

⁴

4.4.3 Ongoing Consultation and Negotiation with City of Burnaby

2 FEI first presented Alternative 6A to the City of Burnaby staff on February 11, 2020 and has 3 continued to consult and negotiate with the City since that time. Over the course of 2020, FEI 4 has discussed with the City the merits of the identified route in the Broadway and Gaglardi Way 5 Corridor - the Gaglardi Route. On July 20, 2020 City of Burnaby Council passed a 6 recommendation brought forward by the City's Finance Management Committee to "oppose the 7 proposed FortisBC Pattullo Gas Line Replacement Project pipeline route through Burnaby".²⁰ On July 31, 2020, the City requested that FEI investigate a new route on Sperling Avenue in the 8 9 City of Burnaby - the Sperling Route. FEI investigated and developed the Sperling Route to an AACE Class 4 level of definition. 10

11 4.4.4 Evaluation of Feasible Alternatives: Gaglardi Route and Sperling Route

12 This section describes Alternative 6A (Gaglardi Route) and Alternative 6D (Sperling Route) as 13 developed to an AACE Class 4 level and sets out FEI's analysis of the two alternatives based 14 on the financial and non-financial criteria described in Section 4.4.2.3 above. Based on the 15 analysis presented below, FEI chose the Sperling Route as its preferred alternative.

16 *4.4.4.1* Description and Analysis of Alternative 6A at a Class 4 Level

FEI's analysis of Alternative 6A in Sections 4.4.1 and 4.4.2 above was based on a Class 5 level of definition to facilitate an "apples-to-apples" comparison at the same estimating level for Alternatives 6A, 6B and 6C. The Class 5 estimate was based on the routing as presented in Figure 4-9, and did not take into account information gained from FEI's further consultation and other activities as it developed a Class 4 estimate for that route.

To develop a Class 4 cost estimate, FEI progressed the Broadway and Gaglardi Way Corridor to a feasible route following industry practices. The alignment of the route was further refined through desktop analysis and feedback from engagement and consultation with stakeholders. Other activities completed by FEI on Alternative 6A included preparing preliminary crossing lists and methodologies, completing desktop traffic management studies, completing a preliminary constructability review, and risk identification and quantification.

Figure 4-12 below shows the Class 4 Gaglardi Route compared to the Class 5 Gaglardi Route presented in Figure 4-9 above. The Class 4 Gaglardi Route reflects two key changes:

First, FEI adjusted the route to avoid the Burnaby Lake Regional Nature Park, and instead progressed on Cariboo Road and 16th Avenue in Burnaby. This route change was made primarily to avoid environmentally sensitive wetlands and riparian areas, and the Cariboo Conservation area, limiting impacts to species at risk and associated lengthy

²⁰ See Burnaby Council Minutes, Page 7 Section 4.8. Online: <u>https://pub-burnaby.escribemeetings.com/FileStream.ashx?DocumentId=47967</u>

- permitting requirements. However, it results in additional urban construction activities on arterial roadways causing increased cumulative traffic impacts.
 - Second, in response to feedback from the City of Burnaby that it could not accommodate the location of the PRS, FEI relocated the PRS for the Gaglardi Route to the City of New Westminster. This results in an additional 500 metres of gas line construction along the route and permit requirements from two municipalities.

Figure 4-12: Map of Class 4 Gaglardi Route

Broadway & Gaglardi Way Broadway & Gaglardi Way Corridor (Class 5) Revised Gaglardi Route (Class 4)

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7 8

As shown in Figure 4-12 above, the Class 4 revised Gaglardi Route involves the installation of approximately 5.5 kilometres of NPS 20 (508 mm) IP gas line in the City of Burnaby and would tie into the newly constructed NPS 30 (762 mm) LMIPSU gas line near the intersection of





- 1 Broadway and Gaglardi Way. It would then travel south on the west side of Gaglardi way
- 2 towards Trans-Canada Highway 1 (TCH1), where it would encounter several major crossings:
- 3 Eastlake Drive, Lougheed Highway, Government Street, BNSF Railway and the Brunette River.
- 4 The gas line would cross TCH1 on the east side of the Cariboo Road Overpass by an auger
- 5 bore and proceed along Cariboo Road to 16th Avenue. The gas line would then travel westerly
- 6 on 16th Avenue to Newcombe Street and head south towards the City of New Westminster. The
- 7 gas line would cross 10th Avenue and proceed to the inlet of the PRS near the intersection of
- 8 McBride Boulevard and 10th Avenue. A short 700 kPa gas line would connect the PRS to the
- 9 trunk distribution system.

10 *4.4.4.2* Alternative 6D Description and Analysis

11 As shown in Figure 4-13 below, the Sperling Route option involves the installation of 12 approximately 5.6 kilometres of NPS 20 (508 mm) IP gas line in the City of Burnaby.

The Sperling Route ties into the newly constructed NPS 30 (762 mm) LMIPSU gas line at Lougheed Highway and Sperling Avenue. The IP gas line would then continue south along Sperling Avenue towards TCH1 and cross the BNSF Railway and Still Creek. The gas line would then cross TCH1 between Sperling Avenue and Nursery Street by an auger bore and proceed along Lakefield Drive and 4th Street and continue to the inlet of the PRS near the intersection of 16th Avenue and 4th Street. A short 700 kPa gas line would connect the PRS to the trunk distribution system. Refer to Figure 4-13 below for a map of the route.



Figure 4-13: Map of the Sperling Route



2

FEI's investigation into the Sperling Route identified a number of technical and stakeholder challenges requiring several studies and discussions. The poor soil conditions in the Burnaby Lake area are characterized by very soft peat (i.e. potentially unstable soils) and a high ground water table presenting challenges during construction and ongoing operations and maintenance of the gas line. The route would also impact assets managed by MoTI, BC Hydro and traverse Metro Vancouver's Burnaby Lake Regional Park

8 Metro Vancouver's Burnaby Lake Regional Park.

9 *4.4.4.3* Further Review Confirmed Alternative 6C Not Feasible

FEI conducted a further review of Alternative 6C at the request of the City of Burnaby and determined that additional routing activities would not improve Alternative 6C's feasibility. Routing could not circumvent the challenging land negotiations, permitting with multiple municipalities and congested utility corridor construction that significantly impacted the feasibility of the corridor. The challenges with Alternative 6B could also not be overcome by further review.



1 4.4.4.4 Evaluation of Alternatives 6A and 6D

2 Using the evaluation criteria and weighting previously discussed in Section 4.4.2, FEI re-

evaluated Alternative 6A and evaluated Alternative 6D using updated route information as of
 November 2020.

5 4.4.4.4.1 NON-FINANCIAL EVALUATION OF ALTERNATIVES 6A AND 6D

6 Table 4-8 below provides a summary of the weighted scores and a rationale for this scoring 7 against the non-financial evaluation criteria of Schedule Impacts, Community, Indigenous and 8 Stakeholder Impacts, and Environmental and Archaeological Impacts. FEI conducted the 9 analysis based on the updated routes at Class 4 project definition, which includes the impacts of 10 the routing changes to Alternative 6A described in section 4.4.4.1 above.

11

Table 4-8: Non-Financial Evaluation Summary of Alternatives 6A and 6D

Criterion	Alternative 6A: Gaglardi Route (Class 4)	Alternative 6D: Sperling Route (Class 4)	
	2	3	
Schedule Impacts (Weighting – 60%)	 Permitting required from two municipalities, with strong opposition Requires negotiations with a few private landowners for RoW and temporary access Low level of congestion of third party utilities in route corridor Potential coordination conflict with the Trans Mountain Expansion Project 	 Project does not cross private land; no private land SRW negotiations are required. Land discussions with various permitting agencies required. Permitting required from one municipality, that is supportive Highest level of construction productivity Overall least congested alternative, fewest number of utility crossings 	
	2	3	
Community, Indigenous and Stakeholder Impacts (Weighting – 25%)	 Significant traffic impacts, including cumulative impacts from other previous (LMIPSU) and planned (non-FEI) projects in proximity to the Gaglardi Route Multiple schools, churches and care facilities potentially impacted Less than 10 businesses potentially impacted Minimal impact to private lands 	 Less than 10 businesses potentially impacted Minimal impact to private lands Impacts to access to community and recreation centres Localized traffic impacts only 	
Environmental and	3	2	
Archaeologicai Impacts	 Critical habitat for several at-risk species; however mitigation available through project design 	 Critical habitat for several at-risk species; however mitigation available through project design 	



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Criterion	Alternative 6A: Gaglardi Route (Class 4)	Alternative 6D: Sperling Route (Class 4)	
(Weighting – 15%)	 Several fish-bearing watercourses, including the Brunette River Known archaeological site; however mitigation available through project design 	 Several fish-bearing watercourses, including Still Creek Water management concerns (dewatering and disposal) Crosses, or is located within close proximity to, wetlands and riparian areas Potential for encountering contaminated soil, or water No known archaeological or heritage sites 	
Weighted Total ¹	2.15	2.85	
<u>Note:</u> ¹ Weighted total is calculated for each alternative by multiplying the score for each criterion with its associated weighting and then summing the scores. The maximum possible weighted total is 3.			

1

2 For the reasons outlined in Table 4-8 above, Alternative 6D was found to be superior to 3 Alternative 6A based on the highest weighted score using all non-financial criteria.

4 4.4.4.2 FINANCIAL EVALUATION OF ALTERNATIVES 6A AND 6D

Alternative 6A (Gaglardi Route) and Alternative 6D (Sperling Route) were developed to an
AACE Class 4 cost estimate. The refined cost estimate took into consideration the development
activities of each route from the technical progression as well as feedback from engagement
and consultation with stakeholders, landowners and the community.

9 Table 4-9 below shows the financial comparison between Alternative 6A (Gaglardi Route) and 10 Alternative 6D (Sperling Route) in terms of levelized delivery rate impact over a 68-year analysis 11 period to FEI's non-bypass customers. While the levelized delivery rate impact to FEI's non-12 bypass customers for Alternative 6A is lower than Alternative 6D, the difference is minimal at 13 0.01 percent. Given the accuracy range of the AACE Class 4 estimates,²¹ FEI considers that 14 the two alternatives are equivalent when compared financially. As such, FEI scored the two 15 alternatives equally for the financial evaluation comparing Alternatives 6A and 6D.

Details of the financial analysis for Alternatives 6A and 6D can be found in ConfidentialAppendices G-1 and G-2, respectively.

²¹ AACE Class 4 estimate expected accuracy range: Low: -15% to -30%, High: +20% to +50%.

1

Table 4-9: Financial Evaluation Summary

	Alternative 6A: Gaglardi Route (Class 4)	Alternative 6D: Sperling Route (Class 4)
Total Capital Costs, AACE Class 4, 2020 (\$ millions)	173.313	175.354
PV of Incremental Revenue Requirement ²² over 68 years (\$ millions)	176.881	178.560
Levelized Delivery Rate Impact over 68 years (in %)	1.13%	1.14%
Levelized Delivery Rate Impact over 68 years (in \$/GJ)	0.0510	0.0515
Average Residential UPC (in GJ/yr)	90.00	90.00
Average Residential Bill Impact per year over 68 years (in \$)	4.59	4.64
Financial Evaluation Score	3	3

2

3 4.4.4.4.3 SUMMARY OF ASSESSMENT OF ALTERNATIVES 6A AND 6D

4 The following Table 4-10 summarizes FEI's assessment of the two route alternatives against all

- 5 evaluation criteria.
- 6

Table 4-10: Overall Alternative Evaluation Summary

Criterion	Weighting	Alternative 6A: Gaglardi Route (Class 4)	Alternative 6D: Sperling Route (Class 4)
Schedule Impacts	54%	2	3
Community, Indigenous and Stakeholder Impacts	22.5%	2	3
Environmental and Archaeological Impacts	13.5%	3	2
Rate Impact	10%	3	3
Weighted Score: ¹	100%	2.24	2.87

7 <u>Note:</u>

8 ¹ Weighted total is calculated for each alternative by multiplying the weighted score for each criterion with its associated overall weighting, and then summing these scores. The maximum possible weighted total is 3.

²² The incremental revenue requirements have been discounted at the after tax cost of capital for FEI based on FEI's capital structure, rates of return, income tax rate for 2021 as approved under BCUC Order G-319-20.



- 1 FEI's evaluation of the two Overland Gas Line routes against the financial and non-financial
- 2 weighted criteria, as shown in Table 4-10 above, demonstrates that Alternative 6D, the Sperling
- 3 Route, has the highest overall weighted score.
- 4 Based on the above analysis, FEI has selected Alternative 6D, the Sperling Route, as its
- 5 preferred route for the Project.



FORTISBC ENERGY INC. PATTULLO GAS LINE REPLACEMENT CPCN APPLICATION (EVIDENTIARY UPDATE DECEMBER 15, 2020)

1 5. PROJECT DESCRIPTION

2 **5.1** *INTRODUCTION*

In this section, FEI describes how it has appropriately designed, engineered and planned the PGR Project in accordance with industry practice and external standards. FEI has developed the project scope, schedule and cost estimate to an appropriate level of definition, and identified risk mitigation activities to mitigate the overall cost and schedule risk of the Project.

- 7 In the following sections, FEI describes the PGR Project in detail as follows:
- Section 5.2 provides an overview of the required Project components to address the PGR Project need;
- Section 5.3 describes FEI's route selection process which includes the evaluation criteria used by FEI to assess the feasible route options considered by FEI;
- Section 5.4 provides the basis of design and engineering, conducted in accordance with
 British Columbia Oil and Gas Commission (BCOGC) regulations and industry standards;
- Section 5.5 explains FEI's approach to construction management for the PGR Project;
- Section 5.6 describes the timing of key Project activities that FEI will undertake to complete the PGR Project prior to decommissioning of the existing Pattullo Gas Line in Q1 2023;
- Section 5.7 outlines FEI's assessment of the required resources to complete the Project;
- Section 5.8 explains how FEI has identified key Project impacts and is taking a reasonable and appropriate approach to mitigate those impacts;
- Section 5.9 explains that FEI has identified the key permits and regulatory approvals that are required to construct the Project; and
 - Section 5.10 provides the basis of the cost estimate, and the processes undertaken to validate the cost estimate including risk assessment and contingency.

25 5.2 FEI HAS IDENTIFIED NECESSARY PROJECT SCOPE

- 26 The Project scope includes the routing, design, construction and commissioning of:
- 5.6 km of new NPS 20 (508 mm) gas line that will operate at a Maximum Operating
 Pressure (MOP) of 2,070 kPa;
- A new underground district pressure regulating station (PRS) near the intersection of 16th Avenue and 4th Street in the City of Burnaby; and
- 50 metres of new NPS 20 (508 mm) gas line that will operate at a MOP of 700 kPa to connect the PRS to the existing trunk distribution system.

23



- 1 The Project scope will also include the modification, decommissioning and/or abandonment of
- 2 existing infrastructure no longer required due to the removal of the Pattullo Gas Line crossing of
- 3 the Fraser River. This includes:
- Abandoning and removing the Pattullo Gate Station in the City of Surrey and approximately 800 metres of NPS 20 (508 mm) gas line operating at a MOP of 700 kPa affixed to the Pattullo Bridge;
- Abandoning in place approximately 1.2 km of the remaining NPS 20 (508 mm) gas line operating at a MOP of 700 kPa from the Pattullo Gate Station to the intersection of McBride Boulevard and Royal Avenue; and
- Modifying approximately 5.5 km of the Livingston to Pattullo NPS 18 (457 mm) (LIV PAT 457) transmission gas line and associated work due to the removal of the Pattullo Gate Station.

13 5.3 FEI HAS APPROPRIATELY EVALUATED AND SELECTED A ROUTE FOR THE 14 PREFERRED ALTERNATIVE

FEI's route selection and design process for the PGR Project follows industry practice and
considers the recommendations of the Canadian Standards Association standard CSA Z662:19
Oil & Gas Pipeline Systems, which is the standard specification for the design, construction,
operation, and maintenance of Canadian gas lines.

Gas line routing is an iterative process starting with a wide 'corridor of interest' and then narrows this corridor to a more defined route at each design phase as more data is acquired, resulting in a final alignment. The process has been tailored to meet the challenges associated with development, land use, terrain, watercourses, infrastructure, local permits and regulations, the environment, archaeology as well as impacts to communities, stakeholders and Indigenous groups. Based on these considerations, FEI has determined that the final route selected must meet the following objectives:

- Safe (to construct and to operate);
- Minimize impacts to the community, stakeholders and Indigenous groups;
- Minimize environmental impacts;
- Maximize the use of modern standard gas line construction techniques; and
- Minimize cost and therefore rate impacts to customers.
- 31

The sections below outline how FEI applied and evaluated the routing objectives, including a two-step route selection process, which includes an assessment of the feasible options to determine the final route. More details on FEI's route selection process are contained in the "Pipeline Routing Criteria and Evaluation Report", P-00758-PIP-REP-0062, included in Appendix C-1.


Step One: Route Corridor Identification 1 5.3.1

2 The initial step in the routing process is a "desktop study" to identify a suitable corridor between 3 the start and end points of the gas line that can meet the routing objectives. Natural terrain 4 conditions, along with current and planned infrastructure development are identified to assist in 5 determining the width of the corridor and the degree of complexity expected with regard to 6 environmental, permitting, engineering and constructability aspects. The corridor width is 7 adjusted to ensure feasible route options within the corridor are available.

8 Figure 5-1 below shows a map of the identified corridor shaded in yellow, with the existing FEI 9 Lower Mainland Intermediate Pressure System Upgrade (LMIPSU) NPS 30 gas line in blue at 10 the top and the existing trunk distribution system in blue at the bottom. The objective of the PGR Project is to construct a north to south gas line connection between these two systems within

- 11
- the identified corridor. 12
- 13



Figure 5-1: Step One – Identified Corridor

15 5.3.2 Step Two: Feasible Route Options Determination and Evaluation

The second step, after a route corridor is identified, involves gathering data to determine 16 17 feasible route options within the corridor. The route options are refined through examination of



- aerial photography, mapping data, survey, environmental studies and major crossing constraint
 assessments as well as feedback from consultation and engagement with stakeholders and
- 3 Indigenous groups.
- 4 At the end of step two, four route options were further evaluated against the routing criteria and
- 5 objectives (as described in detail in Section 5.3.2.2) and the preferred route was selected.

6 *5.3.2.1* Assessment of Feasible Route Options

Following the identification of feasible route options, evaluation criteria were established to
 select a preferred route. FEI evaluated each route option using both quantitative and qualitative
 criteria.

10 5.3.2.2 Evaluation Criteria

- 11 The three broad categories of principles and considerations that were taken into account during
- 12 the route options evaluation are listed and defined in Table 5-1 below.
- 13

Table 5-1: Gas Line Route Evaluation Criteria Definitions

Category 1: Community and Stakeholder Considerations			
Health and Safety	Considers the risks to the community, stakeholders, employees, and contractors during construction and during the life of the gas line.		
Traffic Impacts	Considers the direct and indirect effects of the Project on traffic and commercial/residential access during construction of the gas line.		
Socio-Economic	Considers the effect of the Project on the cultural values, economic well-being, and daily life for local stakeholders and citizens during construction and during the life of the gas line.		
	Category 2: Environmental Considerations		
Ecology	Considers the impact during construction and during the life of the gas line to the environment including environmentally sensitive areas along the project corridor.		
Cultural Heritage	Considers the impact during construction and during the life of the gas line to known archaeology and culturally sensitive areas at the project site.		
Human Environment	Considers the impact of the Project to the human environment including noise, local emissions, aesthetics, nuisance factor and the short and long-term effects that may be observed by residents and visitors in the project area.		
Category 3: Technical Considerations			
Construction	Considers the existing above and belowground constraints in terms of gas line construction activities, pipe-laying productivity, requirements for non-standard higher risk construction techniques, and construction footprint.		
Operation	Considers long-term impacts including those to employees and contractors to maintain the gas line integrity and complete maintenance and repairs. Also considers impacts to adjacent development and third party land ownership and use.		
Adjacent Infrastructure	Considers the potential impacts on adjacent (existing and planned) facilities and buried/above ground utility infrastructure and risk to longevity and safe operation of the gas line and facilities from adjacent infrastructure.		
Project Execution Certainty	Considers the impact of compounding risks associated with the criteria in Categories 1, 2 and 3.		



1 *5.3.2.3* Weighting and Methodology

- 2 Each evaluation criterion was given a weighted score as outlined in Table 5-2 below, in order to
- 3 quantify the relative merits of each option.
- 4

Table 5-2:	Gas Line Route	Evaluation	Weighting ²³
------------	----------------	------------	-------------------------

Criterion	Weighting	Evaluation			
Community and Stakeholder Considerations Weighting					
Health and Safety	10	Assessment of the construction zone environment, nature of the planned construction activities and proximity to vulnerable entities.			
Traffic Impacts	12.5	Roadway usage impacts, number of intersections impacted, number of commercial accesses impacted, etc.			
Socio-Economic	7.5	Properties and businesses directly impacted during construction and nature of impacts, community infrastructure impacted (e.g. schools, hospitals, recreation centers, etc.)			
Sub-total:	<u>30</u>				
	Environme	ntal Considerations Weighting			
Ecology	5	Natural and environmentally sensitive areas impacted.			
Cultural heritage	5	Culturally sensitive areas impacted.			
Human Environment	12.5	Nature and proximity of visual, noise and vibration impacts, residential accesses impeded, etc.			
Sub-total:	<u>22.5</u>				
	Technic	al Considerations Weighting			
Construction	15	Type of construction required, pipe installation productivity, length of gas line, and overall construction footprint, etc.			
Operation	10	Areas of potential operational difficulty identified.			
Adjacent infrastructure	10	Type of adjacent infrastructure, proximity and spacing, planned infrastructure, ability to manage sufficient clearances, etc.			
Project Execution Certainty	12.5	An evaluation of impacts such items as regulatory permitting, timeline/schedule, budget certainty, scope certainty, environmental and archaeological impacts, geotechnical conditions and various constructability considerations (including resources).			
Sub-total:	<u>47.5</u>				
Total	100				

5

6 FEI used a five-point ranking for scoring the route options. The scoring is outlined in Table 5-37 below.

²³ Please refer also to the criteria definitions in Table 5-1.

Score	Impact Evaluation
5	Very low (negligible) impact, best choice
4	Low impact, better choice
3	Moderate impact, good choice
2	High negative impact, poor choice
1	Very high negative (unacceptable) impact, not feasible

Table 5-3: Route Evaluation Scoring

2

3 FEI implicitly considered cost within the Community and Stakeholder, Environmental and 4 Technical evaluation criteria. In general, routing that minimizes impacts to all criteria without 5 adding extensive length would result in the lowest cost.

6 5.3.2.4 Feasible Route Evaluation

FEI divided the route corridor into three segments with alternative alignments based ongeographic features and construction constraints. The three segments include:

- 9 1. North of Trans-Canada Highway 1 (TCH1);
- 10 2. Crossing of TCH1; and
- 11 3. South of TCH1.

12

Two key determining factors for the alignment were the PRS and TCH1 crossing locations. To identify PRS locations, FEI considered land use zoning, proximity to alternative alignments, stakeholder feedback and accessibility. The four locations that FEI identified were:

- 16 A. Mayfield intersection of Mayfield Street and Canada Way;
- 17 B. Edmonds intersection of Edmonds Street and Canada Way;
- 18 C. Graham intersection of 16th Street and 4th Avenue; and
- 19 D. Elwell intersection of Elwell Street and Hill Avenue.

20

21 The segments, PRS locations, and gas line route alternatives are presented below in Figure 5-





Figure 5-2: Step Two – Feasible Route Segments

2

3 5.3.2.5 PRS Location Evaluation

4 FEI applied the evaluation criteria developed in Section 5.3.2.2 and the weighting and scoring 5 developed in Section 5.3.2.3, which resulted in the individual PRS scores shown in Table 5-4

6 below.

Table 5-4:	PRS Evaluation Scores

Locations	Community and Stakeholder Considerations	Environmental Considerations	Technical Considerations	Total
Mayfield	2.3	2.7	2.5	2.5
Edmonds	3.0	3.0	3.4	3.2
Graham	3.8	3.4	4.2	3.9
Elwell	3.2	3.0	2.2	2.7

2

3 The PRS location selection process ranking indicated that the preferred PRS location is Graham

4 (near the intersection of 16th Avenue and 4th Street), highlighted in green in the Table 5-4 above.

5 Details of the individual scores are provided in the Facility Site Selection Report, P-00758-BLD-

6 REP-0003, included in Appendix C-1.

7 5.3.2.6 Gas Line Route Evaluation

8 FEI applied the evaluation criteria developed in Section 5.3.2.2 and the weighting and scoring

9 developed in Section 5.3.2.3, which resulted in the individual segment scores shown in Table 5-

10 5 below. The highest ranked option for each segment is highlighted in green in the table.

11

Table 5-5: Segment Evaluation Scores²⁴

Alternative	Community and Stakeholder Considerations	Environmental Considerations	Technical Considerations	Total		
	Segment 1 –	North of TCH1				
Sperling Avenue	2.7	3.0	2.5	2.7		
	Segment 2 – C	Crossing of TCH1				
Sperling Avenue	2.1	3.0	2.0	2.3		
McCarthy Court	3.2	3.0	2.8	3.0		
Rayside Street	2.8	3.8	2.4	2.9		
Nursery Street	3.3	3.8	3.6	3.5		
	Segment 3 – South of TCH1					
Nursery Street -> Lakefield Drive -> PRS	3.4	3.2	3.6	3.5		
Nursery Street -> Canada Way -> PRS	2.4	4.0	3.0	3.1		
McCarthy Court -> Canada Way -> Nursery Street -> Lakefield Drive -> PRS	3.4	3.2	3.3	3.3		
McCarthy Court -> Canada Way -> PRS	2.4	4.0	3.0	3.1		

²⁴ The segment evaluation scoring was based on a maximum of 5 points.



- 1 The routing process and ranking indicated that the preferred route includes Sperling Avenue for
- 2 Segment 1, the Nursery Street crossing of TCH1 for Segment 2, and Lakefield Drive for
- 3 Segment 3. Details of the individual scores are provided in the Pipeline Routing Criteria and
- 4 Evaluation Report, P-00758-PIP-REP-0062, included in Appendix C-1.

5 A complete gas line Construction Alignment and Temporary Workspace Strategy Plan of the preferred route is available in P-00758-PIP-MAP-0109 to P-00758-PIP-MAP-0126 in Appendix 6 7

C-2.

8 **Final Route Development** 5.3.3

9 The final stage of the routing process will occur during the detailed design phase, which is 10 scheduled for completion as shown in Table 5-10 below. This will involve a detailed field 11 investigation of the route and the environment in which the gas line is to be constructed.

- 12 Detailed engineering, geotechnical engineering, and environmental specialist review, with 13 appropriate agreements from Indigenous groups, landowners and stakeholders will confirm the 14 specific locations for mainline pipe, the PRS site, cathodic protection (CP) equipment sites, and
- 15 main line valve sites within the preferred Sperling route corridor.
- 16 FEI will continue to engage the City of Burnaby, stakeholders and third parties to obtain further
- 17 details of any known or expected developments or encroachments along the route, the location
- 18 of underground obstructions, pipelines, services and structures and all other pertinent data. FEI
- 19 will complete traffic impact assessments as required in consultation with the City of Burnaby and
- 20 the Ministry of Transportation and Infrastructure. FEI will also obtain stakeholder, local
- 21 jurisdiction and government approvals in accordance with statutory requirements.

22 The outcome of the final stage of the routing process will comprise a confirmed gas line route 23 and complete list of the affected landowners and stakeholders, which will facilitate finalizing the

24 scope of work and detailed construction execution plans.

25 5.4 **BASIS OF DESIGN AND ENGINEERING**

26 In this section, FEI demonstrates how industry practice and external standards have been 27 considered and incorporated into the Project design to ensure that the assets will operate safely 28 and reliably.

29 5.4.1 **Standards and Specifications**

- 30 The design, construction and operation of FEI's natural gas lines and stations are in accordance 31 with BCOGC regulations and CSA Z662 standards.
- 32 The overall PGR Project will be developed in accordance with all applicable statutory codes and
- 33 standards including FEI's internal standards. A list of applicable codes, standards, specifications
- 34 and procedures are available in P-00758-PIP-LST-0004 in Appendix C-1.



1 5.4.2 Gas Line Design

The proposed new gas line will operate at 2,070 kPa and be able to meet the capacity needs of the Cities of Burnaby, New Westminster and Coquitlam resulting from the demolition of the current Pattullo Gas Line crossing. The proposed gas line traverses approximately 5.7 km in a north to south alignment along Sperling Avenue, Glencarin Drive, Lakefield Drive and 4th Avenue in the City of Burnaby primarily along municipal road allowance.

7 5.4.2.1 Design Parameters

8 This section specifies the gas line design parameters, and requirements that are taken into 9 account for the new gas line, and available in detail in the Preliminary Pipeline Design Basis 10 Memorandum in P-00758-PIP-DBM-0003 in Appendix C-1.

11

Table 5-6: PGR 508 Gas line Specification Details

Details	Values
Gas line Length	5,637 metres
Gas line Outside Diameter/Nominal Pipe Size	508 mm/NPS 20
Maximum Operating Pressure (MOP)	2,070 kPa (300 psi)
Gas line Material Grade/Specified Minimum Yield Strength (SMYS)	414 MPa (X60)
Gas line Buried Depth (to top of pipe)	Minimum 1.2 metres
Design Temperature	54 degC
Pipe External Coating	CSA Z245.20-18 Fusion Bond Epoxy

12

13 5.4.2.2 Pipe Specification

The pipe specification process for the new gas line follows accepted industry practices, and meets all relevant code requirements, specifically those in the CSA Z662 Oil and Gas Pipeline Systems standard. The wall thickness selection criteria for the new gas line are based on several factors outlined in CSA Z662. The wall thickness selection is based on the following:

- Consideration of any proposed crossings and minimum wall thickness requirements for the specific crossing type;
- Consideration of pipe thinning during the induction bending process; and
- Consideration of stresses induced during construction methodologies, e.g. horizontal directional drilling.

23

A consistent wall thickness was selected in order to better accommodate gas line inline inspection (ILI) operations, to ease constructability (through minimization of transition pieces and welds), and to maximize cost saving opportunities during the pipe production.

1 The design parameters for the new gas line are presented in Table 5-7 below.

2

Table 5-7: Gas Line Design Parameters

Parameter	Value		
Gas Line Product	Odourized Sweet Natural Gas		
Design Flow Rate	102,000 m³/hr		
Maximum Operating Pressure	2,070 kPag		
Certified Operating Pressure	2,070 kPag		
Maximum Operating Temperature	All New Pipes	54 degC	
Minimum Design Metal Temperature	Above Grade	Minus 45 degC	
Minimum Design Metar Temperature	Below Grade	Minus 5 degC	
	Above Grade	5 degC	
Minimum Design Restraint Temperature	Below Grade (non-winter installation)	5 degC	
	Below Grade (winter installation)	Minus 5 degC	

3

Pipe for the project will comply with the CSA Z245.1 Steel Pipe standard and have an outside diameter of 508 mm, a wall thickness of 9.5mm, and use Grade 414 Category II M5C steel. The pipe will be designed for an operating hoop stress less than 30 percent SMYS to meet all CSA Z662 Clause 12 distribution conditions. The conservative grade and wall thickness selection is subject to a fracture control analysis to be completed during detailed design. Complete details of the mainline pipe selection process is available in the NPS 30 MLV Data Sheet in P-00758-PIP-

DSH-0002 and Pipe Wall Thickness Selection Memo in P-00758-PIP-MEM-0019 in Appendix C 1.

12 5.4.2.3 North Takeoff

The proposed gas line start point is located near the intersection of Lougheed Highway and Sperling Avenue in the City of Burnaby. This location is at kilometre point 11.5 along the existing LMIPSU NPS 30 (762 mm) gas line. The North Takeoff will include an underground mainline valve assembly to sectionalize the LMIPSU gas line and isolate the new gas line. Details of this installation are provided in Drawing 94413-M-100-3000 in Appendix C-2.

18 **5.4.2.4 Block Valves**

19 A block valve serves as a means to isolate individual sections of the gas line and stop the flow

of gas if required during normal operation and maintenance or in case of emergencies. If two or

21 more of these valves are closed simultaneously, the resulting gas line 'shut-in' stops the flow of

22 gas through the section of gas line.

Block valves will be located at the North Takeoff location and at the inlet to the 16th Street and
 4th Avenue PRS.



1 5.4.2.5 In-line Inspection

- 2 ILI is a process that utilizes the pipeline gas flow and pressure to propel an inspection tool within
- 3 the gas line. There are a number of types of ILI tools that can be used to detect and size a 4 variety of gas line anomalies, including corrosion, mechanical damage, and cracking.

5 Due to the longevity of steel gas lines, it is appropriate to design the new gas line with 6 provisions for ILI capability. This will enable the cost effective and targeted mitigation of specific 7 gas line hazards (i.e. corrosion) over the service life of the new asset. For further details, see 8 the Preliminary Pipeline Design Basis Memorandum, P-00758-PIP-DBM-0003, in the Appendix 9 C-1.

10 To facilitate ILI, the PGR Project gas line design must incorporate certain features and 11 mechanical components such as avoiding use of tight radius pipe bends, wall thickness 12 transitions, and ensuring that all fittings and appurtenances (e.g. valves, tees) allow for 13 consistent and reliable passage of ILI tools to maximize data collection.

14 5.4.2.6 Corrosion Protection

15 EXTERNAL COATING

External coatings provide the first level of defence against external corrosion of buried steel piping, and are required by the CSA Z662 standard. Coating protection involves the application of a layer of factory applied high electrical resistance material to the outside of the pipe to create a barrier between the steel pipe surface and the soil. Protective coatings are applied after pipe manufacture and prior to delivery for construction. There are different coating materials available depending on the specific operating requirements.

Fusion Bonded Epoxy (FBE) has been selected as the most appropriate coating for the new gas
line. FBE is factory applied under strict quality control practices as required by CSA Z245.20
Plant Applied External Fusion Bond Epoxy Coating for Steel Pipe. FBE coatings are considered
"fail safe" as they will not shield CP current in the case of potential coating damage,
deterioration, or loss of adhesion.

27 For further details see the Coating Selection Report, P-00758-PIP-REP-0009 in Appendix C-1.

28 CATHODIC PROTECTION

29 Cathodic Protection (CP) is required and applied as a secondary defense against external

- 30 corrosion and is used in conjunction with external coatings. Primary corrosion control of the new
- 31 gas line will be achieved via the protective external coating described previously. CP design will
- be in accordance to CSA Z662:19 Clause 9.5 and applicable FEI specifications.

33 INTEGRITY MONITORING

Consistent with the existing gas asset infrastructure, the integrity of the new gas line will be managed within FEI's Integrity Management Program (IMP). The IMP is a corporate-level



- 1 management system for identifying and mitigating hazards to the system that have the potential
- 2 to result in failure with significant consequences. Activities include:
- Monitoring of the CP system in accordance with the CSA Z662 standard and Canadian
 Gas Association Recommended Practice OCC-1, and industry practice. These
 monitoring programs are established and documented within FEI standards; and
- Third-party damage prevention activities, including a permits & inspection process and public safety awareness programs.

8 *5.4.2.7* Land Requirements

As the majority of the gas line will be constructed in existing municipal road allowances, land will
need to be obtained for construction activities such as temporary accesses, construction
workspace, and materials and equipment storage areas. Approximate Temporary Work Space
(TWS) land requirement areas have been generated using the typical right of way cross section,

- 13 summarized in Table 5-8. The size of area will be confirmed as the design progresses.
- 14

Table 5-8: Land Requirements						
ltem	Centreline Length (metre)	Private Parcels with Proposed Statutory Right of Way	Proposed Statutory Right of Way (m ²)	Private Parcels with Proposed TWS	TWS (m²)	Total Land Needed for Project (m²)
Within Public Road Right of Way	4,493	N/A	0	N/A	37,315	37,315
Within Private Parcel	1,185	16	12,507	45	12,770	25,277
Totals	5.678	16	12.507	45	50.085	62,592

15

16 *5.4.2.8* Crossings

The majority of the crossings required for the PGR Project will be constructed using open cut
trench methods. Major crossings will utilize trenchless or aerial crossings. In general, the types
of crossings identified along the proposed gas line route include:

- road crossings;
- railway crossings;
- water crossings; and
- pipeline and utility crossings.

24



1 For further details on the general crossing methodology, please refer to the Crossing

- 2 Methodology Selection Report, P-00758-PIP-REP-0066, as well as the Master Crossing List, P-
- 3 00758-PIP-LST-0005, in Appendix C-1.

4 5.4.3 Stations (Facilities) Design

5 The new gas line will operate at the same MOP as the upstream LMIPSU gas line and will 6 connect to the existing 700 kPa trunk distribution system. As such, pressure control and 7 overpressure protection to interconnect with the existing trunk distribution system are required. 8 As discussed in Section 5.3.2.5, the proposed underground PRS is located near the intersection 9 of 16th Street and 4th Avenue in the City of Burnaby.

10 *5.4.3.1* Design Parameters

11 This section specifies the station design parameters, and requirements, that are taken into 12 account in the station design. Table 5-9 lists the key process parameters in the design of the 13 PRS.

14

Table 5-9: PRS Process Design Parameters

Parameter	Value
Peak Hour Station Inlet Gas Flow	102,324 m³/hr
Minimum Design Gas Flow	26,943 m ³ /hr
Maximum Station Inlet Gas Pressure	2,070 kPa
Minimum Station Inlet Gas Pressure	1,020 kPa
Inlet Gas Temperature Range	5 to 20 degC
Gas Molecular Weight	17.16 M
Discharge Gas Pressure	700 kPa
Maximum Gas Velocity	30 m/s

15

Please refer to the Preliminary Facility Design Basis Memorandum in P-00758-MEC-DBM-0001 in Appendix C-1 for further details on pressure control and overpressure protection requirements. The Preliminary PRS P&ID Drawing is available in 94413-X-200-3001 in Appendix C-2.

20 5.4.3.2 Equipment Specification

FEI completed equipment selection and sizing utilizing the design parameters and operating requirements associated with each piece of major equipment at the station. FEI also considered the function, processes, operating philosophy and maintenance requirements.

- 24 The major equipment for the PRS includes:
- Pressure control and overpressure protection system;

- Orifice meter; and
 - Telemetry system.

1

Details are available in the PRS Equipment Selection Report in P-00758-MEC-REP-0005 and
 the PRS Equipment List in P-00758-BLD-EQL-0001 in Appendix C-1.

6 *5.4.3.3* Pressure Control and Overpressure Protection

7 Two 100 percent capacity pressure regulator runs will be installed to control pressure operating at 700 kPa. The regulator run will consist of a working pressure regulator actively reducing the pressure and a back-up pressure regulator monitoring the downstream pressure and available to protect from potential overpressure from component failure. A full list of requirements are available in the Control Valve Data Sheet in P-00758-MEC-DSH-0001 in Appendix C-1.

Gas filtration provides a secondary form of overpressure protection by removing any solid and/or liquid contaminants from the PGR Project gas stream that may damage the pressure control equipment. A dry gas filter will be installed upstream of the pressure regulator runs to remove any solid and/or liquid contaminants from the new gas line stream prior to entering the PRS and distribution system.

17 *5.4.3.4* **RTU/SCADA** and Communication

18 A Remote Telemetry Unit (RTU) will monitor the station and provide two-way communication 19 with FEI Gas Control. The pressure monitoring signals will be wired to the RTU. The RTU will 20 communicate to supervisory control and data acquisition (SCADA) using cellular and radio 21 communication. The programming and configuration of these systems will be executed by FEI's 22 Electrical, Controls and Instrumentation group.

23 *5.4.3.5 Power Supply*

To provide power for the control and communication equipment, an electrical supply from BC Hydro will be installed to the PRS. The Electrical Power Distribution and Emergency Power Wiring Details Drawing for the PRS is available in 94413-E-000-3003 in Appendix C-2.

27 *5.4.3.6 Land Requirements*

New land is required for the PRS, approximately 25 metres by 6 metres. The PRS Plot Plan is
available in 94413-M-200-3000 in Appendix C-2.

30 5.4.4 System Modifications

31 Approximately 5.5 km of the LIV PAT 457 transmission gas line and associated infrastructure

32 will require modification due to the removal of the Pattullo Gate Station. A new TP/IP regulating

33 facility will be incorporated into the Roebuck Valve Station, located in the City of Surrey.



- 1 To maintain ILI capability of the existing LIV PAT 457, the receiving barrel located at Pattullo 2 Gate Station will be relocated to Roebuck Valve Station.
- 3 3.3 km of the LIV PAT 457 will be downgraded to a Maximum Operating Pressure of 2070 kPa
- and terminate at 128th Street and 100th Avenue station. Modifications to equipment at the 128th
 Street and 100th Avenue station will be completed to accept the lower inlet pressure and fully
- 6 support the distribution system under peak day conditions.
- 7 The remaining 2.2 km section of the LIV PAT 457 will be deactivated by isolating the section 8 between 128th Street and 100th Avenue station and Pattullo Gate Station. This will be 9 accomplished by installing a blind at the outlet of the 128th Street and 100th Avenue station as 10 well as the inlet to the Pattullo Gate Station, purging the line and maintaining a low pressure
- 11 blanket with nitrogen.
- 12 Deactivation of this section of LIV PAT 457 was chosen over abandonment 25 to minimize
- 13 ecological and socio-economic disturbance to the area and allow re-establishment of gas supply
- 14 to the North Surrey region if required in the future to support forecast peak demand beyond the
- 15 20-year planning window. Deactivation will follow all regulatory and code requirements.

16 **5.4.5** Decommissioning and Abandonment

A section of approximately 2.0 km of the existing Pattullo Gas Line Crossing will be abandoned between the Pattullo Gate Station in the City of Surrey to the intersection of McBride Boulevard and Royal Avenue in the City of New Westminster. The section of gas line located on the existing Pattullo Bridge will be abandoned and removed during bridge demolition. Sections located on either end of the bridge will be abandoned in place, grout filled and capped every 200m. The abandonment process will follow applicable FEI specifications.

23 5.5 CONSTRUCTION MANAGEMENT

24 5.5.1 Noise Control

The Project is located in an urban environment and therefore the construction site is located in close proximity to businesses and residents in the City of Burnaby. Noise monitoring and control will comply with local municipal guidelines and bylaws. As stipulated in respective noise bylaws, no construction activities will occur on statutory holidays, Sundays, or at night without applicable by-law exemptions. General noise control measures will be implemented during construction including, but not limited to:

²⁵ Abandonment of an underground line implies permanent removal from service and would include excavation, cutting and capping every 200 m along the abandoned gas line section, and possible grout fill at crossing locations. Additionally, FEI might release its rights under the Right of Way agreements, preventing future reactivation.



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- Scheduling construction at noise sensitive locations during non-sensitive times to limit disruption to sensitive receptors, including wildlife;
 - Maintaining equipment prior to use and ensuring equipment is in good working order;
 - Using noise abatement equipment including mufflers that are in good working order;
- 5 Turning off equipment when not in use;
- Enclosing noisy equipment and using noise barriers, where warranted to limit the transmission of noise beyond the construction site;
- Locating stationary equipment, such as compressors and generators, away from noise receptors;
- Replacing or repairing equipment parts generating excessive noise;
- Informing truck drivers and mobile equipment operators that the use of engine retarder
 brakes will not be permitted in previously identified noise-sensitive locations, regardless
 of municipal bylaws or traffic regulations;
- Maintaining access roads to limit vehicle noise from vibration; and,
- Advising the City of Burnaby and the community of construction periods.

16 5.5.2 Health, Safety and Security

17 Construction site safety and security will be maintained during the course of the Project, 18 including all working and non-working hours inclusive of weekends. A comprehensive project 19 specific health and safety plan will be developed by the pipeline contractor in accordance with 20 FEI standards, WorkSafeBC regulations, and the requirements of other impacted stakeholders.

21 5.5.3 Traffic Management and Control

A major portion of the gas line will be constructed within municipal road right-of-way which will result in associated impacts to traffic including transit, pedestrian, and cycling modes. The alignment falls entirely within the City of Burnaby, and crosses the Trans-Canada Highway 1, which falls under the jurisdiction of the MoTI. Therefore, permit approvals will need to be obtained from both respective road agencies prior to construction start.

The construction work will include taking temporary occupation of sections of road which will vary in length depending upon the specific site conditions, road configuration and municipal permit conditions as related to traffic staging. FEI expects that a number of construction crews will work concurrently to build the sections. At any one time, it is expected that there will be a number of work zones within each segment in effect. Due to the nature of the work, the work zones will be occupied on a 24-hour basis with limited, if any, potential to restore traffic lanes on a daily basis.

Traffic Management Plans will be prepared in consultation with the City of Burnaby to assist in maintaining traffic flow, including transit and school buses as required. Further to this, there are locations where construction activity will occur in close or direct proximity to cycling paths and community recreational facilities. Where appropriate, efforts will be made to limit construction



- 1 during peak traffic periods and stage construction so as to reduce the impact on the local area.
- 2 FEI and the gas line contractor will work with the City of Burnaby to manage traffic delays and
- 3 inform local residences and businesses of temporary traffic delays. Clean-up and restoration of
- 4 the roadways will follow pipe installation as close as reasonably possible to support the
- 5 commencement of traffic flow.

Designated parking areas may be established for construction crews to help manage parking
congestion in residential areas. The contractor will be encouraged to transport construction
workers to site from a central collection point to reduce parking issues and associated traffic
congestion.

10 5.5.4 Environmental and Archaeological Management

FEI will mitigate potential environmental and archaeological impacts of the Project through the implementation of standard best management practices and mitigation measures. Please refer to Section 7 of the Application for details on FEI's environmental and archaeological management of the Project.

15 **5.6** *PROJECT SCHEDULE*

The preliminary Project execution schedule is based on receiving a BCUC decision by Q3 2021,
an early works program after the BCUC decision, and an assumed construction start of Q2
2022.

The Basis of Schedule and Project schedule in the Gantt chart format is available in Appendix
C-4 and in Appendix F respectively. FEI has summarized the Project schedule and divided it

- 21 into eight main groups as shown in Table 5-10.
- 22

Table 5-10: Project Schedule and Milestones

Activity	Milestone Date	
Consultant / Contractor Selection		
Procure Detailed Engineering Services	Dec 2020	
Procure Contractor Services	Nov 2020	
Detailed Design and Constructability Reviews		
30% Design Package	Feb 2021	
60% Design Package	March 2021	
90% Design Package	May 2021	
Issued for Construction Package	July 2021	
Obtain Permit Approvals		
BCOGC Permits – Early Works	Sept 2021	
BCOGC Permits – Mainline and Facilities	Jan 2022	
Federal Permits (Department of Fisheries and Oceans, Species at Risk Act)	Jan 2022	



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Activity		Milestone Date
	Ministry of Transportation and Infrastructure Permits	Jan 2022
	Municipal Permits	Jan 2022
	Third Party Utility Permits	Jan 2022
	Environmental and Archaeological Permits	Jan 2022
Procurement		
	Procure Line Pipe	Mar 2021
Construction Cont	ract Award	·
	30% Design – Cost Estimate Submission	March 2021
	60% Design – Cost Estimate Submission	April 2021
	90% Design – Cost Estimate Submission	June 2021
	Award Mainline Construction Contract	Sept 2021
Mobilization to Site		
	Mobilization for Early Works	Oct 2021
Mainline and Facili	ties Construction	
	Mainline and Facilities Construction	Apr 2022 - Sept 2022
	Mechanical Completion	Oct 2022
	Commissioning	Oct 2022 – Dec 2022
	Restoration and Demobilization	Sep 2022 - Dec 2022
Decommissioning and Abandonment		
	Decommissioning of Pattullo Gas Line	Jan 2023 - Mar 2023
	Abandonment of Pattullo Gas Line	Jan 2023 - Mar 2023
	Infrastructure Modifications	Apr 2023 – July 2023
	Project Close Out	Oct 2022 – July 2023

1 5.6.1 Project Delivery Method/Contract Pricing

2 FEI will use a Construction Manager at Risk (CMAR) project delivery method to deliver the 3 Project. This delivery method is a form of early contractor involvement where a contractor is 4 engaged under a services contract that takes an integrated team approach to the planning, 5 design and construction of the project. The integrated team will consist of FEI, the engineering 6 design firm and a contractor working collaboratively to deliver the Project for the lowest cost and 7 completion prior to the schedule constraint. The aim of this project delivery method is to engage 8 the construction expertise early in the design process to provide constructability input and 9 manage project execution risk. As part of the competitive contractor selection process, FEI and 10 the contractor have agreed on key commercial terms for overhead and profit margin.

To help ensure that the Project is delivered at the lowest reasonable cost, a transparent and progressive "open book" cost estimating process will be used as the design advances from 30 percent design milestone through the 60 to 90 percent design completion milestones. At each



milestone, the contractor will be required to provide a risk adjusted cost estimate. Risk will be allocated collaboratively between FEI and the contractor using the principles that a party shall bear a risk that it can control and is best able to manage. At the 90 percent design milestone, the contractor and FEI will seek to agree on a lump sum fixed price, which includes an amount in the estimate for the risks allocated to the contractor, to complete the Project. The lump sum fixed price effectively means that the contractor holds all of the Project's construction and execution risks assigned to the contractor during the risk allocation process.

8 To establish price competitiveness, the contractor will be required at the onset to provide a 9 document that thoroughly defines all pricing assumptions, shows all cost elements that will be 10 used to estimate all aspects of the work, and provide the steps to show how the estimated total 11 project costs will be derived. FEI will conduct independent cost estimation and estimate 12 validation to determine market competitiveness. FEI will also engage the services of an Owner's 13 engineer to review the contractor's submittals and complete a check estimate review. In 14 addition, a comprehensive cost reconciliation process will be conducted to address any 15 significant differences between the independent estimate and the contractor's. Should FEI and 16 the contractor be unable to reach an agreement on price, schedule or risk allocation, anywhere 17 from 60 percent design onwards, FEI can take an "off ramp" and terminate the services contract 18 for convenience, prepare a tender package and tender the construction.

19 5.6.2 Permitting

Permitting requirements, including federal, provincial, municipal and utility permits, are identified
 and application processes/durations are accounted for in the Project schedule.

22 The permits required for the Project are explained in further detail in Section 5.9.

23 5.6.3 Procurement

Procurement of materials and equipment required for the Project will involve the engagement of third party vendors with sufficient time built into the Project schedule to accommodate construction. The Project will initiate procurement of long lead material items in early 2021, prior to a BCUC decision, as per the Schedule provided in Appendix F in order to commence construction in Q2 2022. It is critical that all major materials and equipment be delivered to site prior to construction activities commencing.

30 5.6.4 Mobilization to Site

FEI has identified opportunities for early works in the Project schedule, such as vegetation removal and preparation of the work sites prior to mainline construction to mitigate schedule risk. FEI plans to commence early works in Q3 2021 once the construction contract is awarded.

34 5.6.5 Mainline and Facilities Construction

35 Mainline construction involves the installation of the gas line and fabrication and installation of 36 the PRS. Construction will occur on multiple work zones within the segments and will be



1 optimized to meet the schedule constraint to limit the duration of construction and reduce the

- 2 impacts on the local community. Mechanical completion, commissioning, restoration and
- 3 demobilization is scheduled to be complete prior to 2022 year end.

4 5.6.6 Decommissioning and Abandonment

5 Decommissioning and abandonment of the existing Pattullo Gas Line is scheduled to be 6 complete by the end of Q1 2023. Any other existing infrastructure modifications that do not 7 affect the timelines associated with the Pattullo Bridge Replacement project schedule will 8 continue and be complete by Q3 2023.

9 5.7 PROJECT RESOURCES

10 **5.7.1 Project Management and Human Resources**

11 Figure 5-3 outlines a functional organization chart for the execution of the Project. The Project

12 will be managed by FEI's project management team and will include both internal and external

13 personnel along with external engineering resources as required. The Executive Sponsor for

14 the Project is the Vice President, Major Projects.





4 5.8 IDENTIFIED PROJECT IMPACTS

5 5.8.1 Environmental Impacts Assessment

6 Site-specific environmental management plans will be developed prior to construction to 7 manage potential environmental risks associated with the proposed construction activities and 8 site conditions. Details of environmental and archaeological components, including mitigation 9 measures, are discussed in detail in Section 7 of the Application.

10 5.8.2 Socio-Economic Impacts Assessment

11 FEI reviewed the Sperling Route and identified adjacent urban communities, business areas,

12 First Nations land, environmentally sensitive parkland, and community recreation facilities. Work

13 will take place entirely within the City of Burnaby.



- 1 Short-term disruption effects of the Project are expected to be temporary and generally minor.
- 2 Some of these impacts include minor traffic delays, temporary access restrictions and detours to
- 3 sections of parkland, a multi-use pathway and community recreation facilities. FEI plans to
- 4 mitigate, manage and minimize potential short-term adverse effects and monitor Project impacts
- 5 as construction proceeds. The mitigation measures will be based on industry best practices. 6 including Project updates to stakeholders, Indigenous groups, and the public. Section 8 of the
- 7
- Application describes FEI's stakeholder consultation and Indigenous engagement processes.
- 8 The Project will likely result in an overall positive impact to residents and businesses in the 9 Lower Mainland. Please refer to Section 9.2 for further discussion of socio-economic benefits of 10 the Project.
- 11 FEI also does not expect that the Project will impact other utility or infrastructure construction 12 within the Project Scope.
- 13 Throughout the Project, FEI will track the following socio-economic indicators: Project 14 investment in local Indigenous communities, in local municipalities, and in the region.
- 15 Based on FEI's experience assessing and delivering previous projects of this scope, the Project
- 16 is not expected to have any long-term negative effects on the socio-economic conditions in the
- 17 area and will have some positive effects for the Indigenous and local supply chain.

5.9 **REQUIRED PERMITS AND APPROVALS** 18

19 5.9.1 Federal

20 Federal permits, notifications and approvals may be required for the Project to comply with the 21 provisions of the Fisheries Act, Species at Risk Act (SARA), Canada Marine Act, and Impact

22 Assessment Act.

23 Notifications and authorizations to comply with the provisions of the Fisheries Act may be 24 required for works associated with geotechnical investigation and construction activities. 25 Fisheries and Oceans Canada is responsible for permitting any federally regulated waterbody 26 where there is potential for fish and fish habitat alteration disruption and destruction.

- 27 The construction of the Project may require SARA permits review or notification. Permits under 28 section 73 of SARA may be required for works associated with the alteration of critical habitat 29 within the project footprint. Environment and Climate Change Canada administers the SARA 30 and is responsible for any impacts to migratory birds through the *Migratory Birds Convention* 31 Act.
- 32 Works for decommissioning of the existing Pattullo Gas Line over the Fraser River and in Port
- 33 Lands falls under the jurisdiction of the Vancouver Fraser Port Authority, is reviewable under the
- 34 Impact Assessment Act and may require notification under the Marine Act.

Review of federal permit and authorization requirements will continue during detailed Project
 design.

3 5.9.2 Provincial

4 *5.9.2.1* BC Oil and Gas Commission

5 The construction, operation and decommissioning activities of the Project are governed by the 6 Oil and Gas Activities Act. The Project will require a new gas line application, which FEI plans to 7 file in Q3 of 2021. A gas line application involves considerable technical scrutiny by the BCOGC. Public and Indigenous consultation, ROW acquisition, land acquisitions, land or 8 9 access rights. archaeological requirements, design reviews, and environmental 10 permits/approvals for work in and around fish bearing streams are all components of the 11 application. Each component must receive BCOGC approval prior to the start of construction. 12 The current schedule assumes a 5-month approval period from the time of filing.

13 *5.9.2.2 Ministry of Transportation and Infrastructure Permits*

Highways and areas under the jurisdiction of the MoTI will require permit approvals. Once the extent of the impact is determined during detailed design, permits will be prepared and submitted for approval. The terms and conditions outlined in these permits will be adhered to during the construction of the Project.

18 5.9.2.3 Other Provincial Permits

Forests, Lands, Natural Resource Operations and Rural Development maintains authority to
 administer general wildlife permits and some aspects of the *Heritage Conservation Act* (HCA);
 however, the BCOGC administers others.

The construction and decommissioning of the Project will require the following Provincial permits:

- *Wildlife Act*, general wildlife permit (amphibian salvage);
- *Wildlife Act*, fish collection permit;
- *Wildfire Act,* BC wildfire service exemption;
- *Heritage Conservation Act*, section 12.2 & 12.4 permits;
- Water Sustainability Act permits;
- Land Act section 39 licence of occupation; and
- *Environmental Management Act* Oil and Gas Waste Regulation water discharge authorization and permits.





1 5.9.3 Municipal

Gas line construction and decommissioning will require municipal permits to ensure construction and installation meets municipal bylaws and guidelines. FEI is currently in the process of identifying all required municipal permits and will determine requirements during detailed design and acquire them prior to commencing construction. The terms and conditions outlined in these permits and approvals will be adhered to during the construction and decommissioning of the Project.

8 5.9.4 Other Permits, Licenses and Authorizations

9 *5.9.4.1* Railway Crossing Permits

10 The Project will require crossing of a railway owned by Burlington Northern Santa Fe (BNSF). 11 Decommissioning and abandonment work will require approvals from Canadian National (CN) 12 Railway, BNSF Railway and Southern Railway of British Columbia, which are crossed by the 13 gas line. Once the scope of the crossing is determined during detailed design, appropriate 14 permits will be prepared and submitted for approval. The terms and conditions outlined in these 15 permits will be adhered to during the construction of the Project.

16 *5.9.4.2* Other Utilities

The Project will result in construction and decommissioning activities in proximity to existing
adjacent utilities. Liaison with all stakeholders combined with onsite investigations will address
stakeholders concerns during detailed design and engineering.

20 *5.9.4.3* Other Pending or Anticipated Applications/Conditions

A qualified environmental professional working in conjunction with FEI's Environmental Affairs group will assist the Project in identifying permits/approvals required in the development of an Environmental Protection Plan for the Project.

The Project will not require an Environmental Assessment Certificate pursuant to the *British Columbia Environmental Assessment Act.*

- Agency notifications, permits or approvals are anticipated under, but not limited to, *the Fisheries*
- 27 Act, Species at Risk Act, Impact Assessment Act, Marine Act, Water Sustainability Act, and
- 28 Heritage Conservation Act. The terms and conditions outlined in these permits and approvals
- 29 will be adhered to during construction and decommissioning works of the Project.



1 5.10 PROJECT COST ESTIMATE AND RISK ANALYSIS

2 5.10.1 Base Cost Estimate

FEI developed the Project cost estimate in conjunction with Mott MacDonald Canada Ltd (Mott
MacDonald), based on criteria from AACE International Recommended Practices 18R-97 and
97R-18. The AACE Class 4 cost estimate was developed from designs and material take-off
quantities completed by Mott MacDonald. Mott MacDonald then used these quantities as the
basis to develop the direct and indirect costs.

- 8 The Mott MacDonald estimate includes:
- 9 Gas line and station construction costs;
- Construction sub-contracts; and
- 11 Engineering services.
- 12

FEI completed the remaining aspects of the Project's base cost estimate, including thefollowing:

- Owner's costs
- 16 o Project management and engineering;
- 17 o Land acquisition;
- 18 o Permits and approvals;
- 19 o Consultation;
- 20 o Environmental and archaeological monitoring; and
- Inspection services and additional construction costs associated with alternating
 current (AC) mitigation, cathodic protection, and gas line decommissioning and
 abandonment.
- 24

The base cost estimate is attached in Confidential Appendix D and includes both Mott MacDonald's estimate and FEI's Owner's cost estimate.

The total base Project cost estimate is \$124.333 million in 2020 dollars, which includes the sum of Mott MacDonald's estimate and FEI's portion of the base estimate. The base cost estimate includes 7 percent PST on materials. FEI provides the summary of total Project cost estimate in

30 Table 6-1 in Section 6 of the Evidentiary Update.

31 **5.10.2** Basis of Estimate

32 The Basis of Estimate is attached in in Confidential Appendix C-3. These documents detail the:

• Estimate background:

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1		0	Purpose and objective of the estimate;
2	•	Basis	of estimate
3		0	Scope of the estimate;
4		0	Assumptions; and
5	٠	Quanti	ity derivation and cost basis:
6		0	Bulk material and equipment cost basis;
7		0	Labour rates;
8		0	Contractors indirects;
9		0	Estimate allowances;
10		0	Other costs and indirects;
11		0	Engineering services; and
12		0	Freight.
13 14 15	These estima	docum ate basis	nents present the following details with respect to estimate scope, procurement, s, construction and engineering assumptions:
16	٠	Work b	preakdown structure;
17	٠	Direct	and indirect costs;
18	•	Estima	ate pricing;
19	•	Constr	ruction costs:
20		0	Labour costs;
21		0	Direct labour;
22		0	Employer contributions;
23		0	Productivity;
24		0	Equipment; and
25		0	Other construction costs.
26	٠	Unit pr	rice items, engineering and materials costs;
27	•	Constr	ruction:
28		0	Detailed construction assumptions;
29		0	Watercourse crossings;
30		0	Materials;
31		0	Equipment mobilization and demobilization;
32		0	Maintenance and services;
33		0	Key sub-contracts; and
34		0	Construction and productivity assumptions; and

FORTIS BC^{**}



- Design assumptions, exclusions and exceptions:
- 2 o Roads;
- 3 o Utilities and foreign pipelines;
- 4 o Watercourses;
- 5 o Trenchless crossings;
- 6 o Induction bends;
- 7 o ILI launcher and receiver barrels; and
- 8 o Valves.
- 9 **5.10.3 Cost Estimate Validation**
- 10 Cost estimate quality assurance and validation were completed as follows:
- Internal reviews that included peer reviews, document quality checks, and independent review of project documents;
- Validation reviews involving both Mott MacDonald and FEI team members throughout the estimate development process to confirm that the estimate assumptions were valid;
- An external independent review to verify and validate that the estimate, as well as schedule, met the AACE Class 4 criteria and requirements and that a well-documented, reasonable and defensible estimate was developed; and
- Internal and external reviews related to constructability and productivity.

19 **5.10.4** Risk Analysis and Contingency Determination

20 FEI engaged Yohannes Project Consulting Inc. (YPCI), a company specializing in project risk 21 management, to conduct a qualitative risk analysis to identify and assess all of the risks 22 associated with the Project. YPCI conducted multiple workshops with the Project team to 23 develop a risk register for the Project to identify risks that could likely occur. As the engineering 24 advances on the Project, the probability or the consequence of several identified risks were 25 either mitigated entirely or reduced. All of the risks associated with the Project are contained within the Pattullo Gas Line Replacement (PGR) Sperling Avenue Route - Qualitative Risk 26 27 Assessment Report Class 4, which is attached as Confidential Appendix E-1.

28 FEI also retained Validation Estimating LLC, USA (Validation Estimating), a company that 29 provides services in estimate validation, risk analysis, contingency and estimation. Validation 30 Estimating completed the contingency estimation using a quantitative analysis by applying an 31 integrated parametric and expected value methodology that is aligned with AACE International 32 Recommended Practice 42R-08: Risk Analysis and Contingency Determination Using Parametric Estimating and 65R-11: Integrated Cost and Schedule Risk Analysis and 33 34 Contingency Determination Using Expected Value. This analysis is described in the report titled 35 "Pattullo Gas Line Replacement (PGR) Project Sperling Avenue Options Capital Cost and 36 Schedule Risk Analysis and Contingency Estimate", attached as Confidential Appendix E-2.



1 *5.10.4.1* Risk Identification Planning

- 2 YPCI conducted the risk identification and qualitative assessment based on guidance from the
- 3 AACE International Recommended Practice 62R-11: Risk Assessment: Identification and
- 4 *Qualitative Analysis* (AACE 62R-11, Revision May 11, 2012). The risks were identified through
- 5 collaborative discussions between YPCI and FEI through a series of risk workshops facilitated
- 6 by YPCI.
- 7 The risk likelihood and consequence matrix scale used for the Project are based on the 5 by 5

Figure 5-4: Risk Assessment Matrix

- 8 risk assessment matrix recommended in AACE 62R-11, as illustrated in Figure 5-4 below.
- 9

	Risk Impact Category (Cost, Schedule, Performance/Quality/Scope) IMPACT							
ikelihood (Probability)	Very Low	Low	Medium	High	Very High			
Very High (>50%)	Moderate	Moderate	Major	Major	Mater			
High (5 - 50%)	Minor	Moderate	Mass	Malor	Major			
Medium (1-5%)	Minor	Moderate	Moderate	Major				
Low (0.1-1.0%)	Minar	Minor	Moderate	Moderate	Moderate			
Very Low <0.1%	Minor	Minor	Minor	Minor	Moderate			

10

11 5.10.4.2 Risk Register, Qualitative Assessment and Action Plan

The risk identification process identified a number of risks, which YPCI tabulated in the risk register included in Appendix A to YPCI's Risk Report (Confidential Appendix E-1). YPCI also recorded the risk response actions to deal with the identified risks in the risk register. The Project Team completed a qualitative assessment to prioritize or rank the risks so that the Project team could focus on risk response actions and mitigation for the high priority risks. As part of this qualitative process, the Project team assigned a likelihood and consequence rating to each identified risk using the risk assessment matrix noted above.

19 *5.10.4.3* Quantitative Risk Analysis and Contingency

Following the completion of the YPCI Risk Report, Validation Estimating completed a quantitative analysis to evaluate the impact of Project specific risks and systemic risks. Validation Estimating completed a Monte Carlo simulation to determine a distribution of possible cost outcomes associated with the existing scope of the Project at different levels of confidence. The analysis derived a risk adjusted P50 cost of \$154.4 million representing a contingency of 24 percent. Please refer to Confidential Appendix E-2 for further details on Validation Estimating's

- 26 methodology and results.
- 27 The output of the Monte Carlo Simulation is shown below in tabular form in Figure 5-5:

1	

Base Estimate:	\$124,333	Currency:	\$CAN	
Probability	Indicated	Contingency		
of Underrun	Funding Amount	Costs (thousands)	Percent of Base Est.	
5%	115,400	(8,900)	-7%	
10%	123,200	(1,100)	-1%	
15%	128,500	4,200	3%	
20%	132,800	8,500	7%	
25%	137,000	12,700	10%	
30%	140,600	16,300	13%	
35%	144,200	19,900	16%	
40%	147,600	23,300	19%	
45%	151,100	26,800	22%	
50%	154,400	30,100	24%	
55%	158,000	33,700	27%	
60%	161,500	37,200	30%	
65%	165,600	41,300	33%	
70%	170,000	45,700	37%	
75%	175,000	50,700	41%	
80%	180,400	56,100	45%	
85%	186,800	62,500	50%	
90%	195,200	70,900	57%	
95%	210,300	86,000	69%	

Figure 5-5: Quantitative Risk Analysis - Monte Carlo Simulation

2

3 5.10.4.4 Risk Assessment Conclusion – Contingency

Contingency²⁶ is expected to be spent and is used as an allocation for risks that are known and
likely to be encountered during Project execution. For the PGR Project, FEI will set the
contingency at a cost value to achieve a P50 confidence level. As such, the Project contingency
will be \$30.1 million (24 percent) at the P50 confidence level.

²⁶ Contingency is defined in AACE International Recommended Practices 10S-90: Cost Engineering Terminology as follows: "An amount added to an estimate to allow for items, conditions, or events for which the state, occurrence, and/or effect is uncertain and that experience shows will likely result, in aggregate, in additional costs. Typically estimated using statistical analysis or judgment based on past asset or project experience." Contingency, by AACE's definition, is expected to be spent.



1 5.10.4.5 Escalation Risk

- 2 Validation Estimating conducted a cost escalation estimate for the Project. According to AACE,
- 3 escalation is "a provision in costs or prices for uncertain changes in technical, economic, and
- 4 market conditions over time. Inflation (or deflation) is a component of escalation." As the base
- 5 estimate was developed using 2020 pricing data and conditions, it does not inherently account
- 6 for escalation. Price increases/decreases beyond 2020, including contingency, must be covered
- 7 by the escalation estimate.

8 Validation Estimating applied the AACE "by-period" method to develop the cost escalation 9 estimate. This method uses price indices by cost account applied to the annual cash flow by 10 cost account. The base indices are forecasts provided by the economic consulting firm IHS 11 Markit. These indices are used to develop weighted indices that match the cost types (gas line 12 material, construction labour, etc.). The indices are further adjusted for forecast global and 13 regional capital spending market conditions (i.e., adjusts for bid markup behaviour as well as 14 productivity trends in hot or cold markets).

The IHS Markit Q3 2020 forecast is showing minimal cost escalation through 2022, which covers the majority of the Project's cash flow. Global and regional capital spending is forecast to rebound somewhat in 2022, which would be after the Project's contracts are set. The probabilistic analysis, which takes into account the historical standard deviation in price changes from the mean, results in the escalation ranges shown in Figure 5-6 below. Please refer to Confidential Appendix E-3 for further details on Validation Estimating's methodology and results.

Base Estimate+p50 conti	ngency \$154,433	
Probability		Percent
of Underrun	Escalation	of Base+Cont
5%	(5,733)	-3.7%
10%	(3,073)	-2.0%
15%	(1,291)	-0.8%
20%	315	0.2%
25%	1,706	1.1%
30%	3,007	1.9%
35%	4,208	2.7%
40%	5,406	3.5%
45%	6,589	4.3%
50%	7,733	5.0%
55%	8,862	5.7%
60%	10,018	6.5%
65%	11,210	7.3%
70%	12,404	8.0%
75%	13,850	9.0%
80%	15,448	10.0%
85%	17,187	11.1%
90%	19,463	12.6%
95%	22 683	14 7%

Figure 5-6: Summary of Escalation Monte Carlo Simulation (2020\$)

2 3

1

Percentages shown are to the base estimate plus P50 contingency

4 FEI will fund escalation at \$7.7 million, which corresponds to the P50 level of confidence.

5 *5.10.4.6 Risk Funding Appropriateness*

FEI engaged Validation Estimating to provide an expert opinion on FEI's choice to fund the
Project at the P50 confidence level. Validation Estimating confirmed that the decision by FEI to
fund contingency for the Project at a P50 confidence level is reasonable. Please refer to
Confidential Appendix E-4 for further details on Validation Estimating's position on FEI's risk
funding levels.

11 **5.11** *Conclusion*

In this section, FEI described the PGR Project in detail, including information on the Project components, route selection process, basis of design and engineering, project schedule and resource requirements, project impacts, and permitting and approval requirements. FEI has provided the basis of project cost estimate and has appropriately completed cost validation and



- 1 project risk assessment. FEI's has identified risk mitigation activities to mitigate the overall cost
- 2 and schedule risk of the Project.



1 6. PROJECT COST ESTIMATE

2 **6.1** *INTRODUCTION*

- 3 The total cost estimate of the PGR Project is \$175.354 million in as-spent dollars and including
- 4 AFUDC. This section provides a breakdown of the total Project cost estimate, summarizes the
- 5 financial analysis, and details the accounting treatment and rate impact of the PGR Project.

6 6.2 SUMMARY OF PROJECT COSTS

7 Table 6-1 below summarizes the total PGR Project estimated capital cost in both 2020 and as-

8 spent dollars. The PGR Project base capital cost estimate meets the criteria for an AACE

9 Class 4 Cost Estimate, as discussed in Section 5.10 of the Application.

Table 6-1: Breakdown of the PGR Project Capital Cost Estimate (\$millions)

	2020 \$	As-Spent \$	Reference
Engineering and Development	9.935	9.946	Section 5.10.1 and Confidential Appendix D (2020 \$)
Material	4.419	4.777	Section 5.10.1 and Confidential Appendix D (2020 \$)
Construction - Direct and Indirect	86.162	90.020	Section 5.10.1 and Confidential Appendix D (2020 \$)
Decommission and Abandonment	11.151	11.867	Section 5.10.1 and Confidential Appendix D (2020 \$)
Property and Right of Way	4.166	4.237	Section 5.10.1 and Confidential Appendix D (2020 \$)
Project Management and Owner's Costs	14.113	15.293	Section 5.10.1 and Confidential Appendix D (2020 \$)
Subtotal Project Capital Cost	129.946	136.140	See Note 1 for 2020 \$ and Note 2 for As-spent \$
Contingency	30.100	31.640	Section 5.10.4.4 and see Note 2 for As-spent \$
Subtotal Project Capital Costs w/ Contingency	160.046	167.779	Table 6-2; Row 10; Col 1 (2020 \$) & Col 2 (As-spent \$)
CPCN Application	0.350	0.350	Section 6.4.3
CPCN Preliminary Stage Development	2.507	2.507	Section 6.4.3
Subtotal w/ Deferral Costs	162.903	170.636	Table 6-2; Row 14; Col 1 (2020 \$) & Col 2 (As-spent \$)
AFUDC	-	7.305	Table 6-2; Row 14; Col 3
Tax Offset	-	(2.587)	Table 6-2; Row 14; Col 4
TOTAL Project Cost	162.903	175.354	Table 6-2; Row 14; Col 1 (2020 \$) & Col 5 (As-spent \$)

^{12 &}lt;u>Notes:</u>

11

- The Project capital cost of \$129.946 million in 2020 dollars is equal to the base cost estimate of \$124.333 million (Section 5.10.1) plus \$5.612 million of capitalized development costs incurred by FEI from February to November 2020.
- The as-spent cost is equal to the amount in 2020 dollars plus escalation. The total escalation at a P50 confidence level is \$7.733 million (Section 5.10.4.5), of which \$6.193 million is escalation on the base capital cost and \$1.540 million is escalation on contingency.
- 19 The PGR Project estimated capital cost, provided in the table above, is based on the following:
- The base cost estimate of \$124.333 million in 2020 dollars developed by FEI and Mott
 MacDonald as described in Section 5.10.1 of the Application, and \$5.612 million of
 actual Project development costs incurred between February and November 2020;

¹⁰

- A contingency estimate of \$30.100 million in 2020 dollars (approximately 24 percent) of
 the base cost estimate (\$124.333 million in 2020 dollars) provides a total Project capital
 budget at a P50 confidence level as discussed in Section 5.10.4.4 of the Application;
- A P50 escalation value of \$7.733 million during the construction period from 2021 to 2023 as discussed in Section 5.10.4.5 of the Application applied to both the base capital cost and contingency. The escalation is used to convert the Project capital cost from 2020 dollars to as-spent dollars;
- Deferred costs of \$2.857 million (as-spent) for the Application and Preliminary Stage
 Development Costs discussed in Section 6.4.3 below; and
- AFUDC, estimated based on FEI's 2021 approved AFUDC rate of 5.47 percent, which is equal to FEI's after-tax weighted average cost of capital.²⁷

12 6.3 FINANCIAL ANALYSIS

13 FEI has performed a financial evaluation of the PGR Project based on the present value (PV) of 14 the incremental revenue requirement and the levelized delivery rate impact to FEI's non-bypass 15 customers over a 68-year analysis period. The 68-year analysis period is based on a 65 year 16 post-project analysis period plus three prior years for the estimated construction schedule of the 17 Project from 2020 to 2023 (when all new assets are in-service by 2023). The 65-year post-18 project analysis period is chosen based on the average service life (ASL) for the distribution 19 main pool asset account (which includes intermediate pressure pipelines) as detailed in FEI's 20 2017 Depreciation Study which was approved by BCUC Order G-165-20 as part of FEI's 2020-21 2024 Multi-Year Rate Plan (MRP) Application.

Table 6-2 below provides the breakdown of the PGR Project Cost of \$175.354 million (as-spent
 dollars) into its asset components, decommission/abandonment costs, deferred costs, financing

costs, and tax offset.

²⁷ As approved for 2021 under BCUC Order G-319-20. The actual AFUDC will be calculated based on the approved AFUDC rate at the time of construction.

1

Table 6-2: Summary of Forecast Capital and Deferred Costs (\$millions)

							Reference
Line	Particular	2020 \$	As-Spent \$	AFUDC	Tax Offset	TOTAL	(Confidential Appendix G-2; Financial Schedule)
		(1)	(2)	(3)	(4)	(5)	(6)
1	Distribution Plant (IP)						
2	Land Rights	4.205	4.300	0.268	-	4.567	Schedule 6: Sum of Line 9 and Line 21 (2020-2023)
3	Distribution Main	137.178	143.673	6.020	-	149.694	Schedule 6: Sum of Line 11 and Line 23 (2020-2023)
4	PRS Station						
5	Land in Fee Simple	1.436	1.469	0.091	-	1.560	Schedule 6: Sum of Line 8 and Line 20 (2020-2023)
6	Structures & Improvements	0.335	0.351	0.014	-	0.365	Schedule 6: Sum of Line 10 and Line 22 (2020-2023)
7	Measuring & Regulating Equipment	3.042	3.174	0.204	-	3.377	Schedule 6: Sum of Line 12 and Line 24 (2020-2023)
8	Subtotal Addition to Plant	146.196	152.967	6.597	-	159.564	Sum of Line 2 to Line 7
9	Decommission and Abandonment Cost	13.850	14.813	0.422	-	15.235	Schedule 6: Sum of Line 32 (2020-2024)
10	Subtotal Project Capital Cost	160.046	167.779	7.019	-	174.799	Line 8 + Line 9
11	PGR Application Cost	0.350	0.350	0.007	(0.095)	0.262	Schedule 9: Line 6
12	PGR Preliminary Stage Development Cost	2.507	2.507	0.278	(2.492)	0.293	Schedule 9: Line 15
13	Subtotal Project Deferral Cost	2.857	2.857	0.285	(2.587)	0.555	Line 11 + Line 12
14	Total Project Cost	162.903	170.636	7.305	(2.587)	175.354	Line 10 + Line 13

3 Table 6-3 below summarizes the financial analysis based on the assumptions discussed in this

4 section. The PV of the incremental revenue requirement is approximately \$178.560 million and

5 the levelized delivery rate impact is 1.14 percent over the 68-year analysis period. Details of the

6 financial evaluation of the Project can be found in the Financial Schedules included in

- 7 Confidential Appendix G-2.
- 8

2

Table 6-3: Financial Analysis of the PGR Project

			Reference
Line	Particular	TOTAL	(Confidential Appendix G-2, Financial Schedule)
1	Total Charged to Gas Plant in Service (\$ millions)	159.564	Schedule 6; Line 35
2	Decommission and Abandonment Cost (\$ millions)	15.235	Schedule 6; Sum of Line 28 (2020 to 2024)
3	Total Project Deferral Cost	0.555	Schedule 9; Line 6 + Line 15
4	Total Project Cost (\$ millions)	175.354	Sum of Line 1 to Line 3
5			
6	Incremental Rate Base in 2025 (\$ millions)	168.086	Schedule 5; Line 19 (2025)
7	Incremental Revenue Requirement in 2025 (\$ millions)	13.773	Schedule 1; Line 11 (2025)
8	PV of Incremental Revenue Requirement 68 years (\$ million)	178.560	Schedule 10; Line 20
9	Net Cash Flow NPV 68 years (\$ million)	(2.948)	Schedule 11; Line 17
10			
11	Delivery Rate Impact in 2025 (%)	1.57%	Schedule 10; Line 23 (2025)
12	Levelized Delivery Rate Impact 68 years (%)	1.14%	Schedule 10; Line 27
13	Levelized Delivery Rate Impact 68 years (\$/GJ)	0.0515	Schedule 10; Line 33

9 10

- 11 The financial evaluation of the PGR Project includes the following assumptions:
- 12 13

• **Inflation:** Two percent annually for incremental O&M, property tax, and future capital replacement costs during the post-Project analysis period. This is comparable to the



- O&M: An estimate of incremental O&M savings associated with the PGR Project of approximately \$0.017 million in 2020 dollars (\$0.018 million in 2023 dollars²⁹). These costs are comprised of:
- approximately \$0.014 million in 2020 dollars (\$0.015 million in 2023) of
 incremental O&M costs as a result of the new pipelines and infrastructures in the
 City of Burnaby;
- 9 offset by the O&M savings of approximately \$0.031 million in 2020 dollars
 10 (\$0.033 million in 2023) due to the removal and retirement of pipeline and infrastructures in the City of Surrey;
- Property Tax: Incremental property tax of approximately \$0.121 million as a result of the new infrastructure in the City of Burnaby and removal of infrastructure in the City of Surrey; and
- Future Capital Replacement: The ASL for the PRS measuring and regulating equipment is 33 years, and the ASL for the PBRS building structure is 38 years,³⁰ both of which are shorter than the 65-year post-Project period used for the financial analysis. As such, for this analysis FEI has included the future replacement of the PRS measuring and regulating equipment as well as the PRS building structure at the end of their average service life at 33 and 38 years, respectively.

21 6.4 ACCOUNTING TREATMENT

In the subsections below, FEI describes the proposed treatment of the PGR Project capital
 costs, the proposed treatment of the abandonment/demolition costs for the existing pipelines in
 the Cities of Surrey and New Westminster, and FEI's requests for the PGR Application and
 Preliminary Stage Development Costs deferral account.

26 6.4.1 Treatment of Capital Costs

- 27 Consistent with FEI's treatment of major project capital costs, including CPCNs:
- The capital costs of the PGR Project (i.e., \$174.799 million set out in Line 10 and Column 5 of Table 6-2 above) will be held in Work in Progress during construction, attracting AFUDC;



²⁸ Consumer Price Index. Online: <u>https://www2.gov.bc.ca/gov/content/data/statistics/economy/consumer-price-index.</u>

²⁹ Based on two percent annual inflation. Since the new gas line is scheduled to be in-service December 2022, the first full year of the new gas line being in-service will be 2023.

³⁰ As per FEI's 2017 Depreciation Study, approved by BCUC Order G-165-20 as part of FEI's 2020-2024 Multi-Year Rate Plan (MRP) Application.



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- Once the assets are placed into service, the associated capital cost will enter rate base as part of the opening balance in the appropriate plant asset accounts, for inclusion in FEI's rate base on January 1 of the following year. Table 6-4 below summarizes the estimated amount of the PGR Project capital costs to be in-service each year between 2022 and 2024. For example, \$157.437 million of the PGR Project related to the new gas line and PRS is scheduled to be completed and placed in service in 2022 as shown in Table 6-4 below,³¹ and therefore will enter FEI's rate base on January 1 of 2023; and
- Depreciation of the assets will begin on January 1 of the year that they enter FEI's rate
 base. For example, depreciation will begin in 2023 for the new assets of the PGR
 Project that were completed and placed in-service in 2022.
- 11 12

Table 6-4: Percentage of Project Complete and In-Service from 2022 to 2024

	Project complete and in-service each year, 2022 - 2024 (\$ millions) (To be transferred to Rate Base January 1 of each following year)						
	2022	2023	2024	TOTAL			
Project Capital Cost In-Service	157.437	2.127	-	159.564			
Decommission & Abandonment Cost	-	14.973	0.262	15.235			
Total Annual Project Costs	157.437	17.100	0.262	174.799			
Annual Project % In-Service	90.07%	9.78%	0.15%	100%			

13

14 6.4.2 Treatment of Decommissioning and Abandonment Costs

15 As discussed in Section 5.4.4 of the Application, a 2.3 km section of the Pattullo Gas Line will 16 be decommissioned and abandoned between Pattullo Gate Station in the City of Surrey and the 17 intersection of McBride Boulevard and Royal Avenue in the City of New Westminster. The 18 Pattullo Gate Station will also be decommissioned. The decommissioning and abandonment 19 costs will be charged to FEI's Net Salvage deferral account in accordance with the approved 20 treatment of these costs as set out in Order G-44-12. The decommissioning, abandonment, and 21 project close out activities are scheduled to occur in 2023 and 2024 as shown in Table 6-4 22 above, with an estimated cost of \$13.850 million (2020 dollars) or \$15.235 million in as-spent 23 dollars (including AFUDC of \$0.422 million). These costs are identified in Confidential Appendix G-2, Financial Schedule 6. The continuity of the Net Salvage Deferral Account for the PGR 24 25 Project can be found in Confidential Appendix G-2, Financial Schedule 9.

26 6.4.3 Application and Preliminary Stage Development Costs

FEI is seeking BCUC approval under Sections 59 to 61 of the UCA for deferral treatment of the Application and Preliminary Stage Development costs.

³¹ The estimated \$2.127 million of project costs in 2023 shown in Table 6-4 is related to the close out costs to complete by July 2023 (approximately 1.33 percent of the total capital costs). These costs will be transferred to rate base on January 1, 2024.


- 1 The Application costs are based on a written hearing process and include expenses for legal 2 review, consultant costs, BCUC costs and BCUC-approved intervener costs.
- 3 The Preliminary Stage Development costs are related to expenses incurred for engaging third
- 4 party-consultants for feasibility evaluation, preliminary development and assessment of the
- 5 potential design and alternatives as required to complete this CPCN Application.
- FEI is seeking approval to record these costs in a new non-rate base deferral account, the PGR
 Application and Preliminary Stage Development Costs deferral account, attracting FEI's
 weighted average cost of capital until it enters rate base. FEI proposes to transfer the balance in
- 9 the deferral account to rate base on January 1, 2022 and commence amortization over a three-
- 10 year period thereafter.
- Table 6-5 below shows that the December 31, 2021 net-of-tax balance for the PGR Application and Preliminary Stage Development Costs deferral account is forecast to be \$0.555 million. The tax offset on capitalized costs is related to the pre-approval development costs incurred in 2020 that are capitalized but that are eligible for deduction for tax purposes in the year incurred. The continuity of the PGR Application and Preliminary Stage Development Costs deferral account
- 16 can be found in Confidential Appendix G-2, Financial Schedule 9.

Table 6-5: Forecast PGR Application and Preliminary Stage Development Costs deferral account (\$ millions)^{32,33}

	Forecast to Dec 31, 2021 (\$ millions) Preliminary		
Particular	Application	Stage Development	TOTAL
Pre-Tax Costs	0.350	2.507	2.857
WACC Return	0.007	0.278	0.285
Total Before Tax Offset	0.357	2.785	3.142
Tax Offset - Costs held in Deferral Account	(0.095)	(0.675)	(0.770)
Tax Offset - Capitalized Costs	-	(1.817)	(1.817)
Total	0.262	0.293	0.555
Annual Amortization for 3 years	(0.087)	(0.098)	(0.185)

19

20 6.5 RATE IMPACT

- 21 The PGR Project will have incremental delivery rate impacts from 2022 to 2025. The causes of
- the delivery rate impacts in each year are explained below:

³² Income tax offset on the deferred costs (i.e., \$0.770 million) equals to the sum of \$0.350 million for the Application costs and \$2.507 million for the Preliminary Stage Development costs times the income tax rate of 27 percent.

³³ Income tax offset on the capitalized costs (i.e., \$1.817 million) equals to the capitalized costs of \$6.730 million times the income tax rate of 27 percent.

- 2022 to 2024: Delivery rates will be impacted in these years by the amortization of the
 PGR Application and Preliminary Stage Development Costs deferral account as
 discussed in Section 6.4.3 above;
- 2023 and 2024: Delivery rates will be impacted in these years as the assets for the new
 IP pipeline and PRS in the City of Burnaby are scheduled to be placed in-service in 2022
 and 2023,³⁴ which will be transferred to rate base on January 1 of 2023 and 2024,
 respectively (as discussed in Section 6.4.1 above); and
- 8 2024 and 2025: Delivery rates will be impacted in these years as the 9 decommission/abandonment costs for the Pattullo Gas Line are scheduled to occur in 10 2023 and 2024,³⁵ after which the costs will be transferred to FEI's Net Salvage deferral 11 account on January 1st of 2024 and 2025, respectively (as discussed in Section 6.4.2 12 above). The estimated delivery rate impact in 2025 due to the decommissioning and 13 abandonment costs is offset by the elimination of the amortization of the PGR 14 Application and Preliminary Stage Development Costs deferral account, resulting in a 15 delivery rate credit in 2025.

16

Table 6-6 below shows the annual delivery rate impact in percentage terms compared to FEI's
 2021 approved non-bypass revenue requirement³⁶ and the incremental annual delivery rate

- 19 impact in percentage terms (year-over-year) from 2022 to 2025.
- 20

21

Table 6-6: Summary of Delivery Rate Impact for the PGR Project

	2022	2023	2024	2025
Annual Delivery Margin, Incremental to 2021 Approved, Non-Bypass (\$ millions)	0.288	5.715	13.890	13.773
% Increase to 2021 Approved Delivery Margin, Non-bypass	0.03%	0.65%	1.58%	1.57%
Incremental % Delivery Rate Impact (Year-over-Year)	0.03%	0.62%	0.92%	(0.01%)
Average Annual % Delivery Rate Impact (4 years, 2022 - 2025)	0.39%			
Average Annual Delivery Rate Impact (4 years, 2022 - 2025), \$/GJ	0.018			
Cumulative % Delivery Rate Impact (4 years, 2022 - 2025)	1.57%			
Cumulative Delivery Rate Impact (4 years, 2022 - 2025), \$/GJ	0.071			

The Project will result in an estimated delivery rate impact of 1.57 percent in 2025 when all construction, including the decommissioning and abandonment, is completed and all capital costs have entered FEI's rate base. The average annual delivery rate impact over the four years from 2022 to 2025 is estimated to be 0.39 percent annually or \$0.018 per GJ annually. For a typical FEI residential customer consuming 90 GJ per year, this would equate to an average bill increase of approximately \$1.62 per year over the four years, or cumulatively \$6.39 over the four years.

³⁴ All new assets will be in-service in 2022. There are approximately \$2.127 million (as-spent) of project closeout costs to complete by July 2023 (approximately 1.3 percent of the total capital costs). These costs will be transferred to rate base on January 1, 2024.

³⁵ There are approximately \$262 thousand (as-spent) of close out costs for the decommissioning and abandonment forecast to occur in the first quarter of 2024 (equivalent 1.7 percent of the total decommissioning and abandonment costs). These costs will be transferred to the Net Salvage deferral account on January 1, 2025.

³⁶ As approved under BCUC Order G-319-20.



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1 7. ENVIRONMENT AND ARCHAEOLOGY

2 7.1 *INTRODUCTION*

FEI is committed to delivering safe, reliable energy in an environmentally responsible manner. Based on the preliminary environmental and archaeological assessments completed by its consultants, FEI expects that the Project will have minimal environmental and archaeological impacts. The environmental and archeological assessments considered the potential impacts of the Project as divided into the following two components:

- the replacement gas line in the Sperling Avenue Corridor (Sperling Route); and
 - the decommissioning of the Pattullo Gas Line.
- 9 10

The Environmental Overview Assessments (EOAs) of the Project components conclude that the environmental risk of the Project is low. FEI will mitigate potential environmental impacts of the Project through the implementation of standard best management practices and mitigation measures. FEI will also minimize the impacts to construction timelines and costs resulting from encountering species at risk, fish habitat, or contaminated soil or groundwater through additional investigations during the detailed engineering phase prior to construction.

17 FEI assessed the footprint of the Sperling Route for high-level archaeological constraints in an 18 Archaeological Constraints Report (ACR) included as Appendix I-1. The ACR concluded that 19 the majority of the expected footprint is considered to have low archaeological potential within 20 highly developed areas. The ACR did not note any registered archaeological or heritage sites 21 overlapping the footprint; however, archaeological potential is considered elevated adjacent to 22 existing and historical watercourses. As recommended by its archaeological consultant, FEI will 23 be conducting an Archaeological Overview Assessment (AOA) for the Sperling Route in early 24 2021 to further assess the potential archaeological impacts.

The AOA of the decommissioning component (Appendix I-2) concluded that the proposed excavation locations are mostly located in areas of high archaeological potential due to an extensive history of occupation in the surrounding area.

28 FEI will conduct an Archaeological Impact Assessment (AIA) to further assess potential 29 archaeological and cultural impacts associated within areas of moderate and high 30 archaeological potential identified in the AOAs. For safety reasons, the AIA may be undertaken 31 concurrent with construction in paved areas, particularly in the decommissioning component. 32 The AIA will provide a detailed assessment to allow for development of site-specific mitigation 33 strategies to offset any potential impacts associated with the Project. Detailed archaeological 34 specifications will be prepared as part of the Project's tendering process to ensure that 35 contractors are aware of the Project's archaeological requirements. If the results of the AIA 36 determine that work is to take place in proximity to archaeological sites, monitoring during 37 excavation works will be conducted, as per the recommendations of the archaeologist.



- 1 FEI provided the Sperling Route ACR and Decommissioning AOA report to Indigenous
- 2 communities who requested drafts for their review and comment in early November 2020. FEI
- plans to incorporate any comments received on the ACR during the detailed engineering phaseof the Project.
- 5 In this Section, FEI explains that:
- the potential environmental impacts identified by the EOA can be mitigated through additional assessment, the implementation of best management practices and mitigation measures, and municipal, regional, provincial and federal permitting processes (Section 7.2); and
- the potential archaeological impacts identified by the ACR and AOA can be mitigated through additional assessment, the implementation of standard best management practices, and standard provincial and Indigenous permitting processes (Section 7.3).

13 **7.2** *ENVIRONMENT*

Hemmera Envirochem Ltd. (Hemmera)³⁷ was retained to complete an EOA for the Sperling
route (Sperling Route EOA) included as Appendix H-1, and Dillon Consulting Ltd. (Dillon)³⁸ to
complete an EOA for the decommissioning component of the Project (Decommissioning EOA)
included as Appendix H-2.

- 18 Hemmera assessed the impacts of the Sperling Route based on the expected footprint of 19 construction. The following route segments were assessed in the Sperling Route EOA:
- North of TransCanada Highway 1;
- TransCanada Highway Crossing; and
- South of TransCanada Highway 1.
- 23

24 Dillion assessed the impacts of the decommissioning componentt, including the following:

- Excavations proposed to cut and cap the existing Pattullo Gas Line;
- Deactivation of the existing gas line; and
 - Decommissioning of Pattullo Gate Station.
- 28

27

- The EOAs used a combination of desktop review of available information and preliminary field reconnaissance (PFR) surveys. The assessments were completed to identify and describe the
- 31 potential impacts to the biophysical environment arising from the Project's activities and to

³⁷ Hemmera is a multi-discipline consulting company that provide professional expertise in environmental sciences, social sciences, and engineering.

³⁸ Dillon is a multi-discipline consulting firm that has provided planning, engineering, environmental sciences and management services to the private and public services since 1946.



- 1 determine recommended mitigation actions. Detailed descriptions of Project related biophysical
- 2 impacts are set out in Section 6.0 and recommended mitigations in Section 7.0 of the Sperling
- 3 Route EOA (Appendix H-1), and Section 4.0 of the Decommissioning EOA (Appendix H-2). The
- 4 results of these environmental overview assessments will inform further detailed assessments
- 5 and the preparation of environmental management plans to be completed prior to the 6 commencement of the Project construction.
- 7 Based on this preliminary assessment, the environmental risk of the Project is low and any
 8 potential environmental impacts from the Project can be mitigated through the application of
 9 standard best management practices and mitigation measures.

10 7.2.1 Sperling Route Environmental Overview Assessment

The results of the Sperling Route EOA (Appendix H-1) completed by Hemmera is set out in the
"Pattullo Gas Line Replacement Project: Sperling to Graham Environmental Overview
Assessment" (Appendix H). The Sperling Route EOA includes the following areas:

- Current land use;
- Contaminated sites (soil and water);
- Terrestrial resources;
- Aquatic resources; and
- Wildlife, including species at risk.
- 19
- 20 The Sperling Route EOA set a study area defined as:
- A 150 m buffer on either side of centreline for desktop assessment
- A 500 m buffer on either side of centreline for assessment of wildlife and species at risk
- 23

The footprint of the Sperling Route is defined as the area directly disturbed for construction of the gas line, including temporary workspace and trenching.

The Sperling Route EOA identified natural features, such as fish, wildlife, and terrestrial habitat that could potentially be affected by project construction and decommissioning as well as issues that could impact the construction, costs, and timelines of the Project. The Sperling Route EOA also identified land use and locations with potential for encountering soil, trench water, or groundwater contamination which may impact project construction, costs, and timelines. Section 7.0 of the Sperling Route EOA report identifies proposed best management practices and mitigation measures to minimize impacts to natural features.

33 *7.2.1.1* Current Land Use

Land use varies throughout the Sperling Route study area, but is primarily located within developed urban areas, municipal and regional parks, and industrial / commercial areas.



Seven parks and conservation areas are located in or adjacent to the Sperling Route study
 area. Of these, three overlap with the Sperling Route footprint:

- 3 Robert Burnaby Park
 - Burnaby Lake Park
 - Graham Park
- 5 6

4

As the proposed Sperling Route footprint is located mostly within road rights-of-way and existing trails, minimal impacts to parks and conservation areas are anticipated.

9 7.2.1.2 Contaminated Sites

Locations where there is a medium to high potential for encountering soil or groundwater
contamination within the Sperling Route footprint may impact construction cost, and timelines.
These areas are defined as Areas of Potential Environmental Concern (APECs).

13 The Sperling Route EOA recommends that low risk APECs be managed during construction,

14 but medium to high risk APECs should be further assessed through the use of subsurface soil

15 and water investigation prior to construction. APECs were identified in the contaminated sites

16 study area, and are summarized in the Sperling Route EOA and in Table 7-1 below.

17 Table 7-1: Registered Contaminated Sites and APECs overlapping with Sperling Route Footprint

APEC Address	Risk Classification	Distance from Pipeline
Former service station (6692 Lougheed Highway)	High	On-site
Railway crossing (Winston Street)	Medium	On-site
Former British Columbia Electric Railway Line	Medium	On-site
Former electronics manufacturing facility (7000 Lougheed Highway)	High (below 3 m)	120 m to northeast

18

FEI will undertake further assessment of medium and high risk APECs during the detailed engineering phase of the Project to minimize the risk of these APECs on the Project costs and timelines.

22 7.2.1.3 Fish and Fish Habitat

The Sperling Route EOA assessed the potential for watercourses, wetlands and fish species at risk within the Sperling Route study area. Thirty watercourses overlap with the Sperling Route

25 footprint, including Still Creek and multiple tributaries to Burnaby Lake.



1 Burnaby Lake and its tributaries are considered salmon habitat. All watercourses that are 2 included in the study area are considered fish habitat.

3 7.2.1.4 Wildlife

4 The wildlife study area was reviewed to determine use by known wildlife and species at risk, 5 and to assess the species' potential presence during desktop review.

6 Twenty species at risk have potential to occur within the Sperling Route study area. Critical7 habitat for two species overlaps with the Sperling Route footprint.

8 7.2.1.5 Vegetation

9 Plant species at risk, ecological communities at risk, and noxious plant species were reviewed10 as a part of the Sperling Route EOA:

- Two plant species at risk have potential to occur in or adjacent to the Sperling Route study area;
- No ecological communities at risk have potential to occur in or adjacent to the Sperling
 Route study area; and
- Four noxious plant species have potential to occur, or have mapped occurrences, within
 the Sperling Route study area.

17 7.2.2 Decommissioning Component Environmental Overview Assessment

18 The results of the Decommissioning EOA completed by Dillon are set out in the "Pattullo Gas 19 Main Replacement Project: Decommissioning of Existing Gas Main Infrastructure Environmental 20 Overview Assessment Report" (Appendix H-2). The Decommissioning EOA includes the 21 following areas

- Current land use;
- Contaminated sites (soil and water);
- Terrestrial resources;
- Aquatic resources; and
- Wildlife, including species at risk.
- 27

The Decommissioning EOA identified natural features, such as fish, wildlife, and terrestrial habitat that could potentially be affected by Project decommissioning as well as issues that could impact the construction, costs, and timelines of the Project. The Decommissioning EOA also identified land use and locations with potential for encountering soil, trench water, or groundwater contamination which may impact project construction, costs, and timelines. Section 4.0 of the Decommissioning EOA identifies proposed best management practices and mitigation measures to minimize impacts to natural features.



- 1 The Decommissioning EOA set a study area defined as:
 - A 400 m buffer on either side of centreline for desktop assessment and assessment of aquatic resources
- A 100 m buffer on either side of centreline for assessment of land use, terrestrial resources, and environmentally sensitive areas
- A 500 m buffer on either side of the centreline for assessment of contaminated sites
- 7

2

3

- 8 The footprint of the decommissioning component is defined as the area directly disturbed for
- 9 cutting and capping of the existing gas line, including temporary workspace, excavations, and10 the area encompassing Pattullo Gate Station.

11 7.2.2.1 Current Land Use

12 Land use varies throughout the decommissioning footprint, but is primarily located within 13 developed urban areas, municipal and regional parks, and industrial / commercial areas. No 14 parks or conservation areas overlap with the decommissioning footprint.

15 7.2.2.2 Contaminated Sites

Locations where there is a medium to high potential for encountering soil or groundwater
contamination within the decommissioning footprint may impact construction cost, and timelines.
These areas are defined as APECs.

19 The Decommissioning EOA recommended that low risk APECs be managed during 20 construction, but medium to high risk APECs should be further assessed through the use of 21 subsurface soil and water investigation prior to construction. APECs were identified in the 22 contaminated sites study area, and are summarized in the Decommissioning EOA and in Table 23 7-2 below.

24Table 7-2: Registered Contaminated Sites and APECs overlapping with Decommissioning25Footprint

APEC Address	Risk Classification	Distance from Pipeline
10905 102 Street (Surrey)	Medium	On-site
11078 Bridge Road (Surrey)	Medium	On-site
Under Pattullo Bridge and rail bridge (Surrey)	Medium	< 50 m
11105 Bridge Road and adjacent parcels (Surrey)	High	50 m



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APEC Address	Risk Classification	Distance from Pipeline
11055 Bridge Road (Surrey)	Medium	50 m
Pattullo Bridge north of 11105 Bridge Road (Surrey)	Medium	60 m
ROW adjacent to 11105 Bridge Road (Surrey)	Medium	50 m cross gradient
New Westminster rail bridge	Medium	< 50 m

1

2 FEI will undertake further assessment of medium and high risk APECs during the detailed

engineering phase of the Project to minimize the risk of these APECs on the Project costs and
 timelines.

5 7.2.2.3 Fish and Fish Habitat

6 The Decommissioning EOA assessed the potential for watercourses, wetlands and fish species7 at risk within the Decommissioning study area.

- Surrey four watercourses (including Fraser River)
 - New Westminster one watercourse (Fraser River)
- 9 10

11 The Fraser River is habitat for several fish species, including provincially endangered white 12 sturgeon, federally and provincially endangered green sturgeon, and all salmonid species. All

13 watercourses that are included in the decommissioning study area are considered fish habitat.

14 *7.2.2.4 Wildlife*

The wildlife study area was reviewed to determine use by known wildlife and species at risk,and to assess the species' potential presence during desktop review.

Three species at risk have potential to occur within the decommissioning study area. No criticalhabitat overlaps with the decommissioning footprint.

19 7.2.2.5 Vegetation

Plant species at risk, ecological communities at risk, and noxious plant species were reviewedas a part of the Decommissioning EOA.

• Two plant species at risk have potential to occur in or adjacent to the decommissioning footprint;



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- No ecological communities at risk have potential to occur in or adjacent to the 1 • 2 decommissioning footprint; and
 - No noxious plant species were noted during the assessment. •

7.2.3 4 Mitigation Measures

- 5 Standard best management practices and mitigation measures to minimize and avoid potential 6 impacts of the Project are described in Section 7.0 of the Sperling Route EOA, and Section 4.0 7 of the Decommissioning EOA including, but not limited to:
- Apply best practices for managing invasive and noxious plants, particularly Japanese 8 • 9 knotweed;
- 10 Adhere to general wildlife measures;
- 11 Adhere to wildlife timing windows;
- 12 Minimize vegetation removal; •
- 13 Restore temporary disturbance footprints in greenspaces promptly; •
- 14 Apply measures to avoid causing harm to fish and fish habitat;
- 15 Adhere to least impact to fish timing windows;
- 16 Assess habitat suitability for species with Critical Habitat polygons overlapping with the 17 Project footprint; and
- 18 Adhere to bird timing windows.

19

3

- 20 FEI will follow the standard best management practices and mitigation measures applicable to
- 21 the Project during construction.

22 7.2.4 Permitting

- 23 Based on the preliminary environmental assessment work completed by Hemmera and Dillon,
- 24 the Project will likely require permitting/authorization under the following legislation:
- 25 Federal
- 26 Fisheries Act
- 27 Species at Risk Act •
- 28
- 29 Provincial
- 30 Agricultural Land Commission Act •
- 31 Environmental Management Act •
- Water Sustainability Act 32 •
- 33 Oil and Gas Activities Act •

- Wildlife Act
- 1 2
- 3 Other
 - Municipal permits
- 4 5

6 During the detailed engineering phase of this Project, FEI will undertake further environmental 7 assessments to confirm permitting requirements and will apply for permits as required. The 8 permits identified at this time are based on the current level of Project engineering and may 9 change during the detailed engineering phase.

10 7.2.5 Further Plans

11 Environmental constraints and potential impacts related to the Project will be further assessed 12 and documented prior to construction of the Project. This phase will include assessment of 13 vegetation, fish and wildlife and their habitat, and surface/ground water resources. Specific 14 studies to determine the presence of Pacific water shrew within the critical habitat polygon at 15 Still Creek will be undertaken. Non-lethal sampling methods, such as Environmental DNA³⁹, will 16 be employed.

Site-specific mitigation strategies will be developed to offset any potential impacts associated with the Project or from the environment on the Project. All required environmental permits for the Project will be identified prior to construction, with approvals sought before construction commences.

Detailed environmental specifications will be prepared as part of the Project tendering process to ensure that contractors are aware of the Project's environmental requirements in addition to FEI's internal environmental standards and requirements. Contractors will be required to review and abide by the project-specific Environmental Management Plan, submit task-specific Environmental Protection Plans, and retain the services of environmental monitor(s) prior to commencement of construction activities for the Project.

27 Environmental monitoring will be undertaken during all sensitive aspects of the work program. 28 The purpose of environmental monitoring during construction is to oversee the natural and 29 social environments, to monitor for any adverse effects, and to verify that the construction site is 30 returned to pre-construction conditions as soon as possible. This includes monitoring 31 compliance with pertinent environmental legislation, regulations, industry standards, and project 32 permit conditions, including any notification requirements or conditions set by the regulator. The 33 environmental monitor will provide inspection of contractor environmental mitigation measures 34 and respond to any environmental issues that may develop during construction. They will have

³⁹ Environmental DNA is biological DNA that is collected from a variety of environmental samples (e.g. soil or water) rather than directly sampled from an individual organism.



1 "stop work authority" in the event that works underway have the potential to impact the natural environment.

FEI will retain the services of a qualified environmental professional to undertake environmental auditing inspections. The environmental auditor will review environmental monitoring reports, inspect the contractor's environmental mitigation and protection measures, and ensure compliance with requirements of the Environmental Management Plan, Environmental Protection Plans, and applicable permits. Post-construction inspections will also be conducted to ascertain the success of the restoration effort and mitigation measures, including any notification requirements or conditions set by the regulator.

10 7.3 ARCHAEOLOGY

FEI retained consultants to assess the potential for archaeological and/or cultural heritage
 resources within the Project area and to determine the requirements for AIAs prior to ground
 disturbing activities.

FEI retained Stantec⁴⁰ to complete an ACR for the Sperling Route (Appendix I-1). An AOA will be conducted during detailed engineering design. The Sperling Route ACR consisted of a desktop review that included examination of an existing archaeological potential model along the route of the preferred alternative, queries of the Remote Access to Archaeological Data application, Provincial Archaeological Report Library, Provincial Consultative Areas Database, and orthophoto imagery.

Preliminary Field Reconnaissance (PFR) work will be conducted once FEI obtains necessary
 permits from Indigenous groups, anticipated in early 2021.

Archer Cultural Resource Management (Archer)⁴¹ was retained to complete an AOA of the decommissioning component of the Project (Appendix I-2). The decommissioning component AOA consisted of desktop review, information obtained from the Pattullo Bridge Replacement Project AOA, and Aboriginal Traditional Knowledge Studies. Due to the abundance of existing available information, no PFR was conducted. Indigenous Communities were contacted as part of the early outreach process.

28 7.3.1 Sperling Route Archaeology Constraints Report

The Sperling Route footprint was assessed for high-level archaeological constraints through an ACR. As part of the ACR, Stantec reviewed a range of environmental, archaeological, cultural, and historical information to assess the Sperling Route footprint for high-level archaeological potential and overlap with known archaeological and historic heritage sites. No registered archaeological sites or registered historic heritage sites overlap the Sperling Route study area.

⁴⁰ Stantec is a multi-discipline consulting firm that has provided a variety of professional services including archaeological, planning, engineering, and environmental services since 1954.

⁴¹ Archer CRM is an archaeological consulting firm that has provided archaeological services since 2006.

- A recognized historic house located in Burnaby at 7244 4th Street situated near the Sperling
 Route footprint is not expected to be directly impacted by Project construction.
- Previous AIA work has been completed at Sperling Avenue north of TransCanada Highway, a
 forested area at Claude Avenue and southern shoulder of TransCanada Highway, and a
 forested area at the confluence of Crayfish Creek Tributary 4 and Crayfish Creek Tributary 3.
- 6 No archaeological materials were observed and no further work is required in these areas.

As recommended by Stantec, FEI will conduct an AOA for areas where ground disturbance activities are anticipated on the Sperling Route and, in particular, where the Sperling Route footprint is in proximity to Burnaby Lake. It is expected that the AOA will begin during the detailed engineering phase of the Project. Information gathered during the geotechnical borehole program will inform the AOA.

FEI will complete AIA work where the Sperling Route footprint overlaps with areas of elevated archaeological potential identified during the AOA. A permit will be required under Section 12.2 of the *Heritage Conservation Act* (HCA) in order to undertake AIA activities. In addition, any Indigenous heritage investigation permits that are applicable at the time of the AIA will be obtained. AIA work may begin during the detailed engineering phase and continue throughout construction, especially in areas of potentially deep buried cultural deposits.

18 7.3.2 Decommissioning Archaeology Overview Assessment

As part of the decommissioning AOA, Archer reviewed available environmental, archaeological, cultural, and historical information. The decommissioning component was assessed for archeological potential and overlap with known archaeological sites. The results of the work completed by Archer are outlined in the AOA (Appendix I-2).

The AOA concluded that the proposed excavation locations are generally located in areas of high archaeological potential due to an extensive history of occupation in the surrounding area. Of the eight excavation sites, four are considered to have elevated potential for intact artifacts. A detailed AIA will be undertaken concurrent with decommissioning activities due to the majority of the work being located under paved roadways. A permit will be required under Section 12.2 of the HCA in order to undertake AIA activities. In addition, any Indigenous heritage investigation permits that are applicable at the time of the AIA will be obtained.

30 7.3.3 Indigenous Community Participation

Notification letters regarding general project information and updates were sent to Indigenous
 communities with asserted interests in the Project area. More information on FEI's engagement
 with Indigenous groups can be found in Section 8 of the Application.

- The decommissioning AOA was conducted under the following Indigenous cultural and heritage investigation permits:
- Cultural Heritage Investigation Permit (Tsleil-Waututh)



- Seyem' Qwantlen Heritage Investigation Permit (Kwantlen)
 - Stó:lō Heritage Investigation Permit
- Musqueam Heritage Research and Investigation Permit
 - Katzie Development Partnership Ltd. Permit
- 4 5

2

6 Prior to future Project-related archaeological assessments (e.g. AOA on the Sperling route, AIA,

7 archaeological monitoring), Indigenous groups will be notified of the work, applicable Indigenous

8 cultural and heritage investigation permits obtained, and communities provided the opportunity

9 to participate in the archaeological assessments.

10 7.3.4 Further Plans

An AOA will be completed for the Sperling Route, and will begin during detailed engineering design. Potential archaeological and cultural impacts associated within the areas of moderate and high archaeological potential will be further assessed during an AIA for both the Sperling Route component and decommissioning component, which will be undertaken either prior to, or concurrent with, construction. Any AIA conducted prior to construction will provide a detailed assessment to allow for development of site-specific mitigation strategies to offset any potential impacts associated with the Project.

18 Detailed archaeological specifications will be prepared as part of the Project's tendering process 19 to ensure that contractors are aware of the Project's archaeological requirements. As described 20 above, contractors will be required to review and abide by the project-specific Environmental 21 Management Plan, which will include best management practices for protection of 22 archaeological and cultural resources, prior to commencement of the Project. If the results of 23 the AIA determine that work is to take place in proximity to archaeological sites, monitoring 24 during excavation works will be conducted, as per the recommendations of the archaeologist. 25 The designated archaeological monitor will have "stop work authority" in the event that works 26 underway have the potential to impact archaeological or cultural resources. Archaeological 27 management on the remainder of the Project will be executed under a Chance Finds Procedure⁴². 28

⁴² The procedures that the contractor will follow upon discovering unanticipated potential heritage resources or human remains (i.e., Chance Finds) to remain compliant with applicable municipal, provincial, and federal legislation as well as applicable Indigenous policies.



1 8. CONSULTATION

2 8.1 *INTRODUCTION*

3 FEI has consulted and engaged extensively on the Project to date and will continue to do so 4 through the course of the Project. FEI has used multiple communication and consultation 5 methods to ensure that stakeholders, including federal and provincial elected officials, local 6 government, customers, residents, businesses, stakeholder groups, schools, places of worship, 7 places of community gathering and permitting agencies, have had the opportunity to become 8 informed about the Project and provide their feedback. FEI has also engaged early with 9 potentially impacted Indigenous groups in a thorough, timely and meaningful manner. FEI 10 values the comments and feedback received, and has incorporated this feedback into its Project 11 planning.

FEI's engagement on the Project began in October 2018 with early engagement on the horizontal directional drill (HDD) options with Indigenous groups. In 2019, FEI continued early engagement with Indigenous groups, and commenced consultation with the City of New Westminster, the City of Surrey and local stakeholders. FEI's early stakeholder consultation and Indigenous engagement log on the HDD alternatives is included in Appendix J-1.

FEI began consultation and engagement on the Gaglardi Route with the City of Burnaby in February 2020, Indigenous groups in March 2020 and local stakeholders in June 2020. To guide the consultation and engagement activities, FEI developed a Consultation and Engagement Plan for the Gaglardi Route, which is included as Appendix J-2. FEI's stakeholder consultation log and Indigenous engagement log for the Gaglardi Route are included as Appendices J-3 and J-4, respectively.

23 On July 31, 2020, the City of Burnaby requested that FEI investigate the Sperling Route as an 24 alternative to the Gaglardi Route. As such, FEI developed a Consultation and Engagement Plan 25 for the Sperling Route, which is included as Appendix J-5. Beginning in August 2020, FEI 26 engaged Indigenous groups and permitting agencies to assess the feasibility of the Sperling 27 Route. After progressing the Sperling Route's initial feasibility assessment, FEI commenced 28 consultation with local stakeholder groups and businesses beginning in October 2020. In 29 November 2020, FEI began consultation with other local stakeholders, including federal and provincial elected officials, customers, residents, schools, places of worship and places of 30 31 community gathering. FEI's stakeholder consultation log and Indigenous engagement log for the 32 Sperling Route are included as Appendices J-6 and J-7, respectively. Throughout this 33 consultation and engagement, FEI tracked issues, interests and concerns raised. FEI will 34 continue to work with Indigenous groups and stakeholders to address any questions or 35 concerns on the Sperling Route.

FEI presented information and encouraged feedback regarding the Project through a number of channels, including meetings, project notification letters, telephone calls and virtual information sessions. Due to COVID-19, FEI assessed its consultation and engagement approach, as



outlined in the consultation and engagement plans, and adapted its approach to address COVID-19 safety requirements. For example, rather than in-person meetings FEI consulted interested parties via telephone, conference calls and virtual information sessions. FEI understands the significant and ongoing impact of the COVID-19 pandemic on communities, and as such, continues to adapt its traditional consultation methods to ensure adequate consultation and engagement opportunities are safely available for stakeholders and Indigenous groups.

- 8 In the following sections, FEI explains how:
- FEI is undertaking, and will continue to undertake, appropriate public and stakeholder consultation regarding the Project (Section 8.2); and
- FEI is undertaking, and will continue to undertake, appropriate engagement with
 Indigenous groups regarding the Project (Section 8.3).

13 8.2 FEI IS UNDERTAKING APPROPRIATE PUBLIC CONSULTATION

FEI's consultation with the public has been a crucial component in the development of the Project. In particular, FEI has incorporated feedback from stakeholders into its route selection process and assessed alternative routes, including the Sperling Route. To support the approval and completion of the Project, FEI's approach is to be open, transparent and consistent in interactions with stakeholders.

19 FEI has extensively consulted with the City of Burnaby since February 11, 2020. FEI's early 20 consultation with the City of Burnaby focused on the Gaglardi Route (see Exhibit B-3). On July 21 31, 2020, the City of Burnaby requested that FEI investigate the Sperling Route as an 22 alternative to the Gaglardi Route. Since that time, FEI has primarily focused its public 23 consultation activities on the Sperling Route in order to understand and assess its feasibility. 24 During this time, FEI shared route information, encouraged comments and questions, and sought feedback on the route including, in particular, its potential impacts. FEI's log of 25 26 stakeholder consultation activities to date for the Sperling Route is included as Appendix J-6.

- The following sub-sections provide details of FEI's public consultation on the Project, and the Sperling Route, which includes:
- Communication and public consultation objectives that FEI adopted in public consultation throughout the development of the Project (Section 8.2.1);
- Identification of stakeholders with an interest in the Project with whom FEI has and will continue to consult (Section 8.2.2);
- Communication materials and methods used and employed by FEI to consult with stakeholders regarding the Project (Section 8.2.3);
- Community, social and environmental considerations that FEI used to guide its consultation with stakeholders (Section 8.2.4);
- Public consultation activities to date, and how FEI incorporated feedback (Section 8.2.5);



- Issues and concerns raised about the Project by customers, residents, businesses and stakeholder groups, and how FEI responded to these issues or concerns to date (Section 8.2.6);
- Future consultation activities that FEI intends to undertake, which will include meetings,
 letters/emails and virtual information sessions (Section 8.2.7); and
- FEI's commitment to address any existing or future outstanding issues or concerns
 (Section 8.2.8).

8 8.2.1 FEI Has Identified Appropriate Communication & Public Consultation Objectives

9 Consistent with industry best practices, FEI adopted the following objectives to guide public 10 consultation and to solicit community feedback throughout the Project:

- Create awareness of the Project, specifically within communities directly impacted by
 Project activities;
- Ensure that balanced and objective information is provided to stakeholders regarding the
 Project;
- Provide opportunities for stakeholders to give feedback and to understand their concerns, incorporating feedback into the Project design and construction activities to proactively mitigate impacts to the public; and
- Proactively provide information to the community, including via media outlets, social media, advertising, newsletters and websites, to help inform the broader public about the Project and future construction work in the community.

21 8.2.2 FEI Has Identified Key Stakeholders for Public Consultation

- As part of developing its Consultation and Engagement Plan for the Sperling Route, FEI identified and consulted with the following stakeholders:
- Members of Parliament and their respective constituency offices;
- Provincial government bodies, including Members of the Legislative Assembly and their respective constituency offices;
- Local government, including the cities of Burnaby, New Westminster and Surrey;
- FEI's gas customers, residents, businesses and stakeholder groups all of whom are either in close proximity to, or may be impacted by the Project;
- Schools, places of worship and places of community gathering in close proximity to the proposed route; and
- Permitting agencies.

33

FEI will continue to refine its communication and consultation methods, based on feedback fromthese stakeholders.



18.2.3FEI Has Used Appropriate Communications Materials and Methods to Support2Consultation

As described further below, FEI developed a number of communication materials and methods
 to carry out consultation with identified stakeholders.

5 **Pre-Announcement Notifications**

Beginning on October 20, 2020 and in advance of publicly announcing the Sperling Route, FEI
contacted stakeholders and permitting agencies via phone and email to introduce the Project
and gather early feedback. Notifications were provided to:

- 9 The Burnaby Board of Trade;
- Staff at the City of Burnaby;
- Recreational facilities located in close proximity to Sperling Avenue;
- 12 The Wildlife Rescue Centre located on Glencarin Drive;
- Burnaby Bike HUB;
- Simon Fraser University staff; and
- Permitting agencies including Metro Vancouver, Metro Vancouver Regional Parks
 District, The Ministry of Transportation and Infrastructure, BC Hydro, TELUS, Shaw,
 Southern Railway of British Columbia, CN Rail and Burlington Northern Santa Fe
 Railway.

19 **Public Announcement of the Sperling Route**

20 On November 19, 2020, FEI announced the Sperling Route to the public, utilizing a number of 21 communications channels including media outreach, digital communications, advertising and 22 social media. A detailed description of these activities is provided below.

23 Information Bulletin

On November 19, 2020, FEI shared an information bulletin detailing the Sperling Route. This information bulletin was posted on FEI webpages including "Talking Energy" and FortisBC.com emailed to subscribers who had signed up for Project updates, and shared with local media and stakeholders. It contained Project details, virtual information session details and FEI contact information. A copy of the information bulletin and related media coverage are included in Appendix J-8 and Appendix J-9 respectively.

30 **Project Webpage**

- 31 The dedicated Project webpage on FEI's "Talking Energy" website was updated on November
- 32 19, 2020 to be reflective of FEI's investigation into the feasibility of the Sperling Route. This
- 33 webpage was created in 2019 to support early consultation regarding the HDD options and was
- 34 subsequently revised on June 17, 2020, to reflect the Gaglardi Route.



1 The webpage provides a Project overview, including maps, FEI contact details and a high-level 2 Project schedule. While the webpage is best viewed online at 3 <u>www.talkingenergy.ca/pattullogasline</u>, a copy is attached as Appendix J-10. The website

- 4 includes a dedicated phone line (604-576-7208) and email (<u>pattullogasline@fortisbc.com</u>) in
- 5 order for the community to contact FEI directly with questions and feedback.
- Between September and November 2020, the Project webpage and information session
 registration page had 1,326 unique visitors (measured as unique page views). This included
 1,038 in November 2020, as FEI started consultation on the Sperling Route.

9 Social media

FEI social media accounts (Facebook, Twitter) provide a timely, effective way to reach
 stakeholders including customers and local communities. For the Sperling Route, FEI has:

- Posted on Twitter between September 25 and October 15, 2020 informing the community that FEI had submitted the Project Application and how stakeholders can get involved. These tweets generated 3,165 views and 28 responses, including comments, shares and likes.
- Beginning November 20, 2020, shared the Sperling Route public announcement and virtual information session details via posts on Twitter and Facebook. As at November 30, 2020, these social media posts had generated 4,372 impressions and 34 responses including comments, shares and likes.
- 20

Examples of FEI's social media communications regarding the Sperling Route are included inAppendix J-11.

23 Bill insert

In its December 2020 billing cycle, FEI sent a bill insert to all natural gas customers informing them of the Project and its expected impact to rates. Bill inserts comprise a paper notification included as part of a customer's monthly bill. It was accompanied by Project notifications included as part of e-bill emails and on FEI's Accounts Online payment portal. This online portal allows customers to pay their bill and is visited by approximately 360,000 customers per month. This bill insert is included in Appendix J-12, and the e-bill and the Accounts Online notifications as Appendix J-13.

31 Email newsletters (e-blasts)

As of November 30, 2020, 100 people had signed up to receive email updates from FEI in relation to the Project. On October 10, 2020, FEI sent a newsletter to subscribers informing them that FEI had filed the Project Application and that interveners could now register to participate in the proceeding before the BCUC. On November 19, 2020, FEI emailed a newsletter to subscribers with details of the Sperling Route and upcoming information sessions. These newsletters are included as Appendix J-14.



1 Direct Notifications/Information Card

2 As part of the public announcement of the Sperling Route, FEI contacted residents and

businesses along the route to ensure they were aware of the Project and had the opportunity toprovide feedback.

5 Ahead of the virtual public information sessions, FEI mailed information cards to more than 6 15,000 addresses in the City of Burnaby who are in proximity to the Sperling Route. The 7 information cards provided Project details, including a map and dial-in information for virtual 8 information sessions held on November 24 and 26, 2020. A copy of these information cards is

9 included as Appendix J-15.

10 Paid Advertisements

- 11 In November 2020, FEI used a combination of print and digital advertising to raise awareness of
- 12 the Sperling Route and encourage participation in the virtual information sessions. This included
- 13 digital and mobile ads geo-targeting Burnaby, as well as a half-page advertisement in the
- 14 *Burnaby Now* newspaper on November 19, 2020.
- Digital advertising generated 322,937 views with 422 people clicking through to view the Project website. The half-page advertisement in the *Burnaby Now* newspaper reached an estimated audience of approximately 45,000 people. These advertisements shared information about the Project, including upcoming information sessions and directed people to the Project website to learn more. See Appendix J-16 for examples of the advertisements referenced above.

8.2.4 FEI's Consultation Approach Reflects Community, Social and Environmental Considerations

22 Community, social, economic and environmental considerations have helped guide the 23 Consultation and Engagement Plan for the Sperling Route. The Sperling Route, as proposed, 24 takes place in an environmentally sensitive area adjacent to Burnaby Lake Regional Park, as 25 well as residential areas south of Highway 1. A number of recreation and athletic facilities are 26 located along Sperling Avenue. FEI is consulting with Federal and Provincial elected officials, 27 local government, customers, residents, businesses, stakeholder groups, schools, places of 28 worship and community gathering, and permitting agencies to identify and mitigate issues, and 29 to connect the local workforce and businesses to Project opportunities.

30 8.2.5 FEI Has Undertaken Appropriate Public Consultation Activities to Date

The following sections provide a summary of FEI's consultation activities with stakeholders, including concerns and questions that were raised throughout the process, how FEI has responded to these to date, and its plan for addressing concerns and questions as the Project develops. FEI will continue to track consultation and corresponding feedback received from stakeholders as the Project progresses.



1 *8.2.5.1* Consultation to Date with Customers, Residents, and Businesses

- Due to COVID-19, FEI conducted virtual public information sessions to consult with interested members of the public, including customers, residents, and businesses. FEI hosted sessions on November 24 and 26, 2020, which included presentations at 5 p.m. and 6:30 p.m. During these sessions, FEI's Project team members participated and answered questions regarding the Project. This virtual public information structure provided opportunities for FEI to share the Project evention and to receive public feedback
- 7 Project overview and to receive public feedback.

8 In total, 21 people participated in the two virtual public information sessions. Members of the 9 public asked questions related to traffic and access to nearby facilities and homes, construction 10 methods and associated timelines, and potential environmental impacts. See Appendix J-17 for 11 a copy of the virtual information session presentation. Themes of questions and FEI's 12 responses are detailed further in Section 8.2.6.

FEI plans to schedule in-person information sessions to supplement the virtual public information sessions when it is safe to do so in accordance with public health guidance. These in-person information sessions would offer an additional opportunity for stakeholders to meet with Project team members to learn about the Project and provide feedback.

17 *8.2.5.2* Consultation to Date with Stakeholder Groups

FEI consulted stakeholder groups, including schools, places of worship and community gatherings impacted by the Project. A record of consultation with these stakeholders is included in the stakeholder consultation log, as copy of which is provided as Appendix J-6. This included FEI reaching out via phone and email offering to discuss the Project individually, as well as inviting the stakeholder groups to participate in the virtual public information sessions. FEI consulted with the following stakeholder groups:

- Burnaby Board of Trade;
- Burnaby Bike HUB;
- Simon Fraser University;
- Burnaby Lake Park Association;
- Burnaby Canoe and Kayak Club;
- Burnaby Lake Rowing Club;
- Local stream keepers;
- Scandinavian Cultural Centre;
- Burnaby Tennis Club;
- Fortius Sports Performance Centre;
- Burnaby Lake Rugby Club;
- Burnaby Archery Club;



- Burnaby Lake Flyers Club;
- Wildlife Rescue Association of British Columbia;
- BC Trucking Association;
- Westminster Bible Chapel;
- 5 Second Street Community School; and
- 6 Lakeview Elementary School.

7 8.2.5.3 Consultation to Date with Local, Provincial and Federal Government

8 8.2.5.3.1 LOCAL GOVERNMENT

9 FEI has focused on frequent and meaningful engagement with the City of Burnaby (City) in an 10 effort to incorporate the City's feedback on the Project and minimize impacts to local residents. 11 FEI acknowledges that the City has unique and valuable insight into the impacts of an urban 12 construction Project on its residents and, therefore, FEI has focused considerable effort on 13 seeking and addressing feedback from the City. This includes investigating the feasibility of a 14 route along Sperling Avenue, at the request of the City.

FEI began consultation with the City on the Gaglardi Route on February 11, 2020, and
introduced the route to Burnaby Mayor and Council at a Council workshop on March 3, 2020. At
the request of the Council, on March 30, 2020 FEI provided a memo describing the need for the
Project and the route selection process. This included a summary of alternatives explored by
FEI.

20 FEI continued to consult and negotiate with the City regarding the Gaglardi Route on a weekly 21 basis. Discussions included, but were not been limited to, traffic management planning, 22 proposed construction methodologies along the route and the proposed location of the 23 underground pressure regulating station. In an effort to achieve Project acceptance, FEI also 24 discussed jointly coordinated projects, introduced by the City, whereby the City expressed a 25 strong interest in FEI constructing municipal capital projects during the execution of FEI's 26 Project to minimize multiple and compounding adverse impacts to the community. These jointly 27 coordinated projects could have included the installation of an IT conduit and construction of a 28 bike path and associated road upgrades along the Gaglardi Route.

Following a meeting on May 20, 2020, the City requested that FEI further explore the Fraser Gate Corridor route (Alternative 6C), which was previously deemed to be not feasible.⁴³ The City expressed an interest in whether FEI would be able to coordinate and execute the construction of the Project with a future City district energy project planned in proximity to the Fraser Gate Corridor route. FEI completed a further analysis of the Fraser Gate Corridor route and provided the City with a memo on June 8, 2020. The memo reiterated FEI's conclusion that

⁴³ Please refer to Section 4.4.2.4 of the Application.

the Fraser Gate Corridor was not feasible, and that effective coordination of construction activities for the gas line and the district energy system project concurrently would introduce

3 unacceptable risk to FEI's PGR Project and would result in significant impacts to the public.

FEI continued discussions with the City on the Gaglardi Route and on July 20, 2020, Council passed a recommendation brought forward by the City's Finance Management Committee to "oppose the proposed FortisBC Pattullo Gas Line Replacement Project pipeline route through Ruraby" 44 The City ponetholess continued to discuss the Gaglardi Route with FEI

7 Burnaby".⁴⁴ The City nonetheless continued to discuss the Gaglardi Route with FEI.

8 On July 31, 2020, the City requested that FEI investigate the Sperling Route Corridor. On 9 August 19, 2020, the City informed FEI that they would no longer continue discussions on the 10 Gaglardi Route. On September 8, 2020, FEI provided the City with a memo outlining the 11 Sperling Route Corridor with three possible route options, and sought feedback from the City on 12 their preferred route option and PRS location. FEI indicated that it would continue to assess the 13 feasibility of the Sperling Route. Discussions between FEI and the City regarding the Sperling 14 Route Corridor have continued and on September 18, 2020, FEI and the City walked the 15 Sperling Route Corridor and discussed the three possible route options.

16 During the walk-through on September 18, 2020, the City also recommended a fourth route 17 option within the Sperling Route Corridor, which is described in Section 5. On September 22, 18 2020, FEI presented the four Sperling route options to Mayor and Council and solicited input. 19 Mayor and Council stated that they preferred the "Sperling Option 4 Route" (i.e. the Sperling 20 Route as described in Sections 4.4.4.2 and 5.3), and subsequently provided FEI with a letter 21 indicating that at a Closed Council Meeting on September 28, 2020, "Council unanimously 22 supported the Sperling Option 4 Route in principle". A copy of the letter is attached as Appendix 23 J-18.

24 Since receiving this letter of unanimous support, FEI has continued to consult and negotiate with the City on a weekly basis regarding the Sperling Route Corridor and specifically Route 25 26 Option 4. Discussions have included such items as traffic management planning, gas line 27 alignment, land acquisition and temporary workspace requirements along the Sperling Route. 28 FEI requires statutory right-of-way from the City, as well as temporary workspace from the City. 29 This includes temporary workspace from the City that is currently leased by Metro Vancouver 30 Regional Parks District (see Appendix J-6 for the Sperling Consultation log, which includes 31 correspondence with Metro Vancouver Regional Parks District).

In an effort to achieve Project acceptance, including obtaining the rights and approvals for the necessary statutory right-of-way and temporary workspace, FEI again discussed jointly coordinated projects proposed by the City. These projects, in the context of the Sperling Route, include the construction of a bike path along the gas line alignment. On December 11, 2020, FEI and the City signed an agreement (Terms of Reference) setting out the terms on which FEI would construct the Project along the Sperling Route Corridor in the City of Burnaby. The City is

⁴⁴ See Burnaby Council Minutes, Page 7 Section 4.8. Online: <u>https://pub-burnaby.escribemeetings.com/FileStream.ashx?DocumentId=47967</u>.

supportive of the Sperling Route. The Terms of Reference is attached as Confidential Appendix
 J-19.

3 8.2.5.3.2 PROVINCIAL AND FEDERAL GOVERNMENT

Local constituency offices for federal Members of Parliament were notified of the Sperling Route
public announcement on November 20, 2020. No concerns or questions were raised. Local
constituency offices for provincial Members of the Legislative Assembly were notified on
November 30, 2020. No concerns or questions were raised.

8 *8.2.5.4* Consultation to Date with Permitting Agencies

9 FEI has focused on frequent and meaningful early consultation with permitting agencies. For the

10 Sperling Route, this has included Metro Vancouver, Metro Vancouver Regional Parks District,

11 The Ministry of Transportation, BC Hydro, TELUS, Shaw, Southern Railway of British Columbia,

12 CN Rail and Burlington Northern Santa Fe Railway.

13 FEI is early in the process of responding to questions and concerns raised by permitting 14 agencies, and submitting information for feedback. Questions and concerns raised by permitting 15 agencies to date include environmental considerations related to the sensitive park habitat and 16 riparian forest between Highway 1 and Burnaby Lake, working within and in proximity to existing 17 statutory right-of-ways, and working near existing third-party utility infrastructure. FEI will continue to consult with permitting agencies as the Project develops to achieve the necessary 18 19 approvals and permits. A record of consultation with these permitting agencies to date is 20 provided in the stakeholder consultation log (Appendix J-6).

8.2.6 FEI Has Responded to Questions and Concerns Raised by Customers, Residents, Businesses, and Stakeholder Groups

FEI has been open and transparent in its consultation and communication with stakeholders regarding the Project, including proactively discussing Project details, and responding to questions and concerns in a timely manner.

The questions and concerns raised during early consultation activities are detailed further in Table 8-1 below.

2	
~	

Table 8-1: Questions and Concerns from Customers, Residents, Businesses, and Stakeholder Groups

Question/Concern	Description of question/concern	FEI's Response
Access during construction	Residents questioned whether the Project would result in full road and multi-use path closures and restrict access to homes, recreation areas and businesses.	FEI will avoid full road and multi- use path closures and maintain access to homes, recreation areas and businesses throughout construction. If access needs to be restricted, it would be communicated proactively and FEI would work with stakeholders to mitigate associated impacts.
Environmental concerns	Several residents and stakeholder groups expressed concerns about potential environmental impacts to Burnaby Lake Regional Park.	FEI will minimize any potential impacts to the environment. This includes conducting pre- construction surveys to identify environmental receptors in the Project study area (e.g., fish, wildlife species at risk etc.), producing an Environmental Management Plan and requiring the contractor to create Environmental Protection Plans that clearly identify how they plan to protect the environment during construction.
Ongoing Project communications	Residents stressed that it is important to promote Project awareness so the community is informed and continues to be informed regarding the Project.	FEI is committed to updating the community as the Project continues to develop.

3 8.2.7 Future Consultation, Communication, and Engagement

FEI is committed to providing Project updates and proactive communication to minimize
concerns and inconveniences associated with construction activities. In order to understand,
minimize and mitigate impacts to stakeholders, FEI will continue to:

- Communicate with Federal and Provincial elected officials, local government, customers,
 residents, businesses, stakeholder groups, schools, places of worship, places of
 community gathering and permitting agencies;
- Identify opportunities to continue consultation with local stakeholders, including through meetings, phone calls, in person or virtual public information sessions; and
- Communicate broadly in the communities that will be most affected by the Project, including through direct notifications, social media, media outreach, advertising, etc. This



 includes informing City of Burnaby residents of engagement opportunities and the distribution of construction notifications to nearby residents and businesses.

3 8.2.8 FEI Will Address or Respond to Outstanding Issues or Concerns

FEI is committed to responding to the feedback received from stakeholders during consultation on the Project. FEI has responded to concerns raised by customers, residents, businesses and stakeholder groups, and has sought to address them. FEI has also responded to questions and concerns raised by permitting agencies, and will continue to address them as the Project develops.

9 8.3 ENGAGEMENT WITH INDIGENOUS GROUPS

10 FEI engages meaningfully with Indigenous groups through transparent, frequent, two-way 11 dialogue, and has done so since early in the Project's development. FEI is guided by its 12 'Statement of Indigenous Principles,' which was developed in 2001, with guidance and input 13 from Indigenous leaders across British Columbia (see Appendix J-20). This collaborative 14 approach leads to the early identification of issues or concerns, and a shared interest in finding 15 mutually agreeable solutions. Since 2018, FEI has engaged with all Indigenous groups with 16 asserted interests in the Project area. FEI endeavors to develop meaningful and enduring 17 relationships with Indigenous groups across the Province and will continue to be guided by its 18 core principles throughout the lifecycle of the Project.

- 19 The subsections below are organized as follows:
- FEI has adopted an approach to engagement with Indigenous groups that is thorough, timely and meaningful (Section 8.3.1);
- FEI has identified the Indigenous groups that may be impacted by the Project (Section 8.3.2);
- FEI has consulted with potentially affected Indigenous groups in a manner that respects
 COVID-19 restrictions and capacity challenges, focusing on email, regular mail and
 virtual meetings (Section 8.3.3);
- FEI has documented and addressed the issues and interests raised by Indigenous groups to date (Section 8.3.4);
- There are no known outstanding issues or questions which cannot be addressed
 through future engagement, and FEI remains committed to addressing any further
 issues or questions that may be raised by Indigenous groups (Section 8.3.5); and
- Indigenous engagement to date has been appropriate (Section 8.3.6).
- 33

All correspondence associated with the engagement that took place with the identified Indigenous groups in connection with the Project is included in Appendices J-1, J-4 and J-7. FEI will continue to engage with potentially affected Indigenous groups through follow-up meetings,



information sharing, and letters/emails, including advising these groups of our filing of theApplication.

3 8.3.1 FEI's Engagement Approach is Appropriate

4 While the constitutional duty to consult rests with Crown agencies, FEI's Indigenous 5 engagement activities aid the appropriate Crown agency in meeting that duty. FEI's approach to 6 consultation is to be thorough, timely and meaningful, ensuring that the potential impacts of the 7 Project on the title, rights and interests of affected Indigenous groups are documented and 8 considered. Through early and ongoing engagement activities, FEI has been able to establish 9 an understanding of the interests of Indigenous groups and incorporate these into early planning 10 work. FEI is committed to working with responsible Crown agencies (including the BC Oil and 11 Gas Commission) to identify, avoid and mitigate potential impacts on Indigenous title, rights and 12 interests, and where appropriate, to discuss and develop options for mitigation and/or 13 accommodation.

14 8.3.2 Indigenous Groups Potentially Affected

FEI developed a list of Indigenous groups with asserted interests to engage regarding the
 Project using information from the BC Government's Consultative Area Database (CAD), as per
 the Spatial Overview Engine (SOE) Reports (Appendix J-21).

18 In Table 8-2 below, FEI provides the Indigenous groups with asserted interests identified

19 through the CAD, including those that are potentially impacted by the Sperling Route and/or

20 decommissioning/abonnement activities associated with the existing Pattullo Gas Line.

21

Table 8-2: Consultative Area Database Query Indigenous Groups

Sperling Route September 2020	Pattullo Gas Line Abandonment/Decommissioning June 2020
Cowichan Tribes	Cowichan Tribes
Halalt First Nation	Halalt First Nation
	Katzie First Nation
Kwantlen First Nation	Kwantlen First Nation
Kwikwetlem First Nation	Kwikwetlem First Nation
Lyackson First Nation	Lyackson First Nation
Musqueam Indian Band	Musqueam Indian Band
Penelakut Tribe First Nations	Penelakut Tribe First Nations
People of the River Referrals	People of the River Referrals
Seabird Island Band	Seabird Island Band
	Semiahmoo First Nation
Shxw'ow'hamel First Nation (via PRRO)	Shxw'ow'hamel First Nation (via PRRO)
Skawahlook First Nation (via PRRO)	Skawahlook First Nation (via PRRO)



FORTISBC ENERGY INC.

PATTULLO GAS LINE REPLACEMENT CPCN APPLICATION (Evidentiary Update December 15, 2020)

Sperling Route September 2020	Pattullo Gas Line Abandonment/Decommissioning June 2020
Soowahlie Indian Band (via PRRO)	Soowahlie Indian Band (via PRRO)
Stó:lō Tribal Council	Stó:lō Tribal Council
Stó:lō Nation	Stó:lō Nation
Stz'uminus First Nation	Stz'uminus First Nation
	Tsawwassen First Nation
Tsleil-Waututh Nation	Tsleil-Waututh Nation

1

2 8.3.3 FEI's Engagement with Indigenous Groups to Date

On August 23, 2020, FEI initiated early engagement on the Sperling Route with Indigenous groups who have issued cultural or heritage permits, or had previously shown interest in Indigenous monitoring of the Project (Table 8-3). FortisBC's archaeological consultant also reached out to determine whether the groups who issued cultural or heritage permits would be issuing new permits, or amending existing permits with respect to this Project.

8 In order to support this early engagement regarding the Sperling Route, FEI offered capacity

9 funding to these Indigenous groups to ensure they had the resources necessary to engage with

10 FEI and its contractors. FEI's archaeological consultant (Stantec) also offered funding to support

- 11 Indigenous archaeological monitors.
- 12

Table 8-3: Sperling Route – Early Indigenous Group Engagement

Initial Communication Date	Indigenous Group	Indigenous Cultural/Heritage Permit	Indigenous Monitoring Interest	Engagement Meeting Date
8/23/2020	People of the River Referrals (PRRO)	New permit required	No decision	9/11/2020
8/25/2020	Kwantlen First Nation	New permit required	Yes	9/16/2020
8/25/2020	Kwikwetlem First Nation	Does not issue permits	Yes	9/8/2020
8/25/2020	Musqueam Indian Band	Amendment to existing permit required	Yes	9/11/2020
9/10/2020	Tsleil-Waututh Nation	Amendment to existing permit required	Yes	Upcoming (01/19/2021)

13



- 1 On September 10, 2020, FEI emailed a Project update (Appendix I-3) to all Indigenous groups
- 2 identified as having interests potentially impacted by the Sperling Route (see Table 8.2, Column
- 3 1). This letter provided information regarding the new route, including a map, and expected
- 4 archaeological, environmental and geotechnical activities. FEI sent a second Sperling Route
- 5 update letter on October 9, 2020 (Appendix J-22).

To date, FEI has sent each Indigenous group two Sperling Route Project notification update
letters (Appendix J-22), for a total of 112 Sperling Route communications including email, phone
calls and virtual meetings (Appendix J-7).

9 In June 2020, FEI sent communications to Indigenous groups identified as having interests 10 potentially impacted by abandonment/decommissioning activities associated with the existing 11 Pattullo Gas Line (see Table 8-2, Column 2). The abandonment and decommissioning activities 12 remain the same and for both these activities and for the Sperling Route, FEI has received no 13 formal position regarding the engagement process thus far from Indigenous groups.

As the Project is still early in its development, FEI is in discussion with interested Indigenous groups regarding the type of funding required to support their engagement activities and the framework of an agreement between FEI and these groups. FEI will continue to provide Project milestone updates, offer applicable Project reports and schedule engagement meetings throughout the lifecycle of the Project.

19 Key engagement activities to date are listed below in Table 8-4. The complete log of 20 engagement with Indigenous groups is included in Appendix J-7.

21

Table 8-4: Indigenous Groups Key Engagement Activities

Format	Date	Indigenous Representatives	Content		
Indigenous Grou	Indigenous Groups - Table 2 (Sperling Route)				
Emailed Documents	Sep 10, 2020	 20 Indigenous Groups (Table 8.2, Column 1) – Sperling Route 	 Sperling Route introduction letter indicating: Indigenous Permits Pending Archaeological Overview Assessment Introduction Environmental Constraints Report Introduction Archaeological & Environmental Consultants introductions Geotechnical Program Pending Route Map 		



FORTISBC ENERGY INC.

PATTULLO GAS LINE REPLACEMENT CPCN APPLICATION (EVIDENTIARY UPDATE DECEMBER 15, 2020)

Format	Date	Indigenous Representatives	Content
Emailed Documents	Oct 9, 2020	 20 Indigenous Groups (Table 8.2, Column 1) – Sperling Route 	 Sperling route update letter indicating: Route Variation (McCarthy & Nursery Crossings) Archaeological Assessments Pending Geotechnical Program Start Date & Approximate Locations (map) Environmental Constraints Report Pending Environmental Overview Assessment Introduction Route Map
Kwantlen First Na	ation		
Virtual Meeting	Sep 16, 2020	 Kwantlen First Nation Lands Officer Lands Manager Manager of Special Operations 	 Project update meeting discussing: New Sperling Route Geotechnical Program Project Progress To Date Capacity Funding Next Steps
Kwikwetlem First	Nation		
Virtual Meeting	Sep 8, 2020	 Kwikwetlem First Nation Referrals Officer Referrals Liaison Officer Lands & Resources Manager Archaeologist - Brown & Oakes Project Manager - Ecologic Consultants 	 Project update meeting discussing: New Sperling Route Geotechnical Program Project Progress To Date Capacity Funding Indigenous Monitoring Next Steps
Email	Oct 16, 2020	Kwikwetlem First NationReferrals Officer	Capacity Funding Framework Document (Draft) emailed for review by Kwikwetlem
Musqueam India	n Band		
Virtual Meeting	Sep 11, 2020	 Musqueam Indian Band Title & Rights Floor Manager Senior Archaeologist Executive Assistant Intergovernmental Affairs Department Archives & Research Manager Manager, Archaeology 	 Project update meeting discussing: New Sperling Route Geotechnical Program Project Progress To Date Capacity Funding Next Steps



FORTISBC ENERGY INC.

PATTULLO GAS LINE REPLACEMENT CPCN APPLICATION (Evidentiary Update December 15, 2020)

Format	Date	Indigenous Representatives	Content
People of the River Referrals Office			
Virtual Meeting	Sep 11, 2020	People of the River Referrals Office & Sto:lo Resource and Research Management • Referrals Manager	 Project update meeting discussing: New Sperling Route Geotechnical Program Project Progress To Date Next Steps

1 8.3.4 FEI Has Responded to Issues and Interests Raised by Indigenous Groups

At the time of filing, Indigenous groups have not raised any concerns directly related to the Sperling Route.

Kwikwetlem First Nation identified the need for capacity funding to support their ability to review
documents. FEI is in two-way dialogue with Kwikwetlem to accommodate their capacity funding
request, with a draft capacity funding framework document being reviewed by Kwikwetlem at
the time of filing.

8 FEI will address other interests raised by Indigenous groups, including involvement in
9 archaeological and cultural monitoring and contracting opportunities, through ongoing
10 engagement activities.

FEI has logged all interactions and responded to all requests for information from theseIndigenous groups. (Appendix J-7)

13 8.3.5 FEI Will Continue to Engage with Indigenous Groups

Aligned with its Statement of Indigenous Principles, FEI remains committed to engaging with
 Indigenous groups in an ongoing, transparent and meaningful manner. These discussions will
 continue, with an emphasis on seeking consensus on the Sperling Route.

17 FEI understands that Indigenous engagement is important throughout the Project lifecycle, 18 including during future planning, construction and restoration activities. Future engagement 19 activities will continue to be conducted using meetings, document sharing, phone calls, virtual 20 presentations, and letters and emails, as appropriate. FEI will also continue to provide planning and construction information for Indigenous groups to review, allowing FEI to incorporate their 21 22 feedback. This information sharing process will include the BC Oil and Gas Commission's 23 permitting, and the associated construction and environmental management plans. FEI will also 24 keep Indigenous groups informed of Project progress, including submission of this Application.

FEI will ensure capacity funding is available as needed so that Indigenous groups can fully participate. FEI will incorporate feedback from Indigenous groups into the Project's procurement plans to identify socio-economic opportunities of mutual interest. FEI will garner detailed reporting on Indigenous employment and socio-economic impacts during this Project lifecycle.



- Follow-up meetings will be scheduled with Indigenous groups as additional information around
 employment opportunities, contracting and procurement becomes available.
- 3 Once the Project is complete, FEI will offer Indigenous groups the opportunity to meet and 4 discuss lessons learned for incorporation into future FEI projects.

5 8.3.6 FEI's Indigenous Engagement Process to Date Has Been Appropriate

6 FEI's Statement of Indigenous Principles states the importance of clear and open 7 communication with Indigenous groups. FEI believes that its engagement process for the 8 Project reflects these principles. Through early engagement activities, FEI has established key 9 points of contact, preferred methods of communication, and an early understanding of potential 10 interests from Indigenous groups. All engagement activities and correspondence have been 11 appropriately logged and included in the appendices to this Application. As the Project 12 develops, FEI will continue to work through various channels to resolve outstanding questions 13 and address comments and concerns.

14 **8.4** *Conclusion*

FEI has consulted and sought feedback from public and all stakeholders and has engaged with the potentially impacted Indigenous groups in the area of the Project. FEI's consultation and engagement has been sufficient to date, and FEI will continue to work with all identified stakeholders and Indigenous groups to address outstanding concerns throughout the lifecycle of the Project.



19.PROVINCIAL GOVERNMENT ENERGY OBJECTIVES AND LONG2TERM RESOURCE PLAN

3 **9.1** *INTRODUCTION*

4 This section discusses the factors that section 46(3.1) of the UCA states the BCUC must 5 consider when determining whether to issue a CPCN:

- 6 (a) the applicable of British Columbia's energy objectives,
- 7 (b) the most recent long-term resource plan filed by the public utility under section 44.1, if8 any, and
- 9 (c) the extent to which the application for the certificate is consistent with the applicable 10 requirements under sections 6 and 19 of the *Clean Energy Act* (CEA).

11

- 12 Sections 6 and 19 of the CEA as referred to in (c) above, do not apply to FEI. FEI addresses
- 13 the other two requirements below.

14 9.2 BRITISH COLUMBIA'S ENERGY OBJECTIVES

The Project will support the British Columbia energy objective in section 2(k) of the CEA "to encourage economic development and the creation and retention of jobs". The Project will support this objective by creating jobs and contributing to the local economy. The PGR Project will create jobs in BC through FEI's contractor, and result in the procurement of goods and services from locally owned and operated vendors and subcontractors. The increase in use of local dining and lodging accommodations during construction will also benefit the economy.

FEI will work with Indigenous and local leaders and organizations to develop the local workforce, support local businesses, and connect them to Project opportunities. For example, to promote Indigenous and other local participation in the Project, FEI will host business-tobusiness and worker-to-business networking events as appropriate, and where they can meet safety requirements associated with the COVID-19 pandemic. These events would facilitate introductions between Indigenous and other local business owners, members of the local workforce, and connect them to contract and employment opportunities

28 9.3 LONG TERM RESOURCE PLAN

The PGR Project is described in Section 6.4 of FEI's most recently filed 2017 LTGRP. At the time of filing the 2017 LTGRP, MoTI (via TransLink) had indicated the existing bridge would be demolished and replaced by the end of 2021, and had directed FEI to remove its existing gas line by the end of 2021. Based on MoTI's current Pattullo Bridge replacement project schedule, demolition is now anticipated to proceed in 2023. Otherwise, the Project remains consistent with the 2017 LTGRP.



1 10. CONCLUSION

2 FEI submits that the PGR Project is in the public interest and should be approved.

As set out in Section 3 of the Application, it is clear that the PGR Project is necessary to replace the system capacity currently provided by the Pattullo Gas Line, which must be decommissioned. FEI must undertake the PGR Project to continue to provide safe and reliable natural gas service to customers residing in the communities of Burnaby, New Westminster and Coquitlam who rely on all or portion of their gas supply from the Pattullo Gas Line.

8 As described in Section 4 of the Application, FEI conducted a thorough evaluation of the 9 alternatives for the PGR Project and has proposed a solution that meets the Project objectives 10 and has the least impact in terms of technical design and scope complexity, cost, construction 11 environmental, archaeological and societal impacts, and impacts to FEI's existing system 12 capacity and resiliency. While a like-for-like replacement of the Pattullo Gas Line would have 13 been desirable, MoTI rejected FEI's requests to attach a gas line on the New Bridge, and a 14 trenchless crossing of the Fraser River was not feasible. Further, FEI's analysis of other 15 alternatives demonstrated that an overland gas line was the only feasible alternative. FEI's 16 evaluation of the Overland Gas Line route options showed that the route in the City of Burnaby 17 has the least impact, and the only solution that can be implemented prior to the time when FEI must decommission the Pattullo Gas Line. 18

FEI completed its alternative analysis and determined that the Sperling Route is the preferred alternative for the Project. FEI has provided a detailed description of the PGR Project, including its cost and rate impacts, an evaluation of the potential environmental and archaeological impacts of the Project, as well as FEI's thorough consultation with stakeholders and Indigenous communities on the PGR Project.

The Company requests that the BCUC grant a CPCN for the PGR Project and approve the PGR
 Application and Preliminary Stage Development Costs deferral account as requested.